

Lucent Technologies
Bell Labs Innovations



**DDM-2000 OC-3 Multiplexer
Releases 8.0 through 11.1**

User/Service Manual — Volume I

363-206-280
Issue 4
April 1998

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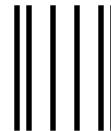
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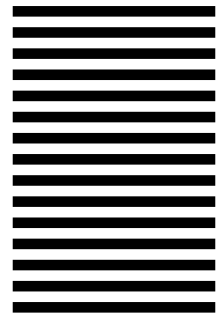
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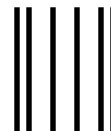
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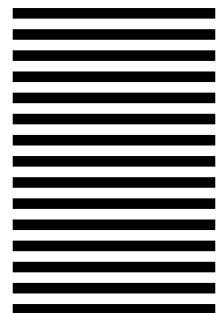
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Contents

About This Document	lix
■ Purpose	lix
■ Intended Audiences	lix
■ Reason for Reissue	lix
■ Safety Instructions	lx
Product Safety Labels	lx
Lightwave Safety Guidelines	lx
General Laser Information	lx
Lasers and Eye Damage	lxi
Classification of Lasers	lxi
Lightwave Safety Precautions	lxii
Safety Precautions for Enclosed Systems	lxii
Safety Precautions for Unenclosed Systems	lxiii
Electrostatic Discharge (ESD) Considerations	lxiii
■ Related Documentation	lxviii
■ Related Training	lxxv
■ Customer Technical Support (CTS)	lxxviii
■ Engineering and Installation Services	lxxxii
Customer Technical Support Enhanced Services	lxxxiii
■ Documentation Support	lxxxiii
■ How to Order Documents	lxxxiv
Standing Orders	lxxxv
■ How to Comment on This Document	lxxxvi
■ Electronic Documentation	lxxxvi

1	System Introduction	1-1
	■ Overview	1-1
	■ Lucent 2000 Product Family	1-1
	■ DDM-2000 Product Family	1-3

Contents

The Year 2000	1-4
■ Introduction to the DDM-2000 OC-3 Multiplexer	1-5
■ DDM-2000 OC-3 Multiplexer Releases	1-6
Release Descriptions	1-6

2	Applications	2-1
	■ Overview	2-1
	■ Introduction	2-2
	■ Network Configurations	2-3
	Path Switched Rings	2-3
	OC-3 Path Switched Rings	2-6
	OC-12 Path Switched Rings	2-9
	OC-12 Ring on OC-3 Multiplexer	2-11
	OC-3 Ring with OC-12 Ring Transport	2-13
	OC-12 STS-1/VT1.5 Path Switched Ring (0x1)	2-17
	OC-1 Path Switched Rings	2-17
	Folded Ring	2-18
	OC-1 Ring Transport on OC-3 Ring	2-20
	Single Homing to Linear DDM-2000 OC-3 Networks	2-22
	Stand-Alone OC-1 Ring/Hub Networks	2-23
	OC-3 Ring Transport on OC-12 Point-to-Point	2-25
	Dual Homing	2-26
	OC-1 Ring Transport on OC-3 Ring	2-26
	Dual Ring Interworking (DRI)	2-28
	Dual Homing with DRI	2-36
	OC-3 Linear Optical Extensions from OC-3 and OC-12 Rings	2-38
	Hairpin Cross-Connections on Rings	2-40
	Enhanced Routing	2-41
	OC-1 Ring Pass-Through	2-41

Contents

OC-1 Ring Hairpin Routing, Single-Homed	2-42
OC-1 Ring Hairpin Routing, Dual-Homed	2-43
Hairpin Local Drop Routing	2-44
Point-to-Point Topologies	2-45
OC-3 Point-to-Point	2-45
OC-3 Repeater	2-50
Hubbing	2-51
OC-3 Hubbing	2-52
OC-3c Transport on OC-12	2-54
Add/Drop	2-56
Electrical Multiplexer	2-58
2000 Product Family Interworking	2-59
SLC-2000 Access System	2-59
DACS IV-2000 Cross-Connect System	2-61
FT-2000 OC-48 Lightwave System	2-62
<i>MegaStar</i> 2000 Radio	2-67
Multivendor Applications	2-68
■ Service Applications	2-69
Loop Feeder	2-69
Interoffice Transport	2-69
Broadband Business Access	2-70
LAN/WAN Data Networking: Native Mode LAN Interconnect (NMLI) Services	2-72
Gateway Between SONET and Asynchronous Interfaces	2-74
Teleprotection and SCADA Applications	2-76
Intelligent Vehicle Highway System (IVHS) Applications	2-78
DS1 Performance Monitoring for Tariff Verification	2-80
DS3 Transmultiplexer (TMUX) Application.	2-82
High bit-rate Digital Subscriber Line (HDSL) Application.	2-83

Contents

3	Shelf Descriptions and Configurations	3-1
■	Overview	3-1
■	DDM-2000 OC-3 Multiplexer Shelf	3-1
■	DDM-2000 OC-3 Shelf Capacity	3-7
■	Shelf Configurations	3-8
	OC-3 Terminating Shelf	3-12
	OC-3 Hub Shelf	3-13
	OC-3 STS-1 Drop Shelf	3-14
	EC-1 Electrical Multiplexer Shelf	3-15
	OC-3 DS1 Add/Drop Shelf	3-16
	OC-3 Ring Shelf	3-17
	OC-3 Dual Ring Interworking (DRI) Shelf	3-18
	OC-3 Ring Shelf with Optical Extension	3-19
	OC-3 VT Hairpin Shelf	3-20
	DS3 Data Services in OC-3 Shelf	3-21
	OC-3 DDM-2000 FiberReach Host Single-Homing Shelf	3-22
	OC-3 DDM-2000 FiberReach Host Dual-Homing Shelf	3-24
	OC-3 FiberReach Host Shelf—Enhanced Routing	3-25
	OC-3 FiberReach Host Shelf - Enhanced Routing with 26G2-U OLIU	3-26
	HDSL Interface	3-27
	Transmultiplexer	3-28
■	DDM-2000 Fan Shelf	3-29

Contents

4	Power	4-1
	■ Overview	4-1
	■ Introduction	4-1
	■ Power Description	4-2
	Circuit Packs	4-3
	OLIU Circuit Packs	4-3
	TG Circuit Packs	4-3
	DS3/TMUX Circuit Packs	4-3
	STS1E Circuit Packs	4-3
	MXRVO Circuit Packs	4-3
	DS1/DS1PM Circuit Packs	4-4
	HDSL Circuit Packs	4-4
	Control Circuit Packs	4-4
	LEDs	4-5
	Power Minor Alarm	4-5
	Power Distribution	4-6

5	Transmission and Synchronization Interfaces	5-1
	■ Overview	5-1
	■ Transmission Interfaces	5-2
	■ Ring Interfaces	5-19
	OC-3/OC-12 Ring (0x1)	5-19
	DS3 Data Services on an OC-3 Ring	5-22
	OC-3/OC-12 Linear (1+1) Optical Extensions	5-23
	OC-3/OC-1 Ring (0x1)	5-25
	OC-1 Ring Function Unit Pass-Through	5-28
	OC-1 Ring Hairpin Local Drop	5-29
	OC-1/OC-1 Function Unit Hairpin Ring	5-30

Contents

■ Synchronization Interfaces	5-34
Timing Modes	5-34
Free-Running	5-34
Line Timing	5-34
DS1 External	5-35
Holdover	5-35
DS1 Output Modes: MULT and SYNC OUT	5-35
DS1 Output Mode, MULT	5-35
DS1 Output Mode, SYNC OUT	5-36
Synchronization Messaging	5-40
Applications	5-41
DS1 Timing Output Integrity	5-41
Automatic Synchronization Reconfiguration	5-43
Synchronization Provisioning Integrity	5-44
Feature Details and Options	5-45
Examples	5-48
Synchronization Reconfiguration Using an Externally Timed Access Ring	5-49
Synchronization Reconfiguration in an Access Ring	5-51
Synchronization Messaging to Support DS1 Timing Outputs	5-54
Dual-Homing DRI Synchronization Configurations	5-56
OC-3 and FT-2000 OC-48 Lightwave System	5-56
OC-3 and OC-12	5-58
OC-3 and OC-1 External/Line Timing	5-60
Network Timing Distribution	5-62
Interoffice Timing Distribution	5-62
Access Network Timing Distribution	5-64

Contents

6	Operations Interfaces	6-1
■	Overview	6-1
■	Craft Interface Terminals (CIT)	6-2
	Local Access	6-4
	Using a PC as a CIT	6-6
	Modem Access	6-6
	Remote Access Using the Data Communications Channel (DCC)	6-7
	CPro-2000 Graphical User Interface and Provisioning Tool	6-8
■	User Panel	6-8
	User Panel LEDs	6-10
	FE SEL Pushbutton	6-10
	ACO/TST Pushbutton	6-11
	UPD/INIT Pushbutton	6-11
	Pushbutton Combinations	6-12
■	Equipment Indicators	6-13
	FAULT Indicators	6-13
	ACTIVE Indicators	6-13
■	Office Alarms	6-14
■	TL1/X.25 Interface	6-15
	ITM SNC	6-15
■	Serial Telemetry (TBOS)	6-16
	TBOS Display Tables	6-17
	TBOS Alarm and Status Points	6-18
	DDM-2000 OC-3 TBOS Control Points	6-21
■	Parallel Telemetry	6-25
■	User-Definable Miscellaneous Discretes— Environmental Alarms and Controls	6-27
■	Order Wire	6-30

Contents

7	Circuit Pack Descriptions	7-1
■	Overview	7-1
■	Introduction	7-1
■	Compatibility	7-2
■	Control	7-2
	BBG8/BBG8B SYSCTL Circuit Pack Description	7-3
	Purpose of Circuit	7-3
	BBG8/BBG8B SYSCTL Faceplate Controls and Indicators	7-3
	General Description of Operation	7-4
	Detailed Description of Operation	7-4
	Control Circuitry	7-4
	Memory	7-4
	Transmission/Timing Circuit Pack Interfaces	7-6
	Operation Interfaces	7-6
	OC-3 Transport Overhead Channel	7-6
	Power Monitoring and Fan Control	7-6
	Interface to Other DDM-2000 OC-3 Shelves	7-7
	Power Circuitry	7-7
	BBG8/BBG8B SYSCTL Hardware Setting	7-8
	BBG8/BBG8B SYSCTL Quick Reference Summary	7-9
	Interface Functions	7-9
	User Panel	7-9
	Telemetry Functions	7-9
	Maintenance Functions	7-9
	BBG9 OHCTL Circuit Pack Description	7-10
	Purpose of Circuit	7-10
	Faceplate Indicator	7-10
	General Description of Operation	7-11
	Detailed Description of Operation	7-11

Contents

OC-3 Transport Overhead Channel	7-11
Parallel Telemetry	7-11
User Definable Miscellaneous Discrete Environmental Alarms and Controls	7-11
X.25 Message-Based Operation Interface	7-11
Order Wire Interface	7-13
BBG9 OHCTL Quick Reference Summary	7-13
Functions	7-13
BBG10 OHCTL Circuit Pack Description	7-14
Purpose of Circuit	7-14
Faceplate Indicator	7-14
General Description of Operation	7-15
Detailed Description of Operation	7-15
OC-3 Transport Overhead Channel	7-15
Parallel Telemetry	7-15
User Definable Miscellaneous Discrete Environmental Alarms and Controls	7-15
X.25 Message-Based Operation Interface	7-15
Order Wire Interface	7-17
BBG10 OHCTL Hardware Settings	7-17
Interface Circuitry	7-18
Maintenance Features and Modes	7-18
Power Circuitry	7-18
BBG10 OHCTL Quick Reference Summary	7-18
Functions	7-18
■ Synchronization	7-19
Synchronization Functions	7-19
BBF2B TGS Circuit Pack Description	7-19
Purpose of Circuit	7-19
TG Faceplate Indicators	7-20
General Description of Operation	7-21
DS1 Timing Output	7-21
Detailed Description of Operation	7-22

Contents

Control Circuitry	7-22
Timing Circuitry	7-23
Clock Output Functions	7-24
Protection Circuitry	7-24
Fault Detection Circuitry	7-25
Power Circuitry	7-25
TG Hardware Settings	7-25
TG Quick Reference Summary	7-27
Provisioned Modes	7-27
Holdover Mode	7-27
Maintenance and Control	7-27
DS1 Output	7-27
■ Transmission - Electrical Interface	7-28
BBF1/BBF1B DS1 Circuit Pack Description	7-28
Purpose of Circuit	7-28
DS1 Faceplate Indicator	7-28
General Description of Operation	7-29
Detailed Description of Operation	7-29
Transmission Circuitry	7-29
Control Circuitry	7-29
Timing Circuitry	7-31
Protection Circuitry	7-31
Fault Detection Circuitry	7-32
Loopbacks	7-32
Performance Monitoring	7-32
Power Circuitry	7-32
DS1 Hardware Settings	7-33
DS1 Quick Reference Summary	7-34
Transmit Functions	7-34
Receive Functions	7-34
Control Functions	7-34
Maintenance Signal Functions	7-34

Contents

BBF3/BBF3B DS1PM Circuit Pack Description	7-35
Purpose of Circuit	7-35
DS1PM Faceplate Indicator	7-35
General Description of Operation	7-36
Detailed Description of Operation	7-36
Transmission Circuitry	7-36
Control Circuitry	7-36
Timing Circuitry	7-38
Protection Circuitry	7-38
Fault Detection Circuitry	7-39
Loopbacks	7-39
Performance Monitoring	7-39
Power Circuitry	7-39
DS1PM Hardware Settings	7-40
DS1PM Quick Reference Summary	7-41
Transmit Functions	7-41
Receive Functions	7-41
Control Functions	7-42
Maintenance Signal Functions	7-42
177A Retainer Card Description	7-43
Purpose of Card	7-43
BBF5 Jumper Circuit Pack Description	7-44
Purpose of Circuit	7-44
BBF8 High bit rate Digital Subscriber Line (HDSL)	7-45
Purpose of Circuit	7-45
HDSL Faceplate Indicator	7-45
General Description of Operation	7-46
Detailed Description of Operation	7-46
Transmission Circuitry	7-46
Control Circuitry	7-48
Timing Circuitry	7-48
Protection Circuitry	7-48
Fault Detection Circuitry	7-49

Contents

Loopbacks	7-49
Optional HDSL Settings	7-50
Performance Monitoring	7-50
Power Circuitry	7-51
HDSL Quick Reference Summary	7-53
Communication Functions	7-53
Control Functions	7-53
Maintenance Signal Functions	7-53
BBG2 MXRVO Circuit Pack Description	7-54
Purpose of Circuit	7-54
MRXVO Faceplate Indicators	7-54
General Description of Operation	7-55
Detailed Description of Operation	7-55
Transmission Circuitry	7-55
Control Circuitry	7-55
Timing Circuitry	7-56
Protection Circuitry	7-56
Fault Detection Circuitry	7-57
Performance Monitoring	7-57
Power Circuitry	7-57
MXRVO Quick Reference Summary	7-58
Transmit Functions	7-58
Receive Functions	7-58
Control Functions	7-58
Maintenance Signal Functions	7-58
BBG4/BBG4B DS3 Circuit Pack Description	7-59
Purpose of Circuit	7-59
BBG4/BBG4B DS3 Faceplate Indicators	7-59
General Description of Operation	7-60
Detailed Description of Operation	7-60
Transmission Circuitry	7-60
VMR Function	7-61
Control Circuitry	7-62

Contents

Timing Circuitry	7-62
Protection Circuitry	7-62
Fault Detection Circuitry	7-63
Loopbacks	7-63
Performance Monitoring	7-63
BBG4/BBG4B DS3 Hardware Settings	7-64
Power Circuitry	7-65
BBG4/BBG4B DS3 Quick Reference Summary	7-65
Transmit Functions	7-65
Receive Functions	7-65
Control Functions	7-65
Maintenance Signal Functions	7-66
BBG6 STS1E Circuit Pack Description	7-67
Purpose of Circuit	7-67
STS1E Faceplate Indicators	7-67
General Description of Operation	7-68
Detailed Description of Operation	7-70
Control Circuitry	7-70
Timing Circuitry	7-71
Protection Circuitry	7-71
Fault Detection Circuitry	7-72
Loopbacks	7-72
Performance Monitoring	7-72
Power Circuitry	7-72
STS1E Hardware Settings	7-73
STS1E Quick Reference Summary	7-74
Transmit Functions (High-Speed Mode)	7-74
Transmit Functions (Low-Speed Mode)	7-74
Receive Functions (High-Speed Mode)	7-74
Receive Functions (Low-Speed Mode)	7-74
Control Functions	7-75
Maintenance Signal Functions (High-Speed Mode)	7-75
Maintenance Signal Functions (Low-Speed Mode)	7-75

Contents

BBG19 DS3 Data Services Interface Circuit Pack	
Description	7-76
Purpose of Circuit	7-76
BBG19 DS3 Faceplate Indicators	7-76
General Description of Operation	7-77
Detailed Description of Operation	7-77
Transmission Circuitry	7-77
VMR Function	7-79
Control Circuitry	7-79
Timing Circuitry	7-79
Locked DS3 Circuitry	7-79
Fault Detection Circuitry	7-79
Loopbacks	7-80
Performance Monitoring	7-80
BBG19 DS3 Hardware Settings	7-81
Power Circuitry	7-82
BBG19 DS3 Quick Reference Summary	7-82
Transmit Functions	7-82
Receive Functions	7-82
Control Functions	7-82
Maintenance Signal Functions	7-83
BBG20 Transmultiplexer	7-84
Purpose of Circuit	7-84
BBG20 TMUX Faceplate Indicators	7-84
General Description of Operation	7-85
Detailed Description of Operation	7-85
Transmission Circuitry	7-85
Control Circuitry	7-86
Timing Circuitry	7-87
Protection Circuitry	7-87
Fault Detection Circuitry	7-87
Power Circuitry	7-88
Loopbacks	7-88
Performance Monitoring	7-88

Contents

BBG20 TMUX Hardware Settings	7-89
BBG20 TMUX Quick Reference Summary	7-89
Transmit Functions	7-89
Receive Functions	7-90
Control Functions	7-90
Maintenance Signal Functions	7-90
■ Transmission - Optical Interface	7-91
Universal Optical Connector	7-91
Optical Interface Circuit Packs	7-93
21D/21D-U OLIU Circuit Pack Description	7-95
Purpose of Circuit	7-95
21D/21D-U OLIU Faceplate Indicators	7-95
General Description of Operation	7-96
Detailed Description of Operation	7-96
Transmission Circuitry	7-96
Control Circuitry	7-98
Timing Circuitry	7-98
Protection Circuitry	7-98
Fault Detection Circuitry	7-99
Performance Monitoring	7-99
Power Circuitry	7-99
21D/21D-U OLIU Quick Reference Summary	7-99
Transmit Functions	7-99
Receive Functions	7-100
Control Functions	7-100
Maintenance Signal Functions	7-100
21G/21G-U/21G2-U OLIU Circuit Pack Description	7-101
Purpose of Circuit	7-101
21G/21G-U/21G2-U OLIU Faceplate Indicators	7-101
General Description of Operation	7-102
Detailed Description of Operation	7-103
Transmission Circuitry	7-103
Control Circuitry	7-104

Contents

Timing Circuitry	7-105
Protection Circuitry	7-105
Fault Detection Circuitry	7-105
Performance Monitoring	7-105
Power Circuitry	7-106
21G/21G-U OLIU Hardware Settings	7-106
21G/21G-U/21G2-U OLIU Quick Reference Summary	7-107
Transmit Functions	7-107
Receive Functions	7-107
Control Functions	7-107
Maintenance Signal Functions	7-108
22F/22F-U/22F2-U OLIU Circuit Pack Description	7-109
Purpose of Circuit	7-109
22F/22F-U/22F2-U OLIU Faceplate Indicators	7-109
General Description of Operation	7-110
Detailed Description of Operation	7-110
Transmission Circuitry	7-110
Control Circuitry	7-111
Timing Circuitry	7-112
Protection Circuitry	7-112
Fault Detection Circuitry	7-113
Performance Monitoring	7-113
Power Circuitry	7-113
22F-type OLIU Quick Reference Summary	7-114
Transmit Functions	7-114
Receive Functions	7-114
Control Functions	7-114
Maintenance Signal Functions	7-115
22D-U OLIU Circuit Pack Description	7-116
Purpose of Circuit	7-116
22D-U OLIU Faceplate Indicators	7-116
General Description of Operation	7-117

Contents

Detailed Description of Operation	7-117
Control Circuitry	7-119
Timing Circuitry	7-119
Protection Circuitry	7-119
Fault Detection Circuitry	7-120
Performance Monitoring	7-120
Power Circuitry	7-120
22D-U OLIU Quick Reference Summary	7-121
Transmit Functions	7-121
Receive Functions	7-121
Control Functions	7-121
Maintenance Signal Functions	7-122
22G-U/22G2-U/22G3-U OLIU Circuit Pack Description	7-123
Purpose of Circuit	7-123
22G-U/22G2-U/22G3-U OLIU Faceplate Indicators	7-123
General Description of Operation	7-125
Detailed Description of Operation	7-125
Transmission Circuitry	7-125
Control Circuitry	7-126
Timing Circuitry	7-128
Protection Circuitry	7-128
Fault Detection Circuitry	7-128
Performance Monitoring	7-128
Power Circuitry	7-129
22G-U/22G2-U/22G3-U OLIU Quick Reference Summary	7-129
Transmit Functions	7-129
Receive Functions	7-129
Control Functions	7-130
Maintenance Signal Functions	7-130

Contents

24G-U OLIU Circuit Pack Description	7-131
Purpose of Circuit	7-131
24G-U OLIU Faceplate Indicators	7-131
General Description of Operation	7-133
Detailed Description of Operation	7-133
Transmission Circuitry	7-133
Control Circuitry	7-134
Timing Circuitry	7-135
Protection Circuitry	7-135
Fault Detection Circuitry	7-136
Performance Monitoring	7-136
Power Circuitry	7-136
24G-U OLIU Quick Reference Summary	7-136
Transmit Functions	7-136
Receive Functions	7-137
Control Functions	7-137
Maintenance Signal Functions	7-138
26G2-U Circuit Pack Description	7-139
Purpose of Circuit	7-139
26G2-U OLIU Faceplate Indicators	7-139
General Description of Operation	7-140
Detailed Description of Operation	7-141
Transmission Circuitry	7-142
Control Circuitry	7-143
Timing Circuitry	7-143
Protection Circuitry	7-143
Fault Detection Circuitry	7-143
Performance Monitoring	7-144
Power Circuitry	7-144
26G2-U OLIU Quick Reference Summary	7-144
Transmit Functions	7-144
Receive Functions	7-144
Control Functions	7-145
Maintenance Signal Functions	7-145

Contents

27G-U/27G2-U OLIU Circuit Pack Description	7-146
Purpose of Circuit	7-146
27G-U/27G2-U OLIU Faceplate Indicators	7-146
General Description of Operation	7-148
Detailed Description of Operation	7-148
Transmission Circuitry	7-148
Control Circuitry	7-149
Timing Circuitry	7-150
Protection Circuitry	7-151
Fault Detection Circuitry	7-151
Performance Monitoring	7-151
Power Circuitry	7-151
27G-U/27G2-U OLIU Quick Reference	
Summary	7-152
Transmit Functions	7-152
Receive Functions	7-152
Control Functions	7-152
Maintenance Signal Functions	7-153

8	Administration and Provisioning	8-1
■	Overview	8-1
■	Administration	8-1
	Version Recognition	8-1
	Security	8-2
	Software Upgrades	8-4
	Software Compatibility	8-4
	Controller Maintenance and Memory	
	Administration	8-4
	Controller Maintenance	8-4
	Memory Administration	8-5
	System Backup and Restoral	8-6
	Service-Affecting Actions	8-7

Contents

■ Multiplexing and Mapping	8-8
DS1 to OC-1/OC-3/OC-12	8-9
DS3 to OC-1/OC-3/OC-12	8-12
EC-1 to OC-1/OC-3/OC-12	8-12
OC-1/OC-3/OC-12 to OC-1/OC-3/OC-12	8-13
OC-3 to OC-1	8-13
OC-1 to OC-1 Hairpin	8-14
STS-1 to STS-1 Hairpin	8-14
OC-3c to OC-3c (Optional Feature)	8-15
DS1 to EC-1	8-15
DS3 to EC-1	8-15
EC-1 to EC-1	8-15
■ Provisioning	8-16
General	8-16
Default Provisioning	8-16
Remote Provisioning	8-16
Automatic Provisioning	8-16
Circuit Pack Replacement	8-16
Feature Package Provisioning	8-17
Data Communications Channel (DCC)	
Provisioning	8-17
Port State Provisioning	8-17
Channel State Provisioning	8-18
Line State Provisioning	8-18
AIS or Unequipped Provisioning	8-18
Open Systems Interconnection (OSI)	
Provisioning	8-19
Operations Interworking Provisioning	8-20
Single-Ended Operations	8-21
Centralized Survivable OS Access (OSGNE)	8-21
Remote Login	8-22
Remote Office Alarms and User Panel	8-22
Remote Software Download and Copy	8-22

Contents

Directory Services Network Element (DSNE)	8-23
Alarm Groups	8-23
Alarm Gateway Network Element (AGNE)	8-24
Operations Interworking Guidelines	8-25
■ Cross-Connection Provisioning	8-26
Cross-Connection Types	8-27
Linear Application Default Cross-Connection Mode	8-30
Manual Cross-Connections	8-31
Allowable Cross-Connects	8-32
Optical Point-to-Point Application	8-45
Optical Drop Application	8-45
Optical Hubbing Application	8-45
Optical Add/Drop Application	8-45
Electrical EC-1 Multiplexer Application	8-46
OC-3/OC-12/OC-1 Path Protected Ring Application	8-46
OC-3/OC-12 Path Protected Ring Drop and Continue Application	8-46
OC-3/OC-12 Path Protected Ring Optical Extension Application	8-46
Manual Cross-Connection Procedure	8-47
Manual Cross-Connection Restrictions	8-48
OC-3 Linear Network Cross-Connection Example	8-50
OC-3 Ring Cross-Connection Provisioning	8-56
OC-3 Ring Network Cross-Connection Example	8-57
DS3/EC-1 Ring Network Cross-Connection Example	8-61
OC-3/OC-12 Ring Drop and Continue Cross-Connection Provisioning	8-61
OC-3/OC-12 Ring Network Drop and Continue Cross-Connection Example	8-64
OC-3/OC-12 VT1.5 Path Switched Ring (0x1) Single Homing	8-66
Example Cross-Connections	8-67

Contents

OC-3/OC-1 Ring Cross-Connection Provisioning	8-70
OC-3/OC-1 Ring Network Cross-Connection Example	8-70
Single-Homed OC-3/OC-1 Path-Switched Ring Example	8-74
Example Cross-Connections	8-76
Dual-Homed OC-3/OC-1 Path-Switched Ring Example	8-77
Example Cross-Connections	8-78
■ Switch Selectable Parameters	8-79
■ CIT Selectable Parameters	8-79
Identifiers	8-85
Performance Monitoring (PM) Parameters Provisionable via the CIT	8-86

9	Maintenance Description	9-1
■	Overview	9-1
	Three-Tiered Operations	9-1
■	Single-Ended Maintenance Philosophy	9-4
	Single-Ended Operations (SEO)	
	Operations Interworking	9-4
■	In-Service Upgrades	9-6
	Software Upgrades	9-6
	Application Upgrades	9-7
■	Software Compatibility	9-8
■	Maintenance Signaling	9-11
	Non-Ring Applications	9-13
	Ring Applications	9-18
■	Fault Detection, Isolation, and Reporting	9-23
	Detection	9-23
	Isolation	9-23
	Reporting	9-23

Contents

■ Protection Switching	9-24
Automatic Line Protection	9-24
Status of ACTIVE LED on OLIUs	9-24
APS Initiation Criteria	9-25
Path Protection Switching (Path Switched Rings)	9-27
Path Protection Scheme	9-28
Path Protection - Locked DS3 Cross-Connect	9-30
Dual Ring Interworking (DRI)	9-31
Dual Ring Interworking (DRI) Path Protection Scheme	9-31
OC-3/OC-12 Path Switched Ring (0x1)	9-33
OC-3/OC-1 Path Switched Ring (0x1)	9-33
Status of ACTIVE LED on Rings	9-33
Equipment Protection	9-33
Synchronization Reference Protection	9-34
■ Loopbacks	9-35
■ Tests	9-35
Transmission Tests	9-35
Automatic Turnup Tests	9-36
Operations Interface Tests	9-38
■ Performance Monitoring (PM)	9-38
VT Performance Monitoring	9-40
DS1 Performance Monitoring	9-40
DS3 Performance Monitoring	9-42
DS3 Path PM	9-42
P-Bit	9-42
Adjusted F&M Bit	9-42
C-Bit	9-43
DS3 Line	9-43
Performance Parameters	9-43
Optical Parameters	9-46
Performance Monitoring Enabling	9-46
Laser Bias Current	9-46
Optical Transmit Power	9-46

Contents

OC-3 Section Parameters	9-46
Performance Monitoring Enabling	9-46
Severely Errored Frame Seconds (SEFS)	9-46
OC-3/EC-1 Line Parameters	9-47
Performance Monitoring Enabling	9-47
Line Coding Violations (B2 Parity)	9-47
Errored Seconds (ES)	9-47
Severely Errored Seconds (SES)	9-47
Unavailable Seconds (UAS)	9-48
Line Protection Switch Counts	9-48
STS Pointer Justification Count (PJC)	9-48
STS-1 Path Parameters	9-48
Performance Monitoring Enabling	9-48
STS-1 Path Coding Violations (B3 Parity)	9-49
Errored Seconds (ES)	9-49
Severely Errored Seconds (SES)	9-50
Unavailable Seconds (UAS)	9-50
VT1.5 Path Parameters	9-50
Performance Monitoring Enabling	9-50
Errored Seconds (ES)	9-50
Severely Errored Seconds (SES)	9-51
Unavailable Seconds (UAS)	9-51
DS1 Path Parameters	9-51
Performance Monitoring Enabling	9-51
Errored Seconds (ES)	9-51
Severely Errored Second (SES)	9-52
Unavailable Seconds (UAS)	9-52
CV-P Coding Violations	9-52
CV-PFE Coding Violations	9-52
DS1 Line Parameters	9-52
ES-L Errored Seconds	9-52
DS3 Parameters	9-53
Performance Monitoring Enabling	9-53

Contents

DS3 Performance Monitoring (PM)	9-53
DS3 Path	9-54
CV-P Coding Violations	9-54
Severely Errored Frame Seconds (SEFS)	9-54
Errored Seconds (ES-P)	9-54
Severely Errored Seconds (SES-P)	9-54
Unavailable Seconds (UAS-P)	9-54
C-Bit	9-55
DS3 Line	9-56
CV-L Coding Violations	9-56
ES-L Errored Seconds	9-56
SES-L Severely Errored Seconds	9-56
OC-1 Section Parameters	9-56
Performance Monitoring Enabling	9-56
Severely Errored Frame Seconds (SEFS)	9-56
OC-1 Line Parameters	9-56
Performance Monitoring Enabling	9-56
Line Coding Violations (B2 Parity)	9-56
Errored Seconds (ES)	9-57
Severely Errored Seconds (SES)	9-57
Unavailable Seconds (UAS)	9-57
STS Pointer Justification Count (PJC)	9-57
OC-12 Line Parameter	9-58
Performance Monitoring Enabling	9-58
Line Coding Violations (B2 Parity)	9-58
Errored Seconds (ES)	9-58
Severely Errored Seconds (SES)	9-58
Unavailable Seconds (UAS)	9-58
Line Protection Switch Counts	9-59
STS Pointer Justification Count (PJC)	9-59
Performance Monitoring Data Storage and Reports	9-60
Performance Monitoring During Failed Conditions	9-60

Contents

Performance Parameter Thresholds	9-60
TCA Transmission to OS	9-61
Performance Monitoring Reports	9-61
TCA Summary Report	9-61
Performance Status Reports	9-61
■ Reports	9-62
Alarm and Status Report	9-62
Provisioning Reports	9-62
Database Change Transmission to OS	9-62
Maintenance History Report	9-62
State Reports	9-63
Equipment Report	9-63
Network Map Report	9-63

10	Technical Specifications	10-1
■	Overview	10-1
■	DDM 2000 OC-3 Multiplexer	10-1
	External Transmission Interfaces	10-1
	Electrical Interfaces	10-2
	DS1 Low-Speed (BBF1B)	10-3
	DS1PM Low-Speed (BBF3/BBF3B)	10-4
	HDSL Interface (BBF8)	10-5
	DS3 Low-Speed (BBG4/4B)	10-6
	EC-1 High-Speed and Low-Speed (BBG6)	10-8
	DS3 Data Services Interface (BBG19)	10-9
	Transmultiplexer (BBG20)	10-10
	Lightguide Jumpers	10-12
	Optical Interfaces	10-13
	Long Reach OC-3 Interface (21G/21G-U/ 21G2-U OLIU)	10-13
	Intermediate Reach OC-3 Interface (22F/22F-U/ 22F2-U OLIU)	10-14

Contents

Long Reach OC-3 Interface (22G-U/22G2-U/ 22G3-U OLIU)	10-15
Long Reach OC-12 Interface (24G-U)	10-16
Intra-office (IS-3) OC-3 Rate Interface (21D/ 21D-U and 22D-U OLIUs)	10-17
Long Reach OC-1 Interface (26G2-U/27G-U/ 27G2-U OLIU)	10-18
OC-3 Optical Interface Mixing	10-33
Universal Optical Connector Attenuators	10-37
SONET Overhead Bytes	10-38
Performance	10-38
Wander/Jitter	10-38
Signal Performance	10-38
Synchronization	10-39
Synchronous Timing Generator (BBF2/ BBF2B)	10-39
Protection Switching	10-40
Linear Networks	10-40
Ring Networks	10-40
Transient Performance	10-40
Power Loss Restart	10-40
Transmission Start-Up on Signal Application	10-40
Delay	10-41
Performance Monitoring	10-41
Operations Interfaces (OI)	10-44
Craft Interface Terminal (CIT)	10-44
Personal Computer (PC) Specifications for Software Download	10-45
Compatible Modems	10-46
CPro-2000 Graphical User Interface and Provisioning Tool	10-47
User Panel	10-48
Equipment Indicators	10-48
Office Alarms	10-48

Contents

Serial Telemetry	10-48
Parallel Telemetry	10-49
User-Definable Miscellaneous Discrete Environmental Alarms and Controls	10-49
Order Wire	10-50
TL1/X.25 Interface	10-51
Physical Specifications	10-53
Shelf Physical Characteristics	10-53
Network Bay and Cabinet Mounting	10-53
Environmental Specifications	10-54
Temperature and Humidity	10-54
EMC Requirements	10-54
Earthquake Requirements	10-54
Fire Resistance	10-55
Underwriters Laboratories (UL)	10-55
Canadian Standards Association	10-55
Power Requirements	10-56
Shelf Fuses	10-56
Power Dissipation	10-57
DDM-2000 OC-3 Reliability	10-59
Summary	10-59
Transmission Availability	10-59
Operation System Interface Availability	10-60
Optical Module Maintenance Objective	10-60
Infant Mortality	10-60
DDM-2000 OC-3 System Reliability Predictions	10-61

11 Commands and Reports

■ Overview	11-1
■ Command Page Format	11-1
■ Addresses	11-3

Contents

■ Special Control Characters	11-9
■ DDM-2000 OC-3 Commands Menu	11-12
■ CPro-2000	11-19
■ Commands	11-21
■ RTRV-ALM Descriptions	11-490
■ RTRV-HSTY Reports	11-516

A	A SONET Overview	A-1
	■ Overview	A-1
	■ History	A-1
	■ Basic Purpose	A-2
	■ Technical Overview	A-2
	SONET Signal Hierarchy	A-2
	SONET Layers	A-4
	SONET Frame Structure	A-6
	Section Overhead	A-6
	Line Overhead	A-7
	Path Overhead	A-8
	STS-1 Path Overhead	A-8
	VT Path Overhead	A-9
	SONET Multiplexing Procedure	A-10
	SONET Demultiplexing Procedure	A-12
	SONET Digital Multiplexing Schemes	A-14
	Asynchronous Multiplexing	A-14
	Synchronous Multiplexing	A-15
	Virtual Tributary Signals	A-15
	Concatenated Mode	A-16
	■ SONET Interface	A-17
	SONET Payloads	A-18
	Higher Rate Transport	A-19
	■ Conclusion	A-19

Contents

Glossary	GL-1

Index	IN-1

Software Release Description	

Volume II — Operation and Maintenance TOP	

Figures

2

Applications

2-1	Path Switched Ring	2-5
2-2	OC-3 Path Switched Ring	2-7
2-3	DDM-2000 OC-3 Path Switched Interoffice Ring	2-8
2-4	OC-12 Path Switched Ring — STS-1 Level Path Switching	2-9
2-5	OC-12 Path Switched Ring Using OC-12 Multiplexer—Mixed STS-1 and VT1.5 Path Switching	2-10
2-6	OC-12 Path Switched Ring Using OC-12 Multiplexer and OC-3 Multiplexer With OC-12 Optics	2-11
2-7	OC-12 VT Path Switched Ring Using DDM-2000 OC-3 Multiplexer With OC-12 Optics	2-12
2-8	OC-3 Ring with OC-12 Ring Transport	2-13
2-9	Multinode OC-3 Ring With OC-12 Ring Transport	2-15
2-10	DDM-2000 OC-12 Path Switched Interoffice Ring	2-16
2-11	Folded Ring Configuration	2-19
2-12	OC-1 Ring Transport on OC-3 Ring Configuration	2-21
2-13	Single-Homed OC-1 Ring to a DDM-2000 OC-3 Linear Application	2-22
2-14	DDM-2000 FiberReach Stand-Alone OC-1 Ring	2-23
2-15	DDM-2000 FiberReach Single Homing to a Stand-Alone OC-1 Hub Host	2-24
2-16	OC-3 Ring Transport on OC-12 Point-to-Point	2-25
2-17	DDM-2000 FiberReach Dual Homing to a DDM-2000 OC-3 Ring	2-27
2-18	Dual Access Configuration	2-29
2-19	Dual Ring Interworking Concepts	2-31
2-20	OC-3/12 to FT-2000 OC-48 Lightwave System Dual Ring Interworking	2-33

Figures

2-21	DDM-2000 Ring Interworking with FT-2000 OC-48 Lightwave System Transport and DACS IV-2000 Grooming	2-35
2-22	DDM-2000 FiberReach Ring Dual Homing to a DDM-2000 OC-3 Ring in a Dual Wire Center Application	2-37
2-23	OC-3 Services Using Linear Optical Extensions	2-39
2-24	VT1.5 Hairpin Cross-Connections	2-40
2-25	OC-1 Ring Pass-Through in a Function Unit	2-41
2-26	Single-Homed Hairpin Routing	2-42
2-27	Dual-Homed Hairpin Routing	2-43
2-28	Hairpin Local Drop Routing	2-44
2-29	OC-3 Point-to-Point Topology	2-45
2-30	Metro Application — Copper in the Riser	2-46
2-31	Metro Application — Fiber in the Riser	2-47
2-32	Campus CENTREX Configuration	2-48
2-33	OC-3 Point-to-Point Interoffice Configuration	2-49
2-34	OC-3 Repeater Configuration	2-50
2-35	OC-3 Hubbing Configuration	2-52
2-36	Small Industrial Park Configuration	2-53
2-37	OC-3c Transport — Private Data/Video/ATM Network Application	2-55
2-38	DS1 Add/Drop — OC-3 Linear Configuration	2-56
2-39	DS1 Add/Drop — OC-3 Interoffice Configuration	2-57
2-40	DDM-2000 OC-3 Electrical Multiplexer Configuration	2-58
2-41	OC-3 Loop Carrier Interface Configuration	2-59
2-42	SLC-2000 Access System in an OC-12 Hubbing Configuration	2-60
2-43	DACS IV-2000 Access Configuration	2-61
2-44	Operations Interworking Application	2-63
2-45	OC-3 Ring Interfaces with FT-2000 OC-48 Lightwave System	2-64

Figures

2-46	DDM-2000 OC-3 to FT-2000 OC-48 Lightwave System Dual Ring Interface	2-65
2-47	OC-3 Linear Interfaces with FT-2000 OC-48 Lightwave System	2-66
2-48	OC-12 Ring Interfaces with FT-2000 OC-48 Lightwave System	2-66
2-49	<i>MegaStar</i> 2000 Radio Support Using DDM-2000 OC-3 Multiplexers	2-67
2-50	Interworking of OC-1/OC-3/OC-12/OC-48 with Tellabs TITAN 5500 DCS	2-68
2-51	Self-Healing Medical Campus Network Application	2-71
2-52	LAN/WAN Data Networking Using Locked DS3 Cross-Connections	2-73
2-53	DDM-2000 Data Service with an ATM Switch	2-73
2-54	OC-12 STS-1 Drop-and-Continue to DS3 Interfaces	2-75
2-55	Teleprotection and SCADA Application	2-77
2-56	Intelligent Vehicle Highway System (IVHS) Application	2-79
2-57	DS1 Path Performance Monitoring for Tariff Verification	2-81
2-58	DS3 Transmultiplexer Application	2-82
2-59	HDSL Application	2-83

3

Shelf Descriptions and Configurations

3-1	DDM-2000 OC-3 Group 4 Shelf — Front View	3-3
3-2	DDM-2000 OC-3 Shelf — Rear View	3-3
3-3	DDM-2000 OC-3 Multiplexer Front Panel	3-6
3-4	DDM-2000 OC-3 Terminating Shelf	3-12
3-5	DDM-2000 OC-3 Hub Shelf	3-13
3-6	DDM-2000 OC-3 STS-1 Drop Shelf	3-14

Figures

3-7	DDM-2000 OC-3 EC-1 Electrical Multiplexer Shelf	3-15
3-8	DDM-2000 OC-3 DS1 Add/Drop Shelf	3-16
3-9	DDM-2000 OC-3 Ring Shelf	3-17
3-10	DDM-2000 OC-3 DRI Shelf	3-18
3-11	DDM-2000 OC-3 Ring Shelf With an Optical Extension	3-19
3-12	DDM-2000 OC-3 VT Hairpin Shelf	3-20
3-13	DS3 Data Services in OC-3 Shelf	3-21
3-14	OC-3 DDM-2000 FiberReach Host Single-Homing Shelf	3-23
3-15	OC-3 DDM-2000 FiberReach Host Dual-Homing Shelf	3-24
3-16	OC-3 DDM-2000 FiberReach Host Shelf — Enhanced Routing Topologies	3-25
3-17	OC-3 DDM-2000 FiberReach Host Shelf — Enhanced Routing with 26G2-U OLIU	3-26
3-18	OC-3/OC-12 Shelf with HDSL Interface	3-27
3-19	OC-3/OC-12 Shelf with Transmultiplexers	3-28
3-20	DDM-2000 Fan Shelf	3-29
3-21	DDM-2000 Fan Shelf — Fan Switches — Front Cover Removed	3-30

4 Power

4-1	DDM-2000 OC-3 Power Architecture	4-2
4-2	Circuit Pack Power and LED Control	4-5
4-3	Typical -48 Volt Power Supply for DDM-2000 OC-3 Multiplexer Single Shelf	4-6

Figures

5 Transmission and Synchronization Interfaces

5-1	DDM-2000 OC-3 Multiplexer Block Diagram — Terminal	5-3
5-2	DDM-2000 OC-3 Multiplexer Block Diagram — STS-1 Drop	5-5
5-3	DDM-2000 OC-3 Multiplexer Block Diagram — Hubbing	5-6
5-4	DDM-2000 OC-3 Multiplexer Block Diagram — SONET Electrical Multiplexer	5-7
5-5	DDM-2000 OC-3 Multiplexer Block Diagram — DS1/DS3/EC-1 Add/Drop and VT1.5/STS-1 Path Switched Ring	5-9
5-6	DDM-2000 OC-3 Multiplexer with OC-12 Optics Block Diagram	5-11
5-7	DDM-2000 OC-3 Multiplexer Block Diagram — DDM-2000 FiberReach Host — Single Homing	5-13
5-8	DDM-2000 OC-3 Multiplexer Block Diagram — FiberReach Stand-Alone Host Configuration	5-15
5-9	Single Homing with 27G-U Dual OC-1 OLIUs	5-17
5-10	DDM-2000 OC-3 Multiplexer Block Diagram — OC-3/OC-3c Repeater	5-18
5-11	OC-3/OC-12 Ring (0x1) Single-Homing	5-20
5-12	OC-3/OC-12 Ring (0x1) Dual-Homing	5-21
5-13	DS3 Data Services on an OC-3 Ring	5-22
5-14	OC-12 Ring Shelf with Linear (1+1) OC-3 Low-Speed Interfaces (Transmit)	5-23
5-15	OC-12 Ring Shelf with Linear (1+1) OC-3 Low-Speed Interfaces (Receive)	5-24
5-16	OC-3/OC-1 Ring (0x1) Single-Homing	5-26
5-17	OC-3/OC-1 Ring (0x1) Dual-Homing	5-27
5-18	OC-1 Ring Function Unit Pass-Through	5-28
5-19	OC-1 Ring Hairpin Local Drop—Intra-Function Unit	5-29
5-20	OC-1/OC-1 Function Unit Hairpin Ring—Inter-Function Unit Single Homing	5-30

Figures

5-21	OC-1/OC-1 Function Unit Hairpin Ring—Inter-Function Unit Dual-Homing	5-31
5-22	OC-1/OC-1 Function Unit Hairpin Ring—Intra-Function Unit Single-Homing	5-32
5-23	OC-1/OC-1 Function Unit Hairpin Ring—Intra-Function Unit Dual-Homing	5-33
5-24	Synchronization Timing Configurations	5-37
5-25	DS1 Timing Output — Dual-Homing Linear	5-42
5-26	Synchronization Reconfiguration — Access Ring	5-44
5-27	Synchronization Reconfiguration — Externally Timed Access Ring	5-49
5-28	Synchronization Reconfiguration — Access Ring	5-51
5-29	DS1 Timing Output with Fiber Failure	5-54
5-30	OC-3 and FT-2000 OC-48 Lightwave System Dual-Homing DRI Configuration	5-57
5-31	OC-3 and OC-12 Dual-Homing DRI Configuration	5-59
5-32	OC-3 and OC-1 External/Line Timing	5-61
5-33	OC-N Derived DS1 Timing Reference	5-63
5-34	Timing from Multiplexed DS1	5-65

6 Operations Interfaces

6-1	Craft Interface Terminal Connectors	6-4
6-2	Craft Interface Terminal Login Sessions	6-5
6-3	User Panel for Group 4 Shelf	6-9
6-4	Miscellaneous Discretes	6-29

Figures

7

Circuit Pack Descriptions

7-1	BBG8/BBG8B SYSCTL Circuit Pack	7-3
7-2	BBG8/BBG8B SYSCTL Circuit Pack Block Diagram	7-5
7-3	BBG8/BBG8B SYSCTL Option Switches	7-8
7-4	BBG9 OHCTL Circuit Pack	7-10
7-5	BBG9 OHCTL Circuit Pack Block Diagram	7-12
7-6	BBG10 OHCTL Circuit Pack	7-14
7-7	BBG10 OHCTL Circuit Pack Block Diagram	7-16
7-8	BBG10 OHCTL Order Wire Option Switches	7-17
7-9	BBF2B TGS Circuit Pack	7-20
7-10	BBF2B TGS Circuit Pack Block Diagram	7-22
7-11	TG Option Switches for DDM-2000 OC-3	7-26
7-12	BBF1/BBF1B DS1 Circuit Pack	7-28
7-13	BBF1/BBF1B DS1 Circuit Pack Block Diagram	7-30
7-14	BBF1/BBF1B DS1 Option Switches	7-33
7-15	BBF3/BBF3B DS1PM Circuit Pack	7-35
7-16	DS1PM Circuit Pack Block Diagram	7-37
7-17	BBF3 DS1PM Option Switches	7-41
7-18	177A Retainer Card	7-43
7-19	BBF5 Jumper Circuit Pack	7-44
7-20	BBF8 HDSL Circuit Pack	7-45
7-21	HDSL Circuit Pack Block Diagram	7-47
7-22	HDSL DIP Switch Settings and STS Path Overhead Bytes	7-52
7-23	BBG2 MXRVO Circuit Pack	7-54
7-24	BBG2 MXRVO Circuit Pack Block Diagram	7-56
7-25	BBG4B DS3 Circuit Pack	7-59
7-26	BBG4/BBG4B DS3 Circuit Pack Block Diagram	7-61
7-27	BBG4/BBG4B DS3 Line Build-Out (LBO) Jumpers	7-64
7-28	BBG6 STS1E Circuit Pack	7-67

Figures

7-29	STS1E Circuit Pack Low-Speed and High-Speed Modes	7-68
7-30	BBG6 STS1E Circuit Pack Block Diagram	7-69
7-31	BBG6 STS1E Line Build-Out (LBO) Jumpers and Mode Switch	7-73
7-32	BBG19 DS3 Circuit Pack	7-76
7-33	BBG19 DS3 Circuit Pack Block Diagram	7-78
7-34	BBG19 DS3 Line Build-Out (LBO) Jumpers	7-81
7-35	TMUX Circuit Pack	7-84
7-36	TMUX Circuit Pack Block Diagram	7-86
7-37	BBG20 TMUX Line Build-Out (LBO) Jumpers	7-89
7-38	Universal Optical Connector	7-92
7-39	21D and 21D-U OLIU Circuit Pack	7-95
7-40	21D/21D-U OLIU Circuit Pack Block Diagram	7-97
7-41	21G and 21G-U/21G2-U OLIU Circuit Pack	7-102
7-42	21G/21G-U/21G2-U OLIU Circuit Pack Block Diagram	7-104
7-43	21G/21G-U OLIU Output Level Switch	7-106
7-44	22F/22F-U/22F2-U OLIU Circuit Pack	7-109
7-45	22F-type OLIU Circuit Pack Block Diagram	7-112
7-46	22D-U OLIU Circuit Pack	7-116
7-47	22D-U OLIU Circuit Pack Block Diagram	7-118
7-48	22G-U/22G2-U/22G3-U OLIU Circuit Pack	7-124
7-49	22G-U/22G2-U/22G3-U OLIU Circuit Pack Block Diagram	7-127
7-50	24G-U OC-12 OLIU Circuit Pack — 24G-U Pair with Interconnect Cable Assembly	7-132
7-51	24G-U OLIU Circuit Pack Block Diagram	7-135
7-52	26G2-U OLIU Circuit Packs	7-140
7-53	26G2-U OLIU Circuit Pack Block Diagram	7-141
7-54	27G-U/27G2-U OLIU Circuit Pack	7-147
7-55	27G-U/27G2-U OLIU Circuit Pack Block Diagram	7-150

Figures

8 Administration and Provisioning

8-1	Locked Cross-Connection	8-28
8-2	Example of STS-1 Addresses	8-49
8-3	OC-3 Linear Network Example Configuration	8-50
8-4	Configuration After First Series of Cross-Connect Commands	8-52
8-5	Configuration After Second Series of Cross-Connect Commands	8-53
8-6	Final Configuration	8-55
8-7	Example OC-3 Ring Configuration Cross-Connections	8-60
8-8	Drop and Continue Nodes	8-63
8-9	Example Dual Ring Configuration Cross-Connections	8-65
8-10	Example OC-3/OC-12 0x1 Single Homing Configuration Cross-Connections	8-69
8-11	Example OC-1 Ring Configuration Cross-Connections	8-71
8-12	Example Single-Homed Path-Switched Ring Configuration Cross-Connections	8-74
8-13	Example Dual-Homed OC-3/OC-1 Path-Switched Ring Configuration Cross-Connections	8-77

9 Maintenance Description

9-1	Three-Tiered Operations	9-3
9-2	Single-Ended Operations	9-5
9-3	Example of Maintenance Signals as a Result of Unprotected Incoming OC-3 Failure	9-12
9-4	DS1 Maintenance Signaling — Non-Ring Application	9-14

Figures

9-5	DS3 Maintenance Signaling — Non-Ring Application	9-15
9-6	OC-3 or EC-1 Line Maintenance Signaling — Non-Ring Application	9-16
9-7	OC-3c (STS-3c) Line Maintenance Signaling — Non-Ring Application	9-17
9-8	Maintenance Signaling — VT Ring Application	9-18
9-9	Maintenance Signaling — VT Ring Application, Unequipped	9-19
9-10	Maintenance Signaling — VT Ring Application, TMUX circuit pack	9-20
9-11	Maintenance Signaling — STS Ring Application	9-21
9-12	Maintenance Signaling STS Ring Application — Unequipped	9-22
9-13	Unidirectional Line Protection Switching	9-26
9-14	Two-Fiber Unidirectional Ring	9-27
9-15	Path Protection Switching	9-28
9-16	Locked DS3 Cross-Connect Path Protection Switching	9-30
9-17	DRI Path Protection Switching	9-32
9-18	Local Equipment Test	9-37
9-19	Local Wiring Cross-Connect Test	9-37
9-20	Optical Span Test	9-37
9-21	DS1/DS3 Line and Path and DS3 Path Performance Monitoring (PM)	9-39
9-22	DDM-2000 OC-3 Multiplexer DS1 Path Performance Monitoring	9-41

10

Technical Specifications

10-1	Optical System Interfaces (Points S and R)	10-19

Figures

11	Commands and Reports	
11-1	Terminating STS-1	11-61
11-2	Hub Application	11-61
11-3	Linear Add/Drop	11-62
11-4	Ring Hairpin Application	11-62
11-5	0x1 Ring Configuration, Single-Homed Application	11-63
11-6	0x1 Ring Configuration, Dual-Homed Application	11-63
11-7	DDM-2000 Shelf with VT1.5 Signals	11-76
11-8	EC1 Loopback	11-120
11-9	DS1 Loopback	11-122
11-10	BBF3B/TMUX Loopback-T1	11-123
11-11	DS3 Loopback	11-127
11-12	TMUX Loopback	11-128
11-13	Automated Test of Local Equipment	11-456
11-14	Automated Test of Local Wiring to Cross-Connect	11-458
11-15	Automated Optical Span Test	11-460
11-16	Automated Transmission Test of DS1 Signal in MUX Direction	11-472
11-17	Automated Transmission Test of DS1 Signal in DEMUX Direction	11-472
11-18	Automated Transmission Test of DS3 Signal in MUX Direction	11-477
11-19	Automated Transmission Test of DS3 Signal in DEMUX Direction	11-477
11-20	Automated Transmission Test of TMUX Signal in DEMUX Direction	11-478

Figures

A

A SONET Overview

A-2	SONET STS-1 Frame — Simplified Version	A-3
A-3	Section, Line, and Path Definitions	A-4
A-4	SONET Frame Format	A-5
A-5	VT Path Overhead Byte	A-9
A-6	SONET Multiplexing Procedure	A-11
A-7	SONET Demultiplexing Procedure	A-12
A-8	STS-1 Synchronous Payload Envelope in Interior of STS-1 Frame	A-13
A-9	Asynchronous Multiplexing	A-14
A-10	Synchronous Multiplexing	A-15
A-11	STS-3c Concatenated Payload	A-16
A-12	SONET Interface	A-17

Tables

3 Shelf Descriptions and Configurations

3-1	DDM-2000 OC-3 Plug-Ins	3-4
3-2	DDM-2000 OC-3 Multiplexer Circuit Pack and Software Compatibility Matrix	3-9
3-3	DDM-2000 Fan Shelf Switch Settings	3-31

5 Transmission and Synchronization Interfaces

5-1	DDM-2000 OC-3 Multiplexer Transmission Interfaces	5-1
5-2	DDM-2000 OC-3 Synchronization	5-40
5-3	Synchronization Messages using K2 Byte	5-45
5-4	Synchronization Messages using S1 Byte	5-46
5-5	Available Synchronization References	5-47

6 Operations Interfaces

6-1	Craft Interface Terminals	6-3
6-2	DDM-2000 OC-3 Pushbutton Combinations	6-12
6-3	DDM-2000 OC-3 TBOS Alarm and Status Points	6-18
6-4	DDM-2000 OC-3 TBOS Control Points	6-21

7 Circuit Pack Descriptions

7-1	HDSL Line Specifications	7-48
7-2	DDM-2000 OLIU Feature Summary	7-93

Tables

8	Administration and Provisioning	
8-1	DDM-2000 OC-3 Multiplexing and Mapping Capabilities	8-8
8-2	Default DS1 to VT1.5 Mapping	8-10
8-3	SONET Networking Software Compatibility	8-20
8-4	OC-3 Multiplexer — Maximum Number of NEs in a Subnetwork	8-25
8-5	DDM-2000 OC-3 Available VT1.5 Cross-Connections, Including Hairpin	8-29
8-6	DDM-2000 OC-3 Available STS-1 Cross-Connections, Including Hairpin	8-29
8-7	DDM-2000 OC-3 Default STS-1 Cross-Connections (Termination)	8-30
8-8	DDM-2000 OC-3 Ring Cross-Connect Types Allowable (Main to Main)	8-33
8-9	DDM-2000 OC-3 Ring Cross-Connect Types Allowable (Main to Function Unit)	8-34
8-10	DDM-2000 OC-3 Ring Cross-Connect Types Allowable (Function Unit to Function Unit)	8-36
8-11	Linear or Ring Manual STS-1 Cross-Connections (Termination/Drop)	8-38
8-12	Linear or Ring Manual STS-1 Cross-Connections (Hub/Drop)	8-38
8-13	Linear Manual STS-1 Cross-Connections (Add)	8-39
8-14	Ring Manual STS-1 Cross-Connections (Pass-Through)	8-39
8-15	Ring Manual STS-1 Cross-Connections (Drop and Continue)	8-40
8-16	Linear or Ring Manual VT1.5 Cross-Connections (Termination/Drop)	8-40
8-17	Linear or Ring Manual VT1.5 Cross-Connections (Hub/Drop)	8-41
8-18	Ring Manual STS-1 Cross-Connections (Hairpin)	8-41

Tables

8-19	Ring Manual VT1.5 Cross-Connections (OC-1 Hub/Drop)	8-42
8-20	Ring Manual VT1.5 Cross-Connections (Drop and Continue)	8-42
8-21	Linear Manual VT1.5 Cross-Connections (Add)	8-43
8-22	Ring Manual VT1.5 Cross-Connections (Pass-Through)	8-43
8-23	Ring Manual VT1.5 Cross-Connections (Locked)	8-44
8-24	Ring Manual VT1.5 Cross Connections (Hairpin)	8-44
8-25	Parameters Provisionable via Hardware Switches	8-80
8-26	Parameters Provisionable via the CIT	8-81

9 Maintenance Description

9-1	DDM-2000 OC-3 In-Service Software Upgrade Compatibility	9-6
9-2	DDM-2000 OC-3 In-Service Upgrades	9-7
9-3	DDM-2000 OC-3 and OC-12 Software Compatibility	9-8
9-4	DDM-2000 OC-3 Software Compatibility	9-9
9-5	DDM-2000 OC-3 and DDM-2000 FiberReach Software Compatibility	9-9
9-6	DDM-2000 OC-3 Multiplexer Dual Ring Interworking Software Compatibility	9-10
9-7	Performance Monitoring Parameters	9-44
9-8	DS3 Performance Monitoring Enabling	9-53
9-9	DS3 Performance Monitoring (PM) Modes	9-55

Tables

10	Technical Specifications	
10-1	Transmission Interface Standards	10-2
10-2	DS3 Interface Modes	10-6
10-3	Enhanced DS3 Performance Monitoring Modes	10-7
10-4	21G/21G-U/21G2-U and 21D/21D-U/22D-U OLIU Specifications	10-20
10-5	21G/21G-U/21G2-U and 21D/21D-U/22D-U OLIU Link Budgets (Note 1)	10-21
10-6	22F/22F-U/22F2-U, 22G-U/22G2-U, and 22G3-U OLIU Specifications	10-23
10-7	22F/22F-U/22F2-U, 22G-U, 22G2-U, and 22G3-U OLIU Link Budgets	10-24
10-8	OC-3 OLIU Link Budget - Multimode Operation	10-26
10-9	24G-U OLIU Specifications	10-27
10-10	24G-U OLIU Link Budgets	10-28
10-11	26G2-U/27G-U/27G2-U OLIU Specifications	10-30
10-12	26G2-U/27G-U/27G2-U OLIU Link Budgets	10-31
10-13	26G2-U/27G-U/27G2-U OLIU Link Budgets — Multimode Operation	10-32
10-14	OC-3 Rate OLIU Mixes — Minimum Link Budgets (dB)	10-33
10-15	OC-3 Rate OLIU Mixes — Maximum Link Budgets for SM Fiber (dB)	10-35
10-16	OC-3 Rate OLIU Mixes — Maximum Link Budgets for MM Fiber (dB)	10-36
10-17	Universal Buildout Attenuators	10-37
10-18	DDM-2000 OC-3/OC-1 Transmission Delay in Microseconds	10-41
10-19	Performance Monitoring Parameters (PM) Provisionable via the CIT	10-42
10-20	CIT Interface Pin Connections	10-44
10-21	TL1/X.25 Interface — Default VC Assignments	10-51
10-22	TL1/X.25 Interface — X.25 Packet Layer Parameters	10-52

Tables

10-23	TL1/X.25 Interface — LAPB Link Layer Parameters	10-52
10-24	TL1/X.25 Interface — EIA-232-D Pin Connections	10-53
10-25	Power Dissipation and Current Drains	10-57
10-26	DDM-2000 OC-3 System Reliability Prediction	10-61
10-27	DDM-2000 OC-3 Circuit Pack Reliability	10-62
10-28	DDM-2000 Fan Shelf Steady State Failure Rates (Based on Bellcore RPP, Issue 4, Data)	10-63

11 Commands and Reports

11-1	DDM-2000 OC-3 Address Table	11-4
11-2	DDM-2000 OC-3 Command Menu	11-12
11-3	RTRV-ALM Descriptions	11-493
11-4	RTRV-HSTY Descriptions	11-516

A A SONET Overview

A-29	SONET Payloads	A-18
A-30	SONET Transport Rates	A-19

Tables

About This Document

Table of Contents

Purpose	lix
Intended Audiences	lix
Reason for Reissue	lix
Safety Instructions	lx
■ Product Safety Labels	lx
■ Lightwave Safety Guidelines	lx
General Laser Information	lx
Lasers and Eye Damage	lxi
Classification of Lasers	lxi
Lightwave Safety Precautions	lxii
Safety Precautions for Enclosed Systems	lxii
Safety Precautions for Unenclosed Systems	lxiii
■ Electrostatic Discharge (ESD) Considerations	lxiii
Related Documentation	lxviii
Related Training	lxxv
Customer Technical Support (CTS)	lxxviii
Engineering and Installation Services	lxxxii
■ Customer Technical Support Enhanced Services	lxxxiii
Documentation Support	lxxxiii
How to Order Documents	lxxxiv
■ Standing Orders	lxxxv
How to Comment on This Document	lxxxvi
Electronic Documentation	lxxxvi

Table of Contents

About This Document

Purpose

This *DDM-2000 OC-3 Multiplexer User/Service Manual, Volume I*, includes Releases 8.0 through 11.1 and provides the following:

- Detailed descriptive information to circuit pack level
- Technical specifications
- Commands and reports descriptions.

The *DDM-2000 OC-3 Multiplexer User/Service Manual (TOP), Volume II*, includes Releases 8.0 through 11.1 and provides operation and maintenance (O&M) task oriented practice (TOP) supporting acceptance, turnup, and maintenance.

Intended Audiences

This user/service manual is used by training and by the end users responsible for O&M of the DDM-2000 OC-3 Multiplexer. It may be used by anyone desiring specific information about the DDM-2000 OC-3 Multiplexer O&M.

For information on releases using the Target ID Address Resolution Protocol (TARP) refer to document number 363-206-285.

Reason for Reissue

This is Issue 4 of this document. It replaces *DDM-2000 OC-3 Multiplexer User/Service Manual, Volume I*, Issue 3. It has been updated with information on Release 11.1 of the DDM-2000 OC-3 Multiplexer. Significant changes to this document are noted by change bars (|) in the outermost margins.

Safety Instructions

Product Safety Labels

Important safety instructions are in this manual. In addition to the instructions on the following page, there are other safety instructions you must follow. These instructions involve lasers, lightwave optical cable and connectors, and precautions when handling circuit packs to prevent damage from electrostatic discharge. This manual also contains admonishments in the form of **DANGERS**, **WARNINGS**, and **CAUTIONS** which must be followed at all times.

These admonishments have the following definitions:

- **DANGER** indicates the presence of a hazard that *will* cause death or severe personal injury if the hazard is not avoided.
- **WARNING** indicates the presence of a hazard that *can* cause death or severe personal injury if the hazard is not avoided.
- **CAUTION** indicates the presence of a hazard that *will* or *can* cause minor personal injury or property damage if the hazard is not avoided. The caution is also used for property-damage-only accidents. This includes equipment damage, loss of software, or service interruption.

Other important safety instructions that you should read are in the "Operation and Maintenance" section of this manual. Only trained personnel should perform the procedures in that section.

The alert symbol • appears throughout this product and in this manual to alert the user to the presence of important operating and maintenance (servicing) instructions for the DDM-2000 OC-3 Multiplexer.

Lightwave Safety Guidelines

General Laser Information

Lightwave/lightguide systems, their associated test sets, and similar operating systems use semiconductor laser transmitters that emit light at wavelengths between approximately 800 nanometers and 1600 nanometers. The emitted light is above the red end of the visible spectrum, which is normally not visible to the human eye. Although radiant energy at near-infrared wavelengths is officially designated invisible, some people can see the shorter wavelength energy even at power levels several orders of magnitude below any that have been shown to cause injury to the eye.

Conventional lasers can produce an intense beam of monochromatic light. The term monochromaticity means a single wavelength output of pure color that may be visible or invisible to the eye. A conventional laser produces a small-size beam of light; and because the beam size is small, the power density (also called irradiance) is very high. Consequently, lasers and laser products are subject to federal and applicable state regulations as well as international standards for their safe operation.

A conventional laser beam expands very little over distance or is said to be very well collimated. Thus, conventional laser irradiance remains relatively constant over distance. However, lasers used in lightwave systems have a large beam divergence, typically 10 to 20 degrees. Here, irradiance obeys the inverse square law (doubling the distance reduces the irradiance by a factor of 4) and rapidly decreases over distance.

Lasers and Eye Damage

Light energy emitted by laser and high-radiance LEDs in the 400-1400nm range may cause eye damage if absorbed by the retina. When a beam of light enters the eye, the eye magnifies and focuses the energy, magnifying the irradiance. The irradiance of energy that reaches the retina is approximately 10^5 or 100,000 times that at the cornea, and if sufficiently intense, may cause a retinal burn.

The damage mechanism at the wavelengths used in telecommunications is thermal in origin (that is, damage caused by heating). Therefore, a specific amount of energy is required for a definite time to heat an area of retinal tissue. Damage is not instantaneous. It occurs only when one looks at the light sufficiently long enough that the product of the retinal irradiance and the viewing time exceeds the damage threshold. Light energies above 1400 nm would cause surface and skin burns and do not affect the retinal area.

Classification of Lasers

Manufacturers of lasers and laser products in the United States are regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) under 21 CFR 1040. These regulations require manufacturers to certify each laser or laser product as belonging to one of four major Classes — Class I, II, IIIa, IIIb, or IV. Lasers are classified according to the accessible emission limits and their potential for causing injury. Lightwave systems are generally classified as Class I, because, under normal operation conditions, all energized laser transmitting circuit packs are terminated on optical fibers which enclose the laser energy with fiber sheath, forming a protective housing. Also, covers are in place over the circuit pack shelves.

Lightwave Safety Precautions

In its normal operating mode, a lightwave system is totally enclosed and presents no risk of eye injury. It is a Class I system under the FDA/CDRH scheme.

The lightguide cables that interconnect various components of a lightwave system can disconnect or break, and may expose people to lightwave emission. Also, certain measures and maintenance procedures may expose the technician to emission from the semiconductor laser during installation and servicing. Unlike more familiar laser devices, such as solid-state and gas lasers, the emission pattern of a semiconductor laser results in a highly divergent beam. In a divergent beam, the irradiance (power intensity) decreases rapidly with distance. The greater the distance, the less energy will enter the eye and the less potential risk for eye injury.

Inadvertently viewing an unterminated fiber or damaged fiber with the unaided eye at distances greater than 5 to 6 inches normally will not cause eye injury provided the power in the fiber is less than a few mW at the shorter wavelengths and higher at the longer wavelengths. However, damage may occur if an optical instrument, such as a microscope, magnifying glass, or eye loupe is used to stare at the energized fiber end.



CAUTION:

Use of controls or adjustments, or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.

Safety Precautions for Enclosed Systems

Under normal operating conditions, lightwave transmission systems are completely enclosed; nonetheless, the following precautions should be observed:

1. Because of the potential for eye damage, technicians should neither disconnect any lightwave cable nor splice and stare into the optical connectors terminating the cables.
2. Under no circumstances shall lightwave/lightguide operations be performed by a technician before satisfactorily completing an approved training course.
3. Since viewing lightwave emission directly with an optical instrument, such as an eye loupe, greatly increases the risk of eye damage, an appropriate label must appear in plain view on the front of the main frame or lightguide termination/interconnection equipment. The label shall read as follows:

NOTICE: UNTERMINATED OPTICAL CONNECTORS MAY EMIT LASER RADIATION. AVOID DIRECT EXPOSURE TO THE BEAM. DO NOT VIEW THIS BEAM WITH OPTICAL INSTRUMENTS.

Safety Precautions for Unenclosed Systems

During service, maintenance, or restoration, a lightwave transmission system is considered unenclosed. Under these conditions, follow these practices:

1. Only authorized, trained personnel shall be permitted to do service, maintenance, and restoration. Avoid exposing the eye to emissions from unterminated, energized optical connectors at close distances. Connectors associated with lightwave regenerators are recessed, which limits exposure distance. However, technicians removing or replacing regenerators should not stare or look directly into the vacant regenerator slot with optical instruments or magnifying lenses. (Normal eyewear or indirect viewing instruments are not considered magnifying lenses or optical instruments.)
2. Only authorized, trained personnel shall use the lightwave test equipment during installation or servicing since this equipment contains semiconductor lasers. (Some examples of lightguide test equipment are OTDR's, Hand-Held Loss Test Sets, and Feature Finders.)
3. Under no circumstances shall any personnel scan a fiber with an optical test set without verifying that all lightwave sources on the fiber are turned off.
4. All unauthorized personnel shall be excluded from the immediate area of lightwave transmission systems during installation and service.

Consult *ANSI*^{*} Z136.1 American National Standard for Safe Use of Lasers for guidance on the safe use of lasers in the workplace.

Electrostatic Discharge (ESD) Considerations



CAUTION:

Industry experience has shown that all integrated circuit packs can be damaged by static electricity that builds up on work surfaces and personnel. The static charges are produced by various charging effects of movement and contact with other objects. Dry air allows greater static charges to accumulate. Higher potentials are measured in areas with low relative humidity, but potentials high enough to cause damage can occur anywhere.

* Registered trademark of American Standards Institute, Inc.

The following precautions should be observed when handling circuit packs in order to prevent damage by electrostatic discharge:

- Assume all circuit packs contain solid state electronic components that can be damaged by ESD. Use only Lucent Technologies' manufactured UL recognized circuit packs in this system. Recognized circuit packs are listed in this user/service manual.
- When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat. If a static-dissipating floor mat is used, be sure that it is clean.
- Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats. If a static-dissipating table mat is used, be sure that it is clean.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- Keep all static-generating materials, such as food wrappers, plastics, and *Styrofoam** containers, away from all circuit packs. Upon removal from the bay, immediately put circuit packs into static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.

* Registered trademark of The Dow Chemical Company.

To reduce the possibility of ESD damage, shelves are equipped with grounding jacks to enable personnel to ground themselves using wrist straps (see Figure A) while handling circuit packs or working on a shelf(s). The jacks for connection of wrist straps are located at the lower right-hand corner of each shelf and are labeled. When grounding jacks are not provided, an alligator clip adapter enables connection to bay frame ground.

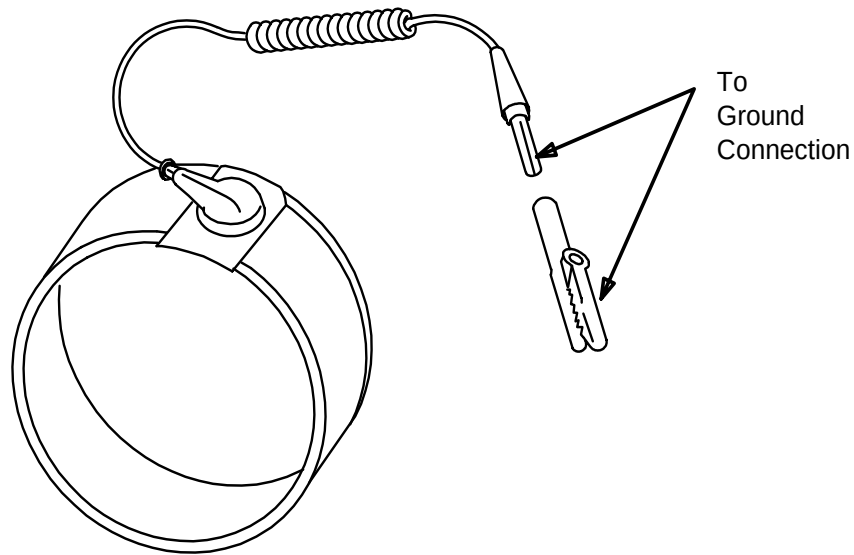


Figure A. Static Control Wrist Strap

IMPORTANT SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
4. Slots and openings in this product's back or bottom are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided. For information on proper ventilation requirements, consult the "Equipment Installation Considerations" section of 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual*.
5. This product should be operated only from the type of power source indicated on the marking label. For information on proper electrical distribution and power requirements, refer to the "Power" and "Technical Specifications" sections of this user/service manual.
6. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the product.
7. To reduce the risk of electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit packs may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.
8. ***Caution: Disconnect two (2) power connections when removing power from the system.***
9. Use only Lucent manufactured UL recognized circuit packs in this system. Recognized circuit packs are listed in this user/service manual.

SAVE THESE INSTRUCTIONS.

IMPORTANT INSTALLATION SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Installation and maintenance procedures must be followed and performed by trained personnel only.
3. All DS1 and DS3 interfaces should not leave the building premises unless connected to telecommunication devices providing primary or secondary protection, as applicable.
4. For information on proper mounting instructions, consult 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual*.
5. Never install telecommunication wiring during a lightning storm.
6. Never install telecommunication connections in wet locations.
7. Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the DS1 or DS3 interface.
8. Use caution when installing or modifying telecommunication lines.

SAVE THESE INSTRUCTIONS.

Related Documentation

The following documents provide additional information about the DDM-2000 Multiplexers:

- Number: 190-523-101 (User Manual only) Release 3.0
Order Comcode 107265944 for User Manual & Software for Release 3.0
Title: *CPro-2000 User Manual*
Audience: Maintenance personnel
Content: Using the tool to provision and maintain ring networks
- Number: 365-576-100 (User Manual only) Release 4.0
Number: 365-576-101 (User Manual & Software) Release 4.0
Title: *CPro-2000 User Manual*
Audience: Maintenance personnel
Content: Using the tool to provision and maintain ring networks
- Number: 365-576-110 (User Manual only) Release 5.0
Number: 365-576-111 (User Manual & Software) Release 5.0
Title: *CPro-2000 User Manual*
Audience: Maintenance personnel
Content: Using the tool to provision and maintain ring networks
- Number: 365-576-120 (User Manual only) Release 6.0
Number: 365-576-121 (User Manual & Software) Release 6.0
Title: *CPro-2000 User Manual*
Audience: Maintenance personnel
Content: Using the tool to provision and maintain ring networks
- Number: 365-576-125 (User Manual only) Release 6.1
Number: 365-576-126 (User Manual & Software) Release 6.1
Title: *CPro-2000 User Manual*
Audience: Maintenance personnel
Content: Using the tool to provision and maintain ring networks
- Number: 363-206-200
Title: *DDM-2000 OC-3 and OC-12 Multiplexers Applications, Planning, and Ordering Guide*
Audience: Network planners, equipment engineers, and sales teams
Content: Features, applications, high-level description, operations, administration, maintenance, and provisioning (OAM&P), system planning, ordering, product support, reliability information, technical specifications, and a synchronous optical network (SONET) overview.

- Number: 363-206-201
Title: *DDM-2000 OC-3 Multiplexer, System Commands Quick Reference*
Audience: Maintenance personnel
Content: Abbreviated list of system commands and parameters for DDM-2000 OC-3 Multiplexers through Release 7.2
- Number: 363-206-204
Title: *DDM-2000 OC-3 Multiplexer Installation Manual*
Audience: Customers planning to install the equipment
Content: Customer installation instructions
- Number: 363-206-206
Title: *DDM-2000 OC-12 Multiplexer — System Commands Quick Reference*
Audience: Maintenance personnel
Content: Abbreviated list of system commands and parameters for DDM-2000 OC-12 Multiplexers through Release 3.1
- Number: C107564270
Title: *ITM SNC Users Guide*
Audience: Operations personnel
Content: Integrated Transport Management SubNetwork Controller information
- Number: 363-206-207
Title: *DDM-2000 OC-12 Multiplexer and OC-12 Regenerator User/Service Manual*
Audience: Maintenance personnel
Content: Detailed description, technical specifications, commands and reports, and O&M procedures for DDM-2000 OC-12 Multiplexers through Release 3.1 and OC-12 Regenerator through Release 2.0
- Number: 363-206-208
Title: *DDM-2000 OC-12 Multiplexer Installation Manual*
Audience: Customers planning to install the equipment
Content: Customer installation instructions
- Number: 363-206-220
Title: *DDM-2000 OC-3/OC-12 Multiplexer Circuit Pack Options Job Aid*
Audience: Maintenance personnel
Content: List of circuit pack options

- Number: 363-206-222
Title: *DDM-2000 OC-3/OC-12 Multiplexer Acceptance Task List Job Aid*
Audience: Maintenance personnel
Content: Checklist of acceptance and turnup procedures
- Number: 363-206-223
Title: *DDM-2000 OC-12 Regenerator — System Commands Quick Reference*
Audience: Maintenance personnel
Content: Abbreviated list of system commands and parameters
- Number: 363-206-281
Title: *DDM-2000 OC-3 Multiplexer — System Commands Quick Reference*
Audience: Maintenance personnel
Content: Abbreviated list of system commands and parameters for DDM-2000 OC-3 Multiplexers Releases 8.1 through 11.1
- Number: 363-206-290
Title: *DDM-2000 OC-12 Multiplexer User/Service Manual, Volumes I and II*
Audience: Maintenance personnel
Content: Detailed description, technical specifications, commands and reports (Volume I), and O&M procedures (Volume II) for DDM-2000 OC-12 Multiplexer Release 5.1
- Number: 363-206-291
Title: *DDM-2000 OC-12 Multiplexer — System Commands Quick Reference*
Audience: Maintenance personnel
Content: Abbreviated list of system commands and parameters for DDM-2000 OC-12 Multiplexers Release 5.1
- Number: 363-206-300
Title: *DDM-2000 FiberReach Multiplexer Applications, Planning, and Ordering Guide*
Audience: Network Planners, equipment engineers, and sales teams
Content: Features, applications, high-level description, operations, administration, maintenance, and provisioning (OAM&P), system planning, ordering, product support, reliability information, technical specifications, and a synchronous optical network (SONET) overview
- Number: 363-206-301
Title: *DDM-2000 FiberReach Multiplexer Wideband Shelf User/Service Manual*
Audience: Maintenance personnel
Content: Detailed description, technical specifications, and O&M procedures for the DDM-2000 FiberReach Multiplexer Wideband Shelf.

- Number: 363-206-310
Title: *DDM-2000 FiberReach Multiplexer Installation Manual*
Audience: Users planning to install the equipment
Content: Customer installation instructions
- Number: 824-102-147
Title: *Lucent 2000 Product Family Operations Interworking Guide*
Audience: Maintenance Personnel
Content: Operations interworking information for the Lucent 2000 Product Family 2000 systems including DDM-2000 Multiplexers and FT-2000 OC-48 Lightwave System
- Number: 824-102-148
Title: *FT-2000 Operations Systems Engineering Guide*
Audience: Engineers
Content: Operations systems engineering information for the FT-2000 OC-48 Lightwave System.
- Number: 824-102-149
Title: *SLC[®]-2000 Access System Operations Systems Engineering Guide*
Audience: Engineers
Content: Operations systems engineering information for SLC-2000
- Number: 824-102-151
Title: *DDM-2000 Multiplexers Operations Systems Engineering Guide*
Audience: Engineers
Content: Operations systems engineering information for the DDM-2000 Multiplexers

■ DDM-2000 OC-3 Drawings:

ED-8C724-10	OC-3 and OC-3/OC-12 Combined Bay Arrangements
ED-8C724-15	Cabling Plan (Rear Access)
ED-8C724-16	Cabling Plan (Front Access)
ED-8C724-20	Cable Assemblies
ED-8C724-21	Cable Assemblies
ED-8C724-30	DDM-2000 Shelf Assembly
ED-8C724-31	User Panel Assembly
ED-8C724-34	Releases 2 and 3 Software Ordering
ED-8C724-36	Release 5 Software Ordering
ED-8C724-37	Release 6 Software Ordering
ED-8C724-38	Release 7 Software Ordering
ED-8C724-39	Release 8 Software Ordering
ED-8C724-40	Release 9 Software Ordering
ED-8C733-30	Fan, Filter, and Baffle Assemblies
SD-7C510-01	Application Schematic
T7C510-31	Interconnect Wiring (Rear Access)
T7C510-32	Interconnect Wiring (Front Access)
801-525-168	Floor Plan Data Sheets

■ DDM-2000 OC-12 Drawings:

ED-8C724-10	OC-3 and OC-3/OC-12 Combined Bay Arrangements
ED-8C727-10	Typical Bay Arrangements
ED-8C727-15	Cabling Plan (Rear Access)
ED-8C727-16	Cabling Plan (Front Access)
ED-8C727-20	Cable Assemblies
ED-8C727-21	Cable Assemblies
ED-8C727-30	Shelf Assembly
ED-8C727-31	User Panel Assembly
ED-8C727-34	DDM-2000 OC-12 Release 2 Software Ordering

ED-8C724-10	OC-3 and OC-3/OC-12 Combined Bay Arrangements
ED-8C727-35	DDM-2000 OC-12 Release 3 Software Ordering
ED-8C727-36	DDM-2000 OC-12 Release 5 Software Ordering
ED-8C727-41	DDM-2000 OC-12 Regenerator Release 2 Software Ordering
SD-7C513-01	Application Schematic
T7C513-31	Interconnect Wiring Diagram (Rear Access)
T7C513-32	Interconnect Wiring (Front Access)
801-525-168	Floor Plan Data Sheets

DDM-2000 equipment is also available in traditional loop enclosure arrangements, descriptions of which may be found in the following Lucent practices:

- Number: 363-205-000
Title: *SLC[®] Series 5 Carrier System Ordering Guide — Loop Transmission Systems* (to be replaced by 363-205-010)
- Number: 363-205-010
Title: *SLC[®] Series 5 System Applications and Planning Guide*
- Number: 626-500-105
Title: *80-Type Cabinets Ordering Information and Lettering Guide*
- Number: 626-500-115
Title: *90-Type Cabinets Coding and Ordering Information*

The following documents provide additional information about related equipment:

- Number: 363-206-150
Title: *DDM-Plus User/Service Manual*
- Number: 363-206-151
Title: *DDM-Plus Installation Manual*
- Number: 363-206-152
Title: *DDM-Plus Quick Reference Guide*
- Number: 363-206-156
Title: *DDM-Plus Equipment Engineering and Ordering Guide*
- Number: 363-206-157
Title: *DDM-Plus Wall DT Installation Manual*

- Number: 365-303-102
Title: *DSX-3 Cross-Connect Bay, Description, Operation, and Maintenance Manual*
- Number: 365-301-130
Title: *System III DSX-3/4, Planning, Engineering, Installation, and Operation — System Reference Guide*
- Number: 365-331-000
Title: *DACS III-2000 Release 2.0 Applications, Planning, and Ordering Guide*
- Number: 365-340-800
Title: *DACS IV-2000 Release 5.0 Reference Manual*
- Number: 365-575-100
Title: *FT-2000 OC-48 Lightwave System Applications, Planning, and Ordering Guide*
- Number: 636-299-120
Title: *LGX[®] Distribution System, Planning, Engineering, Installation, and Operation System Reference Guide*
- Title: MegaStar[™] 2000 Documents
 - Comcode 107585648 Installation Manual
 - Comcode 407397512 Schematic Package
 - Comcode 107585655 Reference Manual
 - Comcode 107585671 System Application Manual

Related Training

The Customer Training and Information Products Centers at Altamonte Springs, Florida, and Lisle, Illinois, provides management courses for planning, engineering, and ordering, as well as training for telecommunications technicians in installation, operations, and maintenance. Suitcasing of these courses is available. Consult your local Lucent Technologies' Account Executive for more information or reservations.

Call **1-888-LUCENT8 (1-888-582-3688)**, **prompt 2** for enrollment.

The following courses are provided by the National Product Training Center:

- Number: LW2211 (CD-ROM)
Title: DDM-2000 OC-3/OC-12 Multiplexer Fundamentals
Audience: A CD-ROM-based course for anyone interested in learning the fundamentals of operation of the DDM-2000 OC-3/OC-12 Multiplexers
Content: General information about the DDM-2000 OC-3 and OC-12 Multiplexers including a product overview, applications, and architecture
- Number: LW2212
Title: DDM-2000 OC-3 and OC-12 Multiplexer Applications and Architecture
Audience: Fundamental planners, account executives, and private telecommunications network technical consultants
Content: General information about the DDM-2000 OC-3 and OC-12 Multiplexers including a product overview, applications, architecture, and deployment planning (a course prerequisite for LW2312)
- Number: LW2312
Title: DDM-2000 OC-3 and OC-12 Multiplexer Equipment Engineering and Planning
Audience: Facility planners, outside plant engineers, central office equipment engineers, and private network design engineers
Prerequisite: LW2212
Content: Information and guidelines required to plan and order DDM-2000 OC-3 and OC-12 Multiplexer equipment for loop feeder and interoffice applications

- Number: LW2604
Title: DDM-2000 OC-3 Multiplexer Ring/Linear Networks, Operations and Maintenance
Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in day-to-day provisioning and maintenance
Content: Information supporting operations, maintenance, and provisioning of ring and/or linear DDM-2000 OC-3 Multiplexers. On-site shelves are used for extensive hands-on experience.
- Number: LW2610
Title: DDM-2000 FiberReach Wideband Shelf, Operations and Maintenance
Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in DDM-2000 FiberReach network functions
Prerequisite: LW2212, LW2312, LW2603, or LW2608
Content: Information supporting operations, maintenance, and provisioning of DDM-2000 FiberReach Wideband Shelf. On-site shelves are used for extensive hands-on experience.
- Number: LW2611
Title: DDM-2000 FiberReach Multiplexer Self-Paced Course
Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in DDM-2000 FiberReach network functions
Prerequisite: LW2212, LW2312, LW2603, or LW2608
Content: Information supporting system engineering and planning, applications, operations, maintenance, and provisioning of DDM-2000 FiberReach networks
- Number: LW2612
Title: DDM-2000 OC-12 Multiplexer Operations and Maintenance
Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in day-to-day provisioning and maintenance
Content: Information supporting operations, maintenance, and provisioning of the DDM-2000 OC-12 Multiplexer. Includes information on DDM-2000 OC-12 linear and ring applications. On-site shelves are used for extensive hands-on experience.

■ Number: LW2614

Title: 2000 Product Family Surveillance and Performance Monitoring

Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in day-to-day provisioning and maintenance

Content: Information supporting operations interfaces using X.25 links to an operations center

■ Number: LW2618

Title: Advanced Ring Network Applications, Operations, and Maintenance

Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in day-to-day operations of FT-2000 and/or DDM-2000 OC-3/OC-12 rings having dual ring interworking (DRI) traffic

Prerequisites: LW2608 and LW2616

Content: Information supporting operations, maintenance, and provisioning of DRI networks. On-site shelves are used for extensive hands-on experience.

Customer Technical Support (CTS)

CTS is available through a toll-free technical assistance number. Lucent maintains a highly-skilled, multi-tier support structure consisting of regional engineers, product specialists, and system designers to support your network equipment. All levels of technical expertise may be called upon to solve the customer problem (refer to Figure B).

The CTS organization provides remote, diagnostic support. On-site assistance is available on a billable contract or time and material basis. Support services may include the following activities:

- Responding to all requests for assistance
- Tracking and maintaining visible ownership of all reported problems, from inception through resolution
- Analyzing and diagnosing reported problems
- Providing restoration and recovery service
- Providing preventive and/or circumvention measures
- Communicating the actions, plans, and problem status to the reporting customer
- Initiating action to establish Modification Requests (MRs) for design issues
- Writing and distributing technical bulletins (Urgent Problem Notification).

CTS services are available on a contract basis in three levels to meet varying customer needs: Preferred, Standard, and Basic Agreements. The Preferred level of support guarantees 24 x 7 (24 hour, 7 day-a-week) coverage of the customer's network. Guaranteed performance commitments for response, service restoration, and problem resolution times are validated by published Service Performance Reports. The Standard level of support guarantees 8 x 5 (8 hour, 5 day-a-week) coverage. Performance commitments are also validated by Service Performance Reports. Out-of-hours support is available for an additional fee. The Basic level of support guarantees 8 x 5 coverage with hourly billing for each support call. Out-of-hours coverage is available with additional fees.

When the customer experiences a problem, the initial point of contact within Lucent is the Regional Technical Assistance Center (RTAC). RTAC is divided into three regions covering North America: region East (includes Canada), region South, and region West. They can be reached by calling 1-800-CAL-RTAC (1-800-225-7822). Lucent works with the customer to define the problem and determine its severity. Problems are worked during the customer's contracted coverage period. By prior agreement, service-affecting problems are worked immediately regardless of contracted coverage with billing reconciliation if required. Acting as a single point of contact with the customer, the RTAC engineer will involve all necessary tiers of support to solve the customer problem.

The CTS organization has also established a dial-up technical support medium called COACH. COACH is a system of on-line support tools aimed at providing product news and bulletins, diagnostic services, compatibility information, and on-line documents. COACH tools provide you with the most up-to-date product information so that problems are either prevented or quickly resolved. Many Lucent Technologies' transmission products, including DDM-2000 Multiplexers, are supported by COACH.

Once logged into COACH, the user specifies which product to access and COACH grants the appropriate combination of tools and commands. The user reaches each one of these tools and commands through a centralized, menu-driven computer program. Every screen provides help in making appropriate menu selections. COACH users will achieve proficiency quickly because of the consistency of menu selections among products.

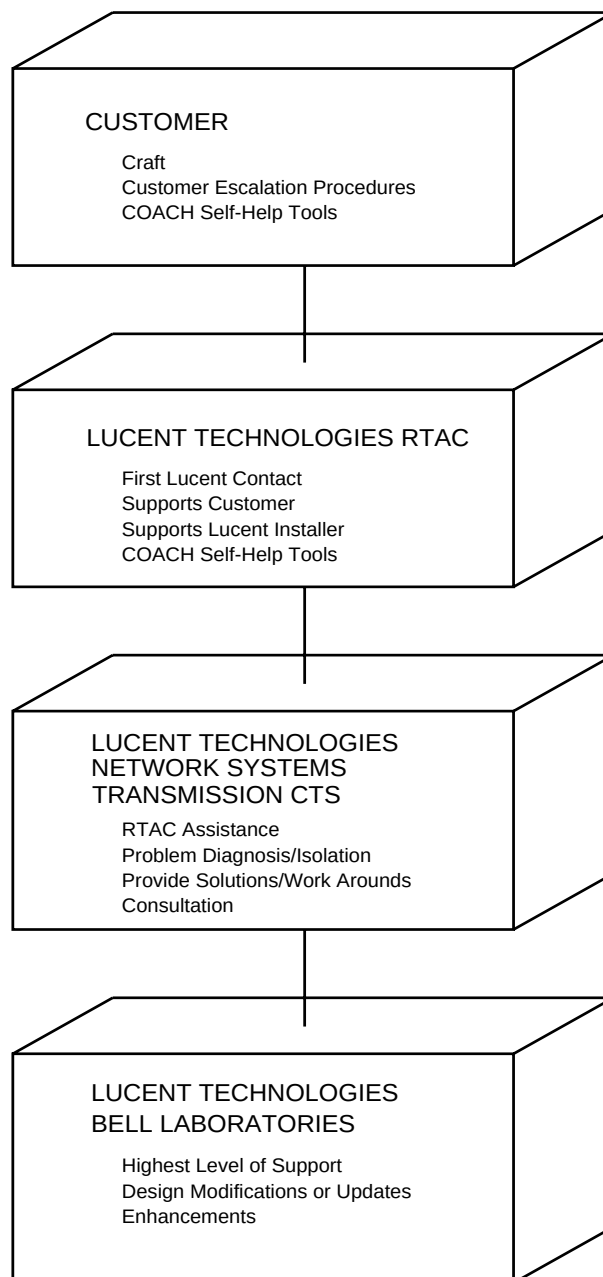


Figure B. Customer Support Levels

The following COACH tools are available to the user:

- Diagnostic Dictionary

The diagnostic dictionary contains histories of previously encountered problems and descriptions of the solutions or workarounds. Your support staff can use this tool when published documentation or standard diagnostic procedures fail to address a problem.

- News and Bulletins

Immediately after a user logs into COACH, the News and Bulletins tool displays bulletins containing urgent information related to the user's products. All users are automatically notified about urgent matters, such as problems with scheduled releases, recalls of hardware or software, or scheduled maintenance for computer support. Less urgent messages are distributed through news items that can be sent to individuals or categories of users. Notification of news appears on the screen immediately following current bulletins.

- Compatibility Data

Occasionally, hardware/software configuration problems arise when new software releases are issued. The Compatibility Data tools permit users to view the correct hardware configuration associated with a specific software release. The user simply enters the appropriate software release number and COACH responds with page-formatted lists of circuit packs compatible with the selected software release. This tool also contains the latest issue numbers of the customer documentation.

- COACH User's Guide

COACH supplies an on-line version of its User's Guide. The COACH User's Guide includes instructions on using the customer support tools and documents any changes to the previous version of the guide.

For information on obtaining a COACH login, contact:

COACH Software Development
Lucent Technologies
1600 Osgood St.
North Andover, MA. 01845

Telephone: **1-800-238-4021**

The RTAC and CTS organization strive to provide proactive and responsive technical customer support for all its products. Through the combined efforts of the individual customer support groups and through COACH tools, the RTAC and CTS organization provide the best possible customer support.

Engineering and Installation Services

The Lucent Technologies Customer Support and Operations (CS&O) organization provides customers with quality product support services. Whether you need assistance in engineering, installation, normal system maintenance, or disaster recovery, the support staff provides you with the quality technical support you need to get your job done. Each segment of the CS&O organization regards the customer as its highest priority and understands your obligation to maintain quality service for your customer.

Within the CS&O organization, the Engineering and Installation Services group provides a highly skilled force of support personnel to provide customers with quality engineering and installation services. These engineering and installation specialists use state-of-the-art technology, equipment, and procedures to provide customers with highly competent, rapid response services. These services include analyzing your equipment request, preparing a detailed specification for manufacturing and installation, creating and maintaining job records, installing the equipment, and testing and turning over a working system.

When the CS&O organization provides job records and installs the equipment, operationally affective changes to the system are automatically identified and applied to the system at no additional cost.

The Engineering and Installation Services group provides the customer with an individually tailored, quality-tested job that meets our published high standards and the customer's operational requirements. The group ensures that the customer's system order is integrated into a complete working system tailored to office conditions and preferences. This process provides for the customer's complete needs. It includes provisions for cabling, lighting, power equipment, and ancillary connections to local and/or remote alarm systems. The group will also respond to any customer changes that occur during installation.

All equipment engineered and installed by Lucent is thoroughly tested and integrated into a reliable system at cutover. Once approved by Lucent's Quality Assurance Test group, the system is turned over to the customer.

The group also provides any specialized engineering and installation services required for unusual or highly individualized applications. These services may include engineering consultations and database preparation. Your local Lucent Technologies Account Executive can provide more information about these services.

Customer Technical Support Enhanced Services

The goal of Lucent Technologies Customer Technical Support Enhanced Services is to keep Lucent Transmission Systems products operating at maximum performance and to prevent problems from interrupting service to customers.

Typical Enhanced Services include:

- Network design, growth planning, and performance analysis
- Multivendor troubleshooting
- Network Integration
- Preventive and remedial maintenance
- Hardware and software upgrade services
- On-site maintenance programs.
- Customized MOP (Method of Procedure) development.

For more information on Lucent's Customer Technical Support Services, contact your Lucent Technologies' Account Executive.

Documentation Support

The Lucent Technologies Customer Training and Information Products organization provides a contact to report errors or to ask questions about information in this document. The document support telephone number is **1-888-LTINFO6 (1-888-584-6366)** (Monday through Friday, 8:00 a.m. to 4:00 p.m. EST).

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Lucent Technologies
Customer Training and Information Products
2400 Reynolda Road
Winston-Salem, NC 27106

You may also report errors or request changes to this document by calling the toll free number, **1-888-LTINFO6 (1-888-584-6366)**, and giving the 9-digit document number.

Electronic Documentation

Documentation for the DDM-2000 OC-3 Multiplexer is now available in electronic form, on compact disk, read-only memory (CD-ROM). CD-ROM has many advantages over traditional paper documentation, including cost savings, search and retrieve capability, and the assurance of the most current documentation.

CD-ROM is available by annual subscription (on standing order).

- To order, call your Technical Information Resource Manager, your Lucent Technologies' Account Executive, or the Lucent Customer Information Center **1-888-LUCENT8 (1-888-582-3688)**.
- For pricing information, contact your Lucent Technologies Network Systems' Account Executive or the Lucent Customer Information Center **1-888-LUCENT8 (1-888-582-3688)**.

The CD-ROM Product Line Order Number for the All Access and Transport Products Grouping is 300-100-010.

- For technical information, call Lucent Documentation Support **1-888-LTINFO6 (1-888-584-6366)**.

Table of Contents

Overview	1-1
Lucent 2000 Product Family	1-1
DDM-2000 Product Family	1-3
■ The Year 2000	1-4
Introduction to the DDM-2000 OC-3 Multiplexer	1-5
DDM-2000 OC-3 Multiplexer Releases	1-6
■ Release Descriptions	1-6

Table of Contents

System Introduction

1

Overview

This section introduces the Lucent Technologies 2000 Product Family and briefly describes the DDM-2000 OC-3 Multiplexer.

Lucent 2000 Product Family

Lucent Technologies is focused on a carefully planned and growing product family designed to provide total network solutions. The 2000 Product Family complies with the synchronous optical network (SONET) standard and builds on features and capabilities that customers have found to be useful and successful in networks, such as single-ended maintenance features and product upgrade capabilities. These upgrade capabilities allow a graceful evolution from today's asynchronous networks to the world-class intelligent networks of the future. The 2000 Product Family provides the significant elements of the Lucent Service Net-2000 Architecture.

Lucent's Service Net-2000 Architecture starts with the network as it exists today and provides real-world solutions to build upon your existing base. It also allows a graceful evolution from rigid wire centers to a network of flexible nodes. This network distributes intelligence to where it functions best.

The Service Net-2000 Architecture offers access bandwidth, service on demand, and self-healing network applications. Access bandwidth offers increased capacity, giving end-users the ability to access any desired service. This

increased access bandwidth, provided over fiber, offers superior network reliability while opening up new revenue opportunities.

Service on demand offers high-capacity services implemented in short intervals. This application gives local exchange carriers the opportunity to generate new revenue faster by provisioning new services at a competitive "fast start" pace. At the same time, they help maintain the existing revenue base by increasing customer satisfaction. Service on demand also reduces start-up costs, thereby improving capital management.

The self-healing network application involves careful planning and provisioning of cross-product capabilities with the 2000 Product Family. At the core of this network is DACS III-2000 and DACS IV-2000 Cross-Connect Systems, the nerve center of interoffice transmission. The intelligent DACS III-2000 and DACS IV-2000 Cross-Connect Systems, working with the ITM XM Controller, can identify failed connections and reroute signals according to a preestablished recovery plan.

The Lucent 2000 Product Family includes the:

- DDM-2000 OC-3 Multiplexer
- DDM-2000 OC-12 Multiplexer
- DDM-2000 FiberReach Multiplexer
- FT-2000 OC-48 Lightwave System
- DACS III-2000 Cross-Connect System
- DACS IV-2000 Cross-Connect System
- ITM XM
- *SLC*[®]-2000 Access System
- Business Remote Terminal-2000 (BRT-2000)
- ITM SNC Sub-Network Controller.
- CPro-2000

DDM-2000 Product Family

The DDM-2000 Product Family includes the DDM-2000 OC-3 Multiplexer, the DDM-2000 OC-12 Multiplexer, the DDM-2000 FiberReach Multiplexer, and DDM-Plus. The DDM-2000 OC-3 and OC-12 Multiplexers are designed for loop (access), interoffice (transport), and customer location applications. They start with many of the proven features of Lucent's DDM-1000 Multiplexer and extend into the future with the flexibility of the SONET standard. The DDM-2000 OC-3 Multiplexer operates at 51 Mb/s, 155 Mb/s or 622 Mb/s, the DDM-2000 OC-12 Multiplexer operates at 622 Mb/s, and the DDM-2000 FiberReach Multiplexer operates at 51 Mb/s. These multiplexers provide flexible and evolvable network solutions. With common operations practices and circuit pack reuse, your investment (for example, technician training, circuit pack inventory) is preserved as the network evolves to higher capacities and advanced topologies.

The DDM-Plus provides a cost-effective fiber extension from the DDM-1000 or DDM-2000 Multiplexers transporting one to four DS1s on a fiber pair, either in a 1x1 protected or unprotected configuration.

The DDM-2000 FiberReach Multiplexer is the newest member of the DDM-2000 product family. The DDM-2000 FiberReach Multiplexer is a full-service access product, combining a 48-line optical network unit with a complete DS1 interface product. DDM-2000 FiberReach is a SONET product that is "hosted" by either a DDM-2000 OC-3 Multiplexer or a SLC-2000 Access System. The extension from the host node is an OC-1 signal in a ring topology. The DDM-2000 FiberReach Multiplexer operates at 51.84 Mb/s. The DDM-2000 FiberReach Multiplexer can be used in DDM-Plus applications where increased capacity and interworking features are needed. See 363-206-300, *DDM-2000 FiberReach Applications, Planning, and Ordering Guide*, for more information.

The DDM-2000 OC-3 Multiplexer supports many network topologies, such as point-to-point, OC-3 fiber hubbing, and linear and ring DS1/DS3/EC-1 add/drop and OC-1, OC-3, and OC-12 rings with time slot interchange (TSI) in a single 8.5 inch high shelf. Each topology is supported with efficiency and a full complement of operations features. The DDM-2000 OC-3 Multiplexer provides integrated DS1 to OC-12 multiplexing.

The DDM-2000 OC-12 Multiplexer supports several stand-alone topologies, including point-to-point, hubbing, add/drop, and ring configurations. The DDM-2000 OC-12 Multiplexer also supports regenerator applications in balanced and unbalanced modes.

The DDM-2000 Multiplexers are designed for easy installation and operation. Centralized operations are supported by a full set of single-ended control and maintenance features. Integrated test capabilities and default provisioning simplify installation. Most tasks can be performed using faceplate LEDs, displays and controls, while a craft interface terminal (CIT) gives access to sophisticated provisioning, maintenance and reporting features. A personal computer (PC) is

needed to download software and to run the CPro-2000 graphical user interface tool software.

In this document, the term "DDM-2000 Multiplexer" is used to reflect the DDM-2000 OC-3, DDM-2000 OC-12, and DDM-2000 FiberReach Multiplexers. Since many features, functions, and circuit packs are common among these multiplexers, information generic to all multiplexers is presented with the DDM-2000 Multiplexer designation. Information specific to a multiplexer is described with the DDM-2000 OC-3, DDM-2000 OC-12, or DDM-2000 FiberReach designation, as appropriate.

The Year 2000

DDM-2000 Multiplexers store dates relative to a non-zero default of January 1, 1970. The last year that can be provisioned using the **set-date** command is 2069. Therefore, DDM-2000 Multiplexers will not be affected by the arrival of the year 2000.

Introduction to the DDM-2000 OC-3 Multiplexer

The DDM-2000 OC-3 Multiplexer is a single shelf SONET digital multiplexer. It is capable of multiplexing up to 84 DS1 signals, or 3 DS3 signals, or 3 EC-1 signals, or 6 OC-1 signals, or a combination of DS1, EC-1, and DS3, and OC-1 signals, into a SONET standard 51.84 Mb/s OC-1, 155.52 Mb/s OC-3 or 622.08 Mb/s OC-12 signal. The OC-1, OC-3, and OC-12 lines, all transmission-affecting circuit packs, and the -48 V DC power feeders may be optionally protected. The shelf can be equipped to serve many diverse network applications and supports a variety of operations interfaces for current and evolving network operations needs.

The DDM-2000 OC-3 Multiplexer is designed for loop (access), interoffice (transport), and customer location applications. The DDM-2000 OC-3 Multiplexer starts with many of the proven features of Lucent's DDM-1000 multiplexer and extends into the future with the flexibility of the SONET standard.

A single 8.5-inch high shelf supports a mix of DS1, DS3, OC-1, OC-3, OC-12, EC-1, OC-3c (STS-3c), and IS-3 signal interfaces, satisfying a wide range of lightwave terminal and SONET electrical multiplexer applications. It supports point-to-point, hubbing, DS1/DS3/EC-1 add/drop, STS-1 drop applications, ring networks, and OC-1 extensions.

The DDM-2000 OC-3 Multiplexer is designed for easy installation and operation. Centralized operation is supported by a full set of single-ended operations (SEO), control, and maintenance features. Integrated test capabilities and default provisioning simplifies installation. Most tasks can be performed using faceplate LED displays and controls, while a CIT gives access to sophisticated maintenance, provisioning, and reporting features. A PC is needed to download software and to run CPro-2000 graphical user interface tool software.

Built-in maintenance capabilities support both installation and system operation. A DDM-2000 OC-3 Multiplexer can be fully tested and installed without external test equipment.

The DDM-2000 OC-3 Multiplexer has a phased release plan. This manual has been updated to include Releases 8.0 through 11.1 and will be updated to cover additional releases as they become available.

DDM-2000 OC-3 Multiplexer Releases

Release Descriptions

The following paragraphs provide brief descriptions of the DDM-2000 OC-3 Multiplexer releases.

Release 2 and later features allow additional circuit pack configurations to activate hubbing and STS-1 linear drop applications. The TL1 message-based interface to Bellcore's Network Monitoring and Analysis (NMA) operations system feature comes as part of the controller hardware and software which must always be furnished separately with Release 2 and later equipment.

Release 3.2 features include three new circuit packs (and associated software): the 22F intermediate reach optical line interface unit (OLIU), which provides full DS1 and DS3 add/drop capability; the 21D OLIU, which provides a short-reach multimode proprietary optical interface (IS-3) between the OC-3 and OC-12 shelves; and the BBF2B TGS circuit pack, which provides DS1 timing outputs. The DS1 timing output is derived from the OC-3 signal. Release 3 includes a security feature that offers security against unauthorized access to the CIT system functions. Logins, passwords, and user categories are provided. Security can be enabled or disabled.

Release 5.1 supersedes Release 5.0 (from this release on, odd feature numbers are for ring releases while even feature numbers are for linear releases) and is a two-fiber, virtual tributary (VT) path switched, ring release that requires the use of 22F OLIUs in the Main-1 and Main-2 slots of all shelves in the ring. Time slots must be reserved all the way around the ring limiting the ring capacity to 84 DS1s. The ring interfaces include DS1 low-speed, DS3 with STS-1 path protection switching and cross-connections, EC-1 low-speed with VT1.5 or STS-1 based cross-connections, or mixed DS1, DS3, and EC-1 interfaces with a total capacity not exceeding the OC-3 bandwidth.

Release 5.1 features include two new circuit packs (and associated software): the BBF3 DS1PM which provides DS1 performance monitoring and the BBG6 STS1E (EC-1) provisioned for low-speed operation. The DS1PM can be mixed with the DS1 circuit packs in the Low-Speed Group slots. The optional DS1 PM feature allows measuring of near-end performance and the extended superframe (ESF) far-end performance report of the incoming DS1 signal. This allows the service provider to determine the end-to-end performance of the DS1 signal. SONET synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

Release 6.0 supports linear applications with new features that include OC-3/OC-12 interworking using the open systems interconnection (OSI) 7-layer protocol stack over the data communications channel (DCC). The OSI 7-layer protocol stack refers to the OSI reference model, a logical structure for network operations standardized by the international standards organization (ISO). Release 6.0 also includes an optional optical carrier level 3 concatenated (OC-3c) feature provided by the 21D or 21G OLIU. This OC-3c transport feature is used to interface with broadband terminals.

Release 6.0 includes one new circuit pack (and associated software): the BBG6 STS1E which provides a high-speed or low-speed EC-1 interface. The STS1E circuit packs are used in the Function Unit slots for EC-1 electrical multiplexer (high-speed) or EC-1 low-speed applications. The optional VT1.5 performance monitoring (PM) feature provides the PM of the V5 byte for errored seconds (ES), severely errored seconds (SES), and unavailable seconds (UAS). The optional DS1 PM feature allows measuring of near-end performance and the ESF far-end performance report of the incoming DS1 signal. This allows the service provider to determine the end-to-end performance of the DS1 signal. Enhanced security features include additional logins. The TL1 message-based interface, introduced in Release 2.0 and enhanced in subsequent releases, for centralized surveillance by NMA systems is enhanced in this release to allow Bellcore's OPS/INE system to provide centralized flow through provisioning of ports and cross-connections.

Release 6.2 replaces Release 6.1 and includes linear optical extensions from an OC-3 ring and an automatic synchronization reconfiguration feature. Automatic synchronization reconfiguration provides the ability to automatically select another synchronization source and to automatically reconfigure the synchronization provisioning in the event of a synchronization source failure or a synchronization change in the network, for example, a fiber cut. The feature can be enabled or disabled. Additional TL1 messages support provisioning, maintenance, testing, PM, and security functions.

Release 6.2 includes *SLC-2000* Release 3.1 and 3.2 interworking and channel state provisioning. Channel state provisioning is a capability provided on *DDM-2000* Multiplexers that suppresses reporting of alarms and events during provisioning by supporting multiple states (automatic, in-service, and not-monitored) for VT1.5 and STS-1 channels.

Release 7.0 is an enhanced ring release. Release 7.0 supports a "drop and continue" feature which is used with DRI applications and an automatic synchronization reconfiguration feature. Release 7.0 features include two new plug-ins (and associated software): the 22D-U and the 22G-U OLIUs. The 22D-U OLIU provides a short-reach IS-3 with TSI optical interface between colocated OC-3 and OC-12 and *SLC-2000* ring shelves. The 22G-U OLIU has the same functionality of the 22F OLIU but with a 23 dB outside plant loss budget allowing for spans of up to 51 km. The 22D-U and 22G-U OLIUs support signal degrade protection switching. The "U" designation for the 22D-U and 22G-U OLIUs means

the OLIUs have universal optical connectors. These OLIUs have adapters that allow the use of *ST*[®], SC, or FC connectors on the faceplates. The 22D-U and 22G-U OLIUs can be used in all releases that currently support 22F OLIUs (Release 3.1 and later).

Release 7.1 is an enhanced ring release featuring interworking with an OC-12 ring and interworking with *SLC*-2000 Release 3.1 and 3.2 in a ring. Release 7.1's new features include channel state provisioning, STS-1 signal degrade protection switching, OC-12 VT1.5 path switched ring (ring 0x1 low-speed interface) optical interconnections between DDM-2000 OC-3 and OC-12 ring shelves (OC-3/IS-3), enhanced DS3 PM, and additional TL1 commands and enhancements.

Channel state provisioning is a capability provided on DDM-2000 OC-3 and OC-12 Multiplexers that suppresses reporting of alarms and events during provisioning by supporting multiple states (automatic, in-service, and not-monitored) for VT1.5 and STS-1 channels. The STS-1 signal degrade feature requires the 22G-U or 22D-U OLIUs and measures the BIP-8 (B3) parity violations and causes a protection switch to the alternate path if the provisioned bit error rate threshold is crossed. The OC-12 VT1.5 path switched ring (ring 0x1 low-speed interface) OC-3/IS-3 interface offers a significant advantage over the 1+1 protected OC-3/IS-3 interface for VT1.5 path switched ring applications. Ring (0x1) low-speed interface means two service lines (no protection lines) are used between the OC-12 Multiplexer ring and the OC-3 Multiplexer ring. Switching is not done on the DDM-2000 OC-12 Multiplexer; rather VT1.5 or STS-1 level switching is done at the DDM-2000 OC-3 Multiplexer.

Enhanced DS3 PM provides a collection (from the fiber or high-speed interface) of the DS3 parity-bit (P-Bit) and frame and multiframe (F&M) bit ES, SES, and UAS to the already provided coding violations and severely errored frame seconds (SESF). The feature is mainly used for DS3 tariff verification.

Release 7.2 is a ring release that provides OC-3 operations interworking with the FT-2000 OC-48 Lightwave System. It also allows interworking between the old controllers (BBG5 and BBG7) and the new controllers (BBG8/BBG8B and BBG9). DDM-2000 FiberReach (OC-1) extensions can be added to Release 7.1 rings by upgrading the rings to Release 7.2 and adding a Release 9.0 OC-3 host node. Only OC-3 DDM-2000 FiberReach host nodes need Release 9.0 software and the new controllers.

- New applications:
 - OC-3 operations interworking with FT-2000 OC-48 Lightwave System. Single-ended operations and DCC connectivity supported over OC-3 interfaces. Requires FT-2000 OC-48 Lightwave System Release 6.0 software.

- OC-3/IS-3 DRI with VT1.5/STS-1 drop and continue. Single-ended operations and DCC connectivity between DDM-2000 systems or DDM-2000 and FT-2000 OC-48 Lightwave Systems in DRI applications.
- Increased network size. A DDM-2000/*SLC*-2000/FT-2000 OC-48 Lightwave System subnetwork of 24 network elements (NE).

■ New features:

- Multiple OS Gateway Network Element (GNE). In DDM-2000/*SLC*-2000 networks, more than one NE can be physically connected to X.25 allowing OSs to automatically select an alternate GNE in case of primary GNE failure. The feature also allows different GNEs to support different OSs simultaneously.
- Provisionable X.25 packet size of 128 or 256 bytes.
- Enhanced PM. Enhancements to DS1 and DS3 line and path PM to further support tariff verification. Enhanced DS3 PM requires the new BBG4B DS3 circuit pack.
- CPro-2000 R3.0, 4.0, 5.0, and 6.0.

Release 8.0 is a linear release using the new BBG8/BBG8B system controller and BBG9 overhead controller circuit packs.

■ New applications:

- OC-3 operations interworking with FT-2000 OC-48 Lightwave System. Single-ended operations and DCC connectivity supported over OC-3 interfaces. Requires FT-2000 OC-48 Lightwave System Release 6.0 software.
- OC-3/IS-3 linear extensions from OC-12 rings. 1+1 linear OC-3 and IS-3 extensions from OC-12 rings.
- Increased subnetwork sizes. A DDM-2000/*SLC*-2000 subnetwork of 32 NEs. A mixed DDM-2000/*SLC*-2000/FT-2000 OC-48 Lightwave System/OC-3 Release 7.2 subnetwork of 24 to 32 NEs.

■ New features:

- Multiple Operations System (OS) Gateway Network Element (GNE). In DDM-2000/*SLC*-2000 networks, more than one NE can be physically connected to X.25 allowing OSs to automatically select an alternate GNE in case of primary GNE failure. The feature also allows different GNEs to support different OSs simultaneously.
- Additional X.25 switched virtual circuits. Nine virtual circuits can be provisioned in any combination of switched and permanent virtual circuits for connections to OSs.
- Provisionable X.25 packet size of 128 or 256 bytes.

- Centralized operations over X.25 link. DDM-2000 CIT commands have equivalent TL1 commands. This allows centralized operations of DDM-2000 systems via the TL1/X.25 link as an alternative to CIT commands.
- New controllers. The new BBG8/BBG8B and BBG9 controller circuit packs provide expanded memory and processing capacity needed to support large networks. Feature enhancements available with the new controllers include:
 - Remote software download. Software can be downloaded from a PC connected to a DDM-2000/SLC-2000 NE to either the local or remote DDM-2000/SLC-2000 NE.
 - Electronic provisioning. Provisionable parameters are set by software, thus decreasing the need for DIP switches. CIT baud rate is provisioned automatically via autobaud detection.
 - User-assigned RT miscellaneous discretes increased from 15 to 21.
 - Upgrades to the new controllers can be done in service.
- Enhanced PM. Enhancements to DS1 and DS3 line and path PM to further support tariff verification. Enhanced DS3 PM requires the new BBG4B DS3 circuit pack.
- Enhanced security. General and reports-only users increased from 50 to 100. Lockout of nonprivileged users and log of all login attempts is provided.
- Electrical facility loopbacks. DS1, DS3, and EC-1 equipment loopbacks of the incoming low-speed signal back towards the DSX.
- STS path trace. Provided in the J1 byte of the SONET path overhead to verify STS path continuity. Allows "labeling" of STS-1s and retrieval of the path by the "label." For example, "ABC #1." STS path trace requires the new BBG4B DS3 circuit pack.
- Provisionable AIS or unequipped conditions. Path AIS provisionable on a path basis. Provides user provisionable generation of AIS or path unequipped signal on a per-shelf basis. Useful in managing cross-connection provisioning if cross-connections are inadvertently deleted.
- Provisionable line and path AIS alarm levels. Alarm levels can be provisioned on a per-line or per-path basis.
- Brownout protection. If the voltage to the shelf drops below the safe operating voltage, the system will suspend normal operations and wait for safe operating voltage to return. Assuming a sufficient voltage level, an "L" will be displayed on the system controller (SYSCTL).

- SYSCTL optical faceplate latch. An optical switch on the BBG8/BBG8B SYSCTL circuit pack latch causes a suspension of controller operations and an "F" to be displayed on the controller panel display when the latch is pulled. Closing the latch causes a controller reset.
- CPro-2000, ITM SNC. Release 8.0 is supported by CPro-2000 Releases 4.0, 5.0, and 6.0, and ITM SNC Release 2.1.

Release 8.1 is a linear release supporting *MegaStar*^{*} 2000 SONET Radio. Release 8.1 requires the BBG8/BBG8B SYSCTL system controller and BBG9 or new BBG10 OHCTL overhead controller. Release 8.1 may be used for non-*MegaStar* 2000 applications when S1 byte synchronization messaging is desired. Release 8.1 will interwork with Releases 7.2 or 9.0.

■ New Applications:

- *MegaStar* 2000 SONET Radio. Part of Lucent Technologies and Harris-Farion *MegaStar* 2000 Radio system supporting mixed fiber and radio topologies. *MegaStar* applications require the BBG10 OHCTL.

■ New Features:

- S1 Byte synchronization messaging. Uses the S1 byte of the SONET overhead to pass timing status information to different nodes in a loop-timed network. Synchronization messaging mode (S1 byte or K2 byte) is provisionable on a per OC-N basis.
- CPro-2000, ITM SNC. Release 8.1 is supported by CPro-2000 Releases 5.0, 6.0, and ITM SNC Release 4.0.

Release 9.0 provides all of the features of Release 7.2 and is a ring release using the new BBG8/BBG8B system controller and BBG9 overhead controller circuit packs.

■ New applications:

- OC-3 DDM-2000 FiberReach host. An OC-3 shelf equipped with 27G-U dual OC-1 OLIUs that supports OC-1 ring extensions from an OC-3 ring, linear, or stand-alone network.
- Automatic synchronization reconfiguration of timing from both Main and Function Unit C slots.
- Increased subnetwork sizes. A DDM-2000/*SLC*-2000 subnetwork of 32 NEs. A mixed DDM-2000/*SLC*-2000/FT-2000 OC-48 Lightwave System/OC-3 Release 7.2 subnetwork of 24 to 32 NEs.

* MegaStar is a registered trademark of Harris Corporation.

- VT hairpin. Cross-connections are allowed between Function Unit A to Function Unit C and Function Unit B to Function Unit C. Optical extensions from Function Unit A slots are also allowed.
 - Dual homing. Ring (0x1) low-speed interface cross-connections between Main and Function Unit slots for dual homing applications between DDM-2000 OC-3 Multiplexers and DDM-2000 FiberReach.
 - Locked cross-connections. Ring (0x1) low-speed interface or VT locked cross-connections between low-speed and high-speed time slots, locking ring traffic onto a designated ring rotation. Used in utility market applications.
- New features:
- Additional X.25 switched virtual circuits. Nine virtual circuits can be provisioned in any combination of switched and permanent virtual circuits for connections to OSs.
 - Centralized operations over X.25 link. DDM-2000 CIT commands have equivalent TL1 commands. This allows centralized operations of DDM-2000 systems via the TL1/X.25 link as an alternative to CIT commands.
 - New controllers. The new BBG8/BBG8B and BBG9 controller circuit packs provide expanded memory and processing capacity needed to support large networks. Feature enhancements available with the new controllers include:
 - Remote software download. Software can be downloaded from a PC connected to a DDM-2000/SLC-2000 network element to either the local or remote DDM-2000/SLC-2000 NE.
 - Electronic provisioning. Provisionable parameters are set by software, thus decreasing the need for DIP switches. CIT baud rate is provisioned automatically via autobaud detection.
 - User-assigned RT miscellaneous discretes increased from 15 to 21.
 - Upgrades to the new controllers can be done in service.
 - Enhanced PM. Enhancements to DS1 and DS3 line and path PM to further support tariff verification. Enhanced DS3 PM requires the new BBG4B DS3 circuit pack.
 - Enhanced security. General and reports-only users increased from 50 to 100. Lockout of nonprivileged users and log of all login attempts provided.
 - Electrical facility loopbacks. DS3, and EC-1 equipment loopbacks of the incoming low-speed signal back towards the DSX.

- STS path trace. Provided in the J1 byte of the SONET path overhead to verify STS path continuity. Allows "labeling" of STS-1s and retrieval of the path by the "label." For example, "ABC #1." STS path trace requires the new BBG4B DS3 circuit pack.
- Provisionable AIS or unequipped conditions. Path AIS provisionable on a path basis. Provides user provisionable generation of AIS or path unequipped signal on a per-shelf basis. Useful in managing cross-connection provisioning if cross-connections are inadvertently deleted.
- Provisionable line and path AIS alarm levels. Alarm levels can be provisioned on a per-line or per-path basis.
- OC-1 line state provisioning. A capability provided on DDM-2000 OC-3 Multiplexers that suppresses reporting of alarms and events by supporting multiple states (in-service and not monitored) for OC-1 lines.
- Brownout protection. If the voltage to the shelf drops below the safe operating voltage, the system will suspend normal operations and wait for safe operating voltage to return. Assuming an insufficient voltage level, an "L" will be displayed on the SYSCTL.
- SYSCTL optical faceplate latch. An optical switch on the BBG8/BBG8B SYSCTL circuit pack latch causes a suspension of controller operations and an "F" to be displayed on the controller panel display when the latch is pulled. Closing the latch causes a controller reset.

Release 9.1 is a ring release which provides all the features of Release 9.0 and requires the BBG8/BBG8B and BBG9 or BBG10 controller hardware. In addition, Release 9.1 supports the following applications and features:

■ New Applications:

- *MegaStar* 2000 SONET Radio. Part of Lucent Technologies and Harris-Farion *MegaStar* 2000 Radio system supporting mixed fiber and radio topologies. *MegaStar* 2000 applications require BBG10 OHCTL.
- Extended FiberReach topologies. Using the new 27G2-U OLIU and Release 2.0 or 2.1 of FiberReach, Release 9.1 supports:
 - Hairpin single and dual 0x1 cross-connects between OC-1s within the same 27G2-U OLIU.
 - Hairpin single and dual 0x1 cross-connects between 27G2-U OLIUs in different function units.
 - Pass-through cross-connects for an OC-1 ring terminated on 27G2-U OLIUs in a function unit.
 - Mixing of all supported cross-connect types.

■ New Features:

- S1-byte Synchronization Messaging. Uses the S1 byte of the SONET overhead to pass timing status information to different nodes in a loop-timed network. Synchronization messaging mode (S1 byte or K2 byte) is provisionable on a per-OC-3 basis.
- Enhanced DS1 PM. Provides 15 minute bins for DS1 path and line PM data.
- Fourth Level of Security. A new Maintenance security level, which allows access to Reports and some maintenance activities is provided in addition to the three current levels of privileged, general, and reports-only.
- Quad-DS1 electrical loopbacks. Provides an electrical facility loopback of four DS1 interfaces from a given BBF1B or BBF3 DS1 circuit pack.
- Large networks. Supports DDM-2000 and FiberReach networks of up to 50 nodes.
- CPro-2000, ITM SNC support. Release 9.1 is supported by CPro-2000 Releases 5.0 and 6.0, and ITM SNC Releases 2.2 and 4.0.
- 27G2-U OLIU. The new 27G2-U OLIU supports the new cross-connects necessary to provide enhanced FiberReach topologies.

Release 11.0 is an enhanced ring release which provides all the features of Release 9.1. In addition, Release 11.0 supports the following applications and features:

■ New Applications:

- OC-12 high-speed optics for OC-3 shelf. Increases ring capacity by providing low-speed DS1 and FiberReach services directly from an OC-12 ring via the OC-3 shelf. Minimizes need for back-to-back equipment. Supports mixing of OC-3 and OC-12 shelves on the same ring during upgrades.
- Enhanced FiberReach topologies. Supports a hairpin local drop of traffic from an OC-1 ring terminated on 27G2-U OLIUs in a function unit to a DS1/EC-1/OC-3 interface in the other function unit group. The 27G2-U is required for these applications. Release 11.0 also supports mixing of local drop, pass-through, and 0x1 cross-connect types.
- Multi-media Data Services: A new DS3 interface provides the flexibility to offer a full range of multi-media data services via embedded and new DDM-2000 networks. This full-solution offering is made possible by interfacing DDM-2000 to any of the numerous commercially available data edge devices which provide the various data services interfaces.

■ New Features:

- New OC-12 OLIU (24G-U) for OC-3 shelf. The new 24G-U OLIU provides OC-12 optics directly from the DDM-2000 OC-3 shelf. This allows the OC-3 shelf to support an OC-12 ring, with the low-speed inputs and capacity of the OC-3 shelf. The 24G-U OLIU provides visibility to the full STS-12 bandwidth and allows for selection of any traffic from any 3 STS-1s on the OC-12 ring for drop at the OC-3 shelf. Remaining traffic can be passed-through on the OC-12 ring.
- Data Services Interface. A new DS3 circuit pack and cross-connect software provide the DDM-2000 interface to an external LAN router/ATM switch for providing Native Mode LAN or general data services via the SONET network.
- Enhanced Software Download. The software upgrade from Release 9.1 to 11.0 and later releases provides a software installation or copy capability which allows compressed files containing the new software generic to be downloaded—locally or remotely—to the DDM-2000 system while the current version is still running. This enhancement reduces both the time the controller is unavailable and the time to download the software. When the appropriate command is initiated, the new generic is installed. Installation of the new generic can be scheduled, allowing coordination of cutover of several NEs in the subnetwork.
- CPro-2000, ITM SNC support. Release 11.0 is supported by:
CPro-2000 Release 6.0 and ITM SNC Release 4.0.
- Frequency error monitoring. STS pointer justification performance monitoring and thresholding provide a means to detect frequency errors in the synchronization network.

Release 11.1 is an enhanced ring release which provides all the transmission features of Release 11.0. In addition, Release 11.1 supports the following applications and features:

■ **New Applications:**

- Enhanced FiberReach topologies. Supports enhanced routing with the single OC-1 26G2-U OLIU. The 26G2-U, with built-in multiplexer capabilities, can drop DS1s without the need for the MXRVO Multiplexer or BBF5 Jumper circuit packs. The 26G2-U provides OC-1 ring pass-through, OC-1 ring hairpin single-homed and dual-homed, and OC-1 ring hairpin local drop applications. The 26G2-U requires the Group 4 or later shelf.
- Transmultiplexer DS3 path termination. The new TMUX circuit pack (BBG20) provides path termination functions for an M13 or C-bit parity DS3 signal. It demultiplexes the DS3 into 28 DS1s, performs DS1 PM, maps each DS1 into a VT1.5, and multiplexes the 28 VT1.5s into an STS-1.
- High bit rate Digital Subscriber Line (HDSL). The HDSL circuit pack (BBF8) provides HDSL interface capability on the DDM-2000 OC-3 shelf. It allows the transport of T1 payloads, for up to 12,000 feet, over two metallic 24 AWG twisted-pair lines.*

■ **New Features:**

- STS-1 hairpin cross-connection
- Single DS1 facility loopback using the BBF3B circuit pack
- Intermediate node STS performance monitoring. This feature collects, reports, and thresholds PM status for the SONET STS-1 Path (B3) derived parameters at intermediate Network Element interfaces.
- CPro-2000, ITM SNC support. Release 11.1 is supported by:

CPro-2000 Release 6.1; ITM SNC Release 6.0
- Reports all active users through the DCC and X.25
- “STS/VT path unequipped” alarm reporting is added to line protected SONET interfaces on ring shelves. On a non-ring interface (i.e. in a function unit slot), the unequipped condition is reported only at a path termination point. The unequipped condition is treated like a path AIS for Yellow/FEBE response and performance monitoring.
- New stratum 3 timing generator circuit pack (BBF4). The TG3 operates with an internal oscillator of ± 4.6 ppm long term accuracy. The TG3 will become available third quarter 1999.

* The HDSL circuit pack can also be installed in DDM-2000 OC-3 shelves running linear Releases 6.2 and later, and ring Releases 7.1 and later. Refer to information included with each circuit pack for provisioning instructions.

- TL1 commands:
 - RTRV-CID-SECU (also new CIT command RTRV-SECU) to report the active user logins.
 - RTRV-LOG to report the 500 most recent events in the history log (equivalent to existing CIT command RTRV-HSTY).
 - ENT-FECOM to provision DCC user-side/network-side settings and to enable or disable remote access via each DCC (equivalent to existing CIT command SET-FECOM which is now supported via CIT remote login and OS).
 - RTRV-FECOM to report the provisioned state of each DCC (equivalent to existing CIT command RTRV-FECOM).

Table of Contents

Overview	2-1
Introduction	2-2
Network Configurations	2-3
■ Path Switched Rings	2-3
OC-3 Path Switched Rings	2-6
OC-12 Path Switched Rings	2-9
OC-12 Ring on OC-3 Multiplexer	2-11
OC-3 Ring with OC-12 Ring Transport	2-13
OC-12 STS-1/VT1.5 Path Switched Ring (0x1)	2-17
OC-1 Path Switched Rings	2-17
■ Folded Ring	2-18
OC-1 Ring Transport on OC-3 Ring	2-20
Single Homing to Linear DDM-2000 OC-3 Networks	2-22
Stand-Alone OC-1 Ring/Hub Networks	2-23
■ OC-3 Ring Transport on OC-12 Point-to-Point	2-25
■ Dual Homing	2-26
OC-1 Ring Transport on OC-3 Ring	2-26
■ Dual Ring Interworking (DRI)	2-28
■ Dual Homing with DRI	2-36
■ OC-3 Linear Optical Extensions from OC-3 and OC-12 Rings	2-38
■ Hairpin Cross-Connections on Rings	2-40
Enhanced Routing	2-41
OC-1 Ring Pass-Through	2-41
OC-1 Ring Hairpin Routing, Single-Homed	2-42

Table of Contents

OC-1 Ring Hairpin Routing, Dual-Homed	2-43
Hairpin Local Drop Routing	2-44
■ Point-to-Point Topologies	2-45
OC-3 Point-to-Point	2-45
■ OC-3 Repeater	2-50
■ Hubbing	2-51
OC-3 Hubbing	2-52
OC-3c Transport on OC-12	2-54
Add/Drop	2-56
■ Electrical Multiplexer	2-58
■ 2000 Product Family Interworking	2-59
SLC-2000 Access System	2-59
DACS IV-2000 Cross-Connect System	2-61
FT-2000 OC-48 Lightwave System	2-62
■ <i>MegaStar</i> 2000 Radio	2-67
■ Multivendor Applications	2-68
Service Applications	2-69
■ Loop Feeder	2-69
■ Interoffice Transport	2-69
■ Broadband Business Access	2-70
■ LAN/WAN Data Networking: Native Mode LAN Interconnect (NMLI) Services	2-72
■ Gateway Between SONET and Asynchronous Interfaces	2-74
■ Teleprotection and SCADA Applications	2-76
■ Intelligent Vehicle Highway System (IVHS) Applications	2-78
■ DS1 Performance Monitoring for Tariff Verification	2-80
■ DS3 Transmultiplexer (TMUX) Application.	2-82
■ High bit-rate Digital Subscriber Line (HDSL) Application.	2-83

Overview

The DDM-2000 Multiplexers serve a wide range of service applications in a wide variety of network configurations economically and efficiently. The first part of this section, "Network Configurations," describes some of the network configurations in which the DDM-2000 Multiplexers and related products can be used to provide specific service applications. The second part of this section, "Service Applications," describes some of the many service applications that can be served with DDM-2000 Multiplexers.

Because the DDM-2000 Multiplexers are very flexible, most of the service applications described in the second part of this section can be served with many of the network configurations described in the first part. The particular network configuration used for a particular service application depends on many factors, such as physical locations involved, including cost, mix of multiple services to be provided with a single network, required interconnections to other networks, and other factors.

Introduction

DDM-2000 Multiplexers provide the flexibility required for operation in today's changing telecommunications networks. With topology and capacity upgrades, a DDM-2000 network can be installed with minimum first cost and then easily grown to add new sites and new services. Many DDM-2000 circuit packs are common with other Lucent Technologies 2000 Product Family products, resulting in further savings as the network evolves.

The DDM-2000 OC-3 and OC-12 Multiplexers are also an ideal solution for private network and customer location applications. The DDM-2000 OC-3 and OC-12 Multiplexers comply with electromagnetic compatibility (EMC) requirements per FCC Title 47, Part 15, and safety requirements per UL 1459 for equipment in dedicated equipment rooms. The DDM-2000 Multiplexers also have Canadian Standards Association (CSA) Certification Standard C22.2 No. 225-M90. Standard access node configurations are available in Lucent's 51A, 80-type and 90-type BRT-2000 cabinets. Fiber distribution of DS1 services is supported with the DDM-Plus extension shelf or DDM-2000 FiberReach, which allows mixing of DS1 line repeater interfaces for embedded metallic facilities and protected quad DS1 optical interfaces. DS0 and Integrated Services Digital Network (ISDN) services are supported from the *SLC*[®]-2000 Access System through copper and fiber distribution.

The DDM-2000 FiberReach Multiplexer is the newest member of the DDM-2000 product family and can be used in all DDM-Plus applications where increased capacity and integrated operations, maintenance, and provisioning features are needed. Only representative DDM-2000 FiberReach Multiplexer applications are included in this section. For more application information, see 363-206-300, *DDM-2000 FiberReach Applications, Planning, and Ordering Guide*.

Network Configurations

This part describes many of the network configurations in which the DDM-2000 Multiplexers can be used. In addition to the configurations specifically described, many other combinations of these network configurations can be used to meet specific application needs.

Path Switched Rings

The need to prevent service outage caused by network failure has created a new class of applications. The 2000 Product Family offers a wide range of self-healing network features that automatically protect against service outage caused by cable cuts and equipment failures, which in turn protect customers and generate increased revenue. These self-healing features include flexible DACS-based restoration with the *DACScan*[®] controller, FT-2000 OC-48 Lightwave System 2- and 4-fiber rings, DDM-2000 OC-3 and OC-12 virtual tributary 1.5 (VT1.5) and STS-1 path switched rings, and *SLC*-2000 Access System path switched rings.

DDM-2000 OC-3, *SLC*-2000 Access System, and DDM-2000 OC-12 self-healing rings offer the performance and administrative benefits demonstrated by the successful Lucent FT Series G Ring Diversity Switch. Since the DDM-2000 OC-3 and OC-12 path switched rings operate in an integrated, single-ended fashion, complex network-level coordination is not necessary to restore traffic. This means restoration is faster and more reliable. Furthermore, bandwidth administration and network reconfigurations (for example, adding or deleting nodes) can be easier because path switching does not require special time slot assignment rules.

The DDM-2000 OC-3 and OC-12 VT1.5 or STS-1 path switched rings operate as shown in Figure 2-1(a.). Traffic entering a path switched ring node is sent onto both rotations of the ring. At the receiving node, the signal having the highest integrity (based on SONET path information) is selected and dropped as outgoing traffic. At intermediate nodes, the traffic is "passed-through" without changing the SONET path information. The DDM-2000 OC-3/OC-12's VT1.5/STS-1 Time Slot Interchange (TSI) capabilities make the provisioning of add/drop and pass-through traffic quick and easy.

In addition, the backup and restoral capability of CPro-2000 can be used to significantly reduce the effort and increase the accuracy of installing several complex ring shelves having similar or identical configurations. After manually provisioning the first node, CPro-2000 can be used to make a copy of the configuration. This copy can then be used to quickly and easily configure all of the remaining nodes using the restoral feature of CPro-2000. Using system backup and restoral in this fashion provides a much quicker and less error-prone installation than manual provisioning.

The self-healing nature of the path switched ring is shown in Figure 2-1(b.). In this case, the fiber failure between nodes C and D causes node C to switch from the counterclockwise ring to the clockwise ring, thus maintaining service between node A and C.

A network which requires the bulk of its traffic to be dropped at a single node is an ideal application for path switched rings. A typical loop feeder network, where most traffic is between the subscriber loop to a central office (CO), fits this mold. Such an application calls for the delivery of protected DS1 and DS3 service to customer locations. In many cases, where the network serves only voice traffic and DS1s, a DDM-2000 OC-3/SLC-2000 path switched ring is a perfect fit. If DS3 service or a mixture of DS1 and DS3 service is needed, multiple OC-3 rings or an OC-12 ring may be necessary. Cost, fiber availability, and bandwidth flexibility all play a part in determining whether a single OC-3 ring, multiple OC-3 rings, or an OC-12 ring will be the best network solution.

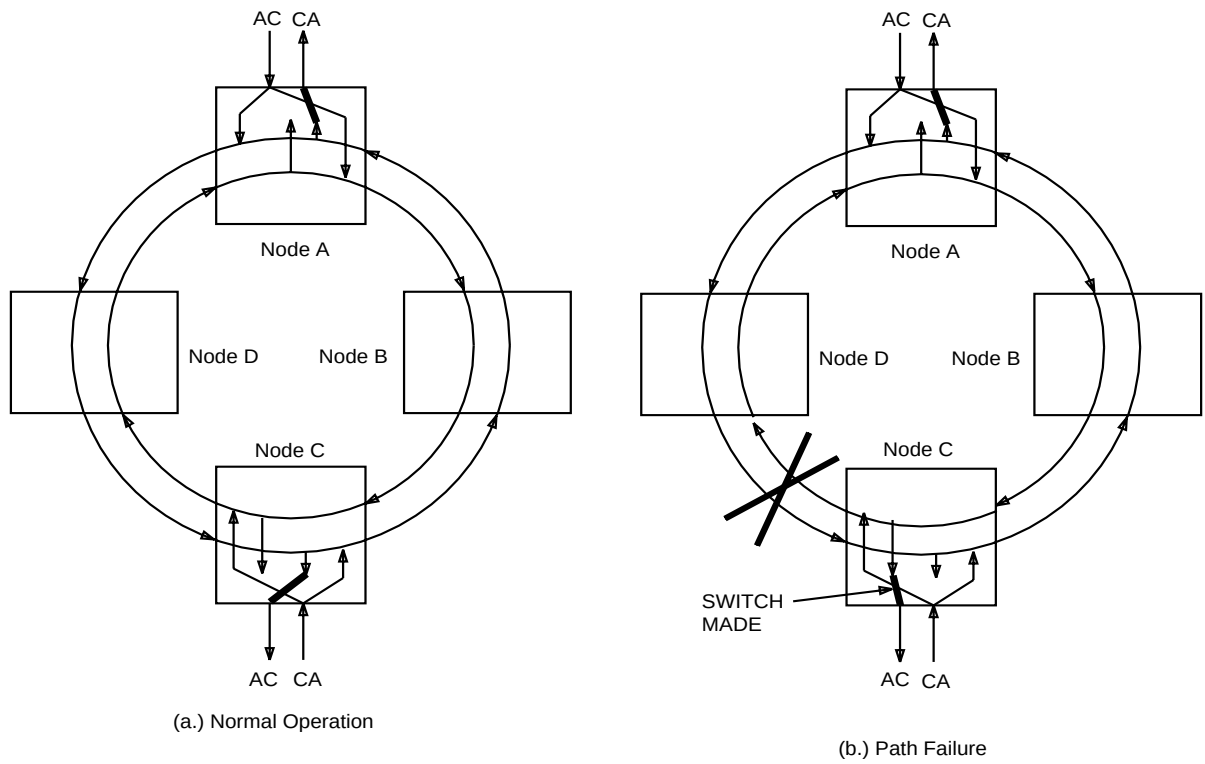


Figure 2-1. Path Switched Ring

OC-3 Path Switched Rings

The OC-3 path switched ring allows several remote sites to share the two-fiber ring facility back to the CO (Figure 2-2). The DDM-2000 OC-3 Multiplexer interfaces to the ring through the main slots at the OC-3 rate and uses its programmable VT1.5/STS-1 TSI capability. Path switching can be done on VT1.5 paths, STS-1 paths, or a mixture of these. Up to 84 DS1s, 3 DS3s, 3 EC-1s, or equivalent combination can be added/dropped from the DDM-2000 OC-3 Multiplexer path switched ring at any node. Because of the ring's path protection scheme, time slots must be reserved all the way around the ring for all ring traffic, limiting the capacity of the ring to the OC-3 line rate. Like the DDM-2000 OC-3 add/drop topology, the TSI feature offers full flexibility in assigning signals between low-speed DS1, DS3, or EC-1 ports, and the high-speed interface at each node. The DDM-2000 OC-3 Multiplexer can easily adapt to unpredicted growth at a ring node.

Extensive equipment reuse between DDM-2000 OC-3 terminal, add/drop, and ring nodes offers a significant operational advantage. The DDM-2000 OC-3 Multiplexer ring shelf is the same shelf as used in terminal and add/drop applications. Also, circuit packs can be retained when upgrading a linear network to a ring.

The ring topology routes traffic between a CO site and a set of remote terminal (RT) sites, as in the add/drop topology, while providing complete protection. In addition, only two OLIUs are needed per DDM-2000 OC-3 Multiplexer, which provides a cost savings over the add/drop topology. Traffic can also be routed between RT sites. The ring can start with as few as two nodes and grow to support many nodes through in-service node additions.

For protection against a CO failure, it may be desirable to include a second CO node in the ring. This dual homing architecture allows all services to be routed to the alternate CO while the first CO is out of service.

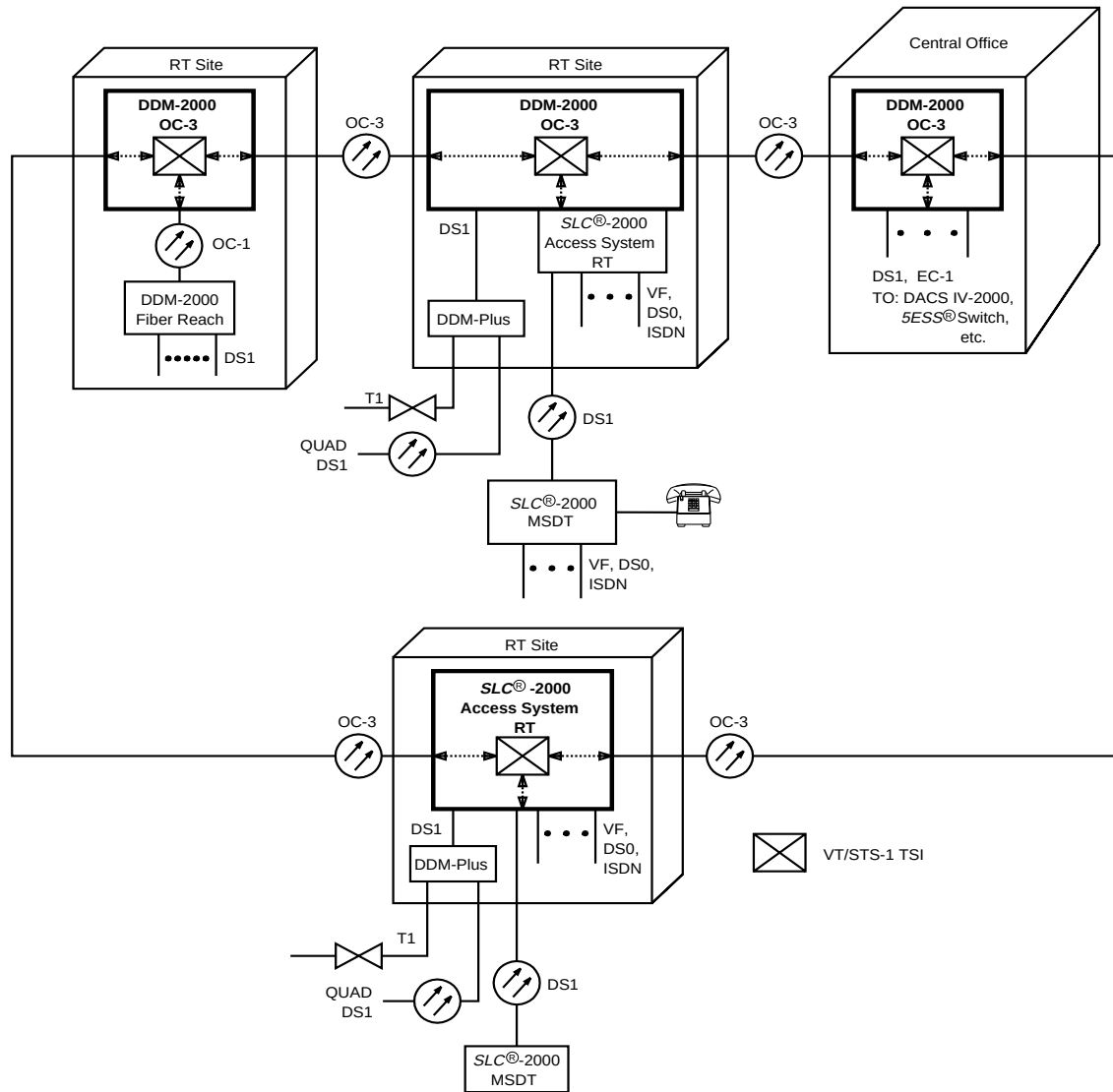


Figure 2-2. OC-3 Path Switched Ring

A DDM-2000 OC-3 Multiplexer VT1.5/STS-1 path switched ring is a very effective self-healing network topology for small cross-section interoffice networks, such as outstate trunks. Low-density routes that primarily transport DS1 traffic are ideally suited to the DDM-2000 OC-3 Multiplexer path switched ring. DS3s/EC-1s may also be carried between offices on DDM-2000 OC-3 Multiplexers (Figure 2-3).

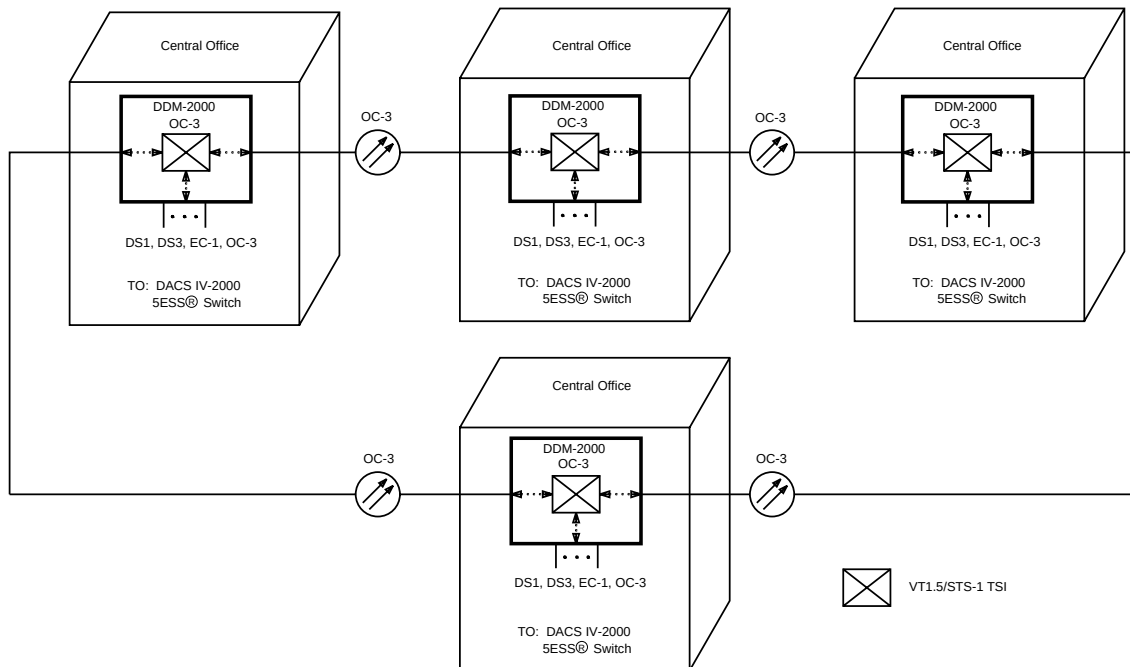


Figure 2-3. DDM-2000 OC-3 Path Switched Interoffice Ring

OC-12 Path Switched Rings

The DDM-2000 OC-12 Multiplexer provides STS-1/STS-3c level path protection switched ring capability. As shown in Figure 2-4, it provides transport of 12 DS3s, 12 EC-1s, 4 OC-3cs, or a mixture with path switching at the STS-1 level (STS-3c level for OC-3c traffic). Such a ring provides an economical, flexible, and reliable solution for loop feeder networks.

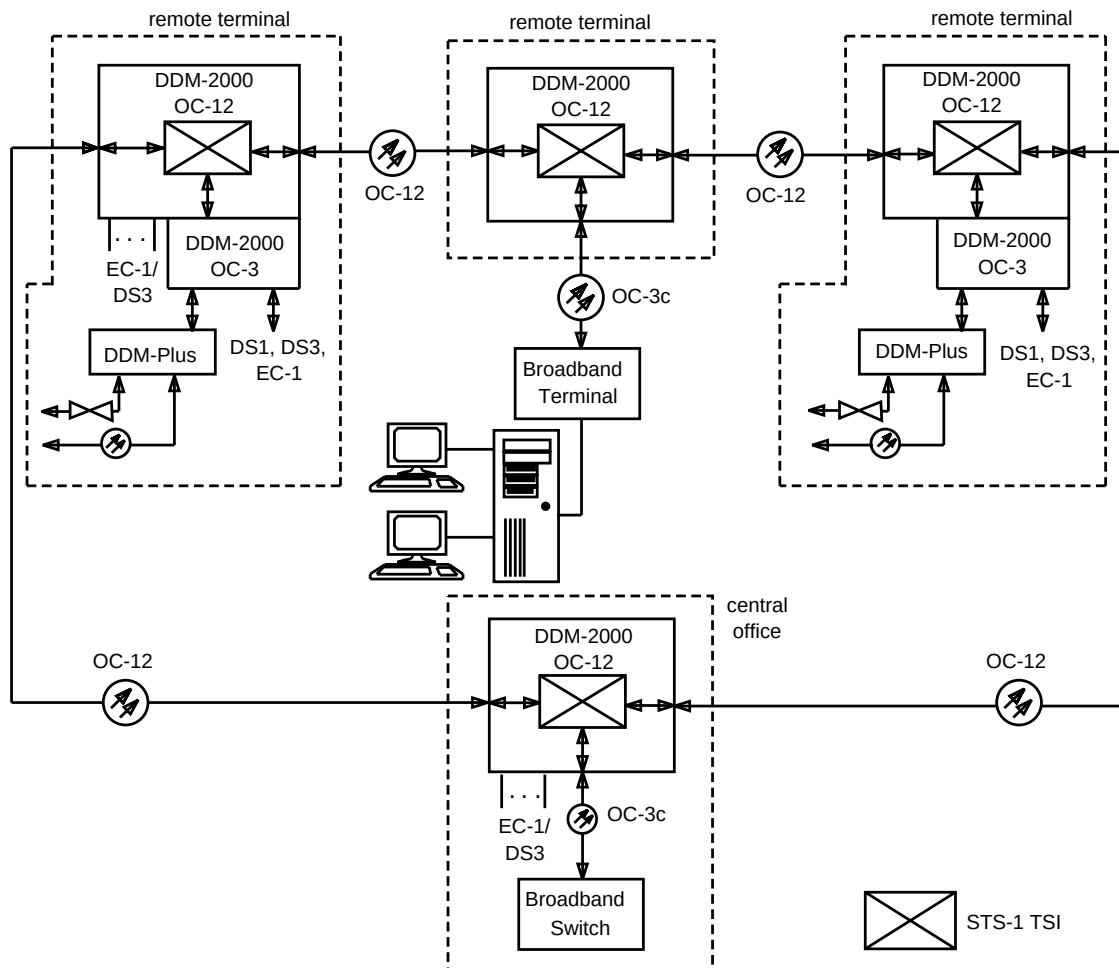


Figure 2-4. OC-12 Path Switched Ring — STS-1 Level Path Switching

Figure 2-5 shows how DDM-2000 OC-3 and OC-12 Multiplexers can be used together to provide a path switched ring operating simultaneously at the VT1.5, STS-1, and STS-3c levels. This ring is especially useful for loop feeder applications with large bandwidth needs. It can also be developed as a result of an upgrade from an OC-3 ring in an environment where growth has exhausted the bandwidth of the OC-3 ring.

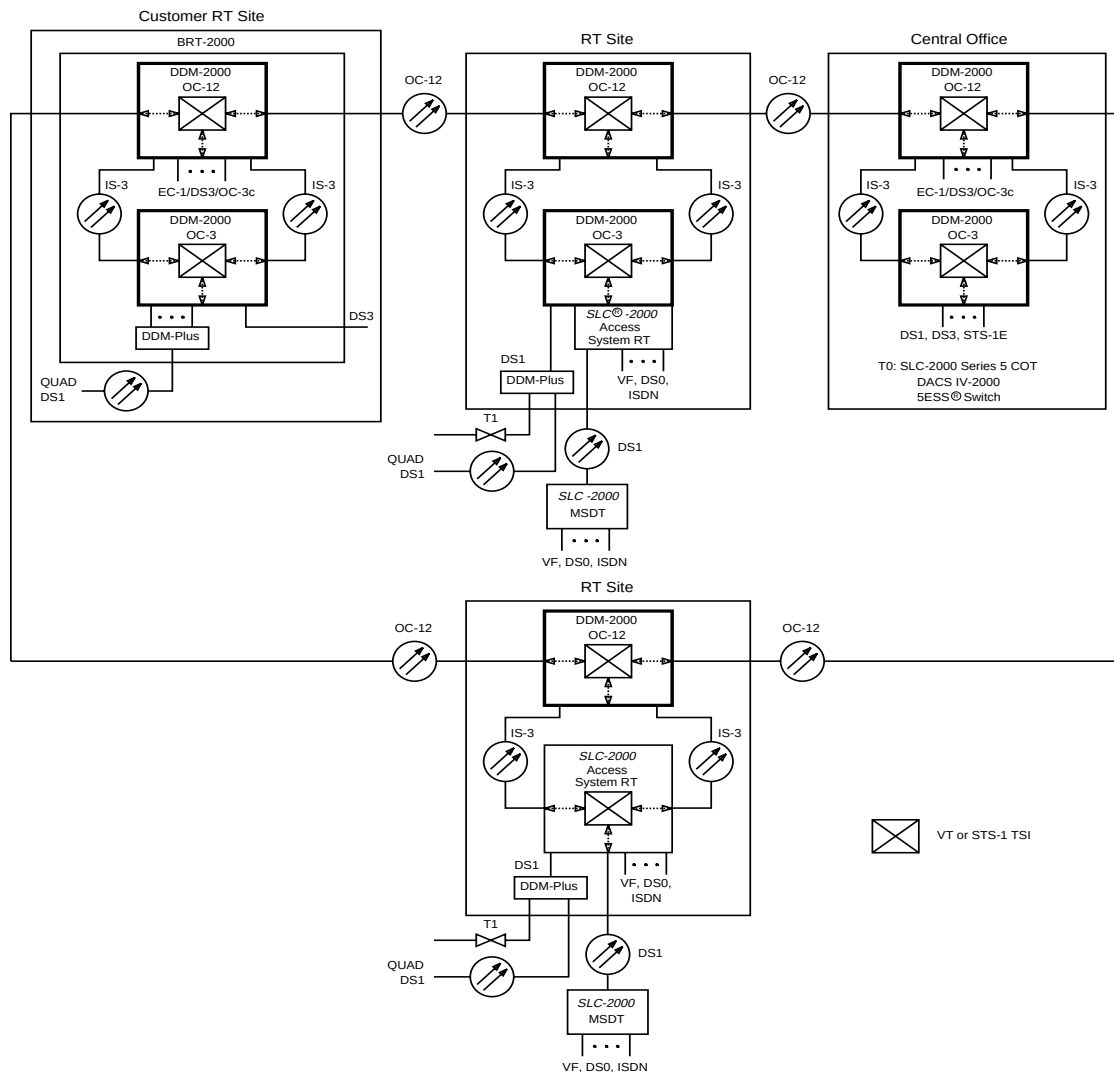


Figure 2-5. OC-12 Path Switched Ring Using OC-12 Multiplexer—Mixed STS-1 and VT1.5 Path Switching

OC-12 Ring on OC-3 Multiplexer

Alternatively, a DDM-2000 OC-3 Multiplexer can be equipped with OC-12 optics. This option offers a cost effective solution at locations where the dropped traffic is primarily VT1.5 based and is accessed from any three of the 12 STS-1s. OC-12 and OC-3 multiplexers equipped with OC-12 optics can be mixed in the same OC-12 ring. The OC-12 multiplexers can be used at sites requiring DS3 and other higher bandwidth STS path-switched traffic, while the OC-3 multiplexer is used at sites requiring VT path access for DS1, FiberReach, etc. Figure 2-6 shows an OC-12 ring that includes both OC-3 and OC-12 multiplexers.

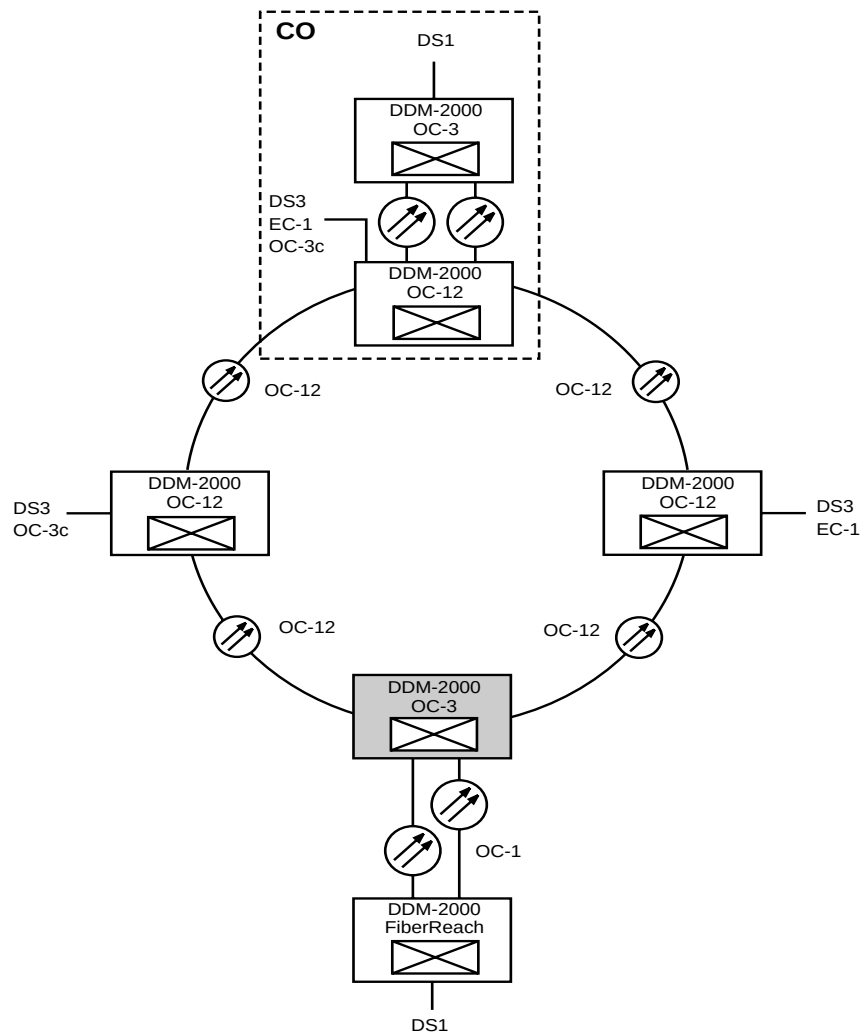


Figure 2-6. OC-12 Path Switched Ring Using OC-12 Multiplexer and OC-3 Multiplexer With OC-12 Optics

The OC-3 multiplexer with OC-12 optics may be used as an in-service upgrade to an OC-3 ring when traffic demand exceeds the 3 STS-1 capacity of an OC-3 ring. Figure 2-7 shows an OC-12 ring composed of OC-3 multiplexers equipped with OC-12 optics. OC-3 shelves with OC-12 optics can be added to the ring to utilize the additional ring bandwidth. This upgrade strategy quadruples the capacity of the ring using the existing fiber and OC-3 multiplexer shelves.

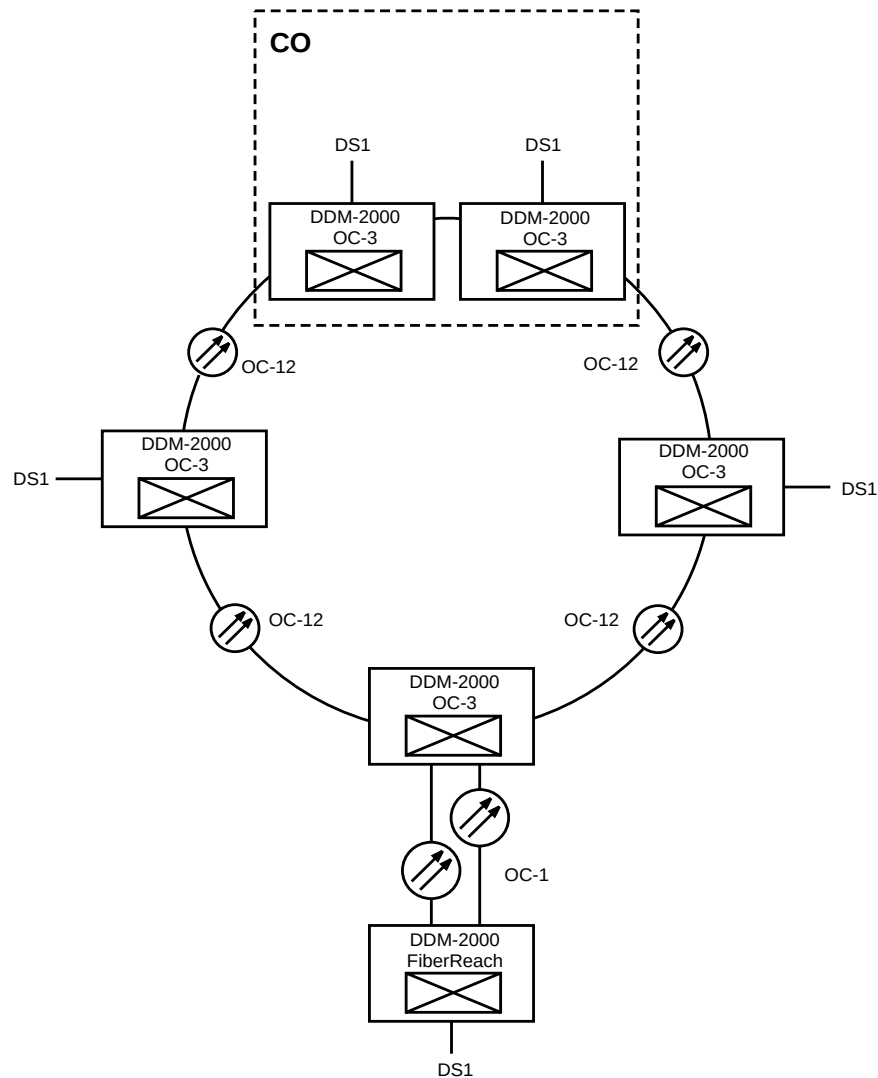


Figure 2-7. OC-12 VT Path Switched Ring Using DDM-2000 OC-3 Multiplexer With OC-12 Optics

OC-3 Ring with OC-12 Ring Transport

If fiber exhaustion is a problem, the 2000 Product Family provides several alternatives for the network planners to pick from, depending on the specifics of their application. If fiber is available, multiple DDM-2000 OC-3 Multiplexer rings can be installed; or if fiber is unavailable or if the administrative ease of a single ring is desired, a single DDM-2000 OC-12 Multiplexer ring can be installed. Fiber exhaustion often occurs when customer demand for voice, DS1, and DS3 services grows to fill the OC-3 ring's capacity. If the growth has come from only one or two sites and there is spare fiber in place, these high demand sites may be cut to a new OC-3 ring without interrupting service. Alternatively, driven by fiber exhaustion or evolution to customer DS3 services, the OC-3 ring may be upgraded while in service to an OC-12 ring. In this configuration (Figure 2-8), DDM-2000 OC-3 Multiplexer equipment is colocated with a DDM-2000 OC-12 Multiplexer shelf to provide a unified VT1.5 path switched ring node with an OC-12 high-speed interface.

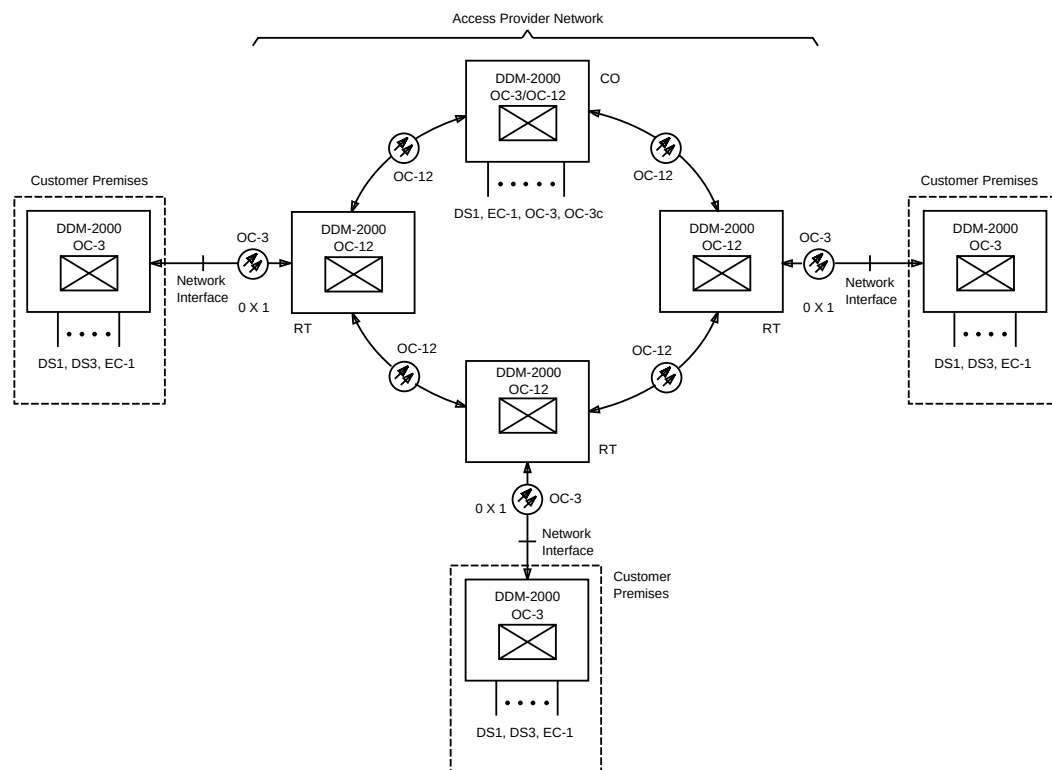


Figure 2-8. OC-3 Ring with OC-12 Ring Transport

VT1.5 bandwidth rearrangement is available which allows the unused VT1.5s from an STS-1 dropped at one site to be dropped at other sites. All DDM-2000 OC-3 and OC-12 Multiplexer shelves connected together in this subnetwork can communicate, using the single-ended operations capability of DDM-2000 Multiplexers. Once the DDM-2000 Multiplexer OC-12 ring is in place, it can be used by itself to provide STS-1 level path switching with DDM-2000 OC-3 Multiplexers to provide VT1.5 level path switching, or in a mixed configuration where both STS-1 level and VT1.5 level switching are supported simultaneously.

The link between the DDM-2000 OC-12 and OC-3 Multiplexers is 0x1 protected for this ring configuration. In this case, the DDM-2000 OC-12 Multiplexer feeds STS-1s directly off of each ring rotation to the DDM-2000 OC-3 Multiplexer where path switching is done. Switching is not done on the DDM-2000 OC-12 Multiplexer; rather VT1.5 or STS-1 level switching is done on the DDM-2000 OC-3 Multiplexer. Interconnecting the DDM-2000 OC-12 and OC-3 Multiplexers via a 0x1 interface allows the same STS-1 to be dropped to DDM-2000 OC-3 shelves at several nodes on the OC-12 ring. This combination of interconnected DDM-2000 OC-12 and OC-3 Multiplexers provides full VT1.5 switching granularity across the entire OC-12 bandwidth at any node on the ring, resulting in a full-fledged VT1.5 path switched OC-12 ring.

The DDM-2000 OC-12 path switched ring can be used in conjunction with the DDM-2000 OC-3 Multiplexer by an access provider to provide OC-3 ring service on an OC-12 ring for end-users. It is becoming more frequent that a single end-user desires a virtual private network from an access provider to connect several sites in a metropolitan area together. It is accomplished by deploying a DDM-2000 OC-12 ring in conjunction with DDM-2000 OC-3 Multiplexers. As described previously, the DDM-2000 OC-3 Multiplexers provide VT1.5 and STS-1 path switching; however, in this case, they are placed at end-user locations. The DDM-2000 OC-3 equipment is then used exclusively by that end-user and three STS-1s worth of bandwidth are reserved on the OC-12 ring for that end-user.

The end-user is given logon privileges to the OC-3 equipment located on their premises, allowing them to gather performance data, provision service, and administer their virtual OC-3 ring network. From the end-user's point of view, they have a virtual OC-3 ring network at their disposal.

For customers who have significant bandwidth demands or whose geographical situation requires additional OC-3 shelves from a single OC-12 location, Figure 2-9 shows how these applications can also be met. In addition, diverse routing to two separate OC-12 shelves can increase the reliability of the network even further.

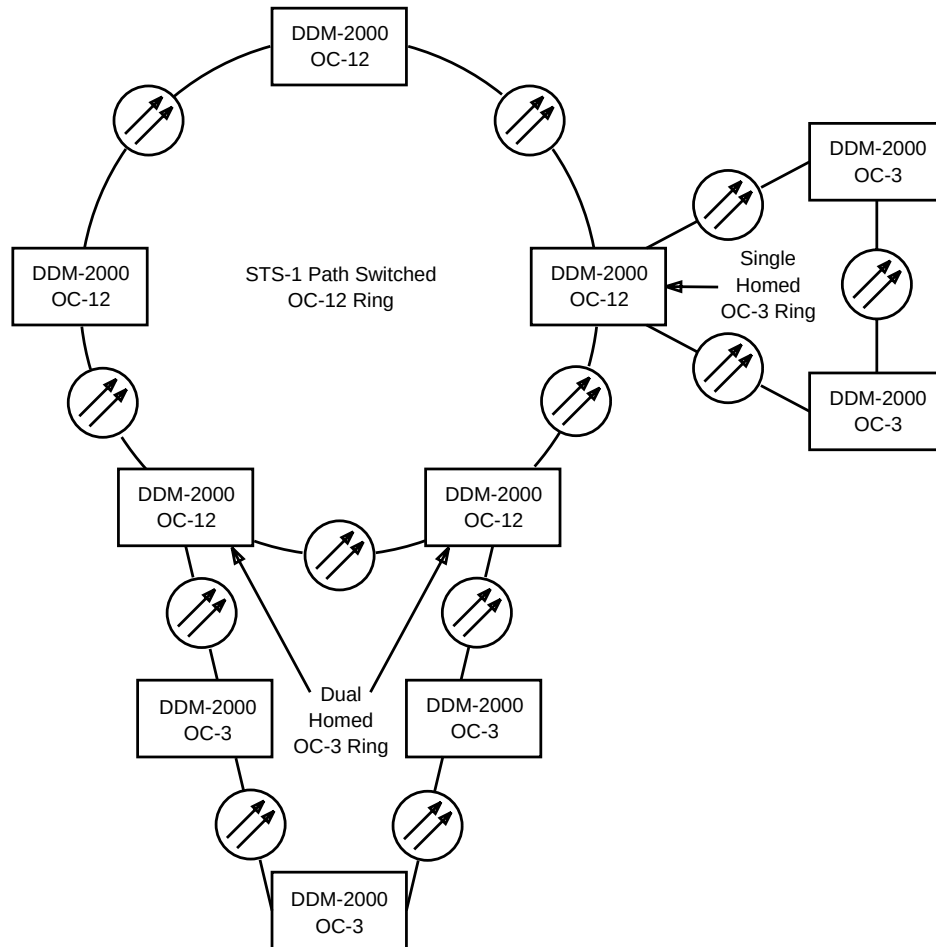


Figure 2-9. Multinode OC-3 Ring With OC-12 Ring Transport

The DDM-2000 OC-3 and OC-12 Multiplexers' path switched ring capabilities work together to provide cost-effective transport for small or medium cross-section interoffice networks, such as outstate trunks. Such a ring, shown in Figure 2-10, provides DS1, DS3, EC-1, and OC-3c transport.

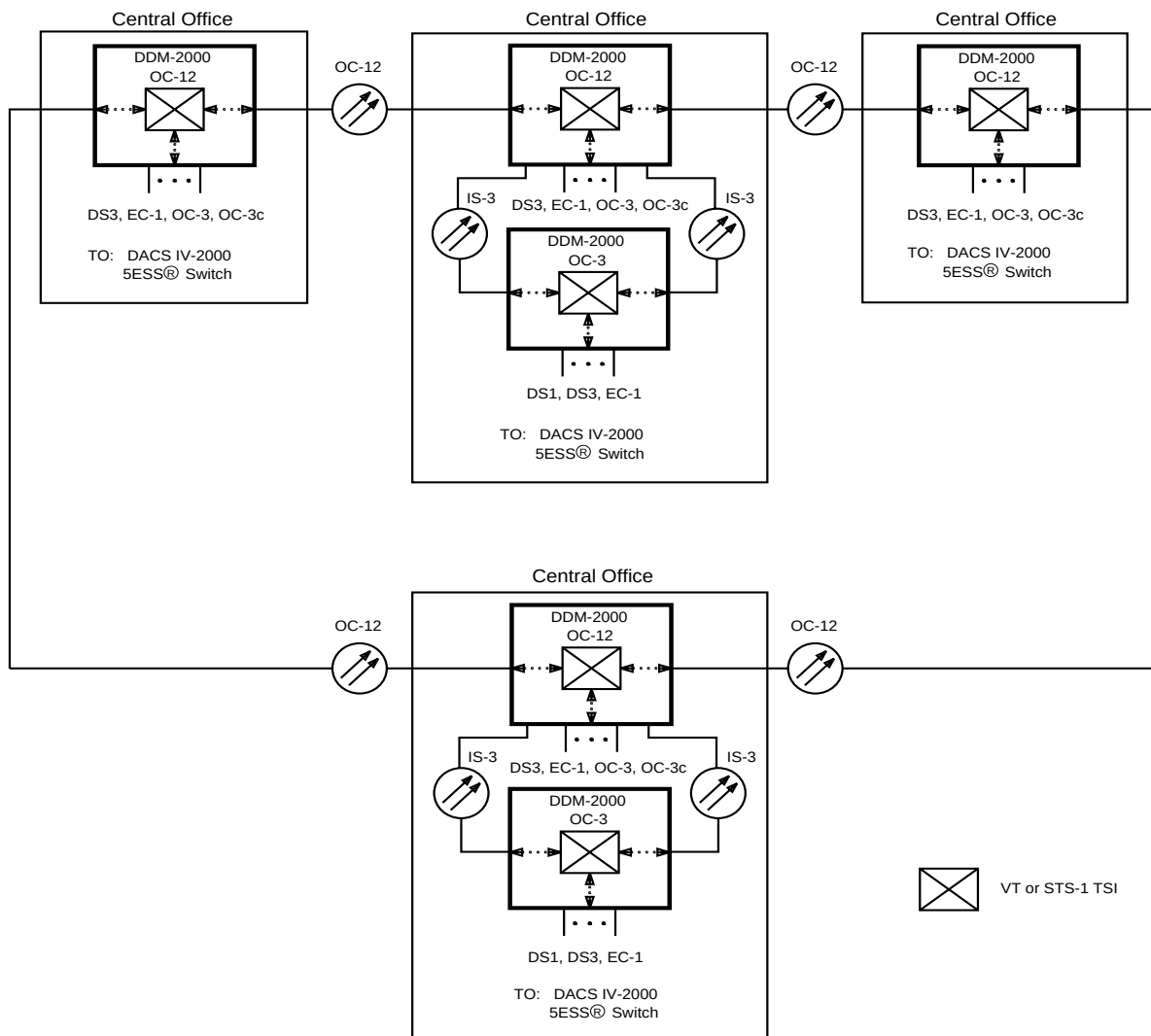


Figure 2-10. DDM-2000 OC-12 Path Switched Interoffice Ring

In a ring configuration, the DDM-2000 OC-12 Multiplexer can provide two high-speed optical interfaces. At a 1310 nm wavelength, it supports a span length of up to 51 kilometers (32 miles) without regenerators. At a 1550 nm wavelength, it supports a span length of up to 100 kilometers (61 miles) without regenerators. Regenerators or add/drop systems can be used to increase the distances for 1310 nm installations.

Each ring node can be independently synchronized from a Building Integrated Timing Supply (BITS) clock. This BITS clock can also be timed using the DDM-2000 DS1 timing output feature.

OC-12 STS-1/VT1.5 Path Switched Ring (0x1)

The DDM-2000 OC-12 ring supports (0x1) OC-3/IS-3 interfaces in its function unit slots. These interfaces must be provisioned as 0x1. Signals pass through the DDM-2000 OC-12 transport ring and exit to the DDM-2000 OC-3 ring. OC-12 function unit slot FN(x)-1 is connected to OC-3 Main-1 and OC-12 function unit slot FN(x)-2 is connected to OC-3 Main-2. Switching is not done on the DDM-2000 OC-12 Multiplexer on these lines, or paths on these lines; rather VT1.5 or STS-1 level path switching is done on the DDM-2000 OC-3 Multiplexer. This allows DDM-2000 OC-3 nodes running ring software to interface with DDM-2000 nodes of an OC-12 ring in such a way as to provide ring-on-ring architecture. Each OC-3 ring so supported occupies up to three STS-1 time slots on the OC-12 ring. Each OC-12 node can provision the same STS-1 time slots as other OC-12 nodes to drop to the OC-3 shelf (to share STS-1s among several OC-3 shelves) or the OC-12 node can provision different STS-1s at different sites. With 0x1 operation, the OC-12 ring passes the contents of these STS-1 time slots between the low-speed OC-3/IS-3 lines and OC-12 high-speed lines without terminating them or performing any path protection switching on them. Up to four OC-3 rings can be supported in this fashion by an OC-12 ring to maximize the OC-12 bandwidth utilization. This allows access to any and all VT1.5 signals at an OC-12 site. Since the high-speed signals from the OC-3 ring(s) are sent as two copies (one clockwise, the other counter-clockwise) on the OC-12 ring, the OC-12 ring capacity is limited to the OC-12 line rate.

The OC-3/IS-3 lines between an OC-12 node and an OC-3 node connected in a ring (0x1) fashion behave like the OC-3 lines between the nodes on an OC-3 ring and do not perform line level protection switching. Instead, the OC-3 shelves perform the normal path protection switching functions.

OC-1 Path Switched Rings

DDM-2000 FiberReach Multiplexers can be configured in an OC-1 path switched ring. The path switched OC-1 ring is best suited for DS1, DS0, and broadband channel transport in a campus or other self-contained environment where there is no need for the additional capacity and flexibility of an OC-3 backbone network.

Folded Ring

DDM-2000 OC-3 and OC-12 rings offer several benefits in addition to service assurance. Economically, a ring network minimizes overall network cost by requiring fewer optical transmit/receive units than a comparable linear add/drop network. Operationally, a ring network provides significant flexibility to increase bandwidth at existing nodes and to add new nodes at locations where unanticipated bandwidth is required.

These benefits make rings highly desirable even when fiber route diversity is not available. When route diversity is not available on part or all of the ring, ring technology can be used to support split and tapered feeder routes to derive economic benefits, provide bandwidth flexibility, ease the process of adding and deleting nodes, and supply survivability against single-node failures.

When route diversity is not available or fiber cable cuts are not a driving concern, the two-fiber path switched ring feature can be applied in a "folded" (a folded ring is a single path ring) configuration (Figure 2-11). This use of DDM-2000 OC-3, OC-12, and *SLC*-2000 access resource manager (ARM) path switched rings applies in particular to hubbing and linear topologies where there is no return path from the end remote site to the CO. While a complete cut through the fiber cable cannot be protected, single-node equipment failures are still protected. Furthermore, a two-fiber ring ARM uses only one optical transmitter/receiver in each direction (two per remote shelf), in contrast to a 1+1 line protection arrangement that requires four optical transmitter/receivers per remote shelf. Thus, the ring configuration reduces equipment costs, a benefit independent of its survivability advantage. The ring topology also makes node addition/deletion straightforward.

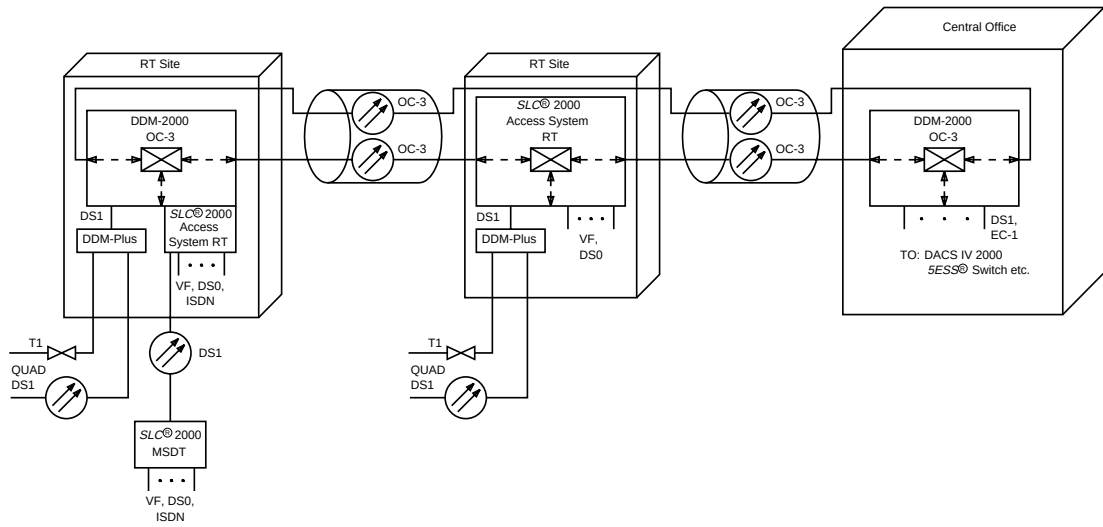


Figure 2-11. Folded Ring Configuration

OC-1 Ring Transport on OC-3 Ring

OC-1 ring transport on OC-3 rings can be used in both single-homed and dual-homed configurations. Figure 2-12 shows how single-homed OC-1 extensions can satisfy a growing access network. Single-homing applications connect both rotations of the OC-1 extension to a single DDM-2000 OC-3 or *SLC-2000* Access System host. The DDM-2000 FiberReach is located at the customer's location, such as in a telecommunications equipment closet on each floor of a high-rise office complex, and delivers up to 28 fully protected DS1 channels per system.

The OC-1 ring capability allows multiple DDM-2000 FiberReach systems to be connected to the backbone network via a single facility. Compared to other optical extension products that are limited to a single remote node per extension, the ring-based DDM-2000 FiberReach solution uses far less fiber and host optics for typical serving areas with multiple business locations. Network growth is as easy as adding another DDM-2000 FiberReach node on the ring; no additional fiber or host circuit packs need to be added.

With the dual OC-1 capability of the 27-type OLIU, a DDM-2000 OC-3 ring node supports up to six single-homed OC-1 extensions; a *SLC-2000* Access System ARM shelf can supply up to two single-homed OC-1 extensions. Thus, competing businesses in the same serving area can receive a dedicated access facility into the backbone ring, alleviating any privacy concerns.

The DDM-2000 FiberReach remote systems employ standard path protection switching for a highly reliable network that guarantees 60 millisecond recovery from any single facility or equipment failure. Path protection switching occurs at the nodes where a channel is dropped from the ring to a low-speed interface. Channels pass between the OC-1 and OC-3 rings at the host DDM-2000 OC-3 and *SLC-2000* systems with a 0x1 cross-connection. This arrangement supports full TSI assignment between low-speed and high-speed time slots while preserving independent service and protection paths between the host and extension rings.

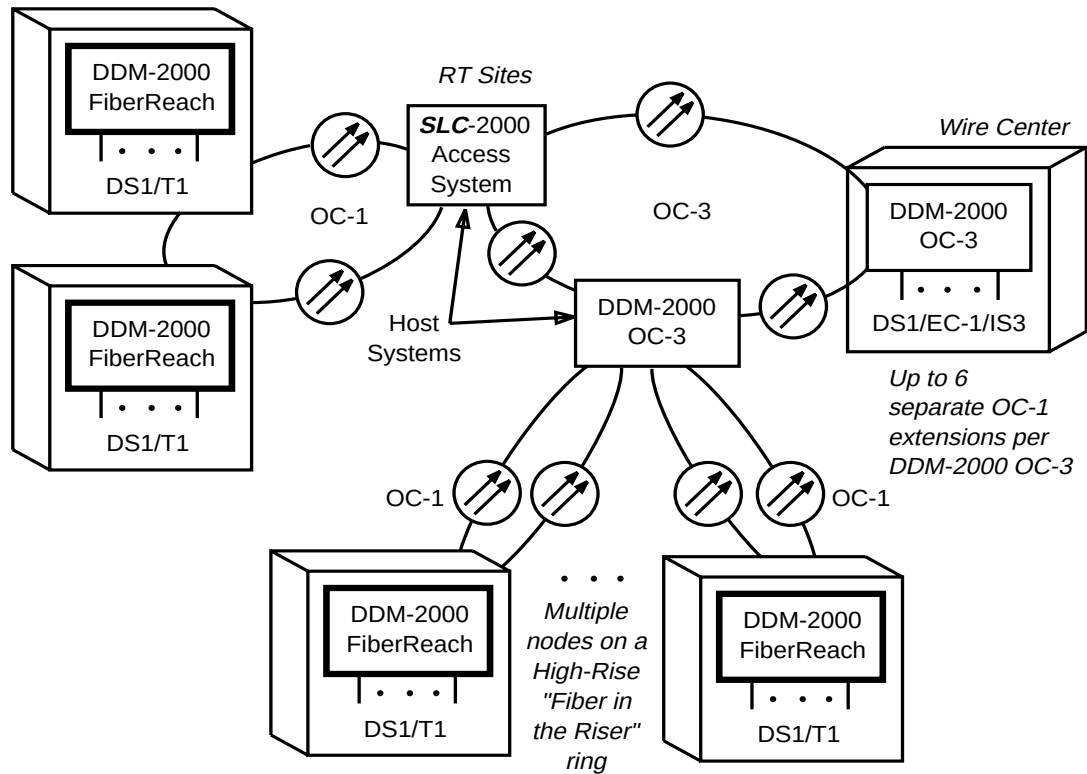


Figure 2-12. OC-1 Ring Transport on OC-3 Ring Configuration

Single Homing to Linear DDM-2000 OC-3 Networks

In business applications where the DDM-2000 OC-3 host is a node on a linear topology, two single-homed OC-1 ring extensions can be provided to multiple DDM-2000 FiberReach Multiplexers as shown in Figure 2-13. In this tapered linear application configuration, function slot "C" of the DDM-2000 OC-3 host is used for incoming traffic, and the "A" and "B" slots are used for downstream traffic or local terminations. The host DDM-2000 OC-3 Multiplexer must be using software Release 9.0 or later. The other DDM-2000 OC-3 Multiplexers in the linear application must be using Release 8.0 software.

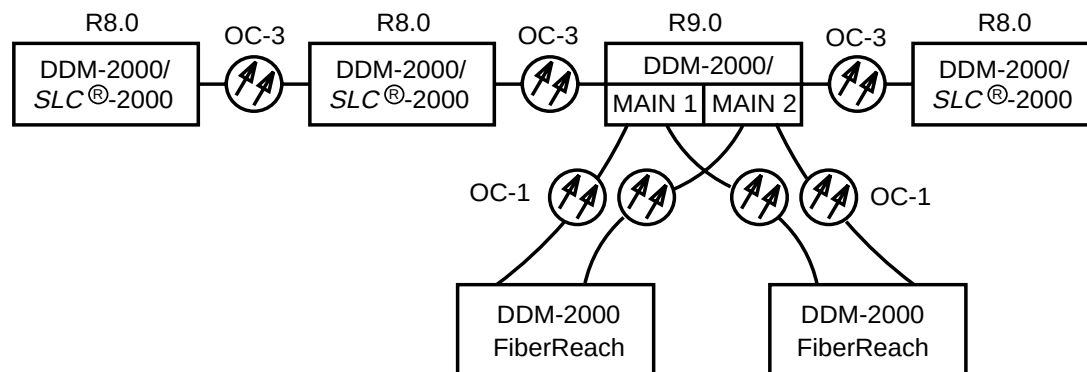


Figure 2-13. Single-Homed OC-1 Ring to a DDM-2000 OC-3 Linear Application

Stand-Alone OC-1 Ring/Hub Networks

In applications such as campus or other self-contained environments, DDM-2000 FiberReach can be deployed in a stand-alone OC-1 ring. This OC-1 ring extension can be configured directly from a DDM-2000/SLC-2000 shelf with 27-type OLIUs in the main slots. A mix of DS1 and T1 carrier traffic from remote DDM-2000 FiberReach nodes can be flexibly groomed and dropped at the host to a mix of DS1, EC-1, and OC-3 interfaces, as shown in Figure 2-14. Channels can be established directly between two DDM-2000 FiberReach remotes on the same OC-1 ring. This configuration would be very effective for customers within a short radius of the wire center or for isolated demand at a distant location where there is no appropriate access network yet in place.

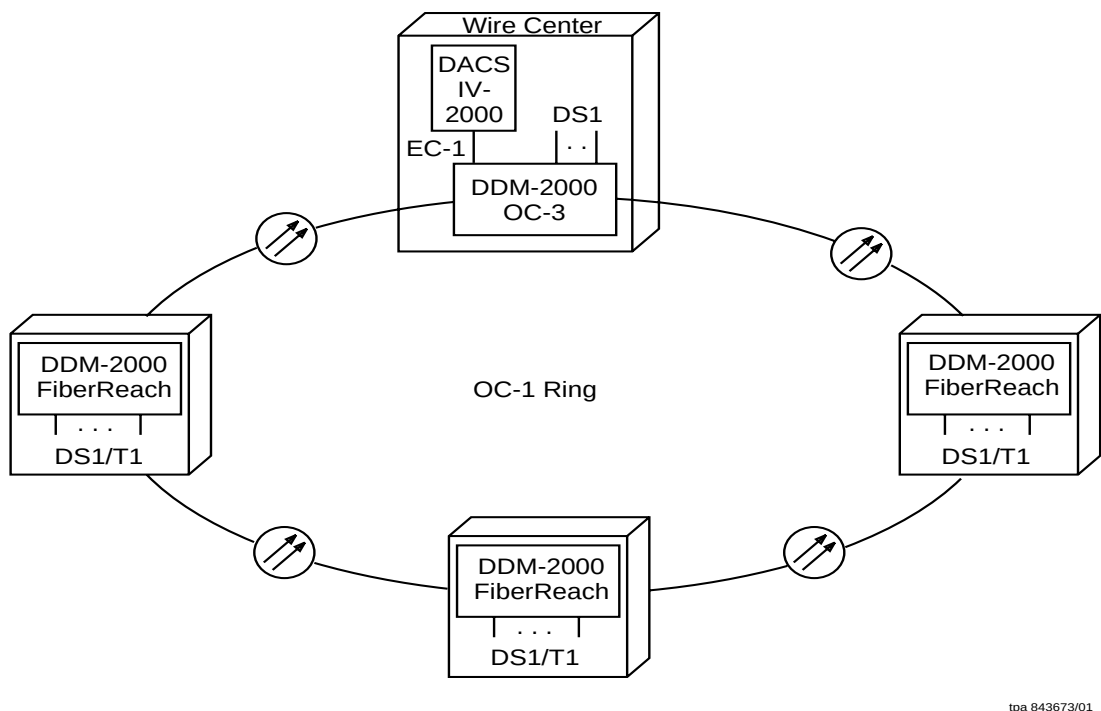


Figure 2-14. DDM-2000 FiberReach Stand-Alone OC-1 Ring

This application can be further expanded to hub up to two OC-1 rings from a stand-alone DDM-2000/SLC-2000 host system, as shown in Figure 2-15.

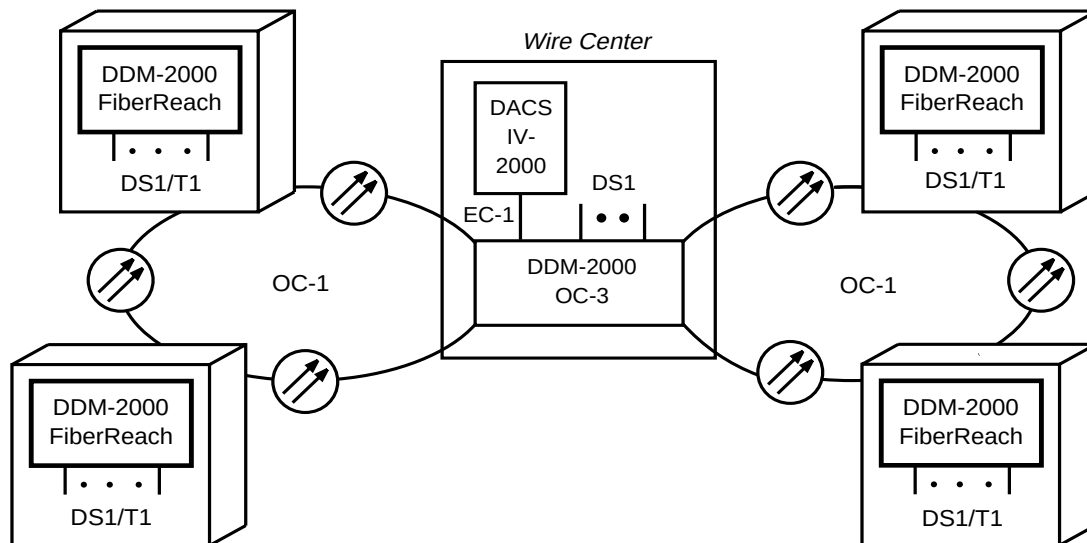


Figure 2-15. DDM-2000 FiberReach Single Homing to a Stand-Alone OC-1 Hub Host

OC-3 Ring Transport on OC-12 Point-to-Point

Rings that cover a large geographical area or interconnected path switched rings are a cost effective and popular way for a service provider to offer these high priority services. Figure 2-16 shows a ring configuration using DDM-2000 OC-3 ring nodes with DDM-2000 OC-12 point-to-point nodes to provide a high-service availability architecture. This configuration will survive fiber, equipment, and catastrophic office failure, since it provides an alternative service path through a secondary CO and uses the path switching ability of the DDM-2000 OC-3 to select between these two paths.

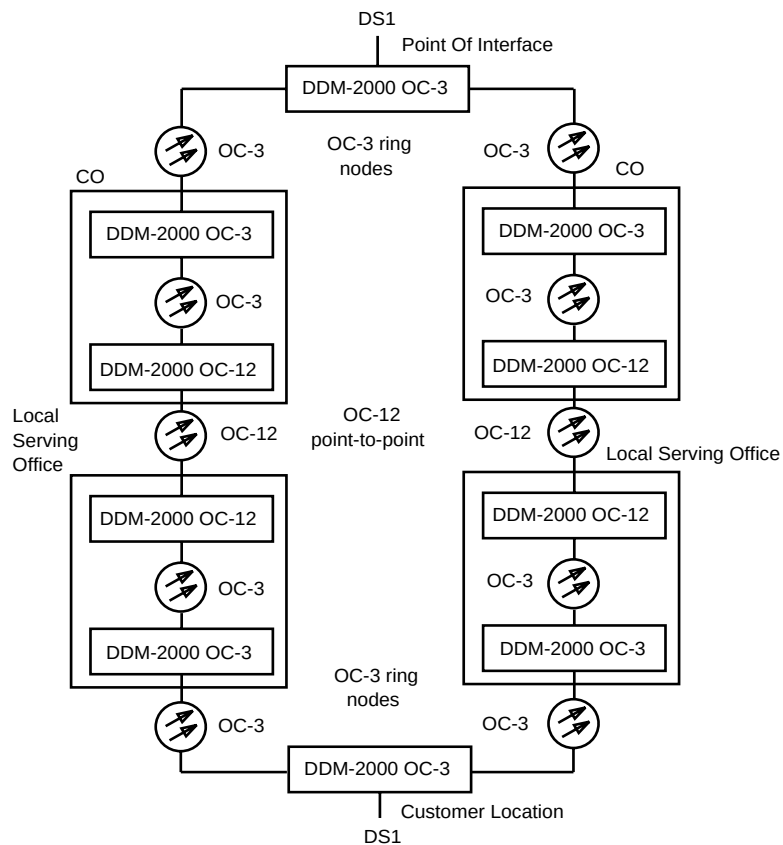


Figure 2-16. OC-3 Ring Transport on OC-12 Point-to-Point

Dual Homing

End-users are demanding service with higher and higher availability. Service providers are responding with tariffs that rely on self-healing networks to offer such high availability service. Some of these tariffs even call for penalties for the service provider when service is interrupted or has a high error rate. The Lucent SONET product family offers many options for meeting these service needs.

OC-1 Ring transport on OC-3 Ring and OC-3 Ring transport on OC-12 ring networks can be implemented in dual homing configurations.

OC-1 Ring Transport on OC-3 Ring

Dual homing offers even more survivability than a single-homed network, as even the catastrophic failure of a host node can be protected. Figure 2-17 shows a dual-homed OC-1 extension from two remote nodes on an OC-3/OC-12 access ring. The host nodes can be two DDM-2000 OC-3/OC-12 or two *SLC*-2000 Access Systems, or one DDM-2000 OC-3/OC-12 Multiplexer and one *SLC*-2000 Access System.

Path protection switching is employed for dual-homed applications, just like in single-homed applications. That is, 60 millisecond path switching is supplied by the remote DDM-2000 FiberReach nodes and the DDM-2000 OC-3 or OC-12 systems in the wire center. The OC-3 host node configuration differs from that used for single-homing because each host node terminates only one leg of the OC-1 extension. At each host node, a connection is made from the single OC-1 extension to just one rotation of the OC-3/OC-12 host ring. Dual- and single-homed extensions can also be mixed at a host node, allowing the access network to be tailored efficiently to different groups of customers.

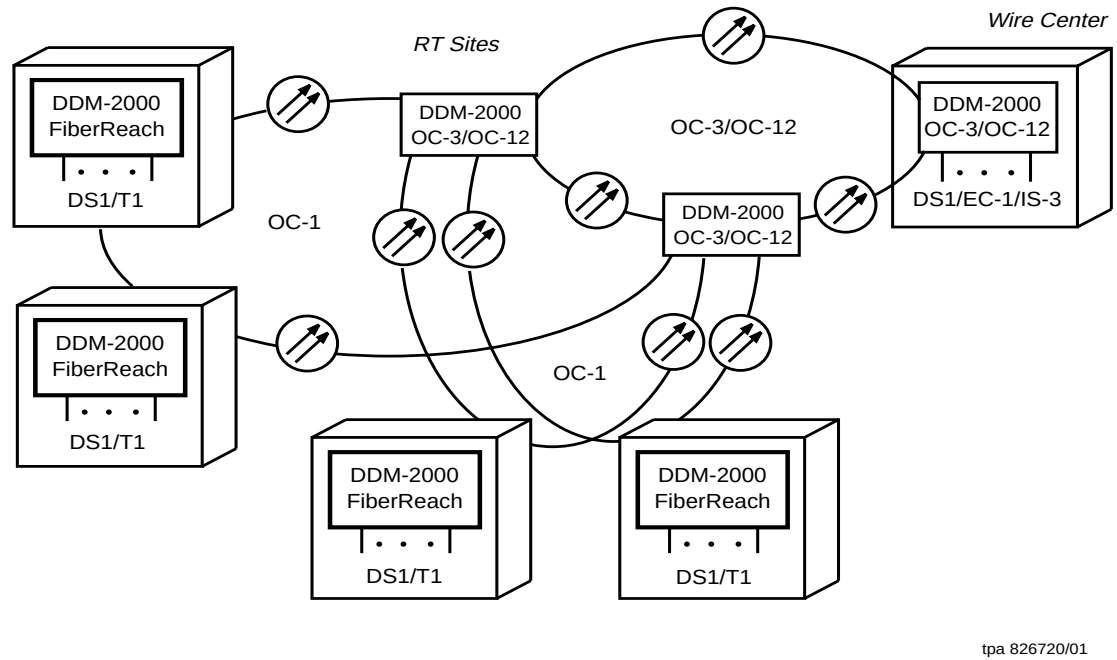


Figure 2-17. DDM-2000 FiberReach Dual Homing to a DDM-2000 OC-3 Ring

Dual Ring Interworking (DRI)

In an interconnected ring or DRI topology two rings are connected together at two geographically separate nodes. In addition to the facility and node failure protection that a single ring provides, the dual node interconnection between the rings provides an automatic alternate route in the event of a catastrophic failure at one of the interconnecting nodes. Typically, such a topology is used to interconnect a loop feeder access ring to a higher bandwidth interoffice ring, as shown in Figure 2-18. This architecture can withstand any single equipment or fiber failure in each of the rings or a failure (which could range from a CO shutdown in the case of fire, for example, or equipment failure, or failure of the facility connecting the two rings) of either of the two interconnecting nodes without losing service on either the access ring or the interoffice ring. Such a catastrophic failure would cause a service outage for a simple ring architecture.

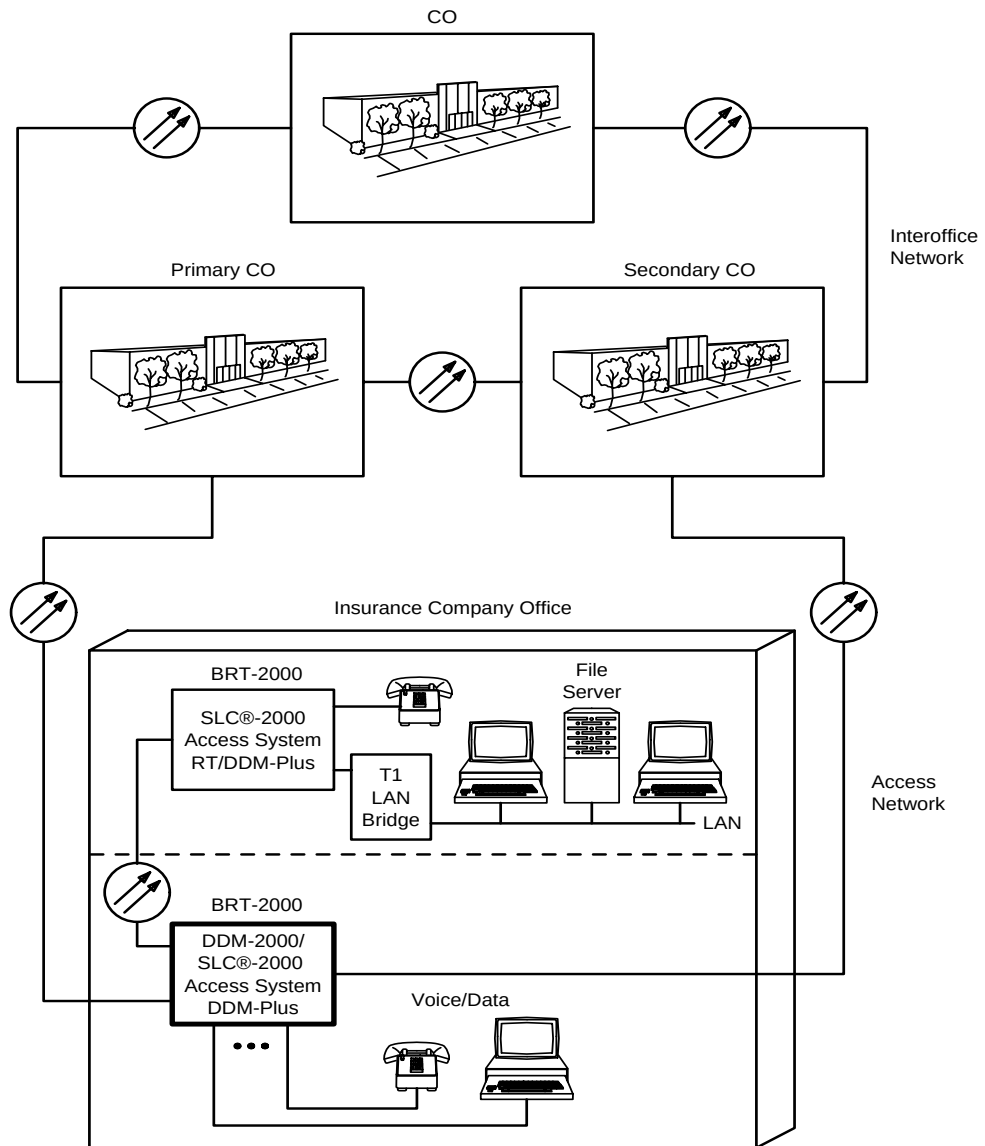


Figure 2-18. Dual Access Configuration

As Figure 2-19 shows, DRI allows a circuit (for instance, between nodes A and Z) with one termination in the upper ring and the other termination in the lower ring to survive a failure of the shared node that is currently carrying service for the circuit. The failure is depicted by an "X" in the figure. The two shared nodes are in CO B and CO C. Both nodes have the signal available to them at all times. When a failure occurs, the two terminating nodes and the two shared nodes switch so that traffic is carried through CO C and around the node failure.

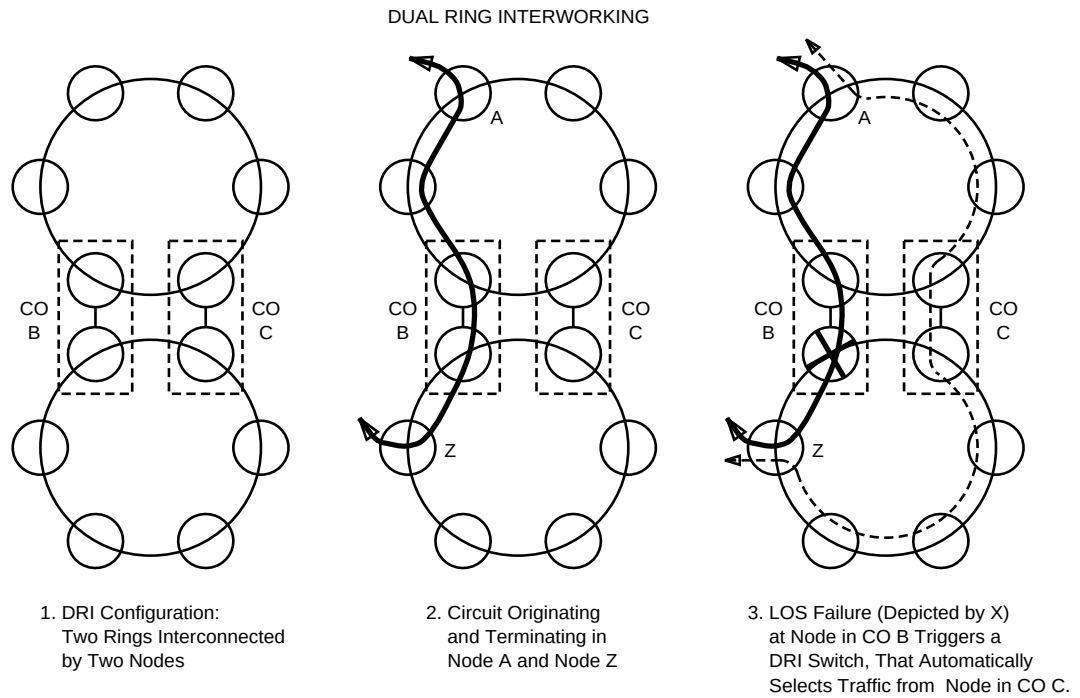


Figure 2-19. Dual Ring Interworking Concepts

DDM-2000 OC-3, OC-12, and FT-2000 OC-48 Lightwave Systems can be configured to offer this topology. Often the DDM-2000 equipment is used for the loop feeder access ring, and the FT-2000 OC-48 Lightwave System equipment is used for the interoffice ring. Figure 2-20 shows a DDM-2000 OC-3 (or OC-12) path switched ring interworking with an FT-2000 OC-48 Lightwave System bidirectional line-switched ring.

The DDM-2000 OC-12 Multiplexer also supports DS3 DRI in addition to the EC-1 and OC-3 interfaces. In the event of a DS3 failure, the OC-12 Multiplexer inserts an STS-1 AIS signal into the STS-1 ring channel used by the DS3 to activate the downstream STS path protection switch.

In this application, the DDM-2000 provides an appearance of loop traffic at both the primary and secondary nodes by dropping traffic at the primary node and simultaneously continuing it on to the secondary node. This capability is called "drop-and-continue." The DDM-2000 OC-3 Multiplexer allows DS1 signals to be multiplexed for handoff at an economical EC-1 or OC-3 rate in the COs. Also, the DDM-2000 OC-3's flexible TSI can be used to prepackage all DRI protected DS1s into a single EC-1 for economical handoff to the OC-48 ring. This capability allows for the easy mixing of DRI and non-DRI services on the same ring network. In this way, only specially tariffed services need to be configured for the extra reliability that DRI provides. DS3/STS1 clear channel services are also supported. The companion FT-2000 OC-48 Lightwave System ring picks up the traffic at these two nodes and carries it to the destination node, unless a failure condition causes a protection switch to the secondary signal. In the reverse direction, a similar process is followed with the OC-48 ring handing off the two copies of the signal at the primary and secondary nodes and the OC-3 ring providing the switching at the destination node.

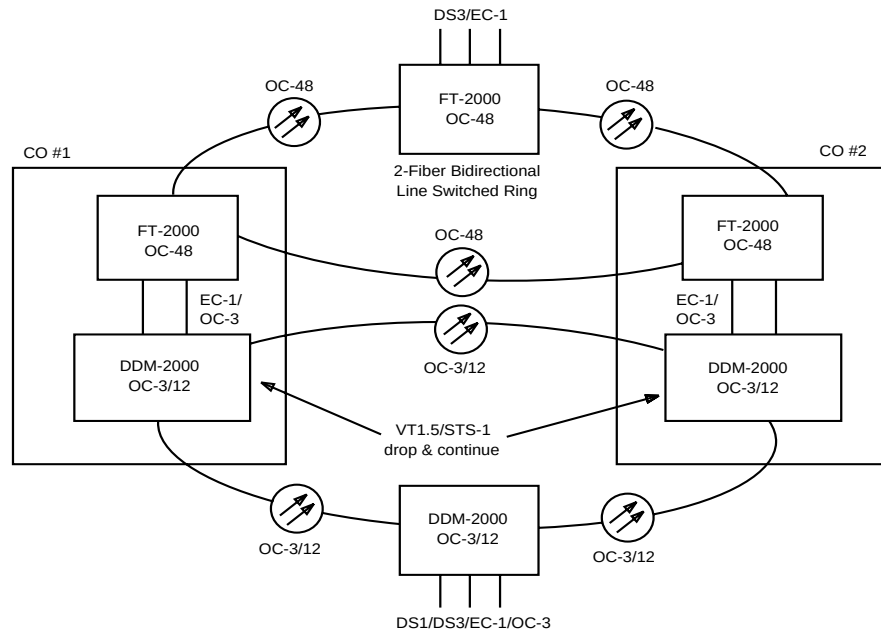


Figure 2-20. OC-3/12 to FT-2000 OC-48 Lightwave System Dual Ring Interworking

The DDM-2000 drop-and-continue feature also finds an excellent application in interconnecting two rings via an intermediate transport network. In the example shown in Figure 2-21, DDM-2000 OC-3 Multiplexer access rings act as a DRI pair via an FT-2000 OC-48 Lightwave System and DACS IV-2000 interoffice network. The advantage of this network is the grooming for DRI traffic provided by the DACS IV-2000. Both DDM-2000 OC-3 rings provide drop and continue at each of their two duplicate COs. Both copies of the signal are transported as separate tributaries through the interoffice network, and path switching is implemented at the edges of the network. Signal redundancy is preserved on an end-to-end basis.

In offices where SONET interconnections are not available, DS3 interfaces can be used between dual OC-12 offices. The DDM-2000 OC-12 Multiplexer also supports DS3 DRI in addition to the EC-1 and OC-3 interfaces. In the event of an incoming DS3 failure from the DSX-3, the OC-12 Multiplexer inserts an STS-1 AIS signal into the STS-1 ring channel used by the DS3 to activate the downstream STS path protection switch. It is recommended that SONET DRI interfaces (EC-1 or OC-3) be used if possible since the DS3 to STS-1 AIS translation feature is on the OC-12 Multiplexers only (R5.1 and later).

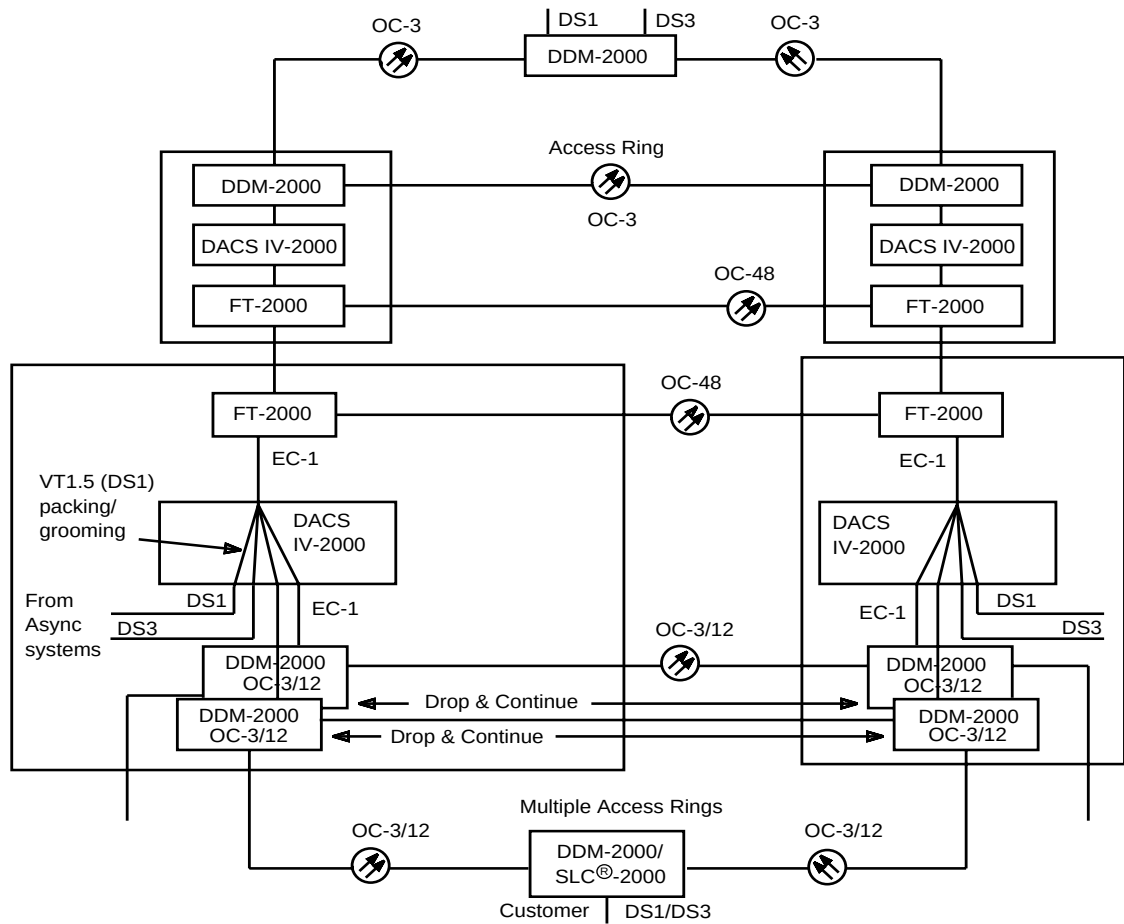


Figure 2-21. DDM-2000 Ring Interworking with FT-2000 OC-48 Lightwave System Transport and DACS IV-2000 Grooming

Dual Homing with DRI

The survivability and networking benefits of Lucent's DRI solution are cost-effectively extended to smaller locations via DDM-2000 FiberReach dual-homing capabilities. Figure 2-22 shows an OC-3 feeder ring from duplicated wire centers with dual-homed DDM-2000 FiberReach extensions from selected feeder ring remote sites.

The host nodes and remote DDM-2000 FiberReach systems are configured just like the previously described dual-homing configuration with single 0x1 cross-connections employed by the host. In the dual wire center architecture, the access network is also protected from a catastrophic failure of one wire center, because the access and interoffice networks have duplicate points of interworking. The DDM-2000 OC-3 systems in the two wire centers employ the drop and continue cross-connection.

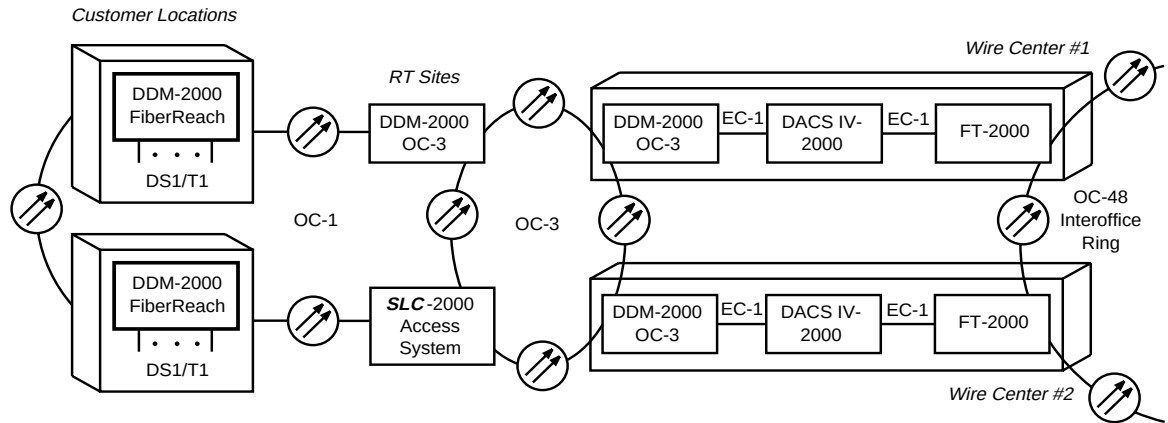


Figure 2-22. DDM-2000 FiberReach Ring Dual Homing to a DDM-2000 OC-3 Ring in a Dual Wire Center Application

OC-3 Linear Optical Extensions from OC-3 and OC-12 Rings

An additional topological flexibility offered by the DDM-2000 OC-3 and OC-12 Multiplexers is 1+1 protected linear OC-3 and IS-3 optical extensions from OC-3 and OC-12 rings. Using this capability, the DDM-2000 OC-3 and OC-12 Multiplexers can support many of the new network configurations desired in the evolving loop feeder environment. As Figure 2-23 shows, an access provider can use linear optical extensions from an OC-12 ring to provide OC-3/OC-3c signals directly to end-users. This gives the end-users the bandwidth they need for large bandwidth applications, such as video, and provides it to them via the path switched ring architecture they require for high service availability. If enabled, full single-ended operations are available on all NEs. This gives the end-user full control of performance monitoring (PM) data, network reconfigurations, and provisioning of the network.

OC-3 optical extensions can also be used to interconnect SONET subnetworks. Examples include interconnection of two access networks and interconnection between access and interoffice rings. Optical extensions can be used to interconnect OC-3 and OC-12 ring subnetworks to an OC-3 terminal, OC-3 and OC-12 add/drop networks, and another OC-3 or OC-12 ring.

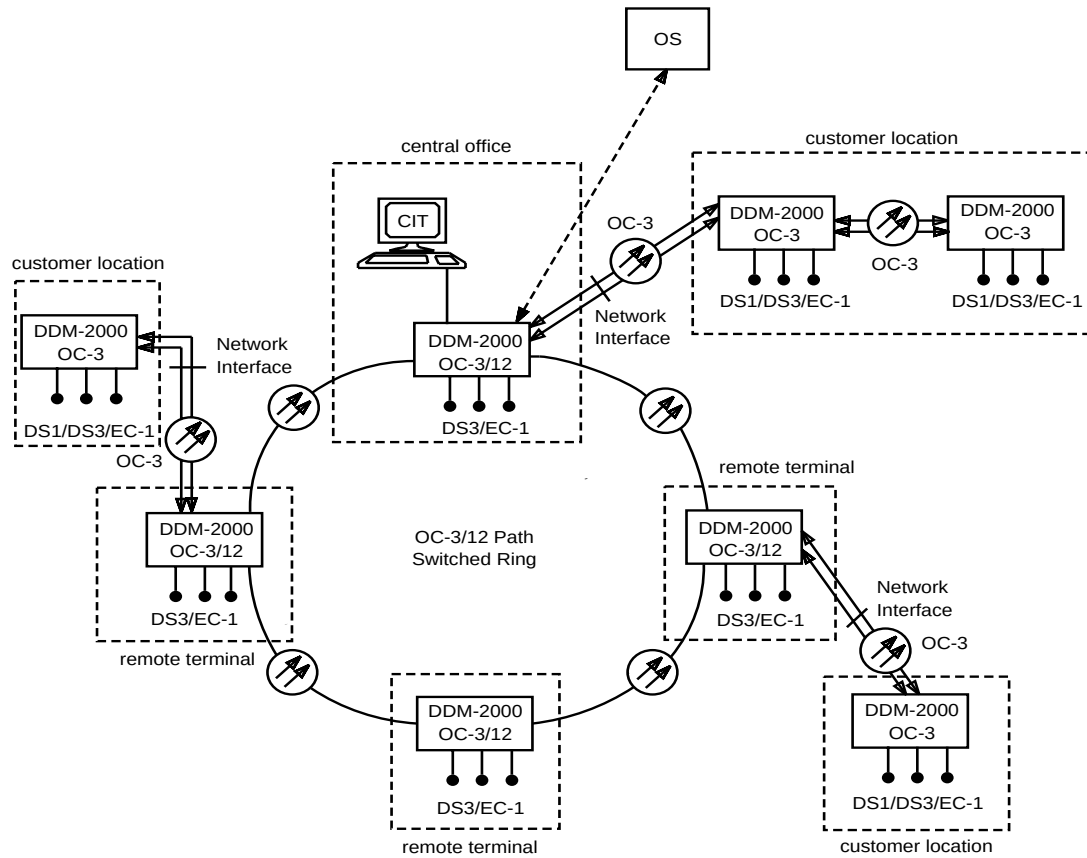


Figure 2-23. OC-3 Services Using Linear Optical Extensions

Hairpin Cross-Connections on Rings

The DDM-2000 OC-3 Multiplexer supports a VT1.5 "hairpin" cross-connection where VT1.5 signals from one function unit can be cross-connected to VT1.5 signals in another function unit or within the same function unit*. Figure 2-24 shows a hairpin cross-connection between function unit C and function unit A or function unit C and function unit B.

The advantage of hairpin cross-connections is equipment savings. If there is a need to access a DS1 within an OC-3 signal, rather than install another OC-3 shelf, you can use the unused function unit slots in any other OC-3 shelf. This type of cross-connection does not use any time slots on the OC-3 ring itself.

Figure 2-24 also shows how hairpin cross-connections can be used on a ring. Hairpin cross-connections can also be used in ring configurations with multiple optical extensions to provide a hubbing topology with a ring at the hub.

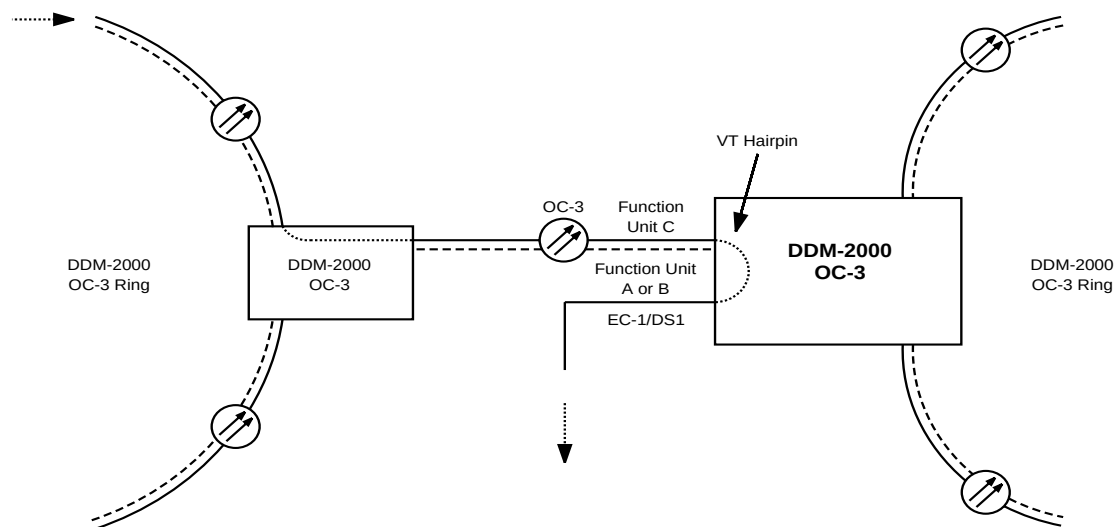


Figure 2-24. VT1.5 Hairpin Cross-Connections

* Beginning with R11.1, the 26G2-U OLIU allows hairpin cross-connections within the same function unit.

Enhanced Routing

DDM-2000 FiberReach hosts can support a collection of enhanced routing features as shown in Figure 2-25, Figure 2-26, and Figure 2-27. These features support cross-connections within and across function units without using bandwidth on the main OC-3 or OC-12 rings. This allows even greater networking flexibility and efficiency. While the high-speed OC-3 interface can carry up to 84 VT1.5 channels, each of the 3 function units has a two OC-1 capacity, or up to an additional 168 VT1.5 channels. Total shelf traffic handling capacity is determined by the mix of main-to-function-unit, and function-unit-to-function-unit hairpin connections.

The OC-1 ring interconnection enhanced routing options utilize 0x1 or pass-through cross-connections at the DDM-2000 host. Path protection switching is performed at the DDM-2000 FiberReach systems at the path endpoints.

OC-1 Ring Pass-Through

This enhanced routing option establishes pass-through cross-connections for channels on an OC-1 ring terminating on a pair of 27G2-U OLIUs in a function unit as shown in Figure 2-25. These cross-connections are just like the pass-through cross-connections that can be provisioned for rings terminating on main slots. This allows traffic to be routed from one FiberReach node to another FiberReach node on the same OC-1 ring without using bandwidth on the OC-3/OC-12 ring.

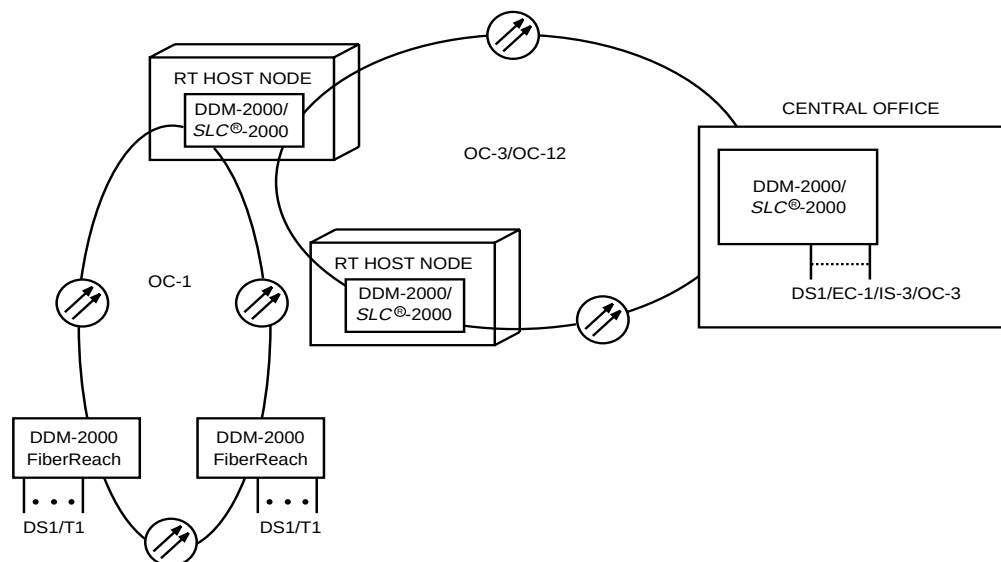


Figure 2-25. OC-1 Ring Pass-Through in a Function Unit

OC-1 Ring Hairpin Routing, Single-Homed

This routing option establishes cross-connections between channels on two separate OC-1 facilities that terminate on 27G2-U OLIU circuit packs, in either the same or different function units as shown in Figure 2-26. In the single-homed configuration, both rotations of each of the two OC-1 rings terminate on a pair of 27G2-U OLIUs. There may be a single pair of 27G2-U OLIUs that terminates both rings, or one pair of 27G2-U OLIUs in each of two function units that terminates the rings. Each rotation of one ring is cross-connected to the corresponding rotation of the other ring. This allows traffic to be routed from one FiberReach node on one OC-1 ring, to any other FiberReach node on another OC-1 ring, without using bandwidth on the OC-3/OC-12 ring.

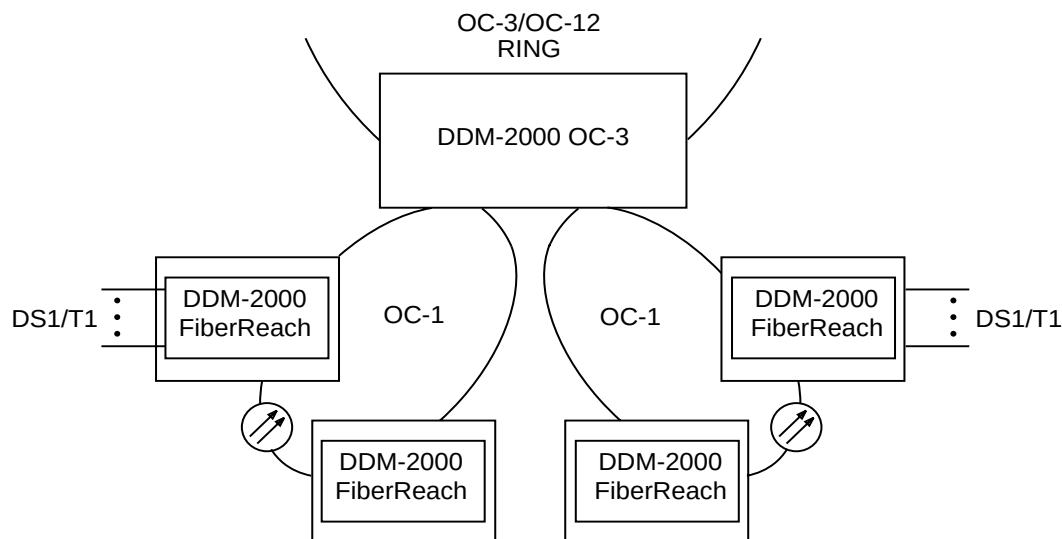


Figure 2-26. Single-Homed Hairpin Routing

OC-1 Ring Hairpin Routing, Dual-Homed

With this routing option, shown in Figure 2-27, cross-connections are established between channels on two separate OC-1 facilities that terminate on 27G2-U OLIU circuit packs in either the same or different function units. In the dual-homed arrangement, only one rotation of each of the two OC-1 rings terminates on a single OC-3 shelf. At the OC-3 shelf, there may be a single 27G2-U OLIU that terminates both rings or a 27G2-U OLIU in each of two function units that terminates the rings. The other rotation of each ring terminates on a different OC-3 shelf. This allows traffic to be routed from one FiberReach node on one OC-1 ring to any other FiberReach node on another OC-1 ring without using bandwidth on the OC-3/OC-12 ring.

A mix of the enhanced routing services shown in Figure 2-25, Figure 2-26, and Figure 2-27 can be created in a single DDM-2000 FiberReach host. OC-3 Release 9.1 or later software and 27G2-U OLIUs are needed for these services.

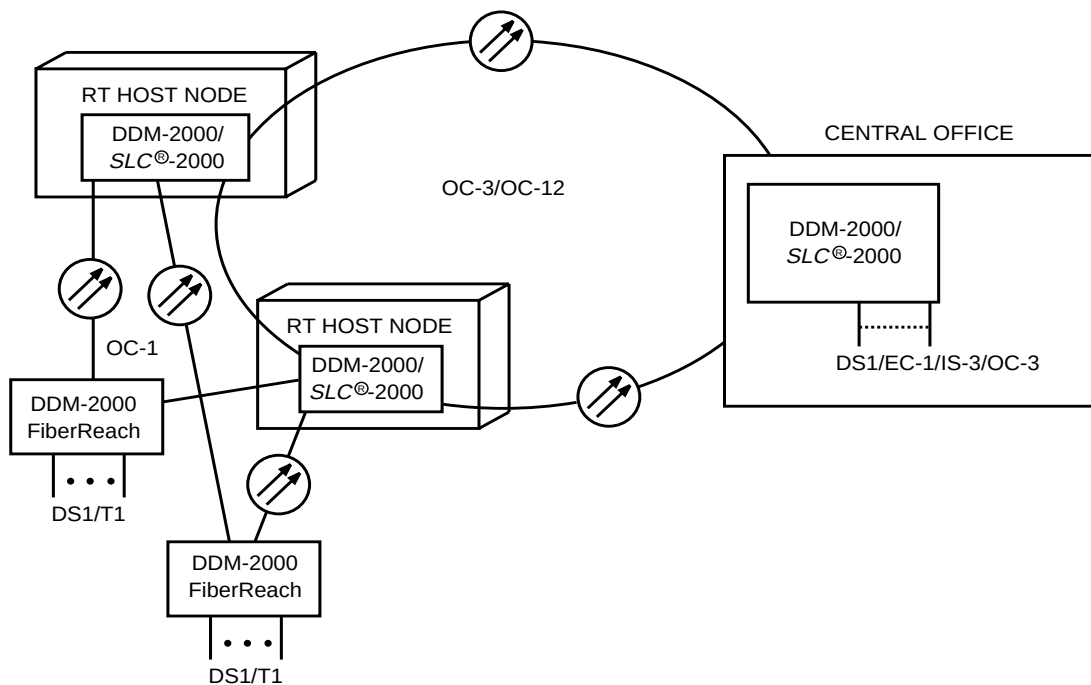


Figure 2-27. Dual-Homed Hairpin Routing

Hairpin Local Drop Routing

Figure 2-28 shows hairpin local drop routing. In this configuration, path-protection switched drop cross-connections are established between channels on an OC-1 ring and ports/channels on DS1/EC1/OC-3 circuit packs. The OC-1 facility terminates on a pair of 27G2-U OLIU circuit packs in a function unit. These connections are just like the drop cross-connections that can be established between channels on a ring terminating on the main slots and ports or channels in a function unit. This allows traffic to be routed from a FiberReach node on an OC-1 ring to a local drop without using bandwidth on the OC-3/OC-12 ring.

A mix of the enhanced routing services shown in Figure 2-25, Figure 2-26, Figure 2-27, and Figure 2-28 can be created in a single DDM-2000 FiberReach host. OC-3 Release 11.0 and later software and 27G2-U OLIUs are needed for these services.

Beginning with Release 11.1, the single OC-1 26G2-U OLIU, with built-in multiplexer capability, further expands the options by allowing the dropping of DS1s without the need for an MXRVO circuit pack (a Group 4 shelf or later is required).

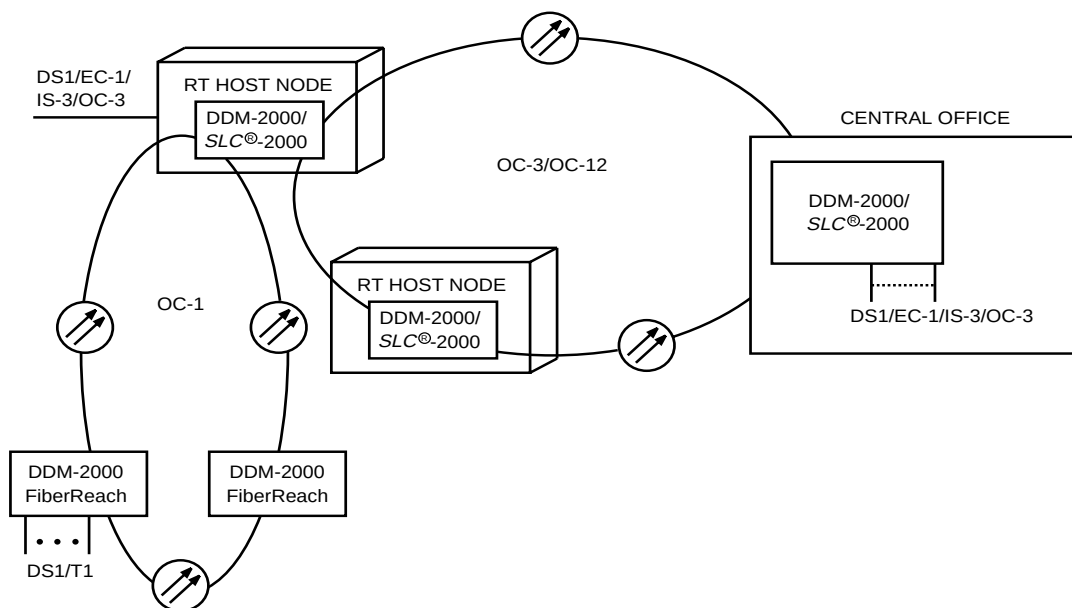


Figure 2-28. Hairpin Local Drop Routing

Point-to-Point Topologies

OC-3 Point-to-Point

The point-to-point application is the traditional means of providing optical transport in the loop feeder. In situations where new demand is isolated to a small number of carrier-serving areas along a given feeder route, maximum simplicity and cost efficiency make point-to-point configurations a good choice. The point-to-point application has the added benefit of consistency with existing operations systems and operations practices.

The point-to-point applications provide an ideal platform from which the loop network can evolve in step with changing service needs. Evolution to multispan applications like add/drop, hubbing, and path switched rings offers planning flexibility and network equipment savings. Starting at the OC-3 rate, the access network can be sized to maximize utilization with an easy upgrade to higher capacities like OC-12.

The DDM-2000 OC-3 point-to-point topology builds on the solid base established by the DDM-1000 Multiplexer. A single 8.5-inch shelf provides OC-3 optical transport for a mix of DS1 and DS3 traffic. Equipped in this manner, the DDM-2000 OC-3 Multiplexer is a low-cost, full-function terminal. The OC-3 point-to-point network (Figure 2-29) consists of OC-3 Multiplexers in the CO and RT sites, connected by four single-mode or multimode fibers (two service, two protection). At the RT site, the OC-3 Multiplexer typically interfaces to digital loop carrier systems like the *SLC* Series 5 Carrier System. DS1 extensions to customer premises or another RT site are provided by the DDM-Plus low-speed extension shelf or DDM-2000 FiberReach, with a choice of DS1 line repeaters or quad DS1 optical interfaces. DDM-Plus optical interfaces can be terminated at a DDM-Plus extension shelf or a DDM-Plus distant terminal.

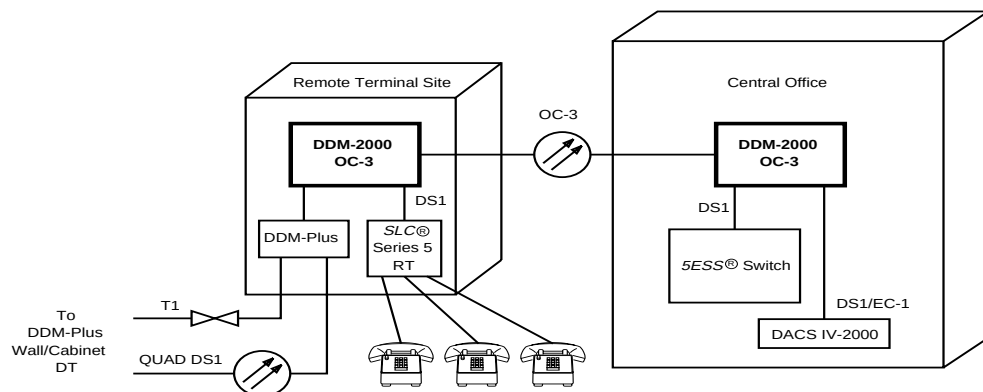


Figure 2-29. OC-3 Point-to-Point Topology

Figure 2-30 and Figure 2-31 show two typical applications in a metropolitan high-rise, where an OC-3 point-to-point network runs from the CO to the customer's building. Figure 2-30 shows an initial application with preexisting copper wiring in the building risers. From a basement cabinet, the DDM-2000 OC-3 Multiplexer and DDM-Plus or DDM-2000 FiberReach provide direct DS1 service over this wiring to cabinets on the floors above.

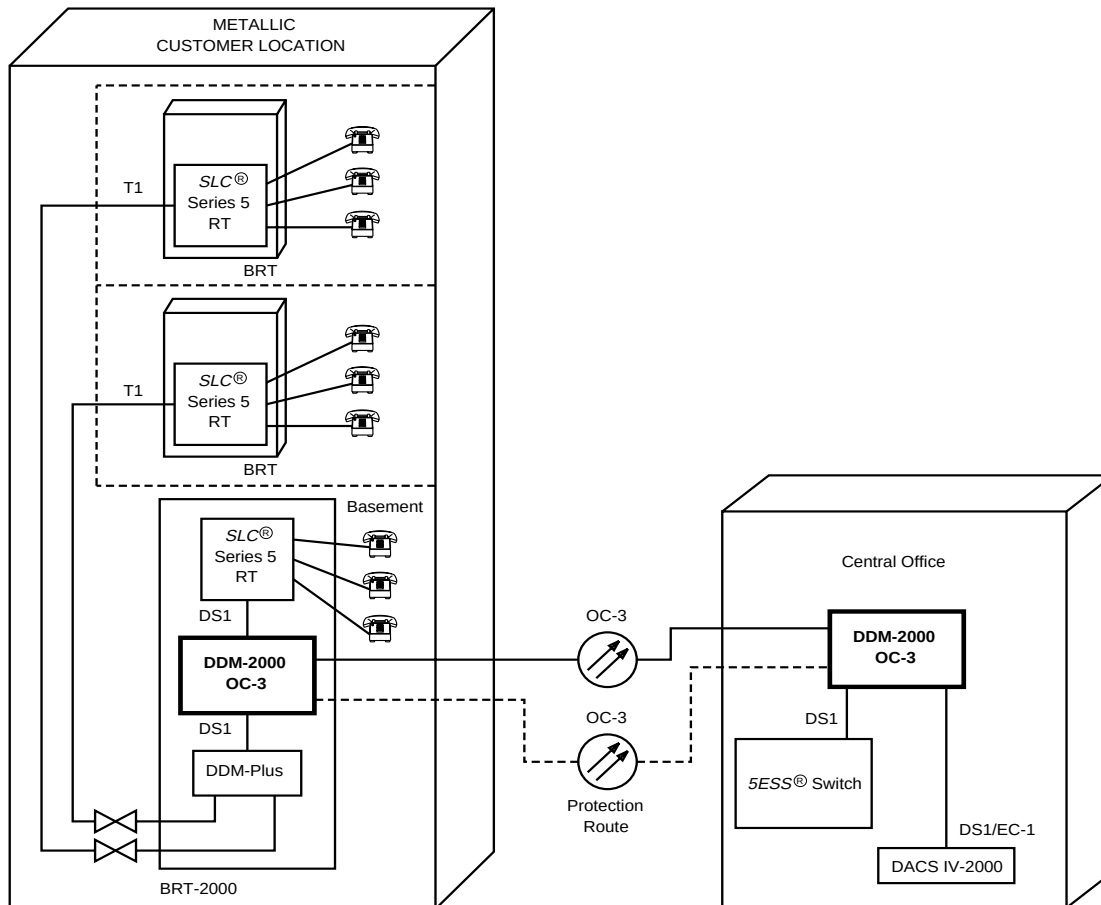


Figure 2-30. Metro Application — Copper in the Riser

Figure 2-31 shows a larger application with fiber in the riser, using the optical extension capability of DDM-Plus or DDM-2000 FiberReach, to extend optical bandwidth to individual floors. Satellite locations contain the DDM-Plus distant terminal (DT) to convert the optical extension interface into four standard DS1 signals. Self-healing needs can be met with cabled ring or diverse routing. The OC-3 bandwidth to customer locations also positions the network to deliver higher bandwidth services, such as video.

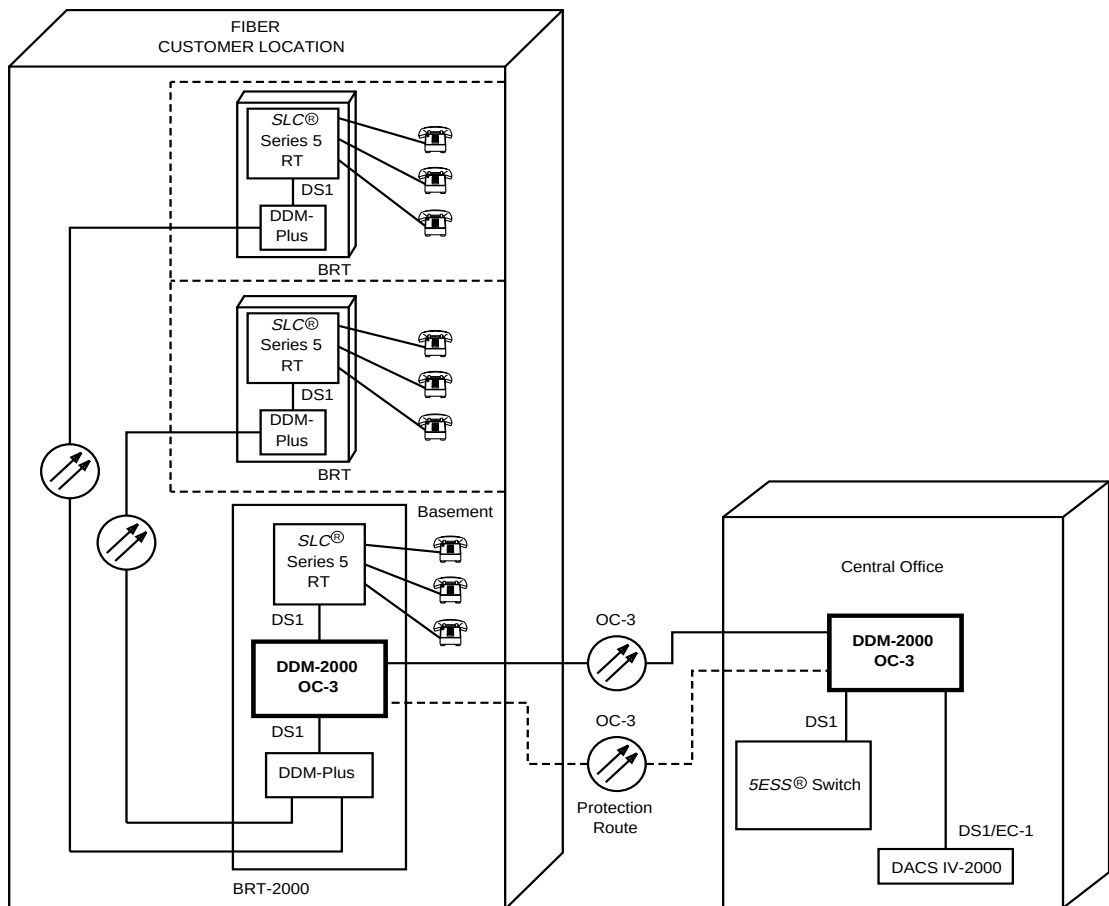


Figure 2-31. Metro Application — Fiber in the Riser

DDM-2000 OC-3 and DDM-Plus or DDM-2000 FiberReach systems provide bandwidth features to improve the delivery of CENTREX services. In a multisite campus application (Figure 2-32), SLC Series 5 Carrier System RTs and DDM-Plus optical extensions carry voice traffic from each building to a DDM-2000 OC-3 Multiplexer at a conveniently located remote terminal site. The DDM-2000 OC-3 Multiplexer provides economical and reliable access to the serving 5ESS® switch. The OC-3 capacity supports a growing campus, as up to 84 DS1s (2016 voice channels) can be provisioned as needed.

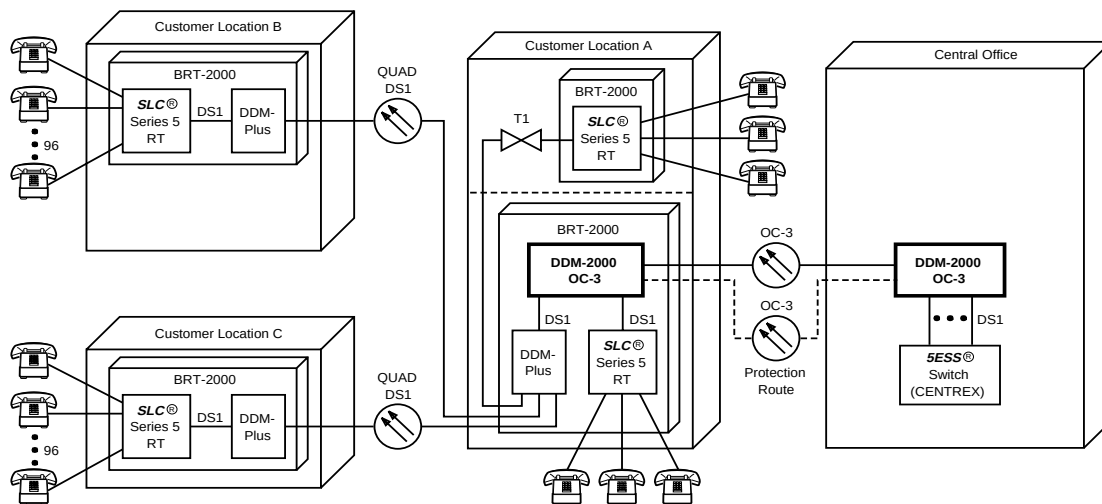


Figure 2-32. Campus CENTREX Configuration

The OC-3 point-to-point interoffice application (Figure 2-33) provides cost-effective DS1, DS3, EC-1, and OC-3c transport in outstate trunk routes that do not justify the expense of OC-12 and higher capacity systems. Just as in the OC-3 point-to-point loop application, the network consists of a pair of DDM-2000 OC-3 shelves configured as optical terminals.

The DDM-2000 OC-3 Multiplexers allow independent synchronization of each site from its own office clock and have the ability to disable single-ended operations when the application crosses a maintenance boundary. Also, timing can be passed from one office clock to another with a DS1 timing output derived from an incoming OC-3 signal. The gigabit cell network switch (GCNS) in the figure is Lucent's asynchronous transfer mode (ATM) switch.

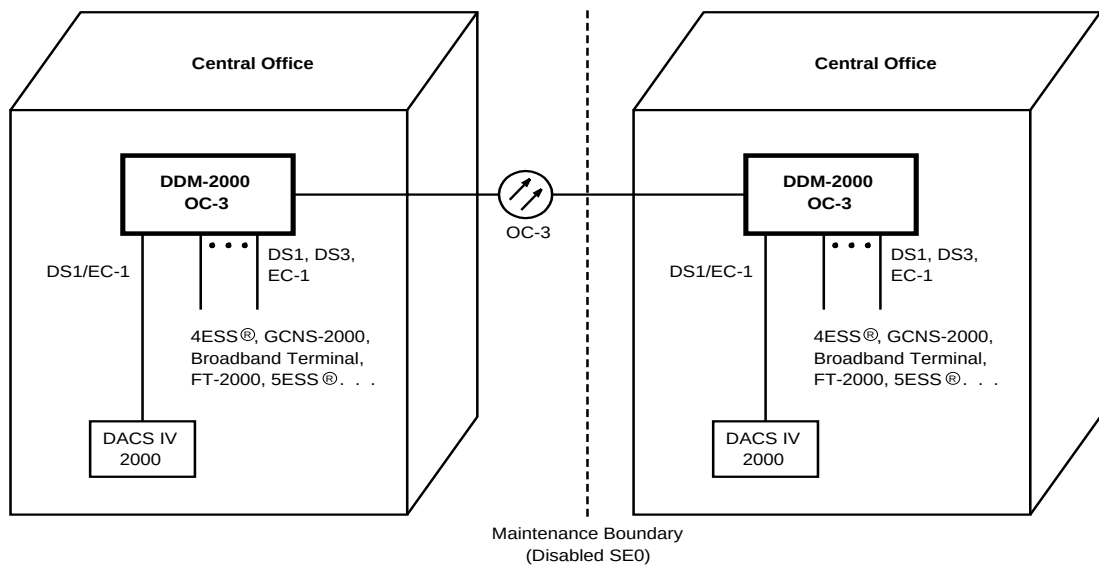


Figure 2-33. OC-3 Point-to-Point Interoffice Configuration

OC-3 Repeater

The DDM-2000 OC-3 Multiplexer supports single-mode fiber spans up to 55 kilometers (34 miles). For longer spans, the DDM-2000 OC-3 Multiplexer can be used in a repeater configuration shown in Figure 2-34. In this particular application of the STS-1 drop shelf configuration, all traffic passes between upstream and downstream OC-3 interfaces with no add/drop to/from low-speed interfaces.

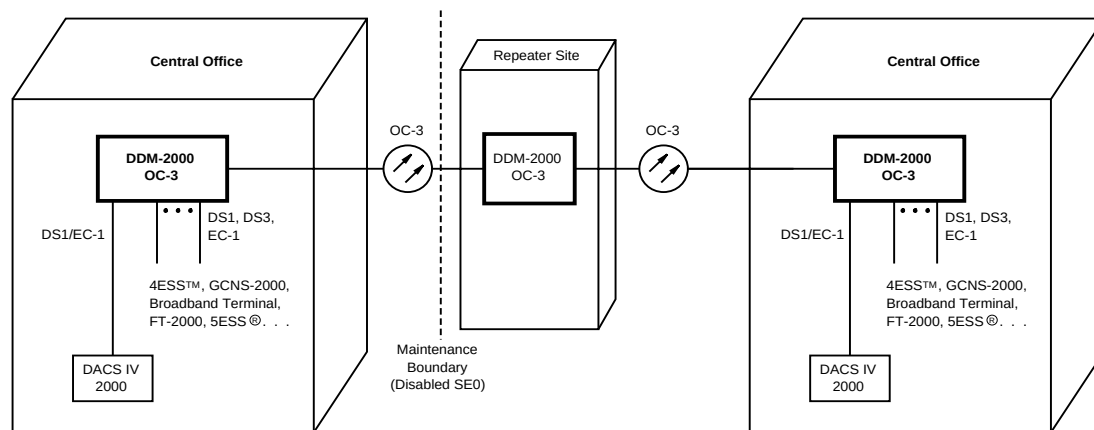


Figure 2-34. OC-3 Repeater Configuration

Hubbing

As the sophistication of telecommunications users and services grows, so too will demands upon the network provider to supply more bandwidth at lower cost and in less time. The 2000 Product Family gives the network provider a competitive advantage through a new level of networking flexibility and efficiency. DDM-2000's add/drop and TSI capabilities are at the core of this advantage.

As an example, the DDM-2000 OC-3 system's TSI offers remotely programmable bandwidth management down to the VT1.5 (DS1 payload) level. A network of DDM-2000 Multiplexers, each positioned near a growth area, provides a ready conduit for customer access to the network. The TSI gives each site access to the full network bandwidth as demand materializes, simplifying long-range network planning and improving ability in the face of changing service needs. Furthermore, remote control of time slot routing streamlines service provisioning and rearrangement and reduces technician activity at a remote site for each new work order.

The VT1.5 TSI in DDM-2000 OC-3 is coupled with the STS-1 TSI in DDM-2000 OC-12, the DS0 TSI in *SLC*-2000 Access System, and DACS IV-2000 to provide full-spectrum bandwidth management across networks of all sizes and configurations.

OC-3 Hubbing

Figure 2-35 and Figure 2-36 are examples of OC-3 hubbing configurations.

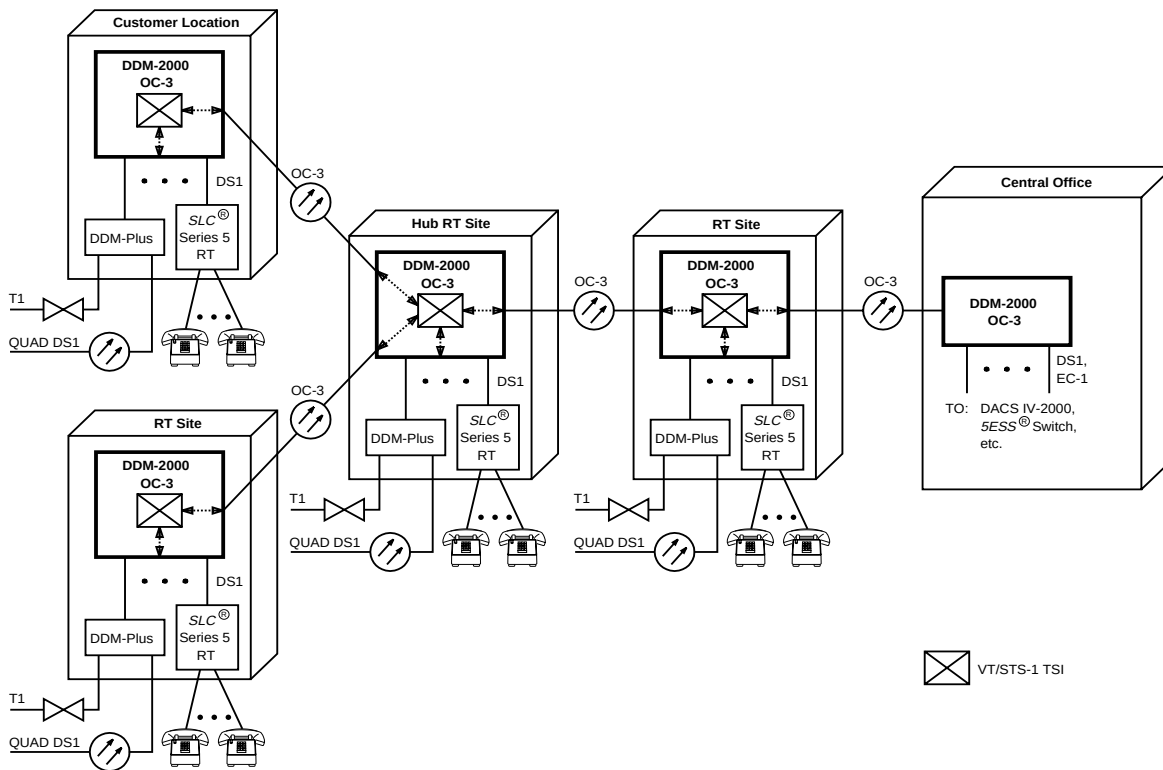


Figure 2-35. OC-3 Hubbing Configuration

A small industrial park, where each building uses more than a few DS1s, is shown in Figure 2-36. The higher bandwidth needs (for example, video) of some buildings suggest an OC-3 hubbing topology rather than quad DS1 optical extensions from a hub remote site. The hub may be in a customer location or a separate outdoor enclosure. From this hub site, OC-3 extensions feed business RT cabinets containing a DDM-2000 OC-3 Multiplexer in each building.

The flexible TSI capability of the DDM-2000 Multiplexers can be used to manage the changing bandwidth needs of the industrial park.

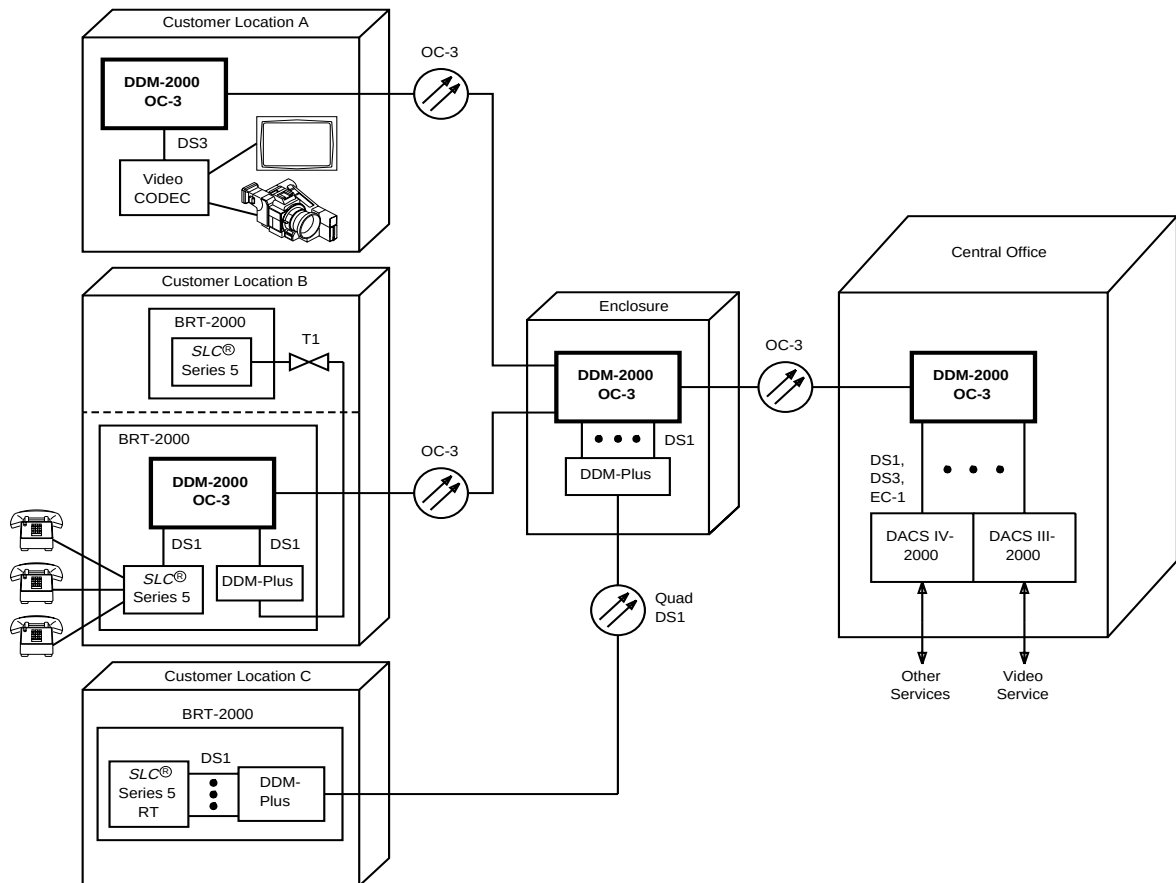


Figure 2-36. Small Industrial Park Configuration

OC-3c Transport on OC-12

To support the emerging market for ATM-based broadband services, the DDM-2000 OC-12 and OC-3 Multiplexers provide an OC-3c low-speed interface. Where broadband services are needed (for example, multimedia), a BRT-2000 with a DDM-2000 OC-12 or OC-3 Multiplexer should be installed near the broadband terminal to provide clear channel transport of the broadband service.

Many DDM-2000 features, such as high reliability, flexible networking configurations, and DS1/DS3/EC-1/OC-3c services, satisfy private network needs. Figure 2-37 shows how DDM-2000 OC-3 and OC-12 Multiplexers provide flexible interconnection of several data/video networks. The two multibuilding campuses have local data needs served by ATM networks.

Video conferencing between the campuses and data traffic between the ATM networks are transported via DDM-2000 OC-12 Multiplexers with some data traffic being extended via the hubbing feature to a remote location served by a DDM-2000 OC-3 Multiplexer. The physical facility, in this case, may be dark (installed but not being used) fiber leased from a local operating company.

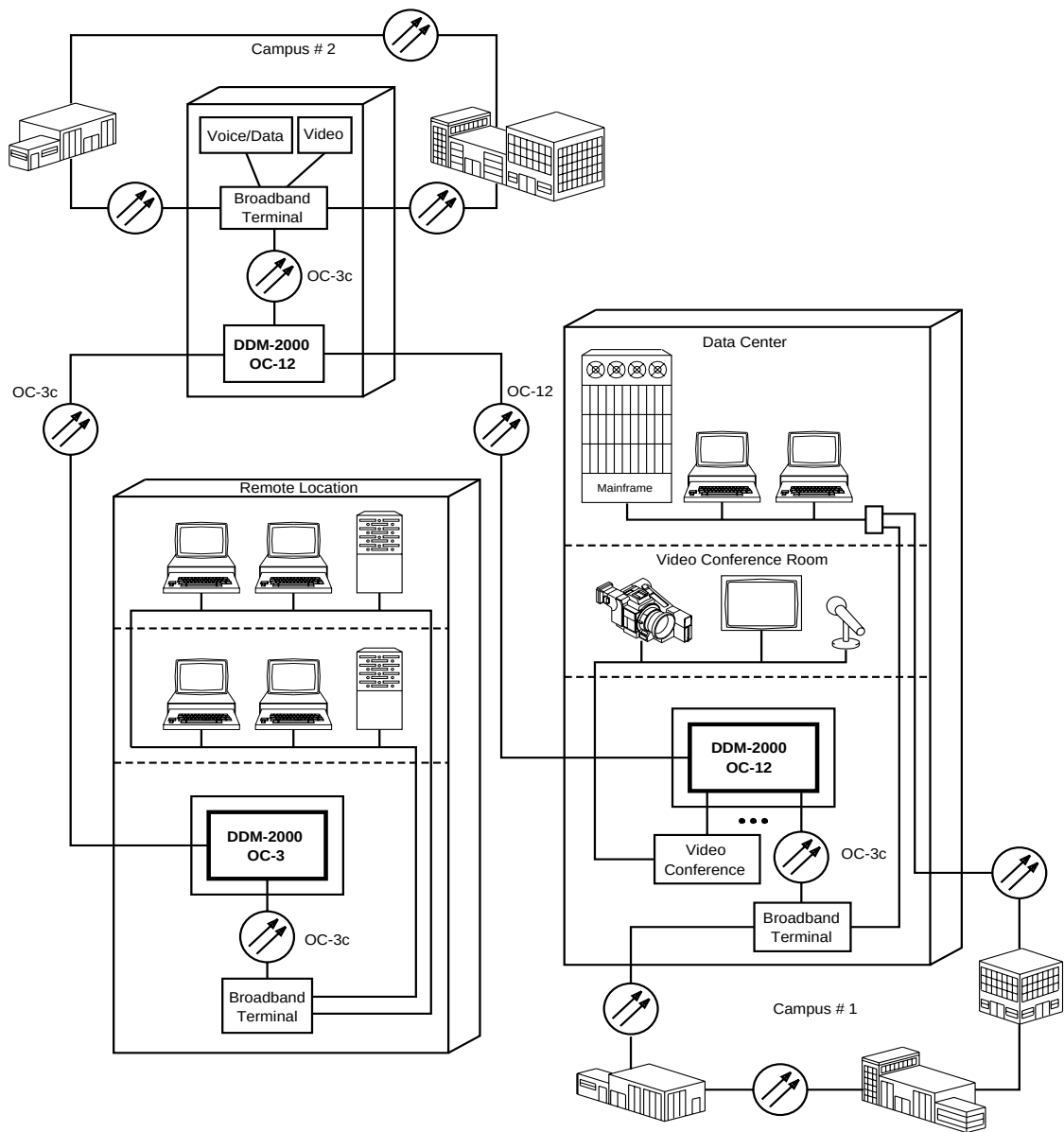


Figure 2-37. OC-3c Transport— Private Data/Video/ATM Network Application

Add/Drop

The DS1 add/drop loop application allows several remote sites to share a common OC-3 facility to the CO. The programmable TSI allows individual DS1 and DS3 services to be routed under local or remote software control. Remote control of time slot routing streamlines service provisioning and rearrangement, reducing technician activity at the remote site for each new work order.

The TSI feature offers full flexibility in assigning signals between low-speed DS1 or DS3 ports and any high-speed time slot. Additionally, the TSI can groom pass-through VT1.5 and STS-1 tributaries to simplify network planning and maximize utilization. The VT1.5/STS-1 TSI capability in the DDM-2000 OC-3 Multiplexer is coupled with an STS-1 TSI in the DDM-2000 OC-12 Multiplexer to provide flexible bandwidth management through the network's long-term evolution.

DDM-2000 OC-3 and OC-12 Multiplexers configured in add/drop topologies can route traffic between a CO site and a set of RT sites, between RT sites, or a mix of both traffic patterns. An initial add/drop network may start with OC-3 facilities, satisfying preliminary demand forecasts with minimum cost. Depending on the route's layout, existing cables and rights-of-way, and other planning concerns, the add/drop network may be arranged in a linear fashion (Figure 2-38). This flexibility in configuration allows the DDM-2000 network to be customized for each specific situation.

The tributary grooming provided by the TSI is especially useful at a hub RT location. At the hub RT site, the TSI sheds unused bandwidth on the OC-3 extensions and packs time slots carrying active service from remote sites onto the high-speed interface back to the CO. This maximizes utilization of existing equipment and facilities.

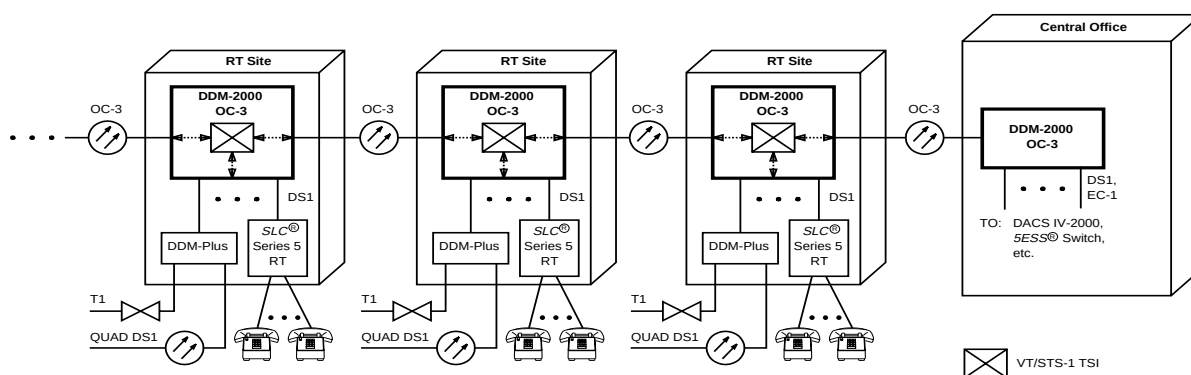


Figure 2-38. DS1 Add/Drop — OC-3 Linear Configuration

The OC-3 DS1 add/drop application (Figure 2-39) provides an extremely flexible, cost-effective solution to small or medium cross-section interoffice networks such as outstate trunks. Low-density routes that primarily transport DS1 traffic are ideally suited to the DDM-2000 OC-3 Multiplexer's capacity, where the capability to add and drop single DS1 tributaries maximizes network utilization and planning flexibility.

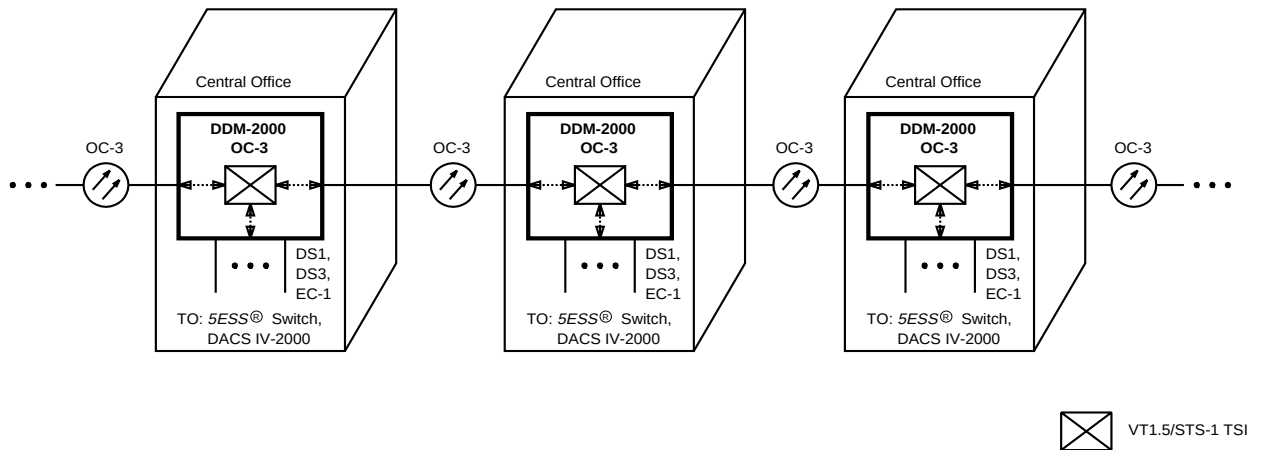


Figure 2-39. DS1 Add/Drop — OC-3 Interoffice Configuration

Electrical Multiplexer

The DDM-2000 OC-3 Multiplexer can be configured as an electrical multiplexer for SONET interoffice networks. The electrical multiplexer configuration is optimized for interworking with other SONET products. With its SONET standard EC-1 interfaces, the electrical multiplexer configuration can also be installed in an unconstrained mixed-vendor environment.

The electrical multiplexer configuration, Figure 2-40, operates as three independent multiplexers, each creating a VT-formatted STS-1 from 28 DS1 low-speed interfaces. Traffic from each one of these electrical multiplexers can be carried over any SONET transmission network and can be terminated on any VT1.5-based SONET NE at the other end of the network. These include other DDM-2000 OC-3 Multiplexers and/or DACS IV-2000 Cross-Connect Systems.

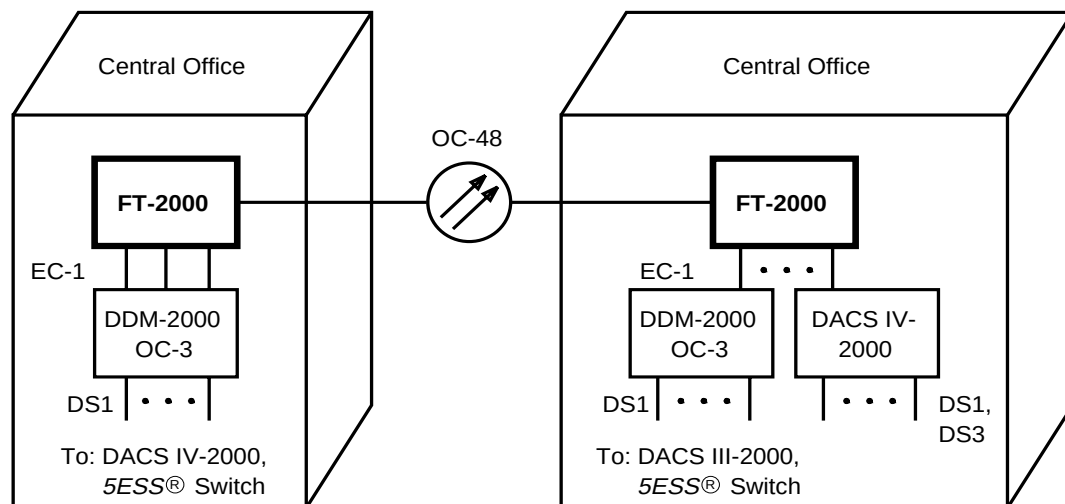


Figure 2-40. DDM-2000 OC-3 Electrical Multiplexer Configuration

2000 Product Family Interworking

SLC-2000 Access System

The *SLC-2000* Access System is Lucent's next generation digital loop carrier (DLC) system. The *SLC-2000* Access System can be installed in any existing pair gain application, providing telephone service, integrated services digital network (ISDN) capability, DS1 pipes, and special services. Full DS0 bandwidth management capabilities (based on Bellcore TR-303) provide for more efficient and flexible network growth.

Figure 2-41 shows a business narrowband application using the DDM-2000 FiberReach Multiplexer on an OC-1 path switched ring (PSR). This application provides protected POTS, ISDN, and special services, as well as DS1 services. The ring host is either a DDM-2000 OC-3/OC-12 remote node or a *SLC-2000* ARM on an OC-3/OC-12 path switched ring. OC-1 extensions from OC-12 rings are planned in a future release.

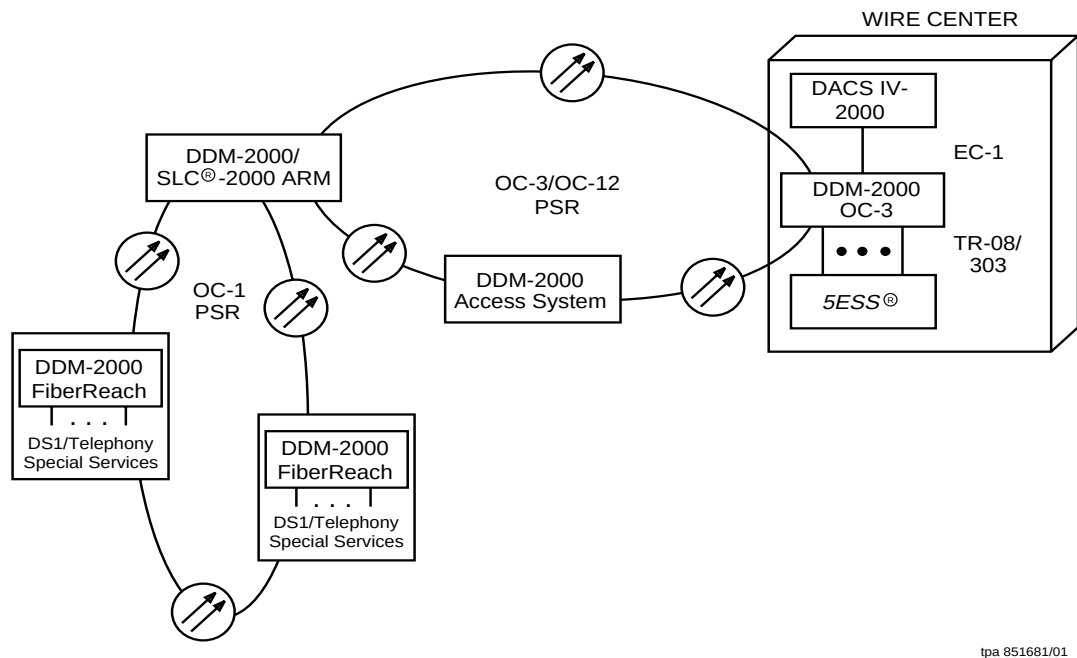


Figure 2-41. OC-3 Loop Carrier Interface Configuration

At hubbing and linear add/drop sites, a DDM-2000 Multiplexer and *SLC*-2000 Access System RT combine to create an integrated SONET DLC node. The DDM-2000 Multiplexer provides the OC-3 and OC-12 facility interfaces and add and drop traffic to the adjacent *SLC*-2000 Access System RT via EC-1 or IS-3 interfaces. Figure 2-42 shows a *SLC*-2000 Access System in an OC-12 hubbing application. A DDM-2000 OC-3 Multiplexer is used at one of the RT sites due to demand for more than 28 DS1 services.

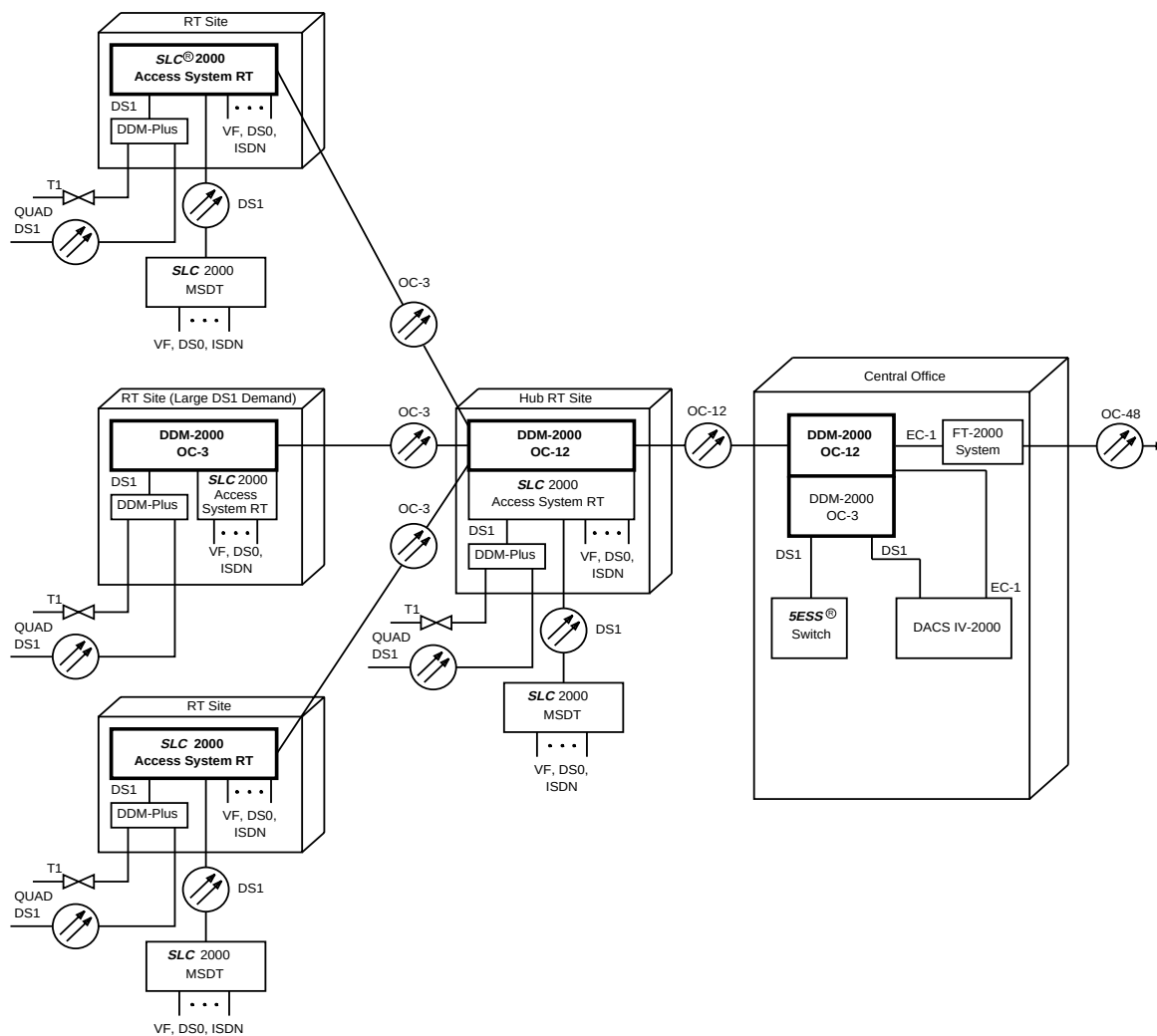


Figure 2-42. *SLC*-2000 Access System in an OC-12 Hubbing Configuration

DACS IV-2000 Cross-Connect System

The DACS IV-2000 can serve as the CO core of a highly flexible and efficient transmission network. A centrally located complex of DACS III-2000 and DACS IV-2000 positions the network to deliver new services more quickly and at a lower cost. DACS IV-2000 is particularly suited for access network integration with its DS1/VT1.5 and DS3/STS-1 cross-connect features and operations interworking with DDM-2000 systems in the subnetwork.

As shown in Figure 2-43, the DDM-2000 access network will interface with a DDM-2000 CO shelf to terminate the fiber and perform OAM&P functions. EC-1 electrical interfaces to DACS IV-2000 will maintain STS-1 and VT1.5 SONET path connectivity (providing, for example, PM) and allow DACS IV-2000 to perform cross-connections on SONET STS-1 and VT tributaries.

In this architecture, the centralized OAM&P functions are at a CO or centralized work center using a single OAM&P link to the DACS IV-2000 using the intra-office (IAO) LAN. This allows full DCC connectivity between the DACS IV-2000 and every SONET NE in a subnetwork.

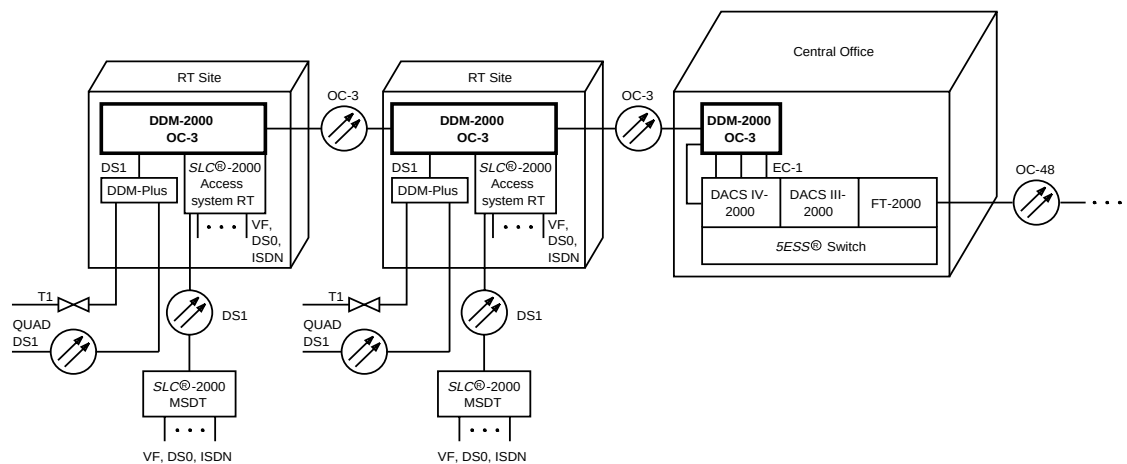


Figure 2-43. DACS IV-2000 Access Configuration

Beginning with DACS IV-2000 Release 5, an Integrated Operations Controller (IOC) has become available to combine the DACS IV-2000 and DDM-2000 SONET technologies. This IOC manages the DACS IV-2000 with optical bays, consisting of DDM-2000 OC-3 and/or OC-12, merging the control of both NEs under an integrated interface. It provides the full range of circuit management and alarm surveillance spanning these NEs.

FT-2000 OC-48 Lightwave System

Operations interworking (OI) provides the capability to access, operate, provision, and administer remote Lucent SONET NEs from any location in a SONET subnetwork or from a centralized OS.

OI is available among Lucent 2000 Product Family systems connected through the SONET DCC including:

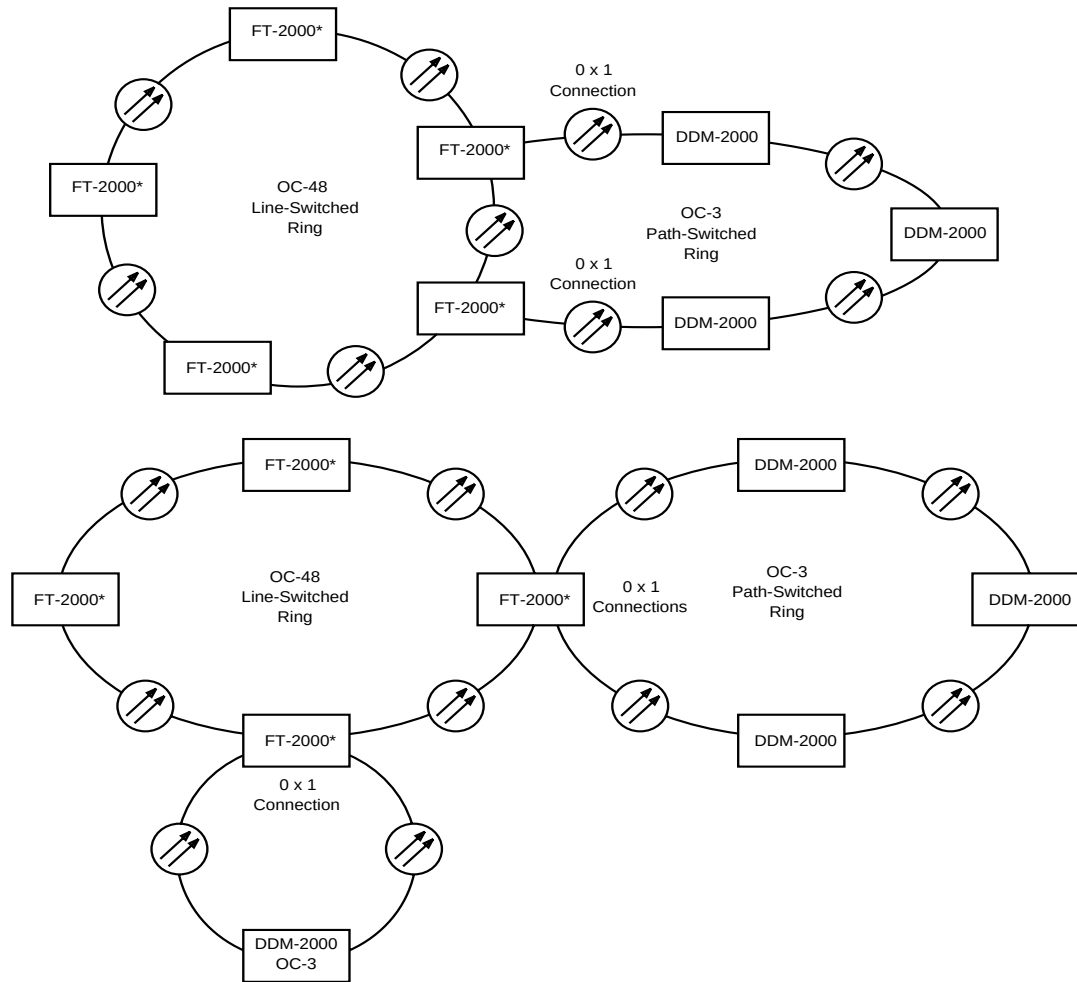
- FT-2000 OC-48 Lightwave System (Release 6.0 and later)
- DDM-2000 OC-3 Multiplexer (Release 7.2 and later).

The FT-2000 OC-48 Lightwave System equipped with Release 6.0 software supports OI applications with DDM-2000 OC-3 Multiplexers (Figure 2-44).

Messages carried on the SONET section DCC support the following interworking applications:

- Remote login
- GNE operation
- Remote NE status
- Remote software download and copy.
- **Remote login:** A user logged in locally to an FT-2000 OC-48 Lightwave System can remotely log in to a DDM-2000 OC-3 Multiplexer via the OC-3 DCC. However, a user logged in locally to a DDM-2000 OC-3 Multiplexer cannot remotely log in to the FT-2000 OC-48 Lightwave System. A user logged in locally to a DDM-2000 OC-3 Multiplexer can remotely log in to another DDM-2000 OC-3 Multiplexer through an FT-2000 OC-48 Lightwave System.
- **GNE operation:** One or more FT-2000 OC-48 Lightwave Systems can serve as a single interface to the local X.25 message-based operations system for the DDM-2000 OC-3 Multiplexers through the OC-3 DCC. The GNE also serves as a single interface for all FT-2000 OC-48 Lightwave Systems in the same ring network and in the same subnetwork. In a mixed DDM-2000 OC-3/FT-2000 OC-48 Lightwave System network, the FT-2000 OC-48 Lightwave System must serve as the GNE(s). Multiple GNEs are supported in a DDM-2000 OC-3 network.
- **Remote NE status:** The FT-2000 OC-48 Lightwave System can receive and transport alarm and status information from other FT-2000 OC-48 Lightwave Systems and DDM-2000 OC-3 Multiplexers that are in the same subnetwork. Within a subnetwork, NEs in the same alarm group (provisionable) exchange alarm and status information through at least one alarm gateway network element (AGNE). When an AGNE receives alarm and status information, it rebroadcasts the information to all the other NEs in the alarm group. An alarm group can support the maximum number of NEs supported in the subnetwork.

- **Remote software download and copy:** An FT-2000 OC-48 Lightwave System can download (copy) software to remote FT-2000 OC-48 Lightwave Systems in the same network and across a DDM-2000 OC-3 network to another FT-2000 OC-48 Lightwave System in the same subnetwork. Similarly, a DDM-2000 OC-3 Multiplexer can download (copy) to another DDM-2000 OC-3 through an FT-2000 OC-48 Lightwave System network.



* FT-2000 OC-48 Add/Drop-Rings Terminal (Release 6 and later)

Figure 2-44. Operations Interworking Application

Figure 2-45 shows two types of OC-3 interface connections between FT-2000 OC-48 Lightwave System line switched rings and DDM-2000 OC-3 path switched rings.

- **Linear (1+1).** In this configuration (top figure of Figure 2-45), there is a 1+1 OC-3 interface connection to an FT-2000 OC-48 Lightwave System NE. A failure of the 1+1 OC-3 interface will trigger a DDM-2000 OC-3 line protection switch. Figure 2-46 shows a major application of this feature in a DRI application using optical OC-3/IS-3 interfaces.
- **Ring (0x1).** In this configuration (bottom figure of Figure 2-45), there are two 0x1 OC-3 interface connections to one FT-2000 OC-48 Lightwave System NE. A failure of one of the 0x1 OC-3 interfaces will trigger a DDM-2000 OC-3 path protection switch.

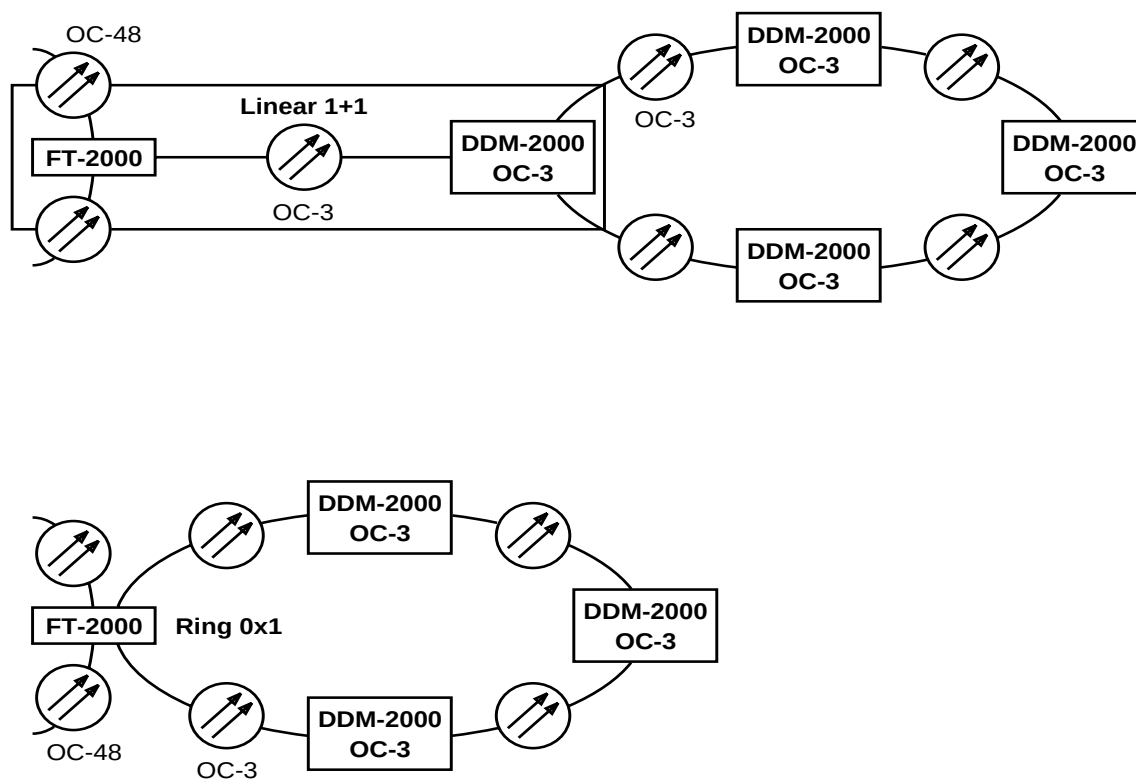


Figure 2-45. OC-3 Ring Interfaces with FT-2000 OC-48 Lightwave System

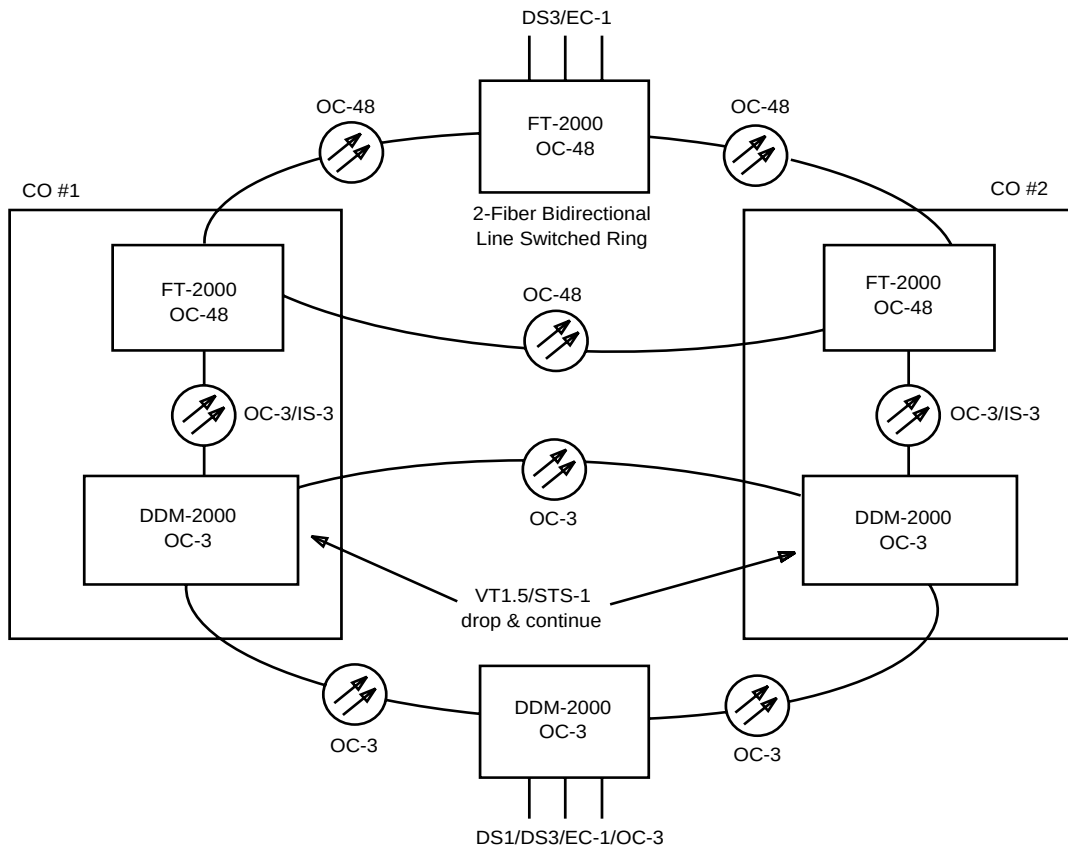


Figure 2-46. DDM-2000 OC-3 to FT-2000 OC-48 Lightwave System Dual Ring Interface

Figure 2-47 and Figure 2-48 show other examples of interfaces between FT-2000 OC-48 Lightwave System and OC-3 linear and OC-12 ring systems.

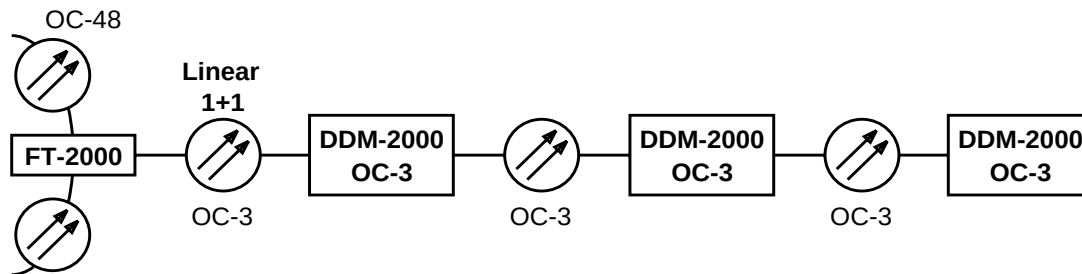


Figure 2-47. OC-3 Linear Interfaces with FT-2000 OC-48 Lightwave System

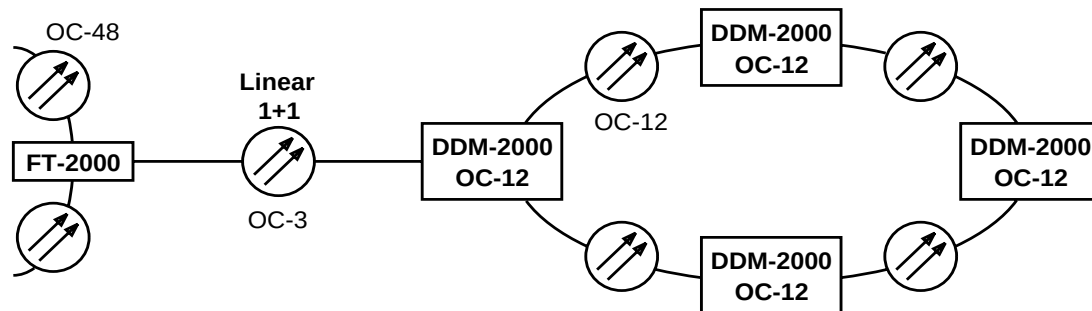


Figure 2-48. OC-12 Ring Interfaces with FT-2000 OC-48 Lightwave System

MegaStar 2000 Radio

These configurations (linear and ring) are part of the Lucent Technologies and Harris-Farion *MegaStar 2000* Radio system supporting mixed fiber and radio topologies. Figure 2-49(a.) shows a linear topology while Figure 2-49(b.) shows a ring topology.

These configurations feature:

- Hybrid fiber and microwave architecture
- DCC connectivity across the microwave span
- Similar OAM&P as DDM-2000 OC-3 Multiplexer linear and ring networks.

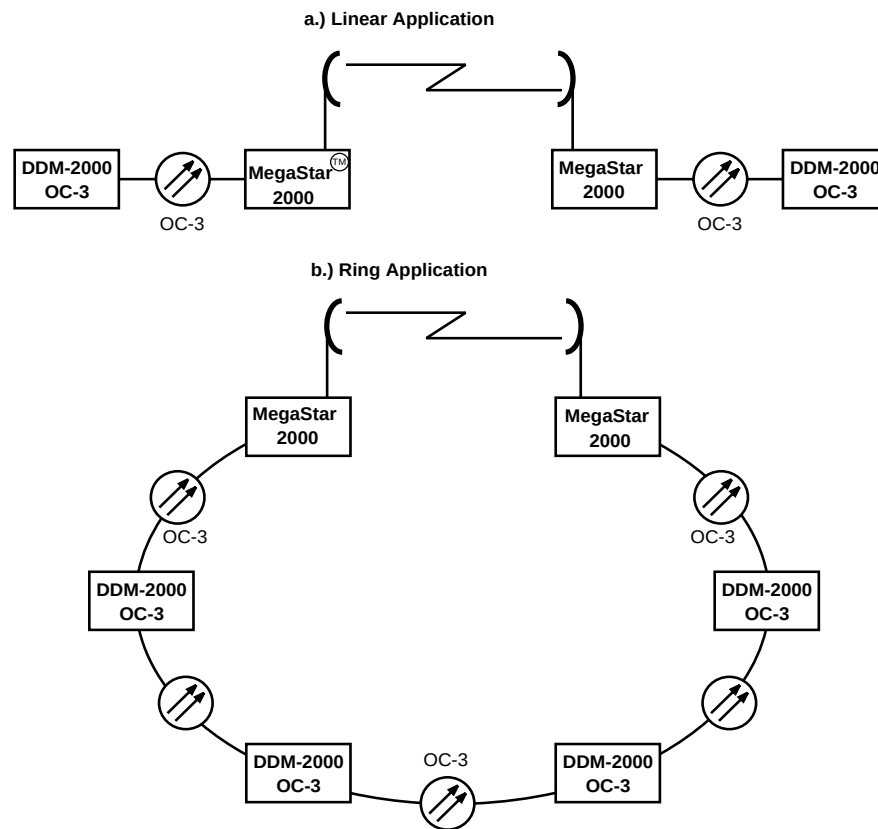


Figure 2-49. *MegaStar 2000* Radio Support Using DDM-2000 OC-3 Multiplexers

Multivendor Applications

Figure 2-50 shows a multivendor application partnering Lucent's DDM-2000 and FT-2000 with Tellabs *TITAN*^{*} 5500 DCS. This interoperability, based on SONET standards, allows service providers to offer more flexible services to generate revenues and improve overall network maintenance efficiency.

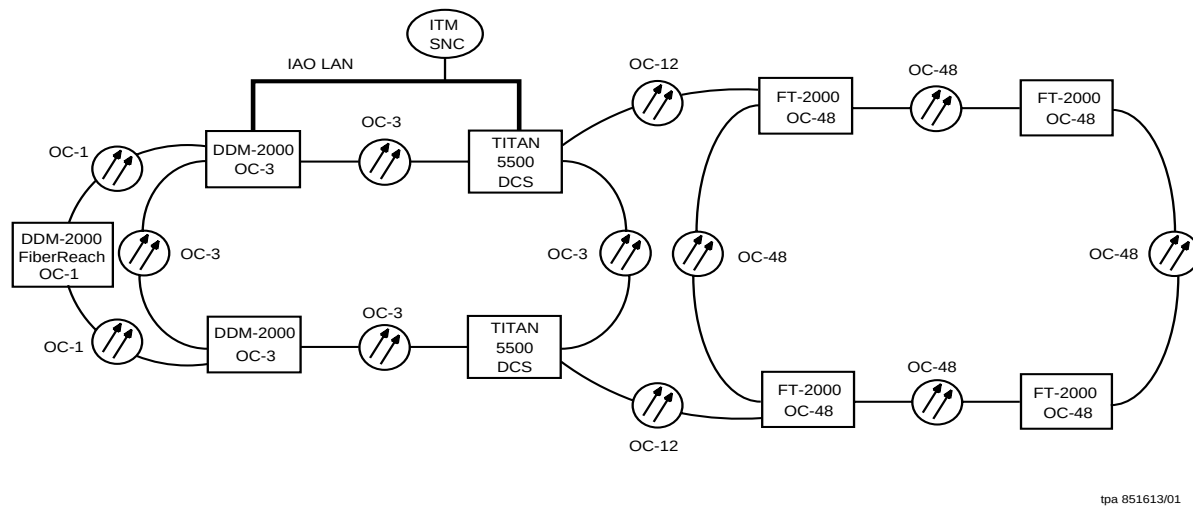


Figure 2-50. Interworking of OC-1/OC-3/OC-12/OC-48 with Tellabs *TITAN* 5500 DCS

* *TITAN* is a registered trademark of Tellabs, Inc.

Service Applications

Loop Feeder

The DDM-2000 Multiplexers provide a full set of interfaces, topologies, operations and upgradability to provide the flexibility and ease of operation required to meet the dynamic requirements of the loop feeder environment.

The DDM-2000 Multiplexers are particularly suited to the evolving needs of loop feeder applications. They offer many essential features: compact size, environmental hardening, single-ended operations, and capacity and topology upgrades. The DDM-2000 Multiplexers' extensive set of topologies allows the network to be optimized for a particular route geography, service mix, and growth forecast.

Interoffice Transport

The DDM-2000 Multiplexers provide the features necessary for interoffice transport applications. Examples include long span optics, OC-12 regenerators, easy capacity upgrades, and full DS1 and DS3 add/drop capability. Interoffice applications include point-to-point, stand-alone SONET electrical multiplexing, add/drop, path switched ring, and DRI.

The DDM-2000 OC-3 and OC-12 Multiplexers provide the following features for interoffice applications:

- DS1 transport
- DS3 transport
- EC-1 transport
- OC-3c transport
- Synchronization distribution
- Single-ended or independent operations
- Single-mode fiber spans up to 55 kilometers (34 miles) for OC-3, up to 51 kilometers (32 miles) for OC-12 at a wavelength of 1310 nm, and up to 100 kilometers (61 miles) for OC-12 at a wavelength of 1550 nm.

A VT1.5/STS-1 path switched OC-3 ring is a very effective self-healing network configuration for small cross-section interoffice networks, such as outstate trunks.

Any number of nodes in a DDM-2000 interoffice network can be independently synchronized from a BITS clock. Timing inputs can also be provided to the BITS from a DDM-2000 OC-3 or OC-12 Multiplexer using the DS1 timing output feature. See Figure 2-33 and Figure 2-34 for examples.

Broadband Business Access

New telecommunications needs for customer networks include higher bandwidth services based on DS1, DS3, and STS-3c rates; a self-healing capability for businesses most sensitive to service disruption; and rapid service deployment and rearrangement to keep pace with a changing environment. The flexible, advanced capabilities of the DDM-2000 OC-3 and OC-12 Multiplexers create a powerful platform along with other Lucent 2000 Product Family systems to keep pace with these dynamic customer needs.

The more a business relies on telecommunications, the more important self-healing networks become. In particular, finance, medical, transportation, education, and government users are insisting on a highly reliable network. These users are also driving for higher bandwidth data and video services.

The large multisite medical facility shown in Figure 2-51 uses broadband services for intersite imaging and video needs as well as lower bandwidth voice and data services into the public network based in ISDN primary rate interface (PRI) and basic rate interface (BRI) interfaces. These services can be delivered efficiently with the DDM-2000 OC-3, OC-12, and *SLC-2000* Access System's flexible TSI and add/drop capabilities. The ring architecture prevents service outage due to a cable cut or node failure.

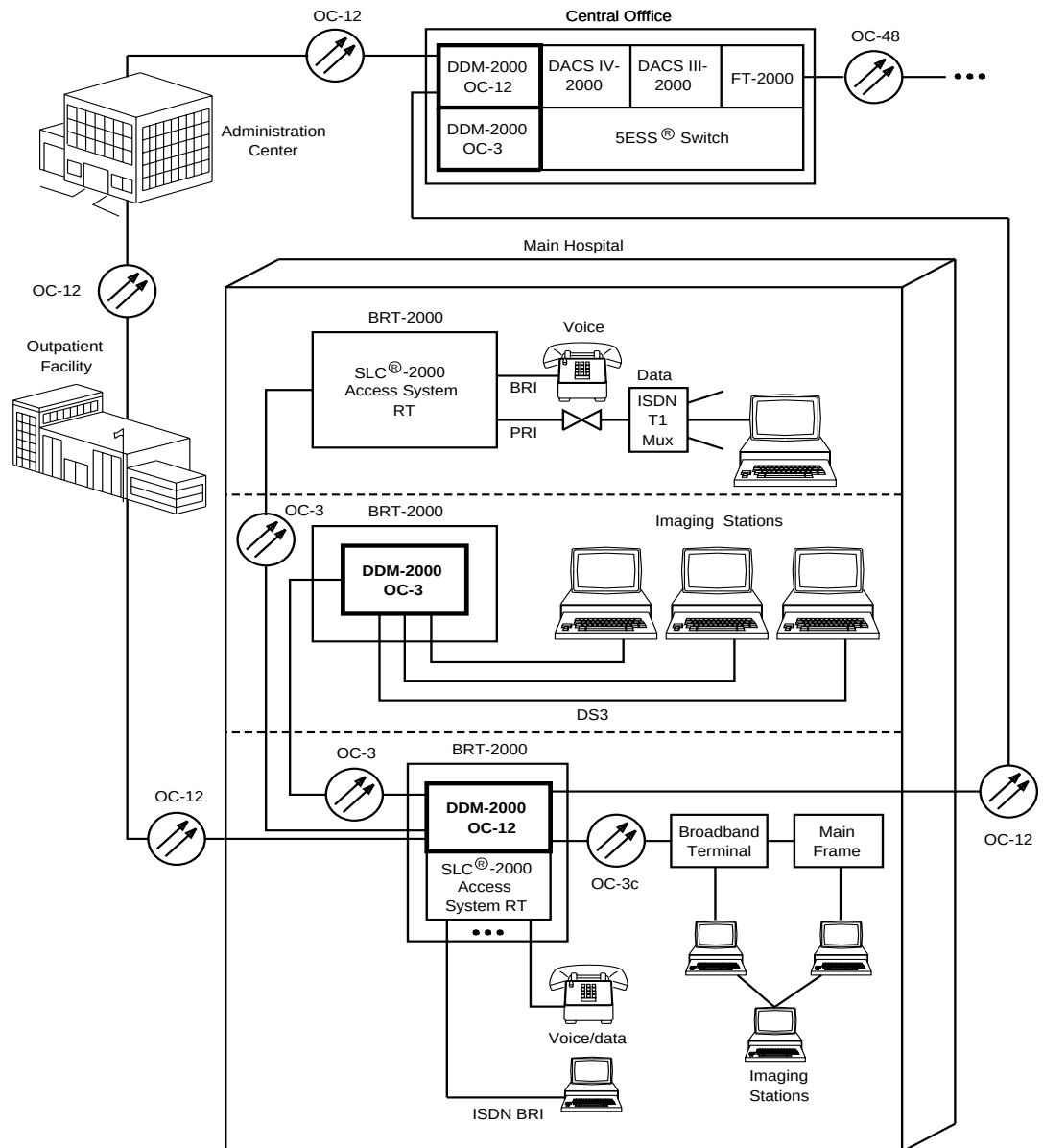


Figure 2-51. Self-Healing Medical Campus Network Application

LAN/WAN Data Networking: Native Mode LAN Interconnect (NMLI) Services

Increasing demands for data and multimedia applications have led to a significant growth in LAN service needs among business customers. These service needs have been focused on providing interconnection of business customer LANs over a wide area network (WAN). To transport these LAN interconnect data services over the public network, LAN routers and concentrators collect the data at a LAN location and map it into traditional telephone network transmission signals (for example, DS1 or DS3). These telephony signals can then be transmitted to wide area locations where the data can be mapped onto the LAN at that location. However, the LAN interconnect service supported in this manner is not Native Mode and does not share the transport bandwidth in an efficient manner.

On the other hand, NMLI service requires that the speed of the connection provided to a customer remains unchanged from end-to-end. It is supported for Ethernet/IEEE 802.3. DDM-2000 OC-3 Multiplexers are ideally suited to serving the growing demands for such NMLI services. DDM-2000 OC-3 can interface to an external LAN/ATM switch via DS3 interfaces (see Figure 2-52). Using such an external LAN/ATM switch approach, DDM-2000 OC-3 Multiplexers can provide the necessary transport and bandwidth management capabilities to meet the business customer LAN interconnect service needs. Delivering LAN interconnect services using DDM-2000 provides the same high level of reliability and availability for these services as is supported for all other premium business services—this includes full STS-1 path-switching in ring configurations.

Release 11.0 introduced a new DS3 Data Services Interface circuit pack (BBG19) for use with data edge devices. Figure 2-53 shows an example of the DDM-2000 providing ring access to an ATM Switch. Up to six BBG19s can be installed in the DDM-2000 function units connecting data edge devices with services such as Ethernet, Token Ring, ATM, FDDI, Frame Relay, and others to the SONET access ring.

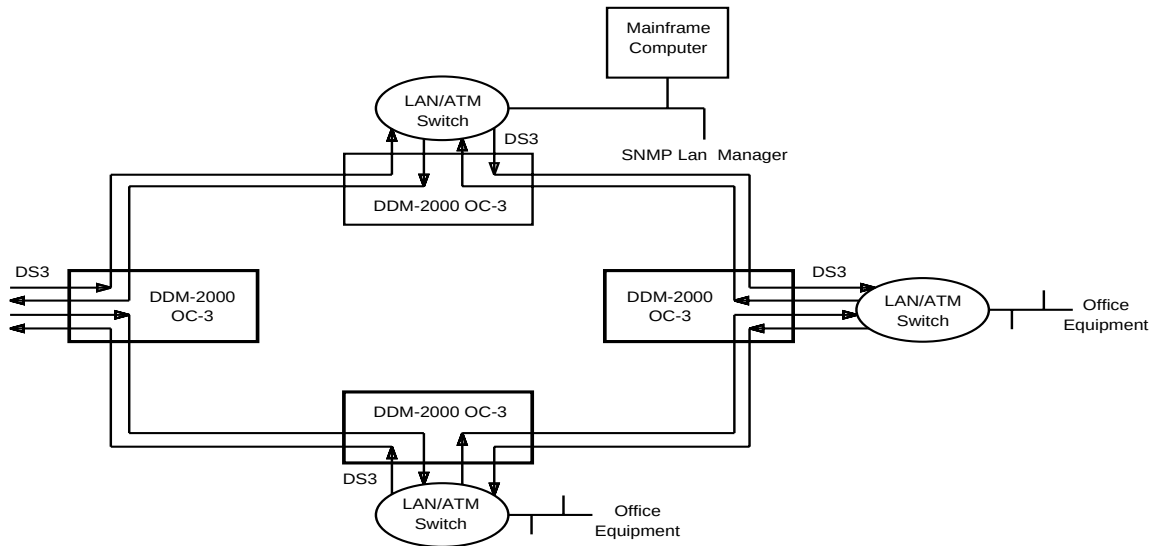
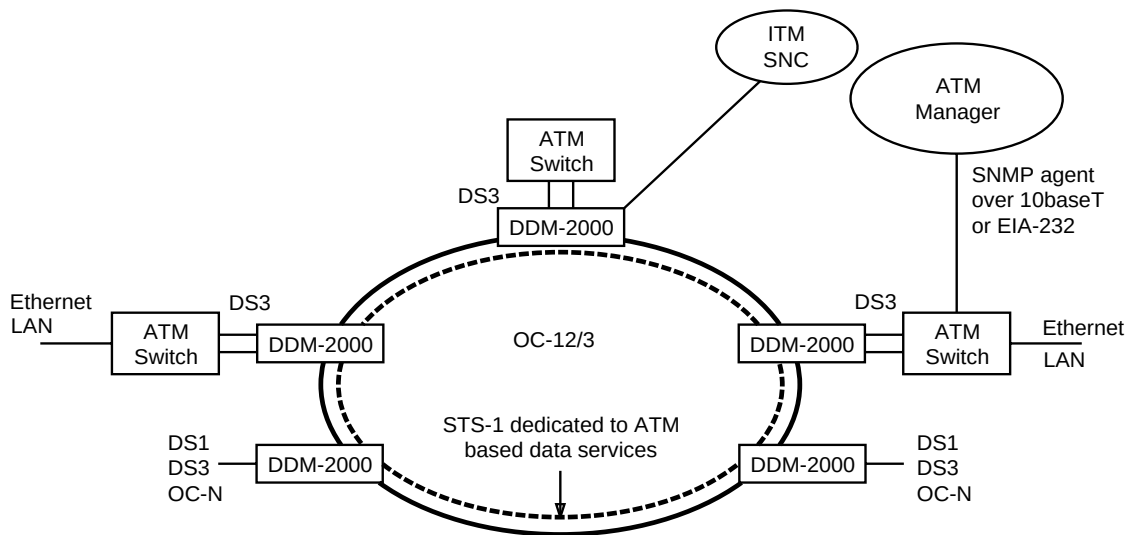


Figure 2-52. LAN/WAN Data Networking Using Locked DS3 Cross-Connections



tpa 852266-01

Figure 2-53. DDM-2000 Data Service with an ATM Switch

Gateway Between SONET and Asynchronous Interfaces

Figure 2-54 shows an OC-12 STS-1 drop-and-continue to DS3 interface application for DDM-2000 OC-12 ring releases. The application is a DRI network with the following components and releases:

- DDM-2000 OC-3 Multiplexers with Release 7.1 or later software/*SLC*-2000 with Release 3.1 or later software path switched ring with VT1.5 drop-and-continue to EC-1 interfaces
- DACS IV-2000 Release 3.0 or later to provide EC-1/DS3 (M13) conversions and cross-connections
- DDM-2000 OC-12 Multiplexers with Release 3.1 or later software.

This configuration is a specific application for interfacing DS1 signals at one end of a SONET system and DS3 interfaces at the other end.



NOTE:

In offices where SONET interconnections are not available, DS3 interfaces can be used between dual OC-12 offices. The DDM-2000 OC-12 Multiplexer also supports DS3 DRI in addition to the EC-1 and OC-3 interfaces. In the event of an incoming DS3 failure from the DSX-3, the OC-12 Multiplexer inserts an STS-1 AIS signal into the STS-1 ring channel used by the DS3 to activate the downstream STS path protection switch. A complete loss of CO 1 or CO 2 would protect the end-to-end path. However, unless there is a specific application requiring this gateway functionality, it is recommended that SONET DRI interfaces (EC-1 or OC-3) be used if possible since the DS3-to-STS-1 AIS translation feature is on the OC-12 Multiplexers only (R5.1 and later).

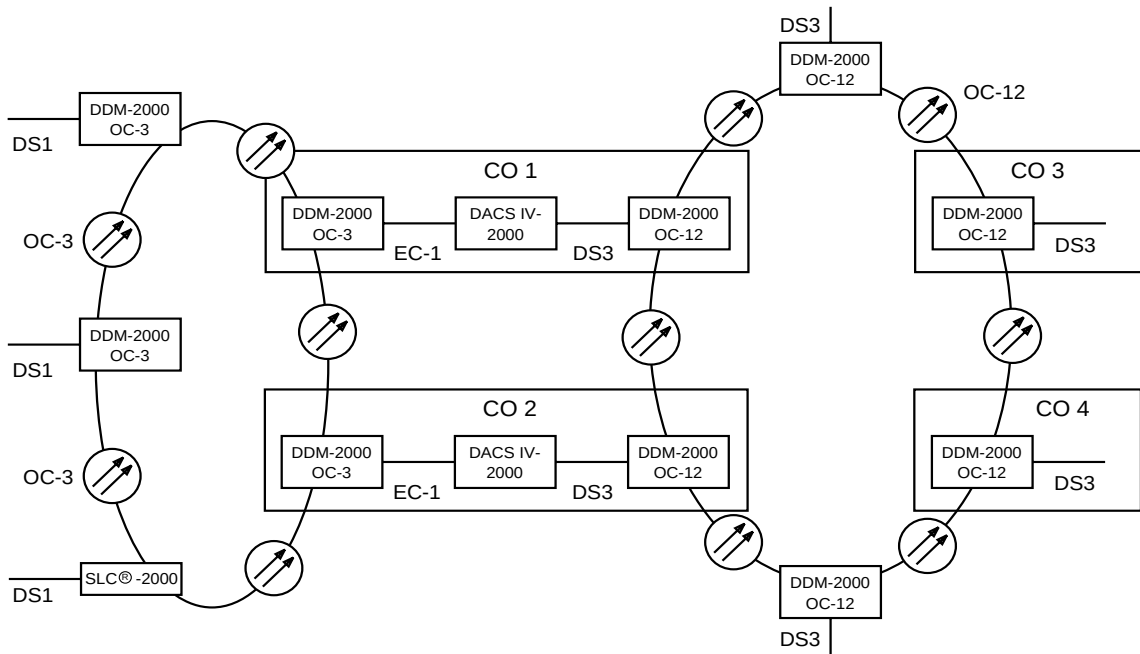


Figure 2-54. OC-12 STS-1 Drop-and-Continue to DS3 Interfaces

Teleprotection and SCADA Applications

Electric utilities are facing an unprecedented demand for increased communications bandwidth to support modern operations and business applications, such as substation automation, computer networking, and video teleconferencing. Many electric utilities are installing SONET fiber optic backbones to meet these needs. SONET fiber optic backbones are a valuable communications resource that can also be used for real-time protective relay and supervisory control and data acquisition (SCADA) applications.

DDM-2000 OC-3, DDM-2000 OC-12, and DDM-2000 FiberReach Multiplexers can be used in a flexible backbone network among electrical substations and other important sites. These systems provide an innovative "locked cross-connection" feature that enhances the ability of SONET rings to transport protective relay and SCADA communications. The locked cross-connection feature meets the teleprotection requirements for minimum and stable transmission delay, minimum system outage during a protection switch, and DS0 level bandwidth management at all ring nodes.

The locked cross-connection feature allows a DS1 to be removed from the TR-496 compliant VT path protection switching algorithm and provisioned as an unprotected path between any two nodes on the ring. As shown in Figure 2-55, locked cross-connection can be used to interconnect adjacent nodes all the way around SONET rings, thereby permitting access to the DS1 at each SONET node. Figure 2-55 shows a single DS1 locked between ring nodes, but this can be extended to an arbitrary number of DS1s within the available SONET bandwidth. This locked cross-connection feature fixes the ring rotation (and delay) of the DS1 paths on the ring and also permits DS0 grooming of the DS1s at each DDM-2000 or DDM-2000 FiberReach node using an external drop/insert multiplexer, such as the RFL 9001 Intelligent Multiplexer. Figure 2-55 shows the DDM-2000 interconnecting at the DS1 level with an adjacent RFL 9001 Intelligent Multiplexer that, in turn, connects on the low-speed side to protective relay and SCADA equipment. Specially designed channel units in the RFL 9001 Intelligent Multiplexer detect when a fault occurs on the power line or substation and communicate at the DS0 level with other substation nodes to isolate the power grid fault. See Section 5, "Operations, Administration, Maintenance, and Provisioning."

In addition to the efficient DS0 grooming capability, the RFL 9001 Intelligent Multiplexer implements its own protection algorithm that can restore the DS0 level circuits within the locked cross-connections should the ring be cut. This algorithm operates much faster than the SONET TR-496 algorithm, thereby minimizing system outage during a protection switch.

Figure 2-55 also shows an optical drop/insert DS1 extension from the SONET rings implemented with RFL 9001 Intelligent Multiplexers. This extension is useful for serving low bandwidth sites remote from the SONET backbone. The figure shows a single host DDM-2000 interconnecting the rings, but the application could be a DRI to provide node survivability.

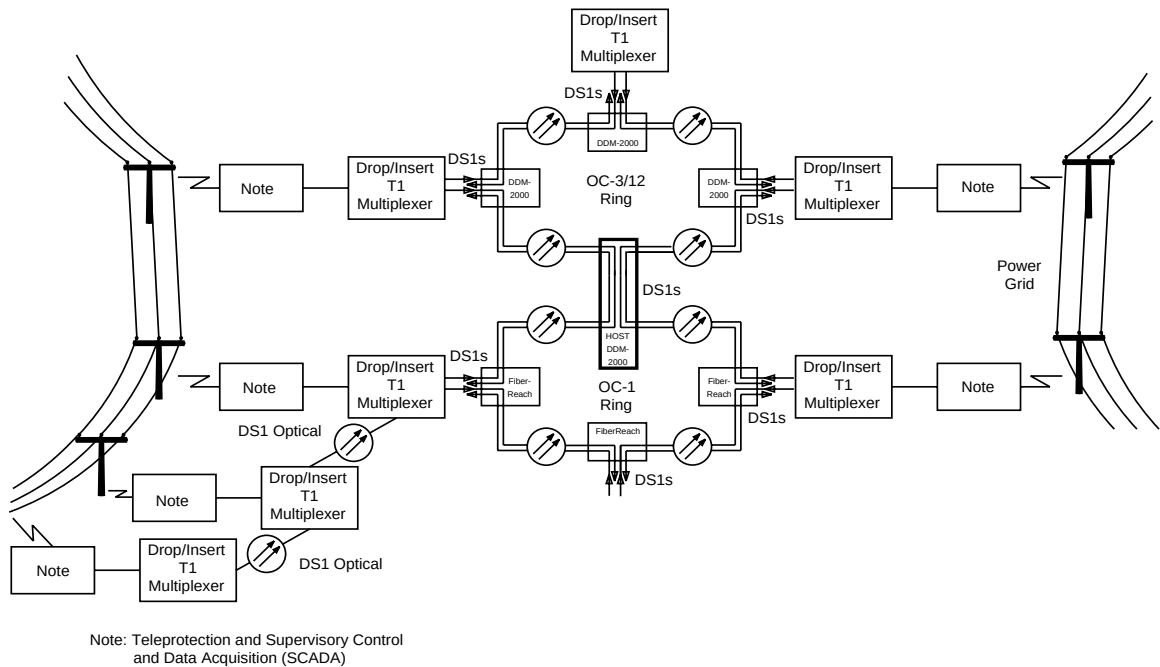


Figure 2-55. Teleprotection and SCADA Application

Intelligent Vehicle Highway System (IVHS) Applications

IVHSs are beginning and will grow to play a major role in the roadway systems of the future. Their primary use in the near-term is to reduce congestion. This is done in several ways.

- The IVHS provides more efficient and optimal traffic management which attempts to avoid congestion in the first place
- The IHVS provides better management of congestion caused by random occurrences, such as accidents or breakdowns
- The IVHS eliminates many of the foreseeable causes of congestion, such as toll-taking, by automating these functions.

In the future, these systems will also help travelers plan their routes by providing up-to-the-minute traffic and highway information. The DDM-2000 OC-3 and OC-12 Multiplexers are a perfect match for the networking needs of these systems.

Figure 2-56 shows a typical IVHS application. An IVHS network calls for carrying data between roadside equipment, such as traffic counters, speed sensors, variable messaging signs, video cameras, toll-taking equipment, pay phones and call boxes, and a traffic operations center, where incoming data is processed and responses are generated. The DDM-2000 OC-3 and OC-12 Multiplexers provide a perfect backbone for carrying this information. The DDM-2000 OC-3 Multiplexer SONET ring capability, when coupled with diverse fiber routing on opposite sides of the roadway, makes the backbone completely self-healing in the face of failures. Such reliability is absolutely essential, especially as travelers come to depend more and more on IVHS networks. The VT1.5 and STS-1 bandwidth management capabilities of the DDM-2000 OC-3 and OC-12 Multiplexers allow flexible allocation of bandwidth to match the dynamics of a roadway system which is undergoing unpredictable changes in traffic patterns, breakdowns, accidents, and repairs. Such bandwidth management provides a system which meets the IVHS network needs in a cost-effective manner. DDM-2000 OC-3 and OC-12 Multiplexers completely meet the transmission needs of an IVHS network.

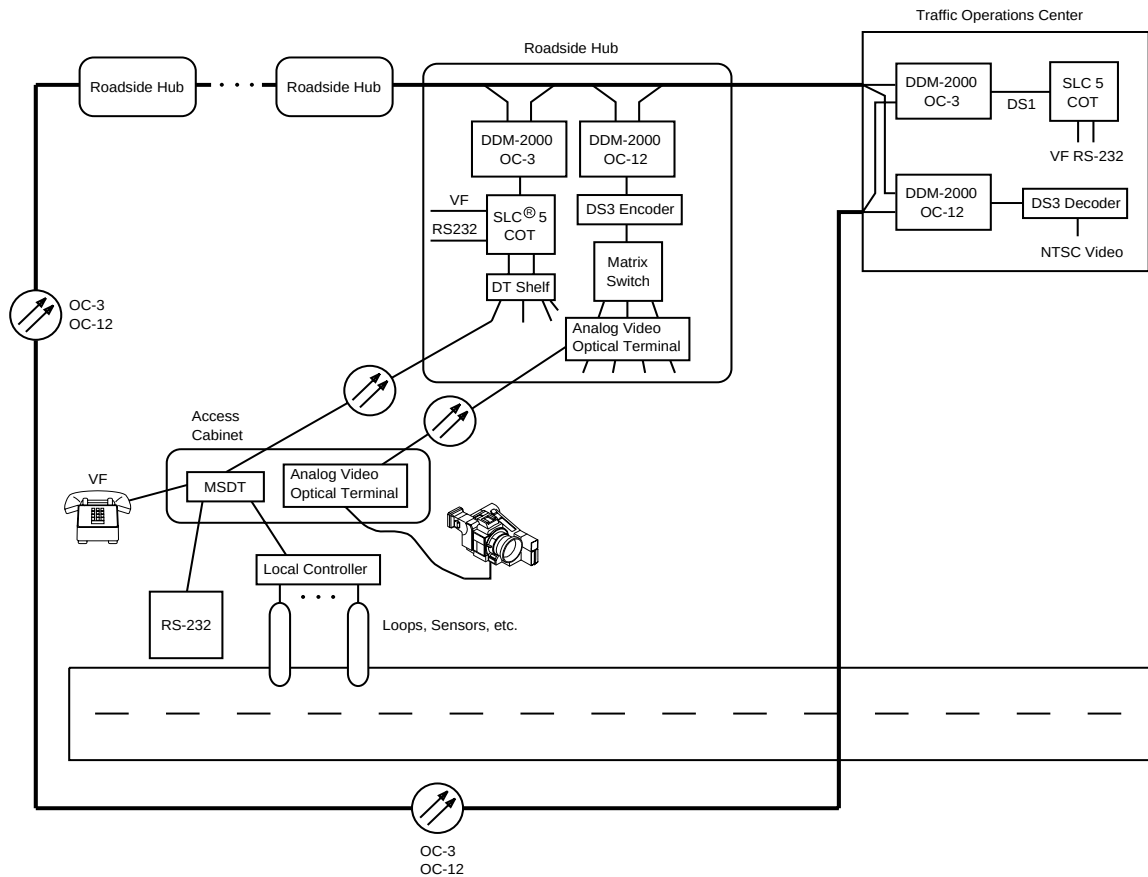


Figure 2-56. Intelligent Vehicle Highway System (IVHS) Application

DS1 Performance Monitoring for Tariff Verification

It is critical in the growing, high-reliability DS1 services market that DS1 performance be accurately measured and recorded in order to verify the terms of a DS1 tariff. The DDM-2000 OC-3 Multiplexer's DS1 PM capability allows a service provider to access this lucrative market by gathering and maintaining DS1 path performance data. The service provider can then use this data to confidently verify the terms of a DS1 tariff.

Figure 2-57 demonstrates a typical configuration for DDM-2000 OC-3 Multiplexers configured to provide DS1 PM. In this example, a business customer is using DS1s to interconnect a LAN at their remote office with a LAN at their corporate headquarters. The DS1 circuit is provided by a public carrier. Starting at the corporate headquarters (location A), an ESF formatted DS1 is fed into the DDM-Plus or DDM-2000 FiberReach and DDM-2000 OC-3 equipment, carried across the public network, and delivered to the LAN bridge/router at the company's remote office (location Z). There the LAN bridge/router (owned by the business customer) evaluates the number of bit errors occurring in the trip from headquarters to the remote office and sends a message in the opposite direction of the ESF data link, reporting these error statistics. The DDM-2000 OC-3 Multiplexer receives this message and stores the information locally on its DS1PM circuit pack. The DDM-2000 OC-3 Multiplexer does this continuously, gradually building a repository of DS1 performance data on the link from location A to location Z. This information is always available to the public carrier's operations center by querying the DDM-2000 OC-3 Multiplexer via its CIT or TL-1 links. Similarly, the DDM-2000 OC-3 Multiplexer at the company headquarters maintains all the performance data on the link from location Z to A, and this data is also transmitted over the TL1 interface. Taken together, these two sources of data provide verification of the two-way DS1 link between location A and Z.

Beginning with Release 11.1, a DS3 Transmultiplexer (TMUX) circuit pack is available for installation in the function unit slots of the DDM-2000 OC-3 shelf. The TMUX accepts an M13 or C-bit formatted DS3 signal and demultiplexes it into 28 DS1s. Performance monitoring can then be done at the DS3 and DS1 (measuring the same path parameters as the DS1 PM circuit pack) levels. This new circuit pack eliminates the need for a separate M13 multiplexer and can add versatility to your tariff verification capabilities (TMUX not shown in Figure 2-57). See Figure 2-58 for a DS3 Transmultiplexer application.

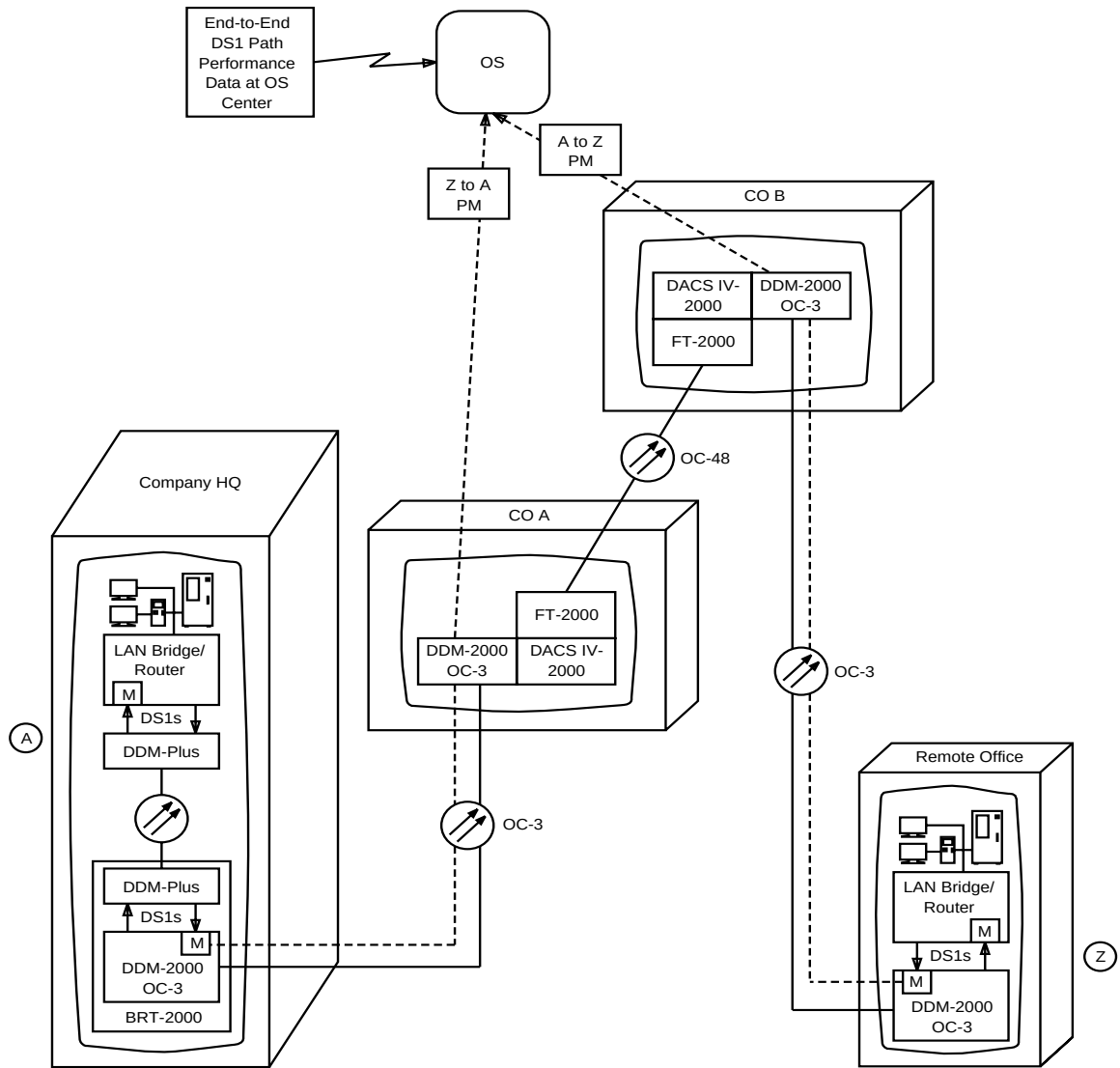


Figure 2-57. DS1 Path Performance Monitoring for Tariff Verification

DS3 Transmultiplexer (TMUX) Application.

The transmultiplexing feature provides an economical means for collection of DS1s at a customer site, and handoff of a fully groomed asynchronous DS3 to the interexchange carrier (IEC) without the need for external M13 multiplexers.

Figure 2-58 shows an example of a total of 28 DS1s connected to three NEs and transported on three different STS-1s. The DS1s are collected and groomed in the DDM-2000 OC-3 shelf on the right, multiplexed to a DS3, and then passed on to the interexchange carrier. The DS3 Transmultiplexer TMUX (BBG20) circuit pack provides this feature.

In the transmit direction the TMUX accepts one DS3 signal and demultiplexes it into 28 DS1s. Performance monitoring can then be performed on the DS1s before they are mapped into floating VT1.5s. The 28 VT1.5s are then multiplexed into STS-1s before being sent to the high-speed OLIU. In the receive direction the reverse process takes place. The TMUX circuit pack also provides enhanced DS3 performance monitoring as well as DS1, VT, and STS-1 PM.

- DS1s that form DS3 can come from multiple STS-1s

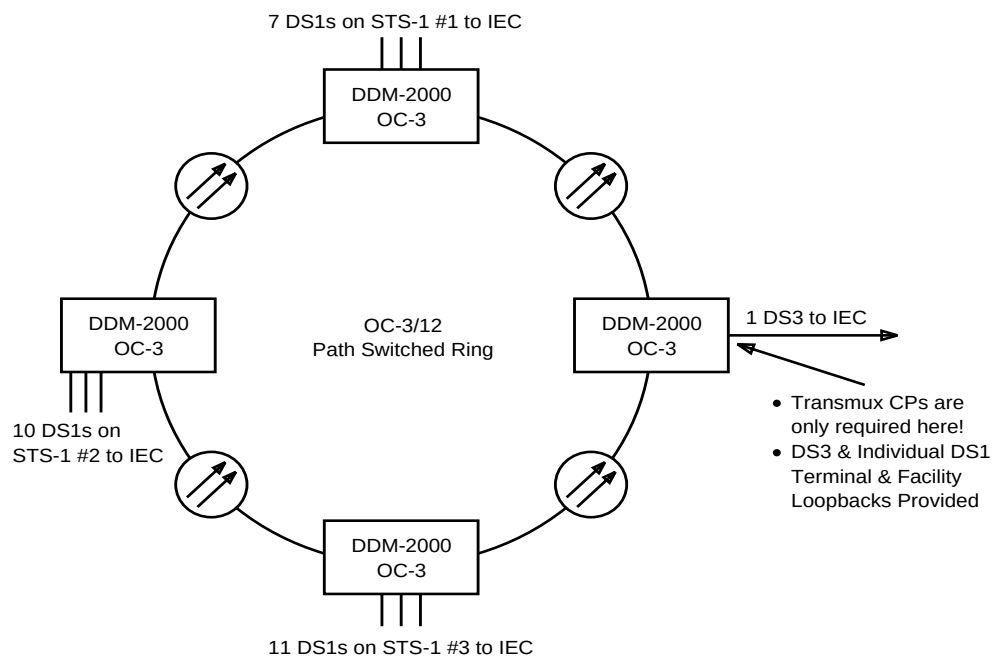


Figure 2-58. DS3 Transmultiplexer Application

High bit-rate Digital Subscriber Line (HDSL) Application.

The HDSL circuit pack (BBF8) provides HDSL interface capability on the DDM-2000 OC-3 shelf to compatible *PairGain*® equipment at the customer premises. It allows the transport of T1 payloads, for up to 12,000 feet, over two metallic 24 AWG twisted-pair lines. Figure 2-59 shows examples of HDSL circuit packs providing this capability in the DDM-2000 OC-3 shelf. Applications for business customers, the private network, cell sites, PBXs, customer premises equipment (CPE), and other applications are supported.

The BBF8 circuit pack fits into the low-speed slots and provides two, four-wire HDSL interfaces. Each interface provides a full DS1 payload capacity mapped to a SONET VT1.5 and then VT cross-connected into an STS-1 through the MXRVO. Once in SONET, the DS1 payload is treated as a normal DS1.*

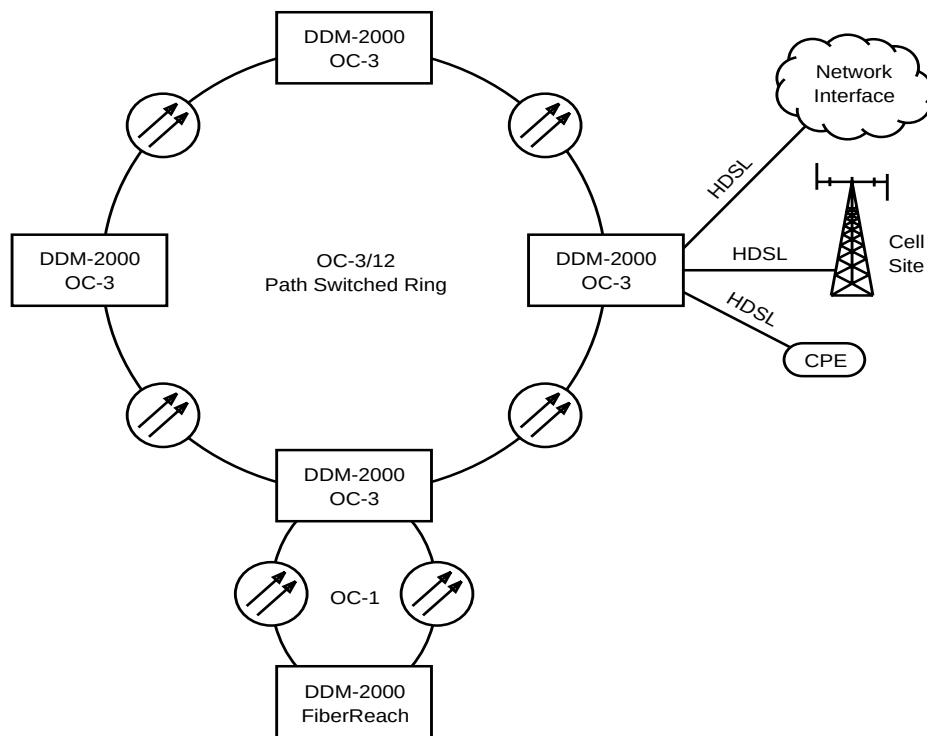


Figure 2-59. HDSL Application

* Note that the HDSL circuit pack can be installed in DDM-2000 OC-3 shelves running linear Releases 6.2 and later, and ring Releases 7.1 and later. Refer to information included with each circuit pack for provisioning instructions.

Shelf Descriptions and Configurations

3

Table of Contents

Overview	3-1
DDM-2000 OC-3 Multiplexer Shelf	3-1
DDM-2000 OC-3 Shelf Capacity	3-7
Shelf Configurations	3-8
OC-3 Terminating Shelf	3-12
OC-3 Hub Shelf	3-13
OC-3 STS-1 Drop Shelf	3-14
EC-1 Electrical Multiplexer Shelf	3-15
OC-3 DS1 Add/Drop Shelf	3-16
OC-3 Ring Shelf	3-17
OC-3 Dual Ring Interworking (DRI) Shelf	3-18
OC-3 Ring Shelf with Optical Extension	3-19
OC-3 VT Hairpin Shelf	3-20
DS3 Data Services in OC-3 Shelf	3-21
OC-3 DDM-2000 FiberReach Host Single-Homing Shelf	3-22
OC-3 DDM-2000 FiberReach Host Dual-Homing Shelf	3-24
OC-3 FiberReach Host Shelf—Enhanced Routing	3-25
OC-3 FiberReach Host Shelf - Enhanced Routing with 26G2-U OLIU	3-26
HDSL Interface	3-27
Transmultiplexer	3-28
DDM-2000 Fan Shelf	3-29

Table of Contents

Shelf Descriptions and Configurations

3

Overview

This section provides the physical description of the DDM-2000 OC-3 Multiplexer shelf and illustrates typical shelf equipment for different configurations. In addition, this section provides a physical description of the DDM-2000 Fan Shelf.

DDM-2000 OC-3 Multiplexer Shelf

The DDM-2000 OC-3 Multiplexer is shown in Figure 3-1 and Figure 3-2. Figure 3-1 is the new Group 4 Shelf. This shelf measures 8.5 inches high by 21.25 inches wide by 13.25 inches deep and fits in a standard 23-inch wide bay. The Group 1 or Group 3 shelf measures 8.5 inches high by 21.25 inches wide by 12 inches deep and fits in a standard 23-inch wide bay. User panels are interchangeable between shelves (old in the new or new in the old). Each shelf is a stand-alone entity with its own fiber cabling and interfaces to DSX-1, DSX-3, STSX-1 office power, and operations interfaces. Cabling for office alarms, parallel telemetry, craft interface terminal (CIT) interfaces, DS1 timing inputs, and telemetry byte-oriented serial (TBOS) can be shared among shelves in a bay. The default configuration provides rear access cabling. Front access through dangler cables is available as an option. Front-access optical connectors interconnect to optical fiber facilities and facilitate shelf loopback and fiber tests. The optical connectors are mounted on the optical line interface unit (OLIU) circuit pack faceplate.

The DDM-2000 OC-3 Multiplexers provide Lucent Technologies universal optical connector on all OLIUs. These OLIUs are designated by a -U. The universal optical connectors are receptacles on the faceplate of the OLIUs that allow a single OLIU to support either *ST*[®], FC-PC, or SC connectors as needed.

A DDM-2000 OC-3 Multiplexer shelf consists of the following:

- 36 circuit pack slots
 - 26 four-inch slots
 - 10 eight-inch slots
- User panel
- Fully connectorized backplane
- Front and back covers.

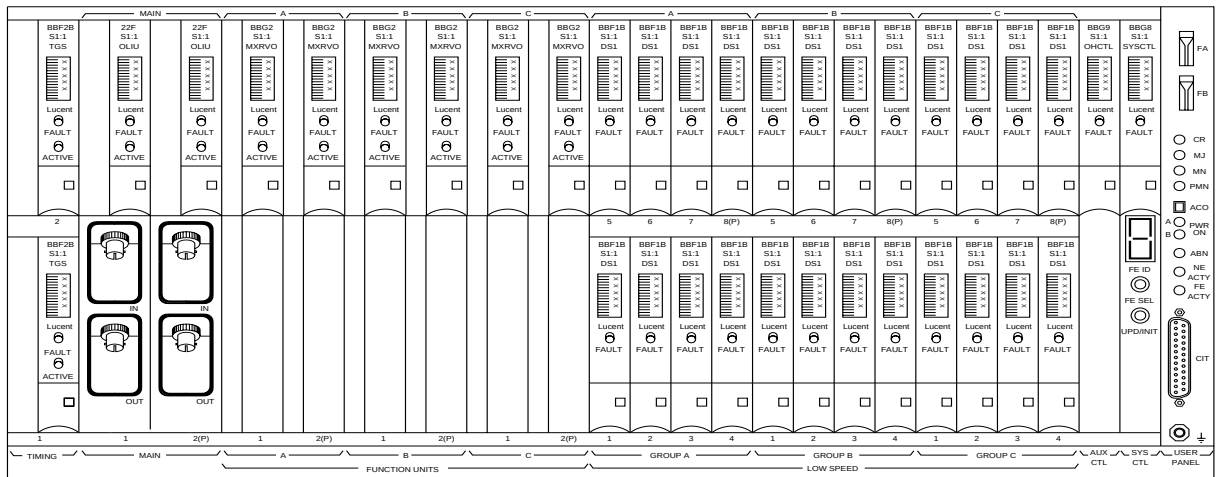


Figure 3-1. DDM-2000 OC-3 Group 4 Shelf — Front View

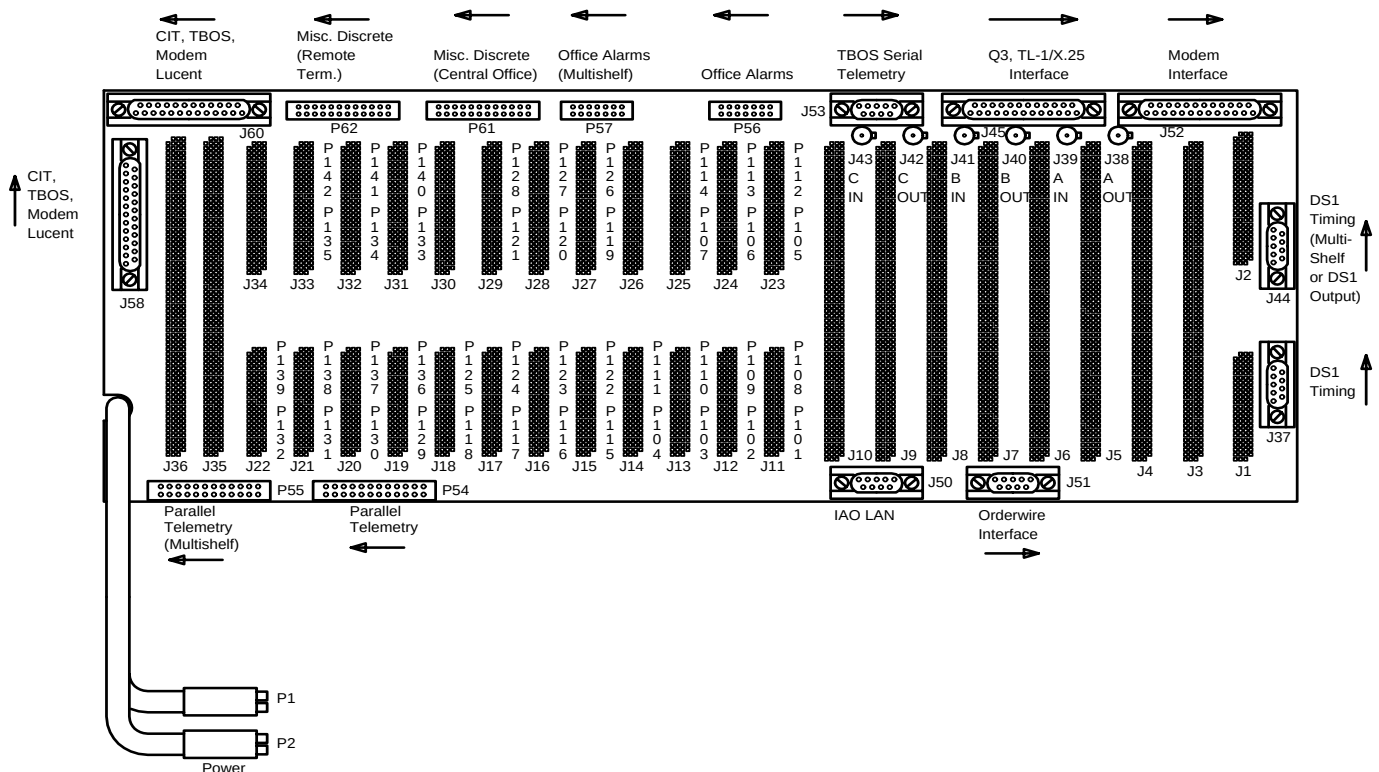


Figure 3-2. DDM-2000 OC-3 Shelf — Rear View

Table 3-1 lists the DDM-2000 OC-3 Multiplexer plug-ins.

Table 3-1. DDM-2000 OC-3 Plug-Ins

Product Code	Functional Name	Functional Designation
BBF1B	DS1 Low-speed Interface	DS1
BBF2B	Synchronous Timing Generator	TGS
BBF3/BBF3B	DS1 Performance Monitoring	DS1PM
BBF5 *	Jumper circuit pack	JUMPER
BBF8	HDSL Interface	HDSL
BBG2	VT-to-STS-1 Multiplexer	MXRVO
BBG4B †	DS3 Low-speed Interface	DS3
BBG5	System Controller	SYSCTL
BBG6	EC-1 Interface	STS1E (EC-1)
BBG7	Overhead Controller	OHCTL
BBG8/BBG8B ‡	System Controller	SYSCTL
BBG9 ‡	Overhead Controller	OHCTL
BBG10 §	Overhead Controller	OHCTL
BBG19	DS3 Data Services Interface	DS3
BBG20	Transmultiplexer	TMUX
21D-U	IS-3 OLIU	OLIU
21G-U/21G2-U	OC-3 OLIU	OLIU
22F2-U	OC-3 OLIU with TSI	OLIU
22G-U/22G2-U/22G3-U	OC-3 OLIU with TSI	OLIU
22D-U	IS-3 OLIU with TSI	OLIU
24G-U ††	OC-12 Ring OLIU	OLIU
26G2-U ¶	OC-1 OLIU	OLIU
27G-U/27G2-U **	OC-1 (Dual OC-1) OLIU	OLIU
177A	Retainer	

* Required in Group 1 and Group 3 shelves serving as DDM-2000 FiberReach host with 27-type OLIUs (Release 9.0 and later). Required in Slot 8(P) of the low-speed group associated with the function unit(s) housing 27G-U OLIUs. Required in low-speed slots 4 and 8 associated with function units(s) housing 27G2-U OLIUs.

† Required for enhanced DS3 performance monitoring (Releases 7.2 and later).

‡ Release 8.0 and later.

§ For use with *MegaStar* applications only (Releases 8.1, 9.1, and later).

¶ Requires Group 4 or later shelf.

** Used in DDM-2000 FiberReach host shelves (Releases 9.0 and later).

†† Requires a Group 4 or later shelf or a Group 3 to Group 4 Upgrade Kit.

As shown in Figure 3-1, starting at the far left, two 4-inch slots are reserved for service and protection timing circuit packs (TGS).

The next two 8-inch slots are reserved for service and protection main dual OC-1, OC-3, IS-3 or OC-12 OLIU circuit packs.

The following six 8-inch slots are for the function units. These slots are divided in three groups designated A, B, and C. The function unit slots can be equipped, depending on the application, with DS3, MXRVO, EC-1 or OC-1 or OC-3 OLIU circuit packs.

The next section of the shelf is reserved for the DS1 low-speed interface and HDSL circuit packs. These slots are also divided into three groups designated A, B, and C which correspond to the function unit groups. Each group consists of eight 4-inch slots for service and optional protection DS1 circuit packs (1x7 protected) or HDSL circuit packs (1x2 protected or 3 unprotected). Unused low-speed interface slots within a partially equipped group must be equipped with retainer cards (177A retainer).

The next section of the shelf consists of two 8-inch slots reserved for control circuit packs. The auxiliary control slot is reserved for a required overhead controller (OHCTL) circuit pack. The system controller (SYSCTL) slot is reserved for the SYSCTL circuit pack.

The user panel, mounted on the right side of the shelf, consists of the following:

- Two –48 volt fuses (5A)
- Four alarm LEDs
- ACO/TEST pushbutton control
- Four (five on Group 4 shelves) status LEDs
- CIT port
- Electrostatic discharge (ESD) jack.

Accidental insertion of same-size circuit packs in incorrect slots is prevented through circuit pack keying. Three keying combinations are provided. The key mechanism is located on the faceplate latch, with an interference mechanism on the shelf.

As shown in Figure 3-3, the front of the shelf is covered with an electromagnetic compatibility (EMC) cover. If the shelf needs to be accessed for maintenance activities, the cover is hinged to drop down 180 degrees, or it can be easily removed by pulling out when at 45 degrees. The back of the shelf is covered by an inner cover over the DS1 interface connectors and an outer cover over the rear of the shelf. All covers are necessary to meet the EMC guidelines set by the Federal Communications Commission (FCC).



Figure 3-3. DDM-2000 OC-3 Multiplexer Front Panel

DDM-2000 OC-3 Shelf Capacity

The DDM-2000 OC-3 Multiplexer provides multiplexing and transport for up to three STS-1 signals in a terminal, add/drop, or ring configuration. In a ring configuration, the drop capacity of 3 STS-1s may be utilized in any combination of low-speed inputs as follows:

- 84 DS1s
- 56 DS1s and 1 DS3 (or EC-1 or OC-1 or 2 partially filled OC-1s)
- 28 DS1s and 2 DS3s (or EC-1s or up to 4 partially filled OC-1s)
- 3 DS3s (or EC-1s or up to 6 partially filled OC-1s)
- 3 (partially filled) OC-3s
- 6 single-homed or 12 dual-homed OC-1 extensions or a mix with other services not to exceed the OC-3 shelf capacity.

In a linear add/drop configuration, this capacity may be utilized in any combination of low-speed inputs as follows:

- 56 DS1s
- 28 DS1s and 1 DS3 (or EC-1)
- 2 DS3s (or EC-1s)
- 2 OC-3s.

System growth proceeds in a modular fashion. Capacity can grow in increments of 4 DS1 signals, up to 28 DS1s per STS-1. The DDM-2000 OC-3 Multiplexer can also provide transport of a single STS-3c signal from one OC-3 interface to another.

In many instances, the OC-3 capacity may be sufficient for many years of growth. Should network needs grow beyond the OC-3 capacity, the facility can be upgraded while in service to the OC-12 capacity using the 24G-U OLIUs.

Shelf Configurations

A single DDM-2000 OC-3 shelf supports all the DDM-2000 OC-3 applications. Users configure shelves for an application by equipping slots with the appropriate circuit packs and providing the required external cabling and software. See 363-206-200, *DDM-2000 Multiplexer Applications, Planning, and Ordering Guide* for cabling information. Only Lucent designated cables should be used with the DDM-2000 OC-3 Multiplexer. Failure to use Lucent designated cables could void the product warranty. Each shelf configuration requires a SYSCTL and OHCTL circuit pack to provide the basic maintenance feature set, single-ended operations (SEO), data communication channel (DCC) processing, and the TL1/X.25 interface. A synchronous timing generator (TG) circuit pack distributes a common clock to the transmission circuit packs and is required for all configurations. A protection TG circuit pack is recommended. Equipage of other slots depends on the application.

All applications should be equipped with a heat baffle as shown in ED-8C724-10.

Table 3-2 is a list of circuit packs that are allowed mapped by release and shelf slots. See Section 10, "Technical Specifications," for information on mixing OLIUs. See Section 7, "Circuit Pack Descriptions," for more information on these and other circuit packs.

Table 3-2. DDM-2000 OC-3 Multiplexer Circuit Pack and Software Compatibility Matrix

Release Number	Slot Name							
	TG	Main	Fn-A	Fn-B	Fn-C	LS Group*	AUXCTL	SYSCTL
8.0 and later releases (Linear)	BBF2 BBF2B	21G/21G-U 22F/22F-U/ 22F2-U 21D/21D-U 22D-U 22G-U/ 22G2-U/ 22G3-U†	BBG2 BBG4/4B*** BBG6(hs)§ BBG6(lis)¶ 21G/21G-U 21D/21D-U 22F/22F-U/ 22F2-U 22D-U 22G-U/ 22G2-U/ 22G3-U†	BBG2 BBG4/4B*** BBG6(hs)§ BBG6(lis)¶ 21G/21G-U 21D/21D-U 22F/22F-U/ 22F2-U 22D-U 22G-U/ 22G2-U/ 22G3-U†	BBG2 BBG4/4B*** BBG6(hs)§ BBG6(lis)¶ 21G/21G-U 21D/21D-U 22F/22F-U/ 22F2-U 22D-U 22G-U/ 22G2-U/ 22G3-U†	BBF1B BBF3/ BBF3B‡ BBF8	BBG9 BBG10¶¶	BBG8/ BBG8B
9.0** and later releases (Ring)	BBF2 BBF2B	22F/22F-U/ 22F2-U‡‡ 22D-U 22G-U/ 22G2-U/ 22G3-U† 27G-U/ 27G2-U§§	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(lis)¶	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(lis)¶	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(lis)¶	BBF1B BBF3/ BBF3B‡ BBF5††† BBF8	BBG9 BBG10¶¶	BBG8/ BBG8B
11.0 and later releases (Ring)	BBF2 BBF2B	22F/22F-U/ 22F2-U‡‡ 22D-U 22G-U/ 22G2-U/ 22G3-U† 24G-U‡‡‡ 27G-U/ 27G2-U§§	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(lis)¶ BBG19‡‡‡	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(lis)¶ BBG19‡‡‡	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(lis)¶ BBG19‡‡‡	BBF1B BBF3/ BBF3B‡ BBF5††† BBF8	BBG9 BBG10¶¶	BBG8/ BBG8B

Table 3-2. DDM-2000 OC-3 Multiplexer Circuit Pack and Software Compatibility Matrix

Release Number	Slot Name							
	TG	Main	Fn-A	Fn-B	Fn-C	LS Group*	AUXCTL	SYSCTL
11.1 and later releases (Ring)	BBF2 BBF2B	22F/22F-U/ 22F2-U‡‡ 22D-U 22G-U/ 22G2-U/ 22G3-U† 24G-U‡‡‡ 27G-U/ 27G2-U§§	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 26G2-U§§§ 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(l§)¶¶ BBG19‡‡‡ BBG20	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 26G2-U§§§ 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(l§)¶¶ BBG19‡‡‡ BBG20	22D-U 22F/22F-U/ 22F2-U 22G-U/ 22G2-U/ 22G3-U† 26G2-U§§§ 27G-U/ 27G2-U§§ BBG2 BBG4/4B*** BBG6(l§)¶¶ BBG19‡‡‡ BBG20	BBF1B BBF3/ BBF3B‡ BBF5††† BBF8	BBG9 BBG10¶¶¶	BBG8/ BBG8B

- * The 177A Retainer card must be installed in unused slots of a partially equipped muldem. Not required with BBF5.
- † The 22G2-U/22G3-U OLIUs do not require external attenuator for loopback testing. Can be used in place of 22G-U in all applications.
- ‡ The BBF3/BBF3B is the DS1PM circuit pack, which can be used in place of or mixed with the BBF1/1B. If mixed, within a low-speed group, the protection circuit pack must be a BBF3/BBF3B. If the DS1PM feature is "enabled" using the **set-feat** command, the BBF3/BBF3B has additional PM capabilities. The BBF3B is also capable of single DS1 facility loopbacks when running Release 11.1.
- § The BBG6(hs) is the BBG6 circuit pack with its switch set for high-speed.
- ¶ The BBG6(l§) is the BBG6 circuit pack with its switch set for low-speed.
- ** The 22-type OLIUs used in ring Release 9.0 must be present in main-1 and main-2 for proper ring operation. If signal degrade protection is not used, the 22F and 22G-U/22G2-U/22G3-U OLIUs can be mixed in the same shelf.
- ‡‡ Signal degrade protection switching requires 22D-U, 22F2-U or 22G-U/22G2-U/22G3-U or 27G-U/27G2-U OLIUs.
- §§ The 27G2-U is required for some enhanced FiberReach host topologies.
- ¶¶ The BBG10 is required for Releases 8.1 and 9.1, *MegaStar* applications only.
- *** BBG4B required to support enhanced DS3 performance monitoring.
- ††† Required in Slot 8(P) of Group 1 and Group 3 shelves functioning as DDM-2000 FiberReach hosts with 27G-U OLIUs. Required in slots 4 and 8(P) in shelves housing 27G2-U OLIUs.
- ‡‡‡ The 24G-U and BBG19 are for use with Release 11.0 and later. Use of these circuit packs require either the Group 4 Shelf or a Front Cover Modification Kit (See 363-206-200, *Applications, Planning and Ordering Guide*, Section 7 - Miscellaneous Equipment and Tools)
- §§§ Requires a Group 4 shelf.

A single DDM-2000 OC-3 shelf supports various shelf configurations including:

- Terminating
- Hubbing
- STS-1 drop
- EC-1 electrical multiplexer
- DS1 add/drop
- Ring
- Dual Ring Interworking
- Optical extension
- VT1.5 Hairpin
- STS-1 Hairpin
- DDM-2000 FiberReach host
- Dual homing
- Enhanced routing.

The following sub-sections describe some examples of how the DDM-2000 OC-3 Multiplexer could be equipped for each of these configurations.

OC-3 Terminating Shelf

Figure 3-4 shows an example of the OC-3 terminating shelf, used for point-to-point network applications and as the central office (CO) terminal of multispan loop access applications. The OC-3 terminating shelf uses the two main OLIU slots to interface an OC-3 line to three function unit positions (A, B, C). Function unit and OLIU circuit packs are equipped in protection pairs, one service and one protection (denoted 1 and 2[P]). Low-speed interface growth proceeds in STS-1 increments at the function unit slots. A DS3 interface is provided by the DS3 circuit pack (shown in slot C); an EC-1 interface is provided by the STS1E circuit pack in slot B, while DS1 services use the MXRVO function unit circuit pack. DS1 service growth proceeds in increments of four DS1s by equipping low-speed slots with DS1 or DS1PM circuit packs up to a maximum of seven service units and one protection unit per Multiplexer. Thus, each protected 28 DS1 "muldem" requires two MXRVO and eight DS1/DS1PM circuit packs. If DS1PM service circuit packs are equipped, the protection slot must also be equipped with a DS1PM circuit pack. Also, two MXRVO circuit packs (service and protection) must always be equipped whenever DS1PM circuit packs are equipped in the associated low-speed group. Also, two MXRVO circuit packs (service and protection) must always be equipped whenever DS1PM circuit packs are equipped in the associated low-speed group.

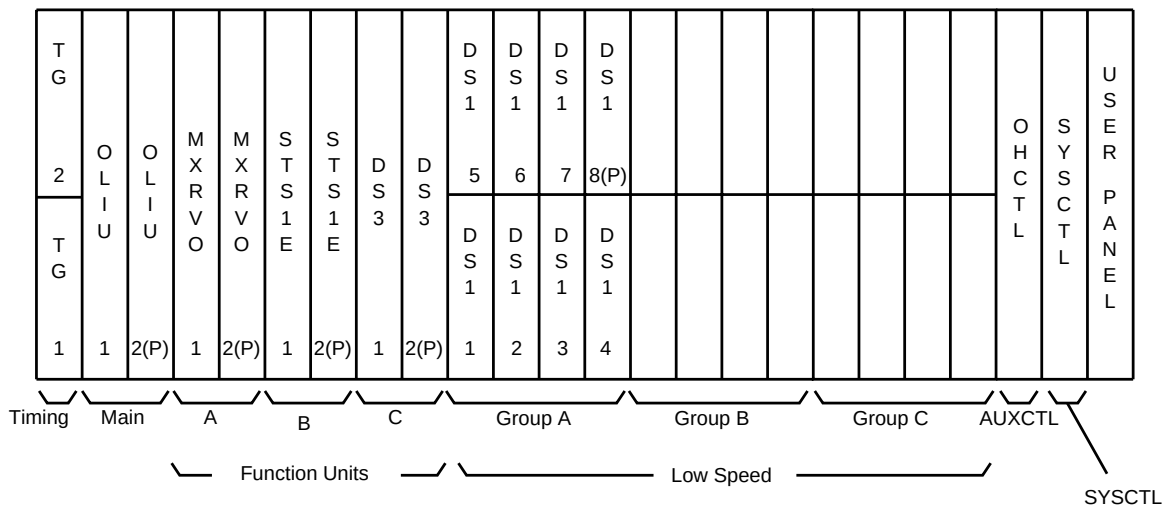


Figure 3-4. DDM-2000 OC-3 Terminating Shelf

OC-3 STS-1 Drop Shelf

The STS-1 drop shelf is shown in Figure 3-6. The OLIU circuit packs are equipped in the C group as well as main positions. This example drops STS-1 #1 from the main OC-3 interface to 28 DS1 interfaces in the A group and routes STS-1 #2 and #3 out of the OC-3 interface in the C group. A DS3 service could also be dropped from STS-1 #1 to a DS3 circuit pack in the A function unit slot. Alternatively, STS-1 #2 could terminate at the shelf by equipping the B group with DS1 or DS3 interfaces. If the shelf is equipped with only OLIU circuit packs in the main and C function unit slots, the shelf can function as an OC-3 or OC-3c repeater.

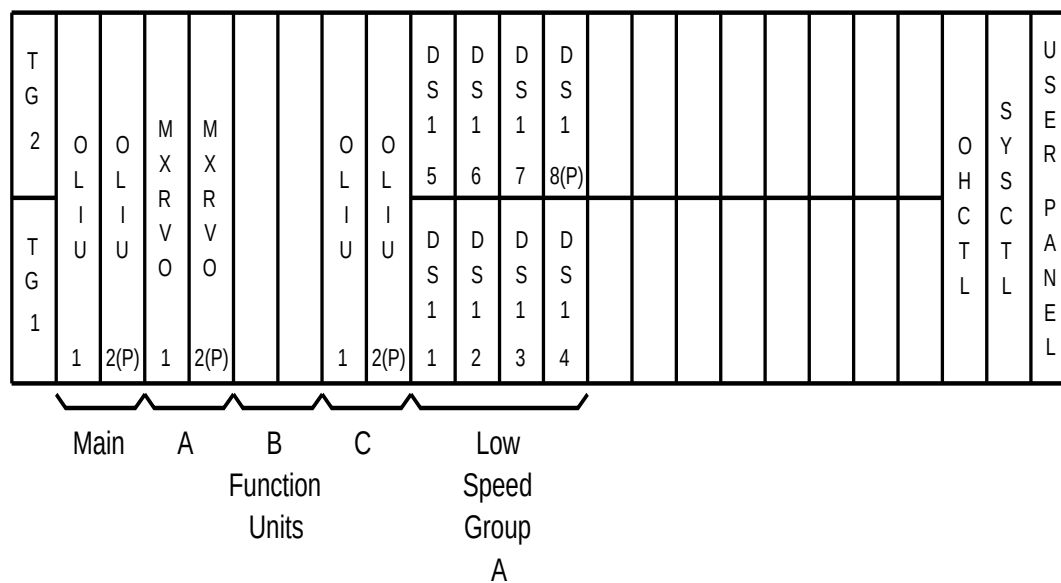


Figure 3-6. DDM-2000 OC-3 STS-1 Drop Shelf

EC-1 Electrical Multiplexer Shelf

Figure 3-7 shows the EC-1 electrical multiplexer shelf. Equipping the DDM-2000 OC-3 with DS1 and STS1E circuit packs provisioned in high-speed mode and DS1 circuit packs allows multiplexing of DS1 signals directly to an EC-1 high-speed electrical signal for intra-office transport. This configuration supports up to three EC-1 interfaces.

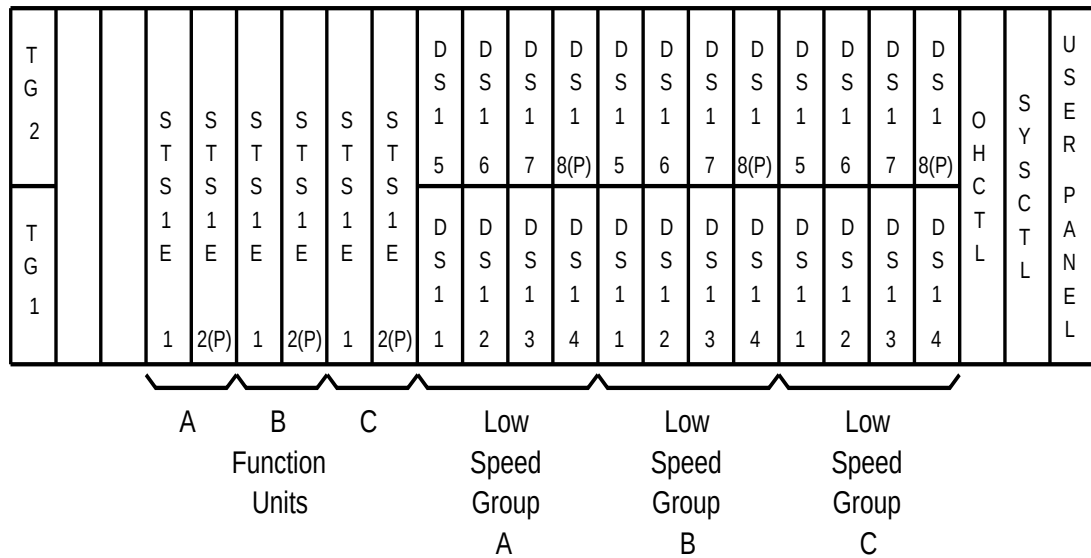


Figure 3-7. DDM-2000 OC-3 EC-1 Electrical Multiplexer Shelf

OC-3 DS1 Add/Drop Shelf

An example of a DS1 add/drop shelf in an intermediate node of an add/drop network is shown in Figure 3-8. The 22-type OLIU circuit packs are equipped in the C function unit Group as well as the main positions. This configuration supports up to 56 DS1 interfaces in an add/drop configuration. Function units A and B can also optionally support DS3 interfaces, EC-1 interfaces, or 22-type circuit packs for optical extensions.

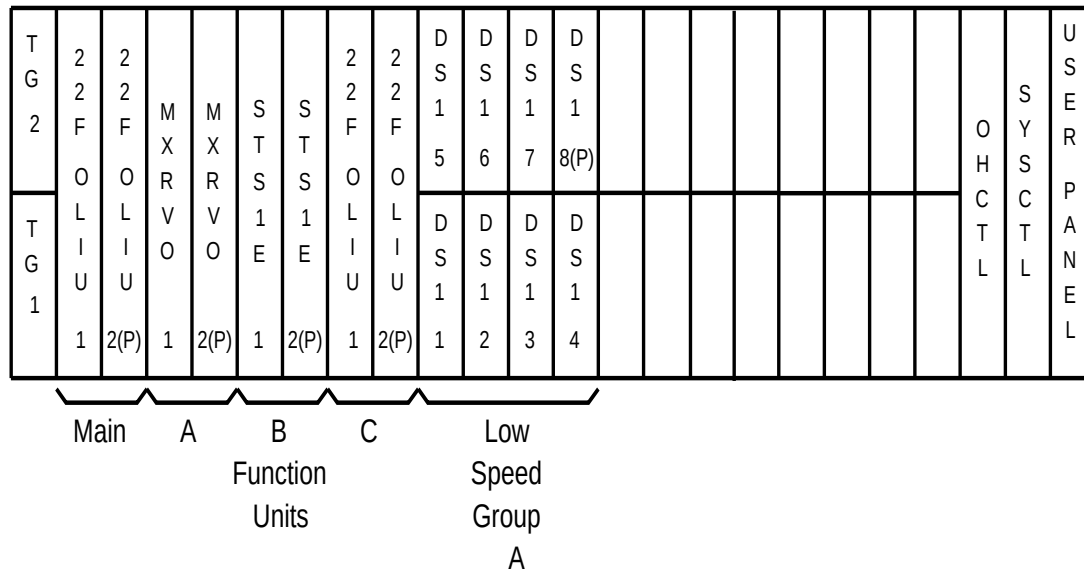


Figure 3-8. DDM-2000 OC-3 DS1 Add/Drop Shelf

OC-3 Ring Shelf

An example of an OC-3 ring shelf is shown in Figure 3-9. The 22-type OLIU circuit packs are equipped in the main positions. The ring shelf optionally supports DS1, DS3, and EC-1 low-speed interfaces. Total ring capacity must not exceed 84 DS1s.

The shelf can be used in an OC-12 VT1.5 path switched ring (0x1) application. In Release 7.1, the DCC must be be provisioned to support this application.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

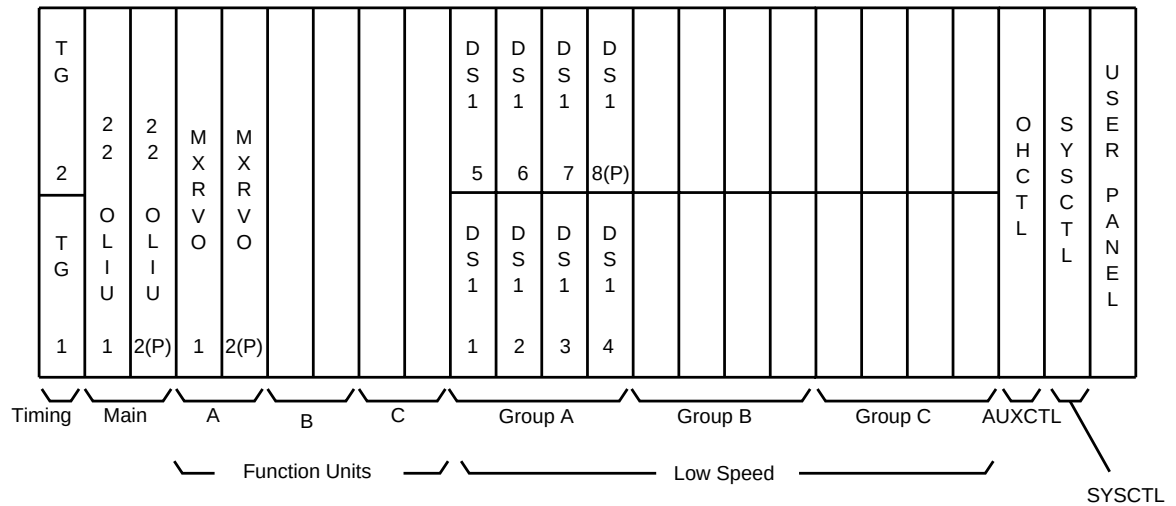


Figure 3-9. DDM-2000 OC-3 Ring Shelf

OC-3 Dual Ring Interworking (DRI) Shelf

An example of an OC-3 DRI shelf is shown in Figure 3-10. The 22-type OLIU circuit packs are equipped in the main positions and can be equipped in function units A, B, or C. At least one pair of STS1E circuit packs must be equipped in at least one of the function unit slots. A DRI shelf can also support MXRVOs and DS3 interfaces for non-DRI circuits.

Starting with Release 7.2, DRI traffic can be interconnected using 22-type OLIU circuit packs in the function unit slots.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

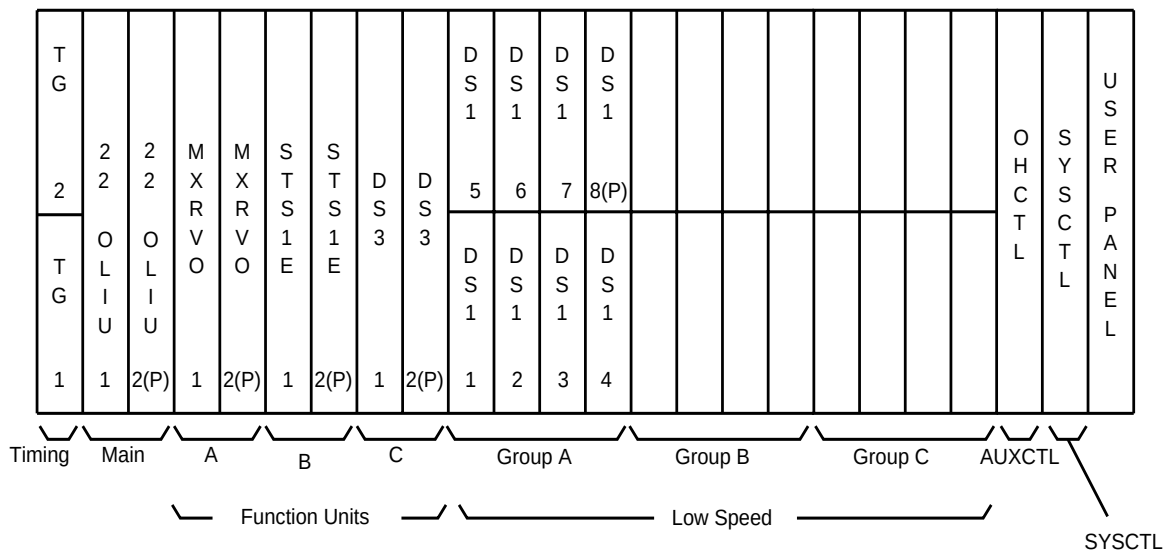


Figure 3-10. DDM-2000 OC-3 DRI Shelf

OC-3 Ring Shelf with Optical Extension

An example of an OC-3 ring shelf with an optical extension is shown in Figure 3-11. The 22-type OLIU circuit packs in the main positions carry ring traffic. The 22-type OLIU circuit packs in function unit B or C positions provide the optical extension capability. Starting with Release 9.0, optical extensions can also be provided from function unit A.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

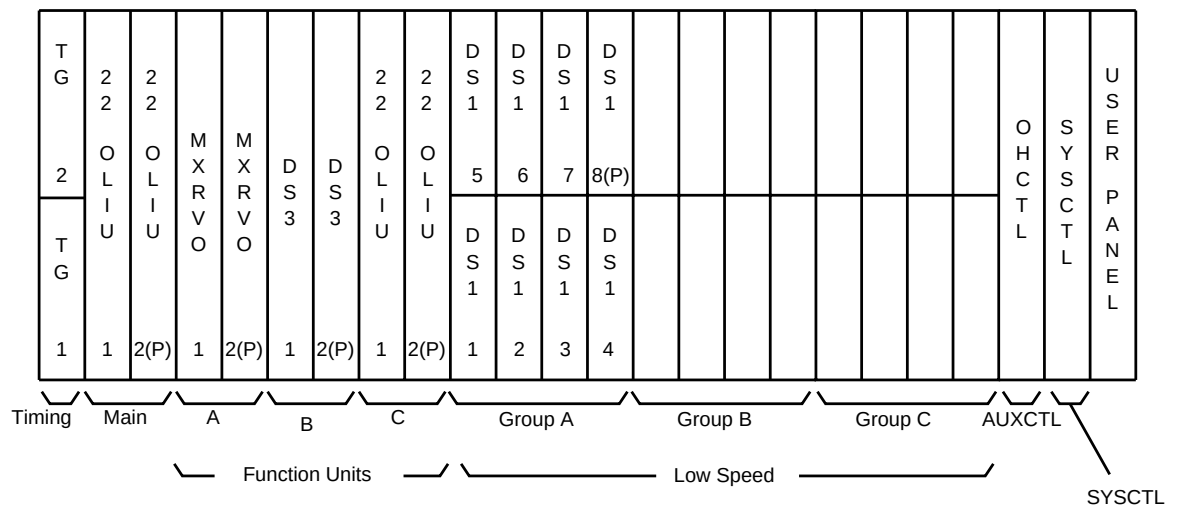


Figure 3-11. DDM-2000 OC-3 Ring Shelf With an Optical Extension

OC-3 VT Hairpin Shelf

An example of an OC-3 VT hairpin shelf is shown in Figure 3-12. The VT hairpin feature allows cross-connections between function units, for example, C to A or B, when those function units are equipped with 22-type OLIUs, STS1E, or MXRVO circuit packs. MXRVO-to-MXRVO cross-connections are not allowed. The VT hairpin feature keeps local VT traffic from being placed on the OC-3 ring. This increases the usable bandwidth on the OC-3 ring and may remove the need to add additional OC-3 shelves.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

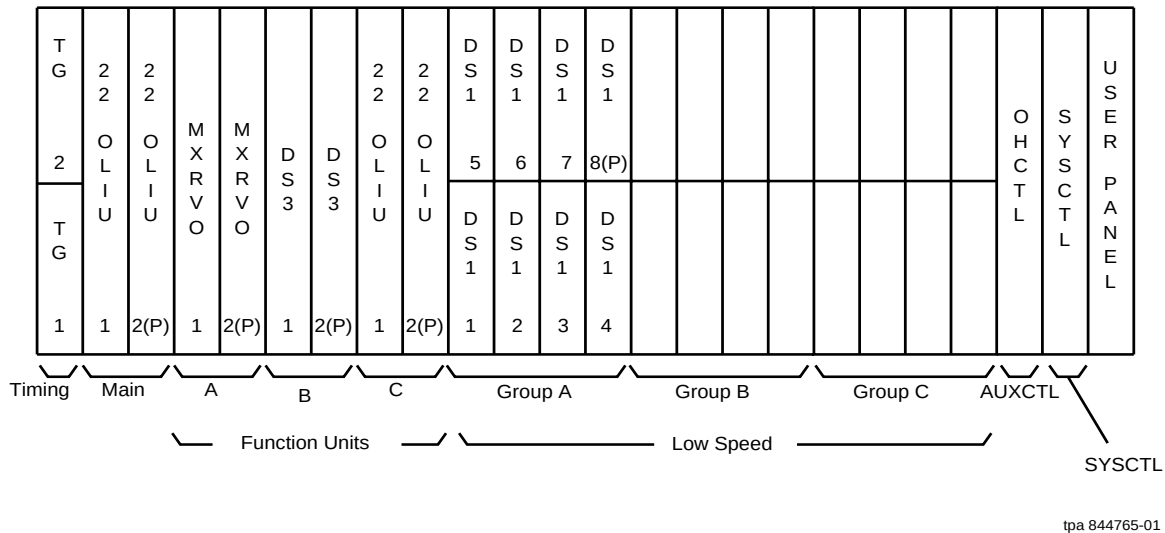


Figure 3-12. DDM-2000 OC-3 VT Hairpin Shelf

DS3 Data Services in OC-3 Shelf

Figure 3-13 shows an example of DS3 Data Services in an OC-3 shelf. The BBG19 DS3 circuit packs installed in function units A and B can provide a full range of Multimedia Data Services Offerings. Four BBG19s are recommended due to cable dressing (right angle BNC connectors are required) for use in function units A, B, or C. However, up to six BBG19s can be installed connecting customer data edge devices with services such as Ethernet, Token Ring, ATM, FDDI, Frame Relay, and others, to the OC-3 ring.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

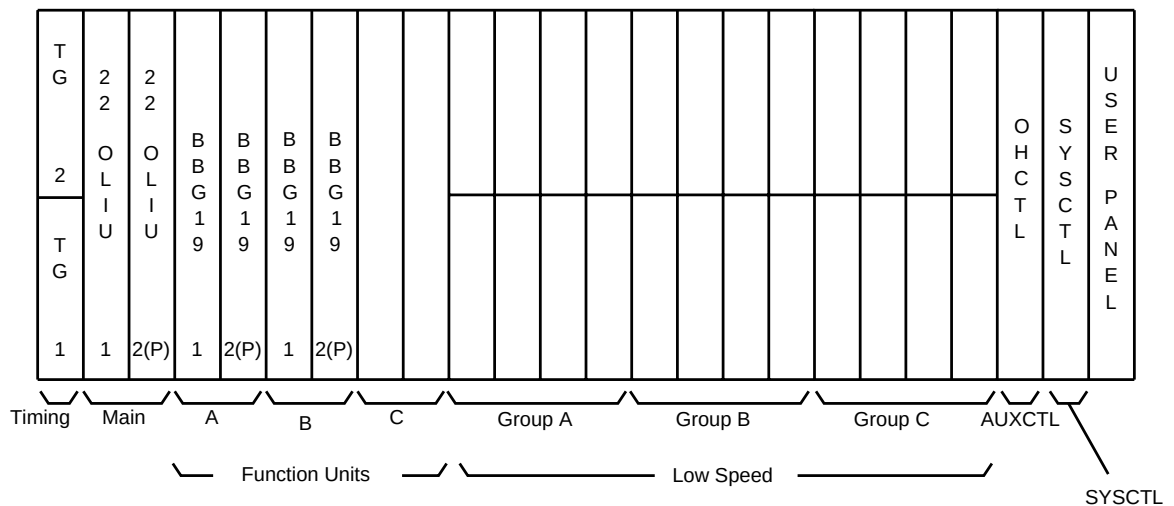


Figure 3-13. DS3 Data Services in OC-3 Shelf

OC-3 DDM-2000 FiberReach Host Single-Homing Shelf

An example of an OC-3 DDM-2000 FiberReach host shelf is shown in Figure 3-14. As a host node, the OC-3 shelf provides add/drop capability between the OC-3 and OC-1 rings (DDM-2000 FiberReach extensions) and inter-OC-1 connectivity via hairpin connections (R9.1). The cross-connection (0x1) between the rings supports full TSI assignment between the interconnected rings while preserving independent service and protection paths between the rings. Using 27-type dual OC-1 OLIUs in the function units, a single OC-3 shelf can support up to six OC-1 extensions in a single-homing arrangement (the 27-type OLIUs must be equipped in pairs). When fully loaded with six 27-type OLIUs, the OC-3 shelf can support up to 12 OC-1 extensions in a dual-homing arrangement. Total shelf traffic handling capacity is determined by the mix of main-to-function unit, and function unit-to-function unit hairpin connections.

Note that In Group 1 or 3 shelves, a BBF5 jumper circuit pack must be installed in Slot 8 of the low-speed group associated with the function unit equipped with a pair of 27-type OLIUs. In addition, a BBF5 must be installed in slot 4 if both OLIUs in the function unit are 27G2-Us.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

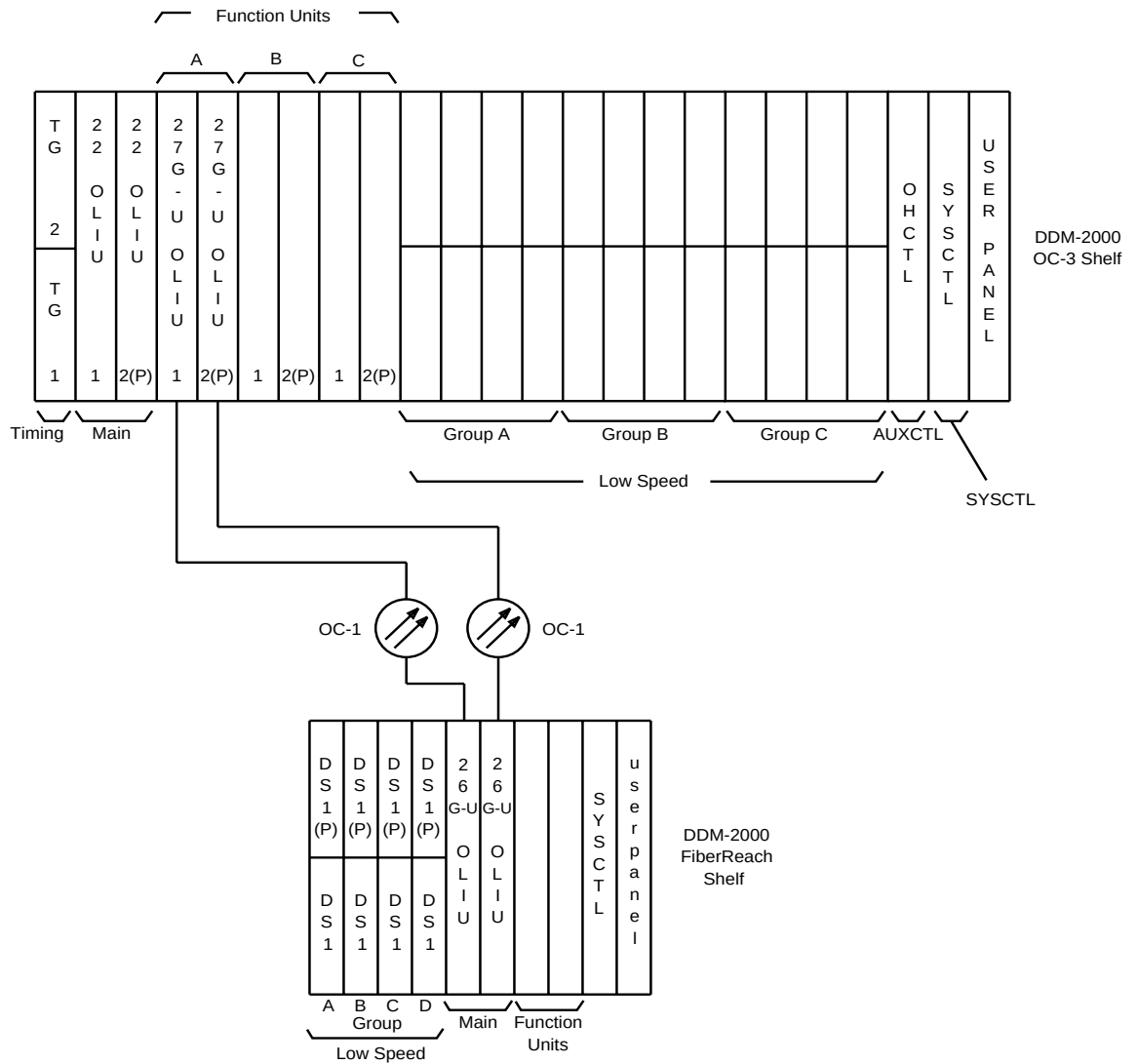


Figure 3-14. OC-3 DDM-2000 FiberReach Host Single-Homing Shelf

OC-3 DDM-2000 FiberReach Host Dual-Homing Shelf

Figure 3-15 shows a DDM-2000 OC-3 shelf equipped for a dual-homing configuration, allowing two hosts to be active on the same OC-3 ring. This allows a 0x1 application where traffic is routed to both hosts to provide host protection. Each host node is connected to the low-speed ring through OLIUs in the function unit. In this application, two DDM-2000 OC-3 shelves are hosting one or two DDM-2000 FiberReach OC-1 rings.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

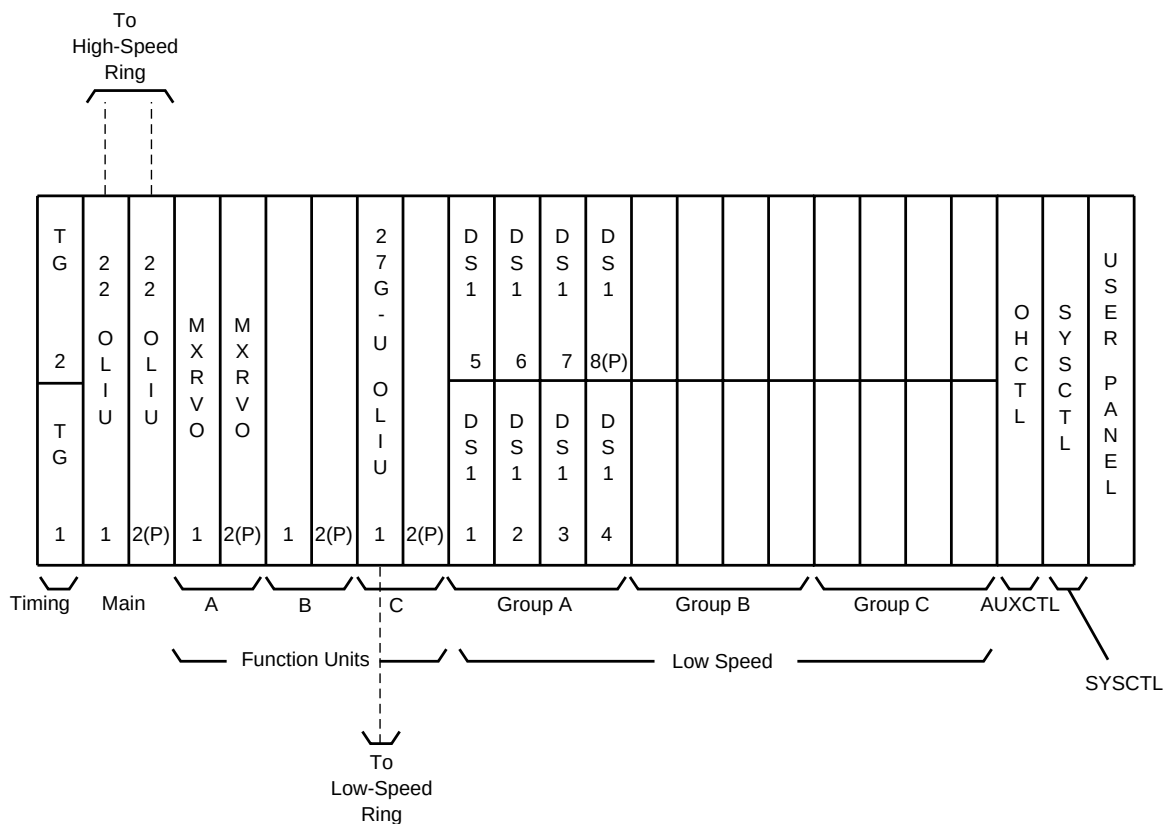


Figure 3-15. OC-3 DDM-2000 FiberReach Host Dual-Homing Shelf

OC-3 FiberReach Host Shelf—Enhanced Routing

When hosting FiberReach enhanced routing topologies (OC-1 ring pass-through, OC-1 hairpin local drop, OC-1 ring hairpin single-homed and dual-homed), an OC-3 shelf changes in only two ways. First, 27G2-U OLIUs must be used instead of 27G-U OLIUs. Second, when using Group 1 or Group 3 shelves, two BBF5 jumper circuit packs must be installed in the low-speed group associated with the function unit equipped with the 27G2-U OLIUs, one in slot 4 and one in slot 8. As an example, Figure 3-16 shows a host shelf that is equipped for the OC-1 ring pass-through application.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

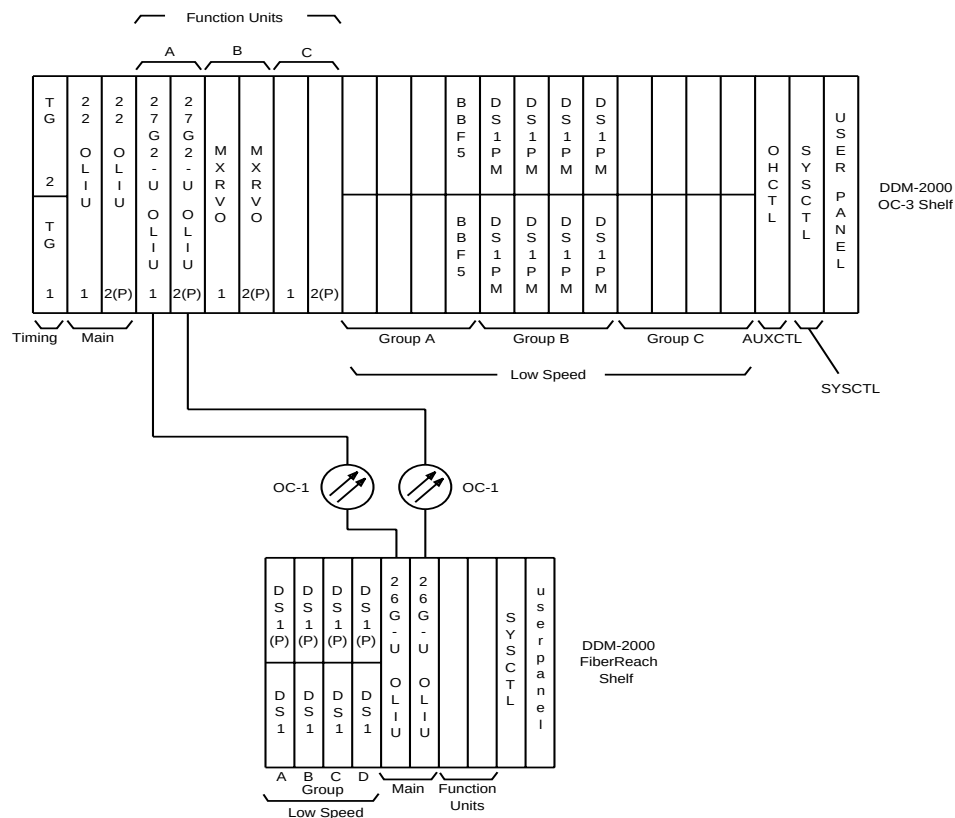


Figure 3-16. OC-3 DDM-2000 FiberReach Host Shelf—Enhanced Routing Topologies

OC-3 FiberReach Host Shelf - Enhanced Routing with 26G2-U OLIU

Figure 3-17 shows enhanced routing with the single OC-1 26G2-U OLIU in place of the dual OC-1 27G2-U OLIU. The 26G2-U can drop DS1s without the need for the MXRVO Multiplexer or BBF5 Jumper circuit packs. The 26G2-U provides OC-1 ring pass-through, OC-1 ring hairpin single-homed and dual-homed, and OC-1 ring hairpin local drop applications. The Group 4 shelf is required.

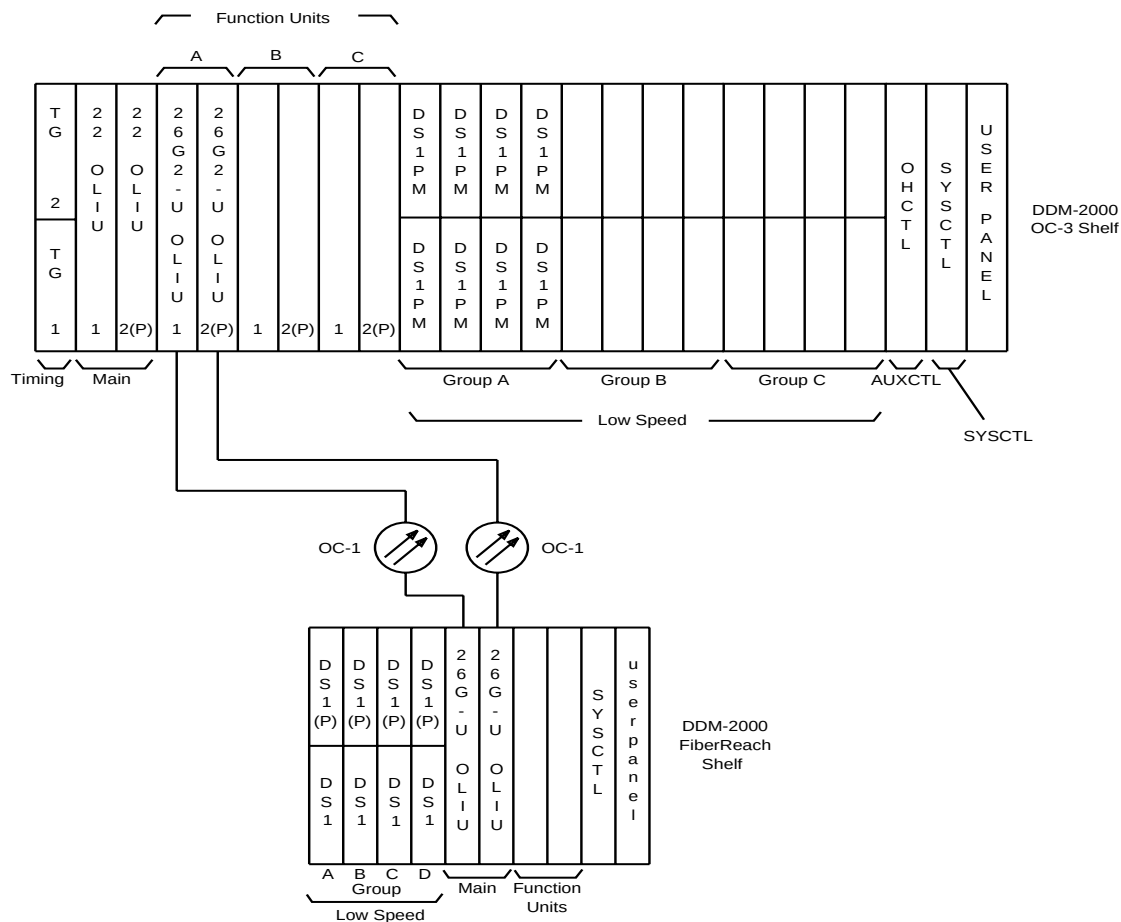


Figure 3-17. OC-3 DDM-2000 FiberReach Host Shelf - Enhanced Routing with 26G2-U OLIU

HDSL Interface

The BBF8 circuit pack provides for HDSL (High bit rate Digital Subscriber Line) interface capability on the DDM-2000 OC-3 shelf. Each BBF8 allows the transport of two T1 payloads, for up to 12,000 feet, over two metallic 24 AWG twisted-pair lines. Figure 3-18 shows examples of HDSL circuit packs providing this capability. Function group A is an example of a 1xN (1x2) protected configuration, while function group C is in the unprotected mode. There is a limit of three HDSL circuit packs per function unit (including the Protection slot).

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

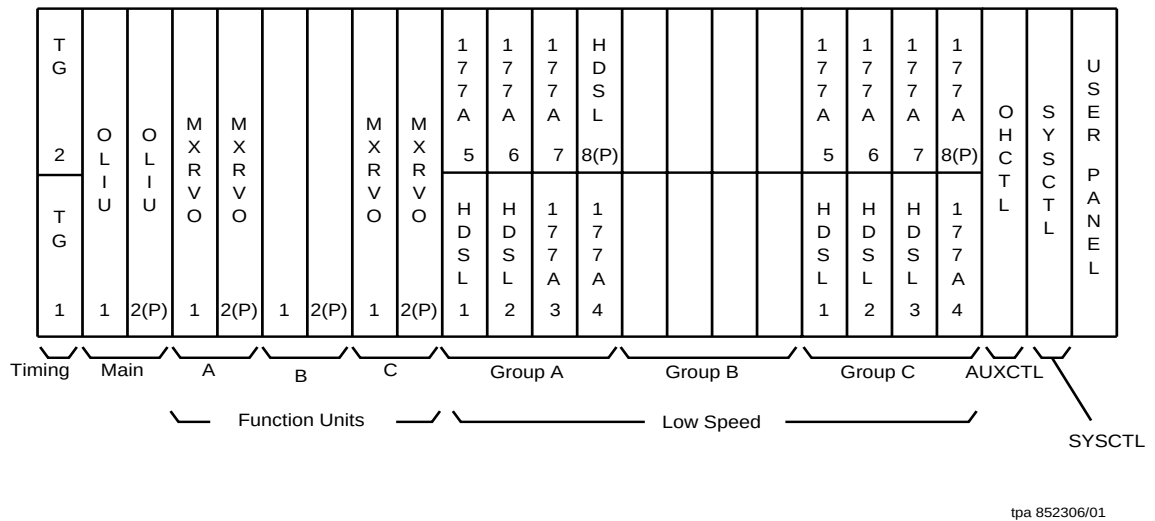


Figure 3-18. OC-3/OC-12 Shelf with HDSL Interface

Transmultiplexer

The DS3 Transmux interface circuit pack (TMUX) provides a mapping between the DS3 low-speed signal and internal STS-1 signals. Up to three DS3 interfaces (1x1 protected) may be supported per shelf. The example in Figure 3-19 shows TMUX packs in function unit A.

In the transmit direction, the BBG20 TMUX circuit pack accepts one 44.736 Mb/s bipolar 3-zero substitution (B3ZS) coded DS3 signal and demultiplexes it into 28 DS1s. Performance monitoring is performed on the DS1s before they are mapped into floating VT1.5s. The 28 VT1.5s are then multiplexed into STS-1 payload envelope(s) using SONET asynchronous mapping. The STS-1 path overhead and pointer bytes are added and the resulting signal is sent to the high-speed OLIU circuit pack.

In the receive direction the reverse process takes place: The STS-1 signal(s) from the OLIU circuit pack goes through STS-1 pointer interpretation, path overhead is removed and processed, and the twenty-eight VT1.5s are stripped of their overhead to produce 28 DS1s. The DS1s are then multiplexed back into the DS3.

Beginning with Release 11.0, equipping the main slots with 24-type OLIUs allows the shelf to provide an OC-12 ring interface.

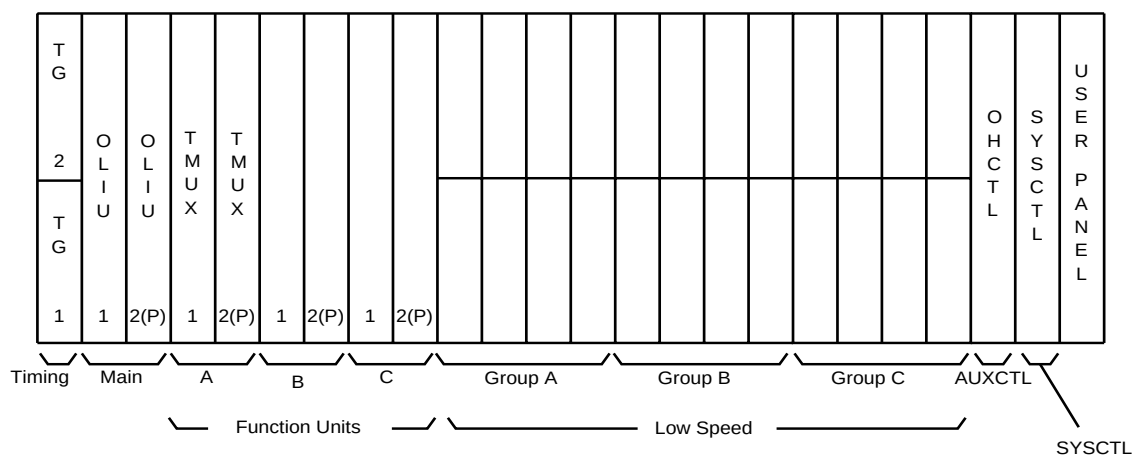
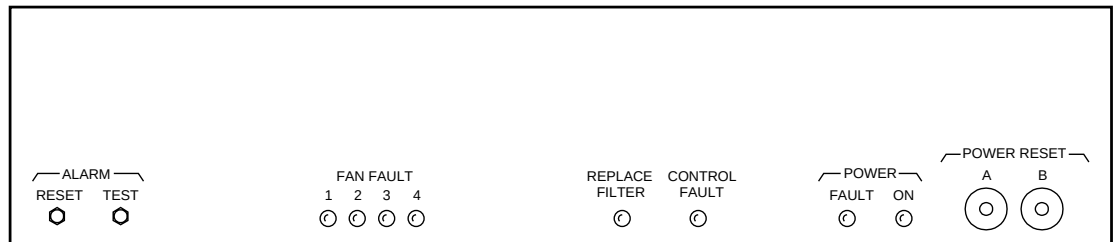


Figure 3-19. OC-3/OC-12 Shelf with Transmultiplexers

DDM-2000 Fan Shelf

The DDM-2000 Fan Shelf (Figure 3-20) provides forced convection cooling to DDM-2000 OC-3 shelves in uncontrolled environments.



Front View

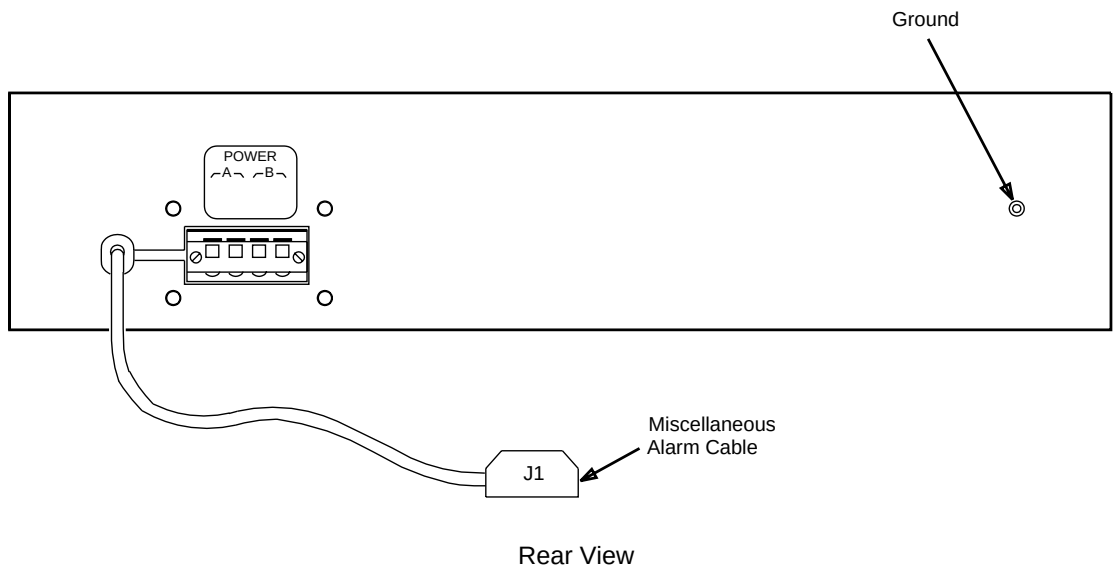


Figure 3-20. DDM-2000 Fan Shelf

The fan shelf is only required in DDM-2000 OC-3 non-Network Equipment Building Standards (NEBS) environments (direct air inlet temperatures exceeding 50° C). The fan shelf is not required in DDM-2000 OC-3 controlled environment applications. All applications should be equipped with a heat baffle as shown in ED-8C724-10 for the DDM-2000 OC-3 Multiplexer.

One DDM-2000 Fan Shelf can cool two DDM-2000 OC-3 shelves.

The fan shelf is 3.9 inches high by 9.3 inches deep by 21.2 inches wide and weighs 25 pounds. Mounting brackets can be attached in three positions to accommodate both front and rear access installations in different bay frames. The fan shelf is fully accessible from the front for service and maintenance.

When the front cover is removed, the four fan units and a four-part switch to the left of center on the front of the shelf are visible (see Figure 3-21). The switches should be set as shown in Table 3-3.

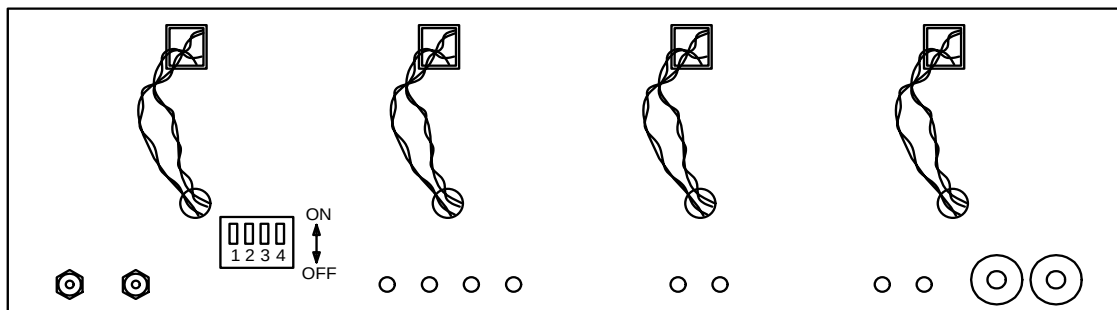


Figure 3-21. DDM-2000 Fan Shelf — Fan Switches — Front Cover Removed

Table 3-3. DDM-2000 Fan Shelf Switch Settings

Cooling Arrangement	Set Point	Switch Settings			
		S1	S2	S3	S4
DDM-2000 OC-3 *	400 fpm	on	off	on	on

* Non-NEBS environments (direct air inlet temperatures exceeding 50° C).

The four fan units are independent of each other; any of them can be removed by removing the connectorized fan cord and the screws that hold the fan unit in the shelf.

A filter must be installed on the bottom of the DDM-2000 OC-3 shelf that is directly under the fan shelf. The filter is attached to the bottom of the DDM-2000 OC-3 shelf by magnetic strips attached to the top of the filter frame.

A terminal block is provided for the direct termination of the two –48 V power feeders. If direct termination is not needed, optional cable assemblies are available (in DDM-2000 OC-12) to connect the power feeders from the DDM-2000 bay power cables to the terminal strip on the rear of the fan shelf. A dangler cable provides an alarm interface so that fan shelf alarms can be reported through an associated DDM-2000 system. The alarm output is a dry contact closure. It is activated whenever a fault is detected on the fan shelf and whenever one or both –48 V power feeders fail. Alarm and power cable openings are provided for both rear and front access installations. A ground stud is provided on the left rear of the fan shelf to meet the UL grounding requirements for rear- and front-access applications. Two ground cables are provided with the fan shelf, one 6-inch cable for rear-access applications and one 18-inch cable for front-access applications. To reach the front of the fan shelf, the 18-inch front-access ground cable must go through the rear cable access opening, through the fan shelf, and exit from the right front cable access opening.

The following pushbuttons and LEDs are accessible through the front cover of the fan shelf:

- The ALARM RESET pushbutton near the left side of the front of the shelf is used to reset fan shelf alarms and register a new combination of set-point switch settings. Once a fan shelf alarm is turned on, it can be reset only by clearing the trouble condition and then pressing the ALARM RESET pushbutton.
- The ALARM TEST pushbutton provides a test of the fan shelf alarms. When pressed and held, all LEDs except the CONTROL FAULT LED and POWER FAULT LED will be lit. After a test is done, the ALARM RESET pushbutton must be pressed to turn the LEDs off. This is a local test; the alarm on the fan shelf alarm interface is not activated.
- Four red FAN FAULT LEDs indicate faults in each of the four independent fan units.
- The red FILTER REPLACE LED indicates that it is time to replace the filter.
- The red CONTROL FAULT LED indicates a fault in the fan shelf monitoring and control system.
- The red POWER FAULT LED indicates a failure in one of the –48 V power feeders.
- The green POWER ON LED indicates that the fan shelf is receiving power from one of the two –48 V power feeders.
- Two pushbutton circuit breakers are located near the right side of the front of the shelf.

Table of Contents

Overview	4-1
Introduction	4-1
Power Description	4-2
■ Circuit Packs	4-3
OLIU Circuit Packs	4-3
TG Circuit Packs	4-3
DS3/TMUX Circuit Packs	4-3
STS1E Circuit Packs	4-3
MXRVO Circuit Packs	4-3
DS1/DS1PM Circuit Packs	4-4
HDSL Circuit Packs	4-4
Control Circuit Packs	4-4
■ LEDs	4-5
■ Power Minor Alarm	4-5
■ Power Distribution	4-6

Table of Contents

Overview

This section describes the power distribution of the DDM-2000 OC-3 Multiplexer.

Introduction

The DDM-2000 OC-3 Multiplexer is powered by –48 volts direct current. The voltages required to power the circuits within the DDM-2000 OC-3 Multiplexer are generated by DC-to-DC converters mounted on circuit packs within the shelf.

The information in this section is for typical applications only. Refer to Section 10, "Technical Specifications," 801-525-168, *DDM-2000 Floor Plan Data Sheets*, and T-82046-30, Power Systems DC Distribution Circuit for Digital Transmission System, for proper engineering of battery plant and feeders for OC-3 Systems.

Power Description

Two independent –48 volt office power feeders (A and B) enter the shelf through dangler cables and are distributed, after fuses, to the circuit packs. These feeder fuses are located on the user panel. Power conversion is performed through modular power converters located on the circuit packs. In each circuit pack (except the low-speed group), the two feeders are diode ORed, fused, filtered, and regulated by the board-mounted power modules. This provides the required redundancy in case of the loss of one feeder or one fuse. Figure 4-1 shows which circuit packs have converters mounted on the printed wiring boards. Power modules are located on the TG, OLIU, MXRVO, OHCTL, SYSCTL, STS1E, and DS3/TMUX circuit packs. The power converter on the MXRVO/STS1E circuit pack in the Function Unit slots also provides power to the DS1/DS1PM circuit packs located in the corresponding multiplexer group.

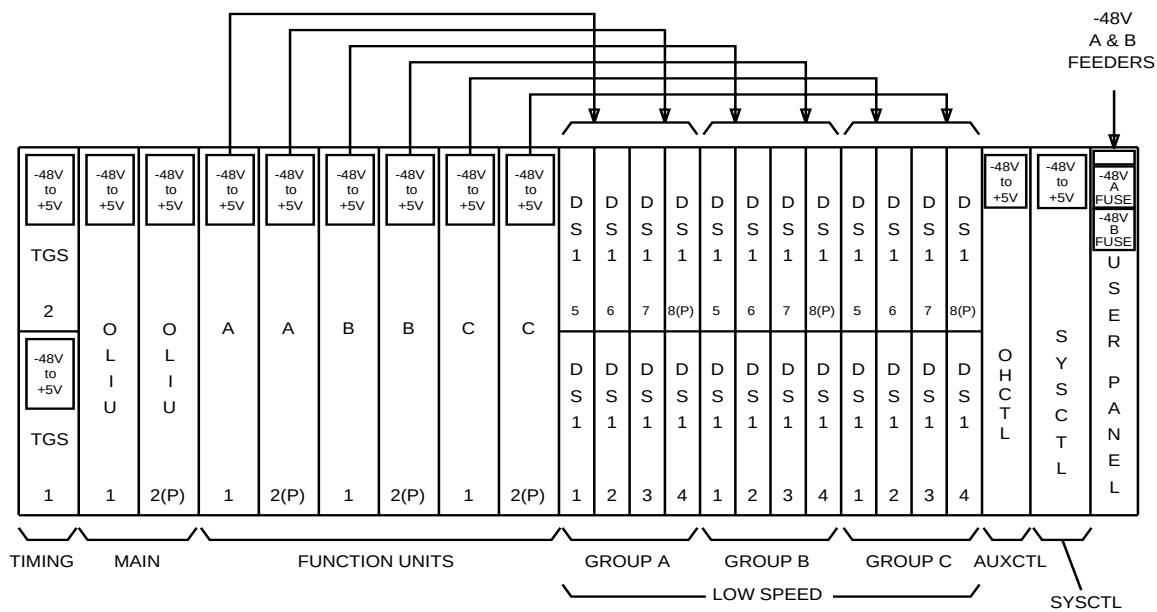


Figure 4-1. DDM-2000 OC-3 Power Architecture

Circuit Packs

OLIU Circuit Packs

The OLIU circuit packs are powered by two DC-to-DC converters located on the circuit packs. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and are fuse-mounted on each of the circuit packs.

TG Circuit Packs

The TG circuit packs are powered by –48 volt to +5 volt DC-to-DC converters located on the packs. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and a fuse mounted on each of the circuit packs. The converters provide +5 volts DC power for the TG circuit packs.

DS3/TMUX Circuit Packs

The DS3/TMUX circuit packs are powered by –48 volt to +5 volt DC-to-DC converters located on the packs. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and a fuse mounted on each of the circuit packs. The converters provide +5 volts DC power for the DS3/TMUX circuit packs.

STS1E Circuit Packs

The STS1E circuit packs are powered by –48 volt to +5 volt DC-to-DC converters located on the circuit packs. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and fuses mounted on the circuit packs. The STS1E circuit packs provide +5 volt DC power for their associated DS1/DS1PM circuit packs.

MXRVO Circuit Packs

The MXRVO circuit packs are powered by –48 volt to +5 volt DC-to-DC converters located on the circuit packs. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and fuses mounted on the circuit packs. The MXRVO circuit packs provide +5 volt DC power for their associated DS1/DS1PM circuit packs.

DS1/DS1PM Circuit Packs

The DS1/DS1PM circuit packs receive +5 volt power via backplane connections from the MXRVO circuit packs. The DS1/DS1PM packs in the "A Group" receive power from the MXRVO/STS1E packs mounted in the "A" Function Unit slots. The "B" and "C" DS1/DS1PM circuit packs likewise receive +5 volt power from the MXRVO/STS1E circuit packs in the "B" and "C" Function Unit slots. Both MXRVO/STS1E circuit packs in a protection pair supply power to the DS1/DS1PM packs. Power selector circuits (diode ORed) and fuses for the +5 volts are located on the DS1/DS1PM circuit packs. The fuses on the DS1/DS1PM circuit packs protect the backplane and prevent DS1/DS1PM unit failures from affecting service in the other DS1 units or MXRVO/STS1E units within the group.

The power selector circuits on the DS1/DS1PM circuit packs automatically select power from either MXRVO/STS1E circuit pack. Each MXRVO/STS1E power converter can support the load of all DS1/DS1PM circuit packs in the group (a condition that occurs if there is an MXRVO/STS1E circuit pack failure).

NOTE:

If any DS1PM circuit packs are used in a Function Unit group, both Function Unit slots must be equipped with MXRVO/STS1E circuit packs. Requirements for equipping both Function Unit slots prevent the potential for continued loss of service after a shelf power failure and subsequent power recovery.

Removal of a single MXRVO/STS1E circuit pack is allowed during maintenance activities (for example, circuit pack failure and replacement) and a non-service-affecting alarm will be activated until the removed circuit pack is replaced.

HDSL Circuit Packs

The HDSL circuit packs are powered in the same way as the DS1/DS1PM circuit packs. However, due to higher power requirements, there is a limit of three HDSL packs (including Protection) in any low-speed group.

Control Circuit Packs

The SYSCTL and OHCTL circuit packs are each powered by a –48 volt to +5 volt DC-to-DC converter located on the pack. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and fuses mounted on the circuit packs.

LEDs

Two green power on (PWR ON A and B) on Group 4 shelves or a single PWR ON on Group 1 and Group 3 shelves—LED(s) on the user panel—indicate that the shelf is receiving fused –48 volt power. The LED will remain illuminated as long as either –48 volt feeder is supplying power to the shelf.

Normally the FAULT LED on the circuit pack faceplates is operated via the controller which provides a ground return for current generated by the on-board converter. In the event of a DC-to-DC converter failure, the LED will be operated via the –48 volt power leads. The –48 volt power leads are supplied through an electronic gate or relay contact normally held open by the converter. The power, fusing, and LED circuits shown in Figure 4-2 are used on all circuit packs with on-board DC-to-DC converters.

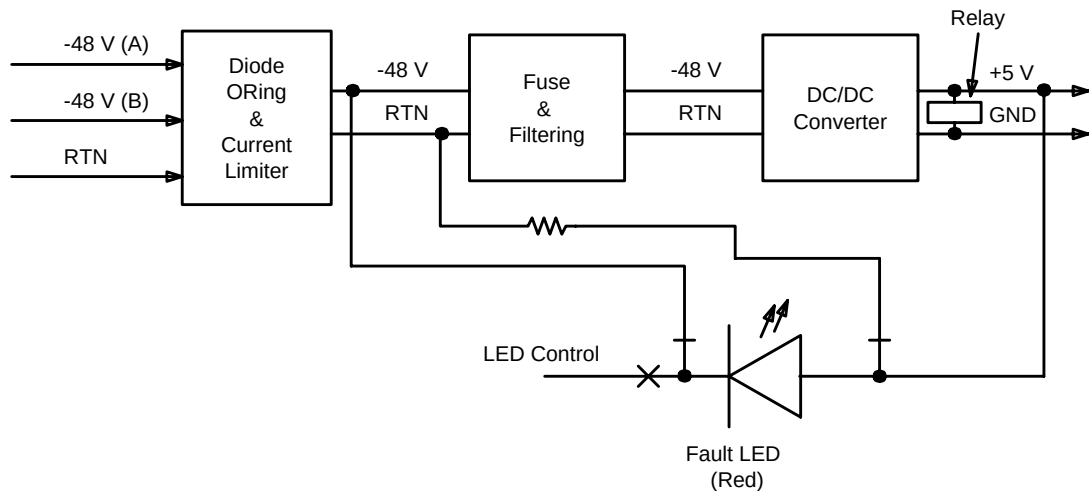


Figure 4-2. Circuit Pack Power and LED Control

Power Minor Alarm

A yellow power minor (PMN) alarm LED is provided on the user panel to indicate an AC power failure at the remote terminal. The PMN alarm can be provisioned by a switch on the SYSCTL circuit pack at the central office (CO) to be either an office minor (MN) or office major (MJ) alarm. PMN alarms are also indicated on serial and parallel telemetry interfaces.

Power Distribution

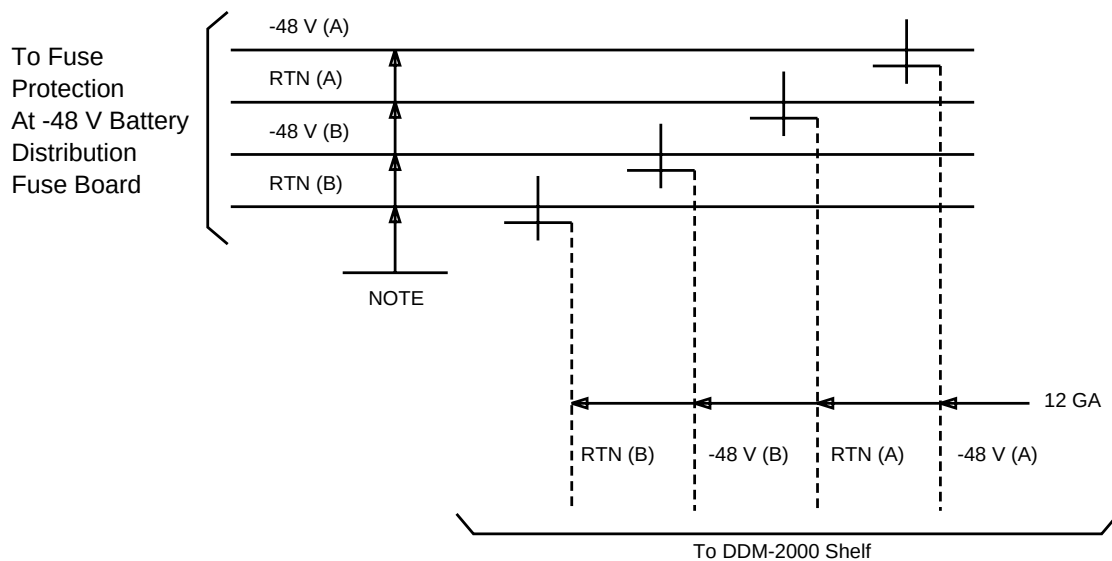
See "Power Requirements" in Section 10, "Technical Specifications," for power dissipation values.

Figure 4-3 shows a typical battery feeder interface for a single shelf.



CAUTION:

This information is for a typical application only. Consult 801-525-168, DDM-2000 Floor Plan Data Sheets, and T-82046-30, Power Systems DC Distribution Circuit for Digital Transmission System, for proper engineering of battery plant and feeders.



NOTE: Feeder size is selected per T82046-30 and EIM 90MV001, Issue 5.

Figure 4-3. Typical -48 Volt Power Supply for DDM-2000 OC-3 Multiplexer Single Shelf

Table of Contents

Overview	5-1
Transmission Interfaces	5-2
Ring Interfaces	5-19
■ OC-3/OC-12 Ring (0x1)	5-19
■ DS3 Data Services on an OC-3 Ring	5-22
■ OC-3/OC-12 Linear (1+1) Optical Extensions	5-23
■ OC-3/OC-1 Ring (0x1)	5-25
■ OC-1 Ring Function Unit Pass-Through	5-28
■ OC-1 Ring Hairpin Local Drop	5-29
■ OC-1/OC-1 Function Unit Hairpin Ring	5-30
Synchronization Interfaces	5-34
■ Timing Modes	5-34
■ Free-Running	5-34
Line Timing	5-34
DS1 External	5-35
Holdover	5-35
■ DS1 Output Modes: MULT and SYNC OUT	5-35
DS1 Output Mode, MULT	5-35
DS1 Output Mode, SYNC OUT	5-36
■ Synchronization Messaging	5-40
Applications	5-41
Feature Details and Options	5-45
Examples	5-48

Table of Contents

■ Dual-Homing DRI Synchronization Configurations	5-56
OC-3 and FT-2000 OC-48 Lightwave System	5-56
OC-3 and OC-12	5-58
■ OC-3 and OC-1 External/Line Timing	5-60
■ Network Timing Distribution	5-62
Interoffice Timing Distribution	5-62
Access Network Timing Distribution	5-64

Transmission and Synchronization Interfaces

5

Overview

This section describes the DDM-2000 OC-3 Multiplexer transmission and synchronization interfaces. Table 5-1 summarizes the DDM-2000 OC-3 Multiplexer transmission interfaces for the current software releases.

Table 5-1. DDM-2000 OC-3 Multiplexer Transmission Interfaces

Application	Linear	Ring	Ring
	R8.0/8.1	R9.0/9.1	R11.0/11.1
DS1 Low-Speed	X	X	X
DS3 Low-Speed	X	X	X
DS3 Data			X
EC-1 High-Speed	X		
EC-1 Low-Speed	X	X	X
IS-3	X	X	X
OC-3	X	X	X
OC-3c	X		
OC-1		X	X
OC-12			X*

* 24G-U OLIU only.

Transmission Interfaces

The DDM-2000 OC-3 Multiplexer supports DS1 and DS3 low-speed interfaces, EC-1 low-speed and high-speed interfaces, OC-3 low-speed and high-speed interfaces, OC-1 low-speed and high-speed interfaces, and an IS-3 interface. The DS1 and DS3 interfaces accept any DSX-1 or DSX-3 compatible signal (clear channel interfaces) and can be mixed on a per-STs-1 basis.

Figure 5-1 is an overall block diagram of the DDM-2000 OC-3 Multiplexer in a terminal configuration. Internally, the OC-3 Multiplexer uses synchronous optical network (SONET) standard multiplexing (refer to Appendix A). On the low-speed side, each group of 28 DS1 signals map into 28 asynchronous floating mode VT1.5 signals. The VT1.5 signals are combined into seven VT groups and then multiplexed to one STS-1 signal. A DS3 signal maps directly to an STS-1 signal via the asynchronous mapping. An EC-1 or OC-1 signal is converted to an STS-1 signal. Three internal STS-1 signals are multiplexed to an STS-3 signal and converted to an OC-3 optical signal.

In the opposite direction, a received OC-3 signal is converted back to an electrical STS-3 signal. The STS-3 signal is then demultiplexed to three STS-1 signals. DS3, EC-1, and OC-1 signals are recovered from their STS-1 signals, while a DS1-formatted STS-1 signal is demultiplexed to 7 VT1.5 groups and then to 28 VT1.5 signals.

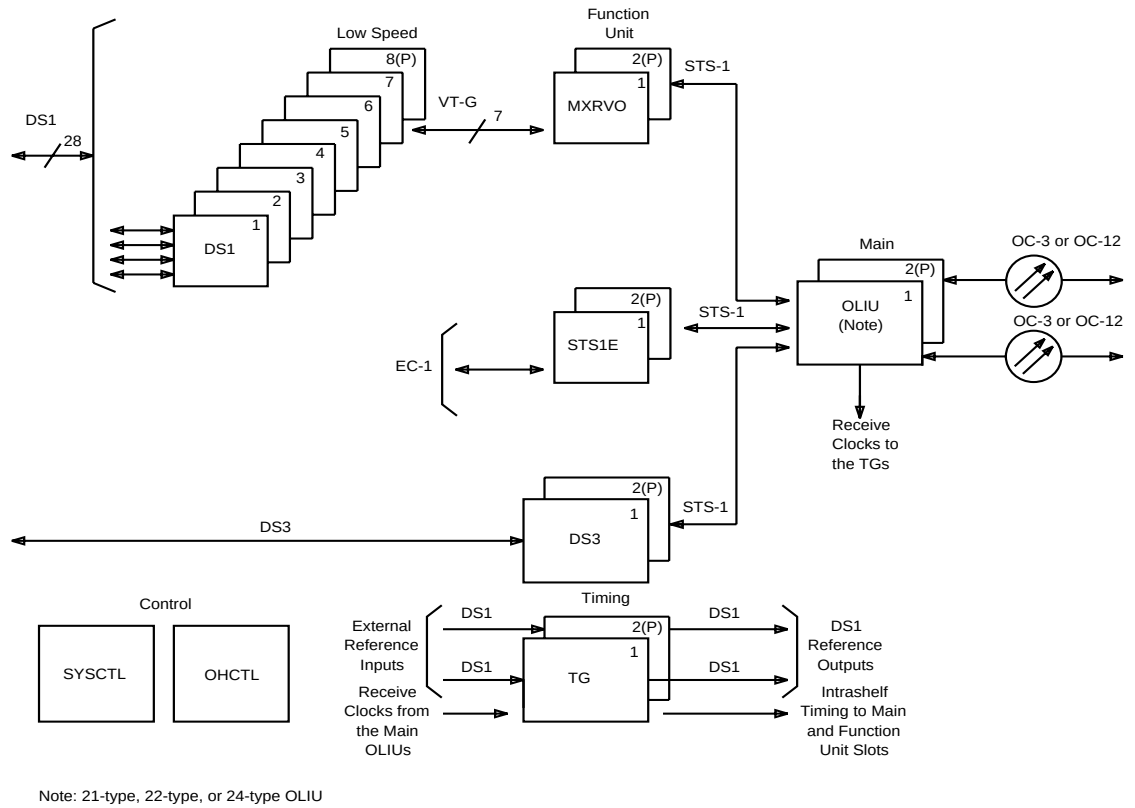


Figure 5-1. DDM-2000 OC-3 Multiplexer Block Diagram — Terminal

With OC-3 interfaces installed in the function unit positions, the OC-3 Multiplexer can be configured for the STS-1 drop (Figure 5-2) and OC-3 hubbing (Figure 5-3) applications. STS-1 drop addresses linear network routes by sending through traffic directly from the OLIU circuit packs in the main positions to the OLIU circuit packs in the C function group positions. The hubbing application equips the B and/or A function groups with OLIU circuit packs in addition to the OLIUs used in the main and C groups for STS-1 drop. This allows multiple optical extensions from one shelf or a fiber hub as shown in Figure 5-2. In this application, STS-1 signals are routed between the main slots and the function group slots. For both STS-1 drop and hubbing applications, default STS-1 routing is provided based on circuit pack equipage with other routing options supported through provisioning.

The DDM-2000 OC-3 Multiplexer transmission can be enhanced with SONET standard EC-1 high- and low-speed interfaces. These EC-1 interfaces provide interworking between the OC-3 Multiplexer and other SONET systems. The BBG6 STS1E circuit pack provides both the high- and low-speed EC-1 interface options. In the high-speed mode (Figure 5-4), the OC-3 Multiplexer functions as a SONET electrical Multiplexer between 28 DS1 signals and an STS-1 signal. In the low-speed mode, it transports an externally created STS-1 payload over DDM-2000's OC-3 facility (Figure 5-4).

The OC-3 Multiplexer also supports an optimized interface, the IS-3, to the DDM-2000 OC-12 Multiplexer. This is implemented via a cost-effective optical interface (21D-U OLIU) in the main slots, allowing all the OC-3 applications to be upgraded to an OC-12 line rate.

Dual OC-1 interfaces provided by the 27-type OLIU can be equipped in the function unit slots to support DDM-2000 FiberReach host applications.

The BBG6 STS1E circuit pack converts the seven virtual tributary group (VT-G) signals into a standard EC-1 electrical signal that reuses the same coaxial backplane interface as the DS3 signals.

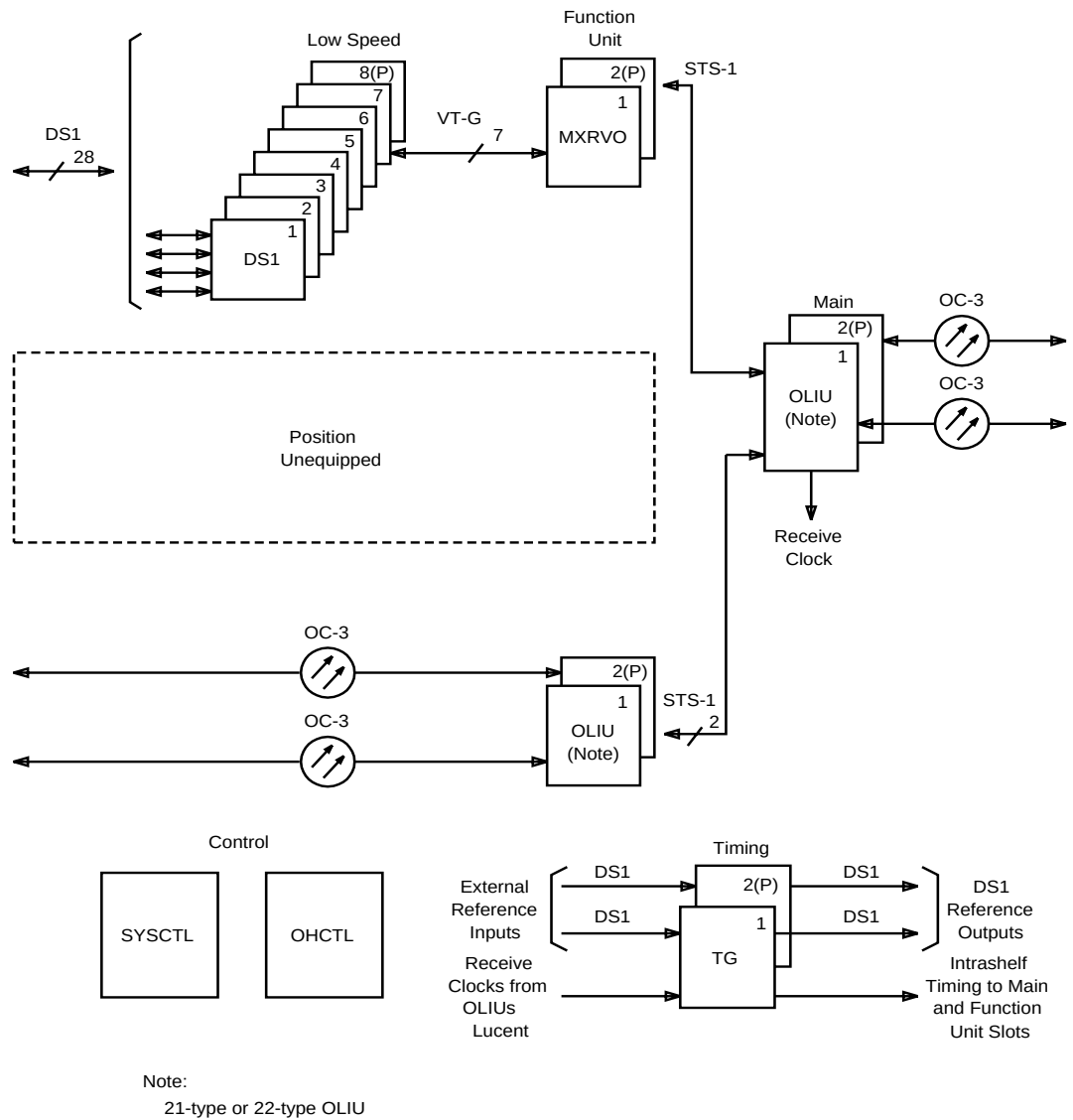


Figure 5-2. DDM-2000 OC-3 Multiplexer Block Diagram — STS-1 Drop

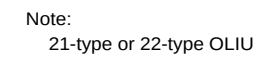


Figure 5-3. DDM-2000 OC-3 Multiplexer Block Diagram — Hubbing

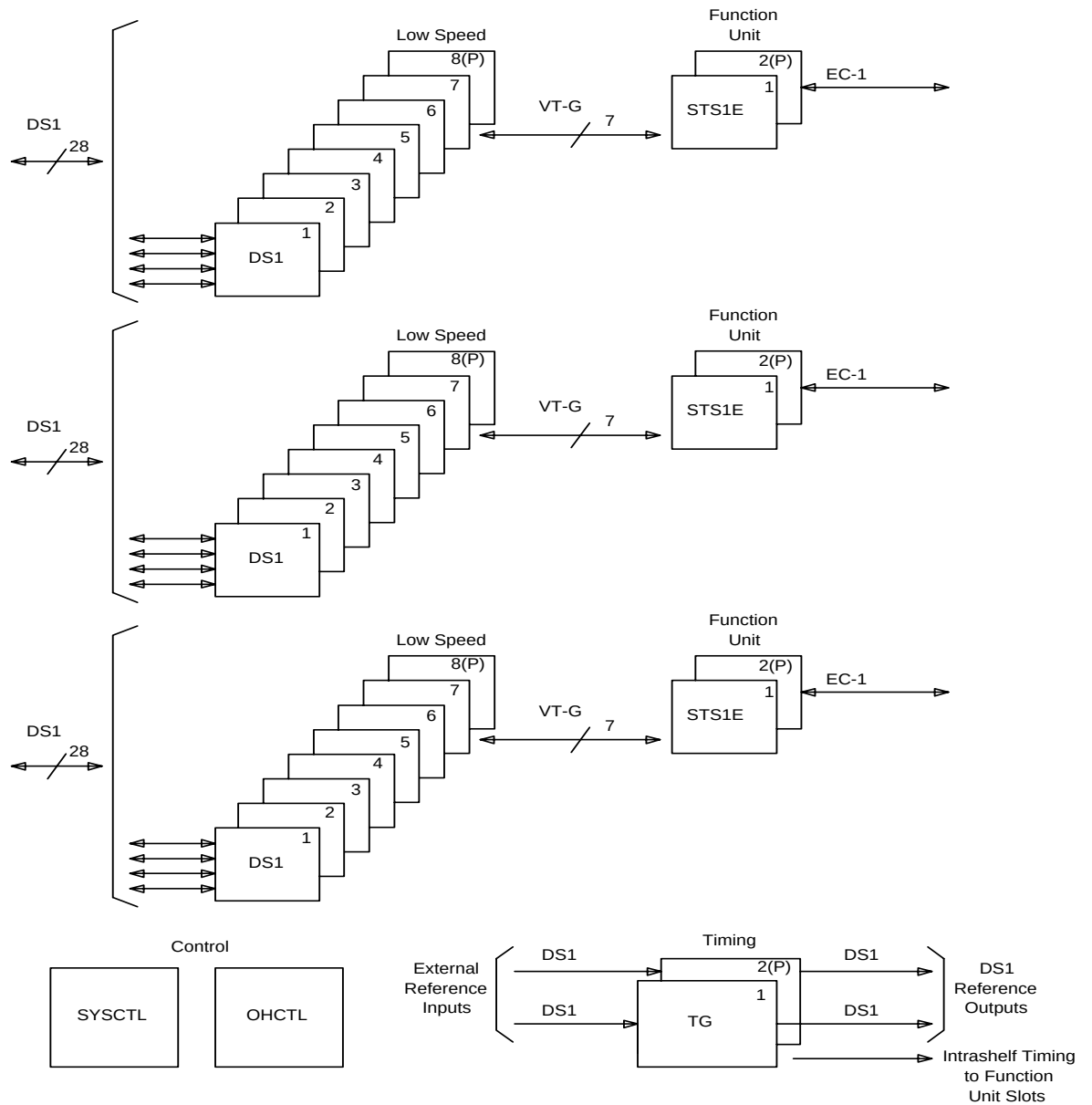


Figure 5-4. DDM-2000 OC-3 Multiplexer Block Diagram — SONET Electrical Multiplexer

For the DS1 add/drop and ring application (Figure 5-5), the time slot interchange (TSI) feature of the 22-type OLIUs provides full flexibility in selecting traffic for each DS1, DS3, or EC-1 low-speed port from any high-speed time slot. The TSI function supports cross-connections across the full bandwidth of each OC-3 interface as well as to any low-speed port.

Figure 5-5 is a block diagram of the DDM-2000 OC-3 Multiplexer VT1.5/STS-1 path switched ring application. The DDM-2000 OC-3 Multiplexer interfaces to the ring through the main slots at the OC-3 rate and uses the programmable VT1.5/STS-1 TSI capability. Path switching can be done on VT1.5 paths, STS-1 paths, or a mixture of these. Up to 84 DS1s, 3 DS3s, 3 EC-1s, 1 OC-3/IS-3 1+1 linear optical extensions, or equivalent combination can be added/dropped from the DDM-2000 OC-3 Multiplexer self-healing ring at any node. Because of the ring's path protection scheme, time slots must be reserved all the way around the ring for all ring traffic, limiting the capacity of the ring to the OC-3 line rate. Like the add/drop topology, the TSI feature offers full flexibility in assigning signals between low-speed DS1, DS3, EC-1 or OC-3 ports and the high-speed interface at each shelf.

The DDM-2000 OC-3 Multiplexer dual ring interworking (DRI) application uses the same shelf configuration as the OC-3 path switched ring (Figure 5-5). The main difference is that the VT1.5/STS-1 paths desired for DRI should be provisioned for drop and continue. As with the VT1.5/STS-1 path switched ring, path selection is at the VT1.5/STS-1 level. The DDM-2000 OC-3 and OC-12 Multiplexer path switched ring architecture allows mixing of drop and continue circuits with standard path switched circuits. TSI flexibility is also maintained in the assignment of low-speed ports to the high-speed interface.

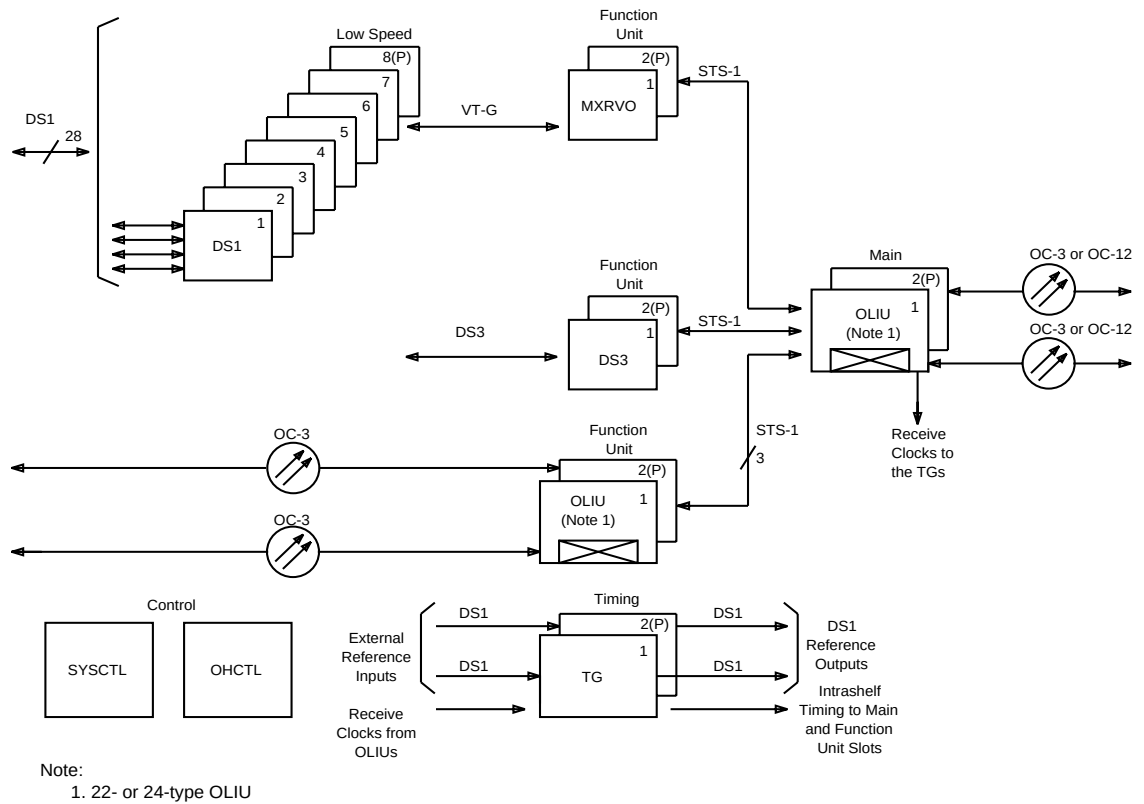


Figure 5-5. DDM-2000 OC-3 Multiplexer Block Diagram — DS1/DS3/EC-1 Add/Drop and VT1.5/STS-1 Path Switched Ring

Figure 5-6 is an overall block diagram of the DDM-2000 OC-3 Multiplexer in a terminal configuration. In this case, however, 24G-U OLIUs are installed in main providing OC-12 optics in an OC-3 shelf.

The 24G-U OLIU receives an OC-12 signal and converts it to an electrical STS-12. This STS-12 is then demultiplexed into 12 STS-1 signals with the capability of routing up to any three of these 12 STS-1s to the function unit slots. The STS-1s that are dropped can contain any combination of VT-G, EC-1, or DS3 signals routed to the function units. The remaining STS-1s continue on the OC-12 ring.

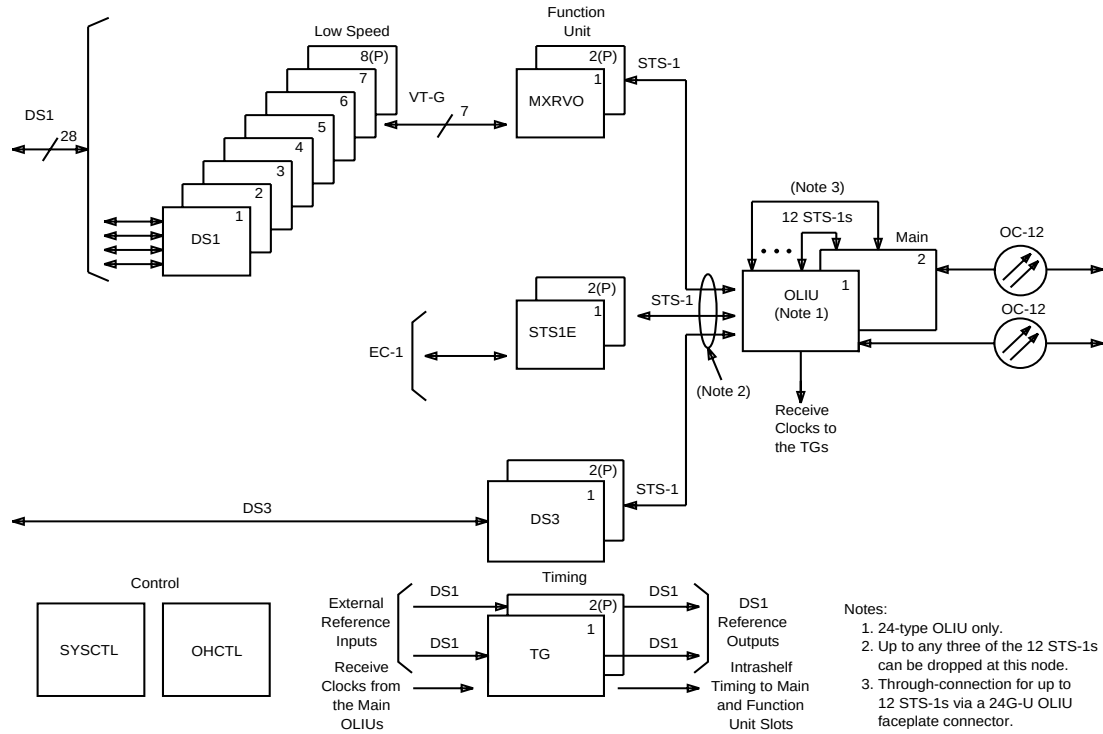
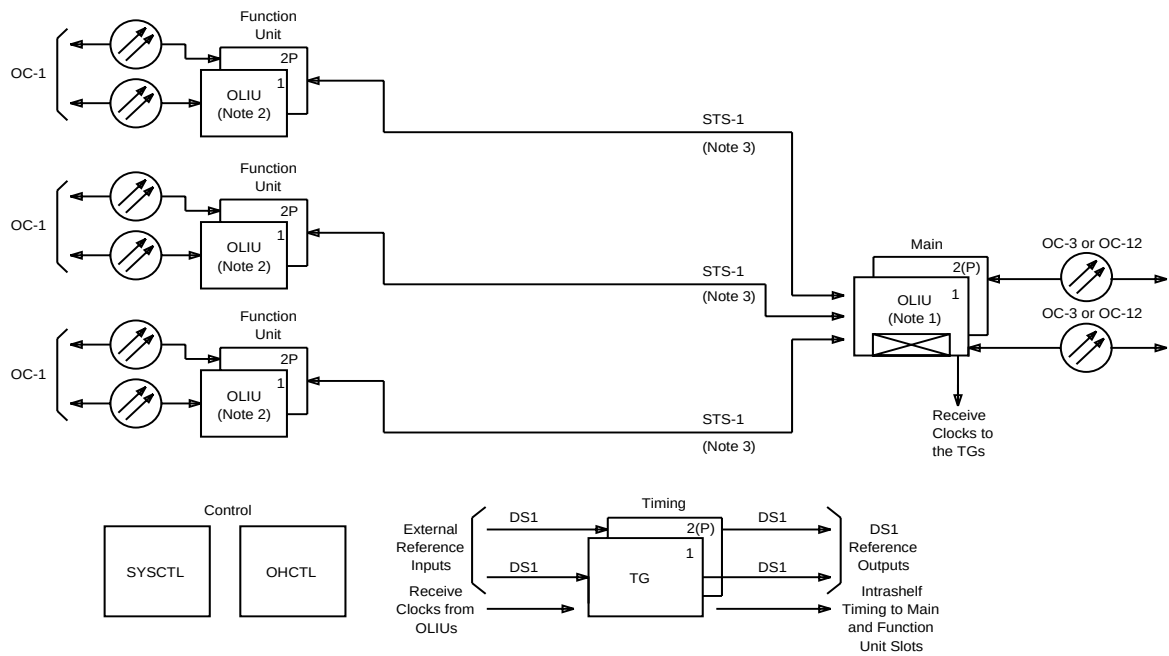


Figure 5-6. DDM-2000 OC-3 Multiplexer with OC-12 Optics Block Diagram

Figure 5-7 is a block diagram of the DDM-2000 OC-3 Multiplexer serving as a DDM-2000 FiberReach host. Dual OC-1 interfaces provided by the 27-type OLIU can be equipped in the function unit slots to support single-homing and dual-homing applications.

Figure 5-7 shows a single-homing arrangement with six 27-type OLIUs in the function unit slots. Each OLIU supports one leg (transmit and receive) of two independent OC-1 rings for a total termination capacity of six OC-1s. Each OC-1 has the capacity of up to 28 VT1.5s. Enhanced routing hairpin connections between OC-1 rings terminating on function unit slots do not consume bandwidth on the ring supported by the OLIUs in the main unit slots. This increases the total capacity of the shelf beyond the 84 VT1.5s supported by the main unit OLIUs.

The 27-type OLIU circuit pack interfaces between two 1310 nm OC-1 optical lines in the transmit and receive directions. It can be used in the main and/or function unit slots of the DDM-2000 OC-3 Multiplexer. Each pair of 27-type OLIUs supports up to two independent OC-1 ring interfaces on a DDM-2000 OC-3 Multiplexer (see Figure 5-9). To support dual homing applications, one 27-type of a pair can be installed in one DDM-2000 OC-3 shelf and the other can be installed in another DDM-2000 OC-3 shelf on the same ring.

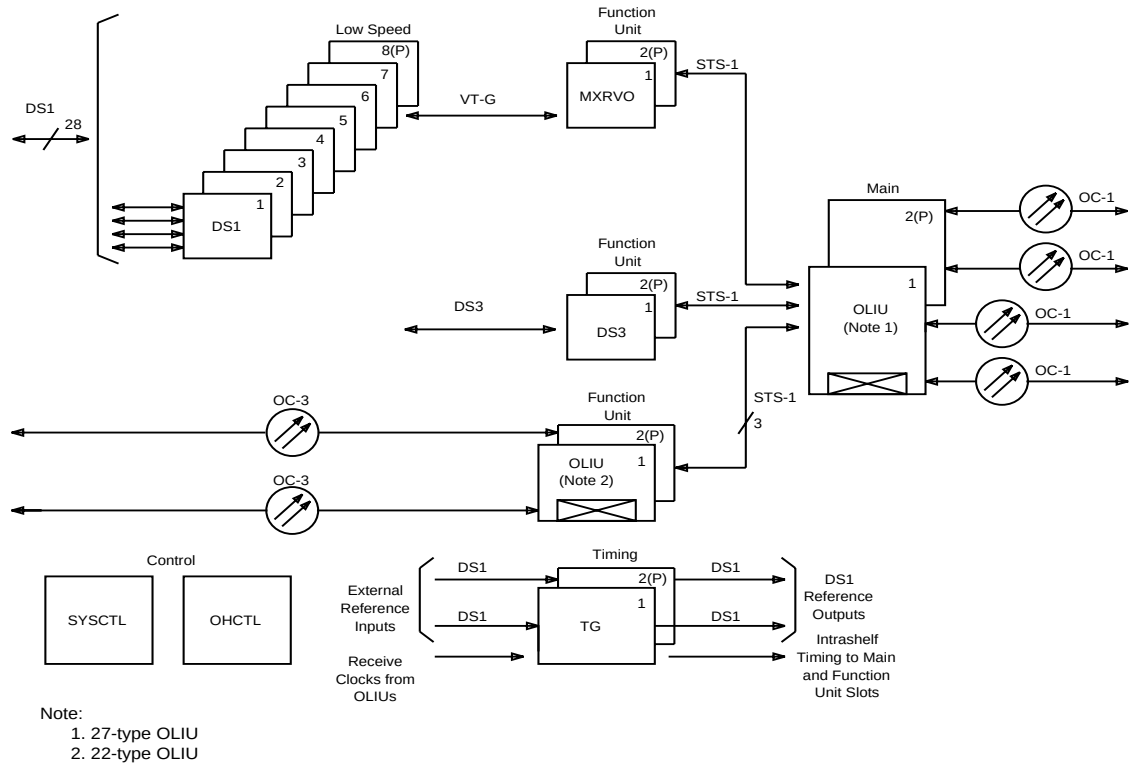


Notes:

1. 22 or 24-type OLIU.
2. 27-type OC-1 OLIU. One direction of two independent OC-1 rings.
3. One or two STS-1s. Shelf capacity is 3 STS-1s (84 DS1s).

Figure 5-7. DDM-2000 OC-3 Multiplexer Block Diagram — DDM-2000 FiberReach Host — Single Homing

With 27-type OLIUs in the main slots, VT1.5 or STS-1 signals from the function slots can be routed to either of the two OC-1 ring interfaces. The signal is transmitted on both rotations of the ring. Standard SONET overhead is added on each OC-1 interface transmitted by the 27-type OLIU. In the receive direction, the 27-type OLIU processes the SONET overhead, monitors the received signals (for parity errors, loss of signal, line and path AIS, etc.), performs standard STS-1 or VT1.5 path switching as required, and routes the signals to any function unit. In both directions of transmission, the two OC-1 ring interfaces are handled independently. Figure 5-8 is an example of this configuration.



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Figure 5-8. DDM-2000 OC-3 Multiplexer Block Diagram—FiberReach Stand-Alone Host Configuration

Fiber access is via four universal optical connectors on the faceplate: one transmit and one receive for each of the two OC-1 ring interfaces (OC-1 line 1 and OC-1 line 2; OC-1 line 1 is the bottom pair). These connectors support ST[®], SC, and FC type optical connectors. Single mode fiber is suggested for optimum performance; multimode facilities are also supported. The 27-type OLIU photonics exceed the span length requirements for SONET intermediate reach interfaces. The 27-type OLIU optical interfaces are compatible with those of the 26-type OLIU, which is used in the DDM-2000 FiberReach Wideband Shelf.

When used in the main shelf position, the 27-types can pass through signals on the OC-1 rings, route signals between the OC-1 ring interfaces and interfaces in the function unit slots, and route signals between function unit slots. When used in the function unit shelf positions, the 27-type can route signals from the OC-1 ring interfaces to the main slots. 27G2-U OLIUs route signals between OC-1 interfaces in the same or different function unit slots (Release 9.1 and later).

In DDM-2000 FiberReach host applications using the DDM-2000 OC-3 Multiplexer Group 1 or Group 3 shelves, the BBF5 jumper circuit pack is a passive circuit pack that provides a method for connecting DCC related control signals and transmission signals between slots in a function unit equipped with 27-type OLIUs. **The BBF5 circuit pack is not needed in Group 4 shelves.** A single BBF5 should be installed in Slot 8(P) of the low-speed group associated with the function unit where the 27G-U OLIUs are equipped. A pair of BBF5 circuit packs should be installed in slots 4 and 8 of the low-speed group associated with the function unit where 27G2-U OLIUs are equipped.

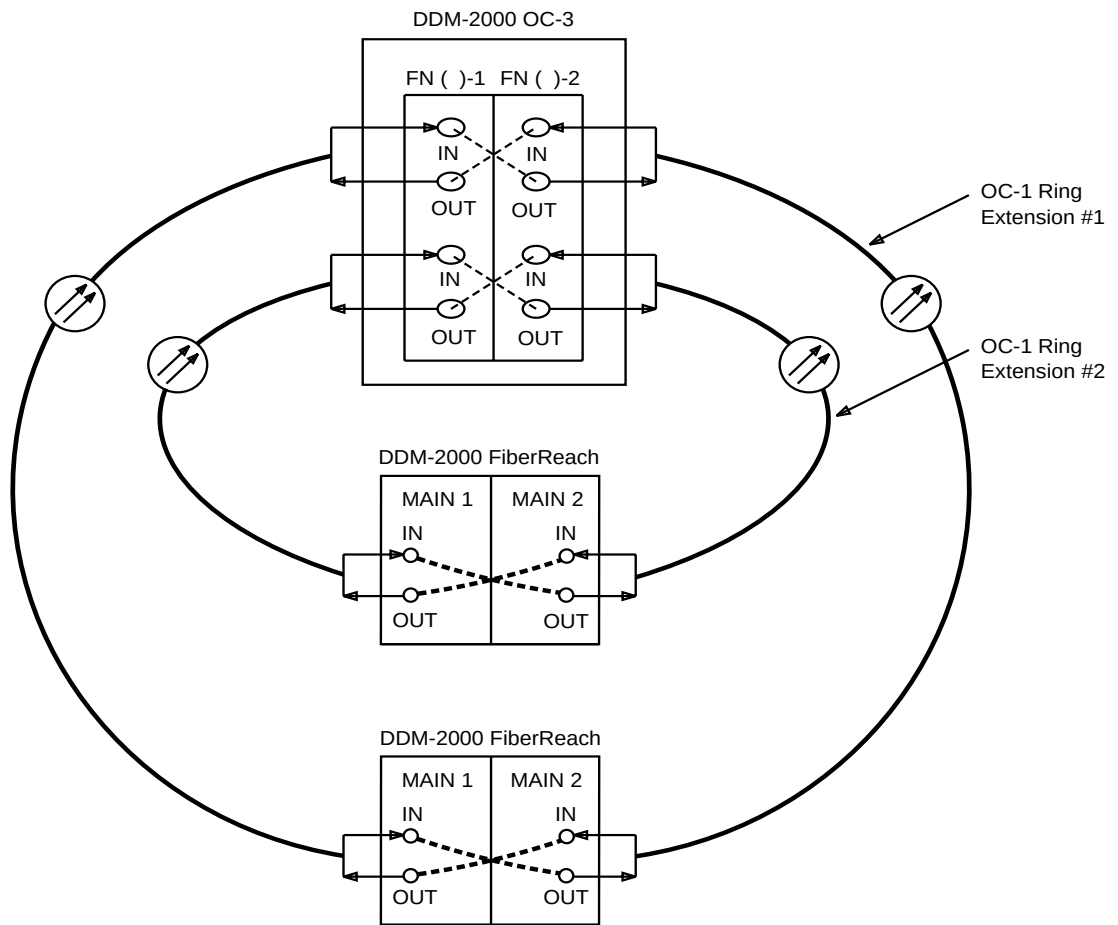
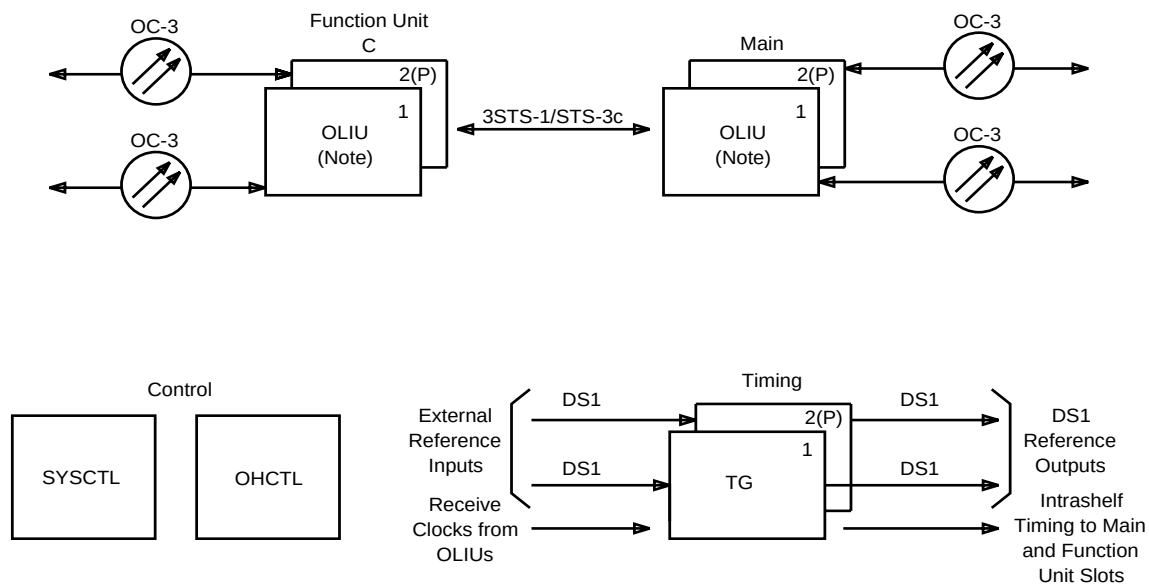


Figure 5-9. Single Homing with 27G-U Dual OC-1 OLIUs

The DDM-2000 OC-3 Multiplexer can be provisioned as an OC-3/OC-3c Repeater (Figure 5-10). This configuration provides a simple, cost effective method for extending an OC-3 line.



Note: 21G/21G-U/21D/21D-U

Figure 5-10. DDM-2000 OC-3 Multiplexer Block Diagram — OC-3/OC-3c Repeater

Ring Interfaces

Ring interfaces can be used in single or dual-homing applications (linear optical extensions are considered to be single-homed). This part describes the following ring interfaces:

- OC-3/OC-12 ring (0x1) single-homing
- OC-3/OC-12 ring (0x1) dual-homing
- OC-3/OC-12 linear (1+1) optical extensions
- OC-3/OC-1 ring (0x1) single-homing
- OC-3/OC-1 ring (0x1) dual-homing.

OC-3/OC-12 Ring (0x1)

The DDM-2000 OC-12 ring supports (0x1) OC-3/IS-3 interfaces in its function unit slots. These interfaces must be provisioned as 0x1 in either single homing or dual-homing applications (see Figure 5-11 and Figure 5-12). Signals pass through the DDM-2000 OC-12 transport ring and exit to the DDM-2000 OC-3 ring. OC-12 function unit slot FN(x)-1 is connected to OC-3 Main-1 and OC-12 function unit slot FN(x)-2 is connected to OC-3 Main-2. Switching is not done on the DDM-2000 OC-12 Multiplexer on these lines, or paths on these lines; rather VT1.5 or STS-1 level path switching is done on the DDM-2000 OC-3 Multiplexer. This allows DDM-2000 OC-3 nodes running ring software to interface with DDM-2000 nodes of an OC-12 ring in such a way as to provide ring-on-ring architecture. Each OC-3 ring so supported occupies up to three STS-1 time slots on the OC-12 ring. Each OC-12 node can provision the same STS-1 time slots as other OC-12 nodes to drop to the OC-3 shelf (to share STS-1s among several OC-3 shelves) or the OC-12 node can provision different STS-1s at different sites. The OC-12 ring passes the contents of these STS-1 time slots between the low-speed OC-3/IS-3 lines and OC-12 high-speed lines without terminating them or performing any path protection switching on them. Up to four OC-3 rings can be supported in this fashion by an OC-12 ring to maximize the OC-12 bandwidth utilization. This allows access to any and all VT1.5 signals at an OC-12 site.

The OC-3/IS-3 lines between an OC-12 node and an OC-3 node connected in a ring (0x1) fashion, behave like the OC-3 lines between the nodes on an OC-3 ring and do not perform line level protection switching. Instead, the OC-3 shelves perform the normal path protection switching functions.

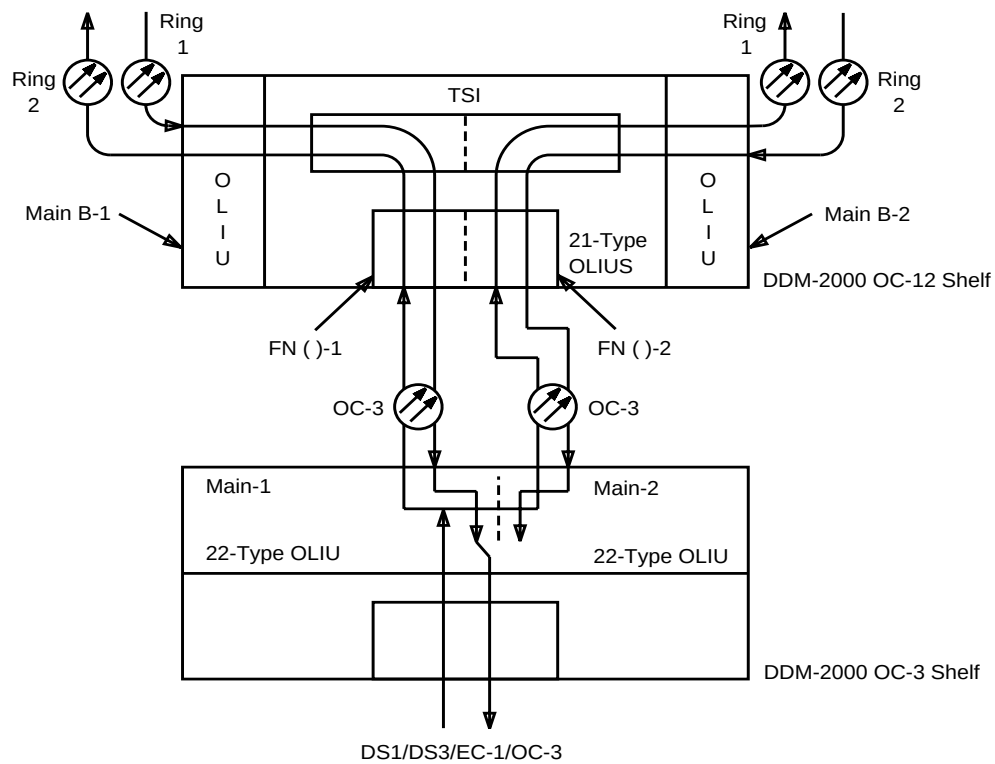


Figure 5-11. OC-3/OC-12 Ring (0x1) Single-Homing

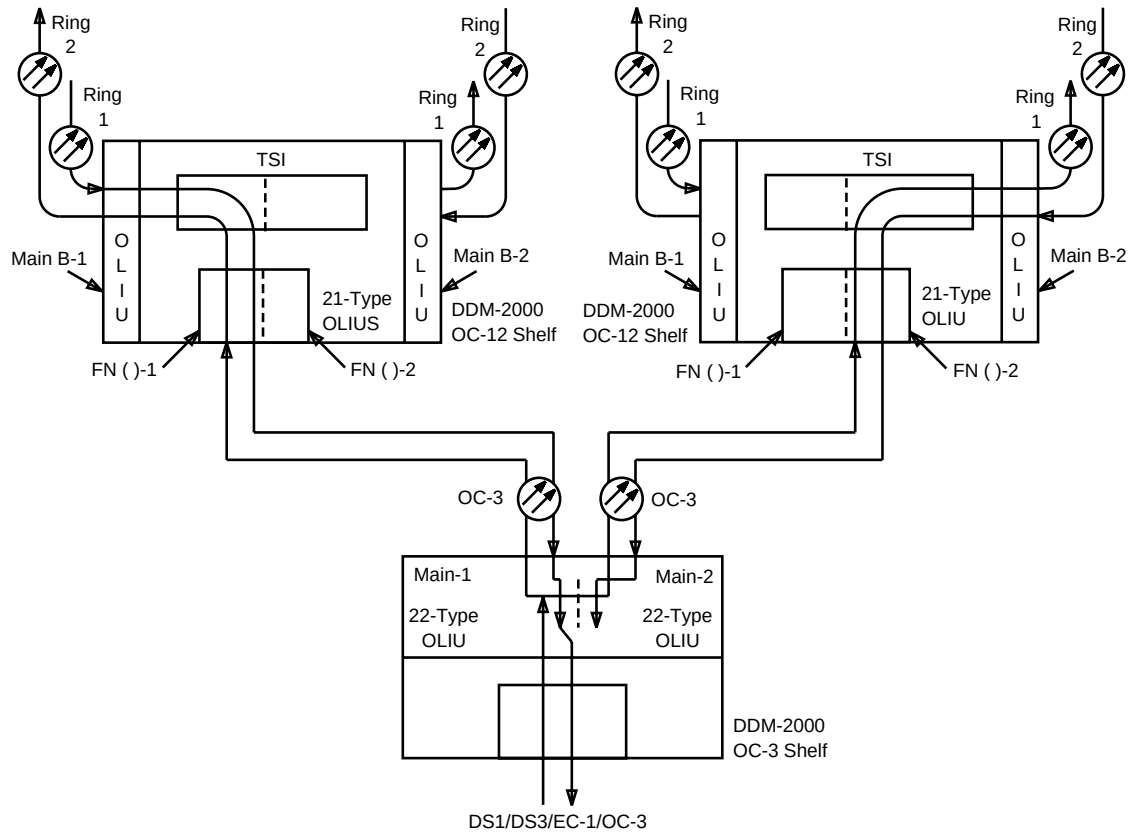
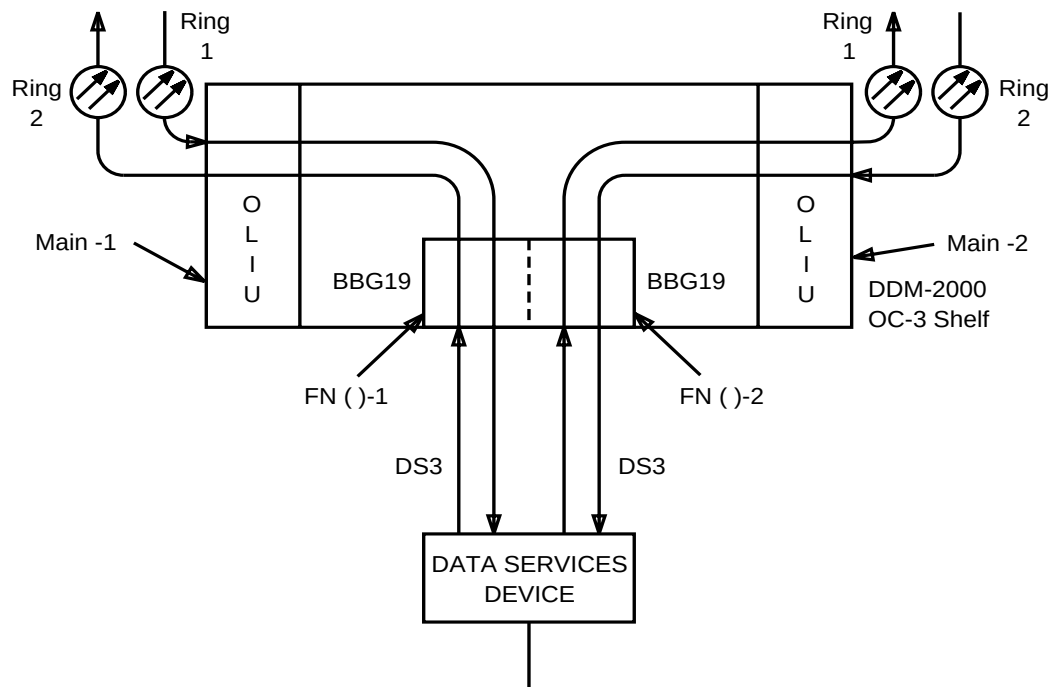


Figure 5-12. OC-3/OC-12 Ring (0x1) Dual-Homing

DS3 Data Services on an OC-3 Ring

Figure 5-13 shows an example of using the BBG19 DS3 Data Services Interface circuit pack to connect to data edge devices providing access to the SONET ring for ATM, Ethernet, Token Ring, FDDI, Frame Relay, and other data services.



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Figure 5-13. DS3 Data Services on an OC-3 Ring

OC-3/OC-12 Linear (1+1) Optical Extensions

See Figure 5-14 and Figure 5-15. In DDM-2000 OC-12 Release 5.0, the function units in the DDM-2000 OC-12 shelf can contain linear (1+1) protected OC-3 circuit packs. This allows a DDM-2000 OC-12 shelf to connect to the main slots of a linear DDM-2000 OC-3 shelf. The signals between the DDM-2000 OC-12 and OC-3 shelves can be either OC-3 or OC-3c signals. This allows more options in designing a DDM-2000 network, such as adding a linear add/drop DDM-2000 OC-3 shelf off of a DDM-2000 OC-12 ring. In the transmit direction, a circuit pack failure will cause a switch. In the receive direction, an incoming STS signal failure or circuit pack failure will cause a switch.

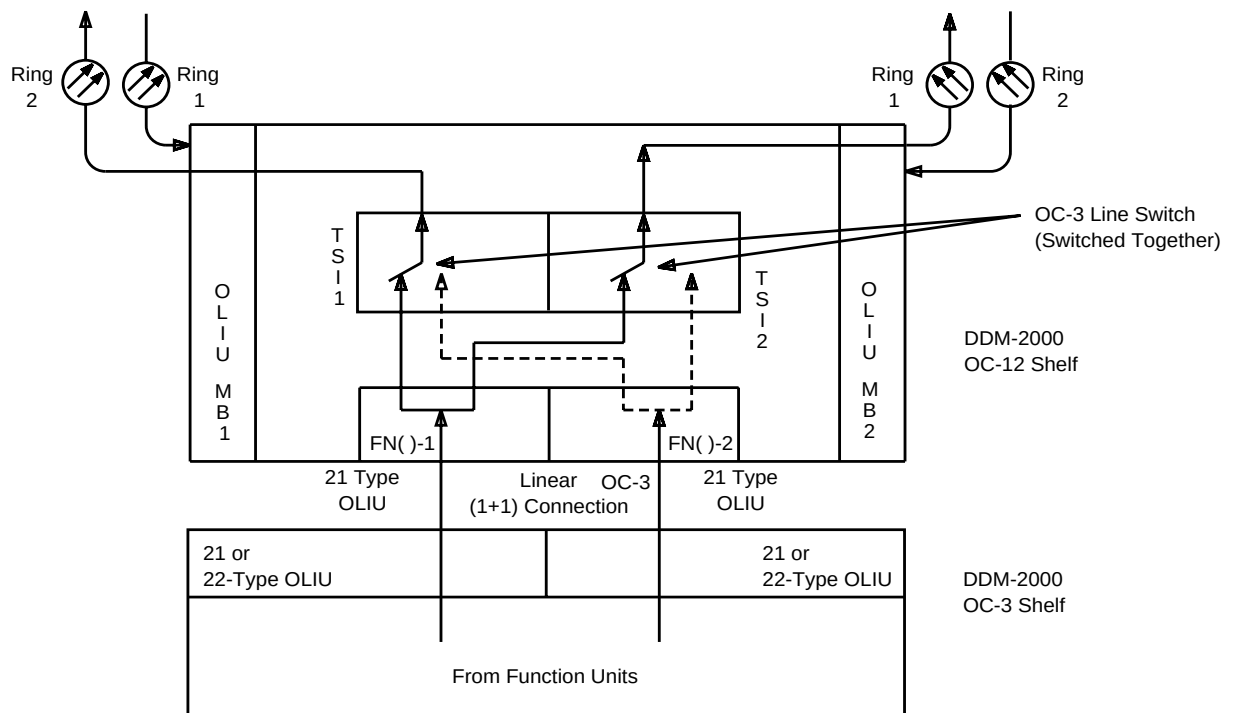


Figure 5-14. OC-12 Ring Shelf with Linear (1+1) OC-3 Low-Speed Interfaces (Transmit)

Note that for OC-12 OLIU or incoming STS-1 path failure, the STS path switch takes place in the TSI. For TSI circuit pack failure, the switch occurs in the function unit OLIUs.

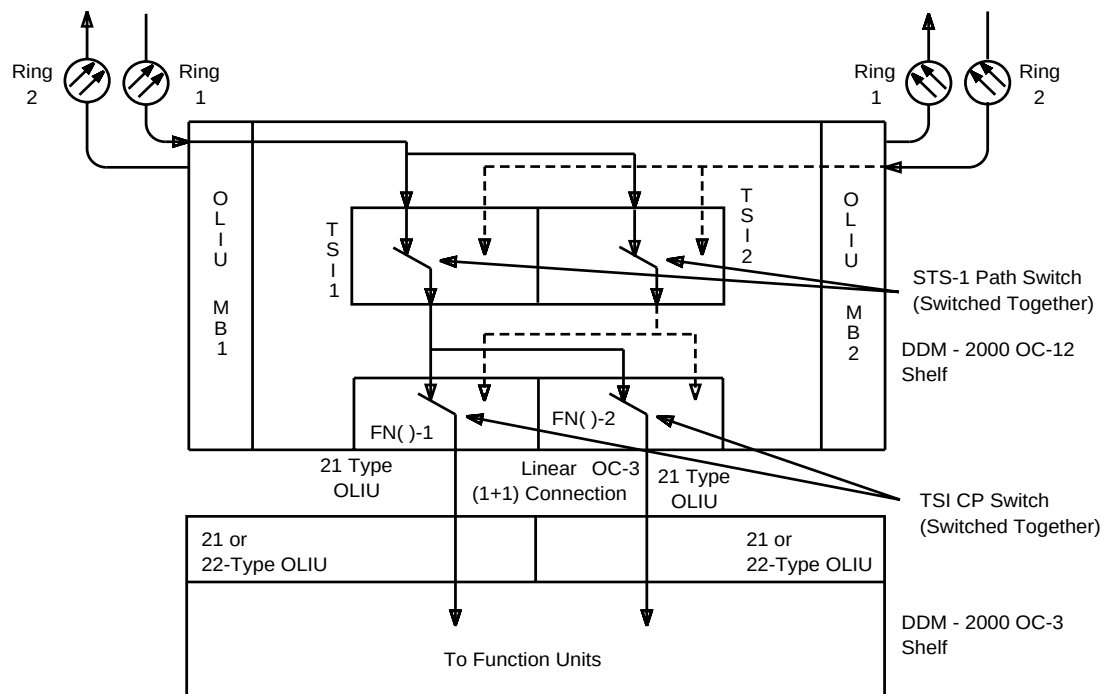


Figure 5-15. OC-12 Ring Shelf with Linear (1+1) OC-3 Low-Speed Interfaces (Receive)

OC-3/OC-1 Ring (0x1)

The OC-3/OC-1 path switched ring is similar to the OC-3/OC-12 ring-on-ring. A DDM-2000 FiberReach shelf interconnects with a DDM-2000 OC-3 ring host shelf through 0x1 provisioned low-speed OC-1 interfaces on a single OC-3 ring shelf. VT/STS path protection switching is done on the DDM-2000 FiberReach shelf.

In single-homing, the DDM-2000 FiberReach ring interconnects through the ring interface with the low-speed OC-1 0x1 interface on a single OC-3 shelf.

In dual-homing, the OC-1 ring interconnects with the OC-1 0x1 interfaces on two separate and normally non-colocated OC-3 shelves. Different function unit slots on the two shelves must be used to connect the OC-1 ring. For example, function unit C2 on one shelf and function unit C1 on the other shelf (see Figure 5-16 and Figure 5-17).

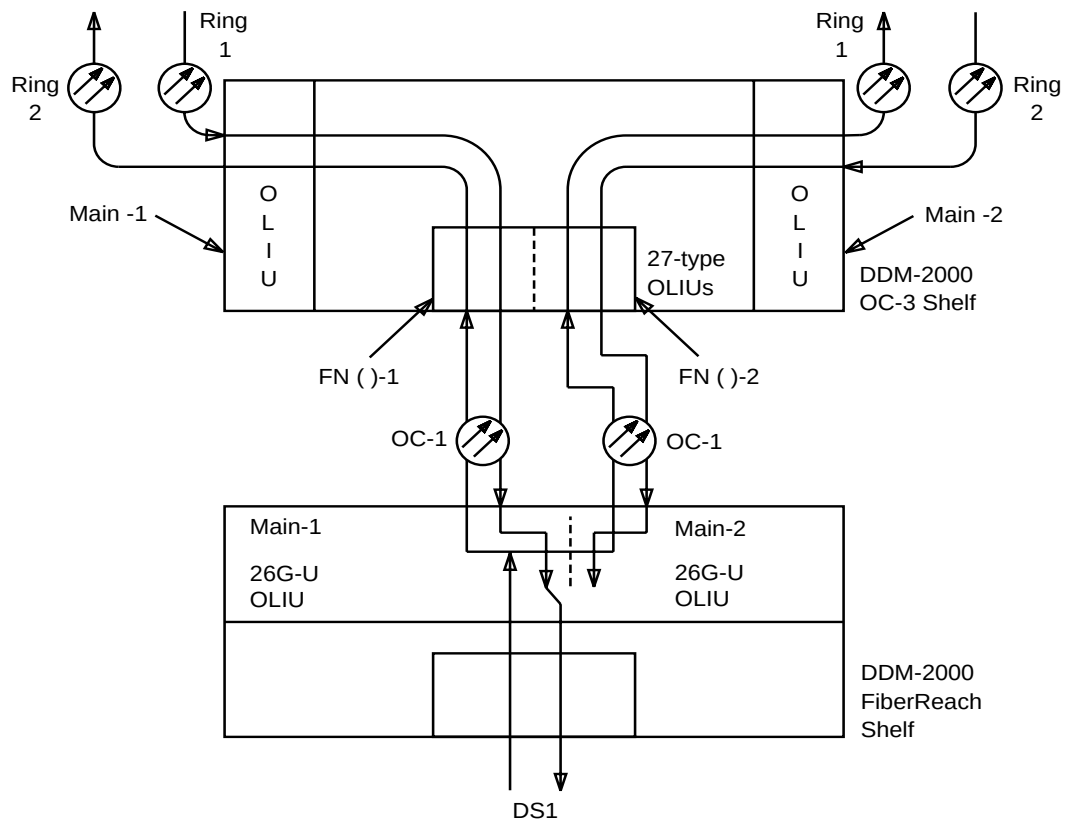


Figure 5-16. OC-3/OC-1 Ring (0x1) Single-Homing

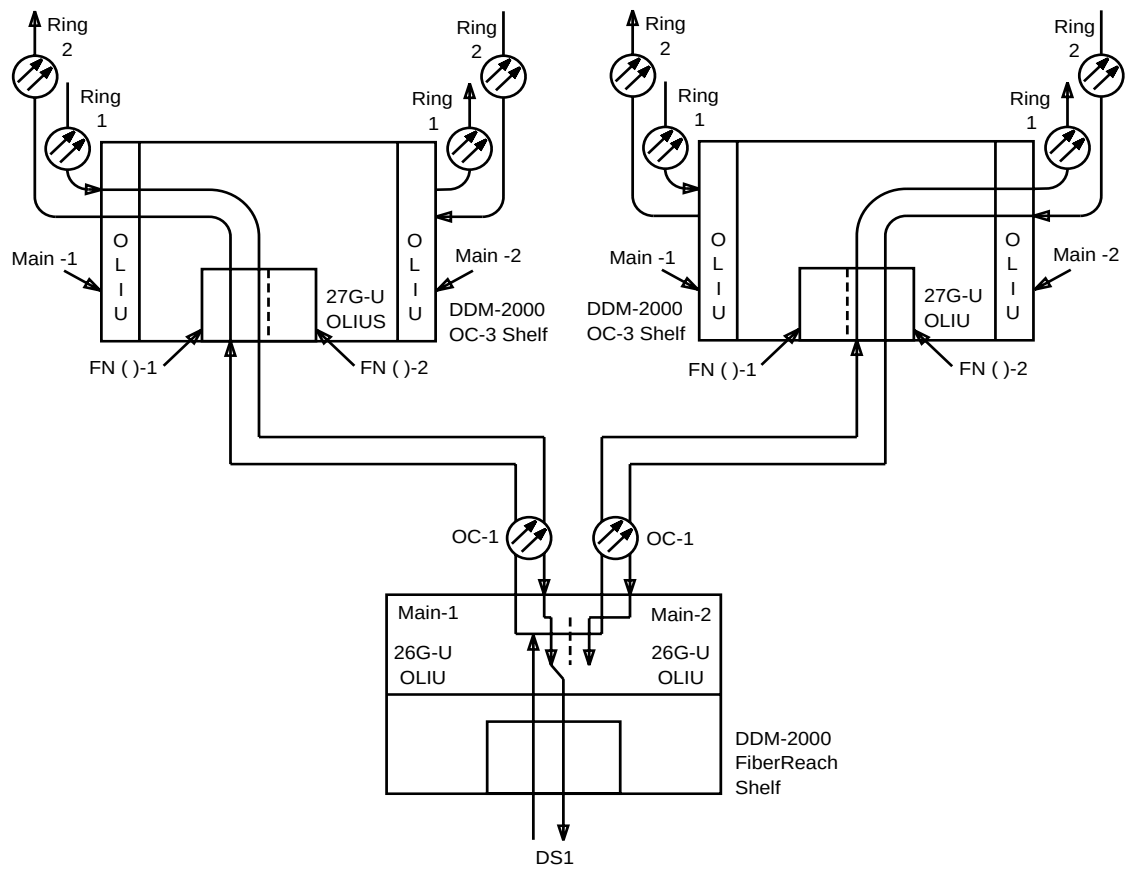
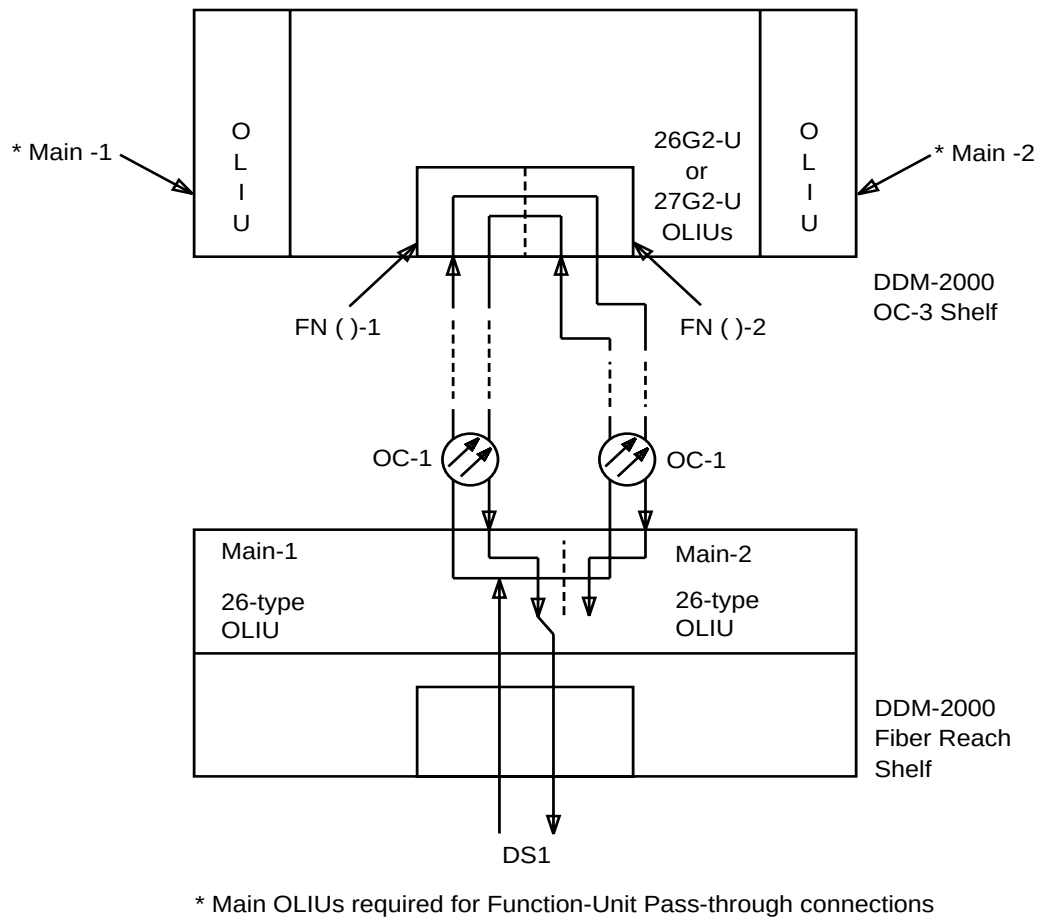


Figure 5-17. OC-3/OC-1 Ring (0x1) Dual-Homing

OC-1 Ring Function Unit Pass-Through

The OC-1 ring function unit pass-through is identical in functionality to the pass-through supported in the main slots. A function unit pass-through connection consumes no bandwidth on the ring supported by the OLIUs in the main slots. Figure 5-18 shows an example of this configuration.

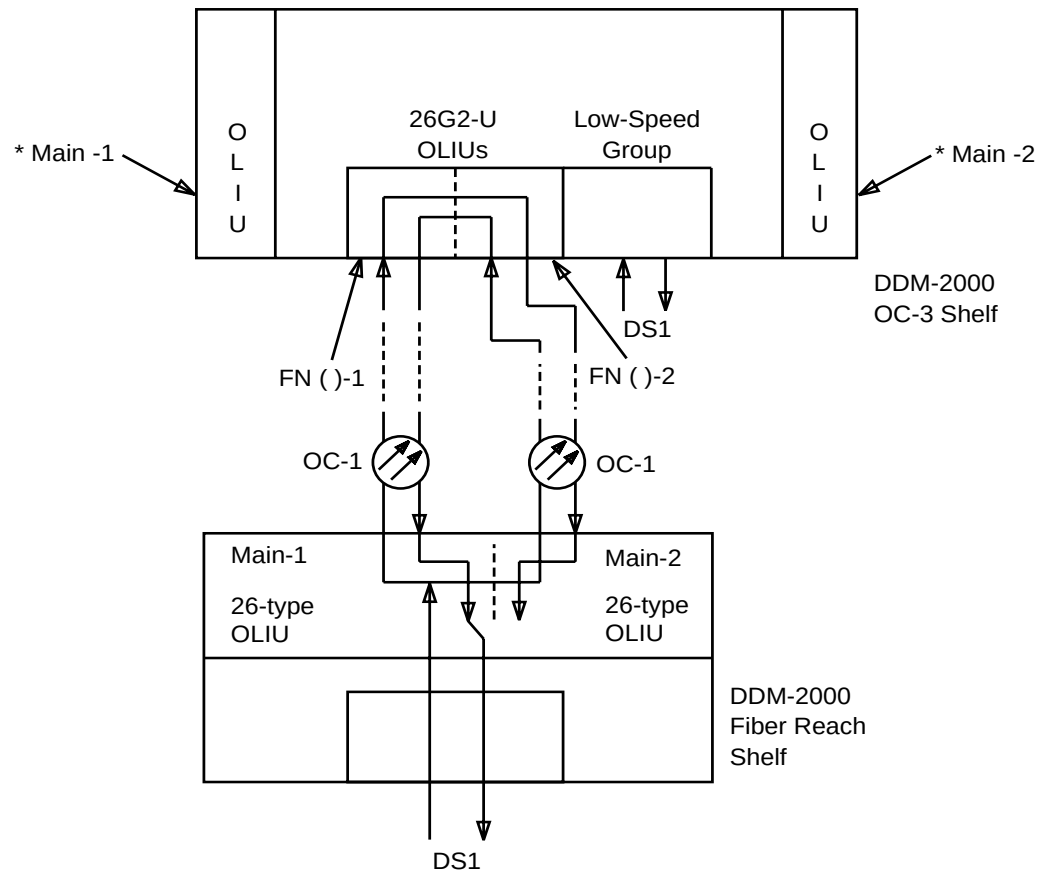


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Figure 5-18. OC-1 Ring Function Unit Pass-Through

OC-1 Ring Hairpin Local Drop

The OC-1 ring hairpin local drop using the 26G2-U OLIU allows local drop of DS1s without the need for an MXRVO Multiplexer circuit pack. This is either an *intra* or *inter*-function unit capability. Figure 5-19 shows an example of this configuration.



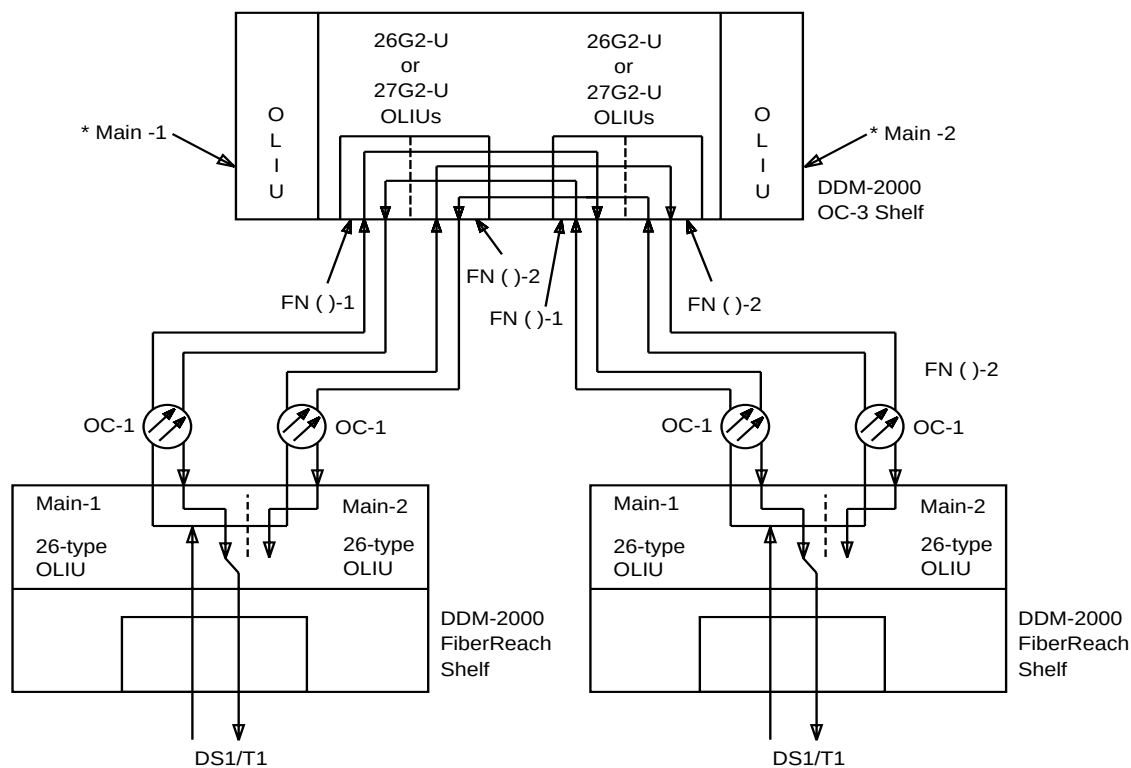
* Main OLIUs required for Function-Unit Pass-through connections

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Figure 5-19. OC-1 Ring Hairpin Local Drop—Intra-Function Unit

OC-1/OC-1 Function Unit Hairpin Ring

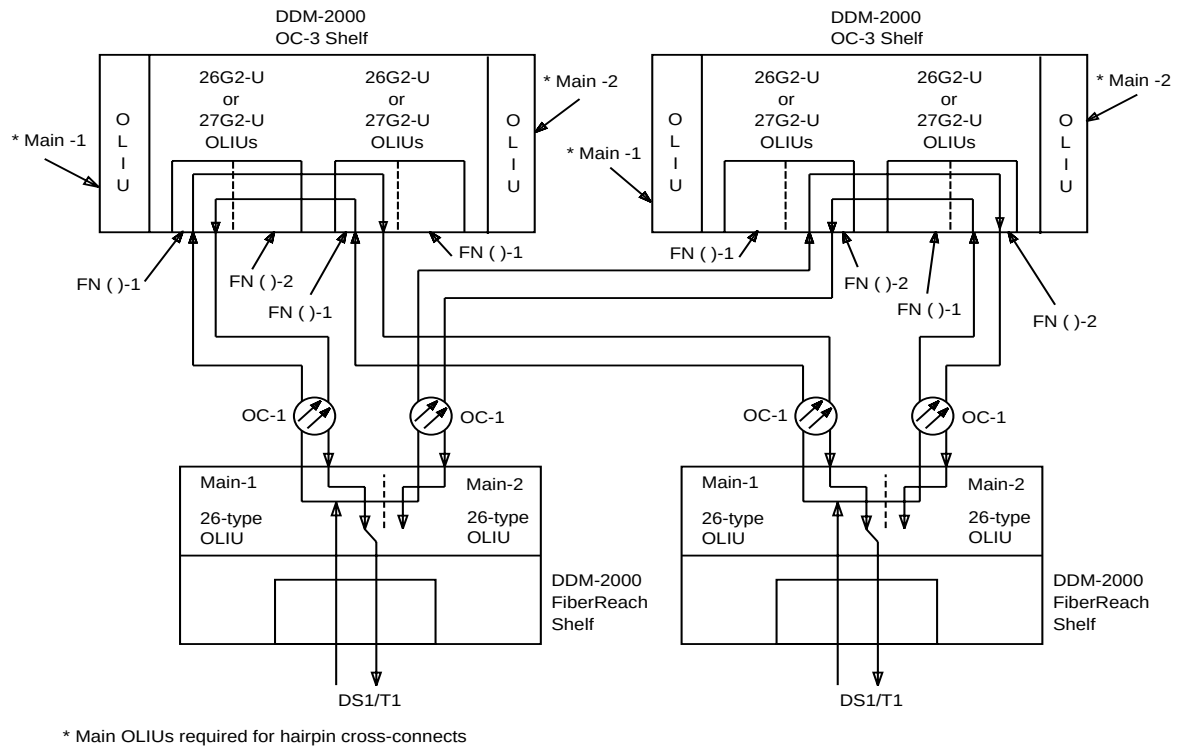
The OC-1/OC-1 function unit hairpin ring is the interconnection of two OC-1 rings terminated in function units. Figure 5-20 through Figure 5-23 show four configurations of OC-1/OC-1 function unit hairpin rings: Figure 5-20 and Figure 5-21 are *inter-function unit* examples using either the single OC-1 26G2-U or the dual OC-1 27G2-U OLIU; Figure 5-22 and Figure 5-23 are *intra-function unit* examples using the dual OC-1 27G2-U OLIU (the 26G2-U OLIU can also support *intra-function unit* hairpin applications). Each OC-1 ring terminates on 0x1 protected OLIU. In the single-homing cases, both rotations of an OC-1 ring terminate on a pair of OLIUs in the same function unit. In the dual-homing cases, each rotation of an OC-1 ring terminates on an OLIU in a function unit in a different OC-3 shelf.



* Main OLIUs required for hairpin cross-connects

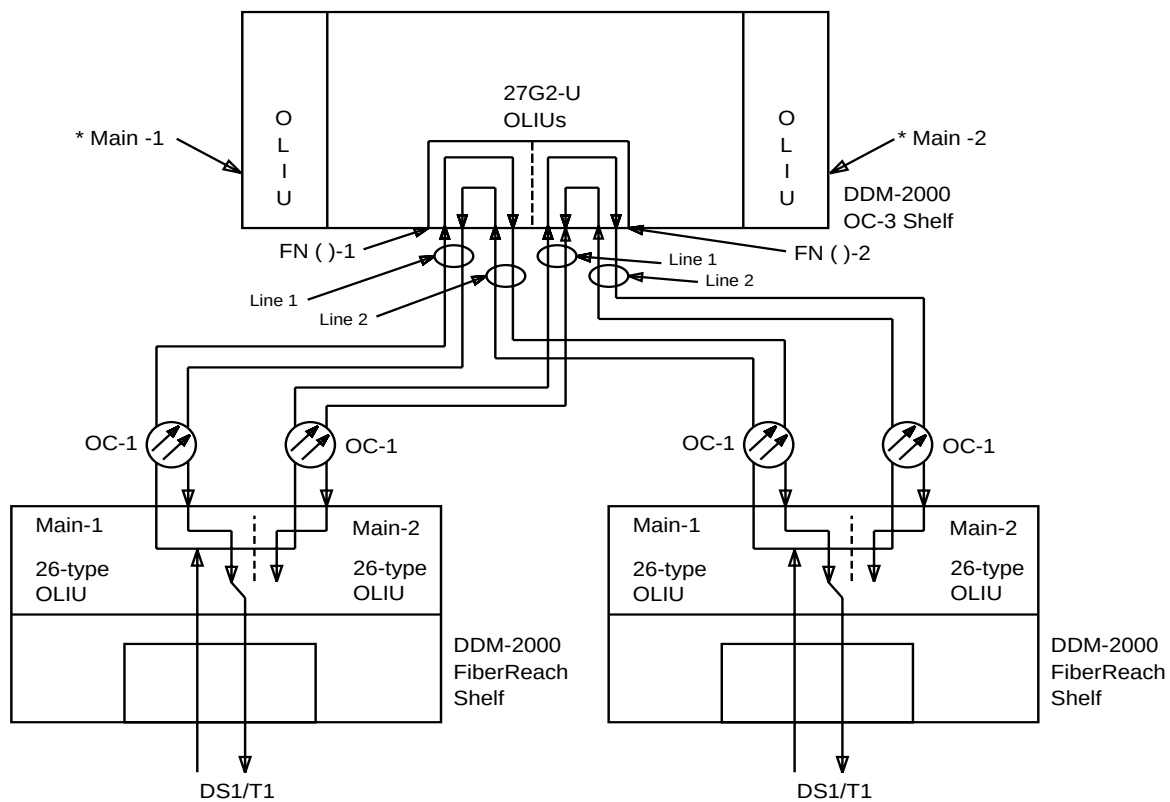
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Figure 5-20. OC-1/OC-1 Function Unit Hairpin Ring—Inter-Function Unit Single Homing



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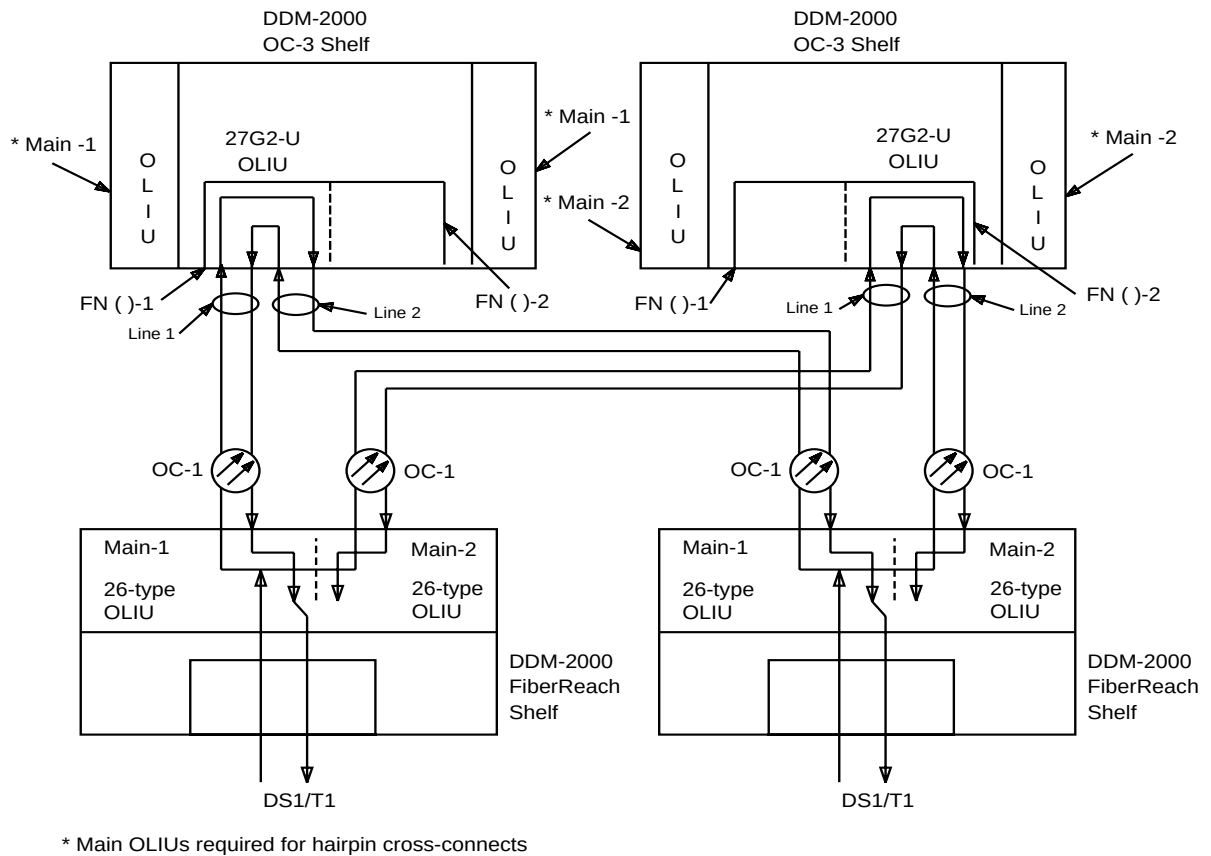
Figure 5-21. OC-1/OC-1 Function Unit Hairpin Ring—Inter-Function Unit Dual-Homing



* Main OLIUs required for hairpin cross-connects

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Figure 5-22. OC-1/OC-1 Function Unit Hairpin Ring—Intra-Function Unit Single-Homing



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Figure 5-23. OC-1/OC-1 Function Unit Hairpin Ring—Intra-Function Unit Dual-Homing

Synchronization Interfaces

Timing Modes

Each DDM-2000 OC-3 Multiplexer can be provisioned to one of three timing modes:

- Free-running from an internal oscillator
- Line-timed from an incoming optical interface. This timing reference is used to generate all outgoing signals.
- External timing from the digital synchronization network via DS1 references (DS1 External).



NOTE:

The synchronization and timing examples used throughout this chapter reference the timing generator as either “TG” or “TGS.” Both references represent the BBF2B TGS circuit pack.

Free-Running

For free-running operation, the TG derives timing from a temperature-compensated, voltage-controlled crystal oscillator (TCVCXO) and a digital phase-locked loop (DPLL) with a full temperature range end-of-life accuracy of ± 15 parts-per-million (ppm) for the BBF2B TGS.

Line Timing

The reference signal feeding the PLL is selected from the internal oscillator or a line timing clock derived from the incoming optical line. In line timing mode, the OC-N line being selected for transmission is also selected as the timing reference. In addition, the OC-3 line in function unit C selected for transmission can optionally be selected for the timing reference. This selection is under the control of the on-board microcontroller and the SYSCTL circuit pack and is dependent on the timing mode selected by the user via on-board selection switches and the status of the references. Loss of both line timing references causes the TG circuit pack to go into holdover mode to maintain system timing.

The terms loop timing and line timing have been changed to clarify timing terminology. When the OLIU derives local shelf timing from the incoming optical signal and the shelf is an intermediate shelf (choice of OC-N lines for timing) in a linear network for example, it is called line timing. Loop timing is a subset of line timing used to describe the timing mode of the terminating node (single source of timing) of a linear network, for example.

DS1 External

Each TG circuit pack receives one DS1 reference signal which it monitors and from which it recovers a clock signal. The recovered clock is cross-fed to its companion TG circuit pack in the same shelf. If the microprocessor on one TG circuit pack detects an incoming DS1 reference failure, it will signal the microprocessor on the companion TG circuit pack. Thus, each TG circuit pack has two DS1 references to choose from, one which is input directly and the other cross-fed. Both TG circuit packs will normally select the same DS1 input. A loss of both DS1 references results in the TG circuit pack entering holdover mode.

Holdover

The TG circuit pack has an internal TCVCXO that maintains shelf timing within ± 4.6 ppm (BBF2B TGS) for 24 hours in the event of an unprotected timing DS1 reference failure.

DS1 Output Modes: MULT and SYNC OUT

The DDM-2000 supports two DS1 output modes: MULT and SYNC OUT. Both modes are used in conjunction with external synchronization modes but only one may be supported on a single shelf.

DS1 Output Mode, MULT

In a CO environment where multiple DDM-2000 Multiplexers are installed in a network bay frame, a single pair of DS1 timing references from the building integrated timing supply (BITS) can be used to externally synchronize all shelves in a bay. This unique feature reduces the number of BITS output ports required to externally synchronize multiple DDM-2000s, thus minimizing network costs.

Each DDM-2000 provides two sets of DS1 input and output ports, one set per TG circuit pack. A DS1 timing reference is initially connected to the bottom shelf in the bay (shelf 1) and each TG terminates and actively buffers this timing reference. The reference is then used as a synchronization reference for that shelf. The buffered signal is also output from each TG as a DSX level (with adjustable equalization). (The TG does not retime or influence the DS1 output when in the holdover mode.) This DS1 output is then connected to the DS1 input port of the next DDM-2000 in the bay via a special (MULT) cable forming a MULT chain. See 363-206-200, *DDM-2000 Multiplexer Applications, Planning, and Ordering Guide*, for cabling information.

If a TG in the MULT chain is removed, shorting contacts in the backplane will redirect input and output signals so the subsequent shelves continue to receive valid DS1 signals. However, if a BBF2B provisioned for SYNC OUT is inserted in the MULT chain, the traceability of the DS1 output will be affected. This could

result in untraceable timing or the creation of timing loops. To ensure that replacement circuit packs are provisioned correctly, the DDM-2000 software will monitor newly inserted packs for the correct “shelf provisioning.” If a newly inserted pack does not match the shelf provisioning, the fault LED is lit on that pack and indicates that a provisioning error has occurred. It is always best to verify TG provisioning **before** insertion.

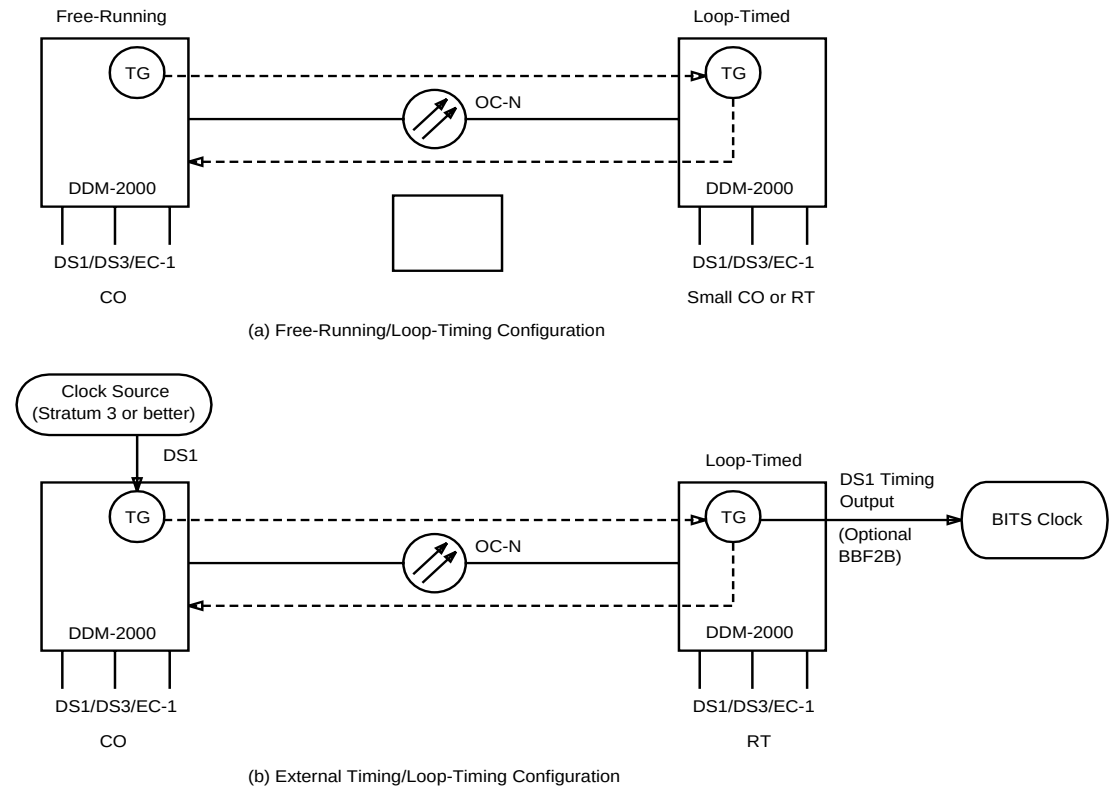
DS1 Output Mode, SYNC OUT

In a CO environment, it may be necessary to externally synchronize a BITS to a SONET reference with traceability to a primary reference source (PRS). When optioned for SYNC OUT, the DDM-2000 will output a derived DS1 traceable to a selected OC-3 or OC-12 input. The frequency of the optical line is divided down to a 1.544 MHz signal and used to create the derived DS1.

When using SYNC OUT, two input timing modes are available: DS1 external-timing or line-timing. These timing modes will only influence the synchronization source used for the derived DS1. In SYNC OUT mode the DDM-2000 uses an external DS1 reference for synchronization. This external reference typically comes from a BITS. In line-timing SYNC OUT mode, the DDM-2000 will use a selected optical reference for synchronization. The derived DS1 is carried to the BITS by a special SYNC OUT cable which is capable of externally timing the DDM-2000 if the DS1 external SYNC OUT mode is selected. See 363-206-200, *DDM-2000 Multiplexer Applications, Planning, and Ordering Guide*, for cabling information.

If a TG provisioned for MULT is inserted into a DDM-2000 provisioned for SYNC OUT, the traceability of the DS1 output will be altered. This could result in untraceable timing or the creation of timing loops. To ensure that replacement packs are provisioned correctly, the DDM-2000 software monitors newly inserted packs for the correct “shelf provisioning.” If a newly inserted pack does not match the shelf provisioning, the fault LED is lit on that pack and indicates that a provisioning error has occurred. It is always best to verify TG provisioning **before** insertion.

The Free-Running, Line Timing, and DS1 External Timing modes can be combined into various subnetwork configurations, some of which are shown in Figure 5-24. The figures show basic single span configurations. In more complex subnetworks, such as hubbing, these basic span configurations are duplicated and/or mixed, depending on the application, to produce a subnetwork synchronization configuration.



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Figure 5-24. Synchronization Timing Configurations (Sheet 1 of 2)

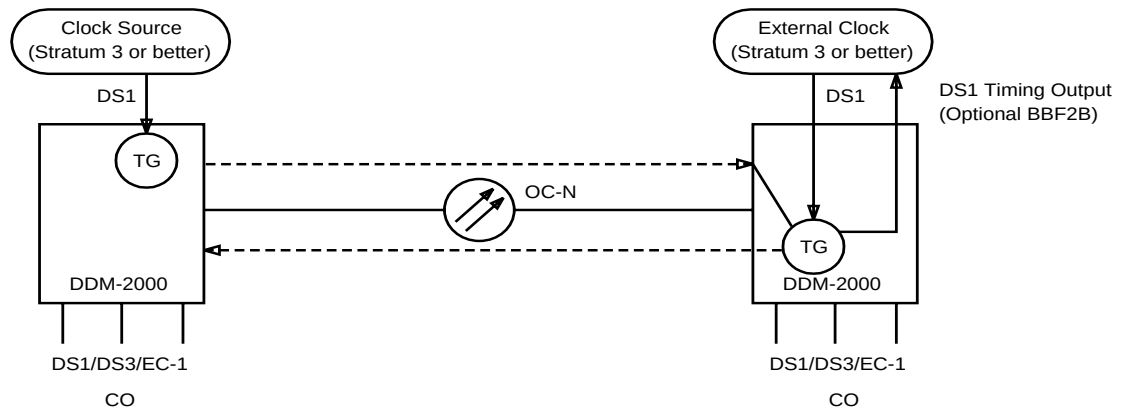
Figure 5-24(a) shows that the CO system is internally timed (free-running). At the RT, the TGS derives its timing from the incoming optical signal and uses it to time itself and loop timing back to the CO.

Figure 5-24(b) and Figure 5-24(c) show the CO timed from an external stratum 3 or better timing source. The RT derives its timing from the incoming optical line and can send a DS1 output to a BITS clock.

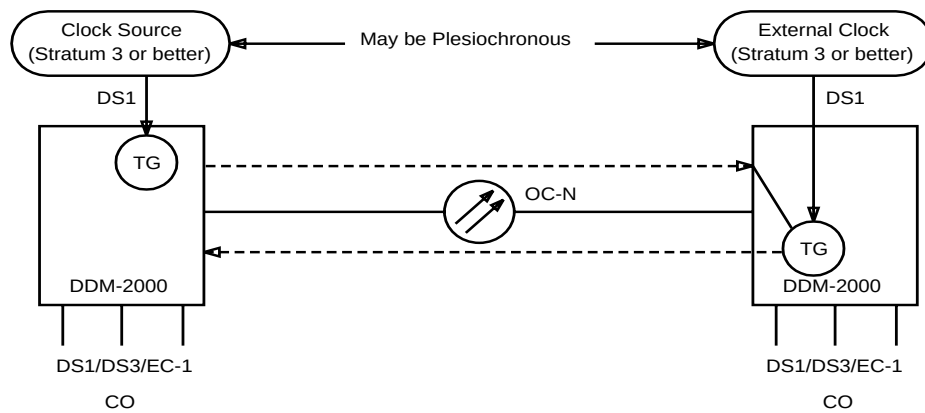
The external timing configuration, Figure 5-24(d), uses external DS1 timing to each DDM-2000 Multiplexer in the network. Since this configuration requires local office clocks at each site, it is most suited to interoffice applications. A DDM-2000 network may have all DS1 references traceable to a primary reference source (PRS) called synchronous operation or multiple PRSs called plesiochronous operation.

The PRS is equipment that provides a timing signal whose long-term accuracy is maintained at 10^{-11} or better with verification to universal coordinated time (time and frequency standard maintained by the U.S. National Institute of Standards and Technology), and whose timing signal is used as the basis of reference for the control of other clocks in a network.

An interoffice ring should have each node externally timed if BITS clocks are available. All other rings should have one node externally timed (two in some dual homing architectures) and the rest of the nodes line-timed. See 363-206-200, *DDM-2000 Multiplexer Applications, Planning, and Ordering Guide*, for more synchronization information.



(c) External Timing At Both Ends Configuration



(d) External Timing Plesiochronous (BBF2B)

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Figure 5-24. Synchronization Timing Configurations (Sheet 2 of 2)

Table 5-2 summarizes the DDM-2000 OC-3 synchronization modes for the current software releases.

Table 5-2. DDM-2000 OC-3 Synchronization

Application	Linear	Ring
	R8.0/8.1	R9.0/9.1/11.0/11.1
Free-Running	X	X
Line Timing	X	X
External Timing	X	X
DS1 Sync Output	X	X
Synchronization Messaging	X	X
Line Timing from Fn-C	X	X
Automatic Synchronization Reconfiguration	X	X

Synchronization Messaging

SONET synchronization messaging is used to communicate the quality of subnetwork timing, internal timing status, and timing states throughout a subnetwork. Transitions to and from holdover or between OC-N references, for shelf timing, and to and from DS1 AIS, for the DS1 Output, are based on synchronization messages received over the OC-N line from which the DDM-2000 system is extracting timing.

In linear networks with synchronization messaging, the TG circuit pack allows line timing and automatic switching from either of two incoming optical interfaces, main OLIU group or function unit slot C when equipped with an OLIU.

In ring networks with synchronization messaging, the TG circuit pack allows line timing and automatic switching from either of the two ring optical interfaces or function unit C.

The DDM-2000 OC-3 and OC-12 Multiplexers provide a synchronization messaging feature to ensure the integrity of network synchronization during both normal and abnormal conditions. Through the use of synchronization messaging, the current quality of the timing source can be conveyed from one DDM-2000 OC-3 Multiplexer to the next.

This capability allows the DDM-2000 OC-3 and OC-12 Multiplexers to automatically change their timing reference in order to always maintain the highest quality timing available. The capability also allows the DDM-2000 OC-3 and OC-12 Multiplexers to inform a local BITS clock when the DS1 timing output has been degraded and should no longer be used as a reference. This synchronization messaging feature is based on the scheme developed in the *ANSI*^{*} T1X1 standards committee.

Applications

The applications that are currently supported with the synchronization messaging feature can be divided into three categories:

1. DS1 timing output integrity
2. Automatic synchronization reconfiguration
3. Synchronization provisioning integrity.

DS1 Timing Output Integrity

The DS1 timing outputs are typically used to distribute timing from the BITS clock in one office (master) to the BITS clock in the next office (slave), using the SONET transmission facilities between them as the synchronization vehicle. The BITS are typically of stratum 2 or stratum 3 accuracy. The DDM-2000 Multiplexer does not introduce its own internal timing source onto the SONET facility but merely transfers the quality of its timing reference. This ability preserves the required hierarchical structure of the timing network and should be maintained at all times.

If the DDM-2000 Multiplexer at the master office enters holdover due to a disconnected reference cable or a local BITS failure, the quality of the DS1 timing output at the slave office will now be traceable directly to the DDM-2000 Multiplexer. If the master DDM-2000 contains a TGS circuit pack, stratum 3 accuracy will be maintained for the first 24 hours of holdover. After the first 24 hours, the DDM-2000 system could exceed stratum 3 accuracy.

If a DDM-2000 system contains a TGS pack, it may change the output of its derived DS1 under some conditions. If the incoming synchronization message is better than internal clock (IC) the derived DS1 will be an 'all ones' with framing. This format is suitable for providing synchronization to a BITS of stratum 3 accuracy. If the co-located DDM-2000 enters holdover or the incoming synchronization message is IC or worse, the derived DS1 format will change to 'all ones' without framing (AIS). This will prevent a BITS from using this input and force the BITS to either select a new input or enter holdover. This change to AIS preserves the stratum timing hierarchy by allowing the BITS to synchronize from a clock of equal or higher quality.

Available in R11.1 and later is the threshold AIS feature. This feature allows the user to select the value of the incoming message that causes the derived DS1 output to output AIS. This feature will allow stratum 2 BITS clock to receive timing from a TGS without violating stratum timing rules.

* Registered trademark of American National Standards Institute.

As shown in Figure 5-25 (an OC-3 linear application used to explain the concepts of synchronization messaging), the use of SONET synchronization messaging notifies the DDM-2000 OC-3 Multiplexer at the slave site to place AIS on the DS1 timing output. This BITS can then enter holdover or switch to an alternate reference.

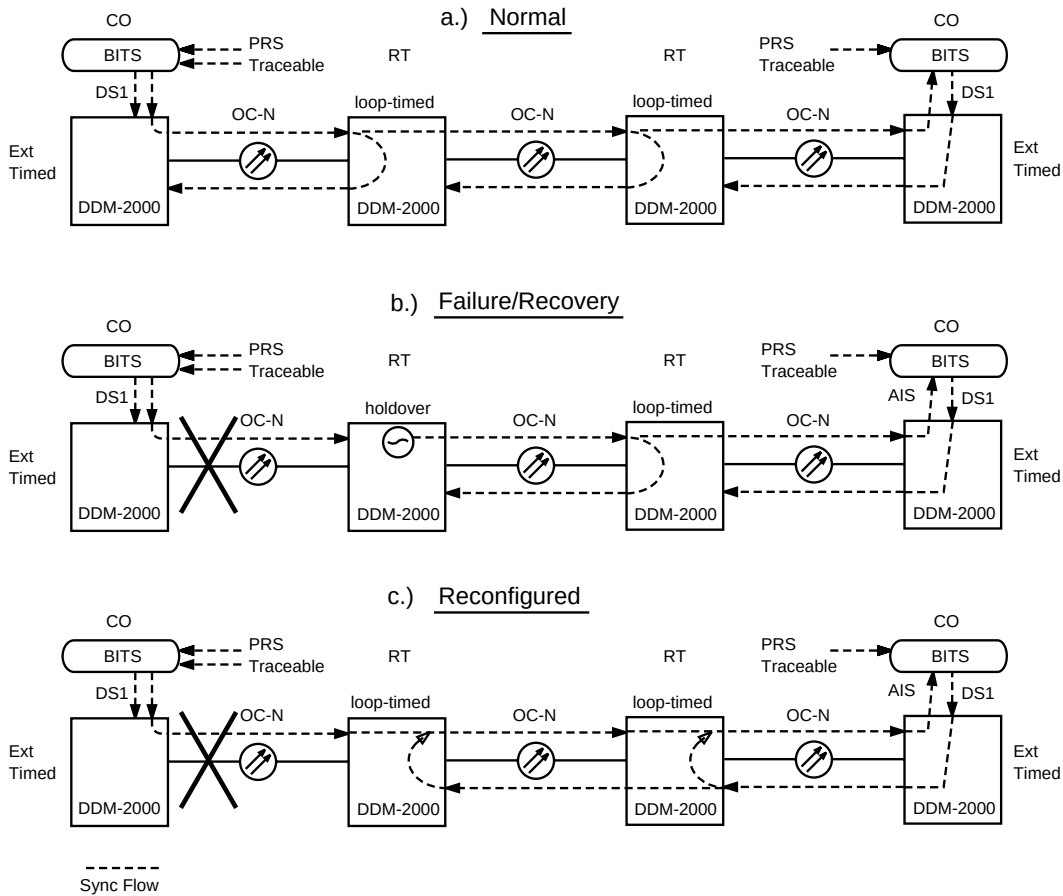


Figure 5-25. DS1 Timing Output — Dual-Homing Linear

Automatic Synchronization Reconfiguration

SONET was designed to operate optimally in a synchronous environment. Although plesiochronous and asynchronous operation can be supported through the use of pointer adjustments, transmission quality is affected by the generation of additional jitter and wander due to pointer adjustments. Because of this, it is desirable to maintain synchronous operation whenever possible. Through the use of synchronization messages, the quality of the different timing references can be made available at each DDM-2000 OC-3 Multiplexer. The DDM-2000 OC-3 Multiplexer shelf can be optioned to determine the best timing reference and switch to it. Through this mechanism, the synchronous operation of the subnetwork can be maintained. The switching of timing references is hitless, and the synchronization messages also allow it to be done without creating timing loops in the process.

In the linear dual-homing network in Figure 5-25(c), normal operation includes an external timing reference at each of the COs. The RT sites are each line-timed from the CO DDM-2000 OC-3 Multiplexers on the left. If a fiber failure occurs between the first two DDM-2000 OC-3 Multiplexers, the automatic synchronization reconfiguration feature will cause the line-timed DDM-2000 OC-3 Multiplexers to change their direction of line timing. This prevents any DDM-2000 OC-3 Multiplexer from operating in holdover for an extended period of time.

Consider the access ring network in Figure 5-26. Under normal operation, the ring has one DDM-2000 OC-3 Multiplexer externally timed and the others line-timed in the counterclockwise direction. If a fiber failure occurs between the first two DDM-2000 OC-3 Multiplexers, the automatic synchronization reconfiguration feature will cause the DDM-2000 OC-3 Multiplexers to change their line timing directions to clockwise. The result is that the ring is again operating synchronously. The ring already provides self-healing restoration of the traffic, so it is especially important to maintain synchronous operation during this type of failure to prevent service degradation due to increased jitter and wander.

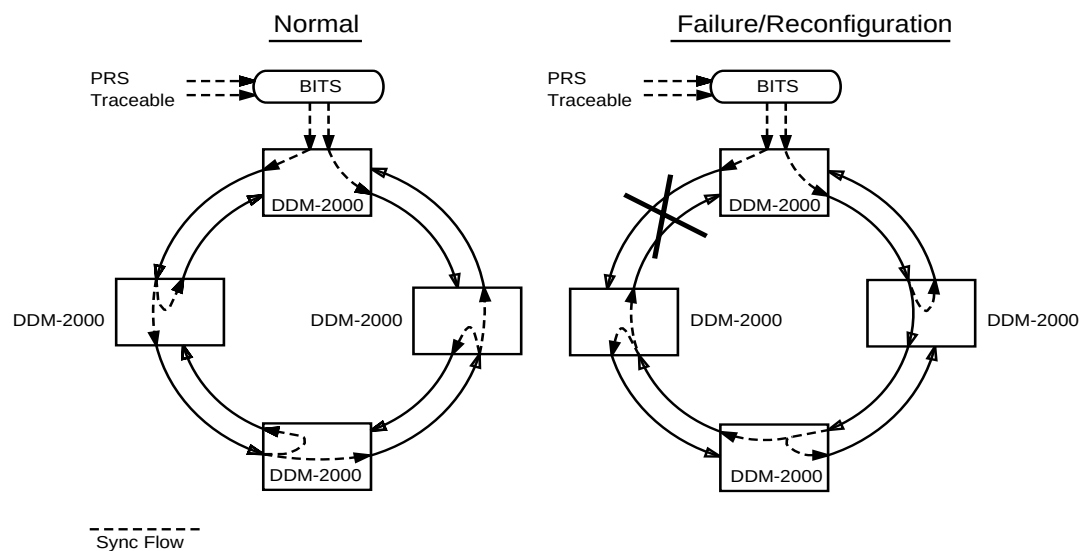


Figure 5-26. Synchronization Reconfiguration — Access Ring

Synchronization Provisioning Integrity

A welcomed side feature of synchronization messaging is that it helps prevent provisioning errors. Provisioned timing loops on the DDM-2000 OC-3 Multiplexers will be quickly detected through the synchronization messaging algorithm and prevented by forcing a shelf into holdover. The system can then be reprovisioned correctly.

Feature Details and Options

As mentioned previously, SONET synchronization messaging is used to communicate the quality of the subnetwork timing throughout the subnetwork. This is done using bits 1-3 of the K2 byte found in the SONET overhead. In OC-3 Release 9.1 and later releases, synchronization messaging can also be done using bits 5-8 of the S1 byte in the SONET overhead (not supported on OC-1 links). If a DDM-2000 OC-3 system is deriving timing from a given OC-N interface and synchronization messaging is enabled on that interface (Kbyte messages and Sbyte messages in OC-3 Release 9.1 and later are provisioned using the **set -ocn** command), the system interprets the received message to determine its internal timing status. The system also determines the state of the DS1 output, if the DS1 output is enabled. The DDM-2000 OC-3 system also transmits over the particular OC-N interface and all other OC-N interfaces that are enabled for synchronization messaging, the appropriate message indicating the quality of its timing, and its active timing mode. Table 5-3 and Table 5-4 list the associated internal timing status and DS1 output states that are associated with synchronization messages received from the OC-N interface when synchronization messaging is enabled. The tables list the messages from low- to high-quality.

Table 5-3. Synchronization Messages using K2 Byte

Received Message	Active Timing Mode *	Default DS1 Output State	Quality Level
Don't Use	Holdover	AIS	7
Timing Looped Back (TLB)	Holdover	AIS	7
Stratum 4 †	Holdover	AIS	6
Internal Clock (IC)	OK to use	AIS	5
Stratum 3 †	OK to use	Good	4
Stratum 2 †	OK to use	Good	3
Sync Quality Unknown (SQU)	OK to use	Good	2
Stratum 1 †	OK to use	Good	1

* This column applies only when provisioned for line-timing mode.

† Presently, DDM-2000 OC-3 Multiplexers cannot generate these messages, but they could be retransmitted and supported for auto-reconfiguration if any of these are received by a DDM-2000 OC-3 Multiplexer.

Table 5-4. Synchronization Messages using S1 Byte*

Received Message	Active Timing Mode †	Default DS1 Output State	Quality Level
Don't Use	Holdover	AIS	7
Traceable SONET minimum Clock	OK to use	AIS	5
Traceable Stratum 3 ‡	OK to use	Good	4
Traceable Stratum 2 ‡	OK to use	Good	3
Sync Trace Unknown	OK to use	Good	2
PRS Traceable ‡	OK to use	Good	1

* S1 byte not supported on OC-1 links.

† This column applies only when provisioned for line-timing mode.

‡ Presently, DDM-2000 OC-3 Multiplexers cannot generate these messages, but they could be retransmitted and supported for autoreconfiguration if any of these are received by a DDM-2000 OC-3 Multiplexer.

Synchronization messaging using the SONET K2 byte and S1 byte can be disabled on a per OC-N interface using the **set-ocn** command (not supported by OC-1). Zeros will be transmitted on bits 1-3 of the K2 byte if this is done; all ones will be transmitted on bits 5-8 of the S1 byte if this is done. The timing and synchronization status of a shelf can be determined using the **rtrv-sync** command.

The "Don't Use" message is sent when the system determines that its timing is not suitable for synchronization; for example, due to failure.

When the DDM-2000 OC-3 system is configured for external timing and its DS1 output port is provisioned for MULT mode, the message Sync Quality Unknown (SQU) for K byte, or Sync Trace Unknown (STU) for S byte, is sent on all the OC-N interfaces where synchronization messaging is provisioned. When the capability of communicating with a BITS clock over the DS1 overhead exists, the quality of the reference signal will be transmitted instead; for example, Stratum 1.

When the DDM-2000 OC-3 system is configured for external timing and its DS1 output port is provisioned for SYNC OUT mode, the Timing Looped Back (TLB) message for K byte, or "Don't Use" message for S byte, will be sent on the OC-N interfaces towards the NE from which the DS1 timing output is being derived. The SQU message for K byte or STU for S byte will be sent on all other OC-N interfaces where synchronization messaging is provisioned. If the DS1 output is generating AIS while the system is configured in this way, the message SQU for K byte, or STU for S byte, will be transmitted on all OC-N interfaces.

When the DDM-2000 OC-3 system is configured for free run or is in holdover mode, the Internal Clock message for K byte or Traceable SONET Clk for S byte

will be sent on all OC-N interfaces where synchronization messaging is provisioned.

When the DDM-2000 OC-3 system is configured for line timing, the TLB message for K byte and "Don't Use" for S byte will be sent on the OC-N interfaces towards the NE from which the timing is being derived. The message received on the OC-N interface will be sent on all other OC-N interfaces where synchronization messaging is provisioned.

With automatic synchronization reconfiguration, the DDM-2000 OC-3 Multiplexer systems use and compare the incoming synchronization messages on the OC-N interfaces available for line timing to select the highest quality synchronization reference available. If the received quality levels are the same on the references available for timing, the existing line timing reference take precedence. This feature guarantees the non-revertive operation of reconfiguration. The line timing reference is provisioned by the **set - sync** command.

The existence of automatic synchronization reconfiguration does not change the system's behavior on traditional line failures; for example, LOF, LOP, LOS, and others.

There are synchronization references in the DDM-2000 OC-3 system that can be provisioned as network timing sources but are not considered as timing sources for automatic synchronization reconfiguration. Examples of these are the linear extensions off of a DDM-2000 OC-3 ring. This type of interface is considered a linear interface, and the system treats it as such with regards to synchronization.

Table 5-5 lists the synchronization references available on DDM-2000 OC-3 and OC-12 system topologies.

Table 5-5. Available Synchronization References

System	Manually Provisionable	Automatically Reconfigurable
OC-3 Linear	Main, Fn-C	Main, Fn-C
OC-3 Rings	Main-1, Main-2, Fn-C	Main-1, Main-2, Fn-C
OC-12 Linear	Main-B	Not applicable
OC-12 Rings	Main-B-1, Main-B-2	Main-B-1, Main-B-2

Function unit C, when equipped with an OC-3/IS-3 OLIU, can be selected as an option for automatic synchronization reconfiguration. This is useful in DRI networks where an OC-3 ring is connected through an OC-3/IS-3 optical interface to an OC-12 or FT-2000 OC-48 Lightwave System ring.

In OC-3 Release 9.1 and later ring releases, the sending of DS1 AIS on the output of the BBF2B circuit pack can be provisioned by using the **set - sync** command. Depending on the quality level of the incoming sync messages, this new parameter can be provisioned to send DS1 AIS upon receiving level 5 (default), level 4, level 3, or level 2. Refer to Table 5-3 and Table 5-4 for definitions of quality levels. AIS will be sent as long as the received message is at the provisioned or greater in quality level number.

Examples

In this part, some detailed examples are given to show specifically how the synchronization messages propagate through the DDM-2000 OC-3 network and assist in the recovery from a fiber failure. Through these examples, one can extend the same concept to any other network that may include different topologies, number of sites, failure locations, and number of BITS clocks.



NOTE:

All nodes in a ring using automatic synchronization reconfiguration must have the synchronization messaging and automatic synchronization reconfiguration features enabled to prevent alarms.

In all of the following examples, if the sync message parameter within the **set - oc3** command has been provisioned to "S byte" for an optical interface, then the equivalent S byte message will be transmitted from that optical interface. The following are equivalent messages:

K2: Sync Quality Unknown is the same as, S1: Sync Trace Unknown

K2: Timing Looped Back is the same as, S1: Don't Use

K2: Internal Clock is the same as, S1: Traceable SONET minimum Clock

K2: Stratum 3 is the same as, S1: Traceable Stratum 3.

Synchronization Reconfiguration Using an Externally Timed Access Ring

Figure 5-27(a) shows an externally timed access ring operating in its normal configuration. The DDM-2000 OC-3/OC-12 Multiplexer at the CO (Site A) is externally timed from a BITS clock referenced to a PRS traceable source (host node). The remaining DDM-2000 OC-3/OC-12 Multiplexers are externally timed from a BITS clock referenced to a derived DS1. The SQU message is sent to indicate where timing is traceable to an external BITS and where it is valid to be used.

Automatic synchronization reconfiguration is not an option for externally timed DDM-2000 OC-3/OC-12 Multiplexers; therefore, a change in the synchronization message will not cause an automatic synchronization reconfiguration.

The stratum level of the BITS clock at the CO (Site A) must be equal to or better (more accurate) than the stratum level of the BITS clocks used at the other sites. This is necessary to maintain the stratum level hierarchy.

a) Synchronization Reconfiguration Example (Before Failure)

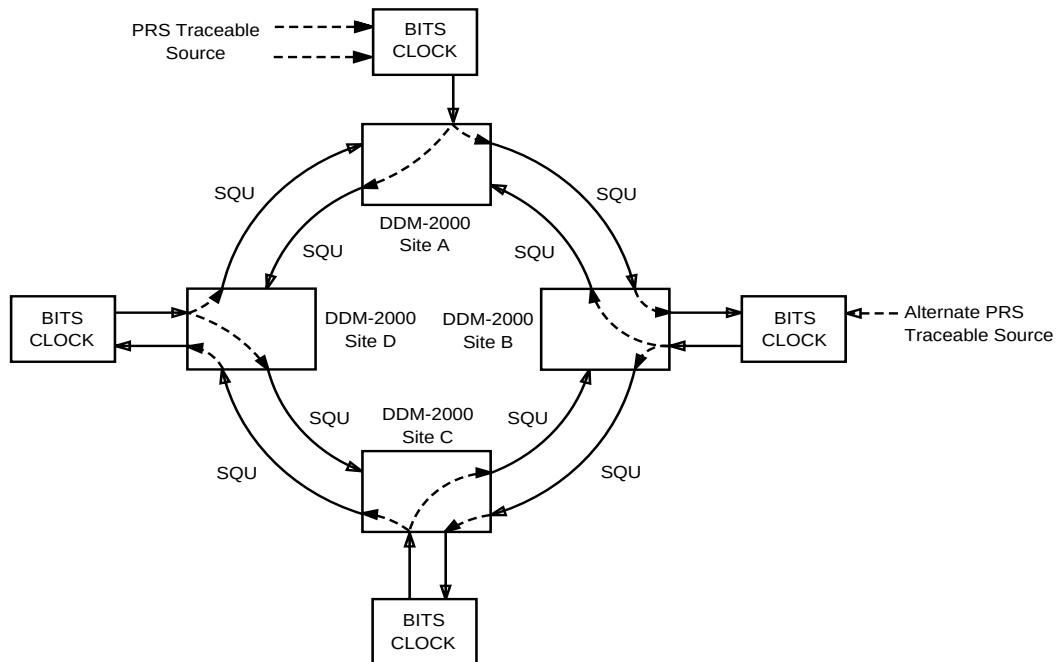


Figure 5-27. Synchronization Reconfiguration — Externally Timed Access Ring
(Sheet 1 of 2)

In Figure 5-27(b), a fiber has been cut between sites A and B. Immediately the DDM-2000 OC-3/OC-12 Multiplexer at site B changes the format of its derived DS1 to AIS. This forces the BITS clock at site B to enter holdover or switch input source (if a valid one is available). Because automatic synchronization reconfiguration is not available, the synchronization status messages are not used. All other non-host nodes will track the holdover clock at site B. Although no timing loops have been formed, the timing of all non-host nodes will differ from the host node by the accuracy of the holdover clock at site B.

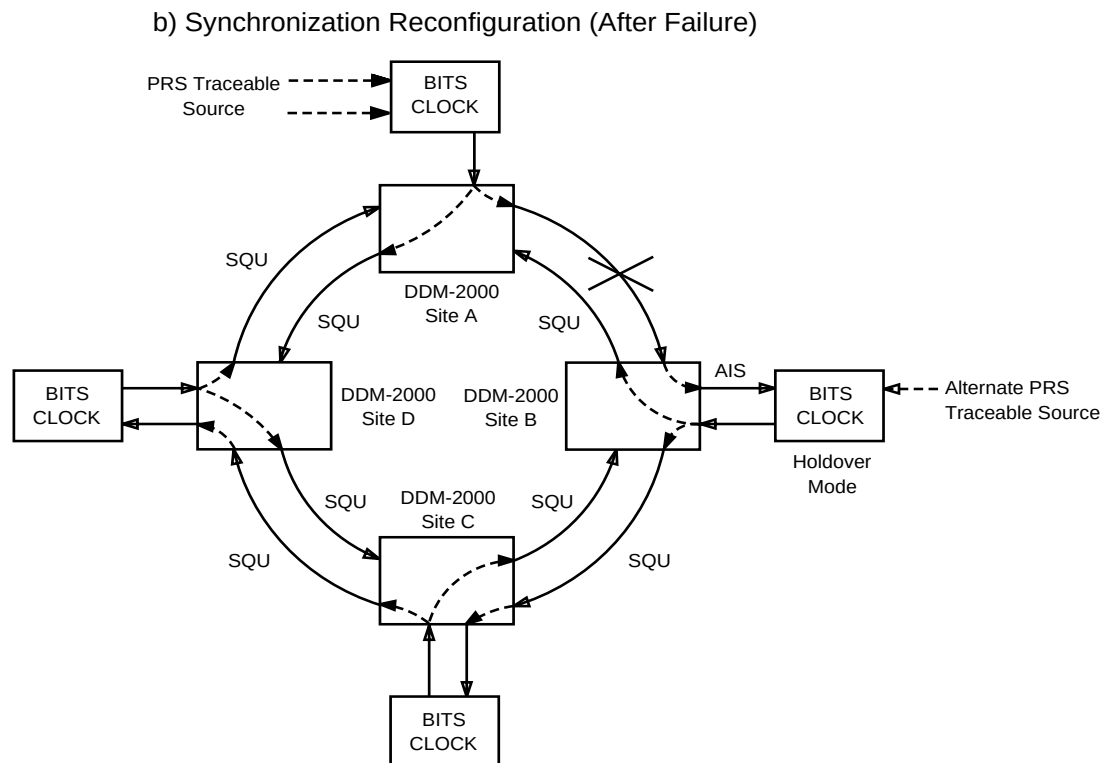


Figure 5-27. Synchronization Reconfiguration — Externally Timed Access Ring
(Sheet 2 of 2)

Synchronization Reconfiguration in an Access Ring

Figure 5-28(a) shows the access ring operating in its normal configuration. The DDM-2000 OC-3 Multiplexer at the CO is externally timed, and each of the other DDM-2000 OC-3 Multiplexers are line-timed in a counterclockwise direction. The SQU message is sent to indicate where timing is traceable to an external BITS and where it is valid to be used. The TLB message is sent on the interface that is being used as the line timing reference and, thus, where using that timing would create a timing loop. Synchronization messaging and automatic synchronization have both been enabled for this network.

In Figure 5-28(b), a fiber has been cut between sites A and B. Immediately, the DDM-2000 OC-3 Multiplexer at site B enters holdover and sends out the internal clock (IC) message to site C. The DDM-2000 OC-3 Multiplexer at site B cannot switch to line time from site C because it is receiving the TLB message on that interface.

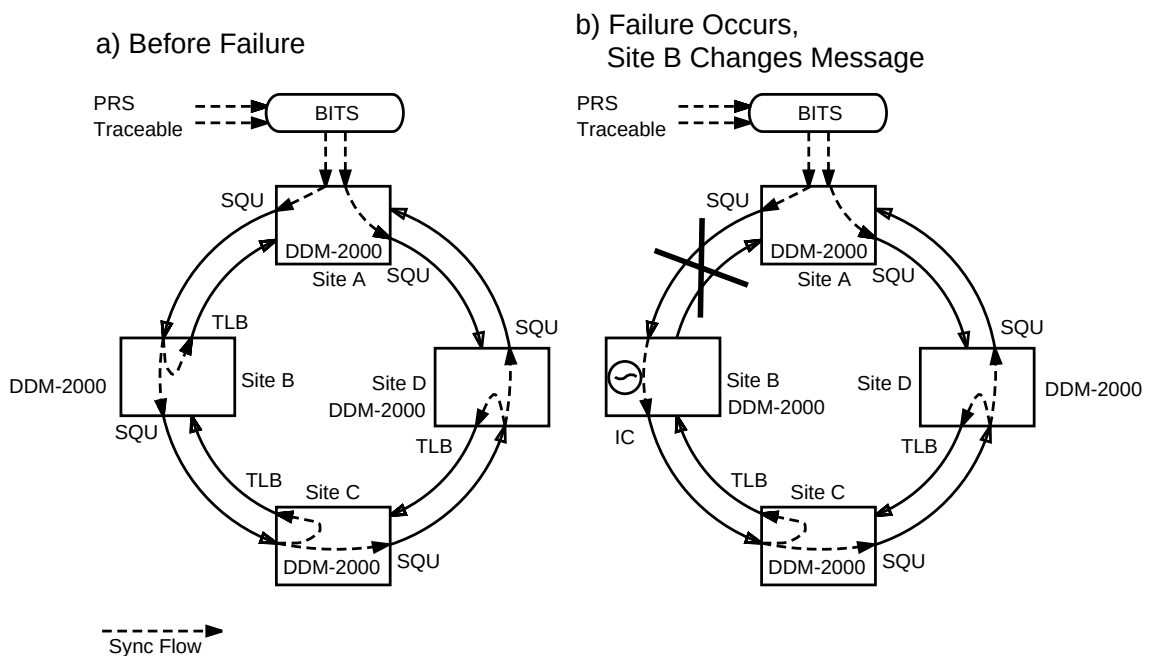


Figure 5-28. Synchronization Reconfiguration — Access Ring (Sheet 1 of 3)

In Figure 5-28(c), the DDM-2000 OC-3 Multiplexer at site C detects the incoming IC message and sends out the IC message to site D. The DDM-2000 OC-3 Multiplexer at site C cannot switch to line time from the other rotation because it is receiving the TLB message on that interface.

In Figure 5-28(d), the DDM-2000 OC-3 Multiplexer at site D detects the incoming IC message. Because this DDM-2000 OC-3 Multiplexer is receiving the SQU message from site A, it will switch to line time from site A because SQU is higher quality than IC. After the switch occurs, the TLB message is sent back to site A and the SQU message is retransmitted to site C.

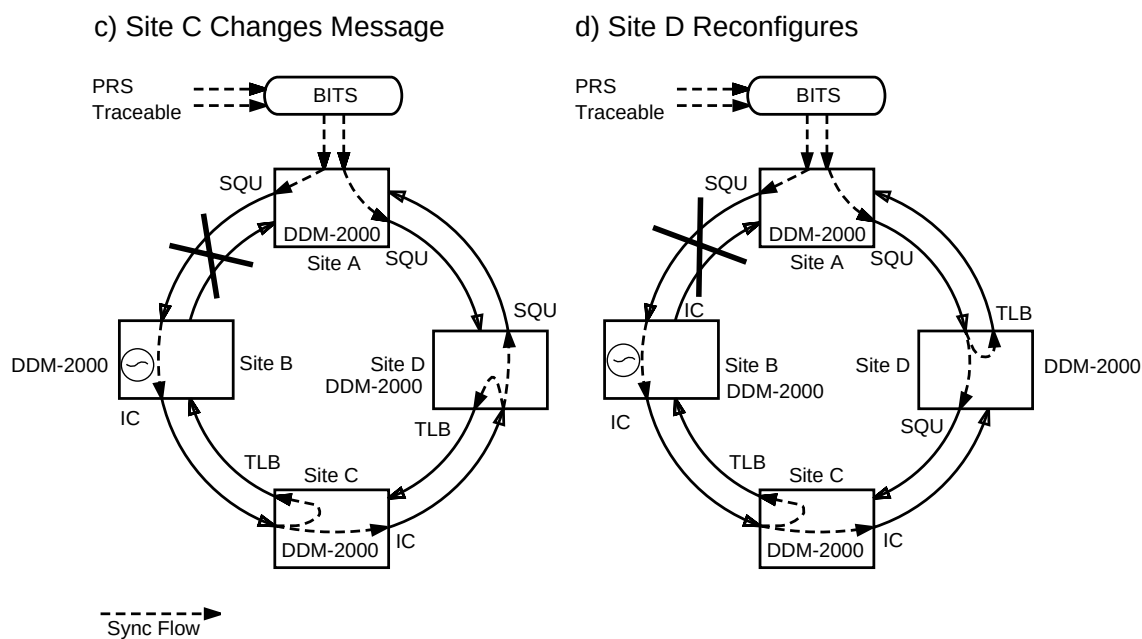


Figure 5-28. Synchronization Reconfiguration — Access Ring (Sheet 2 of 3)

In Figure 5-28(e), the DDM-2000 OC-3 Multiplexer at site C detects the incoming SQU message from site D. The SQU message is a better quality message than the IC message being received from site B, so the DDM-2000 OC-3 Multiplexer at site C switches to line time from site D. After the switch occurs, the TLB message is sent back to site D, and the SQU message is retransmitted to site B.

In Figure 5-28(f), the DDM-2000 OC-3 Multiplexer at site B detects the incoming SQU message from site C. The SQU message is a better quality message than the internal holdover capability, so the DDM-2000 OC-3 Multiplexer at site B switches to line time from site C. After the switch occurs, the TLB message is sent back to site C, and the SQU message is forwarded to site A. When the failure clears, the synchronization remains in the new configuration unless it is manually switched back.

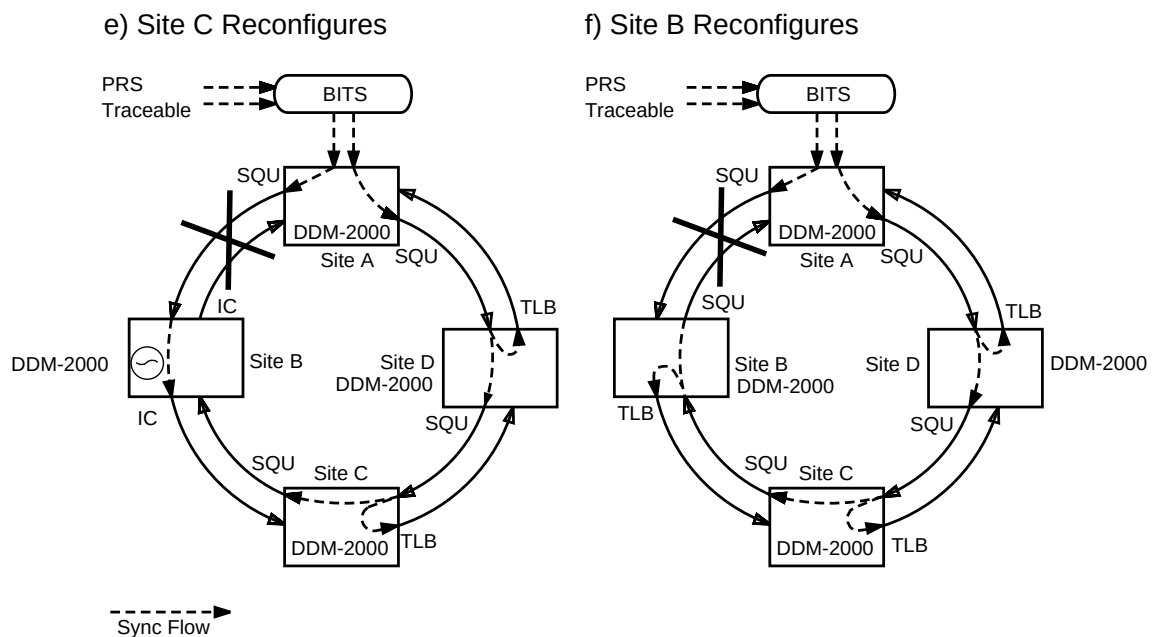


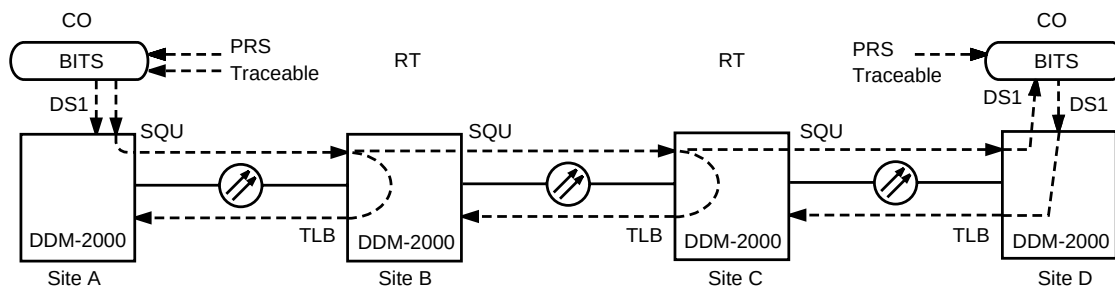
Figure 5-28. Synchronization Reconfiguration — Access Ring (Sheet 3 of 3)

Synchronization Messaging to Support DS1 Timing Outputs

Figure 5-29(a) (an OC-3 liner application used to explain the concepts of synchronization messaging) shows a dual homing linear network operating in its normal configuration. The DDM-2000 OC-3 Multiplexer at site A is externally timed, and the DDM-2000 OC-3 Multiplexers at sites B and C are line-timed from site A. The DDM-2000 OC-3 Multiplexer at site D is also externally timed from another BITS. Both BITS should be PRS traceable. The SQU message is sent to indicate where timing is traceable to an external BITS and where it is valid to be used. The TLB message is sent to indicate where line timing has been used and, thus, where using that timing would create a timing loop. Synchronization messaging has been enabled for this network, but automatic synchronization reconfiguration has not been enabled.

In Figure 5-29(b), a fiber has been cut between sites A and B. Immediately, the DDM-2000 OC-3 Multiplexer at site B enters holdover and sends out the IC message to site C. Synchronization messaging has been enabled for this network, but automatic synchronization reconfiguration has not been enabled.

a) Before Failure



b) After Failure, Site B Changes Message

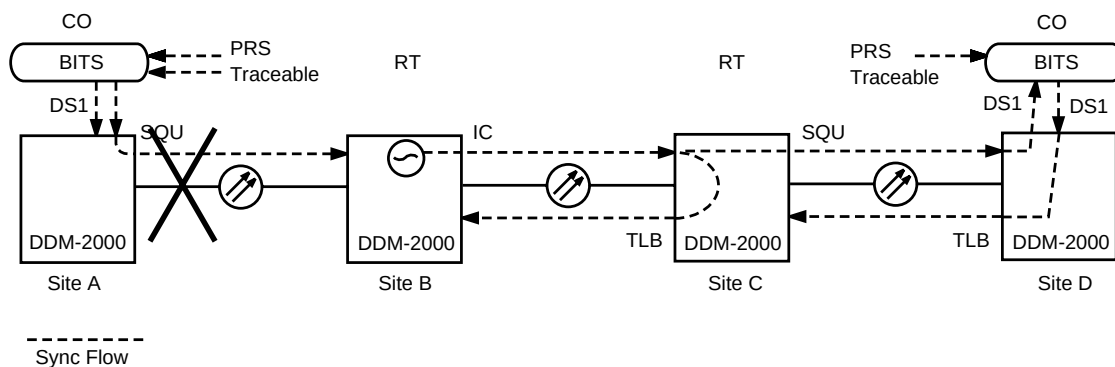


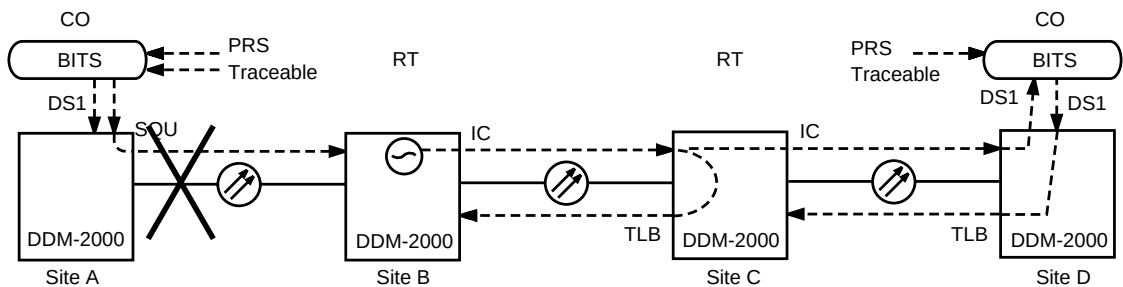
Figure 5-29. DS1 Timing Output with Fiber Failure (Sheet 1 of 2)

In Figure 5-29(c), the DDM-2000 OC-3 Multiplexer at site C detects the incoming IC message from site B and forwards it on to site D.

In Figure 5-29(d), the DDM-2000 OC-3 Multiplexer at site D detects the incoming IC message from site C and sends out AIS to the BITS. The BITS will either switch to an alternate reference, if available, or enter holdover.

If the automatic synchronization reconfiguration feature had been enabled in this example, at this point, sites C and B would attempt to switch line timing directions to retune from site D.

c) Site C Changes Message



d) Site D Changes Message

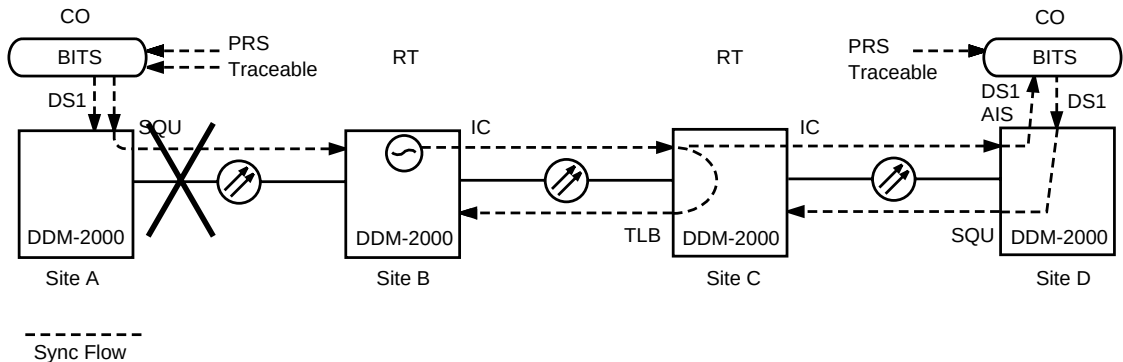


Figure 5-29. DS1 Timing Output with Fiber Failure (Sheet 2 of 2)

Dual-Homing DRI Synchronization Configurations

OC-3 and FT-2000 OC-48 Lightwave System

Figure 5-30 shows how OC-N timing can be distributed from an FT-2000 OC-48 Lightwave System line-switched ring to a DDM-2000 OC-3 path-switched ring using a dual-homing DRI configuration. The OC-3 DRI nodes are connected via OC-3 point-to-point links terminating in function unit C slots. The major characteristics of this configuration are:

- The FT-2000 OC-48 Lightwave System nodes are through-timed and derive timing from different rotations of the OC-48 ring.
- The FT-2000 OC-48 Lightwave System must be provisioned to write stratum 3 synchronization message to the K2 byte so the DDM-2000 ring can use synchronization messaging.
- The two DDM-2000 OC-3 DRI nodes coordinate timing using synchronization status messages on the OC-3 ring so that all nodes will accept timing in the same direction.
- The two DDM-2000 OC-3 DRI nodes must be provisioned for line-timing with timing derived from function unit C. Synchronization messaging on the OC-3 span between the two OC-3 DRI nodes must be disabled so timing loops are not formed. Synchronization messaging and automatic synchronization reconfiguration should be enabled on all other OC-3 interfaces on the DRI nodes.
- All other OC-3 nodes must be provisioned for line-timing with synchronization messaging and automatic synchronization reconfiguration enabled.

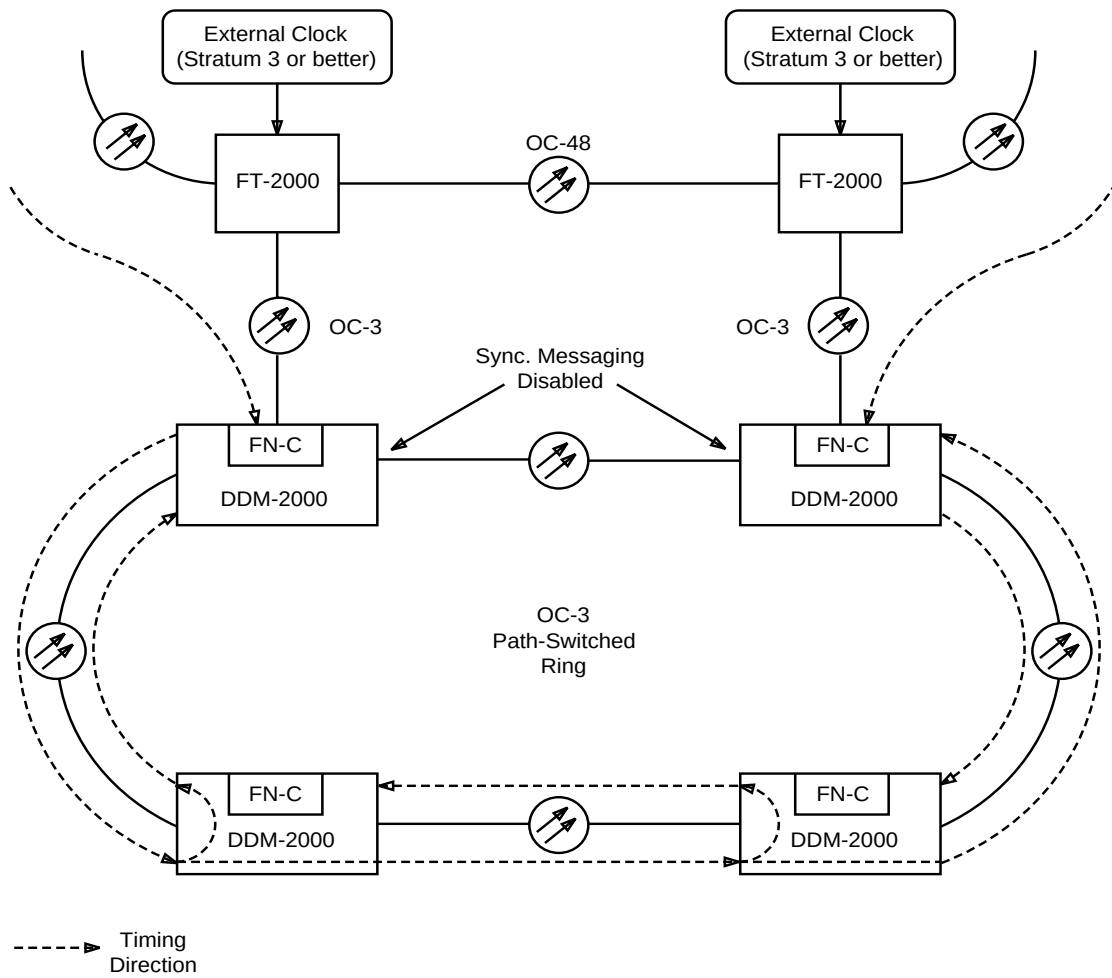


Figure 5-30. OC-3 and FT-2000 OC-48 Lightwave System Dual-Homing DRI Configuration

OC-3 and OC-12

Figure 5-31 shows how timing can be distributed from an OC-12 line-switched ring to a DDM-2000 OC-3 path-switched ring using a dual-homing DRI configuration. The OC-3 DRI nodes are connected via OC-3 point-to-point links terminating in function unit C slots. The major characteristics of this configuration are:

- The OC-12 nodes are externally timed
- The two DDM-2000 OC-3 DRI nodes coordinate timing using synchronization status messages on the OC-3 ring so that all nodes will accept timing in the same direction.
- The two DDM-2000 OC-3 DRI nodes must be provisioned for line-timing with timing derived from function unit C. Synchronization messaging on the OC-3 span between the two OC-3 DRI nodes must be disabled so timing loops are not formed. Synchronization messaging and automatic synchronization reconfiguration should be enabled on all other OC-3 interfaces on the DRI nodes.
- All other OC-3 nodes must be provisioned for line-timing with synchronization messaging and automatic synchronization reconfiguration enabled.

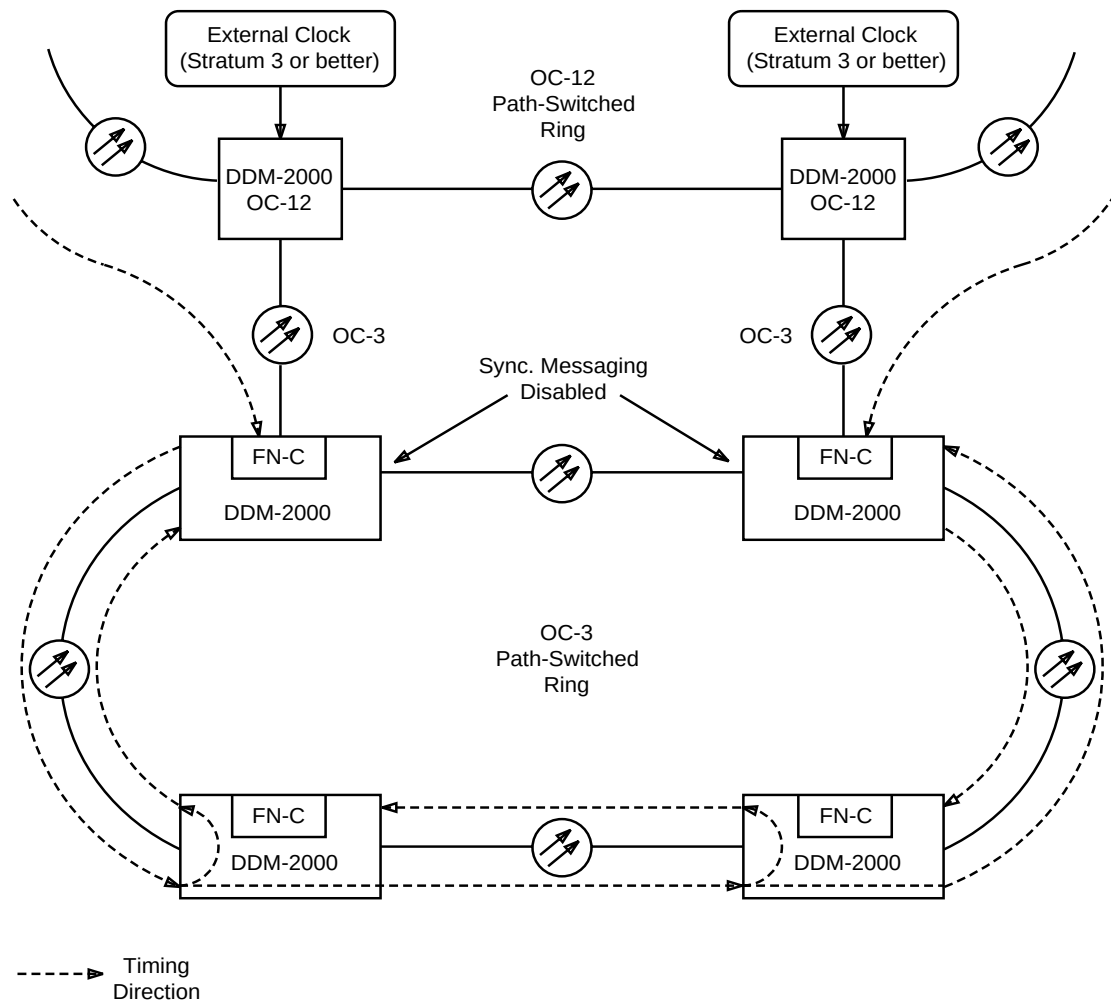


Figure 5-31. OC-3 and OC-12 Dual-Homing DRI Configuration

OC-3 and OC-1 External/Line Timing

The external/line-timing configuration (shown in Figure 5-32) integrates loop feeder and customer location networks into the digital synchronization network as required by the SONET standard. This application is ideal for networks where only one location has a BITS; for example, a loop feeder. The network is synchronized to a local CO clock via DS1 references. The local office clock should be stratum 3 or better, with timing traceable to a primary reference source. The local DDM-2000 OC-3 Multiplexer times its transmitted signals at the low- and high-speed interfaces from the internal oscillator that is locked on the external reference. The remote DDM-2000 FiberReach Multiplexer recovers timing from the incoming OC-N signal and unidirectional timing path and uses this timing for its transmitted signals.

This timing configuration is also recommended for multispan topologies. Line timing can be extended to many DDM-2000 sites without any degradation of timing quality. In the ring topology, synchronization messaging allows automatic synchronization reconfiguration in the event of a fiber or equipment failure. See 363-206-301, *DDM-2000 FiberReach Multiplexer Wideband Shelf User/Service Manual*, for more OC-1 timing configurations.

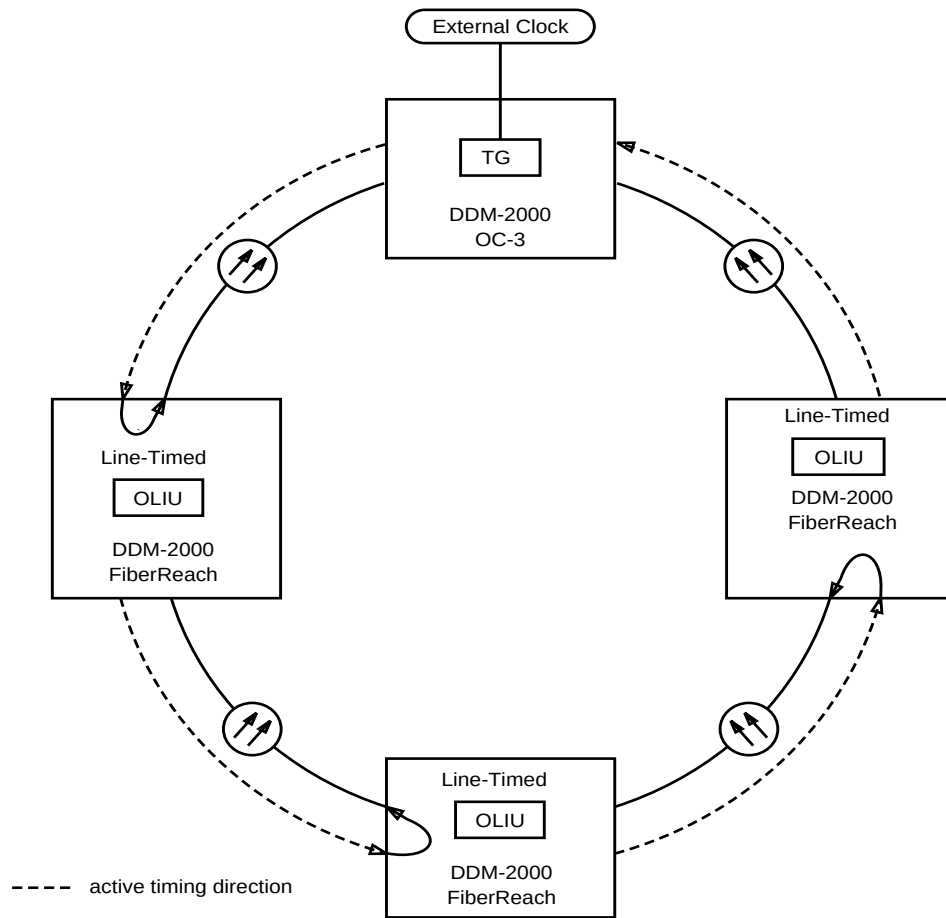


Figure 5-32. OC-3 and OC-1 External/Line Timing

Network Timing Distribution

DS1 signals have long been used to pass timing information through the network synchronization hierarchy. These DS1 timing references should be transmitted between master and slave clock sources over the most reliable facilities available. In some cases, these DS1 signals also carry traffic. The facility of choice has evolved from T-carrier through asynchronous lightwave systems to SONET lightwave systems. As these systems are upgraded to SONET systems, timing distribution plans should be revisited to ensure the quality of the timing signals are not degraded. With proper planning, SONET can be used to improve the overall quality of the network timing.

Interoffice Timing Distribution

One way SONET can be used to improve the quality of interoffice network timing is through the use of OC-N timing distribution. DDM-2000 OC-3 supports the evolution to interoffice OC-N timing distribution by providing a DS1 timing output derived from the incoming OC-N signal. The DS1 timing output is traceable to the clock source that times the DDM-2000 OC-3 subnetwork and has extremely low jitter and wander. This is true regardless of the number of DDM-2000 OC-3 systems connected in the network. This DS1 can be fed to the local BITS clock which subsequently times the local DDM-2000 OC-3 and the other equipment in the office. If a BITS clock is not available in the office, the DS1 timing output can be used to time other equipment (including another DDM-2000 OC-3) directly. DDM-2000 OC-3 can provide DS1 timing outputs in all supported topologies (for example, point-to-point, add/drop, and ring).

With OC-N timing distribution, the OC-N line signal, rather than a DS1 multiplexed into the SONET payload, will provide a timing transport mechanism better suited to a complex, heavily interconnected SONET network. In this configuration, a DS1 reference from the CO BITS clock still times the OC-N transmitted to the remote site. At the remote site, a DS1 output reference is created directly from the received OC-N signal (Figure 5-33).

The stratum level of the BITS clock at the CO must be equal to or better (more accurate) than the stratum level of the BITS clocks used at the RT site. This is necessary to maintain the stratum level hierarchy.

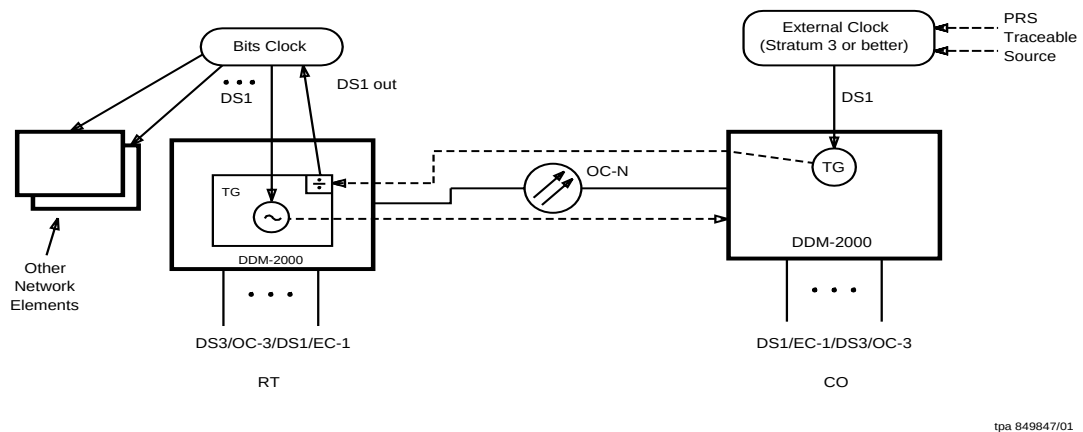


Figure 5-33. OC-N Derived DS1 Timing Reference

OC-N timing distribution has several potential advantages. It preserves transport bandwidth for customer services and guarantees a high-quality timing signal. Also, as the CO architecture evolves to replace DSX interconnects with SONET EC-1 and IS-3 interconnects and direct OC-N interfaces, OC-N distribution becomes more efficient than multiplexing DS1 references into an access facility in the CO.

A previous drawback to using OC-N timing distribution was that network timing failures could not be communicated to downstream clocks via DS1 AIS, since the DS1 signal does not pass over the OC-N interface. With synchronization messaging, clock stratum levels can be passed from NE to NE, allowing downstream clocks to switch timing references without creating timing loops, if a network synchronization failure occurs. If a quality timing reference is no longer available, the DDM-2000 OC-3 sends AIS over the DS1 interface. If the local OC-N lines fail, DDM-2000 OC-3 outputs AIS on the DS1 output or an upstream DDM-2000 OC-3 system enters holdover.

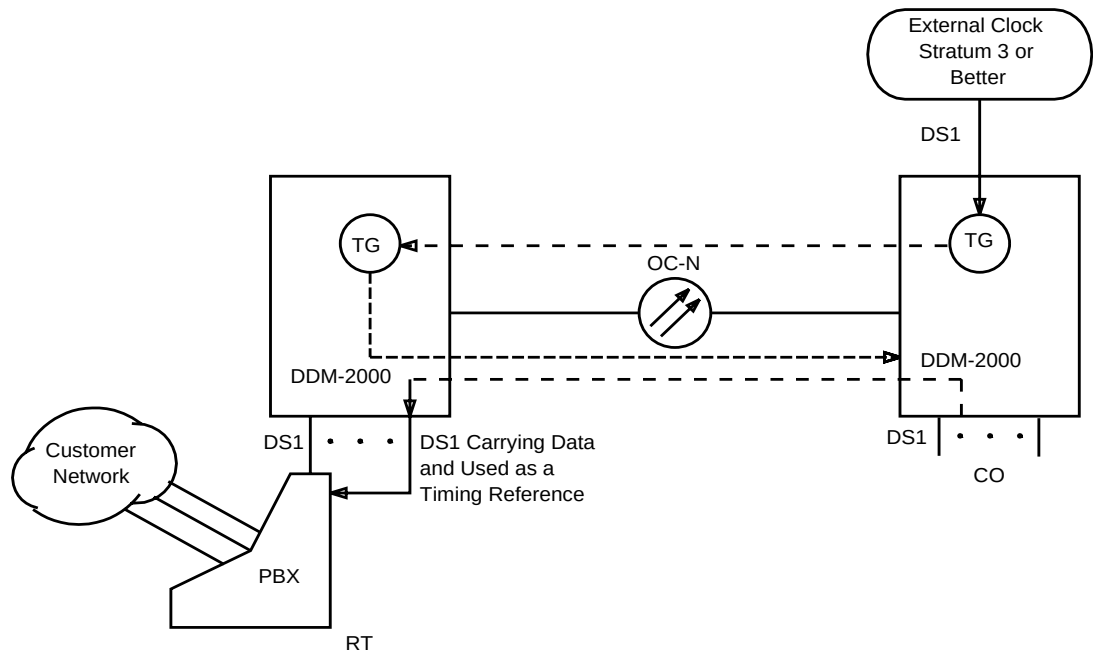
Access Network Timing Distribution

OC-N timing distribution can also be used in access networks or to small COs. In this configuration, a DS1 reference from the CO BITS clock still times the OC-N transmitted to the remote site. The line-timing capability of the DDM-2000 OC-3 Multiplexers provides the ability to recover OC-N timing. The DS1 timing output feature can be used to also extend timing to customer networks or remote sites. In this case, the DS1 timing output can be used to time switch remotes, DDM-2000 OC-3 and OC-12 shelves, or other local equipment directly. Ideally, the equipment can provide an external timing reference. Otherwise, the signal must be input to a traffic DS1 port on the external equipment which will tie up some of this equipment's bandwidth. In this configuration, it is important that the DS1 reference to the DDM-2000 OC-3 in the CO be traceable to the same clock used to source the DS1s being carried to the customer site or small CO. If it is not, slips may occur.

Although an ideal source of timing, OC-N timing distribution, via a DS1 timing output, cannot be used to provide timing in all applications. In cases where the local equipment is not provided with an external timing reference input, or in some private networks where the timing is to be distributed from another private network location, timing may be distributed via traffic-carrying DS1s. In these applications, a stable DS1 timing source can be achieved by ensuring that all elements in the SONET network are directly traceable to a single master clock via line-timing. In this environment, the high-performance desynchronizer design of the DDM-2000 OC-3 Multiplexer allows a DS1 timing reference to be carried as a multiplexed DS1 payload*.

It is recommended that, where possible, the DS1 sources (switch, PBX, or other equipment) be traceable to the same timing source used to time the DDM-2000 OC-3 SONET network. Multiplexed DS1 reference transport is also consistent with current planning and administration methods. Applications include passing synchronization from the public switched network to a PBX-based private network (Figure 5-34) and synchronizing an end-office remote switch to a larger office's host switch.

* Synchronous operation via line-timing eliminates the generation of VT pointer adjustments, thus maintaining the phase stability needed for a high-quality DS1 timing reference. Cross-connecting at the STS-1 level also eliminates the VT pointer adjustments. While the design of the DDM-2000 OC-3 Multiplexer maintains jitter/wander within standard DS1 interface requirements, even in the presence of VT pointer adjustments, and while the DS1 is likely to be stable enough for most equipment to use as a timing reference, some equipment may have more stringent stability requirements for its timing references.



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Figure 5-34. Timing from Multiplexed DS1

Table of Contents

Overview	6-1
Craft Interface Terminals (CIT)	6-2
■ Local Access	6-4
■ Using a PC as a CIT	6-6
■ Modem Access	6-6
■ Remote Access Using the Data Communications Channel (DCC)	6-7
■ CPro-2000 Graphical User Interface and Provisioning Tool	6-8
User Panel	6-8
■ User Panel LEDs	6-10
■ FE SEL Pushbutton	6-10
■ ACO/TST Pushbutton	6-11
■ UPD/INIT Pushbutton	6-11
■ Pushbutton Combinations	6-12
Equipment Indicators	6-13
■ FAULT Indicators	6-13
■ ACTIVE Indicators	6-13
Office Alarms	6-14
TL1/X.25 Interface	6-15
■ ITM SNC	6-15
Serial Telemetry (TBOS)	6-16
■ TBOS Display Tables	6-17
TBOS Alarm and Status Points	6-18
DDM-2000 OC-3 TBOS Control Points	6-21

Table of Contents

Parallel Telemetry	6-25
User-Definable Miscellaneous Discretes— Environmental Alarms and Controls	6-27
Order Wire	6-30

Overview

This section presents the operations interfaces that support technician and provisioning access to the DDM-2000 OC-3 Multiplexer and allow alarms and status information generated by the system to be reported.

Operations interfaces include:

- Two EIA-232-D craft interface terminal (CIT) interfaces
- User panel controls and indicators
- Equipment status indicators
- Office alarms
- TL1/X.25 interface to an alarm surveillance OS, such as Bellcore's Network Monitoring and Analysis (NMA), Operations Systems/Intelligent Network Elements (OPS/INE), and Lucent Technologies ITM SNC (Integrated Transport Management SubNetwork Controller)
- Serial telemetry (TBOS)
- Parallel telemetry
- User definable miscellaneous discrete environmental alarms and controls
- Order wire.

Complete detailed information on the OS interfaces is provided in 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

Craft Interface Terminals (CIT)

The DDM-2000 OC-3 Multiplexer supports three types of access mechanisms through the CIT that can be supported simultaneously.

- Local access
- Remote access via a modem port
- Remote access via the data communications channel (DCC).

A CIT is recommended for installation, maintenance, and administrative activities. The CIT can be either an RS-232-D terminal or personal computer (PC). An *MS-DOS** PC is required for software download and to run CPro-2000 software. Any PC may function as a CIT when loaded with a commercially-available terminal emulation program. See Section 10, "Technical Specifications," for PC specifications.

Table 6-1 lists some of the terminals and PCs that can be used with the CIT interface. Note that some terminals and PCs may no longer be commercially available but can still be used.

* Registered trademark of Microsoft Corporation.

Table 6-1. Craft Interface Terminals

AT&T 610 terminal	DEC§ VT100 terminal
AT&T 615 terminal	ADM 5A terminal
AT&T 630 terminal	HP¶ 2621 terminal
AT&T 730 terminal	HP 2623 terminal
AT&T 5425 terminal†	HP 110 computer**
AT&T 6286 WGS computer‡	IBM†† XT computer
AT&T 6312 WGS computer‡	Toshiba‡‡ T1000 computer
AT&T 6386 WGS computer‡	Toshiba T12000 computer
AT&T 6300 computer‡	AT&T 6300 Plus computer‡
AT&T <i>Safari</i> * computer	NCR§§ 3170 computer

* Safari is a registered trademark of AT&T.

† Was Teletype 5425 or ATTIS 4425.

‡ These *MS-DOS* (*MS-DOS* is a registered trademark of Microsoft Corporation) PCs were tested with *PROCOMM* (*PROCOMM* is a registered trademark of Datastorm Technologies, Inc.) terminal emulation software for maintenance. Other terminal emulation software may also work properly. CTRM software is required for software downloads and is supplied with the DDM-2000 OC-3 and OC-12 Multiplexer software.

§ Trademark of Digital Equipment Corporation.

¶ Registered trademark of Hewlett-Packard Company.

** With terminal emulation software.

†† Registered trademark of International Business Machines Corporation.

‡‡ Registered trademark of Toshiba Corporation.

§§ Registered trademark of NCR Corporation.

Local Access

Figure 6-1 shows the system has two EIA-232-D compatible interfaces for a CIT. The front access interface is configured as data communications equipment (DCE) for direct CIT access (CIT 1). The rear access CIT interface (CIT 2) is configured as data terminal equipment (DTE) to allow a permanent modem connection without requiring a null modem. However, a null modem is required when connecting a CIT directly to the rear access DTE interface. CIT access via a modem connection is identical to local CIT access.

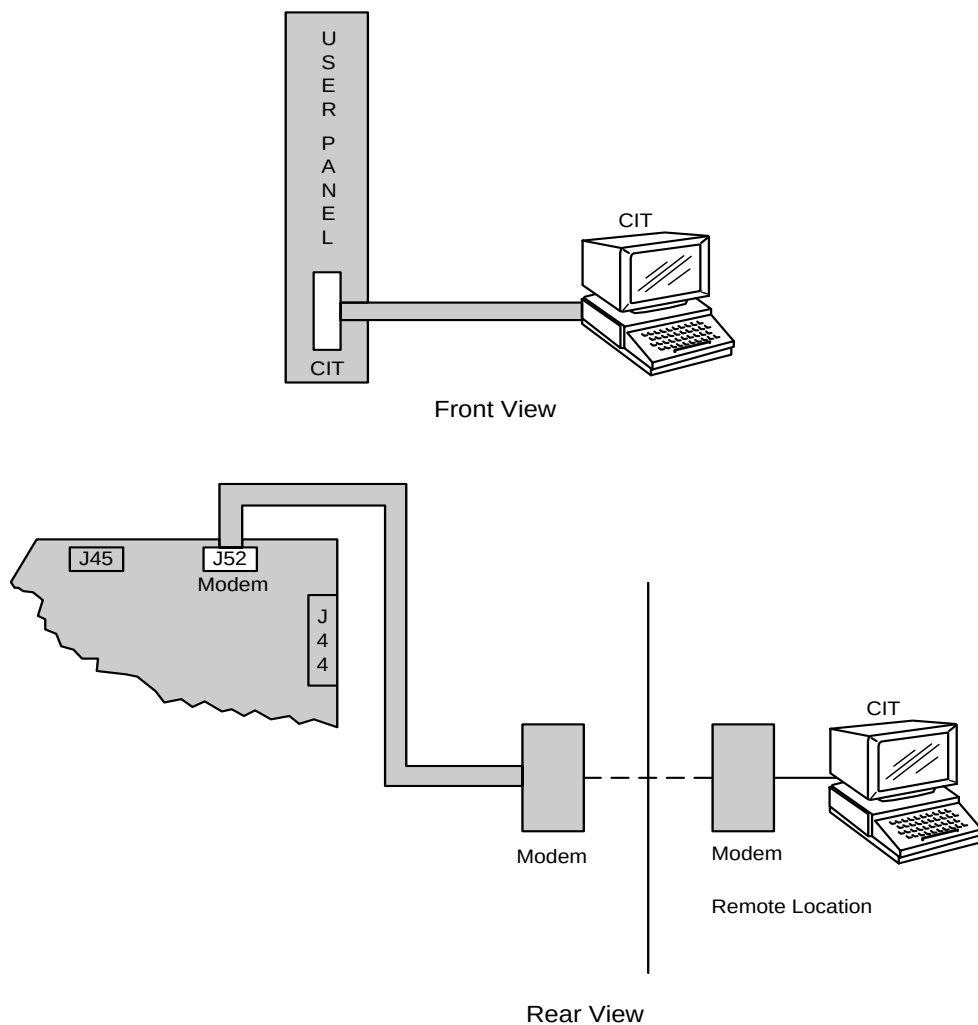


Figure 6-1. Craft Interface Terminal Connectors

The terminal sessions over the front and rear CIT ports (and over the DCC) are independent of one another. Up to three simultaneous CIT login sessions can be supported at any given time (see Figure 6-2).

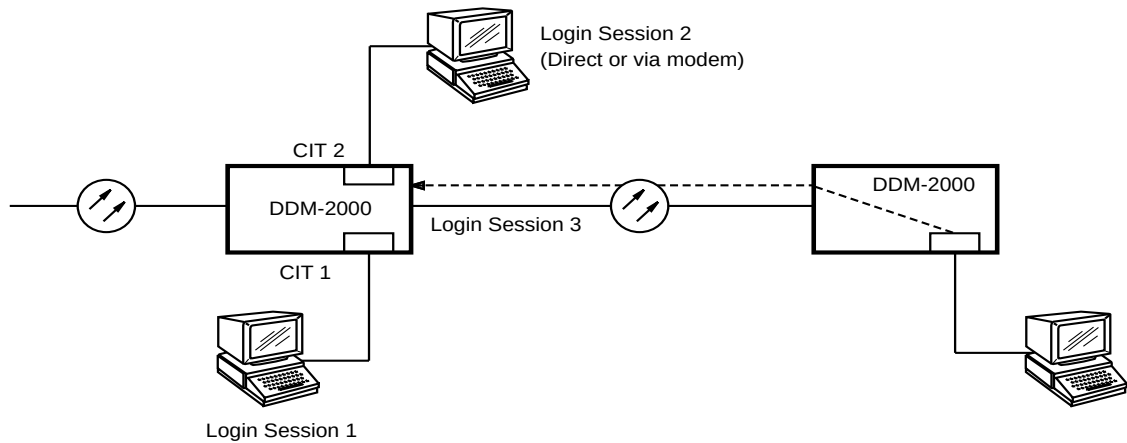


Figure 6-2. Craft Interface Terminal Login Sessions

The DDM-2000 OC-3 CIT interface is based on the Bellcore TL1 language and provides prompt and command modes of operation. On-line context sensitive help is always available to help the technician through command execution. The output messages and reports are presented in easy-to-read sentences and tables. The following functions are provided via the CIT interfaces for the local and remote DDM-2000 OC-3 Multiplexer shelves:

- Loopbacks and testing
- Protection switching
- Performance monitoring (PM)
- Provisioning
- Fault management
- Software downloading
- Security management.

Detailed specifications of the CIT interface are provided in Section 10, "Technical Specifications."

In a bay multiple CIT cabling arrangement, connecting a CIT to any shelf in the bay provides CIT access to that DDM-2000 shelf and any other DDM-2000 OC-3 or OC-12 Multiplexer shelf in that bay. The shelf is selected by using the shelf ID login. In this arrangement, only one front and one rear CIT access can be used. Also with this arrangement, access to shelves in multiple subnetworks can be achieved from the same physical interface. A subnetwork consists of all shelves interconnected with the synchronous optical network (SONET) DCC over OC-N interfaces.

For example, with six shelves per bay and eight bays in a subnetwork, access to 48 shelves is achieved with a single physical interface.

Using a PC as a CIT

In addition to CIT functions, a PC is required for software downloads and facilitates software program updates. Any *MS-DOS* PC can be used to emulate a traditional CIT through a variety of low-cost terminal emulator software packages; thus, an *MS-DOS* PC can serve DDM-2000 OC-3 Multiplexer needs very efficiently. In addition, the DDM-2000 OC-3 Multiplexer user interface can be accessed from within *Windows** (Version 3.0 or later) on an *MS-DOS* PC.

The DDM-2000 OC-3 Multiplexer uses flash erasable program memory (EPROM) devices that can be upgraded through direct download from an *MS-DOS* PC. Upgrades are made available through the distribution of floppy disks compatible with the recommended PCs.

Modem Access

The rear access CIT interface (CIT 2) is configured as DTE to allow a permanent modem connection without requiring a null modem. However, a null modem is required when connecting a CIT directly to the rear access DTE interface. CIT access via a modem connection is identical to local CIT access. Automatic selection (autobaud detection) data rates of 1200, 2400, 4800, 9600, and 19,200 baud are provided for both CIT interfaces.



NOTE:

The DDM-2000 OC-3 Multiplexer CIT interface supports data rates up to 19,200 baud but does not provide flow control. Some terminals and PCs when set for higher data rates will not work properly at these rates with equipment like the DDM-2000 OC-3 Multiplexer that does not provide flow control. The system may appear to stop working when reports or long prompts are displayed. If this happens, try setting the terminal to a lower data rate. The data rate of the DDM-2000 OC-3 Multiplexer is automatically set to match the data rate of the terminal (autobaud).

* Registered trademark of Microsoft Corporation.

The *NCR*^{*} 3170 computer and the AT&T *Safari*[†] computer have a built-in modems and meet the modem requirements.

The following stand-alone modems meet the modem requirements and can be used with the DDM-2000 OC-3 system. *Western Electric*[®] 103-compatible and 212A-compatible modems are also suitable for use with the DDM-2000 OC-3 system. This is not an exhaustive list of compatible modems:

- *Paradyne*[†] 2224-CEO modem (at 1200 and 2400 baud)
- *Paradyne* 2224 modem (at 1200 and 2400 baud)
- *Paradyne* 4024 modem (at 1200 and 2400 baud)
- *Paradyne* 2296 modem (at 4800 and 9600 baud)
- Hayes[‡] *V-series* Smartmodems
- *Penril*[§] Alliance V.32 modem.

Remote Access Using the Data Communications Channel (DCC)

The DDM-2000 OC-3 system supports CIT remote access from the local terminal to a remote system using the data communications channel (DCC) over OC-N interfaces. The DDM-2000 OC-3 system supports one incoming remote login session and one outgoing login session over the DCC at a time. For example, a local user can gain remote access to a remote system in their subnetwork at the same time as a remote user at another system in the subnetwork can gain remote access to the local system.

* Trademark of NCR Corporation.
† Registered trademark of AT&T.
‡ Trademark of Hayes Microcomputer Products, Inc.
§ Registered trademark of Penril Corporation.

CPro-2000 Graphical User Interface and Provisioning Tool

The CPro-2000 Graphical User Interface (GUI) and Provisioning Tool is a *Microsoft*^{*} *Windows* based user interface that can optionally be used with the DDM-2000 OC-3 Multiplexer. The tool simplifies and mechanizes administration, maintenance, and provisioning operations for ring networks. With the tool a user can:

- Display and control cross-connections at each network element (NE) in a subnetwork and the entire subnetwork, including dual ring interworking (DRI) (for example, drop and continue paths at DRI nodes)
- Obtain and display graphical images of the subnetwork configuration, equipment, and cross-connections
- Perform an analysis of the subnetwork to detect provisioning errors
- Retrieve and store data about a selected NE
- Backup and restore provisioning information including cross-connections, DS1 port options, DS3 port options, EC-1 port options, and OC-3 line options.

In response to a user, the tool automatically compiles and sends all the necessary commands to perform a task. If the user is provisioning cross-connections, for example, the tool automatically prevents provisioning errors by comparing the new provisioning information with the subnetwork inventory. For more information, see 365-576-125, *CPro-2000 User Manual*, Release 6.1. See Section 10, "Technical Specifications," for PC requirements to use the tool.

User Panel

The user panel for the Group 4 shelf, shown in Figure 6-3, provides system-level and subnetwork level information and control functions, while the ACTIVE and FAULT LED on each faceplate provide circuit pack level information. These features let many operations tasks (for example, fault isolation or circuit pack replacement) to be performed when a CIT or external test equipment is not available.

The user panel is a factory-installed unit mounted next to the right-hand flange. Additional LEDs and controls are mounted on the SYSCTL faceplate to support basic operations, administration, and maintenance functions without a CIT.

* Registered trademark of Microsoft Corporation.

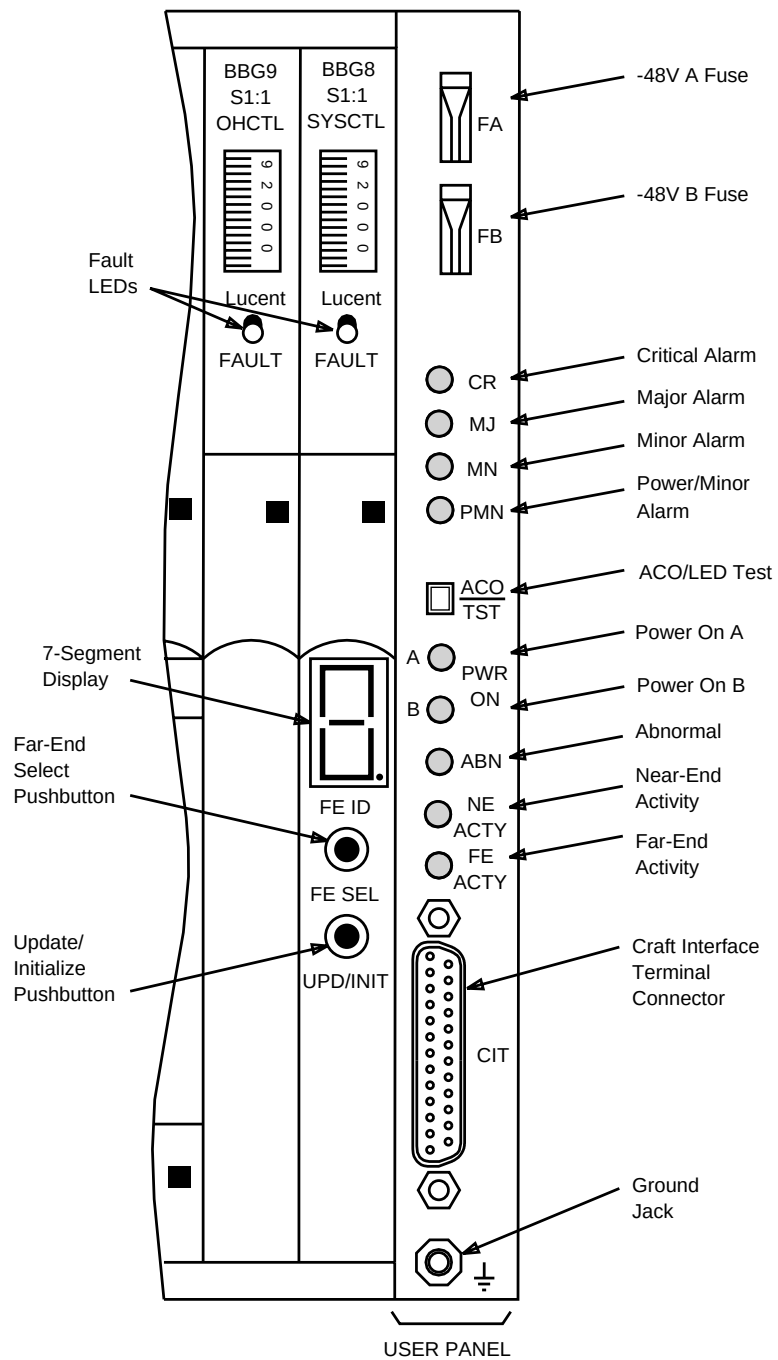


Figure 6-3. User Panel for Group 4 Shelf

User Panel LEDs

The user panel LEDs display a summary of the DDM-2000 shelves in an alarm group. The terms near-end and far-end and local and remote are used to differentiate between the shelf the user is at or working at (near-end, local) and another shelf in the same alarm group connected through the SONET DCC (far-end, remote).

The user panel normally shows a composite of all alarms and status conditions in the alarm group. The composite is defined as follows:

- The highest level alarm LED (CR, MJ, PMN, or MN) of all alarms at the local and any other shelf in the same alarm group is lit. (At most, one alarm LED will be lit at any time.)
- The ABN LED is lit if an abnormal condition exists on this shelf or any other shelf in the same alarm group
- The ACO LED is lit if the alarm cutoff function is active on this shelf
- Each PWR ON LED is lit if the local shelf is receiving –48 V power from its power feeders
- The NE ACTY LED is lit if any alarm, ABN, or "activity" condition exists on this shelf
- The FE ACTY LED is lit if any alarm, ABN, or "activity" condition exists on any other shelf in the same alarm group.

When this composite information is being displayed on the user panel, the 7-segment FE ID is blank.

FE SEL Pushbutton

The FE SEL pushbutton allows technicians to see far-end DDM-2000 conditions from the local shelf. When the FE SEL pushbutton is pushed for the first time, the FE ID display shows "L" and the user panel LEDs show the conditions of the local shelf only.

If the FE SEL pushbutton is pushed again within 15 seconds, the FE ID display shows the local shelf SITE address (with the decimal point), and the user panel LEDs show a composite of the alarm and status condition of all shelves at this site.

In OC-3 applications, there will normally be only one shelf at each site, within the same alarm group, and the set of LEDs lit will be the same for the first and second button pushes. In OC-3/OC-12 applications, there may be up to five shelves at one site within the same alarm group.

The first button push allows display of alarm and status conditions of a single shelf at the local site, and subsequent button pushes allow display of alarm and status conditions at the local site or one of the remote sites.

Each time the FE SEL button is pushed again within 15 seconds, the FE ID display increments to display the next highest SITE address in the same alarm group and the user panel LEDs show the composite alarm and status condition of the shelves in the same alarm group at that site. If the local DDM-2000 OC-3 Multiplexer cannot communicate with another site due to a failure, then all LEDs on the user panel will be lit when the FE ID display shows that site number. After cycling through the sites, "L" and the conditions of the local shelf are again displayed.

When the FE SEL is released and not pushed again for 15 seconds, or if the ACO button is pushed, the 7-segment FE ID display will go blank and the user panel will return to the composite display.

The FE SEL button is useful for small numbers (eight or less) shelves in an alarm group. For large alarm groups (eight or more shelves), where the site number is more than eight, a "dash" (-) is displayed in the 7-segment display and a composite alarm and status for these shelves is displayed.

ACO/TST Pushbutton

The ACO/TST pushbutton tests all the LEDs on the shelf. All LEDs on the shelf will be lit while the pushbutton is pressed. If the ACO pushbutton is pressed and held for more than two seconds, the three digits of the software release number are displayed in the 7-segment FE ID display. If there are any active alarms when the ACO pushbutton is pressed, the audible office alarms will be silenced, all parallel telemetry outputs except system identification (SID) status and ACO will be turned off, the parallel telemetry ACO output will be turned on, and the ACO LED (part of the pushbutton) on the user panel will be lit.

UPD/INIT Pushbutton

This pushbutton is used to initialize a controller when it is first installed in a shelf, to update the system's internal equipment inventory when signals or equipment are removed from the shelf, and when circuit pack options are changed. The system automatically detects new equipment or signals added to the shelf. In these cases, it is not necessary to push the UPD/INIT pushbutton.

An optical switch on the BBG8/BBG8B SYSCTL circuit pack latch causes a suspension of controller operations and an "F" to be displayed on the controller panel display when the latch is pulled. Closing the latch causes a controller reset.

Pushbutton Combinations

The three pushbuttons described previously are used in combinations to perform seven functions. Table 6-2 lists the functions. These functions are used as part of the procedures described in the TOP section of this manual (Volume II).

Table 6-2. DDM-2000 OC-3 Pushbutton Combinations

Function	Pushbutton		
	ACO/TST	UPD/INIT	FE SEL
1. Update		Press	
2. SYSCTL Initialization *		Press	
3. Remove SYSCTL †	Press		Press
4. Software version	Hold		
5. LED test	Hold		
6. Alarm cutoff	Press		
7. Software download †		Hold	Hold

* Used after a SYSCTL is replaced. Press pushbutton during the 10-second interval that the CR LED on the user panel is flashing.

† See TOP section of this manual (Volume II) for detailed procedures.

Equipment Indicators

FAULT Indicators

Red FAULT indicators are provided on all circuit packs. Retainer cards and the BBF5 JMPR circuit pack do not have LEDs. The circuit pack FAULT indicator is lit whenever a failure has been isolated to that pack.

Common failures (for example, power, synchronization, control, etc.) do not cause the FAULT indicators on all circuit packs affected by the failure to be lit; only the FAULT indicator on the failed pack is lit.

FAULT indicators on high- and low-speed transmission interface and timing circuit packs are flashed when a failure of the incoming signal is detected (for example, LOS, LOF, LOP, or crossing of the signal fail or signal degrade threshold).

The FAULT LED on the BBG9 OHCTL blinks when a failure of the DCC from a far-end shelf is detected.

ACTIVE Indicators

A green ACTIVE indicator is provided on each 1x1, 0x1, and 1+1 protected circuit pack. It indicates which circuit packs, "service" and/or "protection," are active (carrying service) at any given time.

Although there is no ACTIVE LED on each low-speed circuit pack to indicate it is carrying service, the status of the circuit packs can normally be determined without the CIT. If a service DS1 circuit pack FAULT LED is lit and the DS1 protection circuit pack FAULT LED is not lit, then the protection circuit pack is carrying service and the failed circuit pack can be removed. The exception to this rule is if a manual protection switch has been executed. In this case, the ABN LED on the user panel will be lit and the user will have to use a CIT to check the status of the system.

Office Alarms

The DDM-2000 OC-3 Multiplexer provides relay contacts for wiring to the office audible and visual alarms. Contacts are provided for each alarm condition: CR (critical), MJ (major), and MN (minor). The DDM-2000 OC-3 Multiplexer is provisionable to activate the office MJ or the office MN alarms when a power minor (PMN) alarm condition is detected at a remote site in the same alarm group. For loop applications, alarm conditions detected at the remote site in the same alarm group cause the appropriate central office audible and visual alarms to be activated.

The MJ and CR contact closures are designed to allow these office alarms to be ORed together and reported as an office MJ alarm.

The CR alarms are fail-safed against power failures. They are activated even if the shelf loses both power feeders.

The audible office alarms for a given site are silenced through activation of the ACO function at any shelf at that site within the same alarm group. Visual alarms are not extinguished by the ACO function.

An alarm hold-off delay is provided, to prevent transient failures from causing unnecessary maintenance activity. The office alarms will not be activated unless a condition of greater duration than the alarm hold-off delay occurs. When a failure clears, an alarm clear delay prevents premature clearing of the alarm.

As with the user panel indicators, when multiple alarms are active, the highest level office alarm (audible and visual) is activated. When the highest level alarm clears, the office alarm "bumps down" to the next highest level active alarm.

If the ACO function has been activated to silence all active audible alarms, then when a "bump down" occurs the audible alarms remain silent. (That is, the lower level visual alarm is activated, but the corresponding audible alarm is not re-activated.) If another alarm occurs while the ACO is active, the highest level audible alarm is activated even if the new alarm is a lower level condition. (For example, if a MJ and MN alarm were active and silenced via the ACO and another MN alarm occurred, the MJ audible alarm would sound.)

See Section 8, "Administration and Provisioning," for more information on alarm groups.

TL1/X.25 Interface

The DDM-2000 OC-3 Multiplexer supports a TL1/X.25 interface via a rear access, synchronous, EIA-232-D port capable of speeds of 1200, 2400, 4800, 9600, and 19,200 baud to control and report alarm and status conditions and PM data to an alarm surveillance OS such as Bellcore's NMA. The TL1/X.25 interface of the DDM-2000 OC-3 Multiplexer provides significantly more detailed information (such as identifying specific circuit packs and facilities) than the parallel telemetry or telemetry byte-oriented serial (TBOS) interfaces.

The DDM-2000 OC-3 Multiplexer supports remote and automated provisioning from a provisioning OS such as Bellcore's OPS/INE or Lucent's ITM SNC (see following paragraphs). The DDM-2000 OC-3 Multiplexer also supports a provisioning interface to RIDES^{*} OS for remote SLC[®]-2000 Access Systems. The DDM-2000 OC-3 Multiplexer also provides enhanced security. See 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*, for more information.

The TL1 maintenance messages of the DDM-2000 OC-3 Multiplexer are based on Bellcore's TR-NWT-000833, Issue 3, Rev. 1, Issue 4, Supplement 1, and Issue 5, Rev. 1. The TL1 provisioning messages of the DDM-2000 OC-3 Multiplexer are based on Bellcore's TR-NWT-000199, Issue 2, and TA-NWT-000199, Issue 6, Supplement 1.

Autonomous and command/response messages are supported. Section 10, "Technical Specifications," provides detailed specifications for the X.25 interface. Detailed information about the input and output parameters for TL1 messages is provided in 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

ITM SNC

ITM SNC is an element management system (EMS) that supports SONET NEs such as the Lucent Technologies DDM-2000, FT-2000, SLC[®]-2000, and the Fujitsu[®] Lightwave Multiplexer (FLM). ITM SNC provides fault, provisioning, configuration, and security management functions via a Graphical User Interface (GUI). Through these functions, ITM SNC is able to support TL1/X.25 communication multiplexing or concentration, to provide network security, and to record all database changes. ITM SNC also provides a cut-through capability, allowing the ITM SNC user to access an NE through its native (TL1) command set.

ITM SNC operates as an enhanced graphical tool and as a general configuration management aid. It provides NE, port, cross-connection, and path provisioning, as well as flowthrough from provisioning OSs to NEs. ITM SNC also provides fault management through subnetwork alarm and event pre-processing prior to sending fault information to a network surveillance system such as Bellcore's Network Monitoring and Analysis-Facility (NMA-F).

* Registered trademark of Ericsson Raynet.

Serial Telemetry (TBOS)

Telemetry byte-oriented serial (TBOS) is a protocol that defines one physical interface for direct connection between the telemetry remote and the monitored equipment. The system provides a TBOS link to remote detailed alarm, status, and control information to/from an OS. The TBOS link is provided through a rear access RS-422 interface port. Data transmission is at 2400 baud. A TBOS display contains 63 alarm/status points to carry information from the DDM-2000 OC-3 system to the OS and 64 control points to carry commands from the OS to the DDM-2000 OC-3 system. Each DDM-2000 OC-3 Multiplexer shelf uses one TBOS display. The number of the display assigned to each shelf is determined by user provisioning from the CIT. One TBOS link can be shared among multiple shelves in a single bay. A TBOS link can support up to eight displays in an OC-3 or OC-12 alarm group or up to four OC-3 or OC-12 point-to-point networks or any combination less than or equal to eight. Large subnetworks can have more than one TBOS link if they are provisioned for multiple alarm groups. However, each alarm group can only have one TBOS link.

A backup function is provided so that failure of a single DDM-2000 OC-3 system in the CO will not interrupt reporting for the other systems that share the same TBOS link. The backup function provided by each shelf is determined by user provisioning from the CIT.

Two types of TBOS displays are provided: one for CO systems and one for RT systems. The type of display used for each shelf is determined by the CO/RT user provisioning from the CIT.

The sending and receiving of TBOS information via the DCC can be enabled or disabled by user provisioning from the CIT. See the **set -ne** command in Section 11, "Commands and Reports."

The alarm/status portion of the TBOS displays contains system alarm and status indications. Each TBOS point is defined as a status or alarm point. Alarm points are designated either as a service-affecting (SA) or non-service-affecting (NSA) indication.

The alarm hold-off and clear delays set for office alarms apply to the TBOS interface as well. In addition, alarm and status indications on the TBOS interface are held for a minimum of 20 seconds to ensure that they can be received by the OS.

The TBOS control displays for both CO and RT systems have protection switching, alarm cutoff, and processor reset control points. The TBOS control displays for RT systems also have control points to turn the miscellaneous discrete environmental controls on and off.



NOTE:

Some telemetry remotes, such as Northern Telecom's 7025 system, are not compatible with the TBOS backup feature of the DDM-2000. See 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*, for more information.

TBOS Display Tables

Table 6-3 and Table 6-4 define the meaning of each point in the alarm and status displays and in the control displays for the DDM-2000 OC-3 Multiplexer. For more information on the TBOS interface and provisioning, refer to 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

TBOS Alarm and Status Points

Table 6-3 summarizes the DDM-2000 OC-3 Multiplexer TBOS alarm and status display. See note and footnote at end of table.

Table 6-3. DDM-2000 OC-3 TBOS Alarm and Status Points

Point	Type (Note)	Central Office Condition	Type (Note)	Remote Terminal Condition
1	SA	Incoming DS1 Signal Failure (LOS+SF/SD)		
2	SA	Incoming DS3/EC1/OC-1 Signal Failure (LOS+LOF+SF/SD +STS1 LOP +EC1 AIS)		
3	NSA	Incoming OC3 Signal Failure (LOS+LOF+SF +STS1/STS3c LOP)		
4	SA	Incoming OC3 Signal Failure (LOS+LOF+SF+AIS)		
5	SA	Incoming STS1/STS3c LOP (on OC3)		
6	SA	Incoming VT Path AIS/LOP/Path Signal Degrade Unequipped		
7	NSA	Incoming OC3 Signal Degrade		
8	SA	Incoming OC3 Signal Degrade/STS Path AIS/Signal Failure/Degrade Unequipped		
9	NSA	Synchronization Equipment Failure		
10	SA			
11	NSA	Multiplex Equipment Failure		
12	SA			
13	NSA	Fuse/Power Circuit Failure		
14	NSA	Controller Failure/Provisioning Error		
15	NSA	Optical Terminating Equipment Failure		
16	SA			
17	NSA	DS1 Terminating Equipment Failure or illegal CP type		
18	SA			
19	NSA	Jumper Card & DS3/EC1 Terminating Equip Failure (CP removed)		
20	SA			
21	NSA	Section Data Comm. Channel (DCC) Failure/Provisioning Error		
22	NSA	Incoming DS3/EC1/OC-1 Signal Failure (LOS+LOF+SF/SD +STS1 LOP +EC1 AIS)		
23	NSA	DS1 Terminating Equipment APS - Automatic Lockout		
24	NSA	OC3 APS Channel Failure *		
25	NSA	Protected DS1 Sync. Ref. Failure		
26	NSA	Unprotected DS1 Sync. Ref. Failure		
27	NSA	PM Summary TCA		
28	NSA	Invalid TBOS Command Received		
29	NSA	Incoming OC3 Line AIS		
30	NSA	Incoming VT Path AIS/LOP/Path Signal Degrade Unequipped		
31	NSA	Incoming STS Path AIS/Signal Failure/Degrade Unequipped		
32	SA	Excessive Sync. Holdover		

Table 6-3. DDM-2000 OC-3 TBOS Alarm and Status Points

Point	Type (Note)	Central Office Condition	Type (Note)	Remote Terminal Condition
33	NSA	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 1
34	NSA	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 2
35	NSA	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 3
36	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 4
37	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 5
38	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 6
39	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 7
40	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 8
41	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 9
42	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 10
43	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 11
44	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 12
45	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 13
46	NSA	Fan Shelf Failure	NSA	Misc. Discrete Env. Alarm/Status 14
47	Alarm	Reserved for Future Alarm Use	NSA	External Minor
48	Alarm	Reserved for Future Alarm Use	NSA	Fan Control Relay Failure
49	Status	Inhibit Sync. Equipment Protection Switching		
50	Status	Inhibit DS1 Sync. Ref. Protection Switching		
51	Status	Holdover Mode Active		
52	Status	Incoming OC3 Line FERF		
52	Status	Manual Forced/Inhibit/Lockout OC3 Line Prot. Switching *		
54	Status	Manual Forced/Inhibit Function Unit Equipment Prot. Switching		
55	Status	Manual DS1 Terminating Equipment Protection Switch		
56	Status	Manual Forced/Lockout DS1 Terminating Equipment Prot. Switching		
57	Status	Abnormal Condition		
58	Status	Valid TBOS Command Received		
59	Status	Communication Failure		
60	Status	Incoming STS Path Yellow OC-1 line FERF		
61	Status	Incoming VT Path Yellow		
62	Status	Reserved for Future Status Use		
63	Status	Reserved for Future Status Use		
64		TBOS Telemetry Link Failure		

Note: Each TBOS point is identified as either an alarm or status point. Alarm points are further distinguished as either service affecting (SA) or non-service affecting (NSA). Status points are always understood to be NSA.

The alarm/status distinction specified in this table is for telemetry remote polling purposes. Alarm points are assured of being communicated to the OS, whereas status points may not be communicated to the OS when alarm or hybrid polling is used. It is recommended that the telemetry remote station constants assign attributes to the DDM-2000 OC-3 TBOS points as follows:

Points 1 - 48 = alarms

Points 49 - 63 = status.

LOF = Loss of Frame, LOP = Loss of Pointer, LOS = Loss of Signal

SD = Signal Degrade Bit Error Ratio, SF = Signal Fail Bit Error Ratio

TCA = Threshold Crossing Alert

* Not applicable to the main OC-3 lines in ring applications.

DDM-2000 OC-3 TBOS Control Points

Table 6-4 lists the TBOS control points for DDM-2000 OC-3 Multiplexer.

Table 6-4. DDM-2000 OC-3 TBOS Control Points

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
1	55&57&58	Manual LS Switch to Protection — MXR A, DS1 1-4 (switch-ls:ls-a-1:pri>manual)
2	55&57&58	Manual LS Switch to Protection — MXR A, DS1 5-8 (switch-ls:ls-a-2:pri>manual)
3	55&57&58	Manual LS Switch to Protection — MXR A, DS1 9-12 (switch-ls:ls-a-3:pri>manual)
4	55&57&58	Manual LS Switch to Protection — MXR A, DS1 13-16 (switch-ls:ls-a-4:pri>manual)
5	55&57&58	Manual LS Switch to Protection — MXR A, DS1 17-20 (switch-ls:ls-a-5:pri>manual)
6	55&57&58	Manual LS Switch to Protection — MXR A, DS1 21-24 (switch-ls:ls-a-6:pri>manual)
7	55&57&58	Manual LS Switch to Protection — MXR A, DS1 25-28 (switch-ls:ls-a-7:pri>manual)
8	55&57&58	Manual LS Switch to Protection — MXR B, DS1 1-4 (switch-ls:ls-b-1:pri>manual)
9	55&57&58	Manual LS Switch to Protection — MXR B, DS1 5-8 (switch-ls:ls-b-2:pri>manual)
10	55&57&58	Manual LS Switch to Protection — MXR B, DS1 9-12 (switch-ls:ls-b-3:pri>manual)
11	55&57&58	Manual LS Switch to Protection — MXR B, DS1 13-16 (switch-ls:ls-b-4:pri>manual)
12	55&57&58	Manual LS Switch to Protection — MXR B, DS1 17-20 (switch-ls:ls-b-5:pri>manual)
13	55&57&58	Manual LS Switch to Protection — MXR B, DS1 21-24 (switch-ls:ls-b-6:pri>manual)
14	55&57&58	Manual LS Switch to Protection — MXR B, DS1 25-28 (switch-ls:ls-b-7:pri>manual)
15	55&57&58	Manual LS Switch to Protection — MXR C, DS1 1-4 (switch-ls:ls-c-1:pri>manual)
16	55&57&58	Manual LS Switch to Protection — MXR C, DS1 5-8 (switch-ls:ls-c-2:pri>manual)
17	55&57&58	Manual LS Switch to Protection — MXR C, DS1 9-12 (switch-ls:ls-c-3:pri>manual)

Table 6-4. DDM-2000 OC-3 TBOS Control Points

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
18	55&57&58	Manual LS Switch to Protection — MXR C, DS1 13-16 (switch-ls:ls-c-4:pri>manual)
19	55&57&58	Manual LS Switch to Protection — MXR C, DS1 17-20 (switch-ls:ls-c-5:pri>manual)
20	55&57&58	Manual LS Switch to Protection — MXR C, DS1 21-24 (switch-ls:ls-c-6:pri>manual)
21	55&57&58	Manual LS Switch to Protection — MXR C, DS1 25-28 (switch-ls:ls-c-7:pri>manual)
22	56&57&58	Lockout Switching — LS-A (switch-ls:ls-a-all:pri=lockout)
23	56&57&58	Lockout Switching — LS-B (switch-ls:ls-b-all:pri=lockout)
24	56&57&58	Lockout Switching — LS-C (switch-ls:ls-c-all:pri=lockout)
25	55&56&57 clear & 58	Reset Switching — LS-A (switch-ls:ls-a-all:pri=reset)
26	55&56&57 clear & 58	Reset Switching — LS-B (switch-ls:ls-b-all:pri=reset)
27	55&56&57 clear & 58	Reset Switching — LS-C (switch-ls:ls-c-all:pri=reset)
28	57&58 & 54 & 53	Forced Switch — FN-A (switch-fn:fn-a:pri=forced) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-a:pri=forced) (if OC3 equipped)
29	57&58 & 54 & 53	Forced Switch — FN-B (switch-fn:fn-b:pri=forced) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-b:pri=forced) (if OC3 equipped)
30	57&58 & 54 & 53	Forced Switch — FN-C (switch-fn:fn-c:pri=forced) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-c:pri=forced) (if OC3 equipped)
31	58	Manual Switch — FN-A (switch-fn:fn-a:pri>manual) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-a:pri>manual) (if OC3 equipped)
32	58	Manual Switch — FN-B (switch-fn:fn-b:pri>manual) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-b:pri>manual) (if OC3 equipped)
33	58	Manual Switch — FN-C (switch-fn:fn-c:pri>manual) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-c:pri>manual) (if OC3 equipped)

Table 6-4. DDM-2000 OC-3 TBOS Control Points (Contd)

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
34	57&58 & 54 & 53	Inhibit Switching — FN-A (switch-fn:fn-a:pri=inhibit) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-a:pri=inhibit) (if OC3 equipped)
35	57&58 & 54 & 53	Inhibit Switching — FN-B (switch-fn:fn-b:pri=inhibit) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-b:pri=inhibit) (if OC3 equipped)
36	57&58 & 54 & 53	Inhibit Switching — FN-C (switch-fn:fn-c:pri=inhibit) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-c:pri=inhibit) (if OC3 equipped)
37	53&57&58	Lockout Switching — FN-A (only if OC3 equipped) (switch-line:fn-a:pri=lockout)
38	53&57&58	Lockout Switching — FN-B (only if OC3 equipped) (switch-line:fn-b:pri=lockout)
39	53&57&58	Lockout Switching - FN-C (only if OC3 equipped) (switch-line:fn-c:pri=lockout)
40	57 clears & 58 & 54 clears & 53 clears	Reset Switching — FN-A (switch-fn:fn-a:pri=reset) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-a:pri=reset) (if OC3 equipped)
41	57 clears & 58 & 54 clears & 53 clears	Reset Switching — FN-B (switch-fn:fn-b:pri=reset) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-b:pri=reset) (if OC3 equipped)
42	57 clears & 58 & 54 clears & 53 clears	Reset Switching — FN-C (switch-fn:fn-c:pri=reset) (if MXRVO/DS3/STS1E equipped) (switch-line:fn-c:pri=reset) (if OC3 equipped)
43	53&57&58/28†	Forced Switch — Main † (switch-line:main:pri=forced)
44	58/28 †	Manual Switch — Main † (switch-line:main:pri=manual)
45	53&57&58/28†	Inhibit Switching — Main † (switch-line:main:pri=inhibit)
46	53&57&58/28†	Lockout Switching — Main † (switch-line:main:pri=lockout)
47	53&57 clear & 58/28†	Reset Switching — Main † (switch-line:main:pri=reset)
48	58	Manual Switch — TGS CP (switch-sync:s=circuitpack,pri=manual)

Table 6-4. DDM-2000 OC-3 TBOS Control Points (Contd)

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)	RT Control Function (Equivalent CIT Command)
49	49&57&58	Inhibit Switching — TGS CP (switch-sync:s=circuitpack,pri=inhibit)	
50	49&57 clear & 58	Reset Switching — TGS CP (switch-sync:s=circuitpack,pri=reset)	
51	58	Manual Switch — Sync. Reference (switch-sync:s=reference,pri=manual)	
52	50&57&58	Inhibit Switching — Sync. Reference (switch-sync:s=reference,pri=inhibit)	
54	CO51&CO57 & CO58 or RT58*	Manual Switch — Sync. Mode (switch-sync:s=mode,pri=manual)	Operate Misc. Discrete Env. Control 1
55	CO51&CO57 clear & CO58 or RT58*	Reset Switching — Sync. Mode (switch-sync:s=mode,pri=reset)	Operate Misc. Discrete Env. Control 2
56	CO28 or RT58*	Reserved for Future Control Use	Operate Misc. Discrete Env. Control 3
57	CO28 or RT58*	Reserved for Future Control Use	Operate Misc. Discrete Env. Control 4
58	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env. Control 1
59	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env. Control 2
60	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env. Control 3
61 62	CO28 or RT58* 58	Reserved for Future Control Use Alarm Cut Off (opr-aco)	Release Misc. Discrete Env. Control 4
63	58	Processor Reset (reset)	
64	28	Reserved for Future Control Use	

Note: The verification status points identified as clearing in response to controls will be cleared *if* the verification status point was set prior to the TBOS control; and in the case of status point 57, abnormal condition, no other abnormal conditions exist.

* For each RT miscellaneous discrete environmental control point, it is recommended that a miscellaneous discrete environmental alarm or status point be wired and data based to serve as a verification status point to confirm that *the desired effect* of each miscellaneous discrete environmental control is achieved.

† These TBOS control points for Main are not applicable to the OC-3 lines for path switched ring applications. Therefore, these commands are not valid for ring applications.

Parallel Telemetry

A parallel telemetry interface is provided as an option to remote a minimum subset of alarm and status information to an operations center.

To provide a single point of access for office wiring, the telemetry outputs from all shelves in a bay can be wired together. This provides a physical OR'ing of the outputs for all shelves.

Since the parallel telemetry alarm closures reflect the office alarms, the alarm hold-off and clear delays apply to the parallel telemetry closures as well. In addition, parallel telemetry points are held for a minimum of 20 seconds to ensure that they can be received by the OS.

The following contact closures are provided:

- Alarms:

- Individual closures for CR, MJ, MN, and PMN alarm conditions are provided. The appropriate contact is closed when an alarm condition is detected.
- As with the user panel indicators and office alarms, when multiple alarms are active, the highest level parallel telemetry alarm closure is activated. When the highest level alarm clears, the parallel telemetry output "bumps down" to the next highest level active alarm.

- Statuses:

The system provides status contact closures to transmit maintenance information to an operations center. The following status closures are provided:

- Near End (NE) Status—This closure identifies the NE as the location where an alarm was detected.
- Far End (FE) Status—These six closures identify the FE as the location where an alarm was detected. Six FE closures are provided to identify which remote site is reporting a fault. Far end NEs must be in the same alarm group as the near end NE to be reported and must have a site ID of from 1 to 7.
- Carrier Line Failure (CLF) Status—This closure indicates detection of failures in a SONET optical or electrical line. This applies to SONET optical or electrical line failures detected incoming to the system.

- Incoming (INC) Status—This closure indicates detection of asynchronous electrical signal failures (that is, LOS or crossing of the signal fail threshold). Asynchronous electrical signal failures include low-speed DS1 or DS3 failures incoming to the system (from the DSX).
- System Identification (SID) Status—This closure identifies the system raising alarms when alarms are paralleled among several systems within a bay. The system ID contact closures are not wired together, as can be done for other parallel telemetry outputs within a bay.
- ACO Output (ACO-O)—Indicates that the ACO function is active. The system provides an ACO parallel telemetry response output to acknowledge the ACO parallel telemetry control input.

■ Controls:

- The system provides an ACO parallel telemetry control. This control input is accepted from the associated maintenance center to silence all telemetry outputs except for the system identification and ACO status in systems that are wired in parallel.
- Activating the ACO function silences the office audible alarms and turns on the ACO LED on the user panel.

■ User-Definable Miscellaneous Discretes—Parallel Telemetry Access:

- In addition to the parallel telemetry alarm, status, and control points described previously, the DDM-2000 OC-3 Multiplexer provides user-definable miscellaneous discrete environmental alarms and controls accessed through the parallel telemetry interface.

For more information on parallel telemetry provisioning and interface, see 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

User-Definable Miscellaneous Discretes—Environmental Alarms and Controls

To allow monitoring and control of equipment colocated with a DDM-2000 OC-3 Multiplexer in a remote site, a set of user-definable miscellaneous discrete environmental alarms and controls is provided.

Twenty-one miscellaneous discrete alarm/status points are provided to monitor environmental conditions at remote terminal sites (open door, high temperature, etc.). The first 14 points and points 16 through 21 are activated by contact closures. The fifteenth point (External Minor) is for monitoring of remote structure power and fan apparatus (for example, DC power shelf failure); this point is activated by a –48 volt input.

Four control points are provided to control equipment (pumps, generators, etc.) at remote terminal sites. When activated, the control points provide a contact closure between the control point output and ground.

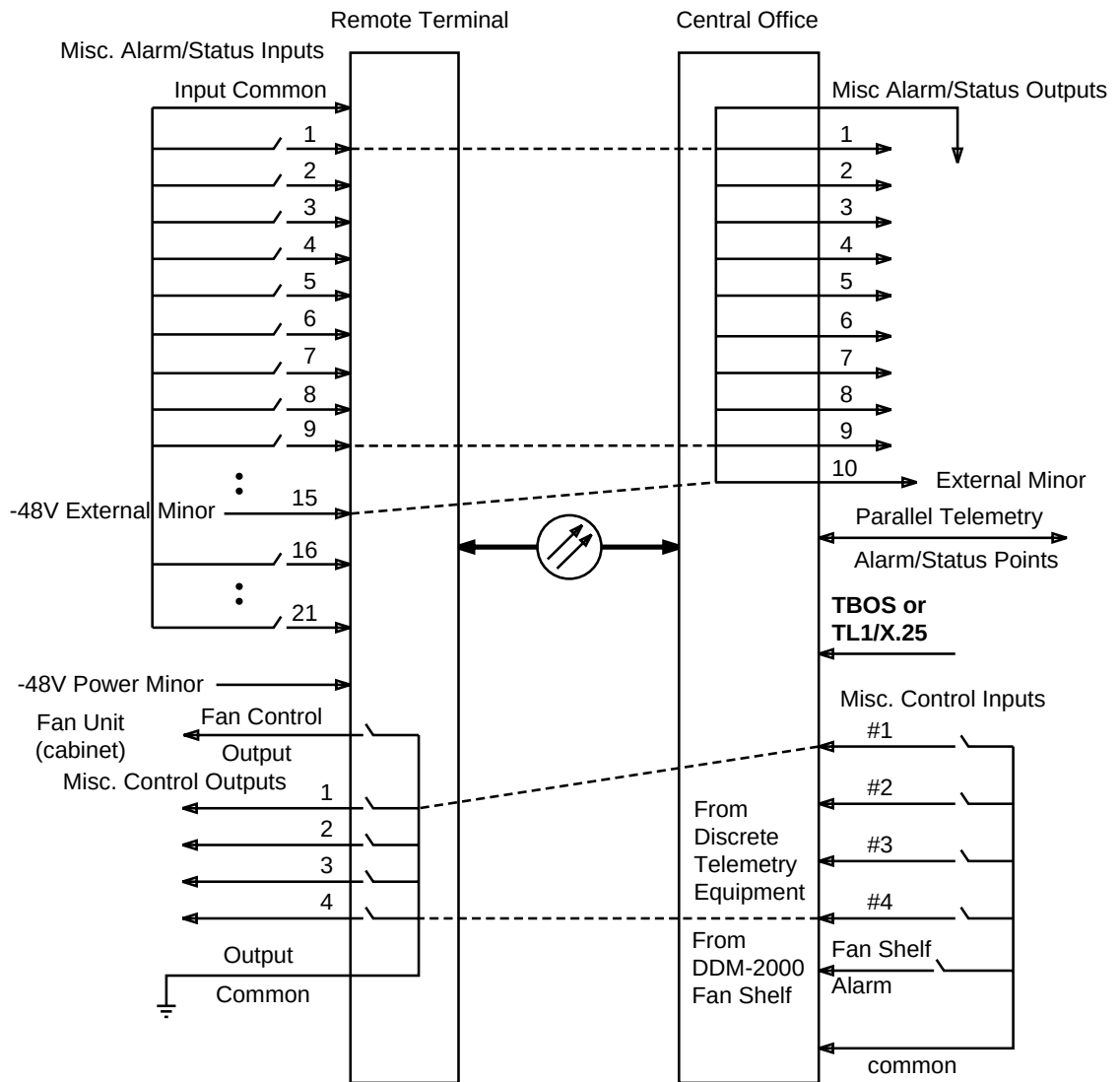
Miscellaneous discrete alarms/statuses and controls are transmitted between the remote DDM-2000 OC-3 Multiplexers and the CO DDM-2000 OC-3 via the SONET section DCC. OS access to all miscellaneous discretes alarm/status points (1 through 21) is provided via TL1/X.25 and access to input point 1 through 15 is available through TBOs. OS access to inputs 1 through 9 and point 15 is provided through a parallel telemetry output interface at the CO. Input point 15 is sent to parallel output point 10 to provide External Minor. Figure 6-4 shows OS access to miscellaneous discretes through the DDM-2000 Multiplexer at the CO. Access to all miscellaneous discrete alarm/status points is also provided through the CIT. The state of the control points can be reported, but not controlled, through the CIT.

The names and alarm levels of the 21 alarm/status points and the names of the 4 control points can be provisioned through the CIT in remote terminal systems. (Refer to the **set-attr-env**, **set-attr-cont**, **rtrv-attr-env**, and **rtrv-attr-cont** commands in Section 11, "Commands and Reports.")

The following additional information is provided for user-definable miscellaneous discretes alarm and control.

- User-Definable Miscellaneous Discretes—Parallel Telemetry Access:
 - In addition to the parallel telemetry alarm, status, and ACO control points described previously, the DDM-2000 OC-3 Multiplexer provides user-definable miscellaneous discrete environmental alarms and controls. A set of 21 alarm/status inputs, from the DDM-2000 OC-3 Multiplexer to an OS, and 10 CO alarm/status outputs are provided.

- In multispan applications (for example, STS-1 drop and hubbing), the control points operated through the parallel telemetry interface at the DDM-2000 OC-3 in the CO are "broadcast" to all remote terminals connected to that DDM-2000 OC-3 Multiplexer in the CO. These can be transmitted between an OS and remote DDM-2000 Multiplexer through a parallel telemetry interface on the DDM-2000 Multiplexer.
- In multispan applications, the miscellaneous discrete environmental alarm and status points from all remote terminals connected to one DDM-2000 OC-3 in the CO are "ORed" by the DDM-2000 OC-3 in the CO for transmission to the OS through the parallel telemetry interface. The far-end status points described previously can be used to determine the location of a miscellaneous discrete environmental alarm.
- Unlike the other parallel telemetry alarm, status, and control points described previously, the miscellaneous discretes are not ORed among shelves in a bay. Each shelf in a bay has its own set of miscellaneous discrete environmental alarms and controls.



Miscellaneous alarm input #14 is typically wired to fan shelf alarm in controlled environment remote terminal applications where the fan shelf is required. If the BBG8 SYSCTL circuit pack is used at the CO, the fan alarm can be wired to miscellaneous discrete 1-9 at the remote site if a parallel telemetry output at the CO is required.

Figure 6-4. Miscellaneous Discretes

Order Wire

The DDM-2000 OC-3 Multiplexer uses the E1 byte in the SONET overhead and provides a 64 kb/s complimentary metal oxide semiconductor (CMOS) or transistor-transistor logic (TTL) compatible interface to an external order wire shelf to provide point-to-point voice communication between DDM-2000 OC-3 systems. The order wire shelf must be installed within 3 feet of the DDM-2000 OC-3 Multiplexer to which it is connected.

The order wire is available only between DDM-2000 OC-3 shelves connected to each other via OLIUs in the Main slots. In multispan applications (for example, STS-1 drop or hubbing) order wire communication is available only between the CO and the first RT.

The BBG10 OHCTL provides enhanced order wire capability (intended for *MegaStar* applications). Six 64Kb/s overhead channels (E1, E2, and F1 from two OLIUs) are multiplexed onto a DS1 interface for connection to an external Channel Service Unit. The DS1 interface uses the same connector (J51) normally used for the E1-Only interface. The BBG10 requires Release 8.1 or later for linear applications and Release 9.1 or later for ring applications.

The E1-Only interface of the DDM-2000 OC-3 Multiplexer has been tested with the *DANTEL** Order Wire Assembly A18-04588-02, and the multiplexed order wire interface has been tested with the Harris/Farion CSU.

* Registered trademark of Dantel, Inc.

Table of Contents

Overview	7-1
Introduction	7-1
Compatibility	7-2
Control	7-2
■ BBG8/BBG8B SYSCTL Circuit Pack Description	7-3
Purpose of Circuit	7-3
BBG8/BBG8B SYSCTL Faceplate Controls and Indicators	7-3
General Description of Operation	7-4
Detailed Description of Operation	7-4
BBG8/BBG8B SYSCTL Hardware Setting	7-8
BBG8/BBG8B SYSCTL Quick Reference Summary	7-9
■ BBG9 OHCTL Circuit Pack Description	7-10
Purpose of Circuit	7-10
Faceplate Indicator	7-10
General Description of Operation	7-11
Detailed Description of Operation	7-11
BBG9 OHCTL Quick Reference Summary	7-13
■ BBG10 OHCTL Circuit Pack Description	7-14
Purpose of Circuit	7-14
Faceplate Indicator	7-14
General Description of Operation	7-15
Detailed Description of Operation	7-15
BBG10 OHCTL Quick Reference Summary	7-18

Table of Contents

Synchronization	7-19
■ Synchronization Functions	7-19
■ BBF2B TGS Circuit Pack Description	7-19
Purpose of Circuit	7-19
TG Faceplate Indicators	7-20
General Description of Operation	7-21
Detailed Description of Operation	7-22
TG Hardware Settings	7-25
TG Quick Reference Summary	7-27
Transmission - Electrical Interface	7-28
■ BBF1/BBF1B DS1 Circuit Pack Description	7-28
Purpose of Circuit	7-28
DS1 Faceplate Indicator	7-28
General Description of Operation	7-29
Detailed Description of Operation	7-29
DS1 Hardware Settings	7-33
DS1 Quick Reference Summary	7-34
■ BBF3/BBF3B DS1PM Circuit Pack Description	7-35
Purpose of Circuit	7-35
DS1PM Faceplate Indicator	7-35
General Description of Operation	7-36
Detailed Description of Operation	7-36
DS1PM Hardware Settings	7-40
DS1PM Quick Reference Summary	7-41
■ 177A Retainer Card Description	7-43
Purpose of Card	7-43
■ BBF5 Jumper Circuit Pack Description	7-44
Purpose of Circuit	7-44
■ BBF8 High bit rate Digital Subscriber Line (HDSL)	7-45
Purpose of Circuit	7-45
HDSL Faceplate Indicator	7-45
General Description of Operation	7-46

Table of Contents

Detailed Description of Operation	7-46
HDSL Quick Reference Summary	7-53
■ BBG2 MXRVO Circuit Pack Description	7-54
Purpose of Circuit	7-54
MRXVO Faceplate Indicators	7-54
General Description of Operation	7-55
Detailed Description of Operation	7-55
MXRVO Quick Reference Summary	7-58
■ BBG4/BBG4B DS3 Circuit Pack Description	7-59
Purpose of Circuit	7-59
BBG4/BBG4B DS3 Faceplate Indicators	7-59
General Description of Operation	7-60
Detailed Description of Operation	7-60
BBG4/BBG4B DS3 Hardware Settings	7-64
BBG4/BBG4B DS3 Quick Reference Summary	7-65
■ BBG6 STS1E Circuit Pack Description	7-67
Purpose of Circuit	7-67
STS1E Faceplate Indicators	7-67
General Description of Operation	7-68
Detailed Description of Operation	7-70
STS1E Hardware Settings	7-73
STS1E Quick Reference Summary	7-74
■ BBG19 DS3 Data Services Interface Circuit Pack Description	7-76
Purpose of Circuit	7-76
BBG19 DS3 Faceplate Indicators	7-76
General Description of Operation	7-77
Detailed Description of Operation	7-77
BBG19 DS3 Hardware Settings	7-81
BBG19 DS3 Quick Reference Summary	7-82
■ BBG20 Transmultiplexer	7-84
Purpose of Circuit	7-84
BBG20 TMUX Faceplate Indicators	7-84
General Description of Operation	7-85

Table of Contents

Detailed Description of Operation	7-85
BBG20 TMUX Hardware Settings	7-89
BBG20 TMUX Quick Reference Summary	7-89
Transmission - Optical Interface	7-91
■ Universal Optical Connector	7-91
Optical Interface Circuit Packs	7-93
■ 21D/21D-U OLIU Circuit Pack Description	7-95
Purpose of Circuit	7-95
21D/21D-U OLIU Faceplate Indicators	7-95
General Description of Operation	7-96
Detailed Description of Operation	7-96
21D/21D-U OLIU Quick Reference Summary	7-99
■ 21G/21G-U/21G2-U OLIU Circuit Pack Description	7-101
Purpose of Circuit	7-101
21G/21G-U/21G2-U OLIU Faceplate Indicators	7-101
General Description of Operation	7-102
Detailed Description of Operation	7-103
21G/21G-U OLIU Hardware Settings	7-106
21G/21G-U/21G2-U OLIU Quick Reference Summary	7-107
■ 22F/22F-U/22F2-U OLIU Circuit Pack Description	7-109
Purpose of Circuit	7-109
22F/22F-U/22F2-U OLIU Faceplate Indicators	7-109
General Description of Operation	7-110
Detailed Description of Operation	7-110
22F-type OLIU Quick Reference Summary	7-114
■ 22D-U OLIU Circuit Pack Description	7-116
Purpose of Circuit	7-116
22D-U OLIU Faceplate Indicators	7-116
General Description of Operation	7-117
Detailed Description of Operation	7-117
22D-U OLIU Quick Reference Summary	7-121

Table of Contents

■ 22G-U/22G2-U/22G3-U OLIU Circuit Pack Description	7-123
Purpose of Circuit	7-123
22G-U/22G2-U/22G3-U OLIU Faceplate Indicators	7-123
General Description of Operation	7-125
Detailed Description of Operation	7-125
22G-U/22G2-U/22G3-U OLIU Quick Reference Summary	7-129
■ 24G-U OLIU Circuit Pack Description	7-131
Purpose of Circuit	7-131
24G-U OLIU Faceplate Indicators	7-131
General Description of Operation	7-133
Detailed Description of Operation	7-133
24G-U OLIU Quick Reference Summary	7-136
■ 26G2-U Circuit Pack Description	7-139
Purpose of Circuit	7-139
26G2-U OLIU Faceplate Indicators	7-139
General Description of Operation	7-140
Detailed Description of Operation	7-141
26G2-U OLIU Quick Reference Summary	7-144
■ 27G-U/27G2-U OLIU Circuit Pack Description	7-146
Purpose of Circuit	7-146
27G-U/27G2-U OLIU Faceplate Indicators	7-146
General Description of Operation	7-148
Detailed Description of Operation	7-148
27G-U/27G2-U OLIU Quick Reference Summary	7-152

Table of Contents

Overview

This section provides a detailed functional description of the DDM-2000 OC-3 Multiplexer circuit packs.

Introduction

The circuit packs in the DDM-2000 OC-3 Multiplexer are divided into three main categories:

- Control circuit packs
 - BBG8/BBG8B system controller (SYSCTL)
 - BBG9 overhead controller (OHCTL)
 - BBG10 OHCTL
- Synchronization circuit pack
 - BBF2B timing generator (TGS)
- Transmission circuit packs
 - BBF1/BBF1B DS1 low-speed interface (DS1)
 - BBF3/BBF3B DS1 performance monitoring (DS1PM)
 - BBF8 high bit rate digital subscriber line (HDSL)
 - BBG2 VT to STS-1 multiplexer (MXRVO)

- BBG4/BBG4B DS3 low-speed interface (DS3)
- BBG6 EC-1 high-speed and low-speed interface (STS1E)
- BBG19 DS3 data services interface
- BBG20 Transmultiplexer
- 21D/21D-U OC-3 (IS-3) optical line interface unit (OLIU)
- 21G/21G-U/21G2-U OC-3 (Long Reach) OLIU
- 22F/22F-U/22F2-U OC-3 (Intermediate Reach) OLIU
- 22D/22D-U OC-3 (IS-3) OLIU
- 22G-U/22G2-U/22G3-U (OC-3 Long Reach) OLIU
- 24G-U OC-12 OLIU on OC-3 shelf
- 26G2-U OC-1 OLIU
- 27G-U/27G2-U OC-3 (Dual OC-1 Long Reach) OLIU

Compatibility

Note the following circuit pack compatibility requirements:

- The BBG8/BBG8B SYSCTL circuit pack and the BBG9 OHCTL circuit pack are both required and must be running compatible software.
- Except during upgrades, 22-type OLIU circuit packs should not be mixed in the same shelf with 21-type OLIUs.

Control

There are two control circuit pack slots, one for the SYSCTL and one for an OHCTL. The control system controls and reports the status of the signal transmission through the DDM-2000 OC-3. All system features are implemented or supported through the control system. However, transmission is unaffected by control system failure. If a controller does fail, protection switches are not done. Therefore, if there is another circuit pack failure requiring a protection switch along with the controller failure, service may be affected depending on the function of the failed circuit pack. The control system continuously monitors the equipment to determine if a protection switch is necessary and to provide equipment performance information.

The control system in each shelf in a subnetwork can communicate with the control system of other shelves in that subnetwork via the synchronous optical network (SONET) section data communications channel (DCC). This allows a user at one point in the subnetwork to control the shelves throughout the network. All system features are implemented or supported through the control system.

BBG8/BBG8B SYSCTL Circuit Pack Description

Purpose of Circuit

The BBG8/BBG8B SYSCTL circuit pack is the main system controller in the system. Together, with its companion overhead controller (OHCTL), it has control over all shelf functions and provides all user interfaces into the system. The BBG8/BBG8B SYSCTL must be used with the BBG9 OHCTL.

BBG8/BBG8B SYSCTL Faceplate Controls and Indicators

The BBG8/BBG8B SYSCTL circuit pack faceplate controls and indicators are shown in Figure 7-1. The SYSCTL has a red FAULT LED and a 7-segment numeric LED display, as well as the FE SEL and UPD/INIT pushbuttons on its faceplate. The red FAULT LED lights on detection of a circuit pack failure.

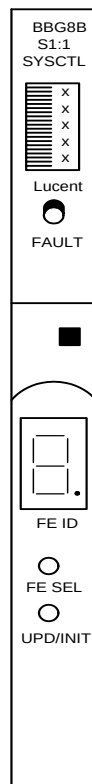


Figure 7-1. BBG8/BBG8B SYSCTL Circuit Pack

An optical switch on the circuit pack latch causes a suspension of controller operations and an "F" to be displayed on the controller panel display when the latch is pulled. Closing the latch causes a controller reset. Controls and indicators are discussed in more detail under "User Panel" in Section 6, "Operations Interfaces."

General Description of Operation

The SYSCTL circuit pack provides the majority of the control functions on the shelf. These include circuit pack monitoring, PM, protection switching, and user interfaces.

The SYSCTL, which contains a microprocessor, controls links to all other circuit packs in the system and links to user interfaces. The processor also provides link access procedure (LAPD) and LAPD packet data processing to support SONET section DCC.

Detailed Description of Operation

Control Circuitry

Processor. Figure 7-2 provides an overall block diagram of the SYSCTL circuit pack. This processor is the highest level processor in the system.

Memory

Program Flash-EPROM . The main program is stored in the flash-EPROM, which combines the nonvolatility of EPROM with the in-circuit reprogramming ability of electrically erasable programmable read-only memory (EEPROM). Electrically Erasable Programmable Read-Only Memory FEPRM allows in-service software upgrades to be performed locally or remotely without replacing the SYSCTL circuit pack. Program upgrades of remote DDM-2000 OC-3 shelves can also be done via the overhead channel from the central office (CO). Of course, software upgrades may also be accomplished by replacing circuit packs with packs that have already had software upgrades.

RAM. The main processor's random access memory (RAM) is used to store all volatile information, such as system alarms, PM information, and parameters, for the main processor's operating system.

EEPROM. All nonvolatile parameters, such as provisioning, are stored in the EEPROM, which maintains its data indefinitely during a power loss.

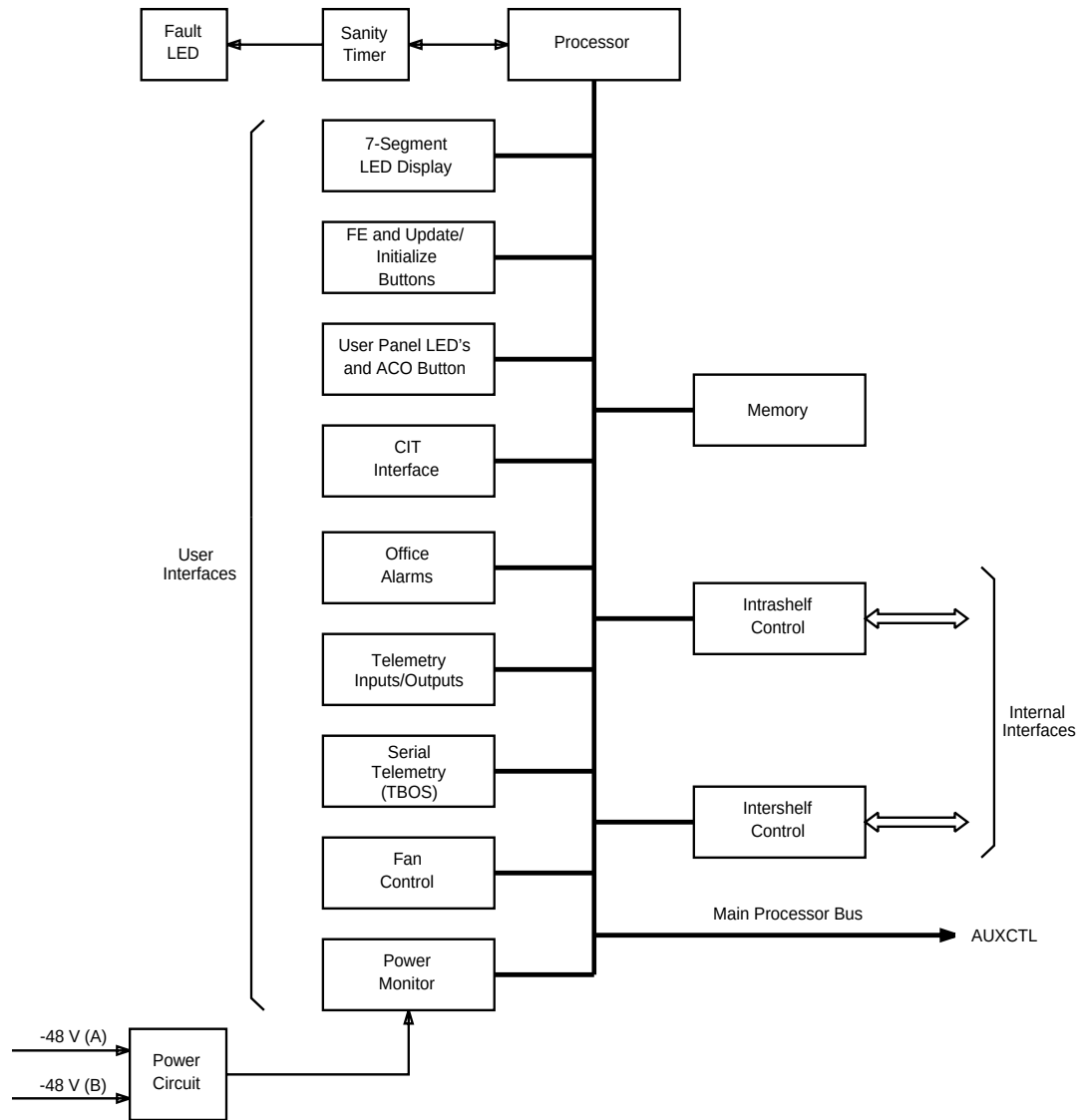


Figure 7-2. BBG8/BBG8B SYSCTL Circuit Pack Block Diagram

Transmission/Timing Circuit Pack Interfaces

The main processor can read and write parameters on the transmission circuit packs through a custom serial interface called the intra-shelf control bus. These circuit packs have a built-in serial link receiver which provides an address map into the device. Through this interface, the processor accesses the custom devices and circuit pack parameters, as well as a small EEPROM which stores each circuit pack's inventory information (*Common Language** code, date of manufacture, etc.). Through this link, the main processor can also light the faceplate LEDs on the circuit packs.

Redundancy has been built into this bus to allow a pack to be switched out of service in the event of a failure within a circuit pack.

Operation Interfaces

The SYSCTL supports all of the operations interfaces described in Section 6, "Operations Interfaces."

OC-3 Transport Overhead Channel

The OHCTL terminates an overhead channel from each main and function unit slot in the shelf, passing information to the SYSCTL over the intra-shelf processor bus.

Power Monitoring and Fan Control

The SYSCTL monitors the two -48 volt feeders and generates an alarm if one fails. It also monitors AC power in a RT application via a PMN alarm input closure and can control the external fan based on an on-board temperature sensor. The system also monitors the fan control relay for contact failure.

If the voltage to the shelf drops below the safe operating voltage, the system will suspend normal operations and wait for safe operating voltage to return. This is referred to as "brownout protection." Assuming a sufficient voltage level, an "L" will be displayed on the SYSCTL. The BBG8 operates in integrated grounding (-48VRTN connected to frame ground) architecture systems. The BBG8B operates in either integrated or isolated grounding (-48VRTN not connected to frame ground) architecture systems.

* Common Language is a registered trademark, and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

Interface to Other DDM-2000 OC-3 Shelves

The SYSCTL interfaces with SYSCTLs of other DDM-2000 OC-3 shelves through the intra-shelf control bus. This interface allows the user to access each DDM-2000 OC-3 shelf in a bay via a modem or craft interface terminal (CIT) connected to any shelf in that bay. The intershelf control bus also allows the user to share a single byte-oriented serial (TBOS) link among a maximum of four shelves (plus four associated RT shelves) by connecting a single telemetry TBOS interface to one shelf in the bay.

Power Circuitry

The SYSCTL receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion to a +5 volt source to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG8/BBG8B SYSCCTL Hardware Setting

The BBG8/BBG8B has two hardware switches, Switch 1 (S1) for Product Identification and Switch 2 (S2) for TBOS Termination. S2-1 sets the DDM-2000 OC-3 shelf as the terminating (last) or nonterminating (not last) shelf in a cascaded TBOS link. S2-2 through S2-8 should be OFF (see Figure 7-3).

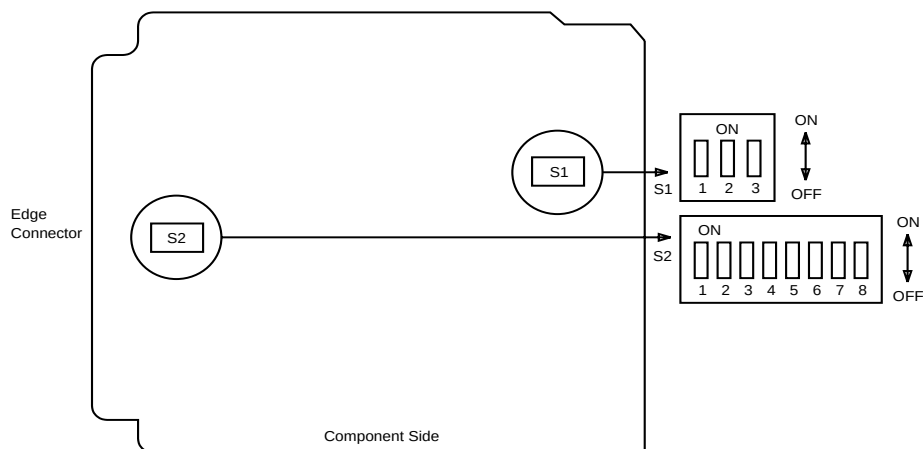
Switch 1 (S1) Settings

Product Identification			
VALUE	S1-1	S1-2	S1-3
DDM-2000/SLC-2000/ DDM-2000 FiberReach	OFF	OFF	OFF
<i>MegaStar</i> * 2000	OFF	OFF	ON

Switch 2 (S2) Settings

VALUE	S2-1	S2-2	S2-3	S2-4	S2-5	S2-6	S2-7	S2-8
TBOS Last	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
TBOS Not Last	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

* Registered trademark of Harris Corporation.



Notes:

1. The switch is set by moving the slide toward the desired position.
2. The FAULT LED will also light if the companion OHCTL is not inserted.

Figure 7-3. BBG8/BBG8B SYSCCTL Option Switches

BBG8/BBG8B SYSCCTL Quick Reference Summary

Interface Functions

Intra-shelf interface functions performed by the SYSCCTL are as follows:

- Direct control of other circuit packs via a serial control link and intra-shelf control bus
- Control of circuit pack and user panel LEDs
- Detecting the presence of, and identifying, circuit packs installed in the system.

Craft Interface:

- Local and remote craft interface automatically provisioned to 300, 1200, 2400, 4800, 9600, or 19,200 baud
- Provides interface for all advanced provisioning, PM, administration, and maintenance activities.

User Panel

- Alarm and status indicators
- Controls.

Telemetry Functions

Telemetry functions provided by the SYSCCTL are as follows:

- TBOS alarm, surveillance, and control (AS&C) interface operating at 2400 baud
- Miscellaneous discrete environmental alarms and control.

Maintenance Functions

Maintenance functions provided by the SYSCCTL are as follows:

- Automatic reset on powerup
- Fault detection, isolation, and reporting
- Protection switching control of other circuit packs
- Inventory information (*CLEI* code, date of manufacture, etc.).

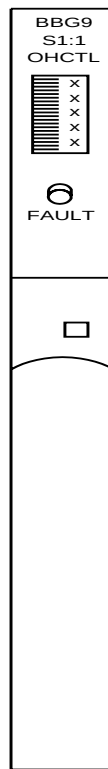
BBG9 OHCTL Circuit Pack Description

Purpose of Circuit

The overhead controller (OHCTL) circuit pack is used in conjunction with the DDM-2000 OC-3 BBG8/BBG8B system controller (SYSCTL). It provides overhead channel interfaces for the system.

Faceplate Indicator

The OHCTL circuit pack faceplate indicator is shown in Figure 7-4. The red FAULT LED lights on detection of circuit pack failure. The red FAULT LED flashes in the event of a SONET DCC failure.



tpa 789856/02

Figure 7-4. BBG9 OHCTL Circuit Pack

General Description of Operation

The BBG9 OHCTL circuit pack provides the following five basic functions:

- Single-ended operation (SEO) communication channel
- Parallel telemetry
- Miscellaneous discrete outputs
- X.25 message-based operations interface
- Basic order wire interface.

Detailed Description of Operation

OC-3 Transport Overhead Channel

Figure 7-5 provides an overall block diagram of the BBG9 OHCTL circuit pack.

The OHCTL terminates an overhead channel from each main and function unit slot. The overhead channel includes a 192 kb per section DCC (SONET bytes D1-D3) and a 64-kb/s order wire channel (SONET byte E1).

Parallel Telemetry

The alarms and status supplied by the BBG9 OHCTL as remote information accessible to an operations center are as follows:

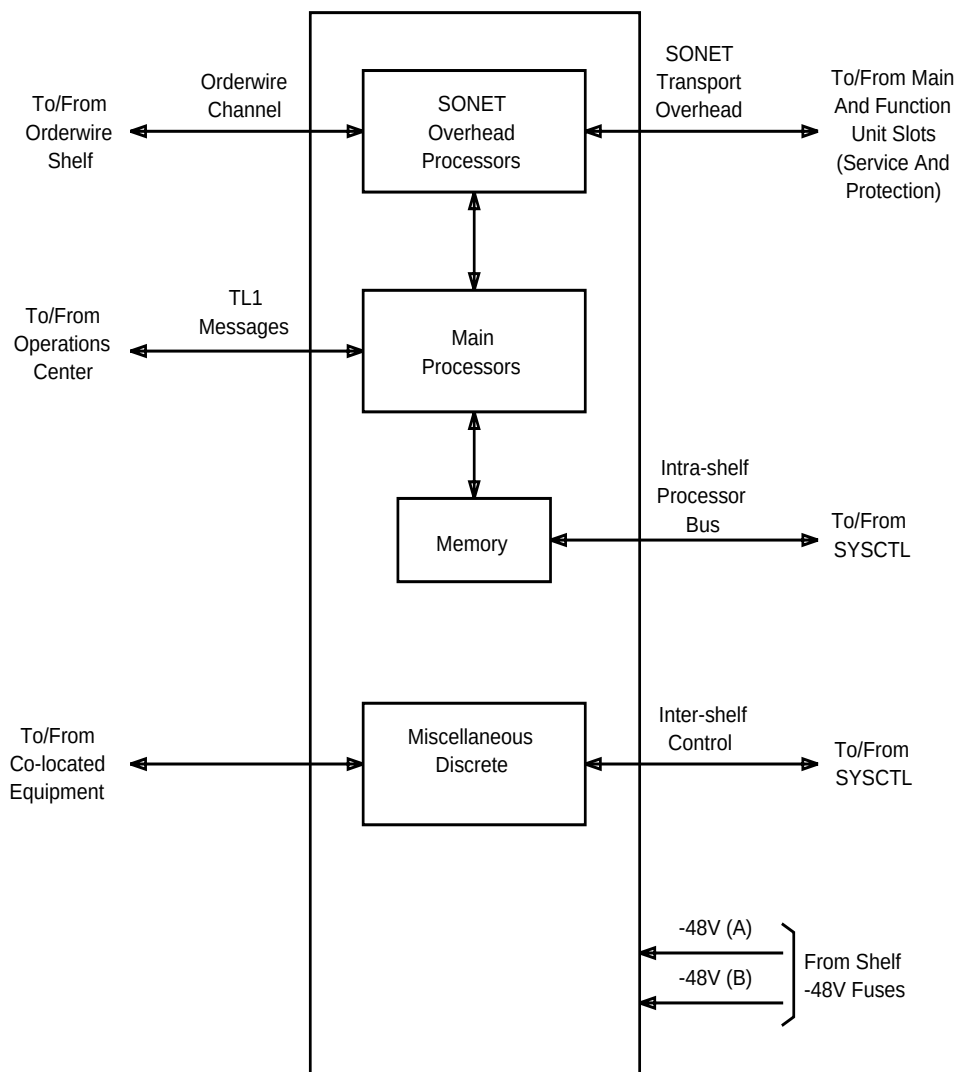
- Alarms (CR, MJ, MN, PMN)
- Status (SID, NE, FE, INC, CLF, ACO)
- Control (ACO).

User Definable Miscellaneous Discrete Environmental Alarms and Controls

The system provides four miscellaneous discrete control outputs and 21 miscellaneous discrete alarm/status inputs when the DDM-2000 OC-3 is configured as a RT. For this application, the SYSCTL supplies all of the necessary miscellaneous discrete I/O. When the DDM-2000 OC-3 resides in a CO, four control inputs and ten alarm/status outputs are provided. If more than ten miscellaneous discrete alarm/status inputs are used at the remote, the TBOS or TL1 interface at the CO will be used to recognize all of the alarm/status. In this configuration, the SYSCTL provides four inputs and four outputs, while the OHCTL provides the remaining six miscellaneous discrete outputs.

X.25 Message-Based Operation Interface

The BBG9 OHCTL provides the TL1/X.25 interface to Bellcore Network Monitoring and Analysis (NMA) OS.



tpa 813446/01

Figure 7-5. BBG9 OHCTL Circuit Pack Block Diagram

Order Wire Interface

The BBG9 OHCTL provides order wire capability via the overhead E1 byte. An external analog to digital converter supplying 64 kb/s data and clock signals is required to use this capability.

BBG9 OHCTL Quick Reference Summary

Functions

Major functions of the OHCTL circuit packs are as follows:

- SONET overhead channel interface to OLIU circuit packs
- Parallel telemetry to remotely provide alarm and status information to an operations center
- User-definable miscellaneous discrete environmental alarm and status outputs for monitoring auxiliary remote site equipment used with a DDM-2000 OC-3 shelf
- An X.25 message-based operations interface
- External order wire interface
- Inventory information (*CLEI* code, date of manufacture, etc.)
- Intra-office LAN interface.

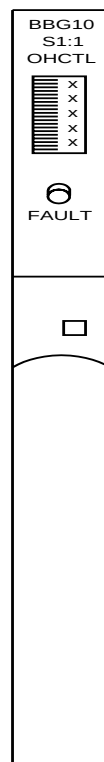
BBG10 OHCTL Circuit Pack Description

Purpose of Circuit

The overhead controller (OHCTL) circuit pack is used in conjunction with the DDM-2000 OC-3 BBG8/BBG8B system controller (SYSCTL). It provides overhead channel interfaces for the system.

Faceplate Indicator

The BBG10 OHCTL circuit pack faceplate indicator is shown in Figure 7-6. The red FAULT LED lights on detection of circuit pack failure. The red FAULT LED flashes in the event of a SONET DCC failure.



tpa 789856/03

Figure 7-6. BBG10 OHCTL Circuit Pack

General Description of Operation

The BBG10 OHCTL circuit pack provides the following five basic functions:

- Single-ended operation (SEO) communication channel
- Parallel telemetry
- Miscellaneous discrete outputs
- X.25 message-based operations interface
- Basic order wire interface.

Detailed Description of Operation

OC-3 Transport Overhead Channel

Figure 7-7 provides an overall block diagram of the BBG10 OHCTL circuit pack.

The BBG10 OHCTL terminates an overhead channel from each main and function unit slot. The overhead channel includes a 192 kb per section DCC (SONET bytes D1-D3) and a 64-kb/s order wire channel (SONET byte E1).

Parallel Telemetry

The alarms and status supplied by the BBG10 OHCTL as remote information accessible to an operations center are as follows:

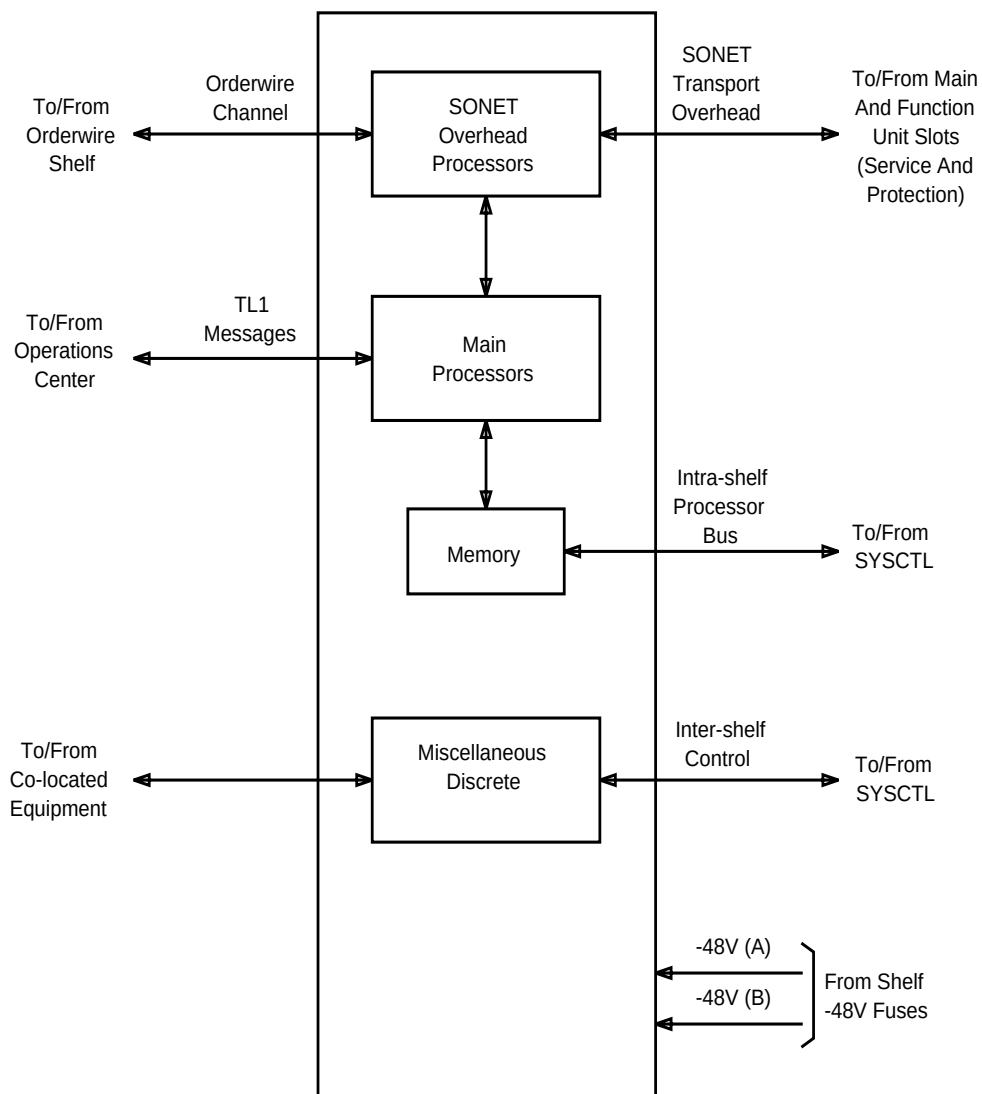
- Alarms (CR, MJ, MN, PMN)
- Status (SID, NE, FE, INC, CLF, ACO)
- Control (ACO).

User Definable Miscellaneous Discrete Environmental Alarms and Controls

The system provides four miscellaneous discrete control outputs and 21 miscellaneous discrete alarm/status inputs when the DDM-2000 OC-3 is configured as a RT. For this application, the SYSCTL supplies all of the necessary miscellaneous discrete I/O. When the DDM-2000 OC-3 resides in a CO, four control inputs and ten alarm/status outputs are provided. If more than ten miscellaneous discrete alarm/status inputs are used at the remote, the TBOS or TL1 interface at the CO will be used to recognize all of the alarm/status. In this configuration, the SYSCTL provides four inputs and four outputs, while the OHCTL provides the remaining six miscellaneous discrete outputs.

X.25 Message-Based Operation Interface

The BBG10 OHCTL provides the TL1/X.25 interface to Bellcore's NMA OS.



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Figure 7-7. BBG10 OHCTL Circuit Pack Block Diagram

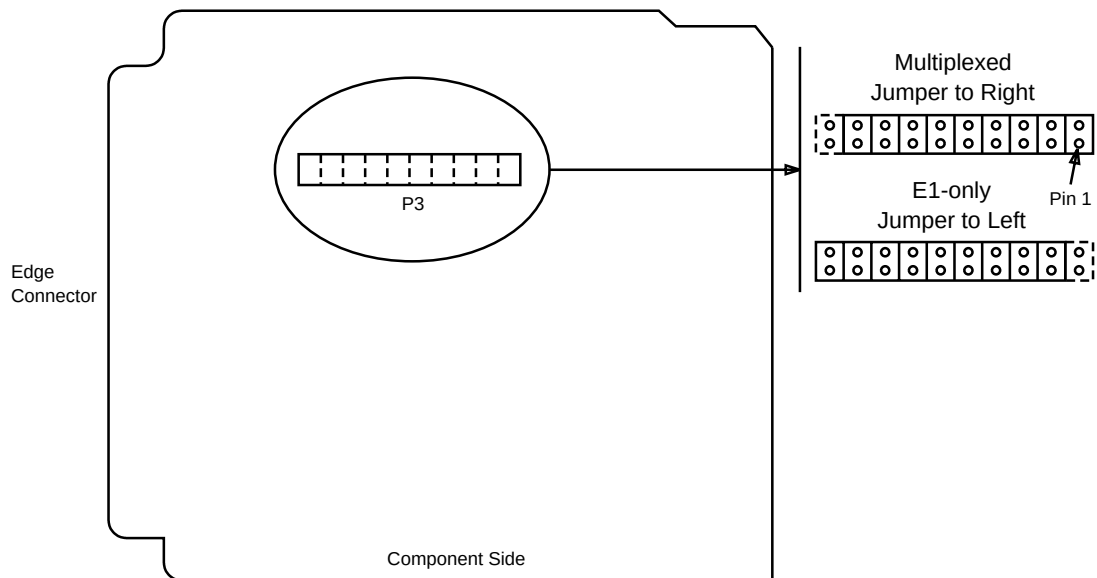
Order Wire Interface

The BBG10 provides order wire capability to two different optical interfaces, with three 64Kb/s data channels (E1, E2, and F1) to each optical interface. The six channels are multiplexed onto a DS1-type interface for connection to an external Channel Service Unit (CSU). This CSU, available from the Farinon division of Harris Corporation, uses the channels for voice and data communications between DDM-2000 locations. In addition to this multiplexed six-channel order wire capability, the BBG10 can be optioned for single channel E1-only operation, as is provided with the BBG9 OHCTL, for non-*MegaStar* applications.

BBG10 OHCTL Hardware Settings

An option block (P3) is provided on the BBG10 to select between E1-Only or Multiplexed order wire capability (see Figure 7-8).

<u>E1-Only</u>	<u>Multiplexed</u>
3 to 4	1 to 2
7 to 8	5 to 6
11 to 12	9 to 10
15 to 16	13 to 14
19 to 20	17 to 18



tpa 851682/01

Note: The option is set by moving the jumper toward the desired position.

Figure 7-8. BBG10 OHCTL Order Wire Option Switches

Interface Circuitry

The OHCTL circuit packs interface with the SYSCTL via the intra-shelf control bus.

Maintenance Features and Modes

Failures of the OHCTL are not service affecting; therefore, there is no protection of the pack.

Power Circuitry

The OHCTL receives two sources of –48 volts which are diode ORed, fused, filtered, and converted to a +5 volts source to power the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG10 OHCTL Quick Reference Summary

Functions

Major functions of the OHCTL circuit packs are as follows:

- SONET overhead channel interface to OLIU circuit packs
- Parallel telemetry to remotely provide alarm and status information to an operations center
- User-definable miscellaneous discrete environmental alarm and status outputs for monitoring auxiliary remote site equipment used with a DDM-2000 OC-3 shelf
- An X.25 message-based operations interface
- External order wire interface
- Inventory information (*CLEI* code, date of manufacture, etc.).

Synchronization

Synchronization Functions

The DDM-2000 OC-3 Multiplexer supports three synchronization modes:

1. DS1 timing input from stratum 3 or better office clock for CO applications
2. Free-running in CO applications when external timing inputs are not available
3. Line (formerly loop) timing for remote timing functions.

In addition, the BBF2B TGS circuit pack provides a DS1 timing output that is used for network synchronization and allows line (formerly loop) timing and DS1 Output timing to be derived from either the main or function unit C OLIU.

The timing circuit packs distribute clock and frame signals, derived from the selected reference source, to the transmission circuit packs.



NOTE:

The synchronous timing generator circuit pack is referenced by either "TG" or "TGS."

BBF2B TGS Circuit Pack Description

Purpose of Circuit

The synchronous timing generator (TG) circuit pack provides timing for the shelf. Other functions include a derived DS1 output for use as a reference signal by a building integrated timing supply (BITS) or a DS1 MULT capability for synchronizing other shelves in the bay. The derived DS1 is traceable to timing from either the main or function unit C OLIUs.

TG Faceplate Indicators

The TG circuit pack faceplate indicators are shown in Figure 7-9.

The red FAULT LED lights on detection of circuit pack hardware failure or improper switch settings.

The red FAULT LED flashes in the event of an incoming DS1 timing reference failure.

The green ACTIVE LED lights when the circuit pack is providing timing to the rest of the shelf.

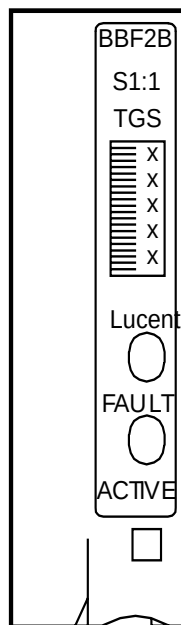


Figure 7-9. BBF2B TGS Circuit Pack

General Description of Operation

The TG circuit pack provides timing signals to the DDM-2000 OC-3 circuit packs. The TG circuit pack is microprocessor controlled and has the capability to synchronize to external DS1 references or to loop references from an incoming optical signal. The on-board oscillator has sufficient accuracy to provide timing signals without synchronization references for point-to-point systems (free-running) and a DS1 timing output for network timing distribution.

The TG circuit pack supports three timing modes to serve a wide range of DDM-2000 OC-3 synchronization needs: external timing, line (formerly loop) timing, and free-running. In addition, external timing or line (formerly loop) timing with DS1 output provisioned for network synchronization is provided.

In external timing mode, each TG circuit pack accepts one DS1 reference from an external stratum 3 or better clock and one cross-coupled from its companion TG circuit pack. A high-stability digital phase-locked loop (DPLL) removes any transient impairments on the DS1 reference for improved jitter performance.

In line (formerly loop) timing mode, the TG circuit pack derives local shelf timing from the received OC-N signal. In addition, the timing function can also be derived from an OLIU equipped in function unit C. This option is only available through software provisioning

In free-running mode, the TG circuit pack derives timing from a high stability temperature-compensated, voltage-controlled crystal oscillator.

In case of unprotected synchronization reference failure, the TG circuit pack will switch to "holdover mode" and continue to provide system timing, using the internal oscillator to maintain the last known good reference frequency.

DS1 Timing Output

The DS1 Output provided by the TG circuit pack can be provisioned to one of two modes of operation:

- MULT
 - This mode is normally used to distribute a DS1 timing reference to other shelves in the bay. In this mode, the distributed DS1 Output is buffered from the external DS1 reference that is input to the shelf.
- SYNC OUT
 - This mode is used to distribute a derived DS1 timing reference to a BITS. In this mode, the distributed DS1 Output is based on the timing signal the TG circuit pack has derived from the received OC-3 signal from either the main OLIU or an OLIU equipped in function unit C.
 - If the DS1 output is provisioned for SYNC OUT mode, DS1 AIS will be inserted on detection of unprotected OC-N line failure.

Detailed Description of Operation

Control Circuitry

Figure 7-10 is an overall block diagrams of the BBF2B TGS circuit packs. The TG circuit pack interfaces with the SYSCTL via the intra-shelf control bus. Through this interface, the SYSCTL monitors the health of the TG circuit pack to provide alarm reporting. The SYSCTL also controls TG circuit pack switching and mode functions, as well as controlling the faceplate LEDs.

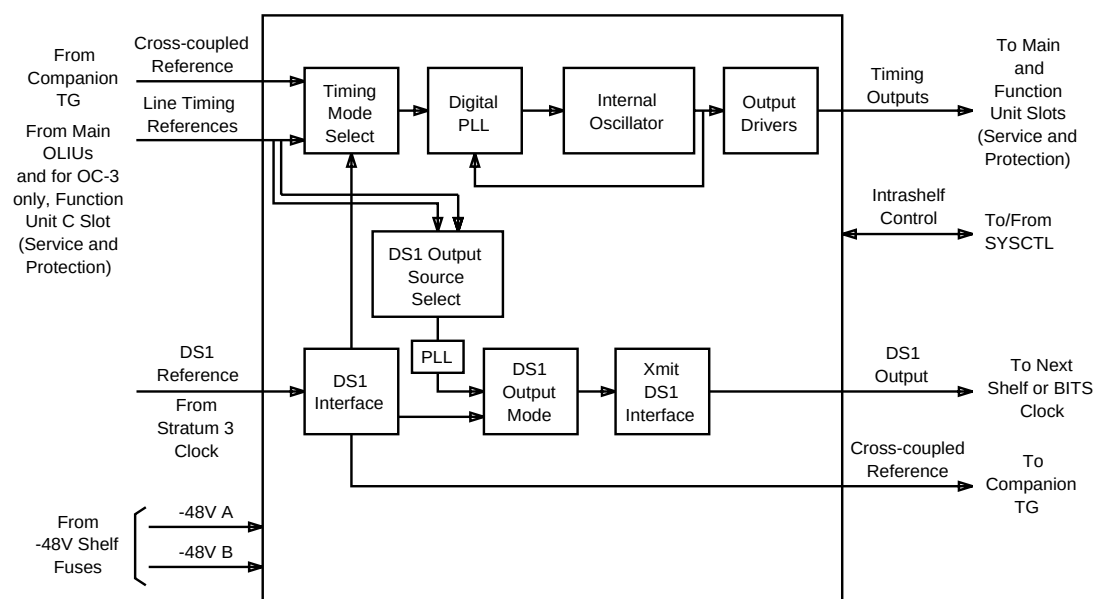


Figure 7-10. BBF2B TGS Circuit Pack Block Diagram

Timing Circuitry

DS1 External Timing. Each TG circuit pack receives one DS1 reference signal which it monitors and from which it recovers a clock signal. The recovered clock is cross-fed to its companion TG circuit pack in the same shelf. If the microprocessor on one TG circuit pack detects an incoming DS1 reference failure, it will signal the microprocessor on the companion TG circuit pack. Thus, each TG circuit pack has two DS1 references to choose from, one which is input directly and the other cross-fed. Both TG circuit packs will normally select the same DS1 input. A loss of both DS1 references will result in the TG circuit pack entering holdover mode.

Line Timing. The reference signal feeding the phase-locked loop is selected from the internal oscillator or a loop-timing clock derived from the incoming optical line. In line (formerly loop)-timing mode, the OC-N line being selected for transmission is also selected as the timing reference. The OC-3 line in function unit C selected for transmission can optionally be selected for the timing reference. This selection is under the control of the on-board microcontroller and the SYSCTL and is dependent on the timing mode selected by the user via on-board selection switches and the status of the references. Loss of both line (formerly loop)-timing references will cause the TG circuit pack to go into holdover mode to maintain system timing.

Free-Running. For free-running operation, the TG derives timing from a temperature-compensated, voltage-controlled crystal oscillator (TCVCXO) and a digital phase-locked loop (DPLL) with a full temperature range end-of-life accuracy of ± 15 parts-per-million (ppm) for the BBF2B TGS.

DS1 Output. The DS1 output port of the TG circuit pack can be provisioned for either MULT or SYNC OUT mode via a hardware switch. In the SYNC OUT mode, the derived DS1 output signal is generated from the incoming OC-N lines through timing synchronization signals from the DDM-2000 OC-3 main OLIUs (main-1 or main-2), which is the default, or function unit C by software command. In the MULT mode, the DS1 output signal is buffered from an external DS1 input reference. This external reference is typically a DS1 from a building integrated timing supply (BITS).

Selection of these timing synchronization signals for the DS1 output in SYNC mode is controlled by the SYSCTL circuit pack. This selection can be provisioned via software command to "track" the active received side of the OC-N line used for transmission, to always select its timing from the specified OC-3 line (main-1 or main-2), or function unit C (fn-c-1 or fn-c-2), regardless of its maintenance condition. Loss of timing reference for the DS1 output will result in the insertion of DS1 AIS on this output port.

Holdover. The TG circuit pack has an internal TCVCXO that will maintain shelf timing in the event of an unprotected timing DS1 reference failure (that is, holdover mode). The TGS (BBF2B) will maintain frequency stability to better than a SONET minimum clock (SMC) accuracy. Beyond this 24 hour period holdover will gradually return to a free-run accuracy.

Clock Output Functions

Intra-shelf Timing Distribution. The generated timing signals are distributed through output drivers to the main and function unit slots. The TG circuit pack provides eight differential 51.84-MHz master clock signals and eight differential 8-kHz composite STS-1 frame sync signals. In the 8-kHz sync signal, every fourth pulse is stretched to double width, providing an embedded 2-kHz reference for the virtual tributary (VT) superframe synchronization.

DS1 Outputs . The DS1 output port can be provisioned by hardware switches for MULT mode or DS1 timing synchronization (SYNC OUT) mode.

- SYNC OUT Mode
 - The DS1 output port of the BBF2B TGS circuit pack can be provisioned to be a derived DS1 signal traceable to a received optical line used for network timing distribution. The SYNC OUT capability is available for a DDM-2000 set for external-timing or line-timing.
- MULT Mode
 - The DS1 output port of the TGS circuit pack can be provisioned to output a buffered copy (at a DSX level) of the DS1 signal at the input port. A DS1 traceable source is applied to the first DDM-2000 shelf. The output of the first shelf is then cabled to the second shelf, and all subsequent shelves fed from the previous ones. In this way, a MULT chain is formed from a single DS1 reference. The MULT capability is only available for a DDM-2000 provisioned for external-timing.

Protection Circuitry

In both external and line (formerly loop)-timing modes, the synchronization references are continuously monitored for error-free operation. If the active reference becomes corrupted, the TG circuit pack will select the standby reference without causing service degradations (that is, hitless reference switching). If both reference inputs are corrupted, the TG circuit pack enters holdover mode where the DPLL holds the on-board oscillator frequency at the last good reference sample while the references are repaired.

In addition, optional 1x1 nonrevertive TG circuit pack protection is provided. When the active TG circuit pack microcontroller determines that its clock output is out of tolerance, it suppresses its timing outputs and signals its TG circuit pack companion unit of its failed condition. The suppressed timing outputs cause a timing hardware switch to the standby TG circuit pack by the transmission circuit packs.

Fault Detection Circuitry

The TG circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the TG circuit pack is inserted or recovers from a transient failure.

The incoming DS1 references are monitored for:

- LOS (128 consecutive zeros)
- DS1 AIS
- LOF
- Excessive out-of-frame count
- Greater than 10^{-3} bit error ratio (BER).

Power Circuitry

The TG circuit pack receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion to a +5 volt source to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

TG Hardware Settings

The TG circuit pack option switches provide the following functions:

- DS1 Reference Line Coding — Selects either alternate mark inversion (AMI) or AMI with bipolar 8-zero substitution (B8ZS) line coding for both DS1 input and DS1 output.
- DS1 Reference Format — Selects either super frame (SF) or extended super frame (ESF) for both DS1 input and DS1 output.
- Timing Mode — Sets timing mode to free run, external DS1, or line (formerly loop) timed.
- DS1 output mode — Sets DS1 output (SF or ESF "all ones" signal) for intra-shelf timing derived either from DS1 external input or from network timing distribution derived from received line. Reference for DS1 timing output is taken from either the main or function unit C OLIU groups.
- Sets equalizer switch for proper cable length when provisioned for SYNC OUT mode. Equalizer settings will be automatically set to shortest cable length when the DS1 output is provisioned for MULT mode.

Figure 7-11 shows the location of the option switches for the BBF2B TGS circuit pack.

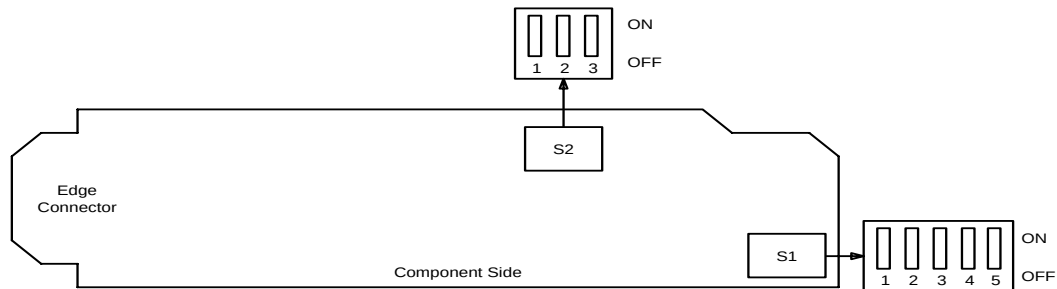


Figure 7-11. TG Option Switches for DDM-2000 OC-3 (Sheet 1 of 2)

Notes:

1. The switches are set by moving the slide toward the desired position.
2. If the invalid switch setting is selected, the FAULT LED lights and an alarm is generated.
3. The main OLIU is the default reference when in Line Timing or SYNC OUT mode.

TG DS1 Line Coding and Frame Format Switch Settings (Note)

DS1 Line Code	Switch S1-1	DS1 Frame Format	Switch S1-2
AMI *	ON	SF *	ON
B8ZS	OFF	ESF	OFF

Note: Controls line coding and frame format for both DS1 input and output.

* Factory default.

TG Timing Mode Switch Settings

Timing Mode	Switch Settings		
	S1-3	S1-4	S1-5 (DS1 Output)
Free-Running	ON	ON	OFF
DS1 External, MULT Mode*	OFF	ON	OFF
Line Timing Main†	ON	OFF	OFF
Line Timing, SYNC OUT Mode†	ON	OFF	ON
DS1 External, SYNC OUT Mode†	ON	ON	ON
Invalid	OFF	OFF	ON
Invalid	OFF	OFF	OFF
Invalid	OFF	ON	ON

* Factory default.

† Main OLIU is default; function unit C by **set -sync** command.

Equalizer Switch Settings

Equalization (Note)	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
131' to 262'	ON	OFF	ON
262' to 393'	ON	OFF	OFF
393' to 524'	OFF	ON	ON
524' to 655'	OFF	ON	OFF
Invalid	OFF	OFF	OFF
Invalid	OFF	OFF	ON
Invalid	ON	ON	ON

Note: Distance in feet for 22 gauge PIC (ABAM) cable.

Figure 7-11. TG Option Switches for DDM-2000 OC-3 (Sheet 2 of 2)

TG Quick Reference Summary

Provisioned Modes

The TG circuit pack can be provisioned through on-board option switches to any one of three timing modes: (a) External timing mode (b) Line (formerly loop) timing mode or (c) Free-running mode.

In addition, the BBF2B TGS circuit pack can be provisioned through on-board option switches to provide a DS1 output for network timing distribution or for shelf timing distribution. Line (formerly loop) timing from the main OC-3 line is the factory default. Line (formerly loop) timing for function unit C can be provisioned with the CIT.

Holdover Mode

The holdover mode maintains the last good reference frequency during unprotected failure of external or line (formerly loop)-timing references.

Maintenance and Control

The following maintenance functions are provided on the TG circuit pack: (a) DS1 reference monitoring, (b) TG and OLIU circuit pack protection switching, and (c) inventory information (*CLEI* code, date of manufacture, etc.).

DS1 Output

- DS1 Output (MULT) — a buffered copy of the external DS1 input reference used for intershell timing
- DS1 Output (SYNC OUT) — derived from received OC-3 line for network timing distribution.

Transmission - Electrical Interface

The electrical transmission circuit packs are the DS1, DS1PM, HDSL, MXRVO, DS3, TMUX, and STS1E.

BBF1/BBF1B DS1 Circuit Pack Description

Purpose of Circuit

The DS1 circuit pack provides a low-speed interface between asynchronous DS1 rate signals and SONET virtual tributary group (VT-G) signals.

DS1 Faceplate Indicator

The DS1 circuit pack FAULT indicator is shown in Figure 7-12. This red FAULT LED is lit by the SYSCTL on detection of a DS1 circuit pack failure. In the event of an incoming signal failure, this LED flashes on and off.

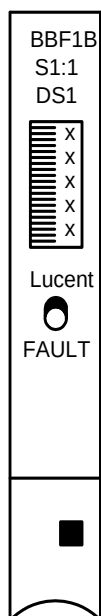


Figure 7-12. BBF1/BBF1B DS1 Circuit Pack

General Description of Operation

The DS1 circuit pack terminates four bidirectional DS1 lines complying with standard DSX-1 signal specifications. The DS1 circuit pack interfaces to the MXRVO/STS1E circuit pack at the VT-G rate (6.912 MHz) and to the SYSCTL.

The BBF1 and BBF1B DS1 circuit packs are functionally equivalent. Either one can be used to replace the other. The BBF1B has improved protection switching performance on circuit pack removal and insertion.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-13 provides an overall block diagram of the DS1 circuit pack. The transmit direction points towards the VT-G and the receive direction points toward the DS1s. In the transmit direction, the DS1 receives four balanced DS1 bipolar signals. Each of these signals passes through a relay to a DS1 interface circuit that converts it to unipolar nonreturn to zero (NRZ) format, recovers its clock, and sends it to the multiplexer (MUX) circuit. The MUX circuit converts each DS1 rate input into a 1.728 Mb/s VT1.5 signal, and then byte interleaves the four VT1.5s to create a VT-G signal that it sends to the MXRVO/STS1E pack using the frame sync and clock received from the MXRVO/STS1E.

Receive Direction. The DS1 receives a VT-G with clock and frame information from the MXRVO/STS1E and demultiplexes the VT-G into four unique VT1.5 signals. Each VT1.5 passes through circuitry that performs pointer interpretation, removes the VT path overhead bits, the fixed stuff bits, and the overhead communications channel bits, and desynchronizes the embedded DS1. The DS1 rate signal is AMI or B8ZS encoded, pre-equalized with a selectable line buildout (LBO). It is then sent as a balanced signal to a DSX-1 that may be located up to 655 feet from the DDM-2000 OC-3.

Control Circuitry

The DS1 circuit pack interfaces with the SYSCTL via the intra-shelf control bus. Redundancy in the intra-shelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The DS1 provides maintenance elements for reporting the status of the circuit pack and the incoming VT1.5 and DS1 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the DS1 responds to control signals from the SYSCTL (such as FAULT LED control).

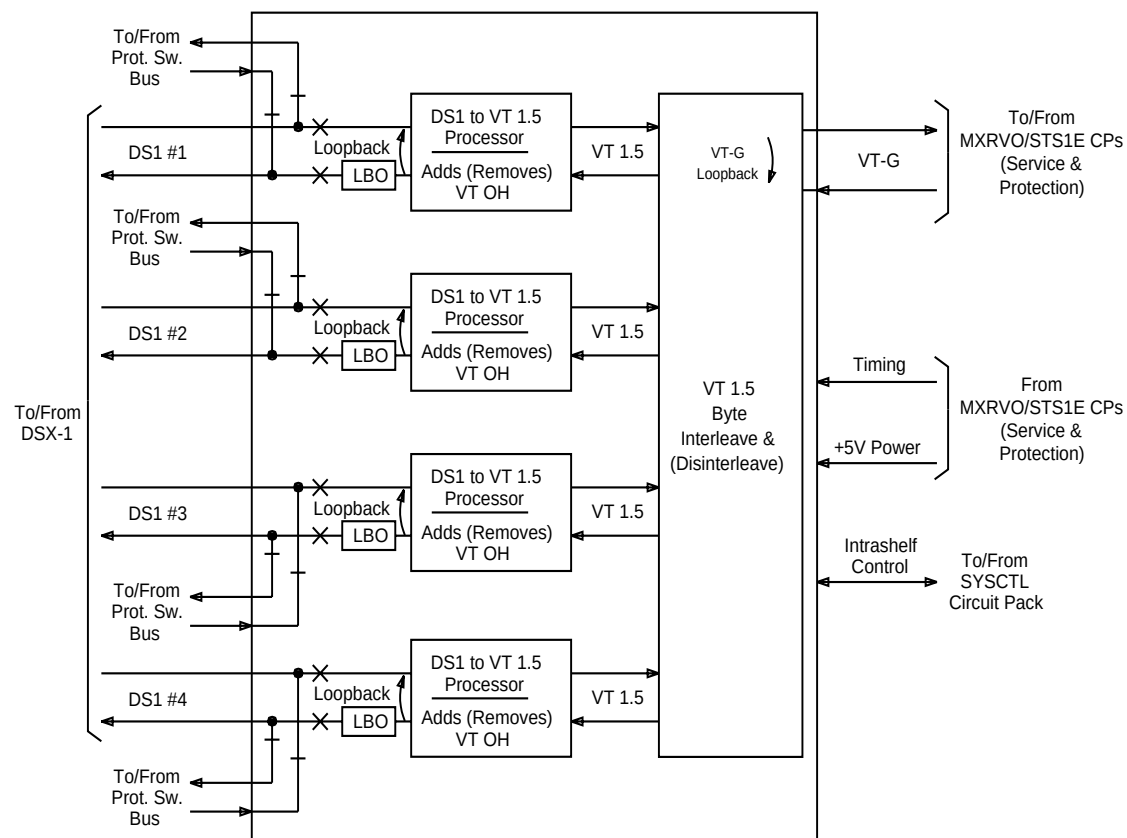


Figure 7-13. BBF1/BBF1B DS1 Circuit Pack Block Diagram

Timing Circuitry

The timing distribution to the DS1 contains ten timing signals: two high-speed clocks (active and standby), four VT-G clocks (two active and two standby), and four frame sync signals (two active and two standby).

The DS1 receives from the MXRVO/STS1E a synchronous transport signal (STS-1) rate high-speed clock that provides the frequency reference for the desynchronizing phase-locked loop. This high-speed reference clock is also used to synthesize the DS1 rate AIS clock source for the DS1 devices and to provide a DS1 test signal.

The DS1 uses the VT-G clocks (6.912 MHz) and the frame sync signals it receives from the MXRVO/STS1E to clock VT-G data to/from the MXRVO/STS1E.

Protection Circuitry

Optional 1x7 revertive DS1 circuit pack protection is provided and this protection is independent of the MXRVO/STS1E circuit pack(s). The DS1 protection switch points are implemented with on-board relays on the DSX-1 side and with logic selectors at the VT-G level on the active and standby MXRVO/STS1E circuit packs. The SYSCTL controls these relays through two serial interfaces so that a failure of one serial interface to the DS1 does not prevent control of the relays. If +5 V power on the DS1 fails, the relays default to the protection state. If the SYSCTL is removed, the relays remain in their current state.

Shorting contacts are provided in the DS1 backplane connector so that when the circuit pack is removed, the DSX-1 cable pairs short through to the protection bus.



CAUTION:

Unused low-speed interface slots within a partially equipped group must be equipped 177A Retainer cards if DS1 protection is used. Failure to do so may result in corrupted transmission. The BBF3 DS1PM circuit pack can be mixed with the BBF1/1B. If mixed, the protection circuit pack must be a BBF3 DS1PM.

When a DS1 circuit pack is inserted, the relays are in the protection state until the SYSCTL determines that the circuit pack is good.

Fault Detection Circuitry

The DS1 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the DS1 circuit pack is inserted or recovers from a transient failure. The incoming DS1 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-6} . Incoming VT1.5 signals are monitored for VT AIS, VT LOP, and yellow.

Loopbacks

The DS1 circuit pack has a DS1 terminal loopback controlled by the SYSCTL via the intra-shelf control bus.

The terminal loopback is provided on the DS1 circuit pack for each DS1 low-speed interface. The loopback is done inside the MUX/DEMUX/DESYNC device and bridges the desynchronizer output signal (transmitted towards the DSX-1) back to the DS1 synchronizer input. When the loopback is operated, the DS1 interface device forces AIS towards the DSX-1.

The DS1 circuit pack also provides a facility loopback for all four DS1 signals (Release 9.1 and later) on a circuit pack. When this loopback is completed, all four DS1 signals received from the DSX are simultaneously looped back toward the DSX. The loopback is a bridge, so the transmitted DS1 signals (towards the high-speed interface) are not affected.

Performance Monitoring

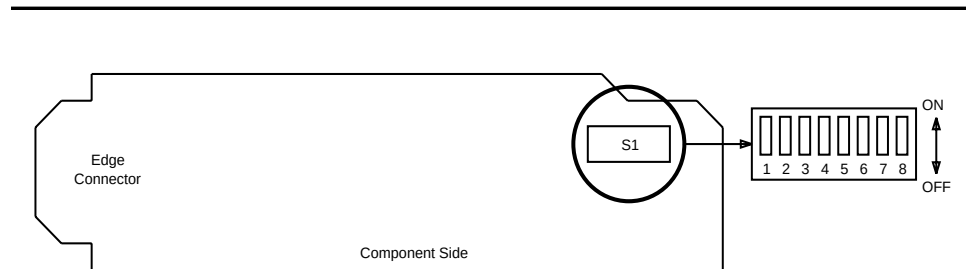
The DS1 circuit pack monitors VT path parameters derived from the V5 coding violations.

Power Circuitry

The MXRVO/STS1E circuit packs supply +5 V power to the DS1 circuit packs in the corresponding DS1 circuit pack groups. These two inputs are diode ORed and the output is fused and then filtered before it is used to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

DS1 Hardware Settings

The line coding and line build out (LBO) are switch settable. The locations of the DS1 circuit pack option switches are shown in Figure 7-14.



Note: The switches are set by moving the slide toward the desired position.

DS1 Cable LBO Settings

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 KHz	DIP Switch Settings		
			S1-1	S1-2	S1-3
0 to 133*	0 to 90*	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

* Minimum of 30 feet required to meet EMI requirements.

DS1 Line Code Settings

Line Code Format	DIP Switch Settings			
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)
B8ZS	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON

Notes:

1. Switch section 8 (S1-8) is unused and ignored by the system.
2. Line code is software overrideable.

Figure 7-14. BBF1/BBF1B DS1 Option Switches

DS1 Quick Reference Summary

Transmit Functions

Major transmit functions of the DS1 circuit pack are as follows:

- Receives four AMI or B8ZS encoded DS1 signals from a DSX-1
- Recovers DS1 clock and NRZ data from each DS1 signal
- Synchronizes and maps each data signal to a VT1.5 synchronous payload envelope (SPE)
- Inserts VT path overhead
- Multiplexes four VT1.5 SPEs to a byte-interleaved VT-G signal
- Provides the VT-G signal to a MXRVO/STS1E circuit pack.

Receive Functions

Major receive functions of the DS1 circuit pack are as follows:

- Receives a SONET VT-G clock and frame synchronizing signals from its associated MXRVO/STS1E
- Demultiplexes the VT-G into four VT1.5 signals
- Terminates VT path and the embedded DS1 signal from each VT1.5 SPE
- Desynchronizes the DS1 signals
- Encodes each DS1 signal into either AMI or B8ZS format
- Pre-equalizes (with LBO) each DS1 and provides them to a DSX-1 as bipolar signals.

Control Functions

The major control functions of the DS1 circuit pack are as follows:

- Protection switching for MXRVO/STS1E circuit pack protection
- VT path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Detects VT path AIS
- Inserts DS1 AIS toward fiber and toward DSX-1
- Inserts and detects VT path yellow signal.

BBF3/BBF3B DS1PM Circuit Pack Description

Purpose of Circuit

The DS1PM circuit pack provides all of the functions of a BBF1B circuit pack and also provides performance monitoring (PM) of SF and ESF signals to allow for T1 tariff verification. For PM, the DS1 signals from the DSX are monitored; PM data from the opposite direction is provided by accessing the ESF data link. The BBF3B has the additional capability of allowing single DS1 facility loopbacks (R11.1 and later).

DS1PM Faceplate Indicator

The DS1PM circuit pack FAULT indicator is shown in Figure 7-15. This red FAULT LED is lit by the SYSCtl on detection of a DS1PM circuit pack failure. In the event of an incoming signal failure, this LED flashes on and off.

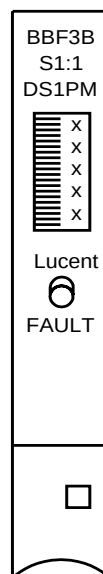


Figure 7-15. BBF3/BBF3B DS1PM Circuit Pack

General Description of Operation

The DS1PM circuit pack terminates four bidirectional DS1 lines complying with standard DSX-1 signal specifications. The DS1PM circuit pack interfaces to the MXRVO/STS1E circuit pack at the VT-G rate (6.912 MHz) and to the SYSCTL.

The DS1 and DS1PM circuit packs are, with respect to transmission, functionally equivalent. In addition to performing all of the functions of the DS1 circuit pack, the DS1PM circuit pack provides PM for the DS1 rate transmit signals.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-16 provides an overall block diagram of the DS1PM circuit pack. The transmit direction points towards the VT-G and the receive direction points toward the DS1s. In the transmit direction, the DS1PM receives four balanced DS1 bipolar signals. Each of these signals passes through a relay to a DS1 interface circuit that converts it to unipolar NRZ format, recovers its clock, and sends it to the MUX and framing (framer) circuits. The MUX circuit converts each DS1 rate input into a 1.728 Mb/s VT1.5 signal and then byte-interleaves the four VT1.5s to create a VT-G signal that it sends to the MXRVO/STS1E circuit pack, using the frame sync and clock received from the MXRVO/STS1E.

Receive Direction. The DS1PM receives a VT-G with clock and frame information from the MXRVO/STS1E and demultiplexes the VT-G into four unique VT1.5 signals. Each VT1.5 passes through circuitry that performs pointer interpretation, removes the VT path overhead bits, the fixed stuff bits, and the overhead communications channel bits, and desynchronizes the embedded DS1. The DS1 rate signal is AMI or B8ZS encoded, pre-equalized with a selectable LBO, and then sent as a balanced signal to a DSX-1 that may be located up to 655 feet from the DDM-2000 OC-3.

Control Circuitry

The DS1PM circuit pack interfaces with the SYSCTL over the intra-shelf control bus. Redundancy in the intra-shelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The DS1PM provides maintenance elements for reporting the status of the circuit pack and the incoming VT1.5 and DS1 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the DS1PM responds to control signals from the SYSCTL (such as FAULT LED control). The PM processor collects information from the framing circuitry and generates DS1 PM parameters which are sent to the SYSCTL.

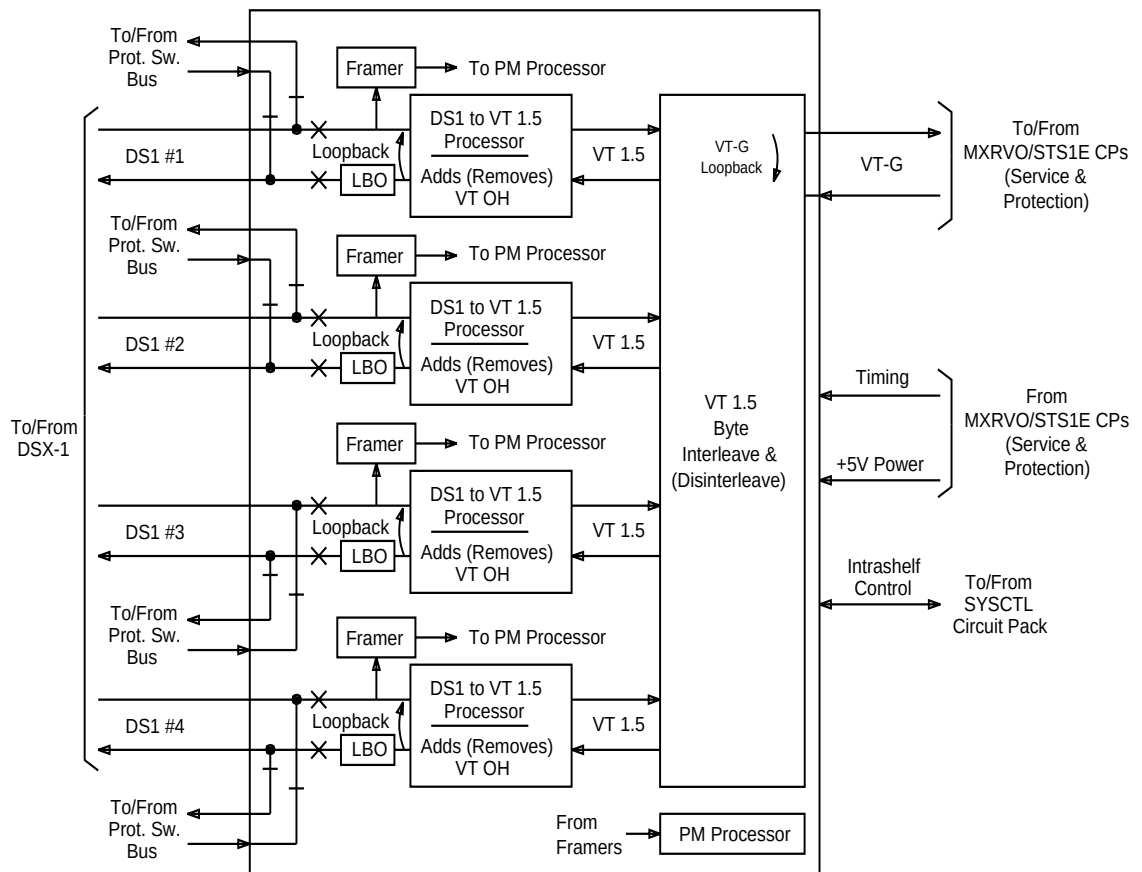


Figure 7-16. DS1PM Circuit Pack Block Diagram

The framer circuit acquires frame information (either SF or ESF) from the DS1 signal and sends the information to the PM processor. The PM processor then generates near-end and far-end (ESF only) DS1 PM parameters. When provisioned for DS1 clear channel, no PM path parameters are generated.

Timing Circuitry

The timing distribution to the DS1PM contains ten timing signals: two high-speed clocks (active and standby), four VT-G clocks (two active and two standby), and four frame sync signals (two active and two standby).

The DS1PM receives from the MXRVO/STS1E an STS-1 rate high-speed clock that provides the frequency reference for the desynchronizing phase-locked loop. This high-speed reference clock is also used to synthesize the DS1 rate AIS clock source for the DS1 devices and to provide a DS1 test signal.

The DS1PM uses the VT-G clocks (6.912 MHz) and the frame sync signals it receives from the MXRVO/STS1E to clock VT-G data to/from the MXRVO/STS1E.

Protection Circuitry

Optional 1x7 revertive DS1PM circuit pack protection is provided, and this protection is independent of the MXRVO/STS1E circuit pack(s). The DS1PM protection switch points are implemented with on-board relays on the DSX-1 side and with logic selectors at the VT-G level on the active and standby MXRVO/STS1E circuit packs. The SYSCTL controls these relays through two serial interfaces so that a failure of one serial interface to the DS1PM does not prevent control of the relays. If +5 V power on the DS1PM fails, the relays default to the protection state. If the SYSCTL is removed, the relays remain in their current state.

Shorting contacts are provided in the DS1PM backplane connector so that when the circuit pack is removed, the DSX-1 cable pairs short through to the protection bus.



CAUTION:

Unused low-speed interface slots within a partially equipped group must be equipped with 177A Retainer cards if DS1PM protection is used. Failure to do so may result in corrupted transmission. The BBF3 DS1PM circuit pack can be mixed with the BBF1/1B. If mixed, the protection circuit pack must be a BBF3 DS1PM.

When a DS1PM circuit pack is inserted, the relays are in the protection state until the SYSCTL determines that the circuit pack is good.

Fault Detection Circuitry

The DS1PM circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCtl via the intra-shelf control bus. An out-of-service test is performed whenever the DS1PM circuit pack is inserted or recovers from a transient failure. The incoming DS1 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-6} . Incoming VT1.5 signals are monitored for VT AIS, VT LOP, and yellow.

Loopbacks

The DS1PM circuit pack has two loopback types: terminal and facility. Both loopbacks are controlled by the SYSCtl via the intra-shelf control bus. Terminal and facility loopbacks are not allowed simultaneously on the same DS1 port.

A terminal loopback is provided on the DS1PM circuit pack for each DS1 low-speed interface. The loopback is done inside the MUX/DEMUX/DESYNC device and bridges the desynchronizer output signal (transmitted towards the DSX-1) back to the DS1 synchronizer input. When the loopback is operated, the DS1 interface device forces AIS towards the DSX-1.

The DS1PM circuit pack also provides a facility loopback for all four DS1 signals (Release 9.1 and later) on a circuit pack. When this loopback is completed, all four DS1 signals received from the DSX are simultaneously looped back toward the DSX. The loopback is a bridge, so the transmitted DS1 signals (towards the high-speed interface) are not affected.

The BBF3B DS1PM circuit pack also has single DS1 facility loopback capability. The loopback, however, is not a bridge and AIS will be transmitted toward the high-speed interface. This feature requires Release 11.1.

Performance Monitoring

The DS1PM circuit pack provides PM circuitry for the following performance parameters:

- VT path parameters derived from V5 coding violations
- DS1 PM derived from SF/ESF frame format depending on provisioning.

Power Circuitry

The MXRVO/STS1E circuit packs supply +5 V power to the DS1PM circuit packs in the corresponding DS1PM circuit pack groups. These inputs are diode ORed and the output is fused and then filtered before it is used to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

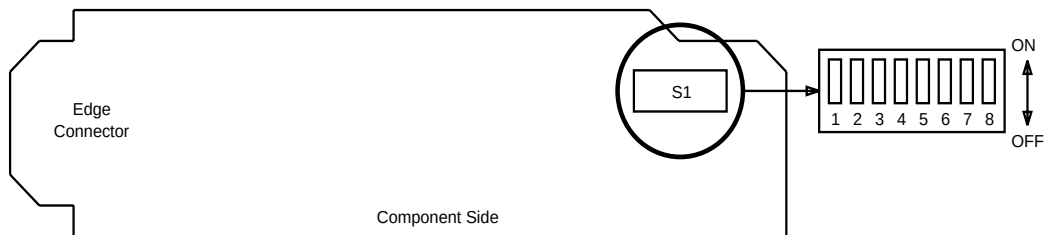


CAUTION:

For power reliability, when a muldem is equipped with DS1PM circuit packs, the associated function unit must be equipped with two MXRVO/STS1E circuit packs.

DS1PM Hardware Settings

The line coding and LBO are switch settable. Other parameters are provisionable through the CIT. The locations of the DS1PM circuit pack option switches are shown in Figure 7-17.



Note: The switches are set by moving the slide toward the desired position.

DS1 Cable LBO Settings

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 KHz	DIP Switch Settings		
			S1-1	S1-2	S1-3
0 to 133*	0 to 90*	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

* Minimum of 30 feet required to meet EMI requirements.

DS1 Line Code Settings				
Line Code Format	DIP Switch Settings			
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)
B8ZS	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON

Notes:

1. Switch section 8 (S1-8) is unused and ignored by the system.
2. Line code is software overrideable.

Figure 7-17. BBF3 DS1PM Option Switches

DS1PM Quick Reference Summary

Transmit Functions

Major transmit functions of the DS1PM circuit pack are as follows:

- Receives four AMI or B8ZS encoded DS1 signals from a DSX-1
- Recovers DS1 clock and NRZ data from each DS1 signal
- Synchronizes and maps each data signal to a VT1.5 SPE
- Inserts VT path overhead
- Multiplexes four VT1.5 SPEs to a byte-interleaved VT-G signal
- Provides the VT-G signal to a MXRVO/STS1E circuit pack.

Receive Functions

Major receive functions of the DS1PM circuit pack are as follows:

- Receives a SONET VT-G clock and frame synchronizing signals from its associated MXRVO/STS1E
- Demultiplexes the VT-G into four VT1.5 signals
- Terminates VT path and the embedded DS1 signal from each VT1.5 SPE
- Desynchronizes the DS1 signals
- Encodes each DS1 signal into either AMI or B8ZS format
- Pre-equalizes (with LBO) each DS1 and provides them to a DSX-1 as bipolar signals.

Control Functions

The major control functions of the DS1PM circuit pack are as follows:

- Protection switching for MXRVO/STS1E circuit pack protection
- VT path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.)
- Monitors a DS1 signal with SF or ESF frame format and generates PM data.

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Monitors DS1 signal for near-end and far-end performance
- Detects VT path AIS
- Inserts DS1 AIS toward fiber and toward DSX-1
- Inserts and detects VT path yellow signal.

177A Retainer Card Description

Purpose of Card

To ensure proper operation of DS1/DS1PM circuit pack protection switching, the 177A Retainer card (Figure 7-18) must be installed in all unused slots within a low-speed group that is partially equipped with DS1/DS1PM circuit packs.



CAUTION:

Unused low-speed interface slots within a partially equipped group must be equipped with 177A Retainer cards if DS1 protection is used. Failure to do so may result in corrupted transmission.

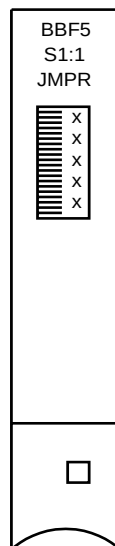


Figure 7-18. 177A Retainer Card

BBF5 Jumper Circuit Pack Description

Purpose of Circuit

In DDM-2000 FiberReach host applications using the DDM-2000 OC-3 Multiplexer Group 1 or Group 3 shelves, the BBF5 jumper circuit pack (Figure 7-19) connects signals between slots of a function unit equipped with 27-type OLIUs. The BBF5 also cross-couples the STS-1 signals between function units equipped with 27G2-U OLIUs. **The BBF5 circuit pack is not needed in Group 4 shelves in any application.** The BBF5 must be installed in Slot 8 of the low-speed group associated with the function unit where both function unit slots are equipped with 27G-U OLIUs. BBF5 circuit packs must be installed in slots 4 and 8 of the low-speed group associated with the function unit where both function unit slots are equipped with 27G2-U OLIUs. Depending on the cross-connection configuration, the removal of a BBF5 may affect transmission and/or communications over the DCC interface.



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Figure 7-19. BBF5 Jumper Circuit Pack

BBF8 High bit rate Digital Subscriber Line (HDSL)

Purpose of Circuit

The HDSL circuit pack (BBF8) provides HDSL interface capability on the DDM-2000 OC-3 shelf to compatible *PairGain*[®] equipment at the customer premises. It allows the transport of T1 payloads, for up to 12,000 feet, over two metallic 24 AWG twisted-pair lines.

The BBF8 circuit pack fits into the low-speed slots and provides two, four-wire HDSL interfaces. Each interface provides a full DS1 payload capacity mapped to a SONET VT1.5 and then VT cross-connected into an STS-1 through the MXRVO. Once in SONET, the DS1 payload is treated as a normal DS1.

HDSL Faceplate Indicator

The HDSL circuit pack FAULT indicator is shown in Figure 7-20. This red FAULT LED is lit by the SYSCTL on detection of an HDSL circuit pack failure. In the event of an incoming signal failure, this LED flashes on and off.

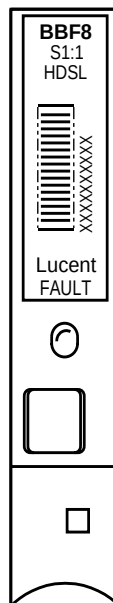


Figure 7-20. BBF8 HDSL Circuit Pack

General Description of Operation

Figure 7-21 provides an overall block diagram of the HDSL circuit pack. The BBF8 circuit pack provides an HDSL interface capability on the DDM-2000 OC-3 Multiplexer. HDSL is an access technology that allows the transport of DS1 payloads over metallic twisted pairs. This technology performs an inverse multiplexing function which splits the DS1 payload into two 784 Kb/s data streams. These two data streams are combined at the far-end to reconstruct the original DS1 payload. Both directions of transmission are carried on each twisted pair.

HDSL is a point-to-point transmission technology between two nodes. One of the nodes (master) is responsible for establishing communications over the *PairGain* proprietary embedded operations channel (EOC). The EOC is required for synchronizing the two HDSL data streams as well as providing OAM&P between the two nodes. The other node (slave) may only retrieve or view these parameters. In each pair of HDSL nodes there must be one master and one slave.

The HDSL signal format used by the BBF8 is compatible with *PairGain* HDSL equipment. Since the BBF8 circuit pack does not provide line powering, the far-end *PairGain* HDLS equipment must be externally powered.

Detailed Description of Operation

Transmission Circuitry

The BBF8 fits into a low-speed slot and provides two, four-wire (2 pair) HDSL interfaces. These interfaces are compatible with *PairGain* HDSL equipment which may be located up to 12,000 feet away. A 2B1Q line code is used on each transmission pair. Each interface provides a full DS1 payload capacity which is mapped to a SONET VT1.5. The HDSL overhead is in a *PairGain* proprietary format and can only be terminated by equipment capable of processing this information. As with the BBF1B (Quad DS1) circuit pack, an MXRVO must be used in the DDM-2000 OC-3 shelf to perform a VT cross-connect function. Once in SONET, the DS1 payload is treated as a normal DS1.

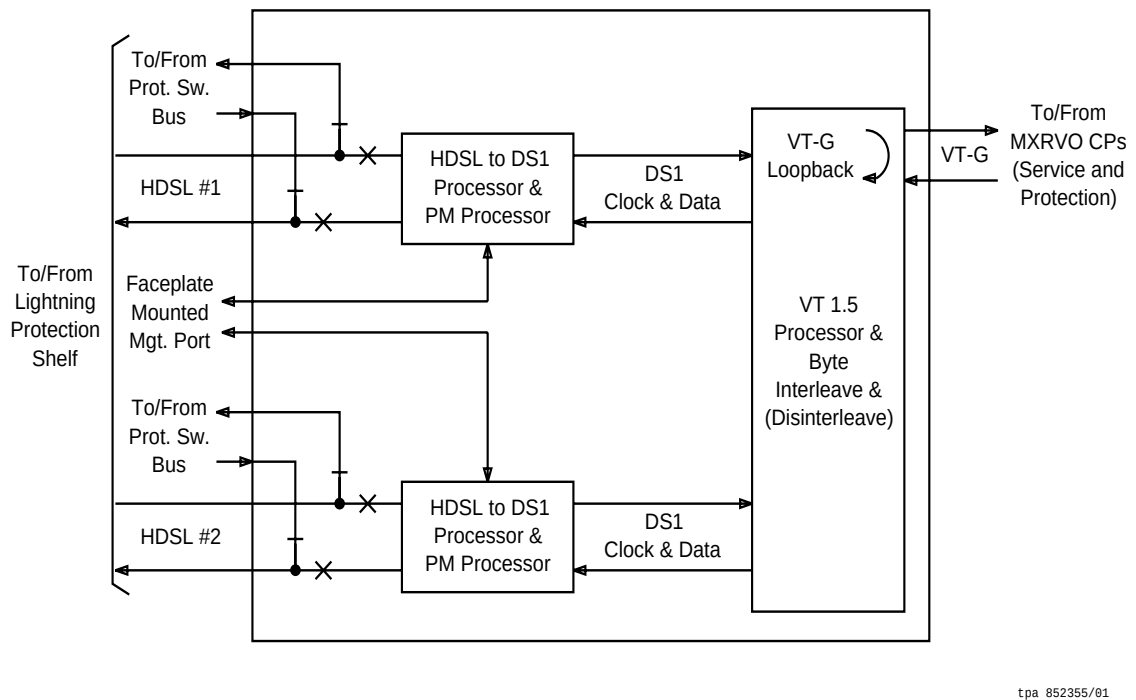


Figure 7-21. HDSL Circuit Pack Block Diagram

The distance limitations for HDSL are based on a maximum signal attenuation of 35 dB. Since signal attenuation decreases as the cable gauge (number) decreases, the lower the gauge the greater the length the HDSL can be extended. Table 7-1 identifies and lists these distances, as well as indicates the loss on the line, in dB per feet, at 196 kHz.

Due to the increased power needs of the BBF8, only three BBF8 circuit packs (including Protection) may be used in a function group. Powering for these packs is provided by the MXRVO in the OC-3 shelf. Pack mixing with Quad DS1 circuit packs is not allowed. The HDSL interfaces do not support line powering. The BBF8 is compatible with DDM-2000 Release 6.2 and later.

Table 7-1. HDSL Line Specifications

Cable Gauge	Loss at 196 kHz dB/ft	Ohms per kft	Maximum Loop for 35 dB Loss	Ohms at Maximum Length
26/0.40 mm	3.880	83.3	9.0 kft/2.75 km/1.7 mi	750
24/0.51 mm	2.841	51.9	12.3 kft/3.75 km/2.3 mi	638
22/0.61 mm	2.177	32.4	16.1 kft/4.9 km/3.0 mi	520
19/0.91 mm	1.535	16.1	22.8 kft/6.95 km/4.3 mi	367

Control Circuitry

The HDSL circuit pack interfaces with the SYSCCTL over the intra-shelf control bus. Redundancy in the intra-shelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The HDLS provides maintenance elements for reporting the status of the circuit pack and the incoming VT1.5 and HDSL signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCCTL for fault detection and isolation. Conversely, the HDSL responds to control signals from the SYSCCTL (such as FAULT LED control). The PM processor collects information from the framing circuitry and generates DS1 PM parameters which are stored in the HDSL pack. Access to the PM information is via a faceplate-mounted connector. Each connector supports two RS-232 interfaces (one for each HDSL port). The port is accessed by using a cable supplied with the circuit pack.

Timing Circuitry

The timing distribution to the HDSL contains ten timing signals: two high-speed clocks (active and standby), four VT-G clocks (two active and two standby), and four frame sync signals (two active and two standby).

The HDSL receives from the MXRVO an STS-1 rate high-speed clock that provides the frequency reference for the desynchronizing phase-locked loop. This high-speed reference clock is also used to synthesize the DS1 rate AIS clock source for the DS1 devices and to provide a DS1 test signal.

The HDSL uses the VT-G clocks (6.912 MHz) and the frame sync signals it receives from the MXRVO to clock VT-G data to/from the MXRVO.

Protection Circuitry

Optional 1xN revertive HDSL circuit pack protection is provided, and this protection is independent of the MXRVO circuit pack. The HDSL protection switch points are implemented with on-board relays on the HDSL side and with logic selectors at the VT-G level on the active and standby MXRVO circuit pack. The

SYSCCTL controls these relays through two serial interfaces so that a failure of one serial interface to the HDSL does not prevent control of the relays. If +5V power on the HDSL fails, the relays default to the protection state.

Shorting contacts are provided in the HDSL backplane connector so that when the circuit pack is removed, the HDSL cable pairs short through to the protection bus.



CAUTION:

Unused low-speed interface slots within a partially equipped group must be equipped with 177A Retainer cards if HDSL protection is used. Failure to do so may result in corrupted transmission. The HDSL circuit pack can not be mixed with the BBF1/1B/3Bs.

When a HDSL circuit pack is inserted, the relays are in the protection state until the SYSCCTL determines that the circuit pack is good.

Fault Detection Circuitry

The HDSL circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCCTL via the intra-shelf control bus. An out-of-service test is performed whenever the HDSL circuit pack is inserted or recovers from a transient failure. The incoming HDSL signal is monitored for HDSL synchronization errors. Incoming VT1.5 signals are monitored for VT AIS, VT LOP, and yellow.

Loopbacks

The HDSL circuit pack has two types of loopback, terminal and facility. Both types are controlled by the SYSCCTL via the intra-shelf control bus. The two loopbacks must be done independently.

The terminal loopback is provided on the HDSL circuit pack for each HDSL interface. The loopback is done inside the VT1.5 processor device and bridges the desynchronizer output signal (transmitted towards the far-end HDSL equipment) back to the DS1 synchronizer input. When the loopback is operated, the DS1 interface device forces AIS towards the far-end HDSL equipment.

The facility loopback is provided for both HDSL signals on the circuit pack. When this loopback is completed, all DS1 clock and data signals received from the VT1.5 processor are simultaneously looped back toward the far-end HDSL equipment. The loopback is a bridge, so the transmitted DS1 signals (towards the high-speed interface) are not affected.

Optional HDSL Settings

All system settings are stored in NVRAM at the unit designated as the system Master. Access to these settings is through the RS-232 faceplate port only. These settings are downloaded to the slave unit at system synchronization and at regular intervals during operation to keep the slave unit updated. The NVRAM is guaranteed to have a capability of 1,000 write cycles. The current state of loopbacks is not considered a system setting, and an active loopback becomes inactive during system resynchronization. Provisioning is not available at either the slave unit or doubler units. The following system settings are available:

- Smartjack Loopback Code Detection: ENABLE or DISABLE
- Special Loopback Code Detection: A1LB, A2LB, A3LB, A4LB, or A5LB
- Errored Second Threshold: NONE, 17, or 170 per 24 hours
- Loopback Time-out: NONE, 20, 60, 120 minutes
- Alarm Notification: ENABLE or DISABLE
- Allocation of DS0 time slots on HDSL loop: ALTERNATE or CONTIGUOUS
- Margin Alarm Threshold: 0-15 dB, 1 dB increments
- DS0 blocking: individually (T1, FT1)
- Fast Loss of Sync Word (LOSW): ENABLE or DISABLE

Performance Monitoring

From any unit in a system, HDSL performance data may be accessed for each HDSL span in the circuit, including up to two HDSL doublers (three total HDSL spans). Access to all PM data is through the faceplate RS-232 port only. Any unit provides access to the following:

- HDSL Span Current Status:
 - Alarms
 - Loopbacks
 - Margins
 - HDSL Pulse Attenuation
 - HDSL clock offset (PPM)
 - 24-hour HDSL Errored Seconds
 - 24-hour HDSL Unavailable Seconds
- HDSL Span History:
 - 15-min, 24-hour, 7-day HDSL Errored Seconds
 - 15-min, 24-hour, 7-day HDSL Unavailable Seconds

- HDSL Alarm History

- LOSW, HDSL1 - Loss of Sync on Loop 1
- LOSW, HDSL2 - Loss of Sync on Loop 2
- ES, HDSL1 - Exceeded ES Threshold on Loop 1
- ES, HDSL2 - Exceeded ES Threshold on Loop 2
- Margin, HDSL1 - Exceeded Threshold on Loop 1
- Margin, HDSL2 - Exceeded Threshold on Loop 2

Power Circuitry

The MXRVO circuit packs supply +5V power to the HDSL circuit packs in the corresponding DS1PM circuit pack groups. These inputs are diode ORed and the output is fused and then filtered before it is used to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.



CAUTION:

For power reliability, when a muldem is equipped with HDSL circuit packs, the associated function unit must be equipped with two MXRVO circuit packs.

Figure 7-22 shows HDSL options selectable via S1.

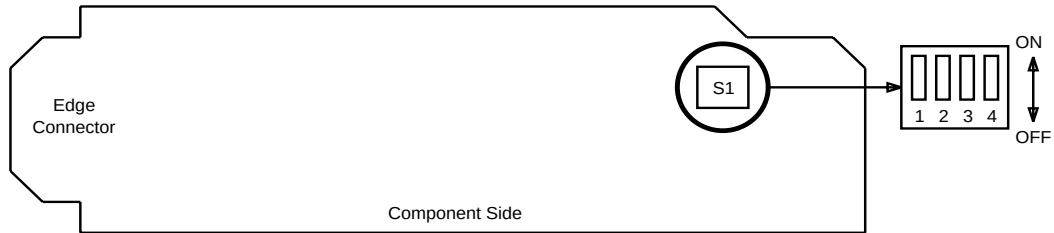


Figure 7-22. HDSL DIP Switch Settings and STS Path Overhead Bytes

HDSL Options		DIP Switch Settings			
		HDSL Port #1		HDSL Port #2	
		S1-1	S1-2	S1-3	S1-4
HDSL START-UP	Master	—	OFF	—	OFF
	Slave	—	ON	—	ON
HDSL MANAGEMENT	Local	OFF	—	OFF	—
	Through	ON	—	ON	—

HDSL Quick Reference Summary

Communication Functions

Major transmit (Xmit) and receive (Rcv) functions of the HDSL circuit pack are as follows:

- Multiplexes four VT1.5 SPEs to a byte-interleaved VT-G signal (Xmit)
- Provides the VT-G signal to a MXRVO/STS1E circuit pack (Xmit)
- Inserts VT path overhead (Xmit)
- Receives up to two HDSL formatted signals (Xmit)
- Provides HDSL to VT1.5 mapping (Xmit)
- Recovers DS1 clock and NRZ data from each HDSL payload (Xmit)
- Synchronizes and maps each data signal to a VT1.5 SPE (Xmit)
- *PairGain* compatible, 4-wire HDSL
- Bi-directional transmission port of 1.544 Mb/s over twisted pair
- Loopback options
- Receives a SONET VT-G clock and frame synchronizing signals from its associated MXRVO/STS1E
- Demultiplexes the VT-G into four VT1.5 signals (Rcv)
- Terminates VT path and the embedded DS1 signal from each VT1.5 SPE (Rcv)
- Desynchronizes the DS1 signals and maps directly into *PairGain* HDSL (Rcv).

Control Functions

The major control functions of the HDSL circuit pack are as follows:

- Protection switching for MXRVO/STS1E circuit packs
- VT path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Monitors a DS1 signal with SF or ESF frame format and generates PM data
- Monitors DS1 signal for near-end and far-end performance
- Detects VT path AIS
- Inserts DS1 AIS toward fiber and far-end HDSL equipment
- Inserts and detects VT path yellow signal.

BBG2 MXRVO Circuit Pack Description

Purpose of Circuit

The virtual tributary (VT) to optical multiplexer (MXRVO) circuit pack interfaces between the DS1 and OLIU circuit packs. It is also an interface between the HDSL and OLIU circuit packs.

MRXVO Faceplate Indicators

The MXRVO circuit pack faceplate indicators are shown in Figure 7-23.

The red FAULT LED lights on detection of circuit pack hardware failure.

The green ACTIVE LED lights when the circuit pack is active (carrying service).

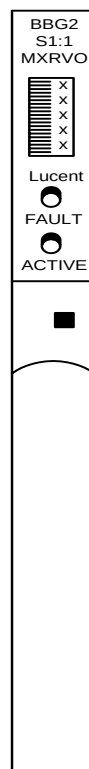


Figure 7-23. BBG2 MXRVO Circuit Pack

General Description of Operation

The MXRVO circuit pack accepts eight VT-G signals from DS1 circuit packs, selects seven, combines them to form an STS-1 signal, inserts STS-1 path overhead, and sends the resulting STS-1 signal to active and standby OLIUs.

The MXRVO selects one of two received STS-1 signals from the OLIUs, terminates STS-1 path overhead, and demultiplexes the STS-1 into seven VT-G signals.

The MXRVO interfaces with the OLIU at the STS-1 rate, to eight low-speed DS1 circuit packs at the VT-G rate, and with the SYSCTL circuit pack.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. In the transmit direction (from the DS1 low-speed packs), the VT-G signals from each DS1 are combined into an STS-1 signal (see Figure 7-24). The STS-1 path overhead and pointer are inserted, and the signal is transmitted to the OLIU.

Receive Direction. In the receive direction (from the OLIU), the STS-1 path is terminated. Then, the STS-1 signal is split into seven VT-G signals for transmission to the DS1 circuit packs.

Control Circuitry

The MXRVO circuit pack interfaces with the SYSCTL via the intra-shelf control bus. The MXRVO provides maintenance elements for reporting the status of the circuit pack and the incoming STS-1 and VT-G signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the MXRVO responds to control signals from the SYSCTL (such as ACTIVE and FAULT LED controls).

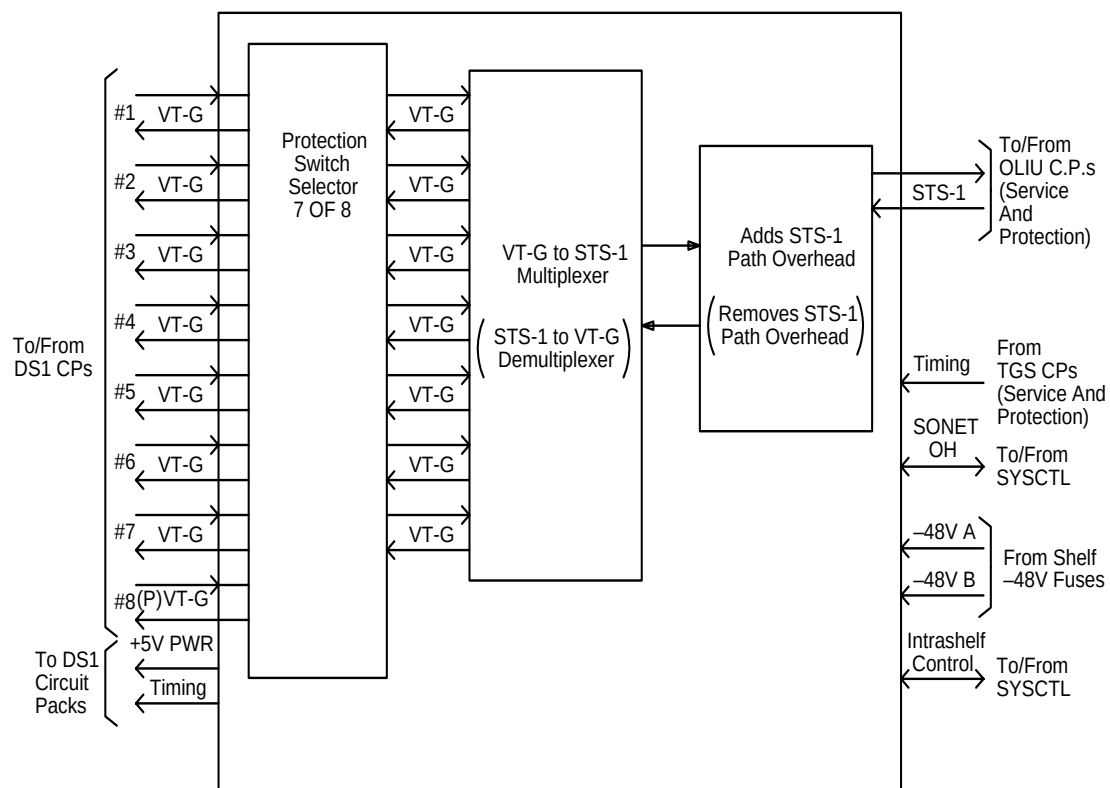


Figure 7-24. BBG2 MXRVO Circuit Pack Block Diagram

Timing Circuitry

The MXRVO receives STS-1 timing signals which are traceable to the STS-1 clocks generated by the TG circuit packs.

The MXRVO can select between the supplied timing signals as requested by the SYSCCTL via the intra-shelf control bus. The selected timing signals are used to time both the receive and transmit directions of the MXRVO.

Protection Circuitry

The MXRVO protection switch points reside on the OLIU and on each low-speed circuit pack for the STS-1 and VT-G signals, respectively. Optional 1x1 nonrevertive MRXVO circuit pack protection is provided and is independent of the OLIU and low-speed DS1 circuit packs.

The MXRVO provides protection switching for the VT-G side of the low-speed circuit packs. The MXRVO can be requested by the SYSCTL through the intra-shelf control bus to replace any of the seven service VT-G inputs with the protection VT-G input. The MXRVO can be requested by the SYSCTL to bridge any of the seven VT-G service outputs to the protection output.

The MXRVO provides SYSCTL-controlled selectors for the STS-1 side of the main OLIU protection switch.

The MXRVO provides selectors for an STS-1 timing switch. The timing switch may be performed autonomously by the MXRVO based on the quality of the received timing signals or by the SYSCTL.

Fault Detection Circuitry

The MXRVO circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and any errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the MXRVO circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The MXRVO circuit pack provides PM circuitry for STS path parameters derived from B3 coding violations.

Power Circuitry

The MXRVO provides power to the corresponding DS1 low-speed circuit packs associated with the function unit group that the MXRVO is in. It receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion into a +5 volt source for use by the MXRVO and the low-speed DS1 circuit packs. A failure of the fuse or converter causes the red FAULT LED to light.



CAUTION:

For power reliability, when a muldem is equipped with DS1PM circuit packs, the associated function unit must be equipped with two MXRVO/STS1E circuit packs.

MXRVO Quick Reference Summary

Transmit Functions

The major transmit functions of the MXRVO are as follows:

- Selects and multiplexes seven VT-G channels into one STS-1 SPE
- Adds STS-1 path overhead
- Provides STS-1 signal to main OLIU circuit packs.

Receive Functions

The major receive functions of the MXRVO are as follows:

- Terminates STS-1 path
- Demultiplexes the STS-1 SPE into seven VT-G signals
- Supplies the seven VT-G signals to the DS1 circuit packs
- Provides timing signals to DS1 circuit packs.

Control Functions

Major control functions are as follows:

- STS-1 path overhead processing
- Protection switching for OLIU circuit pack protection
- Protection switching for DS1 circuit pack protection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Detects STS-1 path AIS coming from the fiber
- Inserts VT path AIS
- Inserts and detects STS-1 path yellow signals
- Inserts VT path unequipped signals.

BBG4/BBG4B DS3 Circuit Pack Description

Purpose of Circuit

The BBG4/BBG4B DS3 circuit pack provides a low-speed interface between asynchronous DS3-rate signals and SONET STS-1 signals. The BBG4B DS3 provides the same functions as the BBG4 DS3 and can be used in place of the BBG4 DS3 in all applications. In addition, the BBG4B DS3 has enhanced DS3 PM capabilities.

BBG4/BBG4B DS3 Faceplate Indicators

The BBG4/BBG4B DS3 circuit pack faceplate indicators are shown in Figure 7-25.



Figure 7-25. BBG4B DS3 Circuit Pack

The red FAULT LED lights by the SYSCTL on detection of BBG4/BBG4B DS3 circuit pack failure. In the event of an incoming DS3 signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

General Description of Operation

The BBG4/BBG4B DS3 circuit pack provides bidirectional transport of one DS3 signal through DDM-2000 OC-3 in either clear channel (CC) mode, violation monitor and removal (VMR) mode, or violation monitor (VM) mode, by mapping the DS3 into an STS-1 signal. The BBG4/BBG4B DS3 performs maintenance and provisioning functions associated with the STS-1 and DS3 signals and provides access to the STS-1 path overhead. It interfaces to the OLIU at the STS-1 rate, to the DSX-3, and to the SYSCTL, and receives timing signals traceable to the TG circuit pack. When provisioned for the CC mode, the DS3 can transport any DS3 rate signal that meets specified electrical interface requirements. When provisioned for the VMR or VM mode, the DS3 signal must meet both electrical and DS3 frame format requirements.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-26 provides an overall block diagram of the BBG4/BBG4B DS3 circuit pack. The transmit direction is the direction towards the STS-1 signal, and receive direction refers to the direction towards the DSX-3. In the transmit direction, the BBG4/BBG4B DS3 receives an incoming B3ZS encoded DS3 signal from the DSX-3. A closed protection relay contact routes the DS3 to a circuit that splits the signal and sends one output to the companion (standby) circuit pack and the other to its own receiver. The BBG4/BBG4B DS3 receiver performs equalization and clock recovery. The MUX circuitry performs B3ZS decoding, optional automatic DS3 AIS insertion, and a provisionable VMR function, then synchronizes and maps the DS3 to the STS-1 rate. The DS3 signal is then synchronized to the STS-1 payload rate, STS-1 path overhead is inserted, and an STS-1 rate signal is transmitted to an OLIU pair.

Receive Direction. The BBG4/BBG4B DS3 receives STS-1 data from both the active and standby OLIUs, selects one STS-1, performs pointer interpretation, processes and removes the path overhead, desynchronizes the embedded DS3, provides a provisionable VMR function, and then B3ZS encodes the signal for transmission to the DSX-3. A jumper allows the user to insert or remove an LBO network (225 ft. of 734A-type cable equivalent) to provide the required signal level and shape at the DSX-3.

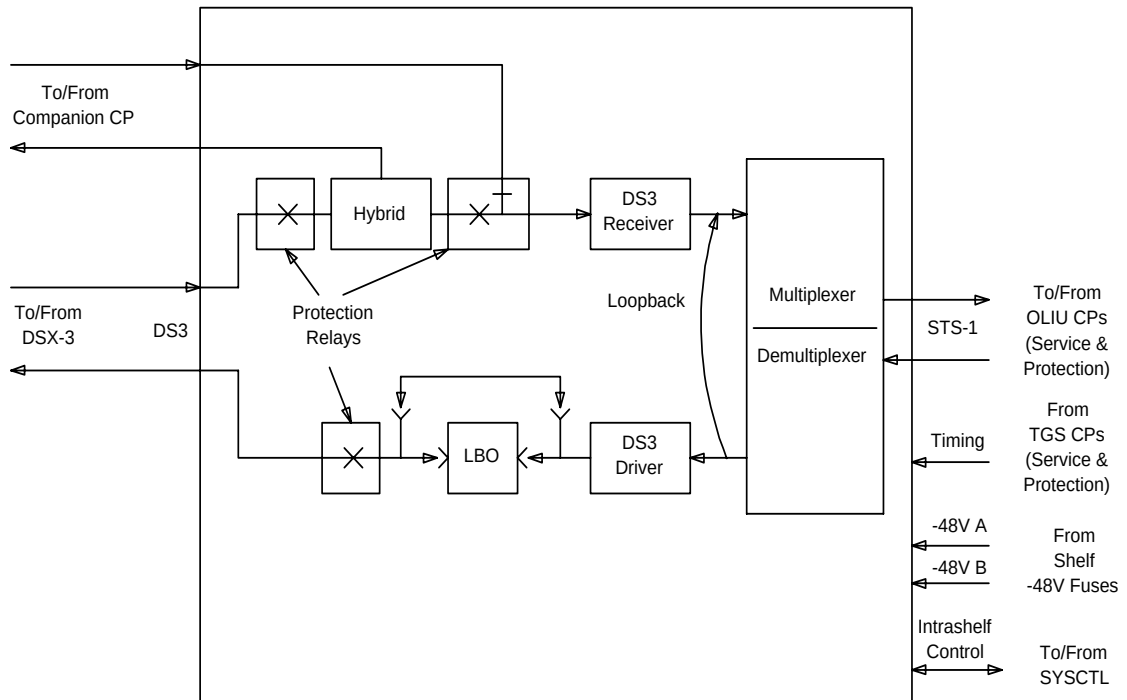


Figure 7-26. BBG4/BBG4B DS3 Circuit Pack Block Diagram

VMR Function

Before the DS3 signal is B3ZS-encoded (receive) or decoded (transmit), a VMR function can be provisioned via the control circuitry for one of three possible modes. These three modes are as follows:

- VMR with DS3 AIS insertion—default
- VM without removal of violations but with AIS insertion
- No violation monitoring CC mode with options for
 - AIS insertion
 - No AIS insertion.

Control Circuitry

The BBG4/BBG4B DS3 circuit pack interfaces with the SYSCTL via the intra-shelf control bus. Redundancy in the intra-shelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The BBG4/BBG4B DS3 provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and DS3 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the BBG4/BBG4B DS3 responds to control signals from the SYSCTL (such as active and fault LED controls).

Timing Circuitry

The BBG4/BBG4B DS3 derives its timing information from the recovered DS3 clock from the DSX-3 incoming signal. In the transmit direction, a 44.736 MHz clock is recovered from the incoming DS3 signal and is used to recover DS3 data. In the receive direction, a smoothed 44.736 MHz clock is generated by a phase-locked loop to accompany the DS3 signal extracted from the STS-1 payload.

In addition to the recovered DS3 clock, the BBG4/BBG4B DS3 circuit pack requires STS-1 timing supplied, via the circuit pack edge connector, from the backplane.

Protection Circuitry

Optional 1x1 nonrevertive BBG4/BBG4B DS3 circuit pack protection is provided. Switch points for the STS-1 side of the DS3 are located on the OLIU circuit packs. Switch points for the DS3 side are implemented with relays on the BBG4/BBG4B DS3 circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL, via the control interfaces. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the DS3 side, a single DS3 input from a DSX-3 is sent to both the active and standby BBG4/BBG4B DS3 circuit packs. Only the active unit selects the DS3 input. The SYSCTL supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the DS3 input signal and sends it to the standby unit and to its own receiver. To implement a protection switch on the DS3 side, the SYSCTL switches the relays on each unit to their opposite state.

When a BBG4/BBG4B DS3 is removed, shorting contacts on the backplane connector operate so that the DS3 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

The BBG4/BBG4B DS3 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the BBG4/BBG4B DS3 circuit pack is inserted or recovers from a transient failure.

The incoming DS3 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-6} , LOS, DS3 OOF, and DS3 AIS. Incoming STS-1 signals are monitored for STS AIS, STS LOP, and yellow and are also monitored for DS3 OOF and AIS.

Loopbacks

Two loopbacks are provided on the BBG4/BBG4B DS3. The terminal loopback bridges the DS3 desynchronizer output signal (transmitted towards the DSX-3) back into the DS3 synchronizer input. Operation of the loopback does not affect the signal transmitted to the DSX-3. The facility loopback bridges the STS-1 output signal to the OLIU back towards the DSX-3. Operation of this loopback does not affect the signal transmitted to the fiber. Both loopbacks are controlled by the SYSCTL through the intra-shelf control bus.

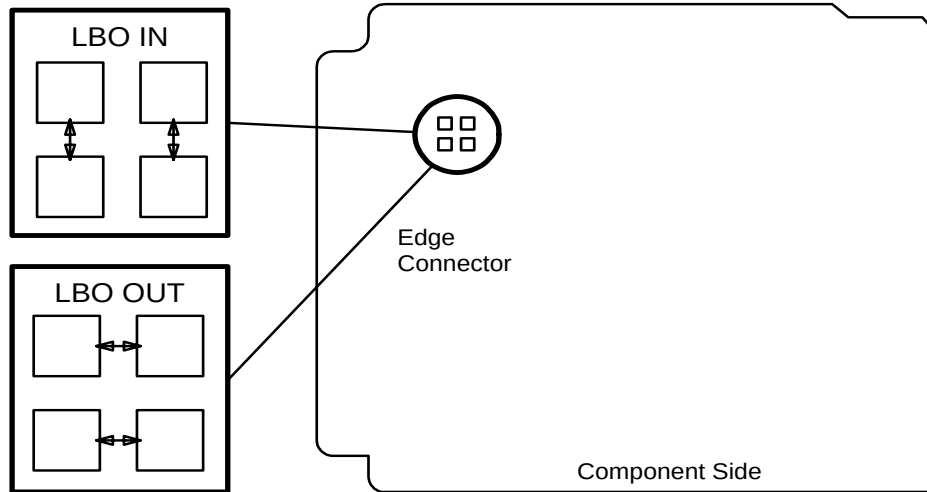
Performance Monitoring

The BBG4/BBG4B DS3 circuit pack provides PM circuitry for the following performance parameters:

- STS path parameters derived from B3 coding violations
- DS3 path parameters derived from P-bit coding violations
- DS3 path parameters derived from frame and multiframe (F&M) bit errors
- DS3 line errors based on B3ZS violations (BBG4B only)
- DS3 P-bit and F&M bit PM for both directions of transmission (BBG4B only)
- C-bit parity and FEBE performance monitoring for both directions of transmission (BBG4B only).

BBG4/BBG4B DS3 Hardware Settings

The location of the BBG4/BBG4B DS3 circuit pack LBO jumpers is shown in Figure 7-27. The BBG4/BBG4B DS3 LBO settings are shown in the table.



BBG4/BBG4B DS3 LBO Settings

Cable Length (Ft)		LBO Setting
735A Cable	734D Cable	
0 to 125	0 to 225	LBO IN
>125 to 250	>225 to 450	LBO OUT

Figure 7-27. BBG4/BBG4B DS3 Line Build-Out (LBO) Jumpers

Power Circuitry

The BBG4/BBG4B DS3 circuit pack receives two sources of –48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG4/BBG4B DS3 Quick Reference Summary

Transmit Functions

The BBG4/BBG4B DS3 transmit functions are as follows:

- Receives a B3ZS-encoded DS3 signal from a DSX-3
- Recovers DS3 clock and NRZ data
- Optionally checks and/or corrects P-bit parity errors
- Synchronizes the data signal to STS-1 signal rate
- Inserts STS-1 path overhead
- Provides the STS-1 signal to the OLIU circuit packs.

Receive Functions

The following receive functions are performed by the BBG4/BBG4B DS3 circuit pack:

- Desynchronizes the incoming STS-1 signal
- Terminates the STS-1 path
- Optionally checks and/or corrects P-bit parity errors
- B3ZS encodes the outgoing DS3 signal
- Pre-equalizes the DS3 signal (with LBO) and transmits it to a DSX-3.

Control Functions

The major control functions are as follows:

- Protection switching for BBG4/BBG4B DS3 circuit packs
- STS-1 path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Detects STS-1 path AIS coming from the fiber
- Detects STS-1 path unequipped signal coming from the fiber
- Inserts DS3 AIS toward the fiber and DSX-3
- Detects DS3 AIS coming from the fiber
- Inserts and detects STS-1 path yellow signal to/from the fiber
- Detects DS3 OOF from the fiber
- Detects DS3 B3ZS violation threshold crossings from the DSX-3
- Inserts and detects STS-1 path trace (BBG4B only).

BBG6 STS1E Circuit Pack Description

Purpose of Circuit

The STS1E circuit pack provides an interface between EC-1 and DS1-rate (high-speed) or EC-1 and OC-3-rate (low-speed) applications.

STS1E Faceplate Indicators

The STS1E circuit pack faceplate indicators are shown in Figure 7-28.

The red FAULT LED is lighted by the SYSCTL on detection of STS1E circuit pack failure. In the event of an incoming signal failure, this LED flashes on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).



Figure 7-28. BBG6 STS1E Circuit Pack

General Description of Operation

The STS1E circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 OC-3 Multiplexer and has two operating modes, EC-1 high-speed (Figure 7-29a) and EC-1 low-speed (Figure 7-29b).

In the high-speed mode, the STS1E circuit pack interfaces with the DS1/DS1PM circuit pack at the VT-G rate (6.192 Mb/s). In the low-speed mode, the STS1E circuit pack interfaces with the OLIU circuit pack at the STS-1 rate (51.84 Mb/s).

The STS1E circuit pack interfaces with the SYSCTL for maintenance, provisioning, and PM functions and interfaces to the TG circuit pack for timing.

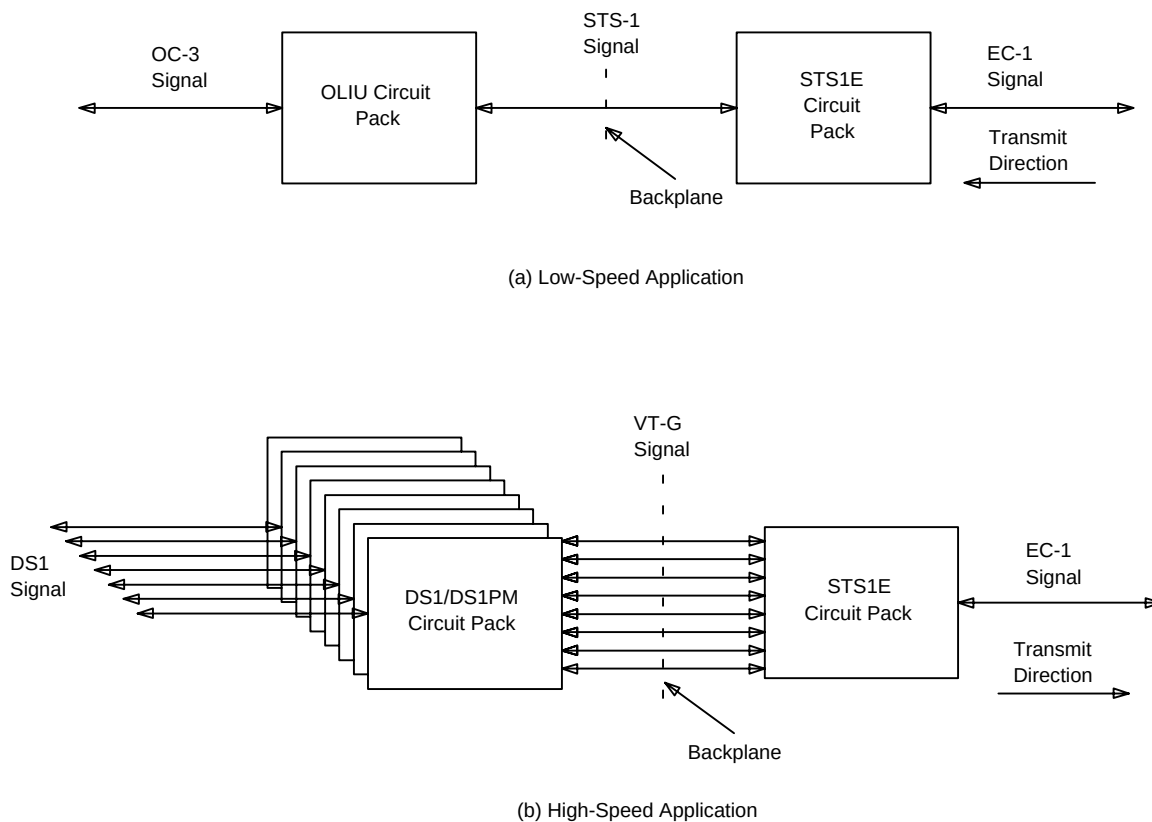
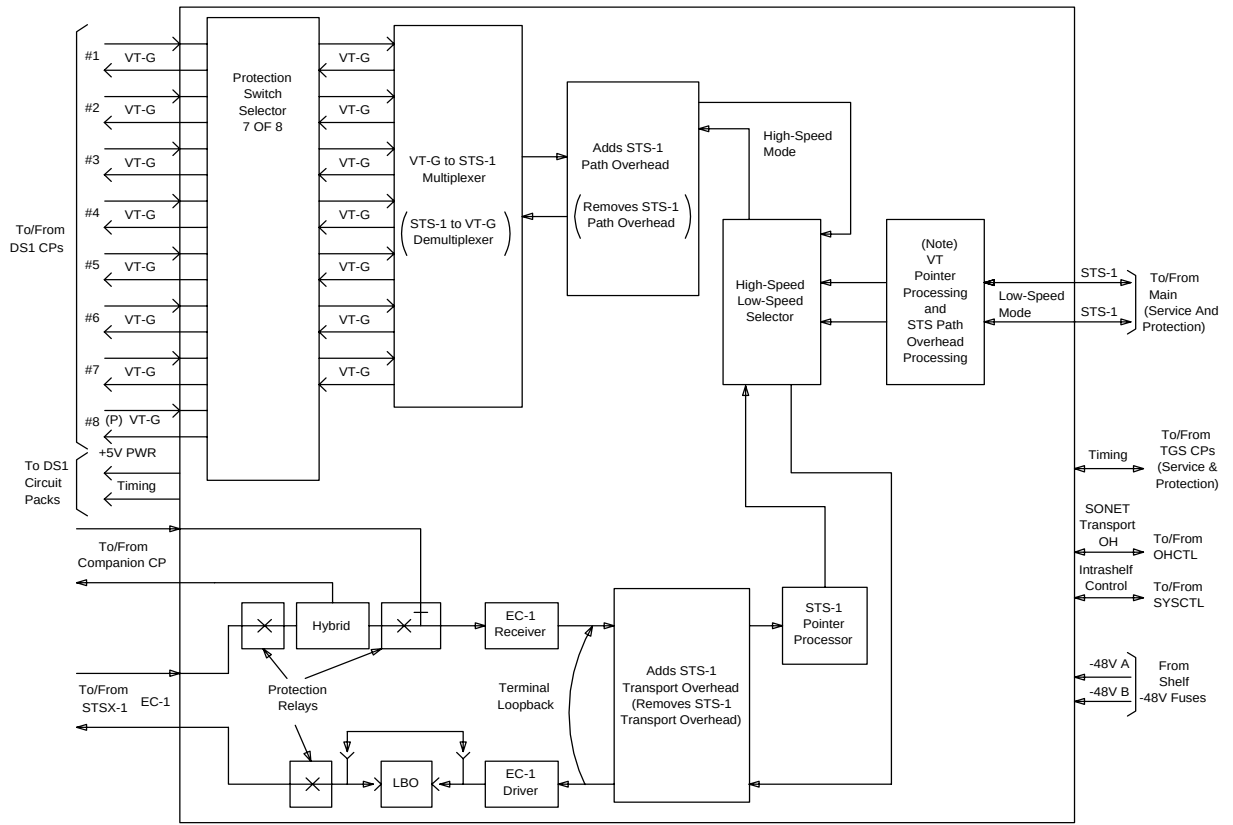


Figure 7-29. STS1E Circuit Pack Low-Speed and High-Speed Modes



Note: Applicable in the low-speed mode with VT cross-connects.

Figure 7-30. BBG6 STS1E Circuit Pack Block Diagram

Detailed Description of Operation

Figure 7-30 is a block diagram of the STS1E circuit pack. The STS1E circuit pack has two modes of operation determined by the setting of a hardware switch, VT-G to and from EC-1 (high-speed mode) or STS-1 to and from EC-1 (low-speed mode).

In the high-speed mode, the STS1E circuit pack receives eight incoming VT-G channels (seven service and one protection) from the eight low-speed DS1/DS1PM circuit packs and selects seven channels. These seven channels, along with STS-1 path overhead, transport overhead, a valid STS-1 pointer, and parity are byte-interleaved into an STS-1 formatted signal and transmitted as an EC-1 signal. In the receive direction, the incoming EC-1 signal is demultiplexed into seven VT-G signals.

In the low-speed mode, the STS1E circuit pack selects an STS-1 signal, either service or protection, from the OLIU circuit pack backplane and sends the signal to the EC-1 interface (receive direction). In the transmit direction, the incoming EC-1 signal is processed and routed to the backplane as an STS-1 signal.

In the low-speed mode, the STS1E circuit pack can be configured for a VT-based STS-1. In this case, the STS-1 path overhead (POH) for the EC-1 is terminated. For non-VT-based STS-1s, the STS-1 path is sent through the STS1E circuit pack unaffected.

Regardless of the operating mode, the STS1E circuit pack:

- Inserts transport overhead
- Provides scrambling and descrambling
- Provides B3ZS encoding and decoding
- Provides waveshaping
- Provides optional LBO for transmission to the STSX-1.

Control Circuitry

The STS1E circuit pack interfaces with the SYSCTL and OHCTL circuit packs.

The SYSCTL receives maintenance elements for reporting the status of the circuit pack, the status of the incoming signal, and inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used for fault detection and isolation. Conversely, the STS1E circuit pack responds to signals from the SYSCTL including protection switching and LED control commands.

The STS1E circuit pack accesses the SONET transport overhead and routes it, via the transport overhead channel interface, to the OHCTL.

Timing Circuitry

The STS1E circuit pack receives timing signals which are traceable to the clocks generated by the TG circuit packs.

The STS1E circuit pack can select between the supplied timing signals as requested by the SYSCTL via the intra-shelf control bus. The selected timing signals are used to time both the receive and transmit directions of the STS1E circuit pack.

Protection Circuitry

Optional 1x1 nonrevertive STS1E circuit pack protection is provided.

In the high-speed mode, the STS1E provides protection switching for the VT-G side of the low-speed circuit packs. The STS1E can be requested by the SYSCTL through the intra-shelf control bus to replace any of the seven service VT-G inputs with the protection VT-G input. The STS1E can be requested by the SYSCTL to bridge any of the seven VT-G service outputs to the protection output. In the low-speed mode, the STS1E provides SYSCTL-controlled selectors for the STS-1 side of the main OLIU protection switch.

STS1E circuit pack protection switch points for the STS-1 side are located on the OLIU circuit packs. Switch points for the EC-1 side are implemented with relays on the STS1E circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL, via the control interface. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the EC-1 side, a single STS-1 input from an STSX-1 is sent to both the active and standby STS1E circuit packs. Only the active unit selects the STS-1 input. The SYSCTL supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the STS-1 input signal and sends it to the standby unit and to its own receiver. To implement a protection switch on the EC-1 side, the SYSCTL switches the relays on each unit to their opposite state.

When an STS1E is removed, shorting contacts on the backplane connector operate so that the STS-1 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

The STS1E circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the STS1E circuit pack is inserted or recovers from a transient failure.

Loopbacks

One loopback is provided on the STS1E circuit pack. This terminal loopback loops the EC-1 output signal transmitted towards the STSX-1 back into the STSX-1 transport overhead processor input.

Performance Monitoring

The STS1E provides PM circuitry for the following performance parameters:

- Line parameters derived from B2 coding violations
- STS-1 parameters derived from B3 coding violations.

Power Circuitry

The STS1E receives two sources of –48 volts that are diode ORed, fused, and filtered before being converted to +5 volts to power the circuit pack and +5.3 volts to power the DS1/DS1PM circuit packs in the low-speed slots.

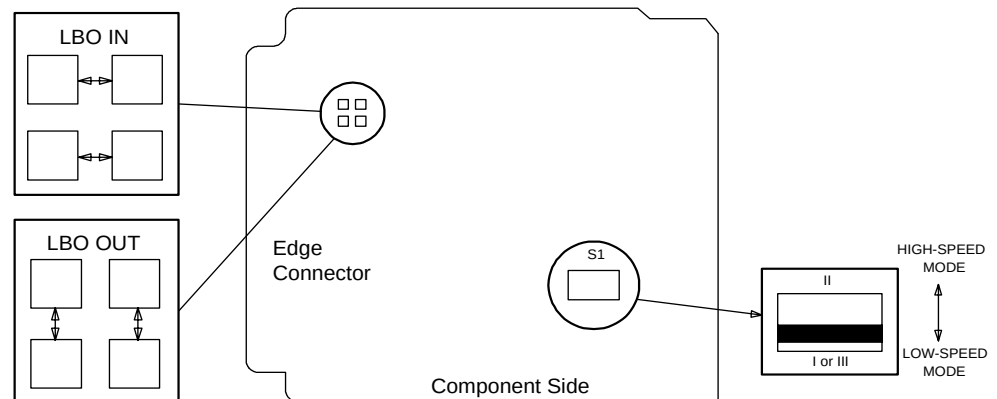


CAUTION:

For power reliability, when a muldem is equipped with DS1PM circuit packs, the associated function unit must be equipped with two MXRVO/STS1E circuit packs.

STS1E Hardware Settings

The location of the STS1E circuit pack LBO jumpers and mode switch are shown in Figure 7-31. The STS1E LBO settings are shown in the table.



STS1E LBO Settings

Cable Length (Ft)		LBO Setting
735A Cable	734D Cable	
0 to 125	0 to 225	LBO IN
>125 to 250	>225 to 450	LBO OUT

Figure 7-31. BBG6 STS1E Line Build-Out (LBO) Jumpers and Mode Switch

STS1E Quick Reference Summary

Transmit Functions (High-Speed Mode)

The STS1E transmit (high-speed mode) functions are as follows:

- Selects VT-Gs from DS1/DS1PM circuit packs, multiplexes VT-Gs with protection selection into a SPE, and adds STS-1 path overhead
- Adds SONET transport overhead, B3ZS encodes and scrambles data, converts to bipolar format, and sends it to the STSX-1.

Transmit Functions (Low-Speed Mode)

The STS1E transmit (low-speed mode) functions are as follows:

- Receives B3ZS-encoded and scrambled EC-1 (STS-1) signal from STSX-1
- B3ZS decodes and descrambles the signal and removes transport overhead
- Processes STS-1 pointers and frame synchronizes the signal
- Optionally provides 6.48 Mb/s reference clock for TG circuit packs
- Terminates STS-1 path (VT-based only).

Receive Functions (High-Speed Mode)

The STS1E receive functions (high-speed mode) are as follows:

- Receives B3ZS-encoded and scrambled EC-1 signal from STSX-1
- B3ZS decodes and descrambles signal and removes transport overhead
- Processes STS-1 pointers and frame synchronizes the STS-1 signal
- Optionally provides 6.48 Mb/s reference clock for TG circuit packs
- Terminates STS-1 path
- Demultiplexes the SPE into seven VT-G signals and supplies VT-G signals to the DS1/DS1PM circuit packs.

Receive Functions (Low-Speed Mode)

The STS1E receive (low-speed mode) functions are as follows:

- Selects an STS-1 input from the OLIU circuit pack and adds transport overhead
- B3ZS encodes and scrambles data, converts to bipolar format, and sends it to the STSX-1.

Control Functions

The major control functions are as follows:

- STS-1 path overhead processing
- Protection switching for OLIU and DS1/DS1PM circuit packs
- Protection switching for TG circuit packs
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions (High-Speed Mode)

The STS1E major maintenance signal functions (high-speed mode) are as follows:

- Detects STS-1 path AIS
- Detects VT1.5 path AIS
- Detects STS-1 LOP
- Detects VT LOP
- Inserts VT path AIS
- Inserts STS-1 path unequipped signal
- Inserts and detects EC-1 line AIS
- Inserts and detects line FERF
- Inserts and detects STS-1 path yellow signal
- Detects EC-1 line failures (LOS, LOF, AIS, and BER)
- Detects EC-1 line signal degrade BER.

Maintenance Signal Functions (Low-Speed Mode)

The major maintenance signal functions (low-speed mode) are as follows:

- Detects STS-1 path AIS (VT cross-connected)
- Detects STS-1 LOP
- Detects VT LOP (VT cross-connected)
- Inserts VT path AIS (VT cross-connected)
- Inserts STS path AIS (STS cross-connected)
- Inserts STS-1 path unequipped signal
- Inserts and detects EC-1 line AIS
- Inserts and detects line FERF
- Inserts and detects STS-1 path yellow signal (VT cross-connected)
- Detects EC-1 line failures (LOS, LOF, AIS, and BER)
- Detects EC-1 line signal degrade BER.

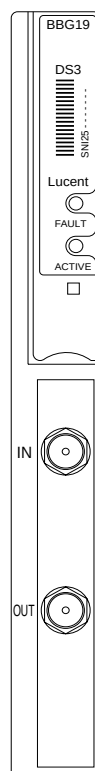
BBG19 DS3 Data Services Interface Circuit Pack Description

Purpose of Circuit

The BBG19 DS3 circuit pack provides a low-speed interface between asynchronous DS3-rate signals and SONET STS-1 signals. It provides front access to DS3 Data Services, such as Ethernet, Token Ring, ATM, FDDI, Frame Relay, and others, via BNC faceplate connectors.

BBG19 DS3 Faceplate Indicators

The BBG19 DS3 circuit pack faceplate indicators are shown in Figure 7-32.



tpa 852246/01

Figure 7-32. BBG19 DS3 Circuit Pack

The red FAULT LED lights by the SYSCCTL on detection of BBG19 DS3 circuit pack failure. In the event of an incoming DS3 signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

General Description of Operation

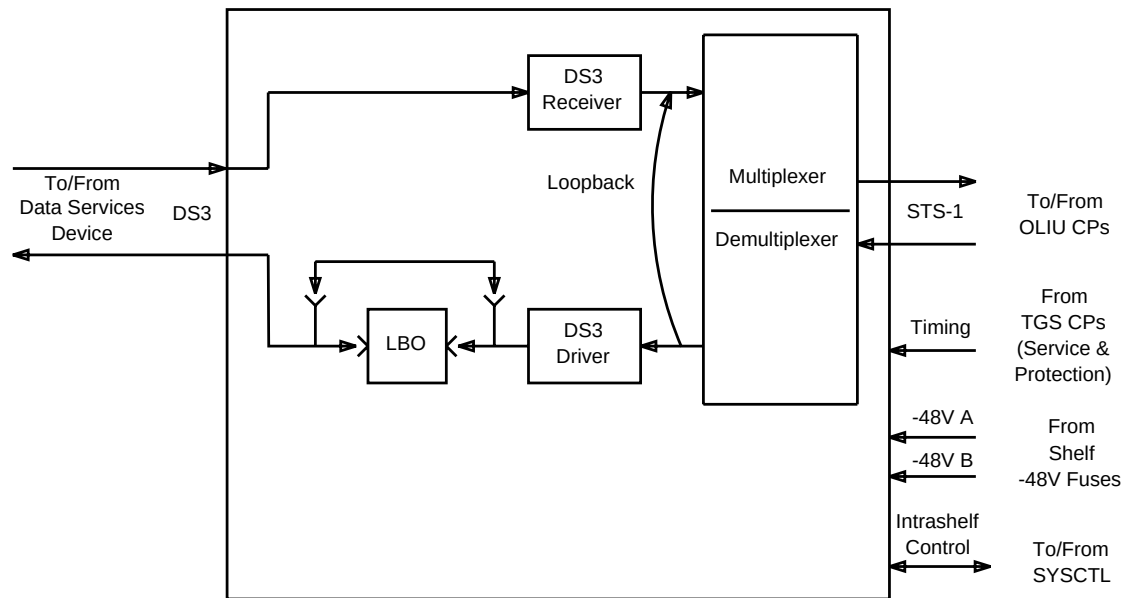
The BBG19 DS3 circuit pack provides bidirectional transport of one DS3 signal through DDM-2000 OC-3 in either CC mode, VMR mode, or VM mode, by mapping the DS3 into an STS-1 signal. The BBG19 DS3 performs maintenance and provisioning functions associated with the STS-1 and DS3 signals and provides access to the STS-1 path overhead. It interfaces to the OLIU at the STS-1 rate, to the data services device, and to the SYSCCTL, and receives timing signals traceable to the TG circuit pack. When provisioned for the CC mode, the DS3 can transport any DS3 rate signal that meets specified electrical interface requirements. When provisioned for the VMR or VM mode, the DS3 signal must meet both electrical and DS3 frame format requirements.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-33 provides an overall block diagram of the BBG19 DS3 circuit pack. The transmit direction is the direction towards the STS-1 signal, and receive direction refers to the direction towards the data services device. In the transmit direction, the BBG19 DS3 receives an incoming B3ZS encoded DS3 signal from the data services device. BNC connectors on the faceplate of the BBG19 provide input and output for the data services signal. The BBG19 DS3 receiver performs equalization and clock recovery. The MUX circuitry performs B3ZS decoding, optional automatic DS3 AIS insertion, and a provisionable VMR function, then synchronizes and maps the DS3 to the STS-1 rate. The DS3 signal is then synchronized to the STS-1 payload rate, STS-1 path overhead is inserted, and an STS-1 rate signal is transmitted to an OLIU pair.

Receive Direction. The BBG19 DS3 receives STS-1 data from the OLIUs, selects one STS-1, performs pointer interpretation, processes and removes the path overhead, desynchronizes the embedded DS3, provides a provisionable VMR function, and then B3ZS encodes the signal for transmission to the data services device. A jumper allows the user to insert or remove an LBO network (225 ft. of 734A-type cable equivalent) to provide the required signal level and shape at the data services device.



tpa 852245/01

Figure 7-33. BBG19 DS3 Circuit Pack Block Diagram

VMR Function

Before the DS3 signal is B3ZS-encoded (receive) or decoded (transmit), a VMR function can be provisioned via the control circuitry for one of three possible modes. These three modes are as follows:

- VMR with DS3 AIS insertion—default
- VM without removal of violations but with AIS insertion
- No violation monitoring CC mode with options for
 - AIS insertion
 - No AIS insertion.

Control Circuitry

The BBG19 DS3 circuit pack interfaces with the SYSCTL via the intra-shelf control bus. The BBG19 DS3 provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and DS3 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the BBG19 DS3 responds to control signals from the SYSCTL (such as active and fault LED controls).

Timing Circuitry

The BBG19 DS3 derives its timing information from the recovered DS3 clock from the data services device incoming signal. In the transmit direction, a 44.736 MHz clock is recovered from the incoming DS3 signal and is used to recover DS3 data. In the receive direction, a smoothed 44.736 MHz clock is generated by a phase-locked loop to accompany the DS3 signal extracted from the STS-1 payload.

In addition to the recovered DS3 clock, the BBG19 DS3 circuit pack requires STS-1 timing supplied, via the circuit pack edge connector, from the backplane.

Locked DS3 Circuitry

The DDM-2000 OC-3 accepts two BBG19s installed side-by-side in a dual 0x1 configuration. This configuration allows for efficient bandwidth utilization in the network for data services traffic. Each DS3 is assigned to both rotations of the ring using the same STS-1 time slot. This dual 0x1 interface also provides route diversity for point to multi-point interconnectivity and route restoration to data networking devices utilizing the BBG19s for access to the SONET network.

Fault Detection Circuitry

The BBG19 DS3 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they

occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the BBG19 DS3 circuit pack is inserted or recovers from a transient failure.

The incoming DS3 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-6} , LOS, DS3 OOF, and DS3 AIS. Incoming STS-1 signals are monitored for STS AIS, STS LOP, and yellow and are also monitored for DS3 OOF and AIS.

Loopbacks

Two loopbacks are provided on the BBG19 DS3. The terminal loopback bridges the DS3 desynchronizer output signal (transmitted towards the data services device) back into the DS3 synchronizer input. Operation of the loopback does not affect the signal transmitted to the data services device. The facility loopback bridges the STS-1 output signal to the OLIU back towards the data services device. Operation of this loopback does not affect the signal transmitted to the fiber. Both loopbacks are controlled by the SYSCTL through the intra-shelf control bus.

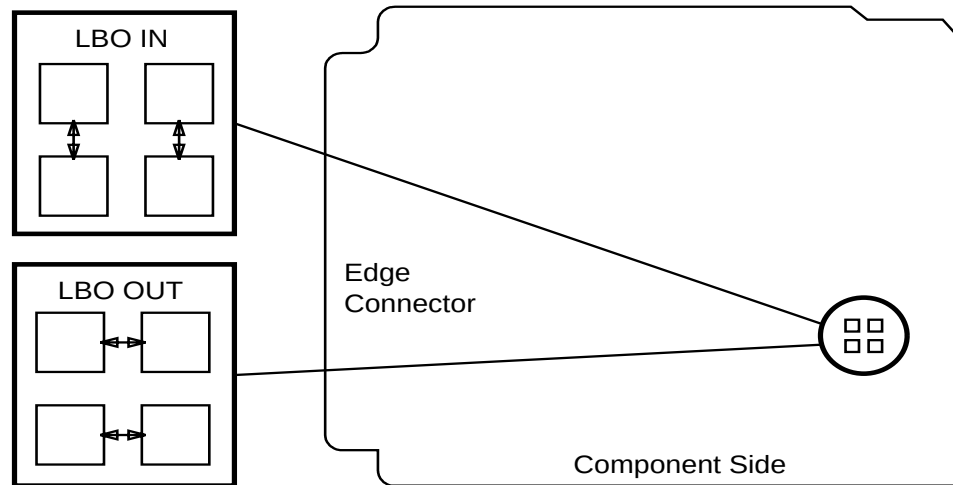
Performance Monitoring

The BBG19 DS3 circuit pack provides PM circuitry for the following performance parameters:

- STS path parameters derived from B3 coding violations
- DS3 path parameters derived from P-bit coding violations
- DS3 path parameters derived from F&M bit errors
- DS3 line errors based on B3ZS violations
- DS3 P-bit and F&M bit PM for both directions of transmission
- C-bit parity and FEBE PM for both directions of transmission.

BBG19 DS3 Hardware Settings

The location of the BBG19 DS3 circuit pack LBO jumpers is shown in Figure 7-34. The BBG19 DS3 LBO settings are shown in the table.



tpa 852244/01

BBG19 DS3 LBO Settings

Cable Length (Ft)		LBO Setting
735A Cable	734D Cable	
0 to 125	0 to 225	LBO IN
>125 to 250	>225 to 450	LBO OUT

Figure 7-34. BBG19 DS3 Line Build-Out (LBO) Jumpers

Power Circuitry

The BBG19 DS3 circuit pack receives two sources of –48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG19 DS3 Quick Reference Summary

Transmit Functions

The BBG19 DS3 transmit functions are as follows:

- Receives a B3ZS-encoded DS3 signal from a data services device
- Recovers DS3 clock and NRZ data
- Optionally checks and/or corrects P-bit parity errors
- Synchronizes the data signal to STS-1 signal rate
- Inserts STS-1 path overhead
- Provides the STS-1 signal to the OLIU circuit packs.

Receive Functions

The following receive functions are performed by the BBG19 DS3 circuit pack:

- Desynchronizes the incoming STS-1 signal
- Terminates the STS-1 path
- Optionally checks and/or corrects P-bit parity errors
- B3ZS encodes the outgoing DS3 signal
- Pre-equalizes the DS3 signal (with LBO) and transmits it to a data services device.

Control Functions

The major control functions are as follows:

- STS-1 path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Detects STS-1 path AIS coming from the fiber
- Detects STS-1 path unequipped signal coming from the fiber
- Inserts DS3 AIS toward the fiber and data services device
- Detects DS3 AIS coming from the fiber
- Inserts and detects STS-1 path yellow signal to/from the fiber
- Detects DS3 OOF from the fiber
- Detects DS3 B3ZS violation threshold crossings from the data services device
- Inserts and detects STS-1 path trace.

BBG20 Transmultiplexer

Purpose of Circuit

The BBG20 Transmultiplexer (TMUX) circuit pack provides a low-speed interface between asynchronous DS3-rate signals and SONET STS-1 signals. The BBG20 TMUX provides DS1, DS3, VT, and STS-1 performance monitoring capabilities with R11.1 and later.

BBG20 TMUX Faceplate Indicators

The TMUX circuit pack faceplate indicators are shown in Figure 7-35. The red FAULT LED lights by the SYSCTL on detection of BBG20 TMUX circuit pack failure. In the event of an incoming DS3 signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

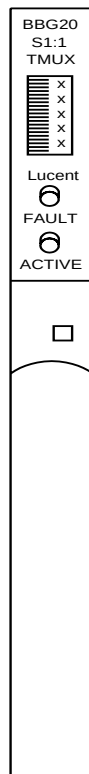


Figure 7-35. TMUX Circuit Pack

General Description of Operation

The BBG20 TMUX circuit pack provides bidirectional transport of one DS3 signal through the DDM-2000 OC-3 shelf.

In the transmit direction, the BBG20 TMUX circuit pack accepts one 44.736 Mb/s bipolar 3-zero substitution (B3ZS) coded DS3 signal and demultiplexes it into 28 DS1s. Performance monitoring is performed on the DS1s before they are mapped into floating VT1.5s. The 28 VT1.5s are then multiplexed into an STS-1 payload envelope using SONET asynchronous mapping. The STS-1 path overhead and pointer bytes are added and the resulting signal is sent to the high-speed OLIU circuit pack.

In the receive direction the reverse process takes place: The STS-1 signal from the OLIU circuit pack goes through STS-1 pointer interpretation, path overhead is removed and processed, and the 28 VT1.5s are stripped of their overhead to produce 28 DS1s. The DS1s are then multiplexed back into the DS3.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-36 provides an overall block diagram of the BBG20 TMUX circuit pack. The transmit direction is the direction towards the STS-1 signal, and receive direction refers to the direction towards the DSX-3. In the transmit direction, the BBG20 TMUX receives an incoming B3ZS encoded DS3 signal from the DSX-3. A closed protection relay contact routes the DS3 to a circuit that splits the signal and sends one output to the companion (standby) circuit pack and the other to its own receiver. The BBG20 TMUX receiver performs equalization and clock recovery. The TMUX circuitry performs B3ZS decoding and demultiplexes it into 28 DS1s. Performance monitoring is performed on the DS1s before they are mapped into floating VT1.5s. The 28 VT1.5s are then multiplexed into an STS-1 payload envelope using SONET asynchronous mapping. The STS-1 path overhead and pointer bytes are added and the resulting signal is sent to the high-speed OLIU circuit pack.

Receive Direction. The BBG20 TMUX receives a VT1.5 structured STS-1 from both the active and standby OLIUs, selects the active STS-1, performs STS-1 pointer interpretation, processes and removes the STS-1 path overhead, performs VT1.5 pointer interpretation, and strips the 28 VT1.5s of their overhead to produce 28 DS1s. The DS1s are then multiplexed back into the DS3.

A jumper allows the user to insert or remove an LBO network to provide the required signal level and shape at the DSX-3.

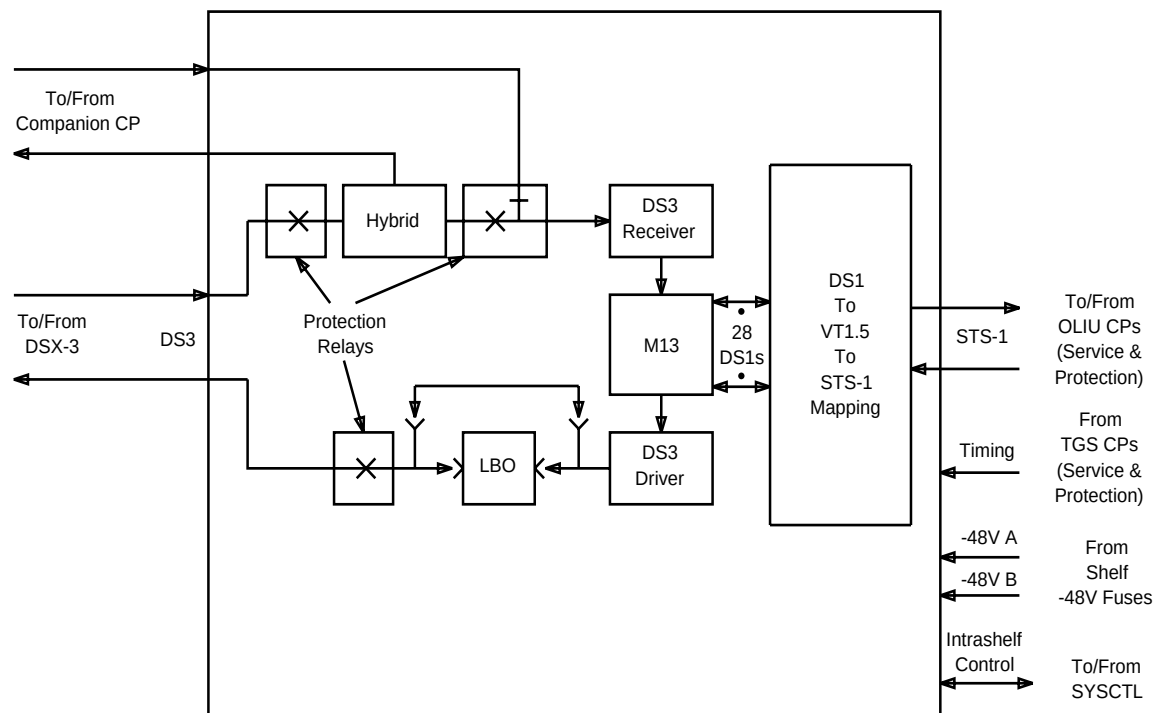


Figure 7-36. TMUX Circuit Pack Block Diagram

Control Circuitry

The BBG20 TMUX circuit pack interfaces with the SYSCTL via the intra-shelf control bus. Redundancy in the intra-shelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The BBG20 TMUX provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and DS3 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the BBG20 TMUX responds to control signals from the SYSCTL (such as active and fault LED controls).

Timing Circuitry

In the transmit direction, a 44.736 MHz clock is recovered from the incoming DS3 signal and is used to recover DS3 data and to generate the clocks needed by the M13 device to convert the DS3 into 28 DS1s. The circuit pack provides a 44.736 MHz clock to time the DS3 output signal.

In addition to the recovered DS3 clock, the BBG20 TMUX circuit pack requires STS-1 timing supplied, via the circuit pack edge connector, from the backplane.

Protection Circuitry

Optional 1x1 nonrevertive BBG20 TMUX circuit pack protection is provided. Switch points for the STS-1 side of the pack are located on the OLIU circuit packs. Switch points for the DS3 side are implemented with relays on the BBG20 TMUX circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL via the control interfaces. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the DS3 side, a single DS3 input from a DSX-3 is sent to both the active and standby BBG20 TMUX circuit packs. Only the active unit selects the DS3 input. The SYSCTL supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the DS3 input signal and sends it to the standby unit and to its own receiver. To implement a protection switch on the DS3 side, the SYSCTL switches the relays on each unit to their opposite state.

When a BBG20 TMUX is removed, shorting contacts on the backplane connector operate so that the DS3 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

The BBG20 TMUX circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the BBG20 TMUX circuit pack is inserted or recovers from a transient failure.

The incoming DS3 signal is monitored for parity threshold crossings in excess of 10^{-3} or 10^{-6} , LOS, DS3 OOF, and DS3 AIS. Incoming STS/VT signals are monitored for STS/VT AIS, STS/VT LOP, STS/VT Unequipped, and yellow.

Power Circuitry

The BBG20 TMUX circuit pack receives two sources of -48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

Loopbacks

Four loopback types are provided on the BBG20 TMUX. Both DS1 and DS3 terminal and facility loopbacks are provided on this pack. For DS1 loopbacks, all 28 are individually addressable. All loopbacks are controlled by the SYSCTL through the intra-shelf control bus.

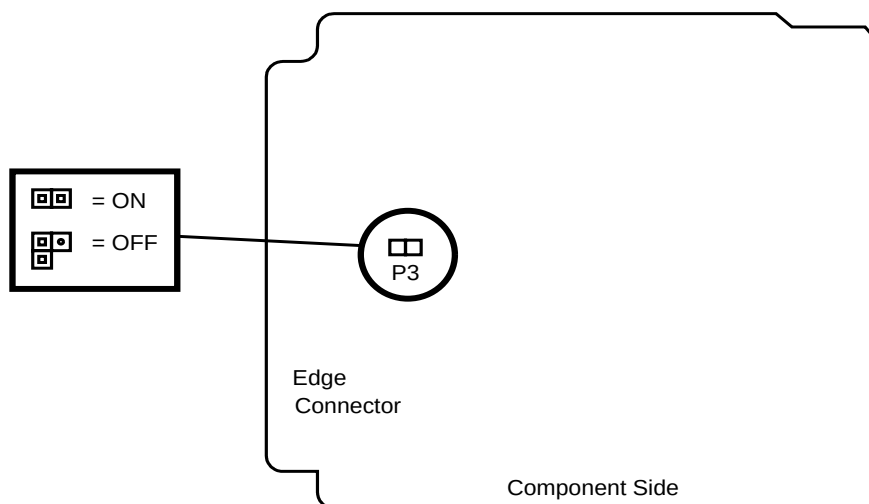
Performance Monitoring

The BBG20 TMUX circuit pack provides PM circuitry for the following performance parameters:

- STS path parameters derived from B3 coding violations
- VT path parameters derived from V5 coding violations
- DS3 path parameters derived from P-bit, F&M-bit, or C-bit coding violations
- DS3 line errors based on B3ZS violations
- DS1 path parameters derived from near-end SF or ESF framed signals and Performance Report Messages (PRM) in ESF framed signals for far-end.

BBG20 TMUX Hardware Settings

The location of the TMUX circuit pack LBO jumpers is shown in Figure 7-37. The TMUX DS3 LBO settings are shown in the table.



BBG20 TMUX LBO Settings

Cable Length (Ft)		LBO Setting
735A Cable	734D Cable	
0 to 65	0 to 120	LBO ON
>65 to 250	>120 to 450	LBO OFF

Figure 7-37. BBG20 TMUX Line Build-Out (LBO) Jumpers

BBG20 TMUX Quick Reference Summary

Transmit Functions

The BBG20 TMUX transmit functions are as follows:

- Receives a B3ZS-encoded DS3 signal from a DSX-3
- Recovers DS3 clock and NRZ data
- Calculates parity errors on the DS3 input
- Demultiplexes the M13 or C-bit formatted DS3 signal into 28 DS1s

- Maps the 28 DS1s into VT1.5s and then into an STS-1
- Inserts STS-1 path overhead
- Provides the STS-1 signal to the OLIU circuit packs.

Receive Functions

The BBG20 TMUX receive functions are as follows:

- Interprets the STS-1 pointer values
- Terminates the STS-1 path
- Disinterleaves the STS-1 signal into 28 VT1.5s and interprets VT pointer values
- Converts the VT1.5 signals to 28 DS1 signals
- Multiplexes the 28 DS1 signals to an M13 or C-bit formatted DS3 signal
- B3ZS encodes the outgoing DS3 signal
- Pre-equalizes the DS3 signal (with LBO) and transmits it to a DSX-3.

Control Functions

The major control functions are as follows:

- Protection switching for BBG20 TMUX circuit packs
- STS-1/VT 1.5 path overhead processing
- DS3 signal monitoring
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The BBG20 TMUX detects the following DS3 signal failures from the DSX-3:

- LOS
- OOF
- AIS
- BER

The BBG20 TMUX inserts DS1 AIS on all DS1 outputs (toward fiber) upon detection of DS3 LOS, OOF, and AIS, and DS2 OOF.

Transmission - Optical Interface

Universal Optical Connector

Circuit packs having a "-U" after their designation indicate that these circuit packs have a universal optical connector.

The following circuit packs are available with the connector:

- 21D-U OLIU
- 21G-U/21G2-U OLIU
- 22D-U OLIU
- 22F-U/22F2-U OLIU
- 22G-U/22G2-U/22G3-U OLIU
- 24G-U OLIU
- 26G2-U OLIU
- 27G-U/27G2-U OLIU.

This connector (Figure 7-38) is a two-part connector consisting of a faceplate-mounted block and an optical buildout. The faceplate block optionally supports an *ST*[®], SC, or FC-type optical buildout.

A 0 dB *ST*-type connector is shipped as standard. Optional SC, or FC 0 dB, or attenuated buildouts can be ordered separately. See Section 10, "Technical Specifications," for a list of universal buildout attenuators.

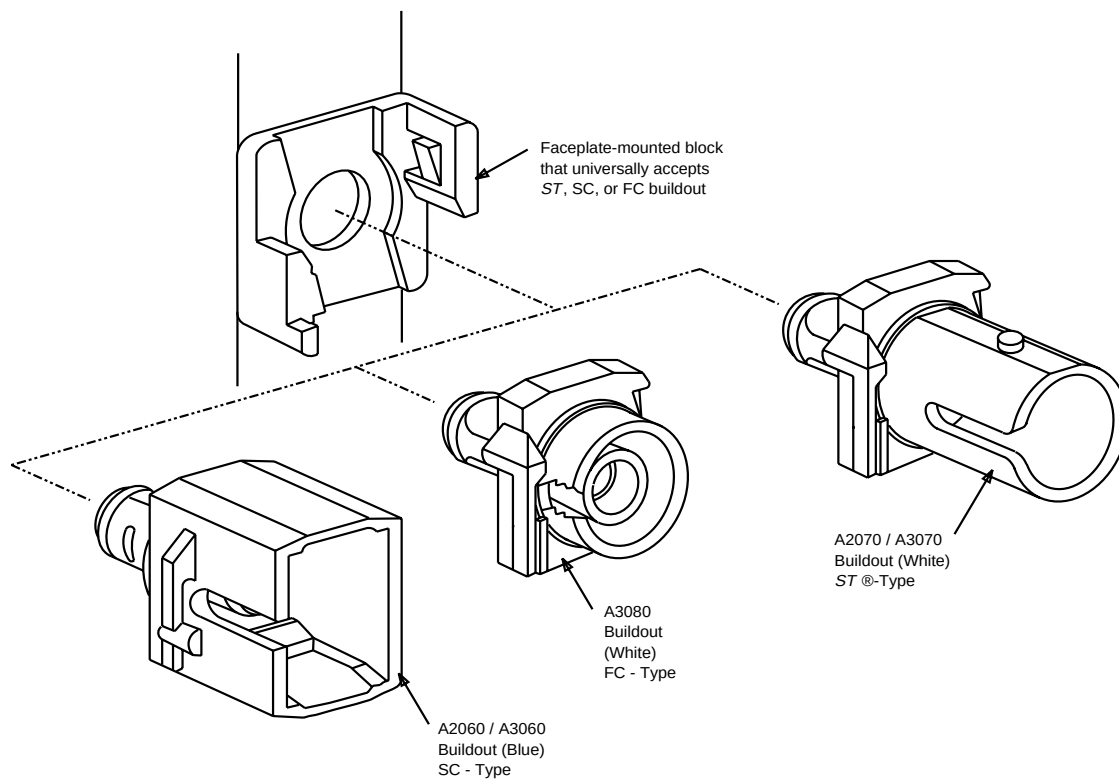


Figure 7-38. Universal Optical Connector

Optical Interface Circuit Packs

Table 7-1 lists the DDM-2000 OLIU Feature Summary

Table 7-2. DDM-2000 OLIU Feature Summary

OLIU	Line Rate (Mb/s)	Span Length (Km)	VT/STS Sig. Degrade PS	TSI	Fiber Type	Ext. Atten.	System	See Note
21D-U	155.52	< 3	No	STS-1/STS-3c	MM	No	OC-3/OC-12	
21G	155.52	55	No	STS-1/STS-3c	SM/MM	Note 6	OC-3/OC-12	1, 3, 5
21G-U	155.52	55	No	STS-1/STS-3c	SM/MM	Note 6	OC-3/OC-12	5
21G2-U	155.52	55	No	STS-1/STS-3c	SM/MM	No	OC-3/OC-12	
22D-U	155.52	< 3	Yes	STS-1/VT1.5	MM	No	OC-3	
22F	155.52	33	No	STS-1/VT1.5	SM/MM	No	OC-3	1, 3
22F-U	155.52	33	No	STS-1/VT1.5	SM/MM	No	OC-3	3
22F2-U	155.52	33	Yes	STS-1/VT1.5	SM/MM	No	OC-3	3
22G-U	155.52	51	Yes	STS-1/VT1.5	SM/MM	7.0 dB	OC-3	3
22G2-U	155.52	51	Yes	STS-1/VT1.5	SM/MM	No	OC-3	3
22G3-U	155.52	55	Yes	STS-1/VT1.5	SM/MM	No	OC-3	
24G-U	622.08	51	Yes	STS-1/STS-3c/ VT1.5	SM	8.0 dB	OC-3	
26G2-U	51.84	44	Yes	STS-1/VT1.5	SM/MM	13.8 dB	FiberReach/ OC-1	4
27G-U	51.84	44	Yes	STS-1/VT1.5	SM/MM	13.8 dB	OC-3	2
27G2-U	51.84	44	Yes	STS-1/VT1.5	SM/MM	13.8 dB	OC-3	2, 4

See notes on following page

Notes:

1. OLIU has *ST*[®] connectors on faceplate.
2. OLIU has two sets of optical interfaces.
3. The 21G, 22F/22F-U/22F2-U, 22G-U/22G2-U OLIUs have been listed as 'discontinued availability' (DA). The 22F/22F-U/22F2-U and 22G-U/22G2-U have been replaced by the 22G3-U OLIU.
4. OLIU has extended TSI capabilities to support pass-through and hairpin cross-connections for OC-1 rings terminated in function units of a DDM-2000 OC-3.
5. When performing an OC-3 loopback on the 21G/21G-U OLIU, the transmit power switch must be in the low-power position.

All OLIUs have universal optical connectors (compatible with *ST*, *SC*, and *FC* connectors) unless specified otherwise.

All OLIUs operate at 1310 nm (nominal).

All OLIUs have one optical transmitter and one optical receiver unless specified otherwise.

The "Span Length" column shows maximum span length for single mode fiber in controlled environment, based on certain assumptions about loss budget. (See "Technical Specifications" section for details.)

The "VT/STS Sig. Degrade PS" column indicates which OLIUs support VT1.5 path protection switching based on signal degrade conditions on individual VT1.5 channels. These OLIUs also support path protection switching based on STS signal degrade and VT unequipped conditions.

The "TSI" column indicates what type of cross-connection (time slot interchange) capability is supported by each OLIU.

The "Fiber Type" column indicates whether the OLIU is compatible with single-mode fiber, multimode fiber, or both.

The "Ext. Atten." column indicates whether an external attenuator is required for optical loopbacks and short span lengths. "No" indicates none required. A dB value indicates the minimum attenuation required.

The "System" column indicates whether the OLIU can be used in the DDM-2000 OC-3 system the DDM-2000 OC-12 system, or both.

21D/21D-U OLIU Circuit Pack Description

Purpose of Circuit

The 21D/21D-U OLIU circuit pack is used to interconnect colocated DDM-2000 OC-3 and OC-12 shelves at the OC-3 rate. The 21D/21D-U OLIU circuit pack performs the optical/electrical conversion between the optical interconnect signal level 3 (IS-3) and STS-3 Optical Interconnect Signal Level 3 signals. The 21D/21D-U OLIU circuit pack also does MUX/DEMUXing between STS-3 and three STS-1 signals and SONET transport overhead access. It also provides routing of the STS-1s between the IS-3 interface and other main and function unit slots in the shelf.

21D/21D-U OLIU Faceplate Indicators

The 21D/21D-U OLIU circuit pack faceplate indicators are shown in Figure 7-39. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash On and Off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

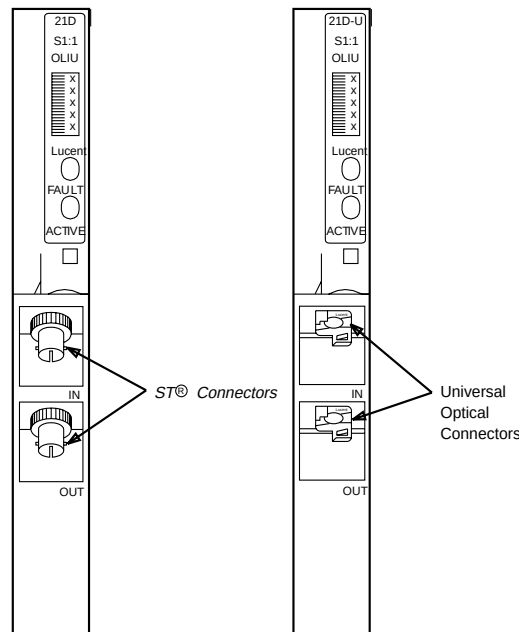


Figure 7-39. 21D and 21D-U OLIU Circuit Pack

General Description of Operation

The 21D/21D-U OLIU circuit pack multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives an LED transmitter to create the IS-3 output.

The received IS-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. The STS-1 signals go through a pointer processor to guarantee frame alignment to the local system clock before being routed to the other main and function unit slots.

The 21D/21D-U OLIU circuit pack provides timing signals to and receives timing signals from the TG circuit packs.

Fiber access for the 21D OLIU is via a pair of *ST*[®] lightguide cable connectors from the 21D OLIU circuit pack faceplate. A faceplate-mounted universal optical connector allows the 21D-U OLIU to accept fiber terminated with *ST*, *SC*, or *FC* connectors. The 21D-U OLIU comes with a 0 dB *ST* buildout. Various combinations of buildouts and connectors are also available. See Section 10, "Technical Specifications," for a list of universal buildout attenuators. The 21D/21D-U OLIU circuit pack provides cost effective interconnect for intra-office applications and is used only for DDM-2000 OC-3 and OC-12 interworking over multimode fiber.

Detailed Description of Operation

Figure 7-40 is a block diagram of the 21D/21D-U OLIU circuit pack.

Transmission Circuitry

Transmit Direction. The STS-1 router selects three of the STS-1 signals received from other main and function unit slots and sends them to the multiplexer. The multiplexer circuitry takes the three STS-1 signals from the output of the router, adds SONET transport overhead, then byte-interleaves and scrambles the signal in a frame synchronous scrambler. The output from the multiplexer is in the STS-3 format and is used to amplitude modulate the LED transmitter, which converts the electrical signal to an NRZ-encoded IS-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded IS-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retim the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes SONET transport overhead.

The overhead information is sent to the SYSCTL via the intra-shelf control bus and the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the pointer processor which performs pointer interpretation and generation on each received STS-1 using the local timing signals. The output of the pointer processor is three STS-1 signals, frame synchronous to each other. The STS-1 router sends each of the three STS-1 signals to the appropriate main or function unit slots.

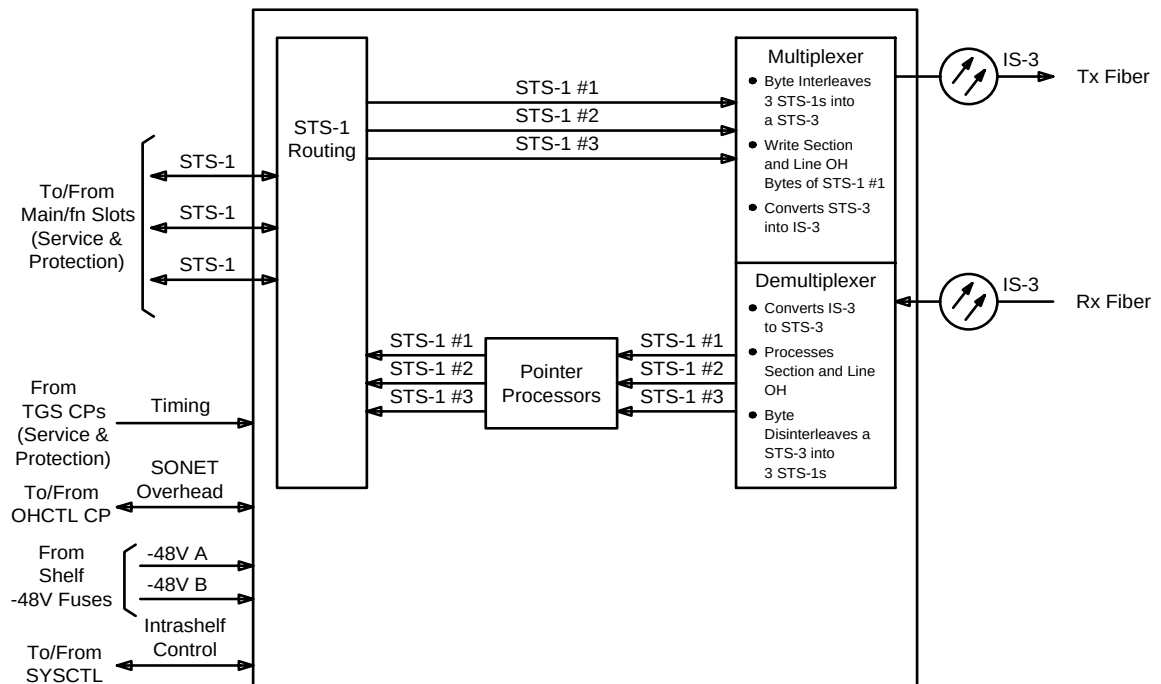


Figure 7-40. 21D/21D-U OLIU Circuit Pack Block Diagram

Control Circuitry

The 21D/21D-U OLIU circuit pack interfaces with the SYSCTL and with the OHCTL circuit packs.

The 21D/21D-U OLIU circuit pack provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 21D/21D-U OLIU circuit pack responds to control signals from the SYSCTL, such as STS-1 routing, protection switching, and LED control commands.

The 21D/21D-U OLIU circuit pack accesses the SONET transport overhead and routes it via the transport overhead channel interface to the AUXCTL slot and/or to the SYSCTL. The transport overhead is routed from the main slots to both the AUXCTL and SYSCTL slots and from the function unit slots to the AUXCTL slot.

Timing Circuitry

Each TG circuit pack sends timing signals to each OLIU. Each OLIU monitors the timing inputs from both TG circuit packs. The 21D/21D-U OLIU normally selects the timing signals from the active TG. Each OLIU provides timing signals derived from the incoming optical signal to both TG circuit packs for line (formerly loop) timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 21D/21D-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 21D/21D-U OLIU circuit pack is protection switched with the optical line.

The 21D/21D-U OLIU circuit pack interfaces with STS-1 signals from the circuit packs in the main and function unit slots and selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 21D/21D-U OLIU provides selectors for timing signals from the TG circuit packs. The 21D/21D-U OLIU monitors these inputs and can autonomously select either one. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 21D/21D-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The 21D/21D-U OLIU provides PM circuitry for the following performance parameters:

- Section SEFS count
- Line parameters based on B2 coding violations.

Power Circuitry

Power for the 21D/21D-U OLIU circuit pack is provided by a DC-to-DC converter located on the circuit pack. The converter supplies +5 volts and –5.2 volts. Both A and B –48 volt backplane busses supply power to the converter through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converter causes the red FAULT LED to light.

21D/21D-U OLIU Quick Reference Summary

Transmit Functions

The following are the major transmit functions of the 21D/21D-U OLIU circuit pack:

- Selects STS-1 inputs from MXRVO, DS3, STS1E, or other OLIU circuit packs
- Provides STS-1 signal cross-connections
- Adds SONET transport overhead
- Byte-interleaves and scrambles the three selected STS-1 signals to an STS-3 or optional STS-3c signal
- Converts the STS-3 or STS-3c electrical signal to an IS-3 or IS-3c optical signal and transmits it over the fiber.

Receive Functions

The following are major receive functions of the 21D/21D-U OLIU circuit pack:

- Receives an IS-3 or IS-3c optical signal and converts it to an electrical STS-3 or STS-3c signal
- Extracts STS-3 clock and retimes the received data
- Demultiplexes the STS-3 or STS-3c signal into three STS-1 signals
- Extracts transport overhead
- Processes the STS-1 or STS-3c pointers and frame-synchronizes the STS-1 signals
- Provides STS-1 signal cross-connections
- Processes the received clock and provides a reference clock to the TG circuit packs.

Control Functions

The following are the major control functions of the 21D/21D-U OLIU circuit pack:

- Switches protection for the optical line and DS3, MXRVO, STS1E, and TG circuit packs
- Processes transport overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The following are the major maintenance signal functions of the 21D/21D-U OLIU circuit pack:

- Inserts and detects STS-1 path AIS
- Inserts and detects SONET line AIS and inserts and detects line far-end-receive failure (FERF)
- Inserts and detects STS-1 path unequipped signal
- Detects IS-3 line failures (LOS, LOF, AIS, and BER)
- Detects IS-3 line signal degrade BER.

21G/21G-U/21G2-U OLIU Circuit Pack Description

Purpose of Circuit

The 21G/21G-U/21G2-U OLIU circuit pack performs the optical/electrical conversion between the optical carrier level 3 (OC-3) and STS-3 signals, multiplexing/demultiplexing between STS-3 and three STS-1 signals, and SONET transport overhead access. The 21G/21G-U/21G2-U can be used in either the main or function unit slots in an OC-3 shelf, or the function unit slots only in an OC-12. In the OC-3 shelf, the 21G/21G-U/21G2-U OLIU circuit pack also provides routing of the STS-1s between the OC-3 interface and other main and function unit slots in the shelf and will support the STS-1 add/drop feature. In the OC-12 shelf, the routing function is performed in the TSI circuit pack.

21G/21G-U/21G2-U OLIU Faceplate Indicators

The 21G2-U OLIU is the same as the 21G/21G-U OLIUs but has improved receiver overload sensitivity, eliminating the need for a Hi/Low power switch for loopback testing. The 21G2-U can be used in place of the 21G/21G-U in all applications.

The 21G/21G-U/21G2-U OLIU circuit pack faceplate indicators are shown in Figure 7-41. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash On and Off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

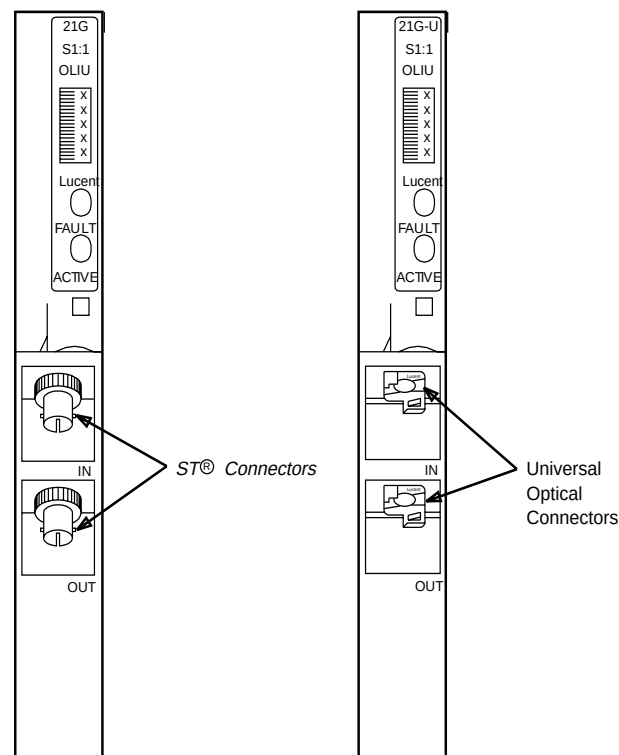


Figure 7-41. 21G and 21G-U/21G2-U OLIU Circuit Pack

General Description of Operation

The 21G/21G-U/21G2-U OLIU multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives the laser transmitter to create the OC-3 output.

The received OC-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. The STS-1 signals go through a pointer processor to guarantee frame alignment to the local system clock before being routed to the other main and function unit slots.

The 21G/21G-U/21G2-U OLIU provides timing signals to and receives timing signals from the TG circuit packs.

Fiber access for the 21G OLIU is via a pair of *ST* lightguide cable connectors from the OLIU faceplate. A faceplate-mounted universal optical connector allows the 21G-U/21G2-U OLIU to accept fiber terminated with *ST*, *SC*, or *FC* connectors. Various combinations of buildouts and connectors are also available. See Section 10, "Technical Specifications," for a list of universal buildout attenuators. The 21G/21G-U/21G2-U OLIU photonics comply with SONET long-reach specifications. While single-mode fiber is suggested for optimum performance, multimode facilities are also supported.

Detailed Description of Operation

Figure 7-42 is a block diagram of the 21G/21G-U/21G2-U OLIU.

Transmission Circuitry

Transmit Direction. The STS-1 router selects three of the STS-1 signals received from other main and function unit slots, or from TSI slots in the OC-12 shelf, and sends them to the multiplexer. The multiplexer circuitry takes the three STS-1 signals from the output of the router, adds SONET transport overhead, then byte-interleaves and scrambles the signal in a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the laser transmitter, which converts the electrical signal to an NRZ-encoded SONET compatible OC-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes SONET transport overhead. The overhead information is sent to the SYSCTL pack via the intra-shelf control bus and the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the pointer processor which performs pointer interpretation and generation on each received STS-1 using the local timing signals. The output of the pointer processor is three STS-1 signals, frame synchronous to each other. The STS-1 router sends each of the three STS-1 signals to the appropriate main or function unit in the OC-3 shelf, or TSI slots in the OC-12 shelf.

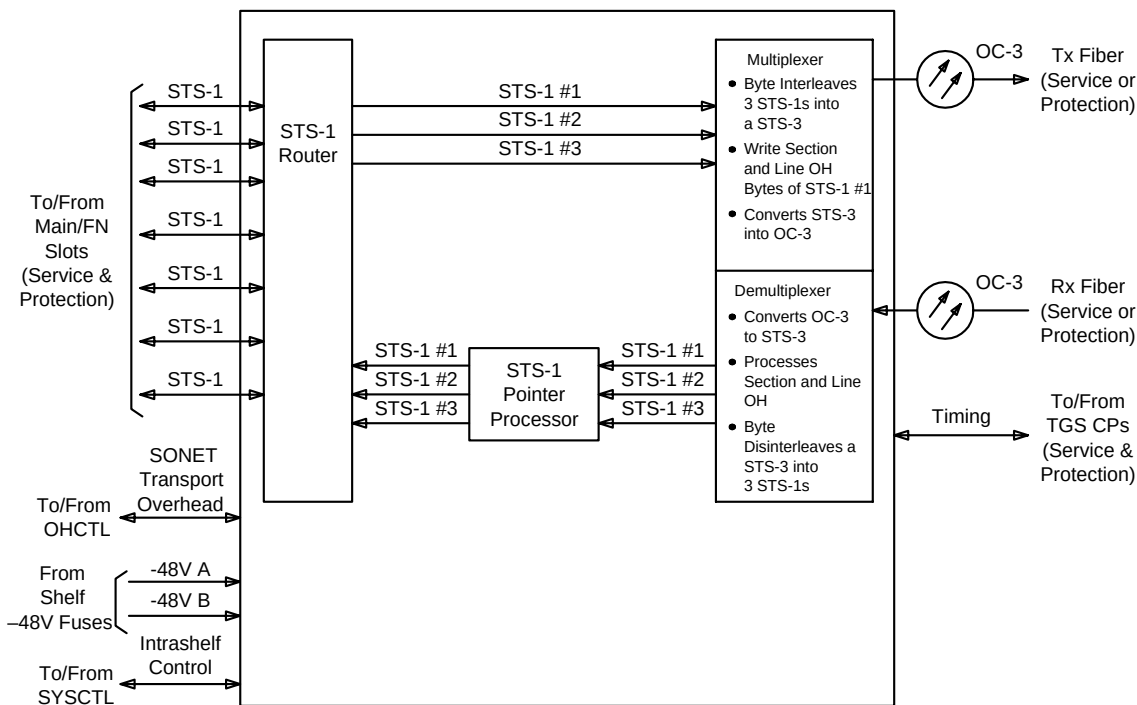


Figure 7-42. 21G/21G-U/21G2-U OLIU Circuit Pack Block Diagram

Control Circuitry

The 21G/21G-U/21G2-U OLIU circuit pack interfaces with the SYSCTL and with the OHCTL circuit packs.

The 21G/21G-U/21G2-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the OLIU responds to control signals from the SYSCTL, such as STS-1 routing, protection switching, and LED control commands.

The 21G/21G-U/21G2-U OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the AUXCTL slot and/or to the SYSCTL. The transport overhead is routed from the main slots to both the AUXCTL and SYSCTL slots and from the function unit slots to the AUXCTL slot.

Timing Circuitry

Each TG circuit pack sends timing signals to each OLIU. Each OLIU monitors the timing inputs from both TG circuit packs. The OLIU normally selects the timing signals from the active TG circuit pack. Each OLIU provides timing signals derived from the incoming optical signal to both TG circuit packs for line (formerly loop) timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 21G/21G-U/21G2-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 21G/21G-U/21G2-U OLIU circuit pack is protection switched with the optical line.

The 21G/21G-U/21G2-U OLIU interfaces with STS-1 signals from the circuit packs in the main and function unit slots in an OC-3 shelf, or TSI slots in an OC-12 shelf, and selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 21G/21G-U/21G2-U OLIU provides selectors for timing signals from the TG circuit packs, monitors these inputs, and autonomously selects either one. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 21G/21G-U/21G2-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the 21G/21G-U/21G2-U OLIU circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The 21G/21G-U/21G2-U OLIU provides PM circuitry for the following performance parameters:

- Laser bias current threshold (21G and 21G-U only)
- Transmit optical power threshold (21G and 21G-U only)
- Section SEFS count
- Line parameters derived from B2 coding violations.

Power Circuitry

Power for the 21G/21G-U OLIU circuit pack is provided by two DC-to-DC converters located on the 21G/21G-U OLIU circuit pack. One converter supplies +5 volts and the other supplies -5.2 volts. Both A and B -48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or either converter causes the red FAULT LED to light. The 21G2-U uses a single +5 volt power supply.

21G/21G-U OLIU Hardware Settings

The location of the 21G/21G-U OLIU circuit pack optical power output level switch is shown in Figure 7-43. This switch allows the 21G/21G-U OLIU to be looped back without an external optical attenuator cable. The optical power output level switch in the LOW POWER position attenuates the transmit optical power by 5 dB.

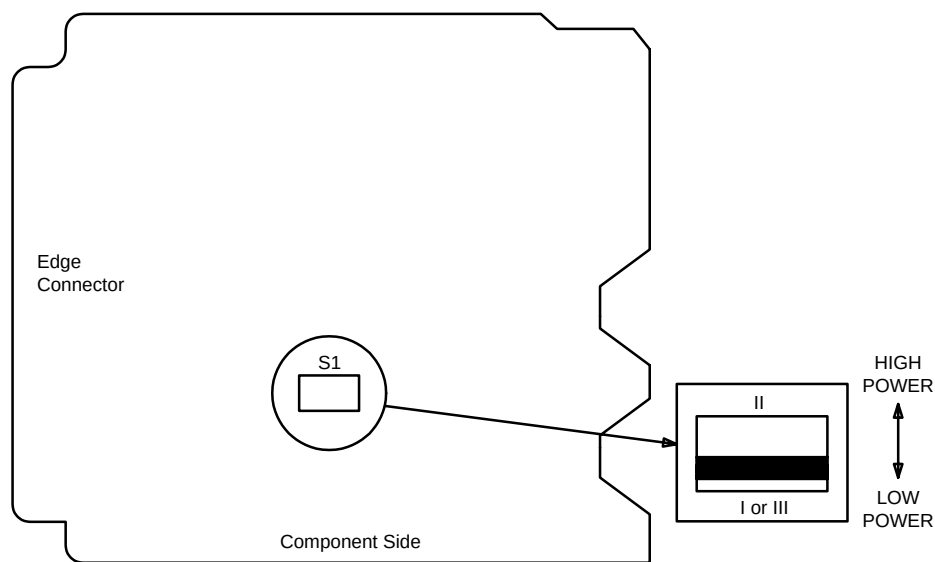


Figure 7-43. 21G/21G-U OLIU Output Level Switch

NOTE: The 21G2-U OLIU does not have a High/Low transmitter power switch due to increased receiver overload used on the 21G2-U. Refer to Table 10-5 for OLIU Link Budget information.

21G/21G-U/21G2-U OLIU Quick Reference Summary

Transmit Functions

The following are the major transmit functions of the 21G/21G-U/21G2-U OLIU circuit pack:

- Selects STS-1 inputs from MXRVO, DS3, STS1E, or other OLIU circuit packs
- Provides STS-1 signal cross-connections
- Adds SONET transport overhead
- Byte-interleaves and scrambles the three selected STS-1 signals to an STS-3 or STS-3c signal
- Converts the STS-3 or STS-3c electrical signal to an optical signal and transmits it over the fiber
- Monitors laser bias and output power (21G and 21G-U only).

Receive Functions

The following are major receive functions of the 21G/21G-U/21G2-U OLIU circuit pack:

- Receives an optical OC-3 or OC-3c signal and converts it to an electrical STS-3 or STS-3c signal
- Extracts STS-3 clock and retimes the received data
- Demultiplexes the STS-3 or STS-3c signal into three STS-1 signals
- Extracts transport overhead
- Processes the STS-1 or STS-3c pointers and frame-synchronizes the STS-1 signals
- Provides STS-1 signal cross-connections
- Processes the received clock and provides a reference clock to the TG circuit packs (OC-3 shelf only).

Control Functions

The following are the major control functions of the 21G/21G-U/21G2-U OLIU circuit pack:

- Switches protection for the optical line and DS3, MXRVO, STS1E, and TG circuit packs on the OC-3 shelf. On the OC-12 shelf, switches protection for the TSI and TG circuit packs.
- Processes transport overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The following are the major maintenance signal functions of the 21G/21G-U/
21G2-U OLIU circuit pack:

- Inserts and detects STS-1 path AIS
- Inserts and detects SONET line AIS and inserts and detects line far-end-receive failure (FERF)
- Inserts STS-1 path unequipped signal
- Detects OC-3 line failures (LOS, LOF, AIS, and BER)
- Detects STS-1 LOP
- Detects OC-3 line signal degrade BER.

22F/22F-U/22F2-U OLIU Circuit Pack Description

Purpose of Circuit

The 22F/22F-U/22F2-U OLIU circuit pack performs the optical/electrical conversion between the OC-3 and STS-3 signals, multiplexing between STS-3 and three STS-1 signals and SONET transport overhead access. This circuit pack also provides routing of the STS-1s and VT1.5s between the OC-3 interface and other main and function unit slots in the shelf and DS1/DS3 add/drop and ring capability. When used to perform DS1/DS3 add/drop or VT1.5 routing, STS-1 path overhead access is also provided.

The 22F-U provides a universal optical connector capable of interfacing with STS-1. The 22F2-U provides additional VT1.5/STS-1 path signal monitoring to support VT1.5/STS-1 path protection switching. All three circuit packs have the same optical interface specifications.

22F/22F-U/22F2-U OLIU Faceplate Indicators

The 22F/22F-U/22F2-U OLIU circuit pack faceplate indicators are shown in Figure 7-44.

The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash on and off.

The green ACTIVE LED lights when the circuit pack is active (carrying service).

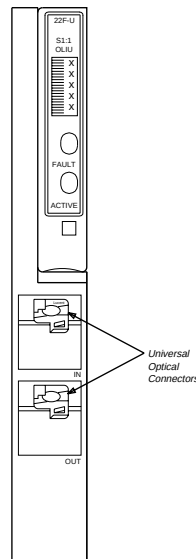


Figure 7-44. 22F/22F-U/22F2-U OLIU Circuit Pack

General Description of Operation

The 22F-type OLIUs multiplex three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives the laser transmitter to create the OC-3 output.

The received OC-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed into three STS-1 signals, and transport/path overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on board. The STS-1 signals go through a pointer processor to guarantee STS-1 frame alignment to the local system clock before being routed to the other main and function unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a VT1.5 cross-connection.

Each 22F-type OLIU provides timing signals to, and receives timing signals from, the TG circuit packs.

Fiber access is via a pair of *ST* lightguide cable connectors from the OLIU faceplate. The 22F-type OLIU photonics comply with SONET intermediate-reach specifications. While single-mode fiber is suggested for optimum performance, multimode facilities are also supported as long as a single-mode jumper is placed between the 22F-type OLIU optical output connector and the multimode fiber.

Detailed Description of Operation

Figure 7-45 is a block diagram of the 22F-type OLIU.

Transmission Circuitry

STS-1 Router and VT1.5 Cross-Connect. The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

Transmit Direction. The STS-1 router selects three of the STS-1 signals directly from the other main and function unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the multiplexer. The multiplexer takes the three STS-1 signals, adds SONET transport overhead, then byte-interleaves and scrambles the signal with a frame synchronous scrambler. The output from the

multiplexer is in the SONET STS-3 format and is used to amplitude modulate the laser transmitter, converting the electrical signal to an NRZ-encoded SONET compatible OC-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes OC-3 transport overhead. The overhead information is sent to the SYSCTL circuit pack via the intra-shelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the STS-1 pointer processor is three STS-1 signals, frame synchronous to each other, which are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends each of the three STS-1 signals to the appropriate main or function unit slots.

Control Circuitry

The 22F-type OLIU circuit packs interface with the BBG8/BBG8B SYSCTL and with the OHCTL circuit packs.

The 22F-type OLIUs provide maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 22F-type OLIUs respond to control signals from the SYSCTL, such as STS-1 routing, VT1.5 routing, protection switching, and LED control commands.

The 22F-type OLIUs access the SONET transport overhead and routes it via the transport overhead channel interface to the OHCTL.

The 22F-type OLIUs access the STS-1 path overhead and routes it via the intra-shelf control bus to the SYSCTL circuit pack.

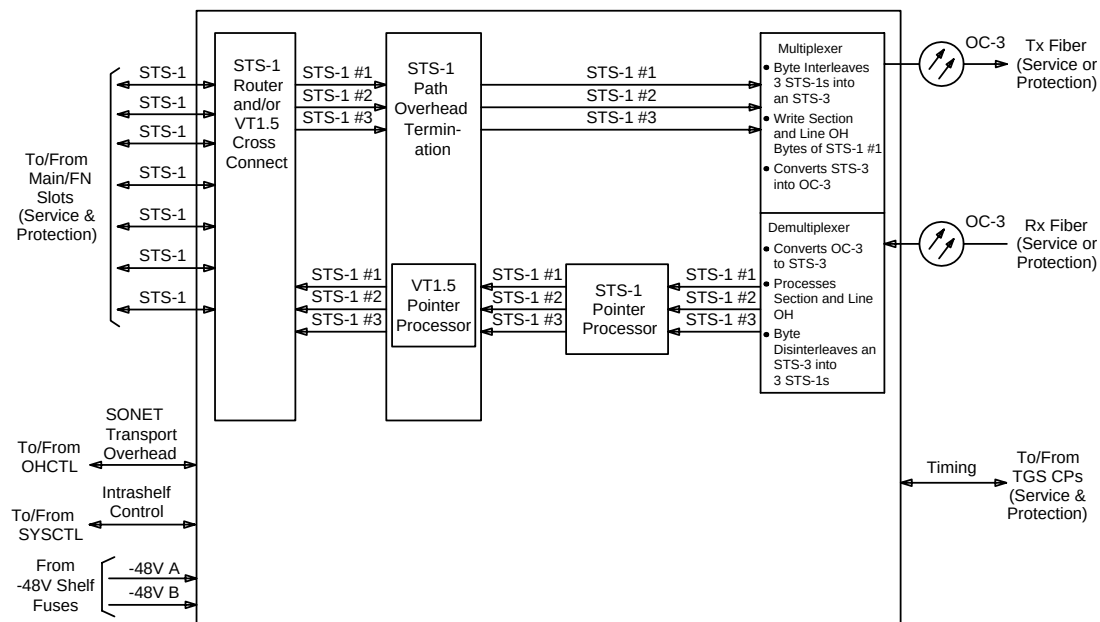


Figure 7-45. 22F-type OLIU Circuit Pack Block Diagram

Timing Circuitry

Each TG circuit pack sends timing signals to each 22F-type OLIU. Each 22F-type OLIU monitors the timing inputs from both TG circuit packs. The 22F-type OLIU normally selects the timing signals from the TG selected by the SYSCTL. Each 22F-type OLIU provides timing signals derived from the incoming optical signal to both TG circuit packs for line (formerly loop) timing and DS1 output (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 22F-type OLIU is protection switched by the SYSCTL in response to an external command, incoming optical signal failure, or internal equipment fault. The 22F OLIU circuit pack is protection switched with the OC-3 line.

The 22F-type OLIU interfaces with STS-1 signals from the circuit packs in the main and function unit slots. It selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 22F-type OLIU provides selectors for timing signals from the TG circuit packs, monitors these inputs, and autonomously selects either TG circuit pack. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 22F-type OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 22F-U OLIU has provisionable VT signal degrade and STS signal degrade BER threshold capabilities for path protection switching.

Performance Monitoring

The 22F-type OLIU provides PM circuitry for the following performance parameters:

- Section SEFS count
- Line parameters derived from B2 coding violations
- STS-1 path parameters derived from B3 coding violations.

Power Circuitry

Power for the 22F/22F-U OLIU circuit pack is provided by two DC-to-DC converters located on the 22F/22F-U OLIU circuit pack. One converter supplies +5 volts and the other supplies –5.2 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or either converter causes the red FAULT LED to light. The 22F2-U uses a single +5 volt power supply.

22F-type OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 22F-type OLIU circuit pack are as follows:

- Selects STS-1 inputs from MXRVO, DS3, STS1E, or other OLIU circuit packs
- Provides STS-1/VT1.5 signal cross-connections
- Adds SONET transport overhead and, if VT1.5 cross-connected, adds STS-1 path overhead
- Byte-interleaves and scrambles the three selected STS-1 signals to produce an STS-3 signal
- Uses a laser transmitter to produce a SONET standard OC-3 optical signal from an STS-3 electrical signal.

Receive Functions

The following are major receive functions of the 22F-type OLIU circuit pack:

- Receives a SONET standard OC-3 optical signal and converts it to an electrical STS-3 signal
- Extracts STS-3 clock and retimes the received data
- Demultiplexes the STS-3 signal into three STS-1 signals
- Extracts transport overhead and, if VT1.5 cross-connected, extracts path overhead
- Processes the STS-1 pointer and frame-synchronizes the STS-1 signals
- Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signal, if VT1.5 cross-connected
- Provides STS-1/VT1.5 signal cross-connections
- Processes the received clock and provides a reference clock to the TG circuit packs.

Control Functions

The major control functions are as follows:

- Switches protection for OC-3 line and DS3, MXRVO, STS1E, other OLIU, and TG circuit packs
- Processes transport and path overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.)
- Supports VT and STS signal degrade protection switching (22F2-U only)

- Supports STS-1 BER signal fail (10^{-3} or 10^{-6}) path protection switching
- Supports path protection switching based on STS-1 unequipped, STS-1 AIS, STS-1 LOP, VT AIS, and VT LOP
- Supports path protection switching based on VT unequipped (22F2-U only).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS
- Inserts and detects OC-3 line AIS
- Inserts and detects STS-1 path unequipped signal
- Inserts and detects line FERF
- Inserts and detects STS-1 path yellow, if VT1.5 cross-connected
- Inserts and detects the STS-1 unequipped signal
- Inserts and detects the VT unequipped signal (22F2-U only)
- Detects OC-3 line failures (LOS, LOF, AIS, and BER)
- Detects OC-3 line signal degrade BER.

22D-U OLIU Circuit Pack Description

Purpose of Circuit

The 22D-U OLIU circuit pack is used to interconnect colocated DDM-2000 OC-3 and OC-12 shelves or *SLC*[®]-2000 at the OC-3 rate. The 22D-U OLIU circuit pack performs the optical/electrical conversion between the optical interconnect signal level 3 (IS-3) and STS-3 signals. The 22D-U OLIU circuit pack also does MUX/DEMUXing between STS-3 and three STS-1 signals and SONET transport overhead access. It also provides routing of the STS-1s between the IS-3 interface and other main and function unit slots in the shelf.

22D-U OLIU Faceplate Indicators

The 22D-U OLIU circuit pack faceplate indicators are shown in Figure 7-46. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

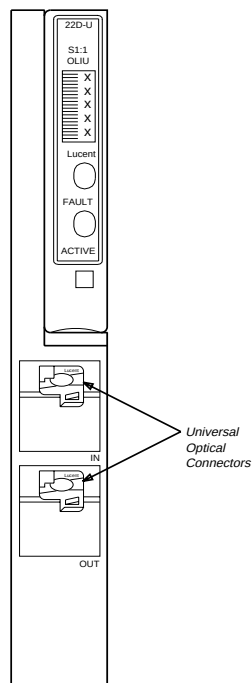


Figure 7-46. 22D-U OLIU Circuit Pack

A faceplate-mounted universal optical connector allows the 22D-U OLIU to accept fiber terminated with *ST*, *SC*, or *FC* connectors. The 22D-U OLIU comes with a 0 dB *ST* buildout. Various combinations of buildouts and connectors are also available. See Section 10, "Technical Specifications," for a list of universal buildout attenuators. A 10 dB attenuator is required for loopback testing. The 22D-U OLIU circuit pack provides cost effective interconnect for intra-office applications and is used only for DDM-2000 OC-3 and OC-12 or *SLC*-2000 interworking over multimode fiber.

General Description of Operation

The 22D-U OLIU circuit pack multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives an LED transmitter to create the IS-3 output.

The received IS-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. The STS-1 signals go through a pointer processor to guarantee frame alignment to the local system clock before being routed to the other main and function unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a VT1.5 cross-connection.

The 22D-U OLIU circuit pack provides timing signals to and receives timing signals from the TG circuit packs.

Detailed Description of Operation

Figure 7-47 is a block diagram of the 22D-U OLIU circuit pack.

The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

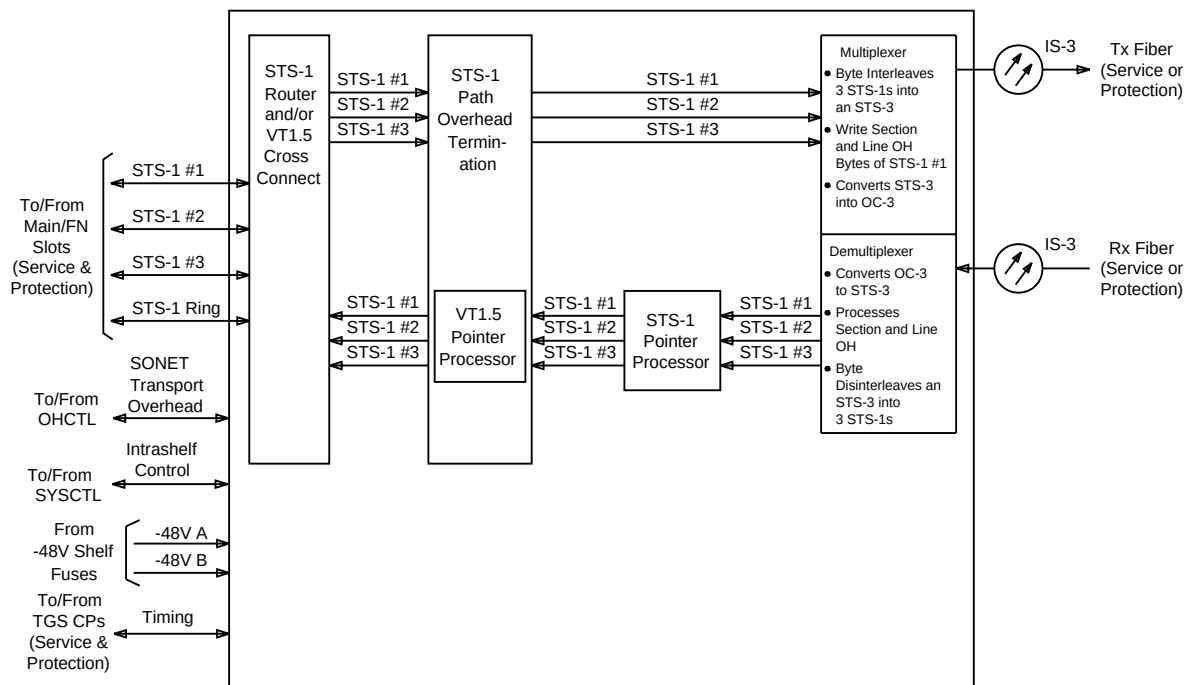


Figure 7-47. 22D-U OLIU Circuit Pack Block Diagram

Transmit Direction. The STS-1 router selects three of the STS-1 signals directly from the other main and function unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the multiplexer. The multiplexer takes the three STS-1 signals, adds SONET transport overhead, then byte-interleaves and scrambles the signal with a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the LED transmitter, converting the electrical signal to an NRZ-encoded SONET compatible IS-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded IS-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retim the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes transport overhead. The overhead information is sent to the SYSCTL circuit pack via the intra-shelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the STS-1 pointer processor is three STS-1 signals, frame synchronous to each other, which are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends each of the three STS-1 signals to the appropriate main or function unit slots.

Control Circuitry

The 22D-U OLIU circuit pack interfaces with the SYSCTL and with the OHCTL circuit packs.

The 22D-U OLIU circuit pack provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 22D-U OLIU circuit pack responds to control signals from the SYSCTL, such as STS-1 routing, protection switching, and LED control commands.

The 22D-U OLIU circuit pack accesses the SONET transport overhead and routes it via the transport overhead channel interface to the AUXCTL slot and/or to the SYSCTL. The transport overhead is routed from the main slots to both the AUXCTL and SYSCTL slots and from the function unit slots to the AUXCTL slot.

Timing Circuitry

Each TG circuit pack sends timing signals to each OLIU. Each OLIU monitors the timing inputs from both TG circuit packs. The 22D-U OLIU normally selects the timing signals from the active TG. Each OLIU provides timing signals derived from the incoming optical signal to both TG circuit packs for line (formerly loop) timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 22D-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 22D-U OLIU circuit pack is protection switched with the optical line.

The 22D-U OLIU circuit pack interfaces with STS-1 signals from the circuit packs in the main and function unit slots and selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 22D-U OLIU provides selectors for timing signals from the TG circuit packs. The 22D-U OLIU monitors these inputs and can autonomously select either one. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 22D-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 22D-U OLIU has provisionable VT signal degrade and STS signal degrade BER threshold capabilities for path protection switching.

Performance Monitoring

The 22D-U OLIU provides PM circuitry for the following performance parameters:

- Section SEFS count
- Line parameters based on B2 coding violations.

Power Circuitry

Power for the 22D-U OLIU circuit pack is provided by a DC-to-DC converter located on the circuit pack. The converter supplies +5 volts and –5.2 volts. Both A and B –48 volt backplane busses supply power to the converter through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converter causes the red FAULT LED to light.

22D-U OLIU Quick Reference Summary

Transmit Functions

The following are the major transmit functions of the 22D-U OLIU circuit pack:

- Selects STS-1 inputs from MXRVO, DS3, STS1E, or other OLIU circuit packs
- Provides VT1.5/STS-1 signal cross-connections
- Adds SONET transport overhead and, if VT1.5 cross-connected, adds STS-1 path overhead
- Byte-interleaves and scrambles the three selected STS-1 signals to produce an STS-3 signal
- Converts the STS-3 electrical signal to an IS-3 optical signal and transmits it over the fiber.

Receive Functions

The following are major receive functions of the 22D-U OLIU circuit pack:

- Receives an IS-3 optical signal and converts it to an electrical STS-3 signal
- Extracts STS-3 clock and retimes the received data
- Demultiplexes the STS-3 signal into three STS-1 signals
- Extracts transport overhead and, if VT1.5 cross-connected, extracts path overhead
- Processes the STS-1 pointer and frame-synchronizes the STS-1 signals
- Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signal, if VT1.5 cross-connected
- Provides STS-1/VT1.5 signal cross-connections
- Processes the received clock and provides a reference clock to the TG circuit packs
- Provides express processing for VT AIS.

Control Functions

The following are the major control functions of the 22D-U OLIU circuit pack:

- Switches protection for the optical line and DS3, MXRVO, STS1E, and TG circuit packs
- Processes transport overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.)

- Supports VT and STS signal degrade path protection switching.
- Supports STS-1 BER signal fail (10^{-3} or 10^{-6}) path protection switching
- Supports path protection switching based on STS-1 unequipped, STS-1 AIS, STS-1 LOP, VT AIS, VT unequipped, and VT LOP.

Maintenance Signal Functions

The following are the major maintenance signal functions of the 22D-U OLIU circuit pack:

- Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS
- Inserts and detects SONET line AIS and inserts and detects line FERF
- Inserts and detects STS-1 path unequipped signal
- Inserts and detects VT path unequipped signal
- Inserts and detects STS-1 path yellow, if VT1.5 cross-connected
- Detects IS-3 line failures (LOS, LOF, AIS, and BER)
- Detects IS-3 line signal degrade BER.

22G-U/22G2-U/22G3-U OLIU Circuit Pack Description

Purpose of Circuit

The 22G-U/22G2-U/22G3-U OLIU circuit pack performs the optical/electrical conversion between the optical carrier level 3 (OC-3) and STS-3 signals, multiplexing between STS-3 and three STS-1 signals and SONET transport overhead access. The 22G-U/22G2-U/22G3-U OLIU also provides routing of the STS-1s between the OC-3 interface and other main and function unit slots in the shelf as well as VT1.5/STS-1 add/drop and ring capabilities. When used to perform VT1.5 add/drop or ring capabilities, STS-1 path overhead access is also provided.

The 22G2-U/22G3-U OLIU is the same as the 22G-U but has improved receiver overload sensitivity, eliminating the need for an external attenuator. The 22G2-U/22G3-U OLIU can be used in place of the 22G-U in all applications. The 22G3-U uses a SONET compliant long-reach transmitter.

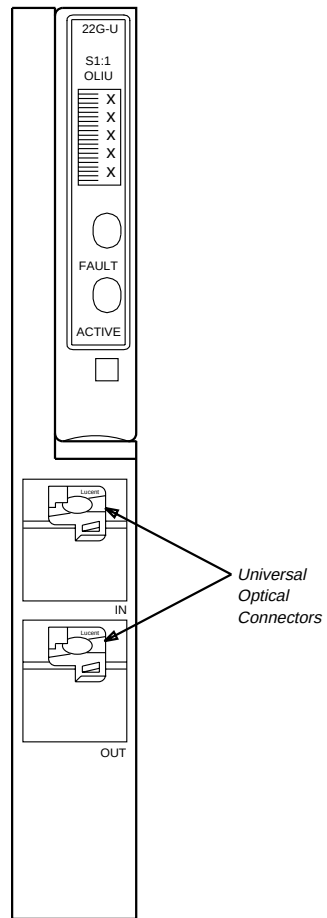
22G-U/22G2-U/22G3-U OLIU Faceplate Indicators

The 22G-U/22G2-U/22G3-U OLIU circuit pack faceplate indicators are shown in Figure 7-48.

The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash on and off.

The green ACTIVE LED lights when the circuit pack is active (carrying service).

A faceplate-mounted universal optical connector allows the 22G-U/22G2-U/22G3-U OLIU to accept fiber terminated with ST, SC, or FC connectors. The 22G-U/22G2-U/22G3-U OLIU comes with a 0 dB ST buildout. For the 22G-U, a 10 dB attenuator is required for loopback testing. The 22G2-U/22G3-U does not need an external attenuator for loopback testing. The 22G-U/22G2-U/22G3-U OLIU operates over single mode fiber. Various combinations of buildout attenuators and connectors are also available. See Section 10, "Technical Specifications," for a list of universal buildout attenuators.



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Figure 7-48. 22G-U/22G2-U/22G3-U OLIU Circuit Pack

General Description of Operation

The 22G-U/22G2-U/22G3-U OLIU multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives the laser transmitter to create the OC-3 output.

The received OC-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed into three STS-1 signals, and transport/path overhead is accessed. Some of the overhead (for example, section DCC) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on board. The STS-1 signals go through a pointer processor to guarantee STS-1 frame alignment to the local system clock before being routed to the other main and function unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a limited VT1.5 cross-connection.

Each 22G-U/22G2-U/22G3-U OLIU provides timing signals to and receives timing signals from the TG circuit packs.

Detailed Description of Operation

Figure 7-49 is a block diagram of the 22G-U/22G2-U/22G3-U OLIU.

Transmission Circuitry

STS-1 Router and VT1.5 Cross-Connect. The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the limited VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

Transmit Direction. The STS-1 router selects three of the STS-1 signals directly from the other main and function unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the multiplexer. The multiplexer takes the three STS-1 signals, adds SONET transport overhead, then byte-interleaves and scrambles the signal with a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the laser transmitter, converting the electrical signal to an NRZ-encoded SONET compatible OC-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-3 signal to equivalent electrical pulses and recovers the received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes OC-3 transport overhead. The overhead information is sent to the SYSCTL circuit pack via the intra-shelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the STS-1 pointer processor is three STS-1 signals, frame synchronous to each other, which are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends each of the three STS-1 signals to the appropriate main or function unit slots.

Control Circuitry

The 22G-U/22G2-U/22G3-U OLIU circuit pack interfaces with the BBG8/BBG8B SYSCTL and with the OHCTL circuit packs.

The 22G-U/22G2-U/22G3-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 22G-U/22G2-U/22G3-U OLIU responds to control signals from the SYSCTL, such as STS-1 routing, VT1.5 routing, protection switching, and LED control commands.

The 22G-U/22G2-U/22G3-U OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the OHCTL.

The 22G-U/22G2-U/22G3-U OLIU accesses the STS-1 path overhead and routes it via the intra-shelf control bus to the SYSCTL circuit pack.

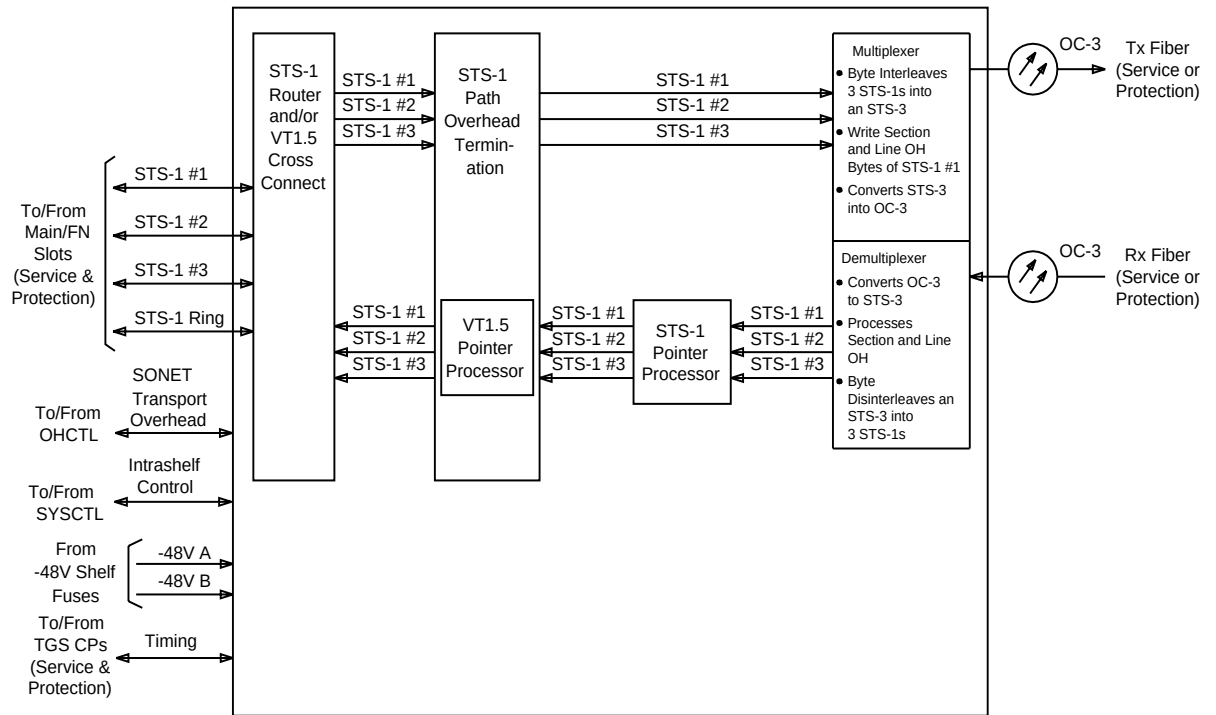


Figure 7-49. 22G-U/22G2-U/22G3-U OLIU Circuit Pack Block Diagram

Timing Circuitry

Each TG circuit pack sends timing signals to each 22G-U/22G2-U/22G3-U OLIU. Each 22G-U/22G2-U/22G3-U OLIU monitors the timing inputs from both TG circuit packs. The 22G-U/22G2-U/22G3-U OLIU normally selects the timing signals from the TG selected by the SYSCTL. Each 22G-U/22G2-U/22G3-U OLIU provides timing signals derived from the incoming optical signal to both TG circuit packs for line (formerly loop) timing and DS1 output (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 22G-U/22G2-U/22G3-U OLIU is protection switched by the SYSCTL in response to an external command, incoming optical signal failure, or internal equipment fault. The 22G-U/22G2-U/22G3-U OLIU circuit pack is protection switched with the OC-3 line.

The 22G-U/22G2-U/22G3-U OLIU interfaces with STS-1 signals from the circuit packs in the main and function unit slots. It selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 22G-U/22G2-U/22G3-U OLIU provides selectors for timing signals from the TG circuit packs, monitors these inputs, and autonomously selects either TG circuit pack. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 22G-U/22G2-U/22G3-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 22G-U/22G2-U/22G3-U OLIU has provisionable VT signal degrade and STS signal degrade BER threshold capabilities for path protection switching.

Performance Monitoring

The 22G-U/22G2-U/22G3-U OLIU provides PM circuitry for the following performance parameters:

- Section SEFS count
- Line coding violation counts
- STS-1 path coding violation counts.

Power Circuitry

Power for the 22G-U/22G2-U/22G3-U OLIU circuit packs is provided by one or two (depending on vintage and series) DC-to-DC converters located on the 22G-U/22G2-U/22G3-U OLIU circuit packs. The converters supply +5 volts to all 22-type OLIUs. They may also supply either +3.3 or –5 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converters causes the red FAULT LED to light.

22G-U/22G2-U/22G3-U OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 22G-U/22G2-U/22G3-U OLIU circuit pack are as follows:

- Selects STS-1 inputs from MXRVO, DS3, STS1E, or other OLIU circuit packs
- Provides VT1.5/STS-1 signal cross-connections
- Adds SONET transport overhead and, if VT1.5 cross-connected, adds STS-1 path overhead
- Byte-interleaves and scrambles the three selected STS-1 signals to produce an STS-3 signal
- Uses a laser transmitter to produce a SONET standard OC-3 optical signal from an STS-3 electrical signal.

Receive Functions

The following are major receive functions of the 22G-U/22G2-U/22G3-U OLIU circuit pack:

- Receives a SONET standard OC-3 optical signal and converts it to an electrical STS-3 signal
- Extracts STS-3 clock and retimes the received data
- Demultiplexes the STS-3 signal into three STS-1 signals
- Extracts transport overhead and, if VT1.5 cross-connected, extracts path overhead
- Processes the STS-1 pointer and frame-synchronizes the STS-1 signals
- Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signal, if VT1.5 cross-connected
- Provides VT1.5/STS-1 signal cross-connections

- Processes the received clock and provides a reference clock to the TG circuit packs
- Provides express processing for VT AIS.

Control Functions

The major control functions are as follows:

- Switches protection for OC-3 line and DS3, MXRVO, STS1E, other OLIU, and TG circuit packs
- Processes transport and path overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.)
- Supports VT and STS signal degrade protection switching
- Supports STS-1 BER signal fail (10^{-3} or 10^{-6}) path protection switching
- Supports path protection switching based on STS-1 unequipped, STS-1 AIS, STS-1 LOP, VT AIS, VT unequipped, and VT LOP.

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS
- Inserts and detects OC-3 line AIS
- Inserts and detects STS-1 path unequipped signal
- Inserts and detects VT path unequipped signal
- Inserts and detects line FERF
- Inserts and detects STS-1 path yellow, if VT1.5 cross-connected
- Detects OC-3 line failures (LOS, LOF, AIS, and BER)
- Detects OC-3 line signal degrade BER.

24G-U OLIU Circuit Pack Description

Purpose of Circuit

The 24G-U OC-12 OLIU circuit pack performs the optical/electrical conversion between the optical carrier level 12 (OC-12) and STS-12 signals, multiplexing between STS-12 and twelve STS-1 signals, and SONET transport overhead access. The 24G-U OLIU also provides routing of any 3 of the twelve STS-1s between the OC-12 interface and other main and function unit slots in the shelf as well as VT1.5/STS-1 add/drop and ring capabilities. When used to perform VT1.5 add/drop or ring capabilities, STS-1 path overhead access is also provided.

The 24G-U OLIU can also be used as an OC-12 upgrade from an OC-3 ring.

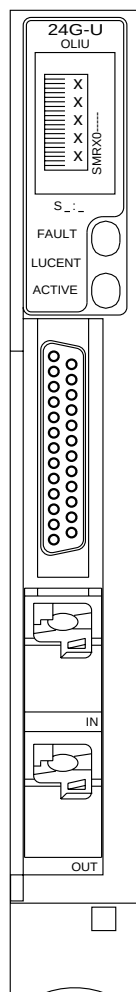
24G-U OLIU Faceplate Indicators

The 24G-U OLIU circuit pack faceplate indicators are shown in Figure 7-50.

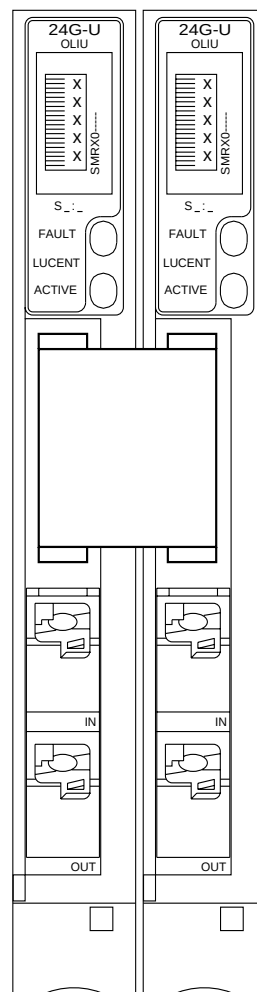
The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash on and off.

The green ACTIVE LED lights when the circuit pack is active (carrying service).

A faceplate-mounted universal optical connector allows the 24G-U OLIU to accept fiber terminated with ST, SC, or FC connectors. An additional interconnect cable assembly (COMCODE #847721271) is required between faceplates of the two 24G-U's to support pass-through traffic on the OC-12 ring (see Figure 7-50). The 24G-U OLIU comes with a 0 dB ST buildout. For the 24G-U, a 10 dB attenuator is required for loopback testing. The 24G-U OLIU operates over single-mode fiber. Various combinations of buildout attenuators and connectors are also available. See Section 10, "Technical Specifications," for a list of universal buildout attenuators.



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Figure 7-50. 24G-U OC-12 OLIU Circuit Pack — 24G-U Pair with Interconnect Cable Assembly

General Description of Operation

The 24G-U OLIU multiplexes twelve STS-1 signals to an STS-12, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-12 signal drives the laser transmitter to create the OC-12 output.

The received OC-12 signal is converted to an electrical STS-12. This STS-12 is descrambled and demultiplexed into twelve STS-1 signals, and transport/path overhead is accessed. Some of the overhead (for example, section DCC) is passed via serial data links to the control packs, while other bytes (for example, framing, parity check) are processed on board. The twelve STS-1 signals go through a pointer processor to guarantee STS-1 frame alignment to the local system clock before being routed to the other main and function unit slots. Any three of the twelve STS-1s can be routed to the function unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a limited VT1.5 cross-connection.

Each 24G-U OLIU provides timing signals to and receives timing signals from the TG circuit packs.

Detailed Description of Operation

Figure 7-51 is a block diagram of the 24G-U OLIU.

Transmission Circuitry

STS-1 Router and VT1.5 Cross-Connect. The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the limited VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

Transmit Direction. The STS-1 router selects up to three of the STS-1 signals directly from the other main and function unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the multiplexer. The multiplexer takes these three STS-1 signals and the remaining STS-1s from the ring (through the faceplate connector), adds SONET transport overhead, then byte-interleaves and scrambles the signal with a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-12 format and is used to amplitude modulate the laser transmitter, converting the electrical signal to an NRZ-encoded SONET compatible OC-12 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-12 signal to equivalent electrical pulses and recovers received clock (622.08 MHz) and uses it to retiming the received data. The demultiplexer circuit accepts the retimed STS-12 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into twelve STS-1 signals, and processes OC-12 transport overhead. The overhead information is sent to the SYCTL circuit pack via the intra-shelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each of the twelve received STS-1, using the local timing signals. The output of the STS-1 pointer processor is twelve STS-1 signals, frame synchronous to each other. Any three of these STS-1s then are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends each of the three STS-1 signals to the appropriate main or function unit slots. All twelve of the received STS-1s are passed through the faceplate connector to the other main OLIU.

Control Circuitry

The 24G-U OLIU circuit pack interfaces with the BBG8/BBG8B SYCTL and with the BBG9 OHCTL circuit packs.

The 24G-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYCTL for fault detection and isolation. Conversely, the 24G-U OLIU responds to control signals from the SYCTL, such as STS-1 routing, VT1.5 routing, protection switching, and LED control commands.

The 24G-U OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the OHCTL.

The 24G-U OLIU accesses the STS-1 path overhead and routes it via the intra-shelf control bus to the SYCTL circuit pack.

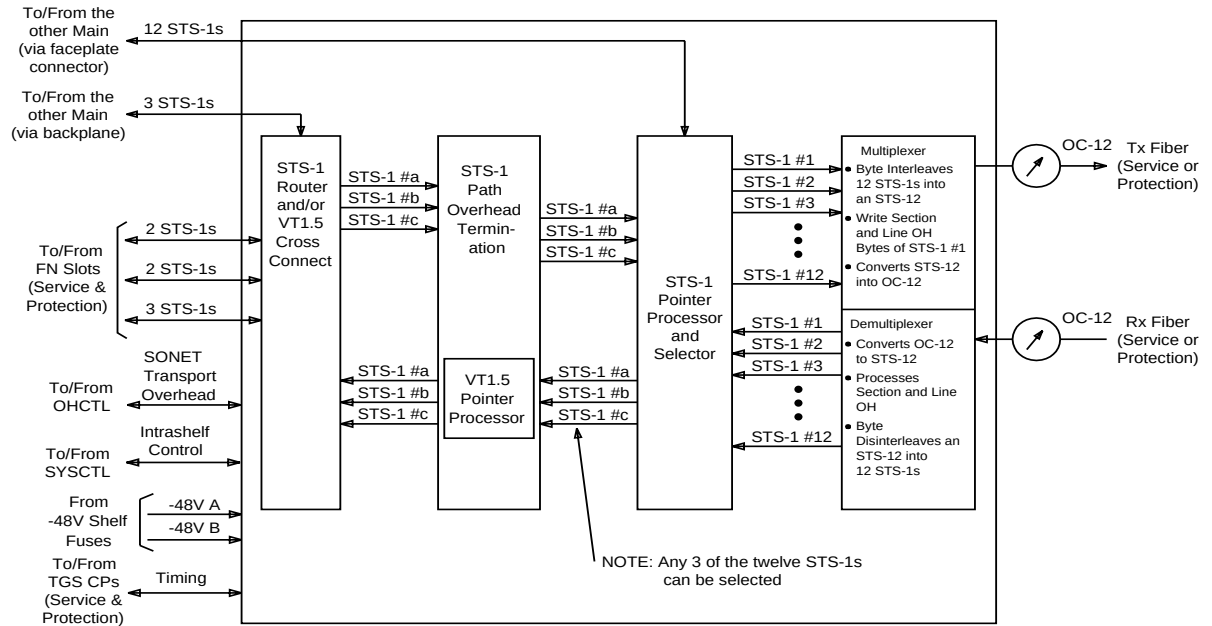


Figure 7-51. 24G-U OLIU Circuit Pack Block Diagram

Timing Circuitry

Each TG circuit pack sends timing signals to each 24G-U OLIU. Each 24G-U OLIU monitors the timing inputs from both TG circuit packs. The 24G-U OLIU normally selects the timing signals from the TG selected by the SYSCTL. Each 24G-U OLIU provides timing signals derived from the incoming optical signal to both TG circuit packs for line timing and DS1 output (BITS).

Protection Circuitry

The 24G-U OLIU is protection switched by the SYSCTL in response to an external command or internal equipment fault. The 24G-U OLIU also supports protection switching for unidirectional path switched rings at the VT and STS level.

The 24G-U OLIU interfaces with STS-1 signals from the circuit packs in the main and function unit slots. It selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 24G-U OLIU provides selectors for timing signals from the TG circuit packs, monitors these inputs, and autonomously selects either TG circuit pack. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 24G-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 24G-U OLIU has provisionable VT signal degrade and STS signal degrade BER threshold capabilities for path protection switching.

Performance Monitoring

The 24G-U OLIU provides PM circuitry for the following performance parameters:

- Section SEFS count for the OC-12 input
- Line coding violation counts for the OC-12 input
- STS-1 path coding violation counts for up to three STS-1s that are VT1.5 cross-connected.

Power Circuitry

Power for the 24G-U OLIU circuit pack is provided by two DC-to-DC converters located on the 24G-U OLIU circuit pack. The converters supply both +5 and +3.3 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converters causes the red FAULT LED to light.

24G-U OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 24G-U OLIU circuit pack are as follows:

- Selects STS-1 inputs from MXRVO, DS3, STS1E, or other OLIU circuit packs
- Provides VT1.5/STS-1 signal cross-connections
- Adds SONET transport overhead and, for up to three VT1.5 cross-connected STS-1s, adds STS-1 path overhead

- Byte-interleaves and scrambles up to three selected STS-1 signals plus the other nine to twelve STS-1s on the ring to produce an STS-12 signal
- Uses a laser transmitter to produce a SONET standard OC-12 optical signal from an STS-12 electrical signal.

Receive Functions

The following are major receive functions of the 24G-U OLIU circuit pack:

- Receives a SONET standard OC-12 optical signal and converts it to an electrical STS-12 signal
- Extracts STS-12 clock and retimes the received data
- Demultiplexes the STS-12 signal into twelve STS-1 signals
- Extracts transport overhead and, for up to three STS-1s (if VT1.5 cross-connected), extracts path overhead
- Processes the STS-1 or STS-3c pointers and frame-synchronizes the STS-1/STS-3c signals
- Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signal, if VT1.5 cross-connected, for up to three STS-1s
- Provides VT1.5/STS-1 signal cross-connections for up to three STS-1s
- Provides STS-1/STS-3c pass-through cross-connections for remaining STS-1s
- Processes the received clock and provides a reference clock to the TG circuit packs
- Provides express processing for VT AIS for VT cross-connected STS-1s.

Control Functions

The major control functions are as follows:

- Switches protection for DS3, MXRVO, STS1E, other OLIU, and TG circuit packs
- Processes transport and path overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.)
- Supports VT and STS signal degrade unidirectional path protection switching for up to three STS-1s
- Supports STS-1 BER signal fail (10^{-3} or 10^{-6}) path protection switching for up to three STS-1s
- Supports path protection switching based on STS-1 unequipped, STS-1 AIS, STS-1 LOP, VT AIS, VT unequipped, and VT LOP for up to three STS-1s.

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS
- inserts and detects VT1.5 path AIS for up to three STS-1s
- Inserts and detects OC-12 line AIS
- Inserts and detects STS-1 path unequipped signal for up to three STS-1s
- Inserts and detects VT path unequipped signal for up to three STS-1
- Inserts and detects line FERF
- Inserts and detects STS-1 path yellow for up to three STS-1s if VT1.5 cross-connected
- Detects OC-12 line failures (LOS, LOF, AIS, and BER)
- Detects OC-12 line signal degrade BER, STS-1 path and VT1.5 path signal degrade, and signal fail for up to three STS-1s.

26G2-U Circuit Pack Description

Purpose of Circuit

The 26G2-U OLIU circuit pack interfaces with a 1310 nm optical line in the transmit and receive directions. It provides an interface between the OC-1 optical line and the electrical STS-1 and VT-G signals. The 26G2-U OLIU circuit pack also has the following functions:

- Active VT timeslot interchanging in the function slot
- Access to low speed slots and main slots from the function slot

The 26G2-U OLIU may be used in the main slots of the DDM-2000 FiberReach wideband shelf or the function unit slots of the DDM-2000 OC-3 shelf (Group 4 or later). The fiber is accessed via a pair of universal optical connectors on the 26G2-U faceplate that supports *ST*[®], SC, and FC type optical connectors. Both single mode and multi mode facilities are supported.

26G2-U OLIU Faceplate Indicators

The 26G2-U OLIU circuit pack faceplate indicators are shown in Figure 7-52. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming OC-1 signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

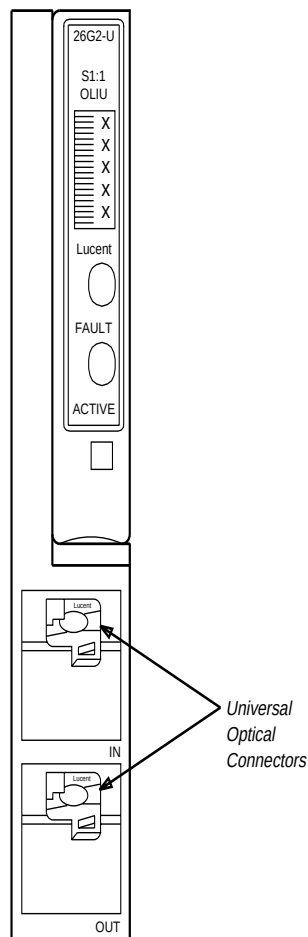


Figure 7-52. 26G2-U OLIU Circuit Packs

A faceplate-mounted universal optical connector allows the 26G2-U OLIU to accept fiber terminated with ST, SC, or FC connectors. The 26G2-U OLIU comes with a 0 dB ST buildout. A 10 dB attenuator is required for loopback testing. Various combinations of buildout attenuators and connectors are also available. See Chapter 10, "Technical Specifications" for a list of universal buildout attenuators.

General Description of Operation

The 26G2-U circuit pack accepts eight VT-G signals from the DS1 circuit packs, performs protection switch selection, combines the selected signals to form an

STS-1 signal, inserts STS-1 path overhead, inserts SONET transport overhead bytes (line and section), and scrambles the resulting signal which drives a separate laser transmitter to create an OC-1 output.

The 26G2-U circuit pack converts a received OC-1 signal back to an electrical STS-1, descrambles and demultiplexes it, and processes the transport overhead. It sends some of the overhead (for example, section data communications channel) via a serial data link to the control packs, and processes other bytes (for example framing, parity check) on board. It performs STS-1 pointer processing to guarantee STS-1 frame alignment to the local system clock and STS-1 path overhead and VT1.5 pointer processing. The 26G2-U then performs VT1.5 TSI, multiplexes four VT1.5 signals to VT-Gs, and sends the VT-Gs to the low-speed slots.

The 26G2-U provides an interface of eight VT-G signals in both the wideband shelf and the OC-3 shelf. These groups are multiplexed into an STS-1 signal. A VT1.5 cross-connect allows VT1.5 switching as required.

Detailed Description of Operation

Figure 7-53 is a block diagram of the 26G2-U OLIU circuit pack.

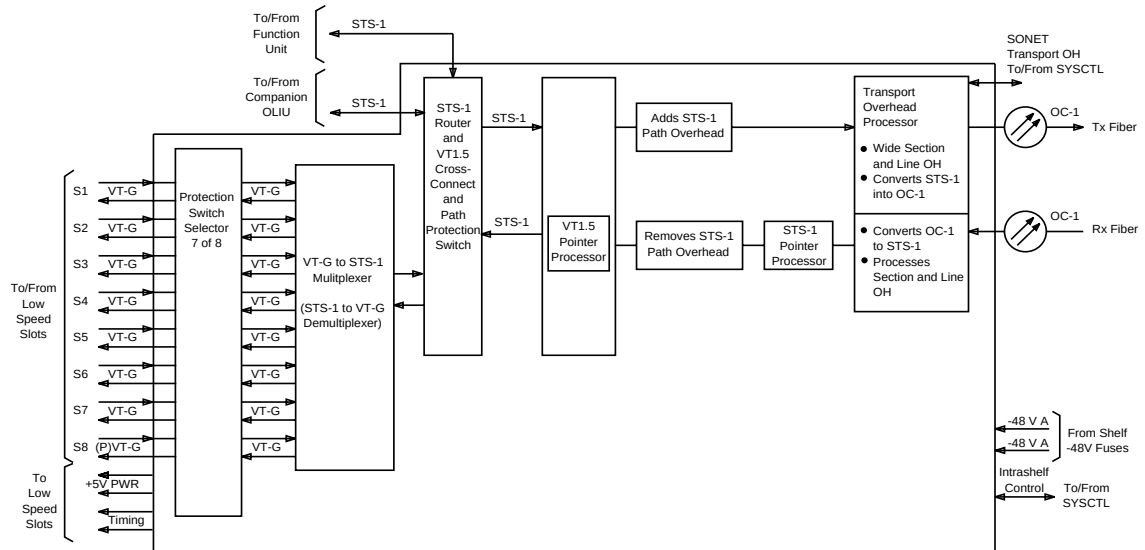


Figure 7-53. 26G2-U OLIU Circuit Pack Block Diagram

Transmission Circuitry

STS-1 Router and VT1.5 Cross-Connect . The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the VT1.5 cross-connect. The outgoing STS-1 may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

Transmit Direction . In the transmit direction (from the low-speed slots toward the optical interface), the VT-G signals from the low-speed slots are combined into an STS-1 signal. The router receives this STS-1 signal, and/or an STS-1 from the appropriate function unit slot, and cross-connects the VT1.5 tributaries. SONET path overhead is then added to STS-1 sourced by the VT1.5 cross-connects before the signals are sent to the transport overhead processor. The transport overhead processor takes the STS-1 signal, adds SONET transport overhead, then scrambles the signal with a frame synchronous scrambler. The output from the transport overhead processor is in the SONET STS-1 format and is used to modulate the amplitude of the laser transmitter, converting the electrical signal to an NRZ-encoded SONET compatible OC-1 optical signal.

In the OC-3 shelf, the 26G2-U OLIU provides an interface between the STS-1 optical signal and electrical VT-G signals. Three STS-1 paths will be brought out to the backplane for STS-1 routing throughout the OC-3 shelf. The 26G2-U also provides an STS-1 electrical interface to a companion 26G2-U OLIU which allows the two OLIUs to be cross coupled.

Receive Direction . In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-1 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock and uses it to retime the received data. The transport overhead processor circuit accepts the retimed STS-1 bit stream, frames on the incoming signal, descrambles it, and processes OC-1 transport overhead. The overhead information is sent to the SYSCTL circuit pack.

The STS-1 output from the transport overhead processor and STS-1 path overhead monitoring is sent to the STS-1 pointer processor which performs pointer interpretation. The STS-1 is sent to the VT1.5 pointer processor for column alignment and VT path overhead monitoring. STS-1 path overhead and VT1.5 pointer processing is performed. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends the STS-1 signal to the appropriate main or function unit slots, or up to 8 VT-Gs to the low-speed slots.

Control Circuitry

The 26G2-U OLIU circuit pack interfaces with the BBG8 system controller (SYSCTL) via the intershell control interface, and with the BBG9 OHCTL via a serial link that accesses the DCC bytes and S1 byte. The 26G2-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 26G2-U OLIU responds to control signals from the SYSCTL such as STS-1 routing, VT1.5 routing, protection switching, and LED control commands.

The 26G2-U OLIU accesses the SONET transport overhead and routes it to and from the SYSCTL circuit pack.

Timing Circuitry

The 26G2-U OLIU recovers timing from the incoming OC-1 signal.

Protection Circuitry

STS-1 and VT1.5 path protection switching, compliant with SONET specifications, is provided. The 26G2-U OLIU is protection switched by the SYSCTL in response to an external command, incoming optical signal failure, or internal equipment fault. The 26G2-U OLIU circuit pack is protection switched by the SYSCTL when the SYSCTL detects a fault on the active 26G2-U OLIU, and the companion 26G2-U OLIU is good.

The 26G2-U OLIU interfaces via VT-G signals with circuit packs in the low-speed slots. It selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

Fault Detection Circuitry

The 26G2-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous, and errors are reported when they occur to the SYSCTL via the intra-shelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 26G2-U OLIU has STS-1 and VT1.5 signal degrade protection switching and STS signal degrade protection switching capabilities.

Performance Monitoring

The 26G2-U OLIU provides PM circuitry for the following performance parameters:

- STS-1 section severely errored frame seconds (SEFS)
- Line coding violations (B2 parity)
- Line errored seconds
- STS-1 path coding violations (B3 parity)
- STS-1 path errored seconds.

Power Circuitry

Power for the 26G2-U OLIU circuit pack is provided by two DC-to-DC converters located on the 26G2-U OLIU circuit pack. The converters supply +5 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. The 26G2-U provides +5V power to the low-speed slots. Failure of the fuse or converters causes the red FAULT LED to light.

26G2-U OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 26G2-U OLIU circuit pack are as follows:

- Selects and multiplexes VT-Gs into one STS-1 synchronous payload envelope (SPE).
- Adds SONET and STS-1 path transport overhead
- Scrambles the STS-1 signal to prepare for optical conversion
- Uses a laser transmitter to produce a SONET standard OC-1 optical signal.

Receive Functions

The following are major receive functions of the 26G2-U OLIU circuit pack:

- Receives one SONET standard OC-1 optical signal and converts it to an electrical STS-1 signal
- Extracts transport and STS-1 path overhead
- Processes the STS-1 pointer and frame-synchronizes the STS-1 signals
- Processes the VT1.5 pointers and column-aligns the VT1.5 signals
- Provides path protection switching
- Sends VT-Gs to the DS1 circuit packs.

Control Functions

The major control functions are as follows:

- Processes transport and path overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.)
- Supports VT and OC-1 signal degrade protection switching
- Supports protection switching of circuit packs in the low-speed slots
- Provides VT1.5/STS-1 signal cross-connections.

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS
- Inserts and detects OC-1 line AIS
- Inserts and detects STS-1 path unequipped signal
- Inserts and detects VT path unequipped signal
- Inserts and detects line FERF
- Inserts and detects STS-1 path yellow, if VT1.5 cross-connected
- Detects OC-1 line failures (LOS, LOF, AIS, and BER)
- Detects OC-1 line signal degrade BER.

27G-U/27G2-U OLIU Circuit Pack Description

Purpose of Circuit

The 27G-U/27G2-U OLIU circuit pack provides the transmit and receive line termination functions for two OC-1 signals. The 27G-U/27G2-U OLIU performs the optical/electrical conversion between two optical carrier level 1 (OC-1) and STS-1 signals and provides SONET transport overhead access. The 27G-U/27G2-U OLIU also provides routing of the STS-1s between the OC-1 interfaces and other main and function unit slots in the shelf as well as VT1.5/STS-1 add/drop and ring capabilities. When used to perform VT1.5 add/drop or ring capabilities, STS-1 path overhead access is also provided.

27G-U/27G2-U OLIU Faceplate Indicators

The 27G-U/27G2-U OLIU circuit pack faceplate indicators are shown in Figure 7-54.

The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming OC-1 signal failure, this LED will flash on and off.

The green ACTIVE LED lights when the circuit pack is active (carrying service).

A faceplate-mounted universal optical connector allows the 27G-U/27G2-U OLIU to accept fiber terminated with ST, SC, or FC connectors. The 27G-U/27G2-U OLIU comes with a 0 dB ST buildout. A 10 dB attenuator is required for loopback testing. The 27G-U/27G2-U OLIU operates over single mode fiber. Various combinations of buildout attenuators and connectors are also available. See Section 10, "Technical Specifications," for a list of universal buildout attenuators.

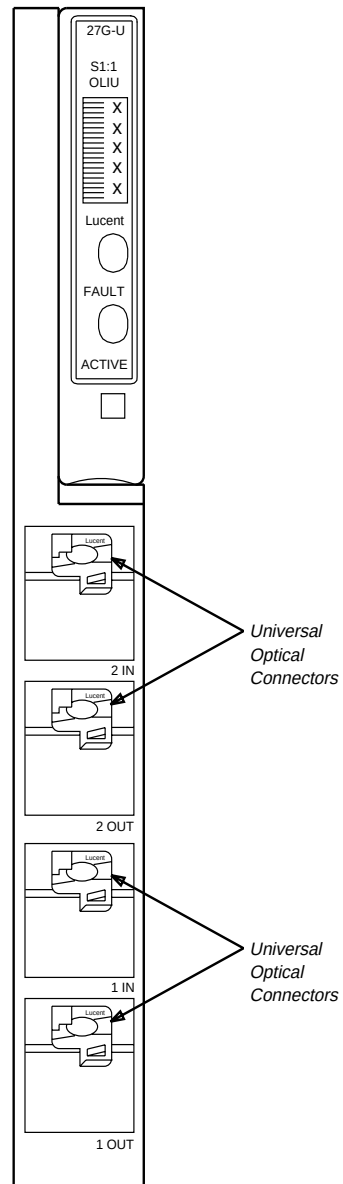


Figure 7-54. 27G-U/27G2-U OLIU Circuit Pack

General Description of Operation

The 27G-U/27G2-U OLIU, for each STS-1, inserts SONET transport overhead bytes (line and section), and for VT1.5 applications, inserts STS path overhead bytes and scrambles the resulting signal. Each STS-1 signal drives a separate laser transmitter to create the two OC-1 outputs.

A received OC-1 signal is converted back to an electrical STS-1. This STS-1 is descrambled and demultiplexed and transport/path overhead is accessed. Some of the overhead (for example, section DCC) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on board. The STS-1 signals go through a pointer processor to guarantee STS-1 frame alignment to the local system clock before being routed to the other main and function unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a VT1.5 cross-connection.

Each 27G-U/27G2-U OLIU provides timing signals to and receives timing signals from the TG circuit packs.

Detailed Description of Operation

Figure 7-55 is a block diagram of the 27G-U/27G2-U OLIU.

Transmission Circuitry

STS-1 Router and VT1.5 Cross-Connect. The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

Transmit Direction. The STS-1 router selects two of the STS-1 signals directly from the other main and function unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the transport overhead processor. The transport overhead processor takes the two STS-1 signals, adds SONET transport overhead, then scrambles the signal with a frame synchronous scrambler. The output from the transport overhead processor is in the SONET STS-1 format and is used to amplitude modulate the laser transmitter, converting the electrical signal to an NRZ-encoded SONET compatible OC-1 optical signal.

Receive Direction. In the receive direction for each OC-1, the optical receiver converts the light pulses from an NRZ-encoded OC-1 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock and uses it to retiming the received data. The transport overhead processor circuit accepts the retimed STS-1 bit stream, frames on the incoming signal, descrambles it, and processes OC-1 transport overhead. The overhead information is sent to the SYSCTL circuit pack via the intra-shelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the transport overhead processor are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the STS-1 pointer processor is two STS-1 signals, frame synchronous to each other, which are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends the two STS-1 signals to the appropriate main or function unit slots.

Control Circuitry

The 27G-U/27G2-U OLIU circuit pack interfaces with the BBG8/BBG8B SYSCTL and with the BBG9 OHCTL circuit packs.

The 27G-U/27G2-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 27G-U/27G2-U OLIU responds to control signals from the SYSCTL, such as STS-1 routing, VT1.5 routing, protection switching, and LED control commands.

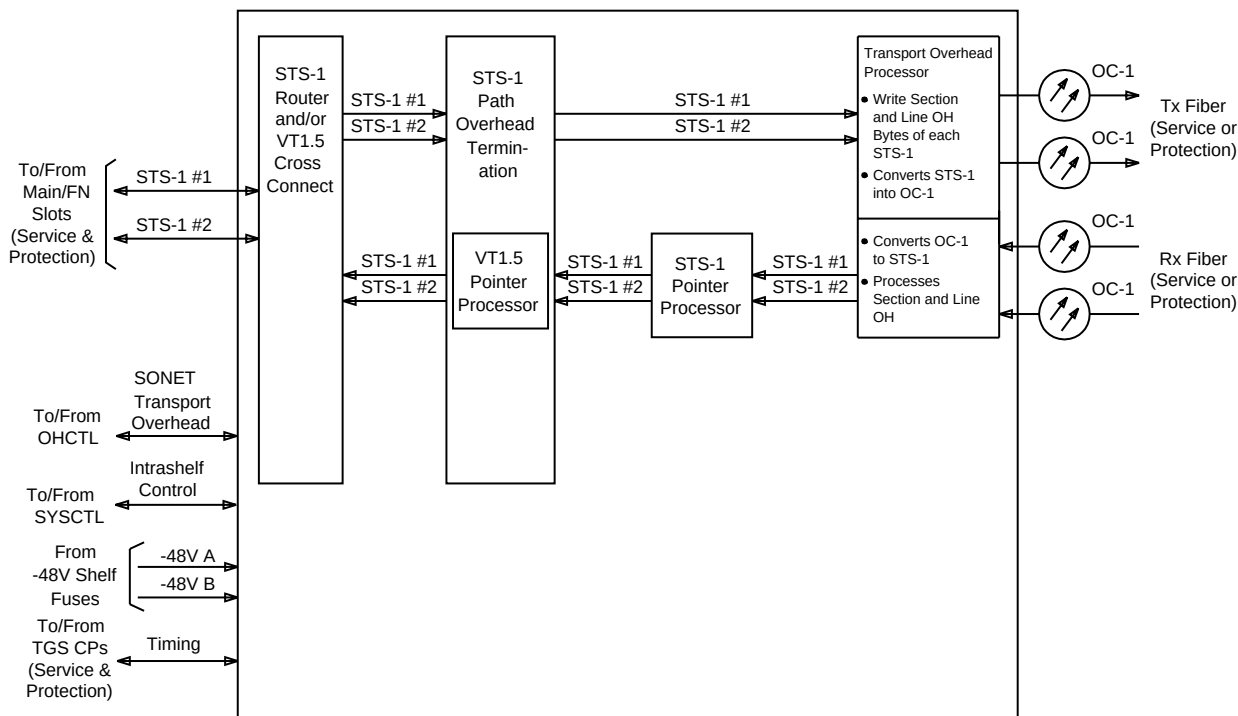


Figure 7-55. 27G-U/27G2-U OLIU Circuit Pack Block Diagram

The 27G-U/27G2-U OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the OHCTL. The 27G-U/27G2-U OLIU accesses the STS-1 path overhead and routes it via the intra-shelf control bus to the SYSCTL circuit pack.

Timing Circuitry

Each TG circuit pack sends timing signals to each 27G-U/27G2-U OLIU. Each 27G-U/27G2-U OLIU monitors the timing inputs from both TG circuit packs. The 27G-U/27G2-U OLIU normally selects the timing signals from the TG selected by the SYSCTL. When inserted in main or function unit C slots, each 27G-U/27G2-U OLIU provides timing signals derived from the incoming optical signal to both TG circuit packs for line timing and DS1 output (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 27G-U/27G2-U OLIU is protection switched by the SYCTL in response to an external command, incoming optical signal failure, or internal equipment fault. The 27G-U/27G2-U OLIU circuit pack is protection switched by the SYCTL when the SYCTL detects a fault on the active 27G-U/27G2-U OLIU and the companion 27G-U/27G2-U OLIU is good.

The 27G-U/27G2-U OLIU interfaces with STS-1 signals from the circuit packs in the main and function unit slots. It selects the signals from the service or protection slot of each pair as directed by the SYCTL.

The 27G-U/27G2-U OLIU provides selectors for timing signals from the TG circuit packs, monitors these inputs, and autonomously selects either TG circuit pack. The SYCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 27G-U/27G2-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYCTL via the intra-shelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 27G-U/27G2-U OLIU has provisionable VT signal degrade and STS signal degrade BER threshold capabilities for path protection switching.

Performance Monitoring

The 27G-U/27G2-U OLIU provides PM circuitry for the following performance parameters:

- STS-1 section SEFS count
- Line coding violation counts (B2 parity)
- Line errored seconds
- STS-1 path coding violation counts (B3 parity)
- STS-1 path errored seconds
- VT path coding violation counts (V5 parity)
- VT path errored seconds.

Power Circuitry

Power for the 27G-U/27G2-U OLIU circuit pack is provided by a DC-to-DC converter located on the 27G-U/27G2-U OLIU circuit pack. The converter supplies +5 volts. Both A and B –48 volt backplane busses supply power to the converter through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converter causes the red FAULT LED to light.

27G-U/27G2-U OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 27G-U/27G2-U OLIU circuit pack are as follows:

- Selects STS-1 inputs from MXRVO, STS1E, or other OLIU circuit packs
- Provides VT1.5/STS-1 signal cross-connections
- Adds SONET transport overhead and, if VT1.5 cross-connected, adds STS-1 path overhead
- Scrambles the two selected STS-1 signals to prepare for optical conversion
- Uses a laser transmitter to produce a SONET compatible OC-1 optical signal from each STS-1 electrical signal.

Receive Functions

The following are major receive functions of the 27G-U/27G2-U OLIU circuit pack:

- Receives two SONET compatible OC-1 optical signals and converts each to an electrical STS-1 signals
- Extracts STS-1 rate clock and retimes the received data
- Extracts transport overhead and, if VT1.5 cross-connected, extracts STS-1 path overhead from each STS-1
- Processes the STS-1 pointer and frame-synchronizes the STS-1 signals
- Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signal, if VT1.5 cross-connected
- Provides VT1.5/STS-1 signal cross-connections
- Processes the received clock and provides a reference clock to the TG circuit packs
- Provides express processing for VT AIS.

Control Functions

The major control functions are as follows:

- Switches protection for OC-1 line and STS1E, MXRVO, other OLIU, and TG circuit packs
- Processes transport and path overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.)
- Supports VT, STS, and OC-1 signal degrade protection switching
- Supports STS-1 BER signal fail (10^{-3} or 10^{-6}) path protection switching
- Supports path protection switching based on STS-1 unequipped, STS-1 AIS, STS-1 LOP, VT AIS, VT unequipped, and VT LOP.

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS
- Inserts and detects OC-1 line AIS
- Inserts and detects STS-1 path unequipped signal
- Inserts and detects VT path unequipped signal
- Inserts and detects line FERF
- Inserts and detects STS-1 path yellow, if VT1.5 cross-connected
- Detects OC-1 line failures (LOS, LOF, AIS, and BER)
- Detects OC-1 line signal degrade BER.

Table of Contents

Overview	8-1
Administration	8-1
■ Version Recognition	8-1
■ Security	8-2
■ Software Upgrades	8-4
■ Software Compatibility	8-4
■ Controller Maintenance and Memory Administration	8-4
Controller Maintenance	8-4
Memory Administration	8-5
■ System Backup and Restoral	8-6
Service-Affecting Actions	8-7
Multiplexing and Mapping	8-8
■ DS1 to OC-1/OC-3/OC-12	8-9
■ DS3 to OC-1/OC-3/OC-12	8-12
■ EC-1 to OC-1/OC-3/OC-12	8-12
■ OC-1/OC-3/OC-12 to OC-1/OC-3/OC-12	8-13
OC-3 to OC-1	8-13
OC-1 to OC-1 Hairpin	8-14
STS-1 to STS-1 Hairpin	8-14
OC-3c to OC-3c (Optional Feature)	8-15
■ DS1 to EC-1	8-15
■ DS3 to EC-1	8-15
■ EC-1 to EC-1	8-15

Table of Contents

Provisioning	8-16
■ General	8-16
■ Default Provisioning	8-16
■ Remote Provisioning	8-16
■ Automatic Provisioning	8-16
Circuit Pack Replacement	8-16
■ Feature Package Provisioning	8-17
■ Data Communications Channel (DCC) Provisioning	8-17
■ Port State Provisioning	8-17
■ Channel State Provisioning	8-18
■ Line State Provisioning	8-18
■ AIS or Unequipped Provisioning	8-18
■ Open Systems Interconnection (OSI) Provisioning	8-19
■ Operations Interworking Provisioning	8-20
Single-Ended Operations	8-21
Centralized Survivable OS Access (OSGNE)	8-21
Remote Login	8-22
Remote Office Alarms and User Panel	8-22
Remote Software Download and Copy	8-22
Directory Services Network Element (DSNE)	8-23
Alarm Groups	8-23
Alarm Gateway Network Element (AGNE)	8-24
Operations Interworking Guidelines	8-25
Cross-Connection Provisioning	8-26
■ Cross-Connection Types	8-27
■ Linear Application Default Cross-Connection Mode	8-30
■ Manual Cross-Connections	8-31
■ Allowable Cross-Connects	8-32
Optical Point-to-Point Application	8-45
Optical Drop Application	8-45
Optical Hubbing Application	8-45
Optical Add/Drop Application	8-45

Table of Contents

Electrical EC-1 Multiplexer Application	8-46
OC-3/OC-12/OC-1 Path Protected Ring Application	8-46
OC-3/OC-12 Path Protected Ring Drop and Continue Application	8-46
OC-3/OC-12 Path Protected Ring Optical Extension Application	8-46
Manual Cross-Connection Procedure	8-47
■ Manual Cross-Connection Restrictions	8-48
■ OC-3 Linear Network Cross-Connection Example	8-50
■ OC-3 Ring Cross-Connection Provisioning	8-56
OC-3 Ring Network Cross-Connection Example	8-57
DS3/EC-1 Ring Network Cross-Connection Example	8-61
OC-3/OC-12 Ring Drop and Continue Cross-Connection Provisioning	8-61
OC-3/OC-12 Ring Network Drop and Continue Cross-Connection Example	8-64
■ OC-3/OC-12 VT1.5 Path Switched Ring (0x1) Single Homing Example Cross-Connections	8-66
■ OC-3/OC-1 Ring Cross-Connection Provisioning	8-70
OC-3/OC-1 Ring Network Cross-Connection Example	8-70
Single-Homed OC-3/OC-1 Path-Switched Ring Example	8-74
Dual-Homed OC-3/OC-1 Path-Switched Ring Example	8-77
Switch Selectable Parameters	8-79
CIT Selectable Parameters	8-79
Identifiers	8-85
Performance Monitoring (PM) Parameters Provisionable via the CIT	8-86

Table of Contents

Overview

This section describes the administration and provisioning features of the DDM-2000 OC-3 Multiplexer. The following topics are described in addition to the administration and provisioning features:

- Multiplexing and mapping
- Cross-connection provisioning for linear and ring networks
- Listing of provisionable parameters with their ranges and default values.

Administration

Version Recognition

The DDM-2000 OC-3 Multiplexer provides automatic version recognition of all hardware, firmware, and software installed in the system. Each circuit pack *Common Language*^{*} code, equipment catalog item (ECI) code, apparatus code and series number, and serial number is stored on the circuit pack and is accessible by the system controller (SYSCTL) via the craft interface terminal (CIT). Circuit packs with socketed devices also report those devices and program identification (PID) codes. The SYSCTL also reports the software version for the system. Refer to the **rtrv-eqpt** command in Section 11, "Commands and Reports."

* Common Language is a registered trademark, and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

Security

DDM-2000 OC-3 Multiplexers provide security capabilities to protect against unauthorized access to the system through the CIT, data communications channel (DCC), and TL1/X.25 interfaces. When security is enabled (default is disabled for the CIT and DCC and always enabled for TL1/X.25), four types of users are allowed access to the system with a valid login and password:

- Privileged users can execute all commands
- General users can execute any commands not restricted to privileged users
- Maintenance users can execute some of the general level and all "reports-only" commands that are not restricted to privileged users
- Reports-only users can only execute commands that retrieve reports from the system.

When the system is first initialized, three default logins and passwords are provided which must be changed by a privileged user before security is enabled. At initialization, privileged users are those users who use the default logins and passwords. Replacement of the SYSCTL circuit pack causes the system to default back to the default logins and passwords. Up to 100 logins and passwords can be added, deleted, and changed by three authorized privileged users. Login and password security can be enabled or disabled. Timeouts can be provisioned independently for front and rear access CIT interfaces and the synchronous optical network (SONET) section DCC. Timeout is disabled on the TL1/X.25 interface. For more information on provisioning, see "System Turnup/Circuit Order," in the TOP section of this manual (Volume II).

Authorized privileged users can establish general user and reports-only user logins using the **set - lgn** command. Authorized privileged users can also "lockout" access by general and reports-only users without deleting the login and password file.

The following commands are restricted to privileged users over the CIT and DCC interfaces. See 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide* for TL1/X.25 command access privileges.

- **init-sys** — Initialize System
- **rstr-passwd** — Restore login and password file
- **rtrv-lgn** — Retrieve Login
- **rtrv-passwd** — Retrieve login and password file
- **set-feat** — Set Features
- **set-fecom** — Set Far-End Communications

- **set-lgn** — Set Login
- **set-secu** — Set Security
- **set-sync** — Set Synchronization characteristics.

When security is enabled, the following commands become restricted to privileged users only:

- **apply** — Locally Overwrite Executing Software
- **cpy-prog** — Copy Program
- **dlt-osacmap** — Delete OS application context ID map
- **dlt-tadrmap** — Delete target identifier (TID) Address Map
- **ent-osacmap** — Enter OS application context ID map
- **ent-tl1msgmap** — Enter TL1 message map for OS
- **ent-ulsdcc** — Enter Upper Layer Section DCC
- **init-pm** — Initialize Performance Monitoring
- **ins-prog** — Install Program
- **reset** — System Reset
- **set-date** — Set network element (NE) Date and time
- **set-ne** — Set NE name.
- **set-x25** — Set X.25 baud rate for OS.

Reports-only users can execute the following commands: **?** (help), **logout**, **rlgn**, **set-passwd** (their own), **toggle**, and all **rtrv** commands **except**, **rtrv-lgn**, and **rtrv-passwd**.

For details on these and other commands, see Section 11, "Commands and Reports."

Software Upgrades

The DDM-2000 OC-3 Multiplexer provides an in-service software installation capability to update the generic program in local and remote systems. Upgrades are distributed on *MS-DOS** formatted diskettes containing the new software and an installation program. Beginning with the upgrade from Release 9.1 to 11.0, an enhanced software download feature allows the source NE to download compressed copies of the new generic to all the other nodes in the network. This downloaded software will remain inactive until the new “**apply**” command is issued to overwrite the current software. This feature allows wide flexibility in scheduling upgrades throughout the network. These software upgrades are the primary mechanism to add new feature enhancements to the in-service DDM-2000 OC-3 network.

The **ins-prog** command supports software installation from a personal computer (PC) and the **cpy-prog** command supports software installation from one shelf to another shelf. For details on these and other commands, see Section 11, “Commands and Reports.”

Software Compatibility

DDM-2000 OC-3 and OC-12 Multiplexers connected in the same subnetwork must be running compatible software. For more information on software compatibility, refer to the software compatibility tables in Section 9, “Maintenance Description.”

Controller Maintenance and Memory Administration

Controller Maintenance

The controller for the DDM-2000 OC-3 Multiplexer consists of the SYSCTL and OHCTL circuit packs. The SYSCTL circuit pack provides CIT interfaces and telemetry byte-oriented serial (TBOS) interfaces and coordinates protection switching, as well as all shelf maintenance and provisioning activities. The OHCTL circuit pack provides an X.25/TL1 interface and a communications interface to remote shelves via the DCC bytes in the OC-N section overhead. Both circuit packs have a processor and both have volatile random access memory (RAM) and nonvolatile memory.

* Registered trademark of Microsoft Corporation.

The DDM-2000 OC-3 Multiplexer is designed so that SYSCTL failures do not affect transmission. That is, no hits or errors will occur on any traffic as a result of a SYSCTL circuit pack failure. A SYSCTL failure does result in the loss of automatic protection switching. However, if a transmission circuit pack fails before a SYSCTL failure, the protection switch will remain effective during the SYSCTL failure and service is preserved. This means that if an active transmission circuit pack should fail while the SYSCTL is failed, a protection switch cannot be done and service carried by the failed circuit pack will be affected.

Memory Administration

All transmission affecting parameters that are set by software, such as bipolar 8-zero substitution/alternate mark inversion (B8ZS/AMI) encoding on DS1 interfaces and STS-1/VT cross-connect assignments, are stored in nonvolatile memory on the SYSCTL circuit pack and on the appropriate transmission circuit packs. When the shelf is powered up or the SYSCTL circuit pack is replaced, the shelf's transmission values are automatically uploaded to the SYSCTL. When a transmission circuit pack is replaced, provisioning data stored on the SYSCTL is automatically downloaded to the replacement circuit pack. Manual action is not required to maintain system provisioning after a circuit pack is replaced.

Certain non-service-affecting provisioned data, such as alarm delay, is stored only on the SYSCTL circuit pack. This means that when a SYSCTL circuit pack is replaced, the new SYSCTL circuit pack should be initialized by pressing the INIT button during the 10-second interval while the CR alarm LED is flashing after the SYSCTL circuit pack is inserted. This action is the same as entering the **init-sys:sysctl** command which sets the SYSCTL circuit pack parameters to their default values. Refer to the **init-sys** command in Section 11, "Commands and Reports," and to "Install or Replace SYSCTL" in the TOP section of this manual (Volume II). If parameters other than the default values are needed, the values must be entered using the CIT. If the INIT function is not performed, whatever values that are stored in nonvolatile memory on the new SYSCTL circuit pack are used. Failure to follow the proper procedure may not cause transmission errors or loss of service but could affect maintenance. For example, an invalid TID could produce confusing TL1 reports to the OS.

System Backup and Restoral

The CPro-2000 Graphical User Interface and Provisioning Tool includes a backup and restoral feature to protect provisioning information in ring networks. This feature saves a copy of a node's provisionable parameters so they can be restored at a later date, if necessary.

The feature provides backup and restoral for:

- Cross-connections
- DS1 port options
- DS3 port options
- EC-1 port options
- OC-3 line options.

See 190-523-101 and/or 365-576-1xx, *CPro-2000 User Manual*, for more information on this feature.

Service-Affecting Actions

Although the DDM-2000 OC-3 Multiplexer is designed to minimize loss of service due to equipment failure or human action, there are certain controller related actions that can cause a loss of provisioning data and possibly loss of service. These actions include:

- Replacing a transmission circuit pack when the SYSCTL is failed or removed can result in a loss of provisioning data and loss of service
- Replacing a transmission circuit pack in a shelf without power can result in a loss of provisioning data. Loss of service may continue on channels associated with the replaced circuit pack after the shelf is powered up.
- Executing the command **init-sys:all** sets all provisioning data, including cross-connect provisioning, to default values. This causes loss of service on any channel connected with non-default cross-connections.
- Failing to disable the SYSCTL circuit pack before it is removed in accordance with TOP procedures could result in unexpected events; however, no loss of service occurs. Refer to the "Install or Replace SYSCTL" procedure in the TOP section of this manual (Volume II).
- Provisioning data is maintained through a software download to the SYSCTL. Replacing the SYSCTL circuit pack with incompatible software and intentionally overriding the software check could result in a loss of service.

Multiplexing and Mapping

Table 8-1 contains a summary of DDM-2000 OC-3 multiplexing and mapping capabilities and the ring or linear release (or later) required.

Table 8-1. DDM-2000 OC-3 Multiplexing and Mapping Capabilities

Interface	Cross-Connect Type	Interface					
		DS1	DS3	EC-1	OC-1	OC-3	OC-12
OC-12	VT1.5	R (11.0)	—	R (11.0)	R (11.0)	R (11.0)	R (11.0)
	STS-1	R (11.0)	R (11.0)	R (11.0)	R (11.0)	R (11.0)	R (11.0)
	STS-3c	—	—	—	—	—	R (11.0)
OC-3	VT1.5	R (5.0) L (3.1)	—	R (5.1) L (6.0)	R (9.0) L (—)	R (5.0) L (3.1)	
	STS-1	R (5.1) L (1.0)	R (5.1) L (1.0)	R (5.1) L (6.0)	R (9.0) L (—)	R (5.1) L (2.1)	
	STS-3c	—	—	—	—	L (6.0)	
OC-1	VT1.5	R (9.0)	—	R (9.0)	R (9.0)		
	STS-1	R (9.0)	R (9.0)	R (9.0)	R (9.0)		
EC-1	VT1.5	R (9.0) L (6.0)	—	R (9.0) L (6.0)			
	STS-1	L (6.0)	L (6.0)	L (6.0)			
DS3	VT1.5	—	—				
	STS-1	—	—				
DS1	VT1.5	—					

Notes:

1. “R” indicates the option is available in Ring releases.
2. “L” indicates the option is available in Linear releases.
3. The numbers in parentheses indicate the earliest software release the capability is available.
4. “R (—)” indicates not supported in ring release.
5. “L (—)” indicates not supported in linear release.
6. “—” indicates not supported in either release.

The following paragraphs describe the multiplexing and mapping capabilities provided by the system. Note that it is possible to mix the multiplexing and mapping options within an OC-3 or OC-12 signal on an STS-1 basis. For example, one STS-1 of an OC-3 or OC-12 interface may carry DS1s in a VT1.5-structured STS-1, and another may carry a DS3 signal.

DS1 to OC-1/OC-3/OC-12

The DDM-2000 OC-3 Multiplexer uses the floating VT mode, asynchronous mapping for clear channel DS1 transport. Each DS1 signal is mapped to a VT1.5 signal; four VT1.5s are byte-interleaved to form a VT-G signal; and seven VT-Gs are byte-interleaved to form a VT-structured STS-1 signal. The STS-1 signals are byte-interleaved to create STS-3 and STS-12 signals respectively.

In the opposite direction, a received OC-1, OC-3, or OC-12 is converted back to an electrical signal and, for OC-3 and OC-12, demultiplexed to STS-1 signals. Each STS-1 is demultiplexed to seven VT-Gs; each VT-G is separated into four VT1.5s; and a DS1 signal is extracted from each VT1.5.

Table 8-2 shows the default mapping of DS1s to VT1.5s in the OC-3 signal on the DDM-2000 OC-3 Multiplexer. In default mapping there is a direct relationship between physical low-speed slot and port on that slot and the VT1.5 time slot within the OC-3. For point-to-point networks, this default mapping allows straightforward network administration because a circuit entering on a slot and port on one shelf, for example a-1-1, will always exit at the same slot and port position, a-1-1, at the far-end shelf. Default mapping can be overridden using the **ent-crs-vt1** and **ent-crs-sts1** commands. See Section 11, "Commands and Reports," for more information on these commands.

With this default mapping, each DS-1 port is associated with a specific timeslot — a VT-G in an STS-1 and a specific VT1.5 in a VT-G.

All "a" location ports are associated with STS-1 number 1, "b" location ports are associated with STS-1 number 2, and "c" location ports are associated with STS-1 number 3. The mapping of a DS-1 to an OC-3 signal requires the port address being connected with a time slot in the optical line interface unit (OLIU) circuit pack. Optical time slots identify the location; STS-1 in the OC-1, OC-3, or OC-12; VT-G in the STS-1; VT1.5 in the VT-G. Some examples of time slot identifications are:

m-1-1-1, m-2-1-3
a-1-1-3, b-3-1-4

Some examples of DS1 port to OC-3 timeslot using default VT1.5 cross-connections are:

a-1-1 to m-1-1-1
b-5-3 to m-2-5-3
c-4-4 to m-3-4-4

Table 8-2. Default DS1 to VT1.5 Mapping

DS1 Port Address	VT1.5 within STS-1	VT1.5 within VT-G	VT-G within STS-1	STS-1 within OC-3
a-1-1	1	1	1	1
a-1-2	8	2	1	1
a-1-3	15	3	1	1
a-1-4	22	4	1	1
a-2-1	2	1	2	1
a-2-2	9	2	2	1
a-2-3	16	3	2	1
a-2-4	23	4	2	1
a-3-1	3	1	3	1
a-3-2	10	2	3	1
a-3-3	17	3	3	1
a-3-4	24	4	3	1
a-4-1	4	1	4	1
a-4-2	11	2	4	1
a-4-3	18	3	4	1
a-4-4	25	4	4	1
a-5-1	5	1	5	1
a-5-2	12	2	5	1
a-5-3	19	3	5	1
a-5-4	26	4	5	1
a-6-1	6	1	6	1
a-6-2	13	2	6	1
a-6-3	20	3	6	1
a-6-4	27	4	6	1
a-7-1	7	1	7	1
a-7-2	14	2	7	1
a-7-3	21	3	7	1
a-7-4	28	4	7	1
b-1-1	1	1	1	2
b-1-2	8	2	1	2
b-1-3	15	3	1	2
b-1-4	22	4	1	2
b-2-1	2	1	2	2
b-2-2	9	2	2	2
b-2-3	16	3	2	2
b-2-4	23	4	2	2
b-3-1	3	1	3	2
b-3-2	10	2	3	2
b-3-3	17	3	3	2
b-3-4	24	4	3	2
b-4-1	4	1	4	2
b-4-2	11	2	4	2

Table 8-2. Default DS1 to VT1.5 Mapping (Contd)

DS1 Port Address	VT1.5 within STS-1	VT1.5 within VT-G	VT-G within STS-1	STS-1 within OC-3
b-4-3	18	3	4	2
b-4-4	25	4	4	2
b-5-1	5	1	5	2
b-5-2	12	2	5	2
b-5-3	19	3	5	2
b-5-4	26	4	5	2
b-6-1	6	1	6	2
b-6-2	13	2	6	2
b-6-3	20	3	6	2
b-6-4	27	4	6	2
b-7-1	7	1	7	2
b-7-2	14	2	7	2
b-7-3	21	3	7	2
b-7-4	28	4	7	2
c-1-1	1	1	1	3
c-1-2	8	2	1	3
c-1-3	15	3	1	3
c-1-4	22	4	1	3
c-2-1	2	1	2	3
c-2-2	9	2	2	3
c-2-3	16	3	2	3
c-2-4	23	4	2	3
c-3-1	3	1	3	3
c-3-2	10	2	3	3
c-3-3	17	3	3	3
c-3-4	24	4	3	3
c-4-1	4	1	4	3
c-4-2	11	2	4	3
c-4-3	18	3	4	3
c-4-4	25	4	4	3
c-5-1	5	1	5	3
c-5-2	12	2	5	3
c-5-3	19	3	5	3
c-5-4	26	4	5	3
c-6-1	6	1	6	3
c-6-2	13	2	6	3
c-6-3	20	3	6	3
c-6-4	27	4	6	3
c-7-1	7	1	7	3
c-7-2	14	2	7	3
c-7-3	21	3	7	3
c-7-4	28	4	7	3

DS3 to OC-1/OC-3/OC-12

The DS3 signal maps directly to an STS-1 via the asynchronous mapping. The STS-1 signals are byte-interleaved to form an STS-3 or STS-12 signal. Finally, the STS-1, STS-3, or STS-12 is converted to an optical OC-1, OC-3, or OC-12 signal, respectively.

In the opposite direction, a received OC-1, OC-3, or OC-12 is converted back to an electrical signal and, for OC-3 and OC-12, demultiplexed to STS-1 signals. A DS3 signal is recovered directly from its STS-1.

The DS3 signal maps directly into the STS-1 payload. The DS3 location is mapped into the STS-1 in the OC-3. For example:

a to m-1
b to m-2
c to m-3
b to c-2

EC-1 to OC-1/OC-3/OC-12

The STS1E low-speed interface receives an EC-1 signal from the backplane coaxial connector which is then routed as an internal STS-1. This signal can be STS-1 or VT1.5 cross-connected to the OC-1, OC-3, or OC-12 interface. Three internal STS-1 signals are multiplexed into an STS-3 or STS-12 and converted to an optical OC-3 or OC-12 signal.

In the opposite direction, a received OC-1, OC-3, or OC-12 is converted into an electrical STS-1, STS-3, or STS-12 and demultiplexed. After either STS-1 or VT1.5 cross-connections, the resulting STS-1 internal signal is converted to an EC-1 signal by the STS1E interface. The STS1E interface can support both STS-1 and VT1.5 cross-connections. The following are examples of STS-1 cross-connections:

a to m-1
b to m-3
c to m-2

The following are examples of VT1.5 cross-connections:

a-1-1 to m-1-1-1
a-7-4 to m-1-1-2
b-1-1 to m-2-1-1

OC-1/OC-3/OC-12 to OC-1/OC-3/OC-12

From each received OC-3 signal, an STS-3 signal is recovered. The STS-3 is demultiplexed to three STS-1s, and the STS-1s are routed to other OC-3 interfaces as provisioned. Three STS-1s are multiplexed to an STS-3, converted to an OC-3, and transmitted over the fiber.

OC-3 to OC-3 cross-connections can be done at the STS-1 level or at the individual VT-1.5 (DS1 time slots) level. Example STS-1 cross-connections are:

m-1 to c-1
m-2 to c-2
m-3 to c-3

The following are some examples of VT1.5 time slot cross-connections for OC-3 to OC-3. These are representative of "pass-through" traffic in a DS1 hub network:

m-1-1-1 to c-1-1-1
m-3-1-4 to c-3-1-4
m-1-3-2 to b-1-3-2
m-2-1-1 to a-2-1-1

OC-3 to OC-1

OC-3 ring traffic is mapped into OC-1 extensions in the same way as any VT is mapped into an OLIU. The VT tributaries are assigned to one of the two STS-1s supported by the 27-type OLIUs. Two 27-type OLIUs are installed in the function unit slots for single homing applications. In dual homing applications, each of the two OC-3 shelves terminating the OC-1 ring extension is equipped with only one 27-type OLIU in a function unit slot. Each VT is mapped from the OC-3 OLIUs (for example, m-1-1-1, m-2-1-1, m-3-1-1) into the 27-type OLIUs with two STS-1s from which to choose (a-1 or a-2).

In the dual homing application, the user must map a VT from the OC-1 ring to the same VT in the OC-3 ring at each of the two host nodes. For example, if at host node #1, c-1-1-1 (OC-1 VT) is mapped to m-2-1-1 (OC-3 VT), the X-1-1-1 (X=a,b,c) OC-1 VT must also map to m-2-1-1 (OC-3 VT) at host node #2. Another consideration in deploying the dual homing configuration is that different function unit slots on the two host shelves must be used to terminate the OC-1 ring. If function unit slot X-2 (X=a,b,c) is used on host node #1, function unit slot X-1 (X=a,b,c) must be used on host node #2.

The traffic that can be mapped from all OC-1 rings terminated on 27-type OLIUs in function unit slots, to the OC-3 ring terminated on OLIUs in the main slots, is limited by the capacity of the OC-3 ring to 84 VT (DS1s). Use of the hairpin connections (described in the next section) increases the total traffic handling capacity of the shelf since the hairpin connections do not consume bandwidth on

the OC-3 ring. The total traffic handling capacity is determined by the mix of main to function unit, and function unit to function unit hairpin connections.

OC-1 to OC-1 Hairpin

Mapping between OC-1 rings homed onto 27G2-U OLIUs in function unit slots follows the normal mapping of VTs to OLIUs. The VT tributaries are assigned to specific STS-1s in the 27G2-U OLIUs. The 27G2-U OLIU has two STS-1s, and one or two 27G2-U OLIUs are installed in the function unit slots. Two OLIUs are used for single homing applications, and one OLIU is used for dual homing applications. Each VT is mapped from one 27G2-U OLIU, with two STS-1s from which to choose (for example, a-1-1-1, or a-2-1-1) to another 27G2-U OLIU. The second 27G2-U may be in the same function unit or a different function unit. If it is in the same function unit, the source and destination STS-1 numbers, which correspond to the OC-1 lines supported by the 27G2-U OLIU, must be different. If the second 27G2-U is in a different function unit, note that connections between the A and the B function units are not allowed.

The traffic handling capacity consumed by the OC-1 to OC-1 hairpin connections is independent of a shelf's main to function unit traffic handling capacity. Thus, a shelf using such connections can connect more than the previous limit of 84 VT1.5s.

The following are examples of OC-1 to OC-1 hairpin VT1.5 time slot cross-connections:

a-1-1-1 to c-1-1-1	Inter-function unit hairpin
b-2-1-1 to c-1-1-1	Inter-function unit hairpin
a-1-1-1 to a-2-1-1	Intra-function unit hairpin
b-1-1-1 to b-2-2-2	Intra-function unit hairpin

STS-1 to STS-1 Hairpin

Provides STS-1 cross-connections for STS-1 hairpin applications; allows function unit A or B to cross-connect to function unit C (cross-connections between function units A and B are not allowed). Hairpinning support is provided where one function unit slot is equipped with EC-1, IS-3, or OC-3 and the other is equipped with OC-3 or IS-3 OLIUs, STS1E, or DS3 circuit packs.

This hairpin feature keeps local STS-1 traffic from being placed on the OC-3 ring. It increases the usable bandwidth on the OC-3 ring and may remove the need to add additional OC-3 shelves.

The following are examples of STS-1 to STS-1 hairpin time slot cross-connections:

a-1 to c-2	Inter-function unit hairpin
b-2 to c-1	Inter-function unit hairpin

OC-3c to OC-3c (Optional Feature)

This application is for linear releases only and is a feature package option which must be enabled using the **set - feat** command. The shelf must be provisioned to accept OC-3c signals by setting the concatenation mode to **enabled** using the **set - oc3** command. Once enabled and provisioned, the 21G-U (or 21D-U) OLIU functions the same as other applications.

An incoming OC-3c signal from the main 21G-U OLIU interface is demultiplexed into three STS-1s. However, these STS-1s are treated in the concatenated mode. These signals are sent to the 21G OLIU interface in function unit C slots where they are multiplexed into an STS-3c and converted back to an OC-3c signal. OC-3c to OC-3c cross-connections are done at the STS-1 level. The only valid cross-connections are:

m-1 to c-1
m-2 to c-2
m-3 to c-3

DS1 to EC-1

When the DDM-2000 OC-3 shelf is used as a stand-alone EC-1 Multiplexer the default cross-connections are automatically created based on circuit pack equipage. Each DS1 signal is mapped to a VT1.5 signal, four VT1.5 signals are byte-interleaved to form a VT-G signal, and seven VT-G signals are byte-interleaved to create a VT-structured STS-1 signal. The STS-1 signal is converted to the standard electrical characteristics of EC-1. This EC-1 signal is managed by the STS1E high-speed interface.

DS3 to EC-1

A DS3 signal is mapped to an STS-1 via the asynchronous mapping. The STS-1 is mapped directly to an EC-1 signal.

EC-1 to EC-1

An EC-1 signal is converted to an STS-1 signal, which can be connected directly to another EC-1 signal. If the STS-1 is VT1.5-formatted, connections can be made between VT1.5 timeslots of the two EC-1 signals.

Provisioning

General

The DDM-2000 OC-3 Multiplexer allows the user to customize many system characteristics through its provisioning features. Provisioning parameters are set by a combination of on-board switches and software control.

Parameters likely to vary from installation to installation and parameters that will not change in service (for example, DS1 and DS3 line buildouts) are set with on-board switches. This allows installations to be performed without a CIT using default provisioning values and switch settings. Other parameters that require a wide range of options or in-service changes are set under software control. For example, performance monitoring (PM) thresholds can be customized for each installation using the CIT.

Default Provisioning

Installation provisioning is minimized with default values set in the factory. Each parameter is given a default. The defaults for software parameters are maintained in the SYSCTL circuit pack. All provisioning data is stored in nonvolatile memory to prevent data loss during power failures.

Remote Provisioning

Software control of many provisioning parameters allows remote provisioning of the DDM-2000 OC-3 Multiplexer. This feature is provided especially for parameters likely to change in service, in support of centralized operations practices.

Automatic Provisioning

Circuit Pack Replacement

Replacement of a failed circuit pack is simplified by automatic provisioning of the current circuit pack values. The SYSCTL circuit pack maintains a provisioning map of the entire shelf, so when a transmission or synchronization circuit pack is replaced, the SYSCTL circuit pack automatically downloads values to the new circuit pack. If the SYSCTL circuit pack is ever replaced, provisioning (transmission, for example) data, from every other circuit pack in the shelf is automatically uploaded to the nonvolatile memory of the new SYSCTL circuit pack.

Feature Package Provisioning

Certain software features are available only through a special licensing agreement with Lucent Technologies.

- VT PM
- DS1 PM
- OC-3c (linear releases).

These features are enabled by privileged user logins according to the licensing agreement, using the **set-feat** command and can be reviewed using the **rtrv-feat** command. These features are optional and may not be active on all systems. For details on these and other commands, refer to Section 11, "Commands and Reports."

Data Communications Channel (DCC) Provisioning

The DCC is automatically provisioned in the following manner and needs no provisioning by the user. The DCC uses the SONET overhead to communicate between NEs and follows the active SONET transmission line.

- In linear systems, there is one DCC assigned for the main slot pair and one DCC for each of the function unit slot pairs.
- In ring systems, there is one DCC assigned for the "m1" ring and another DCC for the "m2" ring. The function unit slot pairs in ring systems have one DCC each when connected to linear (1+1) OC-3 extensions.
- In OC-1 ring applications when the function unit slot pairs are equipped with 27G-U OLIUs, a DCC is assigned for each rotation of each OC-1 ring.

Port State Provisioning

Port state provisioning is a feature provided on DDM-2000 OC-3 Multiplexers that suppresses alarm reporting and PM by supporting multiple states (automatic [AUTO], in-service [IS], and not-monitored [NMON]) for low-speed ports (DS1, DS3, and EC-1).

Ports without signals (undriven) are in the AUTO state until changed to the IS state when a signal is present. The **set-state-t1**, **set-state-t3**, and **set-state-ec1** commands allow a user to change the state of a port to the NMON state or from the NMON state to the AUTO state. The **rtrv-state-eqpt**, **rtrv-t1**, **rtrv-t3**, and **rtrv-ec1** commands allow a user to retrieve current port states. The **upd** command allows a user to change the port state of all undriven ports from IS to AUTO.

Channel State Provisioning

Channel state provisioning is a feature provided on DDM-2000 OC-3 Multiplexers that suppresses reporting of alarms and events for VT1.5 and STS-1 channels during provisioning by supporting multiple states at the OC-3 and EC-1 ports (AUTO, IS, and NMON) for these channels. The **rtrv-state-eqpt**, **rtrv-t1**, **rtrv-t3**, **rtrv-ec1**, **set-state-vt1**, and **rtrv-state-vt1** commands allow a user to retrieve current channel states.

While an end-to-end circuit is being set up, particularly during VT1.5 or STS-1 cross-connection provisioning, transient maintenance signals may result. Without automatic channel state provisioning, these are reported as alarms or events. The technicians are expected to ignore these transient alarms and initiate corrective action only if the alarms persist after the provisioning is completed. To avoid the confusion created by this, DDM-2000 OC-3 Multiplexers provide automatic channel state provisioning.

A VT1.5 or STS-1 channel stays in the default AUTO state until a valid signal (a framed non-AIS or non-LOP signal) is received on that channel. While in AUTO state, no alarms or events are reported on the channel by the DDM-2000 Multiplexer. On receiving a valid signal, which occurs when the end-to-end circuit is completely provisioned, the channel automatically changes to the IS state and normal alarm and event reporting starts. An additional state, NMON, is also supported in which alarm and event reporting is suppressed regardless of the validity of the signal being received on the channel. Like the port state provisioning capability provided for DS1, DS3, and EC-1 ports, the user can use CIT or TL1 commands to manually change a channel from IS or AUTO to NMON, and from NMON to AUTO.

A direct change from NMON to IS is not allowed. See the **set-state-sts1**, **set-state-vt1**, **rtrv-state-sts1**, **rtrv-state-vt1** and **upd** commands.

Line State Provisioning

For OC-3 Release 9.0 and later ring releases, OC-1 interfaces can be set manually to NMON or IS.

AIS or Unequipped Provisioning

In DDM-2000 OC-3 before Release 8.0, if a DS1, DS3, or MXRVO circuit pack, or a cross-connection was inadvertently removed, the system sent a "path AIS" signal. Beginning with OC-3 Release 8.0, the DDM-2000 OC-3 shelf can be optioned to send an "STS/VT-path unequipped" signal instead.

Open Systems Interconnection (OSI) Provisioning

DDM-2000 OC-3 support OSI interworking between DDM-2000 OC-3 and OC-12 Multiplexers. In a given subnetwork, the NEs on each side of an optical span must have their "user-side/network-side" (OSI terminology) parameters provisioned to opposite values.

Local procedures should determine the "user" and "network" side of a span. For example, the CO terminal can be designated the network side and the RT site the user side. It does not matter as long as the two sides are opposite values. See the TOP section of this manual (Volume II) for OSI provisioning procedures.

The network service access point (NSAP) is a multiple part address that uniquely identifies a NE for OSI interworking purposes. A unique NSAP is programmed into the SYSCTL circuit pack at the factory. This default NSAP value is adequate to operate current networks. NSAP provisioning, using the **ent -ulsdcc** command, will be used as part of future upgrade procedures. See the **ent -ulsdcc** command in Section 11, "Commands and Reports" for more information on NSAP provisioning.

When a NE is removed from a subnetwork, either by physically removing it or disabling the SONET DCC, the **dlt -tadrmap** command should be used to remove the NE from the subnetwork database so alarms can be cleared. See "Operations Interworking Provisioning" for more OSI related provisioning.

Operations Interworking Provisioning

Operations interworking provides the capability to access, operate, administer, maintain, and provision remote Lucent SONET subnetwork NEs from any NE in a SONET subnetwork or from a centralized OS.

Operations interworking is available among systems that are connected through the SONET DCC. Lucent systems that support operations interworking include FT-2000 OC-48 Lightwave System, DDM-2000 OC-3 and OC-12 Multiplexers, DDM-2000 FiberReach Multiplexer, and the *SLC*[®]-2000 Access System. Table 8-3 lists the current releases for Lucent SONET products that offer operations interworking through the DCC:

Table 8-3. SONET Networking Software Compatibility

Release	OC-3							OC-12		
	7.2	8.0	8.1	9.0	9.1	11.0	11.1	5.0	5.1	5.2
OC-3, R7.2	X	X	X	X	X	X	X	X	X	X
OC-3, R8.0	X	X		X	X	X	X	X	X	X
OC-3, R8.1	X		X	X	X	X	X	X	X	X
OC-3, R9.0	X	X	X	X				X		
OC-3, R9.1	X	X	X		X			X	X	X
OC-3, R11.0	X	X	X			X			X	X
OC-3, R11.1	X	X	X				X		X	X
OC-12, R5.0	X	X	X	X	X			X		
OC-12, R5.1	X	X	X		X	X	X		X	X
OC-12, R5.2	X	X	X		X	X	X			X
FiberReach, R2.1*	X*	X*	X*	X	X	X	X	X*	X*	X*
FiberReach, R2.2	X*	X*	X*		X	X	X	X*	X*	X*
<i>SLC</i> -2000, R3.3	X	X	X	X	X	X	X	X	X	X
<i>SLC</i> -2000, R4.2	X			X				X		
<i>SLC</i> -2000, R4.4	X	X	X		X	X	X		X	X
FT-2000, R6.0 §	X	X		X				X		
FT-2000, R7.0	X	X	X	X	X			X	X	X
FT-2000, R7.1	X	X	X		X	X	X		X	X
FT-2000, R7.2	X	X	X		X	X	X		X	X

* FiberReach requires an OC-3 Release 9.0 or later host;
Releases 7.2, 8.0 and 8.1 can not host FiberReach.

FiberReach Releases 1.0/2.0 replaced by Release 2.1.

Single-Ended Operations

The DDM-2000 single-ended operations and maintenance philosophy is supported in subnetworks with mixed Lucent 2000 Product Family systems over the DCC. With this feature, users can do OAM&P on a centralized basis, saving travel time and money. Both the CIT and operations interfaces can access the NEs.

Single-ended operations (operations interworking) features include the following:

- Centralized survivable OS access (OS gateway network element [OSGNE])
- Remote login (remote technician access)
- Remote office alarms and user panel
- Remote software download and copy
- Directory services network element (DSNE)
- See also 824-102-147, *2000 Product Family Operations Interworking Guide*.

Centralized Survivable OS Access (OSGNE)

A DDM-2000 subnetwork may have one or more NEs serving as GNEs. An NE is automatically provisioned as an OSGNE upon establishing an X.25 link to its X.25 interface. For example, two NEs could each be connected via their X.25/TL1 interface to the same type of OS with one OSGNE serving as a backup for the other. For more details on engineering a Telecommunications Management Network (TMN) with multiple GNEs, see 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

The OS can use more than one NE as an OSGNE to provide redundancy and/or to distribute TL1 message volume across multiple X.25 links. The OSGNE serves as a single interface to the OS for the NEs in the same Lucent 2000 Product Family subnetwork, using X.25 interfaces. The OSGNE receives operations information from all the NEs through the DCC and reports this information, as well as its own information, to the OS. The operations information is in the form of TL1 messages. Through the OSGNE, the OS can send TL1 commands to any NE in the SONET subnetwork.

Remote Login

Each DDM-2000 Multiplexer terminal can remotely log into other DDM-2000 NEs in the same SONET subnetwork. Operations interworking also allows remote logins between DDM-2000 and the *SLC*-2000 Access System and from the FT-2000 OC-48 Lightwave System to other Lucent 2000 Product Family systems in the same subnetwork. simultaneous

Remote Office Alarms and User Panel

Through the SONET DCC, a NE can receive alarm and status information from remote Lucent 2000 Product Family NEs that are in the same SONET subnetwork. Office alarms and user panel LEDs can also be remotely activated through the DCC. The set of remote NEs that an NE can exchange status information with is determined by the value of the local alarm group parameter. This parameter is provisioned at each local NE and specifies whether that local NE does or does not exchange remote NE status with other NEs in the same SONET subnetwork. Members of an alarm group exchange information through one or more alarm gateway NEs (AGNEs) that are defined in the same alarm group. The AGNE(s) and remote NEs use the DCC to receive and report alarm and status information from and to all NEs in the same alarm group. The AGNE rebroadcasts all alarm and status information from one NE to all the other NEs in the same alarm group. This information is used to activate user panel LEDs and office alarms for each NE in the alarm group. At least one NE in each alarm group must be provisioned as the AGNE.

Remote Software Download and Copy

The DDM-2000 OC-3 and OC-12 Multiplexers can upgrade the system software while in-service. DDM-2000 OC-3 and OC-12 Multiplexers use flash erasable programmable read-only memory (flash EPROM) chips to provide this capability. Software can be downloaded locally using a PC through the EIA-232-D interface on the user panel or remotely over the SONET DCC. Software can be downloaded from a PC to a remote NE even when the local shelf is a different member of the DDM-2000 product family or *SLC*-2000 from the remote shelf (for example, a DDM-2000 OC-12 at the CO and a DDM-2000 FiberReach at the RT site).

Beginning with the upgrade from Release 9.1 to 11.0, an enhanced software download feature allows the source NE to download compressed copies of the new generic to all the other nodes in the network. This software will remain inactive until the new “**apply**” command is issued to overwrite the current software at each node. This feature allows wide flexibility in scheduling upgrades.

Directory Services Network Element (DSNE)

Lucent's 2000 Product Family supports OSI 7-layer protocol stack architecture over the SONET DCC. This architecture requires network layer-3 names called network service access points (NSAPs) for addressing NEs while users at remote OSs and at NE CITs use application layer-7 names called target identifiers (TIDs). The NE in each Lucent 2000 Product Family subnetwork that translates between NSAPs and TIDs is called the DSNE.

Any NE in a SONET subnetwork can act as a DSNE except DDM-2000 FiberReach. Only one NE can be provisioned to be the DSNE at one time, in any subnetwork. Lucent 2000 Product Family NEs added to a subnetwork are automatically registered by the DSNE and have access to all interworking features.

Alarm Groups

When network sizes were smaller, every NE broadcasted its network status to all other NEs. This status information included:

- Alarm/status level
- User panel condition
- ACO status
- TBOS status
- Parallel telemetry status
- Miscellaneous discrete information.

An alarm group is a set of NEs that share status information among themselves. Alarm groups can be nodes in a ring, nodes of a linear extension, nodes of an OC-12 service, or any other logical grouping, such as a maintenance group or geographical group. In DDM-2000, all NEs are defaulted into an alarm group (number 255). Users provision NEs into alarm groups, 1-255, by assigning each member an alarm group number to support operations interworking, large networks, and to avoid sending unnecessary information to every NE. For example, 24 NEs could be provisioned into three alarm groups each with eight NEs that share a community of interest.

All members of the same alarm group share NE status information but do not share information with other alarm groups.

Depending on provisioning, a member of an alarm group can:

- Know the alarm/status of all members of the same alarm group; and if the NE is at the CO, activate audible office alarms for the alarm group.
- List a report of the alarm or status condition of other NEs in the group.
- Display composites of other members' user panel information. If the site identification of a remote NE is from 1 to 8, display the user panel status at the site instead of a composite display. As a feature, the same site/NE identification can appear more than once in a subnetwork as long as it is in different alarm groups. This supports creating large networks by interconnecting several small subnetworks without having to change the site/NE identification.
- Relay other members' parallel telemetry alarm/status closure states to the OS.
- Send and receive miscellaneous discrete alarm/status closure states to and from alarm group members at a CO.
- Send and receive ACO requests to and from members of the same alarm group with the same site number. This supports the ability for a user to activate ACO for a group of NEs having the same site number and subnetwork connectivity to another member NE in the group.

By default, all NEs belong to alarm group number "255" and, if not changed, NE status is sent to all NEs in the network. The maximum alarm group size is equal to the maximum subnetwork size. NEs at the CO can perform CO alarm activation functions.

Alarm Gateway Network Element (AGNE)

One NE in an alarm group must be provisioned as an AGNE. The AGNE broadcasts NE status information to members of its alarm group. Considerations for choosing an NE as an AGNE include being central to the group to minimize communications links and being easily accessible for maintenance purposes. A backup AGNE can be provisioned and "shadow" the primary AGNE by sending duplicate status reports to members of the group. Additional AGNEs can be provisioned for redundancy, but it is recommended that at most two AGNEs be provisioned per alarm group to avoid DCC communications congestion.

For subnetworks having more than 16 NEs, the AGNE and GNE should be separate NEs. The AGNE is a "collection point" and does not have to be an NE in a CO, for example.

Operations Interworking Guidelines

In a mixed network, each NE counts as one. Larger networks may be supported for particular applications or with new software releases should subnetwork growth be a concern. Also, there is no limitation on the size of the networks formed by partitioning a large network into a number of smaller subnetworks by disabling the DCC on the appropriate OC-N interfaces. Software upgrades and DCC partitioning can be done in-service without affecting traffic. If larger subnetworks are needed, contact your Lucent Technologies' account manager.

Table 8-4 summarizes the network size guidelines:

Table 8-4. OC-3 Multiplexer — Maximum Number of NEs in a Subnetwork

Releases	Ring	Linear	Ring	Linear	Ring	Ring	Ring
	R7.2	R8.0	R9.0	R8.1	R9.1	R11.0	R11.1
Number of NEs *	24	32	32	32	50	50	50

* The NE release that supports the smallest number of NEs determines the maximum subnetwork size. Subnetworks that include FT-2000 OC-48 Lightwave Systems or earlier releases of DDM-2000 OC-12 or FiberReach WBS may be limited further. Refer to the User/Service Manual for the specific products or 824-102-147, *Lucent 2000 Product Family Operations Interworking Guide*, for more information on operations interworking.

- Range of values for Alarm Group number — 1 to 255
- Maximum number of NEs per Alarm Group — 50
- Maximum number of Directory Services NE per subnetwork — 1
- Maximum number of incoming TL1 logins per RNE — 8
- Maximum number of outgoing TL1 logins per GNE — 105.

Cross-Connection Provisioning

The DDM-2000 OC-3 Multiplexer can be provisioned for cross-connect routing of signals. In some applications, such as linear add/drop, drop, or hubbing, STS-1 or VT1.5 signal cross-connections may be established to route traffic in a specific manner. All cross-connections are bidirectional. Any STS-1 or VT1.5 signal may be cross-connected to a like signal with an available time slot, with some restrictions. Any STS-1 or VT1.5 signal between the main slot and any function unit slot may be cross-connected. Also, any single STS-1 or any VT1.5 channel in function units A or B may be cross-connected to any available time slots in function unit C when function unit C is equipped with OLIUs.

In ring applications, STS-1 and VT1.5 signals may be cross-connected in several ways. For bidirectional drop services, the normal (default) "two-way" cross-connection is used to connect a like signal in the high-speed main slot to any available time slot in any function unit equipped with low-speed STS1E, DS3, or DS1 circuit packs. For bidirectional hub applications at a ring node, the normal (default) "two-way" cross-connection is used to connect a like signal in the high-speed main slot to any available time slot in either the A, B, or C function unit, which has been equipped with OLIU circuit packs. The bidirectional pass-through service is used to connect the high-speed signal from one side of the ring to the other side. Both rings are connected using a single "two-way" (**ent-crs**) command. The high-speed time slot entering must be the same leaving in pass-through connections.

The "drop and continue" service provides, in a single command (**ent-crs**), the proper bidirectional cross-connection to "drop" a copy of the high-speed signal in the main slot to any available time slot in any function unit and to "continue" the signal on the high-speed channel to the next node. The same command also properly drops the signal from the opposite ring direction.

The DDM-2000 OC-3 Multiplexer has two cross-connect modes of operation, default and manual. On linear systems, this mode is "default" and can be provisioned to "manual." On ring systems, this mode is "manual" and cannot be changed. The cross-connect mode may be changed using the **set-ne** command and selecting the required **crs** mode. The cross-connect mode may be verified with the **rtrv-ne** command. Any cross-connect command may be implemented at each individual site in a network through the CIT connection or at any site via a remote login session from any other site.

Cross-Connection Types

DDM-2000 OC-3 Multiplexers have time slot interchange (TSI) features. This offers users flexibility in directing traffic in and out of these systems to support a wide variety and range of customer applications.

Cross-connections in DDM-2000 OC-3 Multiplexers are made by specifying the SONET rate (VT1.5 and STS-1), the end point addresses (access identifiers), the cross-connection type (two-way, drop and continue, etc.), and, in some cases, the ring direction (ring=m1, ring=m2, etc.). In DDM-2000 OC-3 Multiplexers, each single cross-connection command establishes a two-way cross-connection.

The basic type of cross-connection allows a low-speed port or channel to be cross-connected to a channel in the high-speed interface portion of the shelf. This is used in all linear add/drop applications where DS1, DS3, VT1.5, STS-1, and EC-1 low-speed signals are cross-connected to VT1.5 and STS-1 channels in the high-speed linear interfaces.

The next type of cross-connection allows a low-speed port or channel to be cross-connected to a channel in the high-speed ring interface. This is used in all path switched ring applications where DS1, DS3, VT1.5, STS-1, and EC-1 low-speed signals are cross-connected to VT1.5 or STS-1 channels in both rotations of the rings terminating on the high-speed interfaces. With this cross-connection, all added signals are bridged on to both rotations of the ring, and the better of the two signals received from the two rotations of the ring is dropped.

Another type of cross-connection allows a VT1.5 or STS-1 channel to be "passed-through" between two high-speed ring interfaces or between two OC-1 ring interfaces supported by 27G2-U OLIUs in function units. This is used in all path switched ring applications at nodes where traffic is not dropped. In path switched rings, pass-through grooming (passing a signal on a ring time slot that is different from the ring time slot on which it was received) is not supported.

End-to-end survivable service facilities need to cross multiple rings interconnected at multiple wire centers. To support these applications, a drop-and-continue cross-connection is provided for a signal from a high-speed channel to be dropped to a specified low-speed port or channel and continued on to the next node in the same direction while also adding a corresponding signal from the low-speed port or channel to the high-speed channel in the other rotation of the ring.

A variation of ring cross-connections, the "locked cross-connection," is supported at the VT1.5 level to lock the path selector to a specified rotation of the ring. With this cross-connection, a DS1 or VT1.5 signal from the low-speed interface is cross-connected to the specified VT1.5 channel in the high-speed interface in the specified direction; and any signal received in the same VT1.5 channel from the other ring rotation is ignored.

Locked cross-connections are a ring-to-non-ring type of cross-connection between a ring interface and a non-ring interface in which no path protection switching is provided (see Figure 8-1).

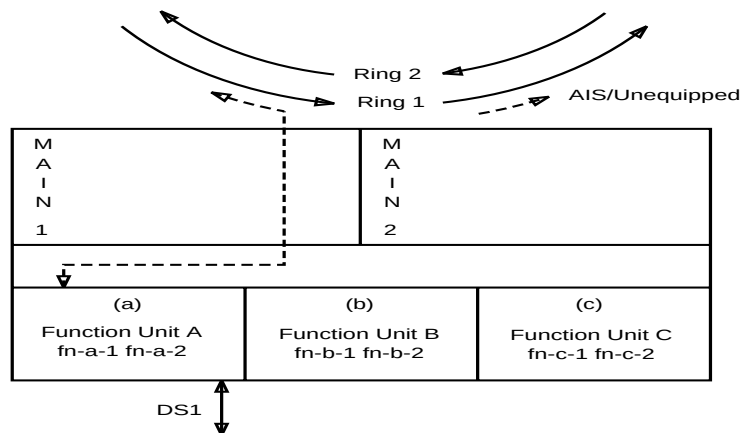


Figure 8-1. Locked Cross-Connection

A locked cross-connection configuration has the following characteristics:

- The signal received on a specified channel, for example, m-1-1-1 of the ring interface m1 from ring 1 in one direction around the ring is transmitted on a non-ring (DS1) interface.
- The signal received on the other ring interface (m2), using the other direction around the ring (ring 2), on the same channel (m-1-1-1) is ignored.
- A signal is transmitted from a non-ring interface (DS1 interface) through the specified channel (m-1-1-1) on ring 2 using ring interface m1.
- The provisioned AIS or unequipped signal is transmitted on the other direction around the ring (ring 1) using ring interface (m2). This signal will not cause any alarms at pass-through nodes and will only cause alarms at terminating nodes if cross-connections are provisioned.

"Hairpin" cross-connections allow local drop of signals, ring extensions supported by a ring host node, and allow passing traffic between two ring interfaces on a single host node. In this case, no high-speed channel is involved and the cross-connections are entirely within the interfaces in the function units.

In DDM-2000 OC-3 Release 9.0, VT1.5 signals from function units A or B can be cross-connected to VT1.5 signals in function unit C. The VT1.5 signals can be in any MXRVO, STS1E, or 22-type OLIU, with the exception that MXRVO-to-MXRVO hairpins are not allowed. Beginning in Release 9.1, VT1.5 and STS-1 signals terminating on 27G2-U OC-1 OLIUs in function units may be hairpin connected. The available interfaces are:

- DS1 to EC-1/OC-3
- EC-1 to OC-3
- EC-1 to EC-1
- OC-3 to OC-3
- OC-1 to OC-1
- STS-1 to STS-1

Table 8-5 lists the number of available VT1.5 cross-connections including hairpin cross-connections:

Table 8-5. DDM-2000 OC-3 Available VT1.5 Cross-Connections, Including Hairpin

Slot	Main	Fn-A	Fn-B	Fn-C
Main	84	56	56	84
Fn-A	56	0	0	56*
Fn-B	56	0	0	56*
Fn-C	84	56*	56*	0

* Hairpin cross-connections.

Table 8-6 lists the number of available STS-1 cross-connections including hairpin cross-connections:

Table 8-6. DDM-2000 OC-3 Available STS-1 Cross-Connections, Including Hairpin

Slot	Main	Fn-A	Fn-B	Fn-C
Main	3/12 *	2	2	3
Fn-A	2	0	0	2
Fn-B	2	0	0	2
Fn-C	3	2	2	0

* Any three of 12 when using a 24G-U OLIU.

Linear Application Default Cross-Connection Mode

In the default cross-connection mode, STS-1 cross-connections are automatically set up. The default cross-connections are determined according to the circuit pack equipage of the DDM-2000 OC-3 Multiplexer. No VT1.5 cross-connections are made in the default mode. If slots are unequipped, then no cross-connection is made.

For some applications, such as a point-to-point configuration, the default mode may provide all the necessary cross-connections required.

DDM-2000 linear systems support a fixed mapping between STS-1 signals embedded in the OC-3 line signal and the STS-1s associated with signals dropped on the shelf. This "default" STS-1 signal mapping is shown in Table 8-7. When the **crs** parameter is "default," attempts to enter or delete cross-connections are denied. When the value of the **crs** parameter is "manual," cross-connections are not created or deleted automatically. Even if a circuit pack is inserted into an empty slot, the system waits for the user to provision the cross-connection before the port is put into service. Likewise, a circuit pack (CP) cannot be removed until the cross-connection to the circuit pack is deleted.

Table 8-7. DDM-2000 OC-3 Default STS-1 Cross-Connections (Termination)

From		To	"To" CP Type (Note)	CIT Command
m-1	<-->	a	MXRVO, STS1E, DS3	-not required-
m-2	<-->	b	MXRVO, STS1E, DS3	-not required-
m-3	<-->	c	MXRVO, STS1E, DS3	-not required-
m-1	<-->	a-1	OLIU	-not required-
m-2	<-->	b-2	OLIU	-not required-
m-3	<-->	c-3	OLIU	-not required-

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Manual Cross-Connections

If the default cross-connections do not provide the necessary connections, then a manual cross-connection mode may be selected by entering the **set-ne** command and changing the **crs** parameter to manual. In the manual cross-connections mode, the cross-connections can be changed using the following commands:

- **ent-crs-sts1** (Enter Cross-Connection STS-1)—This command creates STS-1 signal cross-connections.
- **dlt-crs-sts1** (Delete Cross-Connection STS-1)—This command deletes STS-1 signal cross-connections.
- **ent-crs-vt1** (Enter Cross-Connection VT1.5)—This command creates VT1.5 signal cross-connections. The 22-type OLIU circuit packs must be used to establish VT1.5 cross-connections.
- **dlt-crs-vt1** (Delete Cross-Connection VT1.5)—This command deletes VT1.5 signal cross-connections.
- **cnvt-crs** (Convert Cross-Connection)—This command converts an existing STS-1 cross-connection to 28 individual VT1.5 cross-connections with the same endpoints as the STS-1 cross-connection. VT1.5 signals carried within the original STS-1 appear in the same time slots in the upstream or downstream DDM-2000 OC-3 before and after the conversion takes place. 22-type OLIU circuit packs must be used to convert cross-connections.

The **cnvt-crs** command has the unique ability to convert an existing STS-1 signal into its component 28 VT1.5 signals. This conversion enables an easy upgrade of existing STS-1 drop networks to DS1 add/drop networks. No inverse capability is available to convert 28 VT1.5 signals back to a single STS-1 cross-connection.

DDM-2000 OC-3 systems provide flexible routing of STS-1 and VT1.5 signals between high-speed and function unit interfaces for ring, hubbing, and add/drop applications. These "manual" cross-connections are entered using the CIT and are shown in Table 8-11 through Table 8-24. The **crs** parameter must be set to "manual" to enter flexible STS-1 and VT1.5 cross-connections.

Allowable Cross-Connects

Table 8-8 through Table 8-10 list main and function unit circuit packs and their allowed cross-connect functionality. It also lists the earliest software release the cross-connect was available.

The following list defines the cross-connect types listed in Table 8-8 through Table 8-10.

- **Two-Way:** A two-way cross-connection between two non-ring interfaces is a bidirectional cross-connection between two ports, two channels, or one port and one channel. This type of cross-connection can be used in both “linear” and “ring” generics; when used in a “ring” generic, it is sometimes referred to as a “hairpin” cross-connection.
- **Add/Drop:** A two-way cross-connection add/drop to/from a ring interface is a bidirectional cross-connection between a channel on a path-protection switched ring and a port or channel on a non-ring interface.
- **Dual 0x1:** A two-way dual 0x1 cross-connection between two ring interfaces is a bidirectional cross-connection between channels on each of two different ring interfaces (no path switching). This type of cross-connection is used in “single homing” network configurations.
- **Intra-FN Dual 0x1:** A two-way intra-FN dual 0x1 cross-connection between two ring interfaces is a bidirectional cross-connection between channels on the two different ring interfaces supported by a pair of dual-port OLIUs in the same function unit (no path switching). This type of cross-connection is used in “single homing” network configurations.
- **Dual 0x1 NR:** A two-way dual 0x1 cross-connection between a ring interface and a non-ring interface is a bidirectional cross-connection between a channel on a ring interface and a port on a non-ring interface (no path switching). Also referred to as “Locked DS3.” This type of cross-connection is used in “single homing” network configurations.
- **Pass-Through:** A two-way pass-through cross-connection on a ring interface is a bidirectional cross-connection on a single ring interface.
- **Single 0x1:** A two-way single 0x1 ring to ring cross-connection is a bidirectional cross-connection between channels on each of two different ring interfaces. This type of cross-connection is used in “dual homing” network configurations (no path switching).
- **Intra-FN Single 0x1:** A two-way intra-FN single 0x1 ring to ring cross-connection is a bidirectional cross-connection between channels on the two different ring interfaces supported by a pair of dual-port OLIUs in the same function unit. This type of cross-connection is used in “dual homing” network configurations (no path switching).
- **Single 0x1 NR:** A two-way single 0x1 cross-connection between a ring interface and a non-ring interface is a bidirectional cross-connection between a channel on a ring interface and a port on a non-ring interface. Also referred to as “Locked DS3.” This type of cross-connection is used in “dual homing” network configurations (no path switching).

- **Drop/Continue:** A drop and continue cross-connection is a bidirectional cross-connect between a ring and an non-ring interface which also continues on the ring.
- **Unprotected Video Broadcast:** An unprotected video broadcast source cross-connection on a ring interface is an asymmetric bidirectional cross-connection from a broadcast source onto an OC-N ring.
- **Locked VT:** A ring (0x1) VT locked cross-connection between low-speed and high-speed time slots, locking ring traffic onto a designated ring rotation.

Table 8-8. DDM-2000 OC-3 Ring Cross-Connect Types Allowable (Main to Main)

From MAIN		To MAIN		
Circuit Pack	Cross Connect Type	22-type	24G-U	27-type
22-type	Pass-Through STS	5.1		
	Pass-Through VT	5.0		
	Drop/Continue STS	7.0		
	Drop/Continue VT	7.0*		
24G-U	Pass-Through STS		11.0	
	Pass-Through STS-3C		11.0	
	Pass-Through VT		11.0	
	Drop/Continue STS		11.0	
	Drop/Continue VT		11.0	
27-type	Pass-Through STS			9.0
	Pass-Through VT			9.0
	Drop/Continue STS			9.0
	Drop/Continue VT			9.0*

* All VT1.5 drop and continue cross-connections in a system must be in the same direction, i.e. from the same ring (m1 or m2).

Table 8-9. DDM-2000 OC-3 Ring Cross-Connect Types Allowable (Main to Function Unit)

From MAIN		To FUNCTION UNIT							
Circuit Pack	Cross-Connect Type	22-type*	26G2-U	27G-U	27G2-U	DS3	STS1E†	MXRVO	TMUX
22-type	Add/Drop STS	7.0‡ 9.0§				5.1 ¶	5.1	5.1	11.1
	Add/Drop VT	7.0‡ 9.0§					5.1	5.0	11.1
	Dual 0x1 STS		11.1 §§	9.0	9.0 ¶¶				
	Dual 0x1 VT		11.1 §§	9.0	9.0 ¶¶				
	Dual 0x1 NR STS (Locked DS3)					11.0 **			
	Single 0x1 STS		11.1 ‡‡§§	9.0 ‡‡	9.0 ‡‡¶¶				
	Single 0x1 VT		11.1 ‡‡§§	9.0 ‡‡	9.0 ‡‡¶¶				
	Single 0x1 NR STS (Locked DS3)					11.0 **			
	Drop/Continue STS	7.2					7.0		
	Drop/Continue VT	7.2 ‡‡					7.0 ‡‡		
	Locked VT							9.0	11.1
27-type	Add/Drop STS	9.0				9.0 ¶	9.0	9.0	11.1
	Add/Drop VT	9.0					9.0	9.0	11.1
	Dual 0x1 STS		11.1	9.0	9.0				
	Dual 0x1 VT		11.1	9.0	9.0				
	Dual 0x1 NR STS					11.0 **			
	Single 0x1 STS		11.1 ‡‡	9.0 ‡‡	9.0 ‡‡				
	Single 0x1 VT		11.1 ‡‡	9.0 ‡‡	9.0 ‡‡				
	Single 0x1 NR STS					11.0 **			
	Drop/Continue STS	9.0				9.0 ¶	9.0		

From MAIN		To FUNCTION UNIT							
Circuit Pack	Cross-Connect Type	22-type*	26G2-U	27G-U	27G2-U	DS3	STS1E†	MXRVO	TMUX
27-type (cont'd)	Drop/Continue VT	9.0 ‡‡					9.0 ‡‡		
	Locked VT							9.0	11.1
24-type	Add/Drop STS	11.0				11.0	11.0	11.0	11.1
	Add/Drop VT	11.0					11.0	11.0	11.1
	Dual 0x1 STS		11.1 §§	11.0	11.0 ¶¶				
	Dual 0x1 VT		11.1 §§	11.0	11.0 ¶¶				
	Dual 0x1 NR STS					11.0 **			
	Single 0x1 STS		11.1 §§	11.0	11.0 ¶¶				
	Single 0x1 VT		11.1 §§	11.0	11.0 ¶¶				
	Single 0x1 NR STS					11.0 **			
	Drop/Continue STS	11.0					11.0		
	Drop/Continue VT	11.0					11.0		
	Locked VT							11.0	11.1

- * A 22-type OLIU in a function unit is in "linear" (unprotected or 1+1 line protected), not a ring configuration.
- † This table refers to only "low-speed" STS-1 interfaces.
- ‡ Only FN-B and/or FN-C can be equipped with 22-type OLIUs in this release.
- § FN-A, FN-B and/or FN-C can be equipped with 22-type OLIUs in this release.
- ¶ This entry valid for DS3 circuit packs except the BBG19 front-access pack.
- ** This entry valid for the BBG19 front-access DS3 circuit pack.
- ‡‡ One of the pair of function unit slots will be empty.
- ‡‡ All VT1.5 drop and continue cross-connections in a system must be in the same direction, i.e. from the same ring (m1 or m2).
- §§ The mixing of 0x1, Pass-Through, and local Add/Drop cross-connects is supported beginning with R11.1.
- ¶¶ The mixing of 0x1, Pass-Through, and local Add/Drop cross-connects is supported beginning with R11.0.

Table 8-10. DDM-2000 OC-3 Ring Cross-Connect Types Allowable (Function Unit to Function Unit)

From FUNCTION UNIT		To FUNCTION UNIT						
Circuit Pack	Cross-Connect Type	22-type *	26G2-U	27G2-U	DS3	STS1E†	MXRVO	TMUX
22-type	Two-Way STS	11.1			11.1	11.1		
	Two-Way VT	9.0				9.0	9.0	11.1
	Add/Drop STS		11.1	11.0				
	Add/Drop VT		11.1	11.0				
26G2-U	Add/Drop STS	11.1 ‡‡				11.1	11.1 §‡‡	11.1
	Add/Drop VT	11.1 ‡‡	11.1 ‡,‡‡			11.1	11.1 §‡‡	11.1
	Dual 0x1 STS		11.1 ¶‡‡	11.1 ¶‡‡				
	Dual 0x1 VT		11.1 ¶‡‡	11.1 ¶‡‡				
	Pass-Through STS		11.1 ‡‡					
	Pass-Through VT		11.1 ‡‡					
	Single 0x1 STS		11.1 ¶***‡‡	11.1 ¶***‡‡				
	Single 0x1 VT		11.1 ¶***‡‡	11.1 ¶***‡‡				
27G2-U	Add/Drop STS	11.0 §§				11.0	11.0 §§	11.1
	Add/Drop VT	11.0 §§				11.0	11.0 §§	11.1
	Dual 0x1 STS		11.1 ¶§§	9.1 ¶§§				
	Dual 0x1 VT		11.1 ¶§§	9.1 ¶§§				
	Intra-FN Dual 0x1 VT			9.1 ‡‡				
	Pass-Through STS			9.1 §§				
	Pass-Through VT			9.1 §§				

From FUNCTION UNIT		To FUNCTION UNIT						
Circuit Pack	Cross-Connect Type	22-type*	26G2-U	27G2-U	DS3	STS1E†	MXRVO	TMUX
27G2-U (cont'd)	Single 0x1 STS		11.1 ¶**§§	9.1 ¶**§§				
	Single 0x1 VT		11.1 ¶**§§	9.1 ¶**§§				
	Intra-FN Single 0x1 VT			9.1 ††**				
STS1E	Two-Way VT	9.0				9.0	9.0	11.1
	Two-Way STS	11.1			11.1	11.1		
	Add/Drop STS		11.1	11.0				
	Add/Drop VT		11.1	11.0				
MXRVO	Two-Way VT	9.0				9.0		
	Add/Drop STS		11.1 §‡‡	11.0 §§				
	Add/Drop VT		11.1 §‡‡	11.0 §§				
TMUX	Two-Way VT	11.1				11.1		
	Add/Drop STS		11.1 §	11.1				
	Add/Drop VT		11.1 §	11.1				

* A 22-type OLIU in a function unit is in "linear" (unprotected or 1+1 line protected), not a ring configuration.

† This table refers to only "low-speed" STS-1 interfaces.

‡ This entry represents the hairpin local drop cross-connection between a channel on an OC-1 ring terminating on a pair of 26G2-U OLIUs and a DS1 port in the low-speed group associated with the 26G2-U OLIUs. The MXRVO functionality on the 26G2-U OLIUs is used. Note that it is NOT possible to connect between a channel on an OC-1 ring terminating on a pair of 26G2-U OLIUs and a 26G2-U/DS1 combination in a different function unit.

§ MXRVO functionality within the 26G2-U OLIU is NOT used. Rather, a separate pair of MXRVOS in a different FN group are used.

¶ Cross-connections from one OC-1 ring to a different OC-1 ring in a different function unit.

** One of the pair of function unit slots will be empty.

†† Cross-connections from one OC-1 ring to a different OC-1 ring in the same function unit.

‡‡ The mixing of 0x1, Pass-Through, and local Add/Drop cross-connects is supported beginning with R11.1.

§§ The mixing of 0x1, Pass-Through, and local Add/Drop cross-connects is supported beginning with R11.0.

Table 8-11 through Table 8-24 lists the various types of cross-connections supported. After the tables are descriptions of applications and the types of cross-connections each application requires.

Table 8-11. Linear or Ring Manual STS-1 Cross-Connections (Termination/Drop)

From *		To	"To" CP Type (Note)	CIT Command
m-{1-3}	<-->	a	MXRVO, STS1E, DS3, TMUX	ent-crs-sts1:m-1,a
m-{1-3}	<-->	b	MXRVO, STS1E, DS3, TMUX	ent-crs-sts1:m-2,b
m-{1-3}	<-->	c	MXRVO, STS1E, DS3, TMUX	ent-crs-sts1:m-3,c
m-{1,2}†	<-->	a	MXRVO, STS1E, DS3, TMUX	ent-crs-sts1:m-1,a
m-{1,2}†	<-->	b	MXRVO, STS1E, DS3, TMUX	ent-crs-sts1:m-2,b
m-{1,2}†	<-->	c	MXRVO, STS1E, DS3, TMUX	ent-crs-sts1:m-3,c

Notes:

The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12.
Example: m-{1-12}.

† Ring cross-connection; 27-type OLIU in main.

Table 8-12. Linear or Ring Manual STS-1 Cross-Connections (Hub/Drop)

From *		To	"To" CP Type	CIT Command
m-{1-3}	<-->	a-{1,2}	OLIU	ent-crs-sts1:m-1,a-1
m-{1-3}	<-->	b-{1,2}	OLIU	ent-crs-sts1:m-2,b-2
m-{1-3}	<-->	c-{1,3}	OLIU	ent-crs-sts1:m-3,c-3
m-{1,2}†	<-->	{a,b}-{1-2}	22-type OLIU	ent-crs-sts1:m-1,a-1
m-{1,2}†	<-->	{c}-{1-3}	22-type OLIU	ent-crs-sts1:m-1,a-1

Notes:

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12.
Example: m-{1-12}.

† Ring cross-connection; 27-type OLIU in main.

Table 8-13. Linear Manual STS-1 Cross-Connections (Add)

From		To	"From" CP Type (Note)	CIT Command
a	<-->	c-{1,3}	MXRVO, STS1E, DS3	ent-crs-sts1:a,c-1
b	<-->	c-{1,3}	MXRVO, STS1E, DS3	ent-crs-sts1:b,c-3
a-{1,2}	<-->	c-{1,3}	OLIU	ent-crs-sts1:a-1,c-1
b-{1,2}	<-->	c-{1,3}	OLIU	ent-crs-sts1:b-1,c-1

Note:

The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Table 8-14. Ring Manual STS-1 Cross-Connections (Pass-Through)

From *		To	"To" CP Type (Note)	CIT Command
m-1	<-->	m-1	OLIU	ent-crs-sts1:m-1,m-1
m-2	<-->	m-2	OLIU	ent-crs-sts1:m-2,m-2
m-3	<-->	m-3	OLIU	ent-crs-sts1:m-3,m-3
{a,b,c}-{1-2}	<-->	{a,b,c}-{1-2}	27G2-U OLIU	ent-crs-sts1:a-1,a-1
m-{1,2}†	<-->	m-{1,2}	22-type OLIU	ent-crs-sts1:m-1,m-1

Notes:

Address on the left side MUST BE identical to the address on the right side. There is no interchange function for "pass-through" signals.

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12. Example: m-{1-12}.

† Ring cross-connection; 27-type OLIU in main.

Table 8-15. Ring Manual STS-1 Cross-Connections (Drop and Continue)

From *	To	"To" CP Type (Note)	CIT Command
m-{1-3}	<-->	a	STS1E
m-{1-3}	<-->	b	STS1E
m-{1-3}	<-->	c	STS1E
m-{1-3}	<-->	a-{1,2}	OLIU
m-{1-3}	<-->	b-{1,2}	OLIU
m-{1-3}	<-->	c-{1,3}	OLIU
m-{1,2}†	<-->	{a,b,c}	STS1E
m-{1,2}†	<-->	{a,b}-{1,2}	22-type OLIU
m-{1,2}†	<-->	c-{1-3}	22-type OLIU

Notes:

The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections. The "ring" parameter defines the ring carrying the continue signal. This ring directly connects to the other drop and continue shelf.

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12. Example: m-{1-12}.

† Ring cross-connection; 27-type OLIU in main.

Table 8-16. Linear or Ring Manual VT1.5 Cross-Connections (Termination/Drop)

From *	To	"To" CP Type (Note)	CIT Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1-7}-{1-4}	MXRVO, STS1E, TMUX
m-{1-3}-{1-7}-{1-4}	<-->	b-{1-7}-{1-4}	MXRVO, STS1E, TMUX
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-7}-{1-4}	MXRVO, STS1E, TMUX
m-{1,2}-{1-7}-{1-4}†	<-->	{a,b,c}-{1-7}-{1-4}	MXRVO, STS1E

Notes:

The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12. Example: m-{1-12}.

† Ring cross-connection; 27-type OLIU in main.

Table 8-17. Linear or Ring Manual VT1.5 Cross-Connections (Hub/Drop)

From *		To	"To" CP Type	CIT Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1,2}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1,2}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-2-2-2,b-2-2-2
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-3-3-3,c-3-3-3
m-{1,2}-{1-7}-{1-4}†	<-->	{a,b}-{1,2}-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1
m-{1,2}-{1-7}-{1-4}†	<-->	c-{1-3}-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:m-2-2-2,c-3-3-3

Notes:

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12.
Example: m-{1-12}.

† Ring cross-connection; 27-type OLIU in main.

Table 8-18. Ring Manual STS-1 Cross-Connections (Hairpin)

From	"From" CP Type		To	"To" CP Type	CIT Command
{a,b}-{1-2}	27G2-U OLIU	<-->	c-{1-2}	27G2-U OLIU	ent-crs-sts1:a-1,c-2
{a,b}-{1-2}	27G2-U OLIU	<-->	c-{1-3}	22-type OLIU	ent-crs-sts1:a-1,c-3
{a,b}-{1-2}	22-type OLIU	<-->	c-{1-2}	27G2-U OLIU	ent-crs-sts1:a-1,c-2
{a,b}-{1-2}	27G2-U OLIU	<-->	c	MXRVO,TMUX, STS1E	ent-crs-sts1:a-1,c
{a,b}	MXRVO,TMUX,STS1E	<-->	c-{1-2}	27G2-U OLIU	ent-crs-sts1:a,c-2
{a,b}-{1}	26G2-U OLIU	<-->	c-{1-3}	22-type OLIU	ent-crs-sts1:a-1,c-3
{a,b}-{1-2}	22-type OLIU	<-->	c-{1}	26G2-U OLIU	ent-crs-sts1:a-1,c-1
{a,b}-{1}	26G2-U OLIU	<-->	c	MXRVO,TMUX, STS1E	ent-crs-sts1:a-1,c
{a,b}	MXRVO,TMUX,STS1E	<-->	c-{1}	26G2-U OLIU	ent-crs-sts1:a,c-1
{a,b}	DS3, STS1E	<-->	c-{1-3}	22-type OLIU	ent-crs-sts1:a,c-3
{a,b}-{1-2}	22-type OLIU	<-->	c	DS3, STS1E	ent-crs-sts1:a-1,c
{a,b}-{1-2}	22-type OLIU	<-->	c-{1-3}	22-type OLIU	ent-crs-sts1:a-1,c-3
{a,b}	DS3, STS1E	<-->	c	STS1E	ent-crs-sts1:a,c

Note:

Refer to the **ent-crs-sts1** command for software release information.

Table 8-19. Ring Manual VT1.5 Cross-Connections (OC-1 Hub/Drop)

From *		To	"To" CP Type	CIT Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1,2}-{1-7}-{1-4}	27G-U OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1,2}-{1-7}-{1-4}	27G-U OLIU	ent-crs-vt1:m-2-2-2,b-2-2-2
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-2}-{1-7}-{1-4}	27G-U OLIU	ent-crs-vt1:m-3-3-3,c-2-3-3
m-{1,2}-{1-7}-{1-4}†	<-->	{a,b,c}-{1,2}-{1-7}-{1-4}	27G-U OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1
m-{1-3}-{1-7}-{1-4}	<-->	a-{1}-{1-7}-{1-4}	26G2-U OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1}-{1-7}-{1-4}	26G2-U OLIU	ent-crs-vt1:m-2-2-2,b-1-2-2
m-{1-3}-{1-7}-{1-4}	<-->	c-{1}-{1-7}-{1-4}	26G2-U OLIU	ent-crs-vt1:m-3-3-3,c-1-3-3
m-{1,2}-{1-7}-{1-4}†	<-->	{a,b,c}-{1}-{1-7}-{1-4}	26G2-U OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1

Notes:

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12. m-{1-12}.

† Ring cross-connection; 27-type OLIU in main.

Table 8-20. Ring Manual VT1.5 Cross-Connections (Drop and Continue)

From *		To	"To" CP Type (Note)	CIT Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1-7}-{1-4}	STS1E	ent-crs-vt1:m-1-1-1,a-1-1:cct=dc,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1-7}-{1-4}	STS1E	ent-crs-vt1:m-2-3-4,b-3-4:cct=dc,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-7}-{1-4}	STS1E	ent-crs-vt1:m-3-3-3,c-3-3:cct=dc,ring=m2
m-{1-3}-{1-7}-{1-4}	<-->	a-{1,2}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1:cct=dc,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1,2}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-2-2-2,b-2-2-2:cct=dc,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-3-3-3,c-3-3-3:cct=dc,ring=m2
m-{1,2}-{1-7}-{1-4}*†	<-->	{a,b,c}-{1-7}-{1-4}	STS1E	ent-crs-vt1:m-1-1-1,a-1-1:cct=dc,ring=m1
m-{1,2}-{1-7}-{1-4}†	<-->	a-{1,2}-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1:cct=dc,ring=m1
m-{1,2}-{1-7}-{1-4}†	<-->	b-{1,2}-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:m-2-2-2,b-2-2-2:cct=dc,ring=m1
m-{1,2}-{1-7}-{1-4}†	<-->	c-{1-3}-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:m-3-3-3,c-3-3-3:cct=dc,ring=m2

Notes:

The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections. The "ring" parameter defines the ring carrying the continue signal. This ring directly connects to the other drop and continue shelf.

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12. m-{1-12}.

† Ring cross-connection; 27G-U OLIU in main.

Table 8-21. Linear Manual VT1.5 Cross-Connections (Add)

From		To	"To" CP Type (Note)	CIT Command
a-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	MXRVO, STS1E	ent-crs-vt1:a-1-1,c-1-1-1
b-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	MXRVO, STS1E	ent-crs-vt1:b-2-2,c-2-2-2
a-{1,2}-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	OLIU	ent-crs-vt1:a-2-2-2,c-2-2-2
b-{1,2}-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	OLIU	ent-crs-vt1:b-2-2-2,c-3-3-3

Note:

The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Table 8-22. Ring Manual VT1.5 Cross-Connections (Pass-Through)

From *		To	"To" CP Type (Note)	CIT Command
m-1-{1-7}-{1-4}	<-->	m-1-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-1-1-2,m-1-1-1
m-2-{1-7}-{1-4}	<-->	m-2-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-2-3-4,m-2-3-4
m-3-{1-7}-{1-4}	<-->	m-3-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-3-5-3,m-3-5-3
{a,b,c}-{1-2}	<-->	{a,b,c}-{1-2}	27G2-U OLIU	ent-crs-vt1:a-1-1-1,a-1-1-1
m-1-{1-7}-{1-4}†	<-->	m-1-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:m-1-1-2,m-1-1-2
m-2-{1-7}-{1-4}†	<-->	m-2-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:m-2-3-4,m-2-3-4

Notes:

Address on the left side MUST BE identical to the address on the right side. There is no interchange function for "pass-through" signals.

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12. Example: m-{1-12}.

† Ring cross-connection; 27G-U OLIU in main.

Table 8-23. Ring Manual VT1.5 Cross-Connections (Locked)

From *		To	“To” CP Type	CIT Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1-7}-{1-4}	MXRVO	ent-crs-vt1:m-1-1,a-1-1-1:cct=locked,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1-7}-{1-4}	MXRVO	ent-crs-vt1:m-2-2,b-2-2-2:cct=locked,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-7}-{1-4}	MXRVO	ent-crs-vt1:m-3-3,c-3-3-3:cct=locked,ring=m1
m-{1,2}-{1-7}-{1-4}†	<-->	{a,b,c}-{1-7}-{1-4}	MXRVO	ent-crs-vt1:m-1-1,a-1-1-1:cct=locked,ring=m1

Notes:

* Whenever 24-type OLIUs are installed in main the range of STS-1s will be from 1 to 12. m-{1-12}.

† Ring cross-connection; 27G-U OLIU in main.

Table 8-24. Ring Manual VT1.5 Cross Connections (Hairpin)

From	“From” CP Type		To	“To” CP Type	CIT Command
{a,b}-{1-2}-{1-7}-{1-4}	27G2-U OLIU	<-->	c-{1-2}-{1-7}-{1-4}	27G2-U OLIU	ent-crs-vt1:a-1-1-1,c-2-1-1
a-{1-2}-{1-7}-{1-4}*	27G2-U OLIU	<-->	a-{1-2}-{1-7}-{1-4}*	27G2-U OLIU	ent-crs-vt1:a-1-1-1,a-2-1-1
b-{1-2}-{1-7}-{1-4}*	27G2-U OLIU	<-->	b-{1-2}-{1-7}-{1-4}*	27G2-U OLIU	ent-crs-vt1:b-1-1-1,b-2-1-1
c-{1-2}-{1-7}-{1-4}*	27G2-U OLIU	<-->	c-{1-2}-{1-7}-{1-4}*	27G2-U OLIU	ent-crs-vt1:c-1-1-1,c-2-1-1
{a,b}-{1-2}-{1-7}-{1-4}	22-type OLIU	<-->	c-{1-7}-{1-4}	STS1E/MXRVO	ent-crs-vt1:a-1-1,c-1-2
c-{1-3}-{1-7}-{1-4}	22-type OLIU	<-->	{a,b}-{1-7}-{1-4}	STS1E/MXRVO	ent-crs-vt1:c-1-1,b-1-2
{a,b}-{1-2}-{1-7}-{1-4}	22-type OLIU	<-->	c-{1-3}-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:a-1-1-1,c-1-1-1
{a,b}-{1-7}-{1-4}	STS1E	<-->	c-{1-7}-{1-4}	STS1E/MXRVO	ent-crs-vt1:a-1-1,c-1-1
c-{1-7}-{1-4}	STS1E	<-->	{a,b}-{1-7}-{1-4}	TMUX MXRVO/TMUX	ent-crs-vt1:c-1-1,b-1-1
{a,b}-1-{1-7}-{1-4}	26G2-U OLIU	<-->	c-{1-3}-{1-7}-{1-4}	22-type OLIU	ent-crs-vt1:a-1-1-1,c-1-1-1
{a,b}-{1-2}-{1-7}-{1-4}	22-type OLIU	<-->	c-1-{1-7}-{1-4}	26G2-U OLIU	ent-crs-vt1:a-1-1-1,c-1-1-1
{a,b}-1-{1-7}-{1-4}	26G2-U OLIU	<-->	c-{1-7}-{1-4}	STS1E/TMUX/ MXRVO	ent-crs-vt1:a-1-1-1,c-1-1
{a,b}-{1-7}-{1-4}	STS1E/TMUX/ MXRVO	<-->	c-1-{1-7}-{1-4} }	26G2-U OLIU	ent-crs-vt1:a-1-1-1,c-1-1
{a,b,c}-1-{1-7}-{1-4}	26G2-U OLIU	<-->	{a,b,c}-1-{1-7}-{1-4}	26G2-U OLIU	ent-crs-vt1:a-1-1-1,c-1-1-1

* STS-1 number must be different in 'from' and 'to' addresses.

Optical Point-to-Point Application

This is a linear application with two NEs. Valid mapping is provided by termination cross-connections. Either "default" or "manual" mode is supported per shelf. DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the **crs** mode is "manual."

Optical Drop Application

This is a linear application with multiple NEs in a chain. Function unit "C" of intermediate nodes is equipped with OLIUs to transport signals to the next NE. Valid mapping is provided by termination and drop cross-connections. Either "default" or "manual" mode is supported per shelf. Intermediate drop nodes may require "manual" cross-connections. DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the **crs** mode is "manual."

Optical Hubbing Application

This is a linear application with multiple NEs in a hub/chain. Hub NEs function units can be equipped with OLIUs to transport signals to the next NE. Valid mapping is provided by termination, hub, and drop cross-connections. Either "default" or "manual" mode is supported per shelf. Intermediate hub nodes may require "manual" cross-connections. DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the **crs** mode is "manual."

Optical Add/Drop Application

This is a linear application with multiple NEs in a chain. Function unit "C" of intermediate nodes is equipped with OLIUs to transport signals to the next NE. Valid mapping is provided by termination, add, and drop cross-connections. Either "default" or "manual" mode is supported per shelf.

Intermediate drop nodes may require "manual" cross-connections. Intermediate add/drop nodes require "manual" cross-connections and an OLIU circuit pack, a 22-type, that supports add/drop cross-connections.

DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the **crs** mode is "manual."

Electrical EC-1 Multiplexer Application

This is an application with one NE. Valid cross-connections are provided by the shelf and depend on the equipage. DS1 services are supported by EC-1 (STS-1) signal mapping to 28 VT1.5 signals as described under default cross-connections. The STS1E circuit pack must be hardware-provisioned for the "high-speed" mode.

OC-3/OC-12/OC-1 Path Protected Ring Application

This is a path protected ring application with multiple NEs in a two-fiber ring. The main optical units of each node in the ring are equipped with ring OLIU circuit packs, the 22-type, 24-type, or 27-type to transport signals to the next NE as well as drop signals at the NE. Valid mapping is provided by termination and pass-through cross-connections. Only the "manual" cross-connect mode is supported.

OC-3/OC-12 Path Protected Ring Drop and Continue Application

This is a path protected ring application with multiple NEs in a two-fiber ring. All but two nodes are normal ring application nodes (see previous application). Two nodes are defined to be the drop and continue nodes and are neighbors. They function to provide two copies of each service on the ring to another ring (dual ring interworking) or to wire centers (dual wire center service). Special drop and continue cross-connections are used to support this feature. The STS1E low-speed circuit pack is used to transport traffic between rings or to the wire centers. This feature provides node failure survival functionality. These two special nodes can also provide normal ring functionality at the same time.

OC-3/OC-12 Path Protected Ring Optical Extension Application

This is a path protected ring application with multiple NEs in a two-fiber ring and OLIU circuit packs in function units A, B, and/or C of an NE. This application allows services to exit the ring on OC-3 interfaces to other NEs. Mixed network topologies (ring and linear) are possible but require compatibility between the ring and linear software releases. See the software compatibility tables in Section 9, "Maintenance Description."

Manual Cross-Connection Procedure

The DDM-2000 OC-3 system has a per-shelf parameter called **crs**, which determines if the shelf uses automatic "default" STS-1 signal routing or requires the user to enter and delete all cross-connections. Manual mode (**crs=manual**) disables the "default" routing and unlocks the cross-connect table for editing by the user.

The following procedure reprovisions linear systems from default to manual:

- a. From the CIT, issue the command **set-ne:crs=manual** to put the shelf into "manual" mode. On linear systems, any existing "default" cross-connections" made by the shelf will still be active but are now "manual."
- b. All cross-connections entered by the user are "manual" connections and must be deleted by the user to change service.
- c. All commands to change signal routings (enter or delete) may be service affecting. A warning and confirmation for the request is issued as explained in Section 11, "Commands and Reports," for the **ent-crs** and **dlt-crs** commands.
- d. Manual routing requires that slots be equipped. The **ent-crs** routing command will check if the slot is equipped and display an error message denying illegal requests.
- e. Manual routing requires that slots be equipped. Therefore, if the last circuit pack of a protected pair is removed from the slot even if there is no signal on the circuit pack, the action is alarmed. The "Update" command will be denied. The manual routing must be deleted before the circuit pack can be removed and the slot becomes unequipped using the "Update" command.
- f. The **rtrv-crs** commands display the cross-connect routing table.
- g. In function slots A, B, and C, more than one STS-1 signal or 28 VT1.5 signals can be manually routed to them. This is invalid for MXRVO, STS1E, and DS3 circuit packs. If a routing command is issued and the circuit pack type is wrong, the command is denied.
- h. In linear systems, to put the shelf back into "default" cross-connect mode requires that the existing cross-connections be STS-1 and be valid defaults (see Table 8-7). The user is required to reset the cross-connections to meet these rules. If the cross-connect table is not valid, the **set-ne:crs=default** command is denied.

Manual Cross-Connection Restrictions

Restrictions on manual cross-connections include the following:

- All VT-1.5 cross-connections (**ent - crs - vt1**) are done via the OLIU circuit packs in the main slots. The OLIU circuit packs must be 22-type, 24G-U, or 27-type.
- Time slots in function units A and B cannot be cross-connected to each other.
- When function units A and B are equipped with OLIUs, they can only carry two STS-1 or 56 VT1.5 signals. They cannot be cross-connected with main or function unit C to carry three STS-1 or 84 VT1.5 signals.
- A cross-connection cannot be made to a slot that is in the unequipped state. Also, a cross-connection may not be made with any signal where a cross-connection already exists. The existing cross-connection must be deleted before a new cross-connection can be entered.
- If the system is equipped with OLIUs in function unit A and/or B, only one STS-1 signal per function unit is allowed to be connected (added) to function unit C.
- For VT1.5 cross-connections, all drop and continue cross-connections on a shelf must be entered into the same ring.
- For ring applications, use the following rules to establish cross-connections in each ring:
 - a. All drop connections (including DRI, if present) from the same ring must be provisioned the same, either all VT1.5 or all STS-1.
 - b. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node, you should provision the pass-throughs as VT1.5 cross-connections. Provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects (**cnvt - crs**) to drop DS1s at a later time.
 - c. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

To do a cross-connection successfully, proper addressing of cross-connect points is necessary. Figure 8-2 shows example STS-1 addresses. For a complete list of valid addresses, refer to Table 8-7 through Table 8-22.

M STS-1 #1 (m-1)			
A STS-1 #2 (m-2)			
I STS-1 #3 (m-3)			
N OLIU			
			Function Unit C
			OLIU
Function Unit A		Function Unit B	
MXRVO		DS3	STS-1 #1 (c-1)
(a)		(b)	STS-1 #2 (c-2)
			STS-1 #3 (c-3)

Figure 8-2. Example of STS-1 Addresses

OC-3 Linear Network Cross-Connection Example

The following paragraphs describe a linear network example configuration, explain the default cross-connections, and describe how to create and delete manual cross-connections. The example configuration is a linear network with four sites. For the purposes of this example, it is assumed that each shelf has recently been installed and all shelves are in the default cross-connect mode. Figure 8-3 shows the four sites with dashed lines indicating the default STS-1 cross-connections.

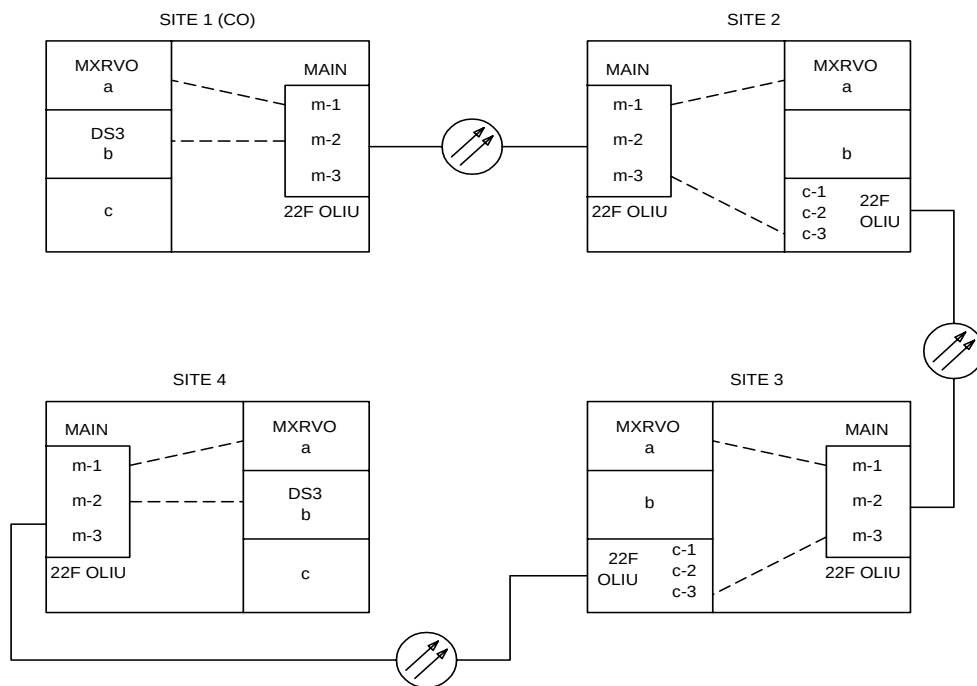


Figure 8-3. OC-3 Linear Network Example Configuration

Initially, Site 1 (a CO) is equipped with 22-type OLIU circuit packs in the main slots, MXRVO and DS1 circuit packs in function unit A, a DS3 circuit pack in function unit B, and no equipment in function unit C. Sites 2 and 3 are equipped with 22-type OLIU circuit packs in the main and function unit C slots and MXRVO and DS1 circuit packs in function unit A. Function unit B at Sites 2 and 3 are unequipped. Site 4 has 22-type OLIU circuit packs in the main slot, MXRVO and DS1 circuit packs in function unit A, DS3 circuit packs in function unit B, and no equipment in function unit C. Note that in this example default configuration there

is no way to support service for the DS3 port in function unit B of Site 1 or Site 4 or the MXRVO at Site 3 as currently equipped.

A user may want to route a DS3 signal from Site 1 function unit B through to Site 4 function unit B and may want to assign a DS1 from Site 1 function unit A to DS1 ports in function unit A of Sites 2, 3, and 4. These cross-connections are not set up by the default cross-connections at all the sites, so the manual cross-connect mode must be selected to change the cross-connections. At Site 1, the default cross-connections support the necessary signal routing. At Site 2, however, the cross-connections must be changed. The manual cross-connect mode should be selected at Site 2, and the **ent-crs-sts1:m-2,c-2** command should be used to connect **m-2** to **c-2**. Also, since STS-1 #3 (**m-3**) is not carrying service, that cross-connection can be deleted with the **dlt-crs-sts1:m-3,c-3** command. The same cross-connections that were entered and deleted at Site 2 should be entered and deleted for Site 3. At Site 4, the default cross-connections support the necessary connections. Figure 8-4 shows the new cross-connections for these four sites after the first series of cross-connect commands with DS3 service established between Site 1 and Site 4.

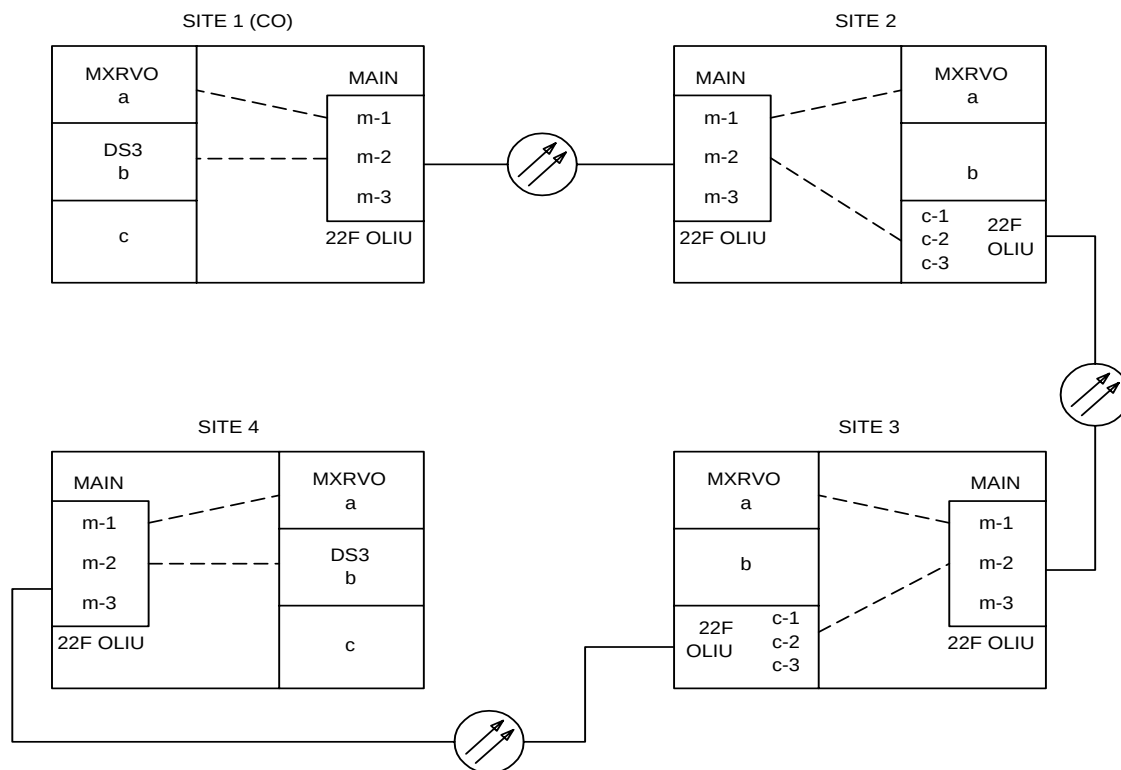


Figure 8-4. Configuration After First Series of Cross-Connect Commands

If a user wants to assign all DS1 traffic in Site 1 function unit A to DS1 ports in Site 4 function unit A, the cross-connections must be changed further to accommodate this routing. At Site 1, the cross-connection already exists to support this routing. At Site 2, the cross-connections must be changed. The necessary cross-connection is **m-1** to **c-1**, but a cross-connection on **m-1** already exists. Since Site 2 is already in the manual cross-connect mode (from the earlier cross-connection changes), the user would use the **dlt-crs-sts1:m-1,a** command to delete the **m-1** to **a** cross-connection. Next use the **ent-crs-sts1:m-1,c-1** command to enter the **m-1** to **c-1** cross-connection. Again, the same cross-connections that were entered and deleted at Site 2 should be repeated at Site 3. At Site 4, the preexisting cross-connections support the routing. Figure 8-5 shows the new cross-connections for these four sites after the second series of cross-connect commands with DS1 service established between Site 1 and Site 4.

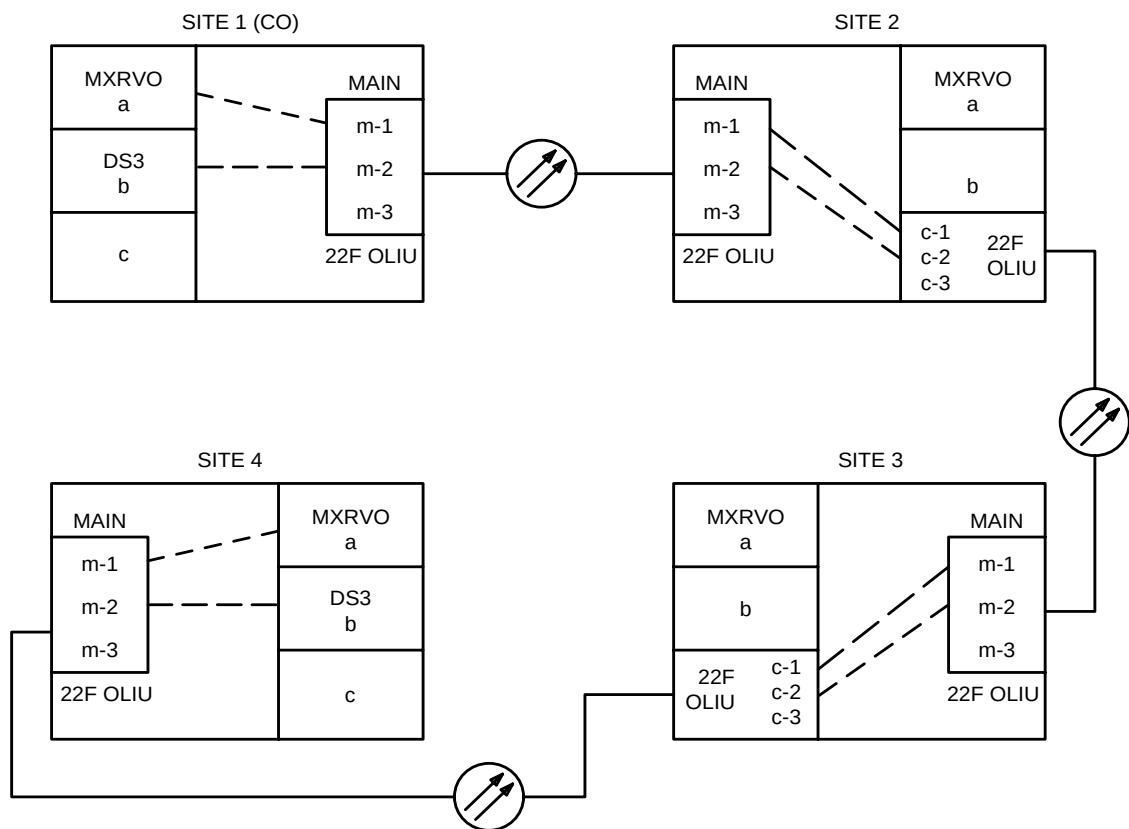


Figure 8-5. Configuration After Second Series of Cross-Connect Commands

Finally, a user may want to carry DS1 traffic from Site 1 to Sites 2 and 3, drop some VT1.5 traffic at function unit A at Sites 2 and 3, and continue some traffic through to Site 4. The cross-connections must be changed further to accommodate this routing. At Site 1, the existing cross-connections support the necessary connections. At Site 2, the cross-connections must be changed. First, the **cnvt-crs** command should be used on the **m-1** to **c-1** cross-connection to convert the STS-1 signal to 28 VT1.5 signals. Next, to drop some of the VT1.5 signals at function unit A, the user must first delete them from the main to fn-c, then create a cross-connection from the main to low-speed groups in fn-a. The user would want to use the **rtrv-crs-vt1** command to list the existing cross-connections. The following commands delete one VT group (4 VT1.5 signals) from the 28 VT1.5 signals between **m-1** and **c-1** and direct these four signals to function unit A:

```
dlt-crs-vt1:m-1-2-1,c-1-2-1
dlt-crs-vt1:m-1-2-2,c-1-2-2
dlt-crs-vt1:m-1-2-3,c-1-2-3
dlt-crs-vt1:m-1-2-4,c-1-2-4
ent-crs-vt1:m-1-2-all,a-2-all
```

The four VT1.5 cross-connections can be deleted individually, or can be deleted with one command, using the address **-all** to signify all four VT1.5 signals (**dlt-crs-vt1:m-1-2-all,c-1-2-all**). The remaining VT1.5 signals are still cross-connected from **m-1** to **c-1** and are sent through to the next site.

At Site 3, other cross-connections must be changed. First the **cnvt-crs** command should be used on the **m-1** to **c-1** cross-connections to convert the STS-1 signal to 28 VT1.5 signals. Next, to drop some of the VT1.5 signals at function unit A, the user must first delete them from main to function unit C, then create a cross-connection from main to the low-speed group in function unit A.

The following commands delete one VT group (4 VT1.5 signals) from the 28 VT1.5 signals between **m-1** and **c-1** and direct these four signals to function unit A:

```
dlt-crs-vt1:m-1-3-all,c-1-3-all
ent-crs-vt1:m-1-3-all,a-3-all
```

Since Site 2 dropped some VT1.5 signals, the user can reuse the transmission capacity to add traffic at Site 3, sending it to Site 4:

dlt-crs-vt1:m-1-2-all,c-1-2-all

ent-crs-vt1:a-2-all,c-1-2-all

At Site 4, the previous cross-connections support the necessary routing.

Figure 8-6 shows the final configuration for these four sites with dotted lines showing the VT1.5 signals.

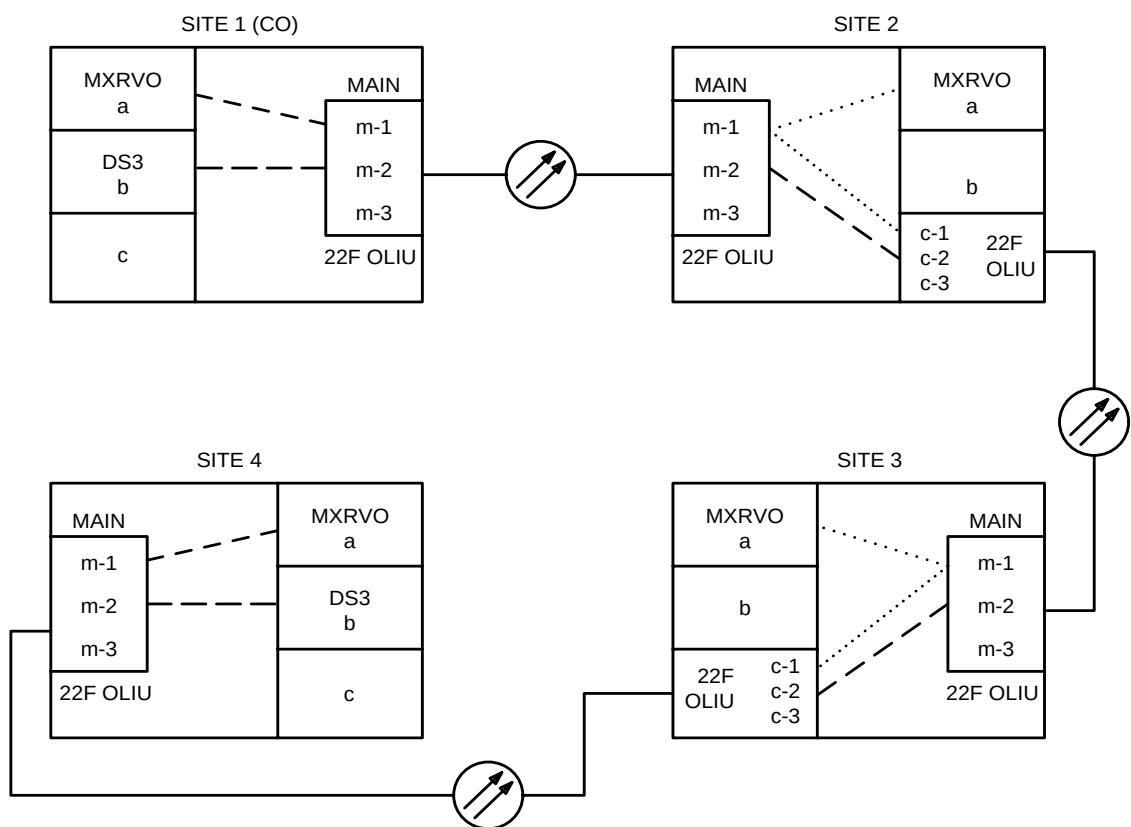


Figure 8-6. Final Configuration

OC-3 Ring Cross-Connection Provisioning

For every DS1, VT1.5, STS-1, or DS3 transported through a ring network, a cross-connection is needed in every NE (node) on the ring. A "drop" cross-connection is needed at the nodes where service enters or exits the ring. A "pass-through" cross-connection is needed at all other nodes (intermediate nodes) on the ring.

For the DDM-2000 OC-3 Multiplexer, cross-connections of both ring paths are entered with a single command entry per shelf. This minimizes the possibility of provisioning a circuit without a protection channel. A DDM-2000 OC-3 ring has 84 VT1.5 channels or 3 STS-1 channels. The ring channels are always carried within the 22-type OLIU circuit packs in the main 1 and main 2 slots. The VT1.5 ring channels are designated **m-{sts#}-{vtg#}-{vt#}**. The STS-1 channels are designated **m-{sts#}**. In cross-connection provisioning, there is no need to identify ring channels in main 1 different from main 2 because both rings are always provisioned with the same information.

At the entry and exit points, the VT channels are cross-connected to the low-speed ports (for example, **{ls group}-{slot#}-{port# on slot}, a-7-4**). These are called "drop" connections. For example, the command **ent-crs-vt1:m-2-6-4,a-1-3** connects the third low-speed port associated with slot 1 of low-speed group A to the fourth VT1.5 within the sixth VT group within the second STS-1 of both rings. Similarly, for STS-1 channels, the command **ent-crs-sts1:m-2,a** connects the DS3 or EC-1 port of function group A to the second STS-1 of both rings.

At the intermediate nodes, a pass-through cross-connection establishes a cross-connect path on both rings. Pass-through cross-connections are designated by using the same VT or STS-1 ring channel twice in the cross-connect address. For example, the single command **ent-crs-vt1:m-2-6-4:m-2-6-4** connects a pass-through cross-connection both to and from the fourth VT1.5 within the sixth VT group within the second STS-1 of both the service and protection ring. Also note that, unlike linear networks that require 22-type OLIUs in both main and fn-C slots to create pass-through connections, ring pass-through cross-connections are made directly between both main OLIUs.

Depending on local practice, work orders will normally identify the low-speed port designations at the entry and exit points in the network and the TIDs of the NEs at these points. The work order may also designate the VT1.5 or STS-1 ring channel which will be used for this service. If the work order does not designate a ring channel to use, use the command **rtrv-crs-vt1**; or **rtrv-crs-sts1**; to identify all the ring channels that are currently unassigned. The work order also may not designate all the other NEs on the ring that need to be provisioned with pass-through cross-connections. In this case, use the **rtrv-map-netwrk** command to identify the TIDs for all the NEs in a ring.

OC-3 Ring Network Cross-Connection Example

The following paragraphs describe a ring network example configuration and describe how to create manual cross-connections to establish the ring network. The example configuration is a ring network with two ring fibers and six nodes. Ring 1 carries ring traffic in the clockwise direction while Ring 2 carries ring traffic in the counterclockwise direction. For the purposes of this example, it is assumed that each shelf has recently been installed, equipped with 22-type OLIUs in the main 1 and main 2 slots, MXRVOs in the function unit slots, and DS1s in the Low-Speed Group slot; and all shelves are properly installed and provisioned. This example is for DS1 services. DS3 and EC-1 low-speed services can follow an equivalent procedure. See "System Turnup/Circuit Order," in the TOP section of this manual (Volume II). Figure 8-7 shows the six nodes with dashed lines indicating the cross-connections.

Ring configurations support manual VT1.5 or STS-1 cross-connections. Manual cross-connections must be made at **each** node in the network for each circuit being established. Drop cross-connections are made at the drop nodes where service enters or exits the node (Nodes 1 and 5) and pass-through cross-connections are made at **each** intermediate node (Nodes 2, 3, 4, and 6).

The example is for DS1 services but can be used to STS-1 services if the function units are properly equipped with DS3 and or STS1E circuit packs. The STS1E circuit pack can support 28 VT cross-connections or one STS-1 cross-connection.

Pass-through cross-connections should be established first to minimize alarms. The example assumes that the drop cross-connections are made after the pass-through cross-connections are made. This is the preferred method, since it assures that all cross-connections are associated with services.

An alternate method is also possible. Before service is established, all shelves can be defaulted to set up all pass-through cross-connections in the ring. This method has the advantage of only having to delete pass-through and establish drop cross-connections at the add/drop nodes. However, this method may introduce the possibility of affecting service when cross-connections are deleted. This is because it will not be possible to distinguish between pass-through cross-connections that are in use carrying service from those that are available. Use of this default pass-through provisioning method is only recommended if the accuracy of the cross-connection information on the work order is assured.

The following commands may be used to delete, enter, and retrieve cross-connections: **dlt-crs-vt1**, **ent-crs-vt1**, **rtrv-crs-vt1**, **dlt-crs-sts1**, **ent-crs-sts1**, and **rtrv-crs-sts1**. See Section 11, "Commands and Reports," for a description of these commands.

When compared to linear add/drop provisioning, the steps for ring cross-connect provisioning are simpler because the same ring channel designation is associated with the same service in every node on the ring. It is important that the pass-through signal is assigned the same channel address for all nodes in the ring including the add/drop nodes **m-1-2-3** in the example.

Do the following procedure:

1. Using the work order, identify the TIDs of the entry and exit points on the ring (Nodes 1 and 5 in the example).
2. Determine if the work order is specifying use of a particular ring channel (some work orders may abbreviate the **m-1-2-3** designation as **m123**). If the work order does not designate a VT1.5 ring channel to use, use the **rtrv-crs-vt1:all**; to identify all unused ring channels. The output report will show a dash in the Address 2 column for all unused channels. In the example, we will cross-connect a DS1 from Node 1 through the ring and drop the DS1 at Node 5 using **m-1-2-3**.
3. Log in or remote log in to all the TIDs that are not entry and exit points (intermediate nodes) and enter ring "pass-through" cross-connections. At each intermediate node of the network, use the **ent-crs-vt1:** command to cross-connect the VT1.5 (DS1) channel time slots between main 1 and main 2. For example, to cross-connect the channel time slot associated with STS-1 #1 in VT group 2 DS1 port 3, use the **ent-crs-vt1:m-1-2-3,m-1-2-3** command.



NOTE:

Only one command is required to establish the pass-through cross-connection on **both** rings (main 1 to main 2 for Ring 1 and main 2 to main 1 for Ring 2). Address 1 and address 2 must be the same.

4. Log in or remote log in to each drop node and enter the "drop" cross-connection. At both drop nodes of the DS1 circuit being established, use the **ent-crs-vt1:** command to cross-connect the VT1.5 (DS1) channel time slot to the proper group, slot and port (for example, **ent-crs-vt1:m-1-2-3,a-2-3**).



NOTE:

Only one command is required to establish the drop cross-connections on **both** rings between main and fn-A. At exit nodes, assuming normal operation, the same signal is present on both rings. The 22-type OLIU monitors the input from each ring and selects one to drop to fn-A.

5. Status and alarm conditions can be present during the provisioning operation but will clear once the last ring cross-connection for this DS1 service is completed. If they do not, the **rtrv-alm**; and **rtrv-crs-vt1**; commands can be used to isolate the problem. See the TOP section of this manual (Volume II).
6. Log in or remote log in to all the nodes and verify appropriate drop or pass-through ring cross-connections.
7. Test both paths around the ring. Since DDM-2000 OC-3 uses non-revertive path switching to minimize the number of hits on services, the initial path selection is arbitrary. Use **rtrv-state-path** and **sw-path-vt1** commands to test both ring paths around the ring network at the drop nodes of the new service. The **sw-path-vt1** command should be limited to the addresses that are being tested. For the example, the commands are **sw-path-vt1:m1-1-2-3** and **sw-path-vt1:m2-1-2-3**.

The **rtrv-state-path** and **sw-path-vt1** commands use a slightly different VT1.5 ring channel designations from the cross-connect designations because these commands need to identify which of the two paths around the ring is currently active. If the ring path and selected VT1.5 channel are being received on main 1, the active ring channel designation for the **rtrv-state-path** and **sw-path-vt1** commands will be **m1-1-2-3**, where the **m1** is the path received on main 1. If the ring path and selected VT1.5 channel are being received on main 2, the ring channel designation for the **rtrv-state-path** and the **sw-path-vt1** commands will be **m2-1-2-3**, where the **m2** is the path received on main 2. The DDM-2000 OC-3 allows a per-path designation on the **sw-path-vt** command. This assures that only the new DS1 service being provisioned will be subject to protection switch hits. If this is not the first DS1 service being added to the ring, it is strongly recommended that the pulling of circuit packs or fibers to test the protection path not be done, since it would subject existing DS1 services to protection switch hits.

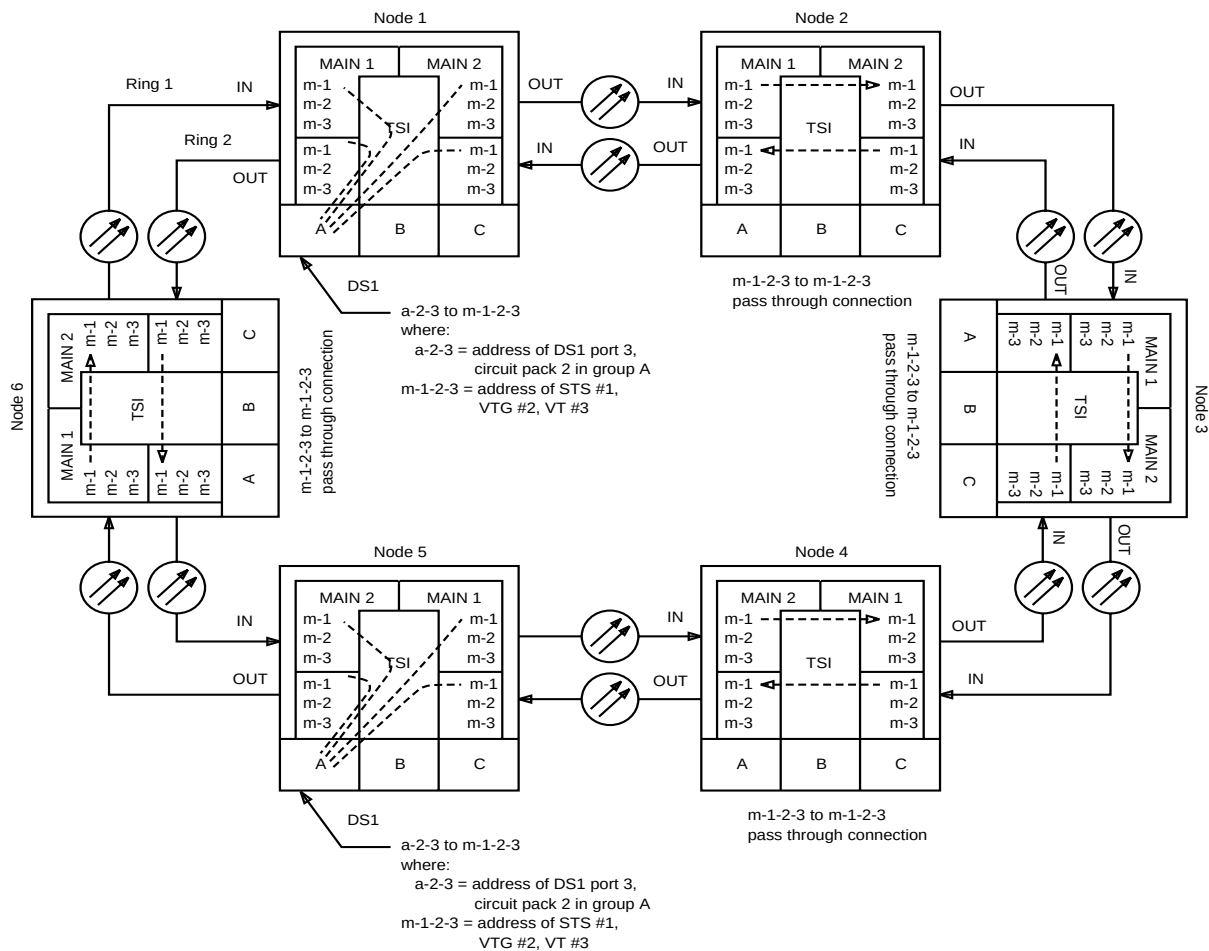


Figure 8-7. Example OC-3 Ring Configuration Cross-Connections

DS3/EC-1 Ring Network Cross-Connection Example

DS3/EC-1 ring network provisioning follows the same procedure as the DS1 ring provisioning example except that function unit B is involved. For example, in Figure 8-7, replacing the MXRVO and DS1 circuit packs at Node 1, function unit B, and at Node 6, function unit B with DS3 or STS1E circuit packs, converts the figure to a DS3 path protected ring. The following cross-connections would then be made:

Node	Cross-Connection
2, 3, 4, and 5	ent-crs-sts1:m-2,m-2
1	ent-crs-sts1:m-2,b
6	ent-crs-sts1:m-2,b

OC-3/OC-12 Ring Drop and Continue Cross-Connection Provisioning

All the information on "Ring Cross-Connection Provisioning" applies to "Ring Drop and Continue Cross-Connection Provisioning." Please review "Ring Cross-Connection Provisioning" as that information is not repeated here. Only the new provisioning information is presented here. This information applies to both STS-1 and VT1.5 traffic. Only the cross-connection addresses are different. A mixed traffic ring of STS-1 and VT1.5 drop and continue services is supported.

Two nodes are defined to be drop and continue nodes in a ring subnetwork and are the exit points where "two" copies of the same service are available. By making two copies of the same service available at two nodes, the network is protected from failure of a node (for example, a CO) that affects all traffic on the ring. For rings that carry drop and continue services, the drop and continue nodes are neighbors and all "drop and continue" traffic must be continued on the ring connecting the two nodes.

In Figure 8-8 (one half of a drop and continue DRI application) CO 1 and CO 2 are drop and continue nodes. Traffic continued at CO 1 uses Ring 2 which is the fiber connecting CO 1 to CO 2. Likewise, continued traffic at CO 2 uses Ring 1, which is the fiber connecting CO 2 to CO 1.

When a new service is added to the ring, use the normal procedures to add service to all nodes of a ring except to the drop and continue nodes. Before a drop and continue cross-connection can be made to a low-speed function unit, the slots must be equipped with either STS1E low-speed circuit packs or OC-3 OLIUs. This circuit pack type is the interface for drop and continue applications. The cross-connection command for drop and continue at CO 1 (see Figure 8-8) has two additional parameters. They are cross-connection type (**cct**) and ring identification (**ring**). The **cct** is **dc** for drop and continue. The parameter **ring** for the **ent-crs-sts1** or **ent-crs-vt1** command defines the direction of the continued signal. The counterclockwise ring is called **m2** because it is always connected to main-2 OLIU. Similarly, the clockwise ring is called **m1** because it is always connected to main-1 OLIU. At CO 1 the parameter for **ring** is **m2**, which means to continue the signal on Ring 2 toward CO 2. For VT1.5 cross-connections, once the first VT drop and continue cross-connection defines the ring direction, all other VT drop and continue cross-connections at that node are forced to use that ring rotation.

Similarly at CO 2, the other drop and continue node, the cross-connection command requires the same two parameters. The **cct** parameter is **dc** and the value for **ring** is **m1**, which means to continue the signal on Ring 1 toward CO 1.

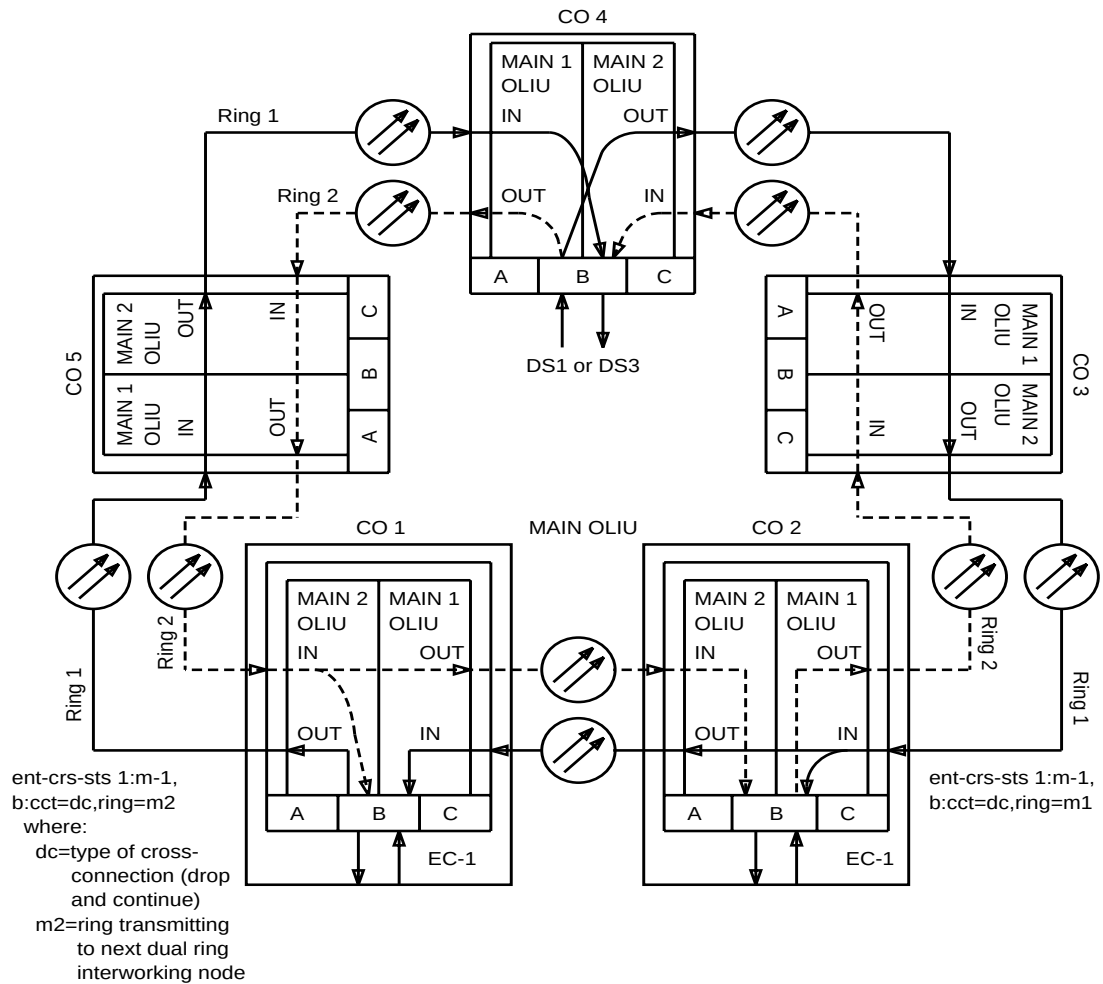


Figure 8-8. Drop and Continue Nodes

OC-3/OC-12 Ring Network Drop and Continue Cross-Connection Example

Figure 8-9 shows a DRI network.

1. The user wants to provision a fully protected service using drop and continue cross-connections in this dual ring topology. The service is a DS3 at RT2 (bottom node in figure) to CO 4 (top node in figure).
2. All nodes in both rings require 22-type or 24-type OLIUs in the main slots and all nodes require the same release of drop and continue ring software. The two terminating nodes (CO 4 and RT2) require low-speed DS3 circuit packs in a function unit as defined by the work order.
3. The site CO 1 has two NEs, one is part of the upper ring subnetwork and the other is a part of the lower subnetwork. They are connected by EC-1 signals provided by STS1E low-speed circuit packs. The figure shows these connections in function unit B of both NEs but any available function unit can be used.
4. Note in the figure the identification of Ring 1 (clockwise) and Ring 2 (counterclockwise). This identification is a key to correct provisioning and needs to be checked before cross-connections are made.
5. The work order will specify the low-speed channel of the DS3 service, the available high-speed channel on the lower ring, and the low-speed channel assigned at the drop and continue nodes. While it is not required by DDM-2000 that the low-speed channel of the drop and continue nodes be the same, it is recommended to simplify record keeping.
6. For this example, the cross-connections are:
ent-crs-sts1:b,m-1 at RT2 (two-way drop)
ent-crs-sts1:m-1,m-1 at RT3 and RT1 (pass-through)
ent-crs-sts1:m-1,b:cct=dc,ring=m1 at CO 1 (lower NE)
ent-crs-sts1:m-1,b:cct=dc,ring=m2 at CO 2 (lower NE).

The continued signal at CO 1 must be assigned to Ring 1 ("m1"), and the continued signal at CO 2 must be assigned to Ring 2 ("m2").

7. In a similar manner, the upper ring is provisioned according to the work order. The high-speed and low-speed addresses do not have to be the same as the ones used in the lower ring, but they must follow the rules for rings, which is to assign a single high-speed channel to all nodes for this DS3 service.

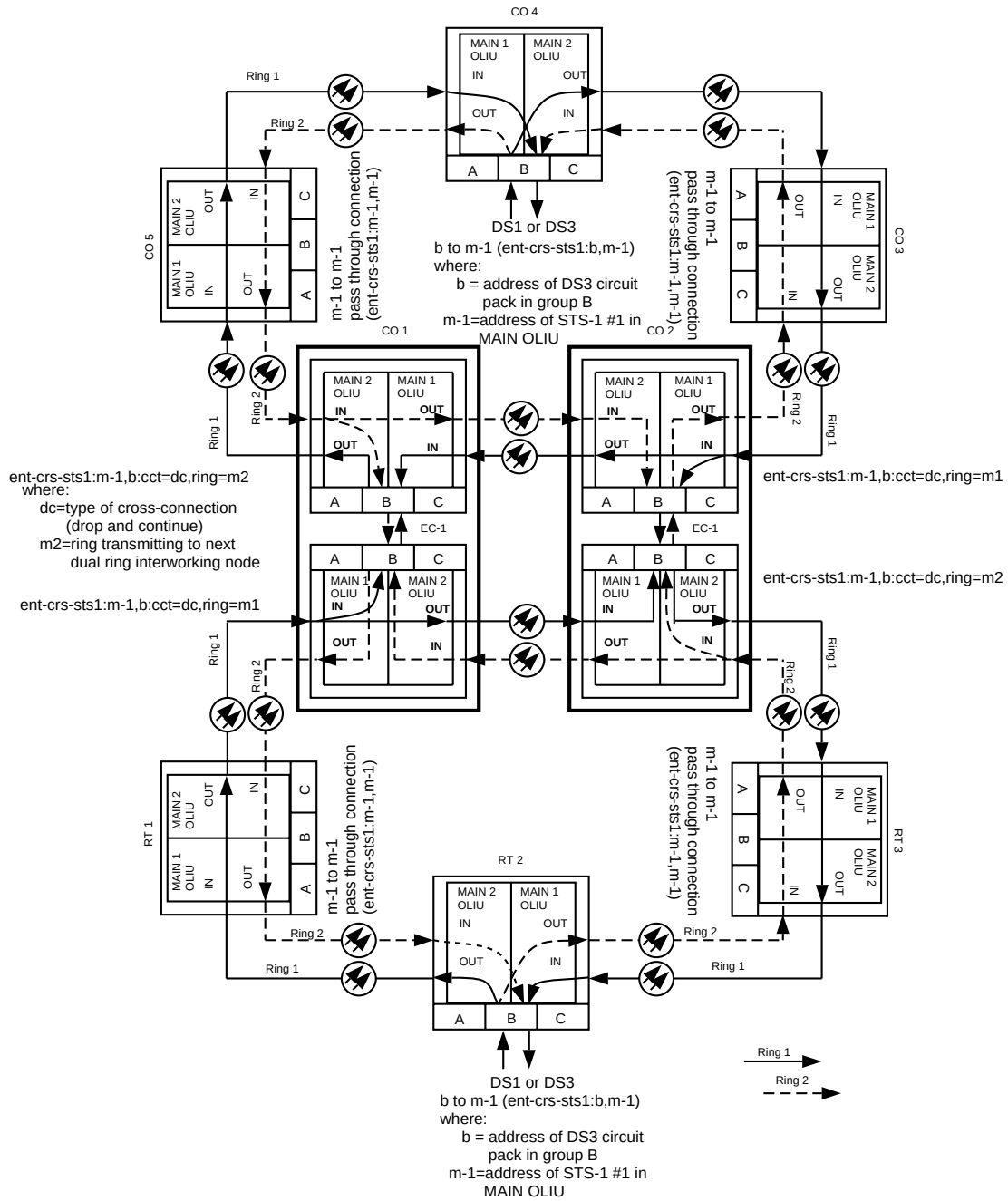


Figure 8-9. Example Dual Ring Configuration Cross-Connections

For this example, the cross-connections are:

ent-crs-sts1:m-1,b:cct=dc,ring=m2—at CO 1 (upper NE)
ent-crs-sts1:m-1,b:cct=dc,ring=m1—at CO 2 (upper NE)
ent-crs-sts1:m-1,m-1—at CO 3 and CO 5 (pass-through)
ent-crs-sts1:b,m-1—at CO 4 (two-way drop).

The continued signal at CO 1 must be assigned to Ring 2 ("m2"), and the continued signal at CO 2 must be assigned to Ring 1 ("m1").

8. Cross-connections supporting DS3 services are STS-1 cross-connections. Cross-connections supporting DS1 services may be either STS-1 or VT1.5 cross-connections. VT1.5 drop and continue services use the same procedure except that the addresses and channels used are VT. The interface between the two rings at the drop and continue nodes is still the STS1E circuit pack, which can support VT1.5 cross-connections as well as STS-1 cross-connections. See the TOP section of this manual (Volume II) for procedures.

OC-3/OC-12 VT1.5 Path Switched Ring (0x1) Single Homing

Figure 8-10 shows an example of an OC-12 VT1.5 path switched ring (0x1) single homing application. The figure is placed after the example explanation and can be removed for reference.

The DDM-2000 OC-12 ring supports 0x1 OC-3/IS-3 interfaces in its function unit slots. These interfaces must be provisioned as 0x1. Signals pass through the DDM-2000 OC-12 transport ring and exit to the DDM-2000 OC-3 ring. OC-12 function unit slot FN(x)-1 is connected to OC-3 main-1, and OC-12 function unit slot FN(x)-2 is connected to OC-3 main-2. Switching is not done on the DDM-2000 OC-12 Multiplexer on these lines or paths on these lines; rather VT1.5 or STS-1 level path switching is done on the DDM-2000 OC-3 Multiplexer. This allows DDM-2000 OC-3 nodes running ring software to interface with DDM-2000 nodes of an OC-12 ring in such a way as to provide ring-on-ring architecture. Each OC-3 ring so supported occupies up to three STS-1 time slots on the OC-12 ring. Each OC-12 node can provision the same STS-1 time slots as other OC-12 nodes to drop to the OC-3 shelf (to share STS-1s among several OC-3 shelves) or the OC-12 node can provision different STS-1s at different sites. When 0x1 is used, the OC-12 ring passes the contents of these STS-1 time slots between the low-speed OC-3/IS-3 lines and OC-12 high-speed lines without terminating them or performing any path protection switching on them. Up to four OC-3 rings can be supported in this fashion by an OC-12 ring to maximize the OC-12 bandwidth utilization. This allows access to any and all VT1.5 signals at an OC-12 site. Since the high-speed signals from the OC-3 ring(s) are sent as two copies (one clockwise, the other counter-clockwise) on the OC-12 ring, the OC-12 ring capacity is limited to the OC-12 line rate.

The OC-3/IS-3 lines between an OC-12 node and an OC-3 node connected in a ring 0x1 fashion behave like the OC-3 lines between the nodes on an OC-3 ring and do not perform line level protection switching. Instead, the OC-3 shelves perform the normal path protection switching functions.

Some points to note for this application are:

- 0x1 can be thought of as a "ring on ring" with many of the characteristics of a single ring.
- Pass-through cross-connections may be required at the VT and STS level.
- The OC-3 ring can be composed of any three STSs in the OC-12.
- An OC-12 STS may be the first STS in one extension, the second STS in another, and the third STS in another.

Example Cross-Connections

The OC-12 (STS level) cross-connections are:

- At CO: mb-1:a-3
mb-1 is dropped to the third STS in the OC-3 between CO and CO-1.
- At RT1: mb-1:a-1
mb-1 is dropped to the first STS in the OC-3 between RT1 and RT1-1.
- At RT2: mb-1:c-2
mb-1 is dropped to the second STS in the OC-3 between RT2 and RT2-2.
- RT3 is an OC-3 shelf equipped with OC-12 optics. The 24G-U OLIUs provide the ability to drop up to any three of the 12 STS-1s at this node. The remaining STS-1s continue on the OC-12 ring.
- At RT4: mb-1:mb-1
mb-1 is passed through RT4 at the STS level.

These cross-connections can be thought of as establishing one STS of an OC-3 ring embedded in the OC-12 system. This is sometimes referred to as a "ring on ring." In the example, the OC-3 nodes are CO-1, RT1-1, and RT2-2. The STS itself traverses all eight nodes. An "ordinary" STS (for example, one that carries a DS3 from an originating node to a terminating node) can drop at only two locations (terminate in two-way at the source and destination), and pass-through cross-connections are needed at the intermediate nodes. There can be multiple drop (ring 0x1) type cross-connections to optical extensions.

The VT cross-connections that follow drop or pass through individual VTs in the STSs. This is like an ordinary OC-3 ring, except that, the same OC-12 STS can be dropped to different STSs in the various OC-3s. In an ordinary ring, the same time slot (for example m-1-1-1) is used all the way around the ring. In a ring-on-ring application, the TSI can change in each extension. The same VTG/VT will be used but the STS can change.

The OC-3 (VT level) cross-connections are:

- At CO-1: a-1-4:m-3-2-1
The first VT in the second VTG is assigned between CO and CO-1. This slot will be used to transport the DS1 that will terminate on port a-1-4.
- At RT1-1: b-2-1:m-1-2-1
The above DS1 will leave the system from port b-2-1 at RT1-1. The VTG/VT slot (-2-1) is set by the cross-connection at CO-1. Because OC-12 STS mb-1 is dropped to the first STS in this OC-3 extension (m-1), port b-2-1 is cross-connected to m-1-2-1.
- At RT2-2: m-2-2-1:m-2-2-1
At RT2, time slot mb-1 is dropped to the second STS going to RT2-2 (m-2). The VT/VTG assignment remains -2-1. A VT pass-through cross-connection is needed to enable future DS1s to be dropped at RT2-2. If drops will never be needed, STS pass-through cross-connections can be used.
- RT3 is an OC-3 shelf equipped with OC-12 optics. The 24G-U OLIUs provide the ability to drop up to any three of the 12 STS-1s at this node. The remaining STS-1s continue on the OC-12 ring.

With these cross-connections, DS1s originating at any of the three OC-3 nodes can be terminated at any one of the others with VT cross-connections at those nodes only. The STS "pipe" is in place with the OC-12 cross-connections. As was the case with the example DS1, two VT drop cross-connections and two pass-through cross-connections are needed.

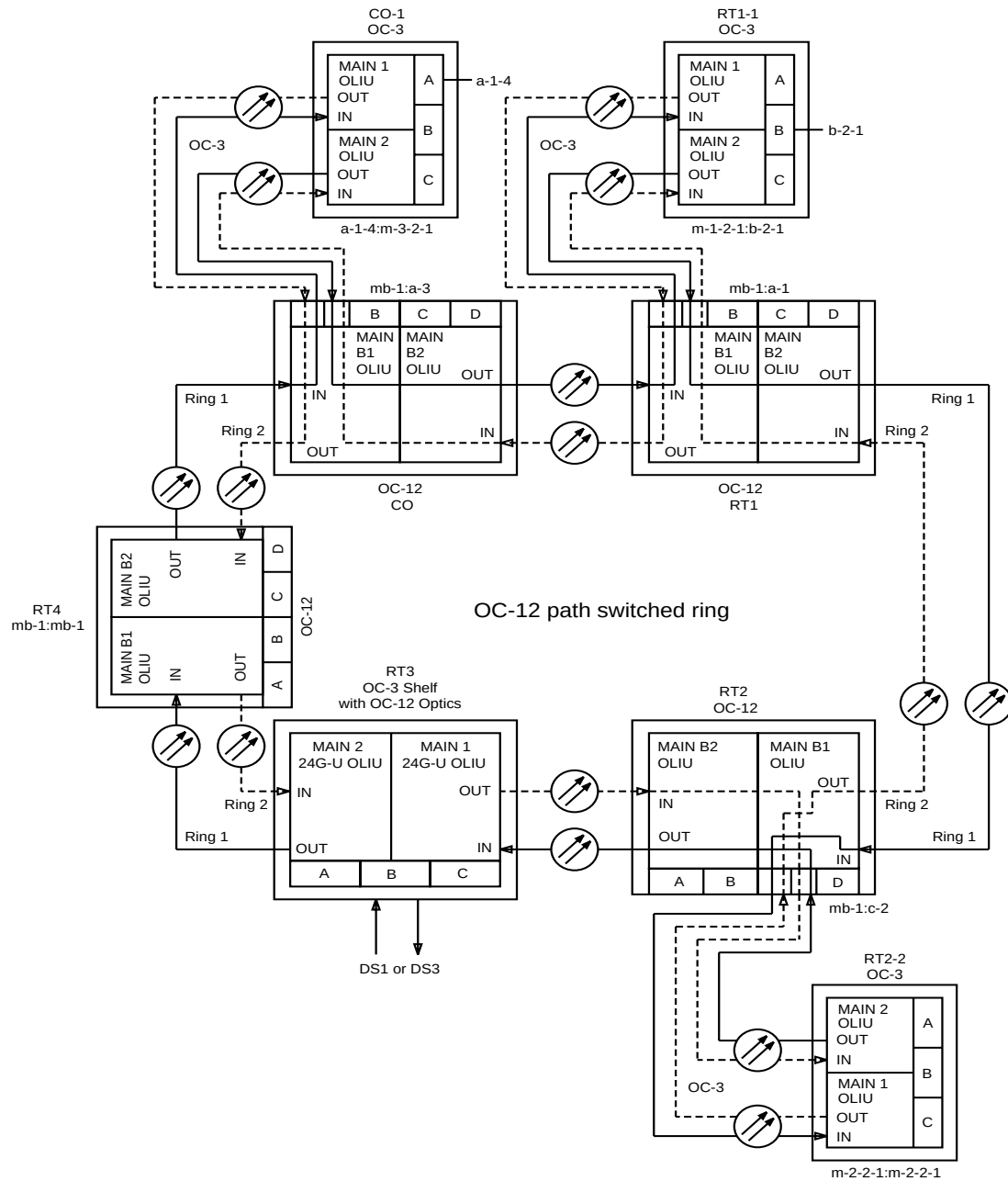


Figure 8-10. Example OC-3/OC-12 0x1 Single Homing Configuration Cross-Connections

OC-3/OC-1 Ring Cross-Connection Provisioning

For every DS1 transported through a ring network, a cross-connection is needed in every NE (node) on the ring. A "drop" cross-connection is needed at the nodes where service enters or exits the ring. A "pass-through" cross-connection is needed at all other nodes (intermediate nodes) on the ring.

For the DDM-2000 Multiplexers, cross-connections of both ring paths are entered with a single command entry per shelf. This minimizes the possibility of provisioning a circuit without a protection channel. A DDM-2000 OC-1 ring has 28 VT1.5 channels. The ring channels are always carried within the 26-type OLIU circuit packs in the main 1 and main 2 slots in FiberReach WBS nodes. There is no need to identify ring channels in main 1 different from main 2 because both rings are always provisioned with the same information.

At the entry and exit points, the VT channels are cross-connected to the low-speed ports (for example, **{ls group}-{slot#}-{port# on slot}, a-1-4**). These are called "drop" connections. For example, the command **ent-crs-vt1:m-1-6-4,a-1-3** connects the third low-speed port associated with slot 1 of low-speed group A to the fourth VT1.5 within the sixth VT group within the first (and only) STS-1 of both OC-1 rings.

At the intermediate nodes, a pass-through cross-connection establishes a cross-connect path on both rings. Pass-through cross-connections are designated by using the same VT ring channel twice in the cross-connect address. For example, the single command **ent-crs-vt1:m-1-6-4:m-1-6-4** connects a pass-through cross-connection both to and from the fourth VT1.5 within the sixth VT group within the first STS-1 of both the service and protection ring.

Depending on local practice, work orders will normally identify the low-speed port designations at the entry and exit points in the network and the TIDs of the NEs at these points. The work order may also designate the VT1.5 ring channel which will be used for this service. If the work order does not designate a ring channel to use, use the command **rtrv-crs-vt1**; to identify all the ring channels that are currently unassigned. The work order also may not designate all the other NEs on the ring that need to be provisioned with pass-through cross-connections. In this case, use the **rtrv-map-netwk** command to identify the TIDs for all the NEs in a ring.

OC-3/OC-1 Ring Network Cross-Connection Example

The following paragraphs describe a ring network example configuration and describe how to create manual cross-connections to establish the ring network. Figure 8-11 shows the five nodes with dashed lines indicating the cross-connections.

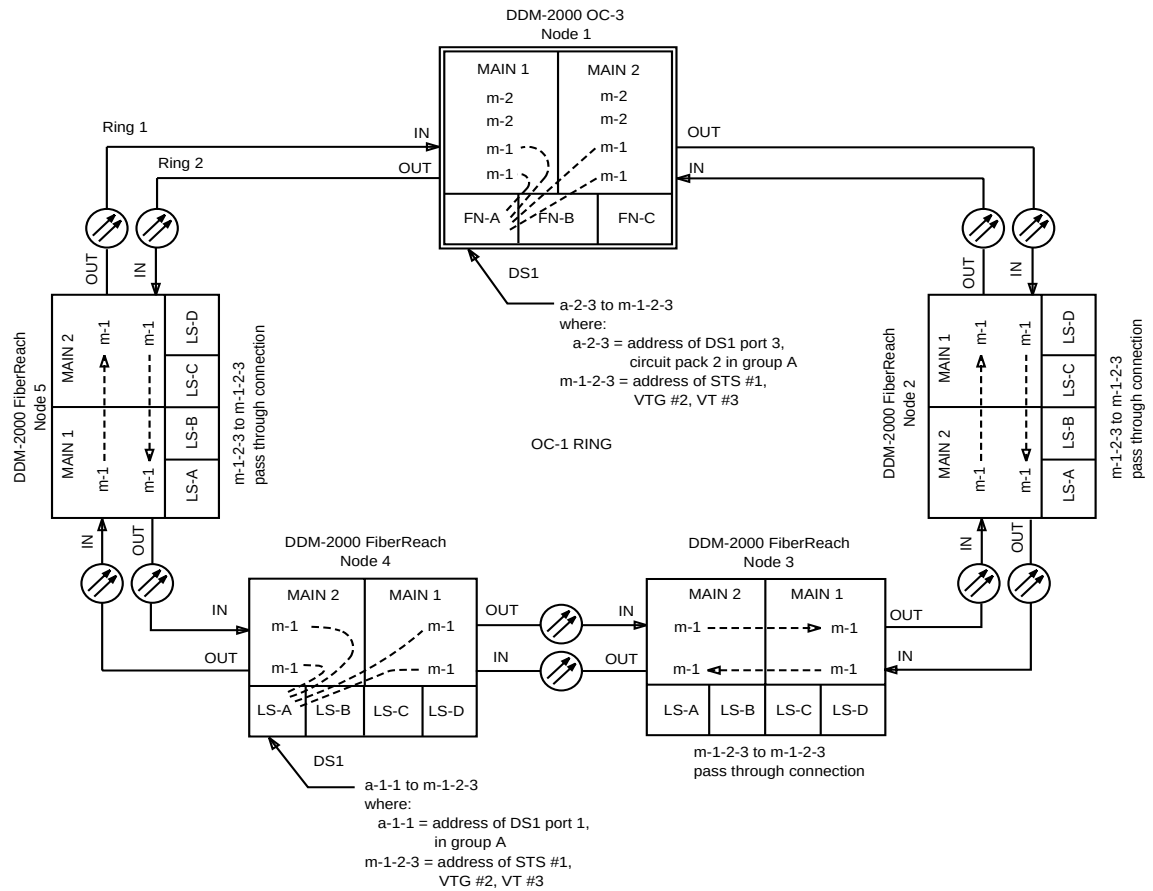


Figure 8-11. Example OC-1 Ring Configuration Cross-Connections

In Figure 8-11, the example configuration is a ring network with two ring fibers and five nodes. Ring 1 carries ring traffic in the clockwise direction while Ring 2 carries ring traffic in the counterclockwise direction. In the example configuration, Node 1 is a DDM-2000 OC-3 shelf equipped with 27-type OLIU circuit packs in the main slots, MXRVOs in function unit A, and DS1 or DS1PM circuit packs in the Low-Speed Group A slots. Nodes 2 through 5 are DDM-2000 FiberReach Multiplexer wideband shelves with 26-type OLIU circuit packs in the main slots and DS1 or DS1PM circuit packs in the low-speed Group A slots. All shelves are properly installed and provisioned. This example is for DS1 services. See "System Turnup/ Circuit Order" in the TOP section (Volume II) for actual procedures.

Ring configurations support manual VT1.5 cross-connections. Manual cross-connections must be made at **each** node in the network for each circuit being established. Drop cross-connections are made at the drop nodes where service enters or exits the node (Nodes 1 and 4) and pass-through cross-connections are made at **each** intermediate node (Nodes 2, 3, and 5).

It is recommended that pass-through cross-connections be entered first, as shown below, to avoid transient alarms during provisioning.

The following commands may be used to delete, enter, and retrieve cross-connections: **dlt-crs-vt1**, **ent-crs-vt1** and **rtrv-crs-vt1**. See Chapter 11, "Commands and Reports," for a description of these commands.

To establish the end-to-end DS1 circuit from Node 1 to Node 4, as shown in Figure 8-11, enter a cross-connection at each node as follows:

1. Enter the following pass-through cross-connections at Nodes 2, 3, and 5:

ent-crs-vt1:m-1-2-3,m-1-2-3:cct=twoway;

2. Enter the following cross-connection to drop the VT1.5 channel from the OC-1 ring to a DS1 interface at Node 1:

ent-crs-vt1:m-1-2-3,a-2-3:cct=twoway;

3. Enter the following cross-connection to drop the VT1.5 channel from the OC-1 ring to a DS1 interface at Node 4, a DDM-2000 FiberReach Wideband shelf:

ent-crs-vt1:m-1-2-3,a-1-1:cct=twoway;

4. Test both paths around the ring. Since DDM-2000 uses non-revertive path switching to minimize the number of hits on services, the initial path selection is arbitrary. Use **rtrv-state-path** and **sw-path-vt1** commands to test both ring paths around the ring network at the drop nodes of the new service. The **sw-path-vt1** command should be limited to the addresses that are being tested. For the example, the commands to be used at Node 1 and Node 4 are:

sw-path-vt1:m1-1-2-3 and **sw-path-vt1:m2-1-2-3**.

Note that this same configuration could be set up using the second OC-1 interface on the 27G-U OLIUs in the main slots of the DDM-2000 OC-3 shelf at Node 1. To do this using the same VT1.5 timeslot on the OC-1 ring, replace the VT1.5 address **m-1-2-3** with **m-2-2-3** in Step 2, above. All other cross-connections remain the same.

Single-Homed OC-3/OC-1 Path-Switched Ring Example

Figure 8-12 shows an example of an OC-1 VT1.5 single-homed path-switched ring application. The NEs on the OC-3 ring can be either DDM-2000 OC-3 Multiplexers or *SLC-2000* Access Systems. Refer to this figure when reviewing this example.

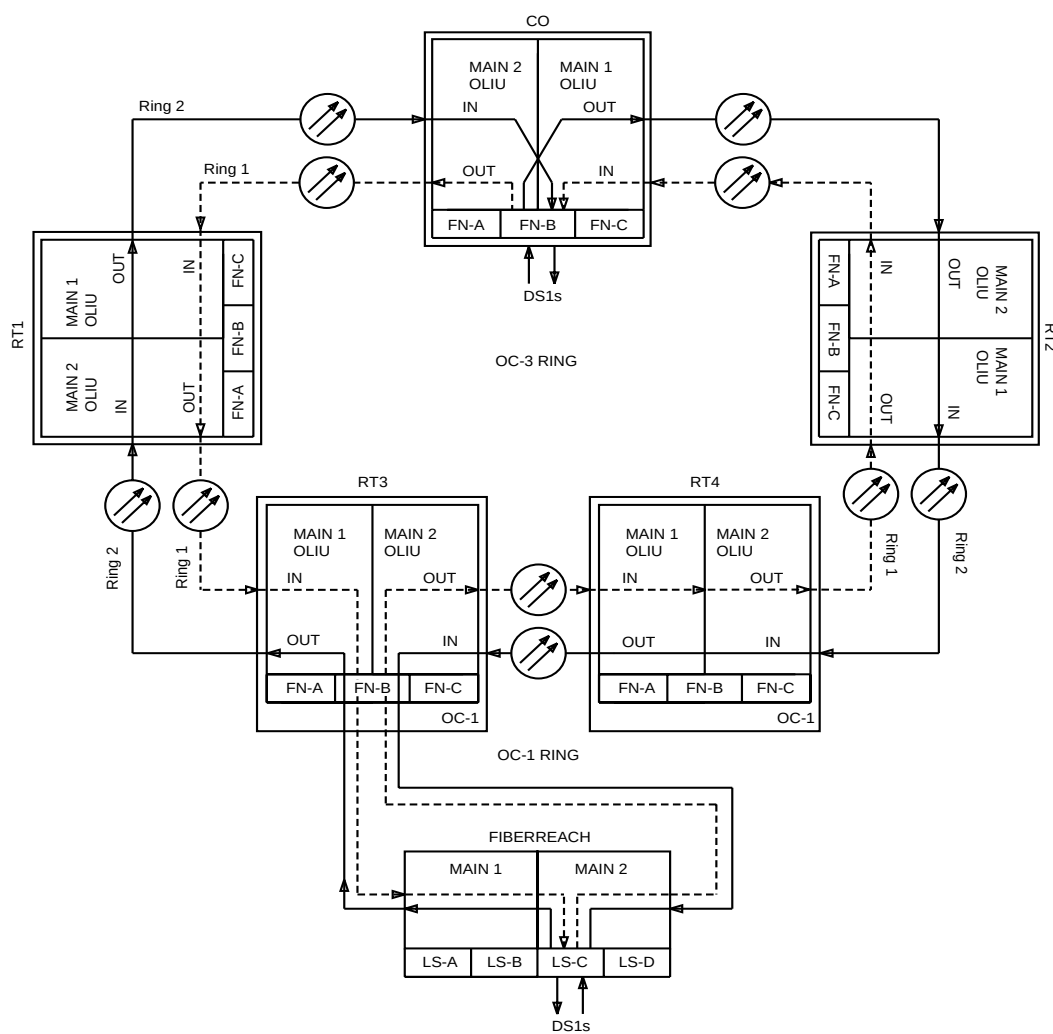


Figure 8-12. Example Single-Homed Path-Switched Ring Configuration Cross-Connections

In Figure 8-12, the DDM-2000 OC-3 shelf at RT3 supports a single-homed OC-1 interface in function unit B. Signals are connected between the OC-3 interface in main-1 and the OC-1 interface(s) in fn-B-1, and between the OC-3 interface in main-2 and the OC-1 interface(s) in fn-B-2. Switching is not done on the DDM-2000 OC-3 Multiplexer on these interfaces; rather VT1.5 level path switching is done on the DDM-2000 FiberReach Multiplexer and on the DDM-2000 OC-3 shelf at the CO node. This allows DDM-2000 FiberReach nodes to interface with DDM-2000 nodes of an OC-3 ring, providing "ring-on-ring" architecture. Each OC-1 ring so supported occupies up to 28 VT1.5 time slots on the OC-3 ring. When single-homing is used, the OC-3 system passes the VT1.5 time slots between the OC-1 interfaces and OC-3 interfaces without terminating them or performing any path protection switching on them. Up to six OC-1 rings can be supported by one DDM-2000 OC-3 shelf in this way. Since the signals from the OC-1 ring(s) are sent as two copies (one clockwise, the other counter-clockwise) on the OC-3 ring, the OC-3 ring capacity is limited to the OC-3 line rate (84 VT1.5 signals). So, although one DDM-2000 OC-3 shelf can support up to six OC-1 rings, the full capacity of all six OC-1 rings cannot be carried on the OC-3 ring.

The OC-1 lines between an OC-3 node and an OC-1 node behave like the OC-1 lines between the nodes on an OC-1 ring and do not perform line level protection switching. Instead, the DDM-2000 FiberReach shelves perform the normal path protection switching functions.

Some points to note for this application are:

- Single-homing can be thought of as a "ring-on-ring" with many of the characteristics of a single ring.
- Pass-through cross-connections may be required at the VT level on both the OC-1 and OC-3 rings.
- The OC-1 ring can be composed of up to 28 VT1.5 signals from the OC-3 ring.
- More DDM-2000 FiberReach wideband shelves could be added to the OC-1 ring. A cross-connection from the OC-1 interface to a DS1 interface would be required at one of the DDM-2000 FiberReach wideband shelves on the OC-1 ring, and pass-through cross-connections would be required at all other DDM-2000 FiberReach wideband shelves on the OC-1 ring.

Example Cross-Connections

To establish the end-to-end DS1 circuit from the CO to the DDM-2000 FiberReach wideband shelf as shown in Figure 8-12, enter a cross-connection at each node as follows:

- At RT1, RT2, and RT4:

ent-crs-vt1:m-1-2-3,m-1-2-3:cct=twoway;

The VT signal passes through these sites on the OC-3 ring, so two-way cross-connections with identical addresses are provisioned here.

- At RT3: **ent-crs-vt1:m-1-2-3,b-1-5-4:cct=twoway;**

This single command establishes the following signal paths through the DDM-2000 OC-3 shelf at RT3:

- from main-1, STS-1 #1, VTG #2, VT1.5 #3 to FN-B-1, STS-1 #1, VTG #5, VT1.5 #4
- from FN-B-1, STS-1 #1, VTG #5, VT1.5 #4 to main-1, STS-1 #1, VTG #2, VT1.5 #3
- from main-2, STS-1 #1, VTG #2, VT1.5 #3 to FN-B-2, STS-1 #1, VTG #5, VT1.5 #4
- from FN-B-2, STS-1 #1, VTG #5, VT1.5 #4 to main-2, STS-1 #1, VTG #2, VT1.5 #3

1. At the CO: **ent-crs-vt1:m-1-2-3,b-7-4:cct=twoway;**

This is a "drop" from the OC-3 ring to a DS1 interface.

2. At DDM-2000 FiberReach: **ent-crs-vt1:m-1-5-4,c-1-1:cct=twoway;**

This is a "drop" from the OC-1 ring to a DS1 interface.

It is recommended that the pass-through cross-connections be entered first, as shown here, to avoid transient alarms during provisioning.

Dual-Homed OC-3/OC-1 Path-Switched Ring Example

Dual-homing offers even more survivability than a single-homed network, as even the catastrophic failure of a host node can be protected. Figure 8-13 shows an example of a dual-homed OC-1 extension from two remote nodes on an OC-3 access ring. The NEs on the OC-3 ring can be either DDM-2000 OC-3 Multiplexers or *SLC-2000* Access Systems.

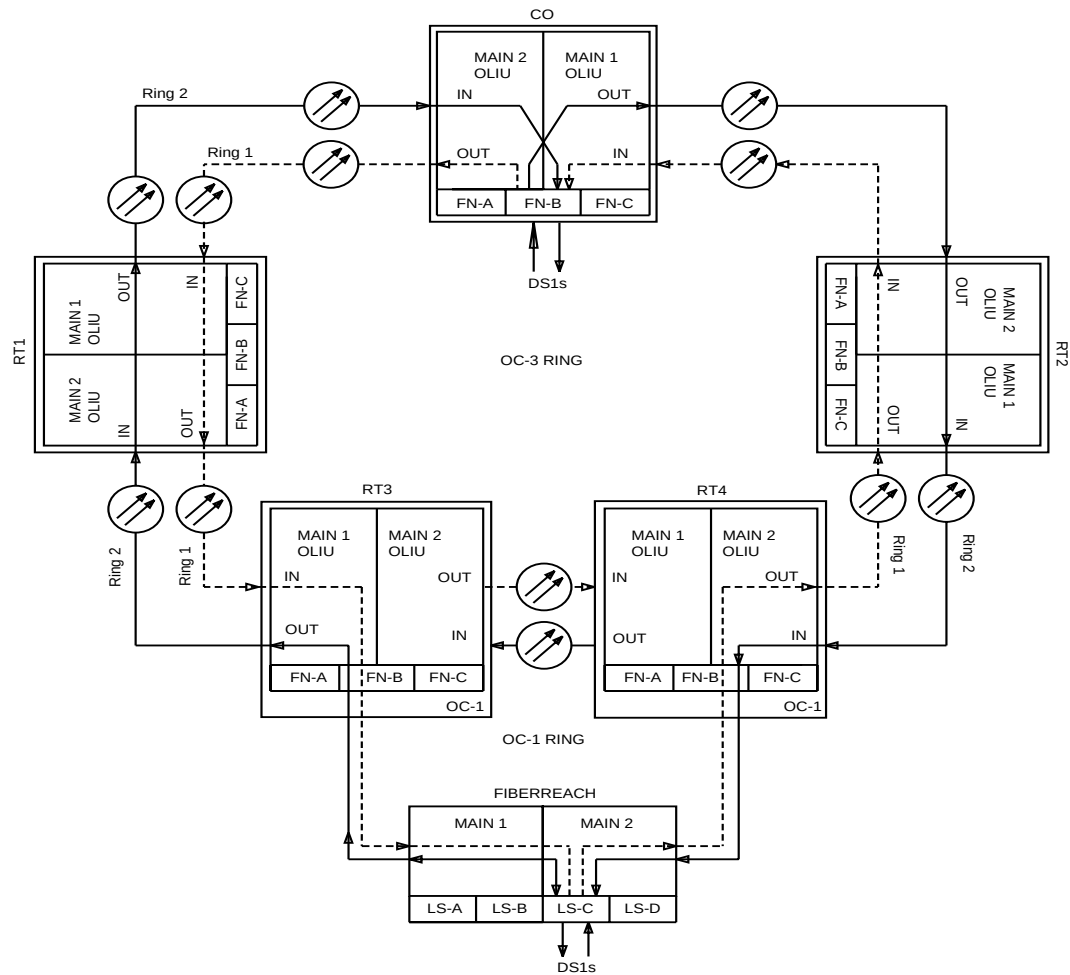


Figure 8-13. Example Dual-Homed OC-3/OC-1 Path-Switched Ring Configuration Cross-Connections

Path protection switching is employed for dual-homed applications, just like in single-homed applications. That is, path switching is supplied by the remote DDM-2000 FiberReach nodes and the DDM-2000 OC-3 systems in the wire center. However, the OC-3 host node configuration is different than for single homing. Since an OC-3 host node terminates only one leg of the OC-1 extension, it employs a 0x1 low-speed interface to the OC-1 ring extension. The dual OC-1 circuit pack can be unprotected in a dual-homed application. Dual- and single-homed extensions can also be mixed at a host node, allowing the access network to be tailored efficiently to different groups of customers.

Example Cross-Connections

The cross-connect commands at each node in Figure 8-13 are as follows:

- At RT1 and RT2: **ent-crs-vt1:m-1-2-3,m-1-2-3:cct=twoway;**
The VT signal in the ring is only passing through these sites, so two-way cross-connections with identical addresses are provisioned here.
- At RT3 and RT4: **ent-crs-vt1:m-1-2-3,b-4-7:cct=twoway;**
At these sites, the VT1.5 signal is routed between a timeslot on the OC-3 ring and a timeslot on the OC-1 ring.
- At the DDM-2000 FiberReach: **ent-crs-vt1:m-1-4-7,c-1-4:cct=twoway;**
At this site, the signal is routed from a DS1 interface to the same timeslot on both rotations of the OC-1 ring. In the other direction, the VT1.5 signals received from both rotations of the OC-1 ring are monitored, path protection switching is provided, and the selected signal is routed to the DS1 interface.
- At CO: **ent-crs-vt1:m-1-2-3,b-1-1:cct=twoway;**
At this site, the signal is routed from a DS1 interface to the same timeslot on both rotations of the OC-3 ring. In the other direction, the VT1.5 signals received from both rotations of the OC-3 ring are monitored, path protection switching is provided, and the selected signal is routed to the DS1 interface.

Switch Selectable Parameters

Table 8-25 lists the parameters provisionable via hardware switches. Refer to the command pages in Section 11, "Commands and Reports," for a complete explanation of parameters.

CIT Selectable Parameters

Table 8-26 lists the parameters provisionable via the CIT. Refer to the command pages in Section 11, "Commands and Reports," for a complete explanation of parameters. Additional information on the ID parameters are provided in the "Identifiers" part immediately following Table 8-26.

Table 8-25. Parameters Provisionable via Hardware Switches

Parameter	Range	Pack	Command (Note)
Product ID (S1)	"Product Type"	SYSCTL	rtrv-ne
TBOS termination (S2)	last, not last	SYSCTL	
Optical transmitter power	high, low	21G/21G-U OLIU	rtrv-oc3
DS1 reference format §	SF, ESF	TG	rtrv-sync
DS1 reference line coding §	AMI, B8ZS	TG	rtrv-sync
Shelf timing mode	free-running, external DS1, line timed	TG	rtrv-sync
SYNC Output LBO ‡	5 settings (cable dependent)	TG	
DS1 Output	MULT/SYNC OUT	TG	rtrv-sync
DS1 line coding *	AMI, B8ZS	DS1	rtrv-t1
DS1 LBO †	5 settings (cable dependent)	DS1	
DS3 LBO †	2 settings (cable dependent)	DS3	
STS1E LBO †	2 settings (cable dependent)	STS1E	
STS1E pack type	high-speed, low-speed	STS1E	rtrv-eqpt rtrv-ec1
OW type	E1-Only, Multiplexed	BBG10 OHCTL	set-ow
OW type	<i>MegaStar 2000</i>	BBG8/BBG8B	

Notes:

Current switch settings except DS1 LBO, SYNC Output LBO, DS1 LBO, STS1E LBO, and TBOS termination can be reported using CIT.

* CIT can override switch settings. (Factory default is *noOverride*.) Parameter can be set for each port.

† Parameter can be set for each circuit pack.

‡ Operational only when in SYNC OUT mode.

§ For both DS1 in and out.

Table 8-26. Parameters Provisionable via the CIT

Parameter	Range	Default (Note 1)	Command (Note 2)
Date	current value	70-01-01	set-date
Time	current value	00:00:00	set-date
Target ID (system name)	20 characters	Site#NE#	set-ne
Cross-connect mode §§	default, manual	default	set-ne
Site number	1-32	32	set-ne
Network element #	1-5	5	set-ne
Shelf number	1-8	1	set-ne
CO/RT select	CO, RT	RT	set-ne
TBOS address	1-8	1	set-ne
TBOS link	primary, secondary, normal, to TBOS	no TBOS	set-ne
TBOS remote	enabled, disabled	disabled	set-ne
DSNE ¶¶	yes, no	no	set-ne
AGNE	yes, no	no	set-ne
Alarm group number	1-255	255	set-ne
STS Uneqpd./AIS insert	Uneqpd., AIS	AIS	set-ne
VT Uneqpd./AIS insert	Uneqpd., AIS	AIS	set-ne
CIT page length	0 (pager off), 3-150 rows	24	set-link
PM thresholds	See PM Table 10-19		set-pmthres
Alarm holdoff delay	0-30 sec	2	set-attr-alm
Alarm clear delay	0-30 sec	15	set-attr-alm
Power minor almn. level	MN, MJ	MN	set-attr-alm
OC-1 degrade threshold	10^{-5} to 10^{-9}	10^{-6}	set-oc1
AIS almn. level of NSA OC-1			
Line AIS	CR, MJ, MN, NA	NA	set-oc1
OC-3 degrade threshold	10^{-5} to 10^{-9}	10^{-6}	set-oc3
Sync Messaging	K byte, S byte, disabled	K byte	set-oc3
Concatenation mode §§	enabled, disabled	enabled	set-oc3
AIS almn. level of NSA OC-3			
Line AIS	CR, MJ, MN, NA	NA	set-oc3
Orderwire* (E1-Only)	thru, e1dropmain, e1dropfnc	e1dropmain (Linear) thru (Ring)	set-ow
Orderwire* (Multiplexed)	thru, muxdrop	muxdrop (Linear) thru (Ring)	set-ow
OC-12 degrade threshold §§§	10^{-5} to 10^{-9}	10^{-6}	set-oc12
Sync Messaging §§§	K byte, S byte, disabled	K byte	set-oc12
AIS almn. level of NSA OC-12			
Line AIS §§§	CR, MJ, MN, NA	NA	set-oc12
STS-1 path signal			
degrade threshold †††	10^{-5} to 10^{-9}	0 (disabled)	set-sts1
NSA STS-1 path AIS			
alarm level	MN, NR	MN	set-sts1
SA STS-1 path AIS			
alarm level	CR, MN, NA, NR	MN	set-sts1
STS-1 channel state ***	NMON, AUTO ‡	AUTO	set-state-sts1

Table 8-26. Parameters Provisionable via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
OC-1 line state ‡‡‡	NMON, IS	IS	set-state-oc1
VT1.5 path signal degrade threshold ***†††	10^{-5} to 10^{-8}	0 (disabled)	set-vt1
NSA VT path AIS	MN, NR	MN	set-vt1
SA VT path AIS	MJ, MN, NA, NR	MJ for ring MN for linear	set-vt1
VT channel state ***	NMON, AUTO ‡	AUTO	set-state-vt1
DS3 VMR mode †	VMR, VM, clear channel	VMR	set-t3
Clear channel DS3 AIS insertion †	yes, no	no	set-t3
DS3 sig failure alm. level †	CR, MJ, MN, NA	CR	set-t3
DS3 failure threshold †	10^{-3} , 10^{-6} BER	10^{-3}	set-t3
DS3 PM mode †	off, on	on	set-t3
DS3 PM frame †	m13, cbit	m13	set-t3
DS3 PM format †	pbit, fmbit, cpbit	pbit	set-t3
DS3 AISAlmLevel (TMUX only)	CR, MJ, MN, NA	NA	set-t3
DS3 Xbit (TMUX only)	1, 0	1	set-t3
DS3 port state †	NMON, AUTO ‡	AUTO	set-state-t3
DS1 line coding †	AMI, B8ZS, noOverride §	noOverride	set-t1
DS1 alarm level †	MJ, MN, NA	NA	set-t1
DS1 AIS insertion †	yes, no	yes	set-t1
DS1 failure threshold †	10^{-3} , 10^{-6} , 10^{-7} , 10^{-8} BER	10^{-3}	set-t1
DS1 BPV to LOS †	yes, no	no	set-t1
DS1 PM Mode †	off, on	off	set-t1
DS1 PM Format †	sf, esf, esfn	esf	set-t1
DS1 primary port state †	NMON, AUTO ‡	AUTO	set-state-t1
Environmental alarm level	CR, MJ, MN, NA	MN	set-attr-env
Environmental alarm type	10 characters		set-attr-env
Environmental alarm description	26 characters		set-attr-env
Control point description	26 characters		set-attr-cont
Far-end communication via DCC **	enabled, disabled	enabled	set-fecom
DCC identity for OSI ntws.	userside, networkside	see command pgs.	set-fecom
Set security **	enabled, disabled, lockout	disabled	set-secu
CIT security **	enabled, disabled, lockout	disabled	set-secu
CIT timeout (minutes) **	0-120	15	set-secu
DCC security **	enabled, disabled, lockout	disabled	set-secu
DCC timeout (minutes) **	0-120	15	set-secu
Sync Timing Source §§ ‡‡	main, fn-c	main	set-sync
Sync Output Mode	track¶, lock1, lock2	track	set-sync
Sync Timing Source †† ‡‡	main-1, main-2, fn-c	main-1	set-sync
SYNC mode switching	revertive, nonrevertive	revertive	set-sync
AIS Threshold	level 5, level 4, level 3, level 2	level 5	set-sync
Auto. sync. reconfig.	enabled, disabled	disabled	set-sync

Table 8-26. Parameters Provisionable via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
EC-1 alarm level † EC-1 degrade threshold † EC-1 port state †	CR, MJ, MN, NA 10 ⁻⁵ to 10 ⁻⁹ BER NMON, AUTO ‡	CR 10 ⁻⁶ AUTO	set-ec1 set-ec1 set-state-ec1
Feature package ** VT PM, DS1 PM, or STS3c	enabled, disabled	disabled	set-feat
X.25 packet size	128, 256	256	set-x25
NSAP OrganizationID (Operator ID) Reserved (Reserved) Routing Data (Domain/Area)	6 hex digits 4 hex digits 8 hex digits	000000 0000 00000000	ent-u1sdcc ent-u1sdcc ent-u1sdcc
VC ckt. type X.25 attach. SNPA: LCN for PVCs	PVC, SVC LCN, DTE	PVC LCN1 (PVC) LCN2 (PVC) LCN3 (PVC)	ent-osacmap
or DTE address for SVC OS type (ACID)	see command pgs. see command pgs.		ent-osacmap ent-osacmap
ACID (OS type or funct.) TL1 message type Action to assoc. message type to OS	see command pgs. see command pgs. enabled, disabled	enabled	ent-t1lmsgmap ent-t1lmsgmap ent-t1lmsgmap
Cross-connection type Ring ID for drop&continue	two-way, dc m1, m2	two-way see command pgs.	ent-crs-sts1 ent-crs-sts1
Cross-connection type	two-way, dc, locked	two-way	ent-crs-vt1
Outgoing STS-1 path trace message	62 characters	see command pgs.	set-trace-sts1
Expected STS-1 path trace message	62 characters	see command pgs.	set-trace-sts1

See notes and footnotes at end of table.

Notes:

1. Default means factory default (the CIT prompts display current provisioned values).
 2. To view the current values, precede these commands with **rtrv-** instead of **set-**.
- * BBG10 required for Releases 8.1 and 9.1. *MegaStar* applications only.
- † Parameter can be set for each port.
- ‡ AUTO means the port or channel is ready to be automatically provisioned via signal detection.

- § noOverride means read and use switch settings on circuit pack.
 - ¶ Track means the source for timing will be selected from the active received OC-3 Line specified. It applies to linear 1+1 optical interfaces only.
 - ** This command is available to privileged users only.
 - †† Rings.
 - ‡‡ Setting this parameter also affects DS1 output source and DS1 sync output mode. See **set-sync** command in Section 11, "Commands and Reports."
 - §§ Linear releases.
 - ¶¶ One and only one shelf in a subnetwork must be set to "yes" for proper DCC communications.
 - *** Parameters can be set for each channel.
 - ††† Ring releases. Requires 22D-U/22F2-U/22G-U/22G2-U/22G3-U OLIUs.
 - ‡‡‡ Ring releases.
 - §§§ With 24G-U OLIU in main slots.
-

Identifiers

The following IDs are used for the shelf, site, NE, target, CO/RT, NSAP address, GNE, DSNE, and AGNE. See also the *Lucent 2000 Product Family Operations Interworking Guide*, 824-102-147 and the *DDM-2000 Operations Systems Engineering Guide*, 824-102-151.

- **Shelf ID:** The shelf ID is a parameter with values of from 1 to 8. The shelf ID provides a convenient way to log into a selected shelf in a bay using the CIT. Therefore, each shelf (OC-3 or OC-12) in a bay must be assigned a unique shelf ID. The recommended numbering is to start at the bottom of the bay and assign the bottom shelf with a shelf ID of 1 and work up to the top of the bay.
- **Site ID:** The site ID is a parameter with values of from 1 to 64 site addresses. The same site IDs can be used if the NEs are in different alarm groups. The site ID is displayed on the 7-segment display on the SYSCTL circuit pack to indicate to which site the USER panel alarm LEDs apply. For site IDs greater than eight, a dash is displayed on the 7-segment display. The same site ID should be assigned to all shelves in the same bay or cabinet. If the NE is part of a subnetwork with an FT-2000, then it may be necessary to use more than one site number in a bay. It is recommended that the site ID be assigned consecutively starting at the CO site unless parallel telemetry is used. If parallel telemetry is used, the CO site should be assigned as site 7, and the remote sites should be assigned numbers 1 through 6. See the TOP section of Volume II for procedures on setting the Site ID.
- **NE ID:** The NE ID is a parameter with values of from 1 to 5. NEs (OC-3 or OC-12 shelves) at a specific site that belong to the same subnetwork must be assigned a unique NE ID. The NE ID is combined with the site ID to form a default value for the TID. In an OC-3 or OC-12 only network, there will only be one shelf per subnetwork at each site. Therefore, all the shelves in the subnetwork could be assigned a NE ID of 1. In a mixed network, there may be up to five NEs per site that are part of the same subnetwork. In this case, each NE with the same site number must be assigned a unique NE ID.
- **TID:** The TID is a 20-character parameter that is set through the CIT using the **set -ne** command. The TID is used in the **r lgn** command to identify an NE to which a remote login session is being established. The TID is also used by an OS system to identify NEs using the TL1 message-based communications protocol.

After the **init-sys:all** command is entered, the system sets the TID to a default value obtained by combining the site ID with the NE ID. The TID must be unique among all NEs. The default TID may be changed using the **set -ne** command to a unique user-assigned value recognized by the OS.

- **CO/RT:** The CO/RT parameter for CO or RT identifies the system as having the characteristics of a CO or RT. The default is RT. The parameter controls the TBOS display type, operation of the miscellaneous discretes, and the external fan control.
- **NSAP:** The NSAP is a multiple part address that uniquely identifies the NE. The NSAP is used for subnetwork communications using the OSI protocol. The NSAP is set to unique values assigned to control hardware at the factory and does not have to be modified by the user. The user can only modify the values defined by the **ent -u lsdcc** command. The Routing Domain and Area parameters must not be changed from their default values when interworking with FT-2000 OC-48 Lightwave Systems.
- **GNE (OSGNE):** An NE that has an active TL1/X.25 link to an OS is automatically an OSGNE. Subnetworks can have multiple OSGNEs.
- **DSNE:** In a subnetwork, one and only one shelf **must** be provisioned as a DSNE by setting its DSNE parameter to "yes" using the **set -ne** command. The DSNE parameter must be set to "yes" to provide proper DCC communications. The DSNE provides directory service (TID to NSAP address translation) for all NEs in a subnetwork.
- **AGNE:** In an alarm group, an NE must be designated as a AGNE by setting its AGNE parameter to "yes" using the **set -ne** command. An AGNE is an NE in an alarm group, through which members of an alarm group exchange alarm and status information. By default, all NEs are in the same alarm group (255). For subnetworks having more than 16 NEs, the AGNE and GNE should be separate NEs. The AGNE is a "collection point" and does not have to be an NE in a CO, for example.

Performance Monitoring (PM) Parameters Provisionable via the CIT

For a list of PM parameters provisionable via the CIT, see Table 10-19 in the "Specifications" chapter of this manual.

Table of Contents

Overview	9-1
■ Three-Tiered Operations	9-1
Single-Ended Maintenance Philosophy	9-4
■ Single-Ended Operations (SEO) Operations Interworking	9-4
In-Service Upgrades	9-6
■ Software Upgrades	9-6
■ Application Upgrades	9-7
Software Compatibility	9-8
Maintenance Signaling	9-11
■ Non-Ring Applications	9-13
■ Ring Applications	9-18
Fault Detection, Isolation, and Reporting	9-23
■ Detection	9-23
■ Isolation	9-23
■ Reporting	9-23
Protection Switching	9-24
■ Automatic Line Protection	9-24
Status of ACTIVE LED on OLIUs	9-24
APS Initiation Criteria	9-25
■ Path Protection Switching (Path Switched Rings)	9-27
Path Protection Scheme	9-28
Path Protection - Locked DS3 Cross-Connect	9-30

Table of Contents

■ Dual Ring Interworking (DRI)	9-31
Dual Ring Interworking (DRI) Path Protection Scheme	9-31
■ OC-3/OC-12 Path Switched Ring (0x1)	9-33
■ OC-3/OC-1 Path Switched Ring (0x1)	9-33
■ Status of ACTIVE LED on Rings	9-33
■ Equipment Protection	9-33
■ Synchronization Reference Protection	9-34
Loopbacks	9-35
Tests	9-35
■ Transmission Tests	9-35
■ Automatic Turnup Tests	9-36
■ Operations Interface Tests	9-38
Performance Monitoring (PM)	9-38
■ VT Performance Monitoring	9-40
■ DS1 Performance Monitoring	9-40
■ DS3 Performance Monitoring	9-42
DS3 Path PM	9-42
DS3 Line	9-43
■ Performance Parameters	9-43
■ Optical Parameters	9-46
Performance Monitoring Enabling	9-46
Laser Bias Current	9-46
Optical Transmit Power	9-46
■ OC-3 Section Parameters	9-46
Performance Monitoring Enabling	9-46
Severely Errored Frame Seconds (SEFS)	9-46
■ OC-3/EC-1 Line Parameters	9-47
Performance Monitoring Enabling	9-47
Line Coding Violations (B2 Parity)	9-47
Errored Seconds (ES)	9-47
Severely Errored Seconds (SES)	9-47
Unavailable Seconds (UAS)	9-48

Table of Contents

Line Protection Switch Counts	9-48
STS Pointer Justification Count (PJC)	9-48
■ STS-1 Path Parameters	9-48
Performance Monitoring Enabling	9-48
STS-1 Path Coding Violations (B3 Parity)	9-49
Errored Seconds (ES)	9-49
Severely Errored Seconds (SES)	9-50
Unavailable Seconds (UAS)	9-50
■ VT1.5 Path Parameters	9-50
Performance Monitoring Enabling	9-50
Errored Seconds (ES)	9-50
Severely Errored Seconds (SES)	9-51
Unavailable Seconds (UAS)	9-51
■ DS1 Path Parameters	9-51
Performance Monitoring Enabling	9-51
Errored Seconds (ES)	9-51
Severely Errored Second (SES)	9-52
Unavailable Seconds (UAS)	9-52
CV-P Coding Violations	9-52
CV-PFE Coding Violations	9-52
■ DS1 Line Parameters	9-52
ES-L Errored Seconds	9-52
■ DS3 Parameters	9-53
Performance Monitoring Enabling	9-53
DS3 Performance Monitoring (PM)	9-53
DS3 Path	9-54
DS3 Line	9-56
■ OC-1 Section Parameters	9-56
Performance Monitoring Enabling	9-56
Severely Errored Frame Seconds (SEFS)	9-56
■ OC-1 Line Parameters	9-56
Performance Monitoring Enabling	9-56
Line Coding Violations (B2 Parity)	9-56

Table of Contents

Errored Seconds (ES)	9-57
Severely Errored Seconds (SES)	9-57
Unavailable Seconds (UAS)	9-57
STS Pointer Justification Count (PJC)	9-57
■ OC-12 Line Parameter	9-58
Performance Monitoring Enabling	9-58
Line Coding Violations (B2 Parity)	9-58
Errored Seconds (ES)	9-58
Severely Errored Seconds (SES)	9-58
Unavailable Seconds (UAS)	9-58
Line Protection Switch Counts	9-59
STS Pointer Justification Count (PJC)	9-59
■ Performance Monitoring Data Storage and Reports	9-60
■ Performance Monitoring During Failed Conditions	9-60
■ Performance Parameter Thresholds	9-60
■ TCA Transmission to OS	9-61
■ Performance Monitoring Reports	9-61
TCA Summary Report	9-61
Performance Status Reports	9-61
Reports	9-62
■ Alarm and Status Report	9-62
■ Provisioning Reports	9-62
■ Database Change Transmission to OS	9-62
■ Maintenance History Report	9-62
■ State Reports	9-63
■ Equipment Report	9-63
■ Network Map Report	9-63

Overview

This section defines the "maintenance philosophy" outlining the various features available to monitor and maintain the DDM-2000 OC-3 Multiplexer. Specific trouble clearing and maintenance procedures are provided in the operation and maintenance (TOP) section of this manual (Volume II).

Three-Tiered Operations

Figure 9-1 shows the three-tiered operations procedures for the DDM-2000 OC-3 Multiplexer. The DDM-2000 OC-3 Multiplexer operations procedures are built on three levels of system information and control, spanning operations needs from summary-level status to detailed reporting.

The first operations tier consists of light-emitting diodes (LEDs) and pushbuttons on the user panel and circuit pack faceplates. These allow routine tasks to be performed without a craft interface terminal (CIT) or any test equipment. The user panel provides system-level alarm and status information for both the local and remote terminals. The circuit pack faceplate FAULT LEDs allow fast and easy fault isolation to a particular circuit pack.

The second operations tier provides access to DDM-2000 OC-3 Multiplexer operations from a CIT over an EIA-232-D interface. System details that cannot be obtained from the first operations tier alone can be obtained over the CIT interface. A VT-100 compatible terminal or terminal emulator software running on a personal computer (PC) can be used as a CIT. Command and prompt modes are available with extensive on-line help features. The CIT interface supports

operations, administration, provisioning, and maintenance (OAM&P) activities, such as performance monitoring (PM), on any and all network elements (NE) in the SONET subnetwork from a single DDM-2000.

An optional graphical user interface tool (CPro-2000) is also available. Using CPro-2000, which runs on an *MS-DOS*^{*} PC, a user can take advantage of the graphics to do many provisioning related activities.

The third operations tier consists of the remote operations systems (OS) interfaces. These OS interfaces include parallel telemetry, telemetry byte-oriented serial (TBOS), and TL1/X.25 interfaces.

Parallel telemetry consists of individual closures that can be remoted to an operations center. These closures provide information on alarm status, fault location, transmission signal failure indications, and user definable miscellaneous discretes. These are not "dry" contact closures. They can handle only a limited amount of current and are polarized to operate with the proper voltage polarity. TBOS offers more information over its 2400 b/s RS-422 interface. The TBOS interface offers eight displays with one display dedicated to each shelf in a DDM-2000 alarm group. Each display provides 63 information points (DDM-2000 OC-3 and OC-12 to OS) and 64 control points (OS to DDM-2000 OC-3 and OC-12).

The DDM-2000 OC-3 Multiplexer supports a full-featured TL1/X.25 interface to multiple OSs. The DDM-2000 OC-3 Multiplexer supports alarm surveillance and PM with OSs, such as Bellcore's Network Monitoring and Analysis (NMA) OS.

The DDM-2000 OC-3 Multiplexer supports automated service provisioning with memory administration OSs, such as Bellcore's Operations System Intelligent Network Element (OPS/INE) and Lucent Technologies Integrated Transport Management SubNetwork Controller (ITM SNC). The DDM-2000 OC-3 Multiplexer also supports remote recovery and control functions, installation provisioning, and security over the TL1/X.25 link. The TL1/X.25 interface provides significantly more detailed information, such as identifying specific circuit packs and facilities, and control capabilities than the parallel telemetry or TBOS interfaces.

The *SLC*[®]-2000 Access System supports the same X.25 interface and TL1 message set as the DDM-2000 OC-3 Multiplexer. Newer releases of the *SLC*-2000 Access System add digital loop carrier (DLC) specific functionality in the existing messages (for example, for DLC related alarms) and in addition support DLC specific commands (for example, DS0 level provisioning). See 363-208-000, *SLC-2000 Access System, Applications, Planning, and Ordering Guide*, for more information.

* Registered trademark of Microsoft Corporation.

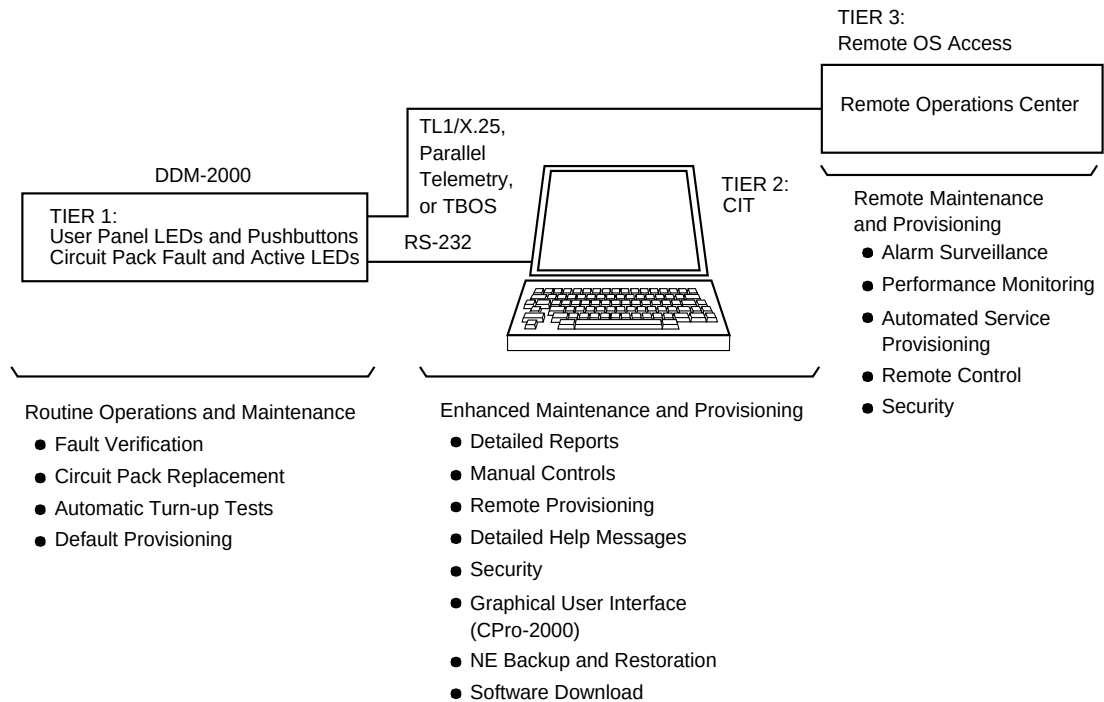


Figure 9-1. Three-Tiered Operations

Single-Ended Maintenance Philosophy

As a loop-optimized product, the DDM-2000 OC-3 Multiplexer allows operation and maintenance of all remote systems in an OC-3 or OC-3/OC-12 Multiplexer subnetwork from the central office shelf. A subnetwork consists of DDM-2000 systems interconnected by optical lines with the SONET data communications channel (DCC) enabled. Similarly, a technician working at a remote site can gain access to the central office (CO) shelf associated with that DDM-2000 OC-3 Multiplexer, as well as with other remote sites in the same subnetwork. The DDM-2000 OC-3 Multiplexer uses the SONET DCC to provide CIT remote access, user panel remote access, and OS remote access. The DDM-2000 OC-3 Multiplexer uses the International Standards Organization (ISO) compliant open systems interconnection (OSI) protocol for communicating between DDM-2000 shelves over the DCC.

Single-Ended Operations (SEO) Operations Interworking

Figure 9-2 shows the single-ended operations (SEO) capability that provides remote access to all DDM-2000 systems in a network from a single location. This minimizes technician travel because most maintenance, provisioning, and administration can be performed on the entire subnetwork by accessing any DDM-2000 Multiplexer in the subnetwork. The SEO capability is provided by the DDM-2000 Multiplexers regardless of the subnetwork topology as long as DCC connectivity is available. The SEO (DCC) capability can be disabled between DDM-2000 shelves to create network maintenance boundaries (for example, interoffice applications) or for security reasons.

The single-ended maintenance philosophy is supported in subnetworks with mixed Lucent Technologies 2000 Product Family systems. SEOs are supported between DDM-2000 and SLC-2000 systems. SEOs between DDM-2000 and FT-2000 systems require DCC connectivity. See Section 3, "Applications," and Section 8, "Administration and Provisioning," for more information on operations interworking applications.

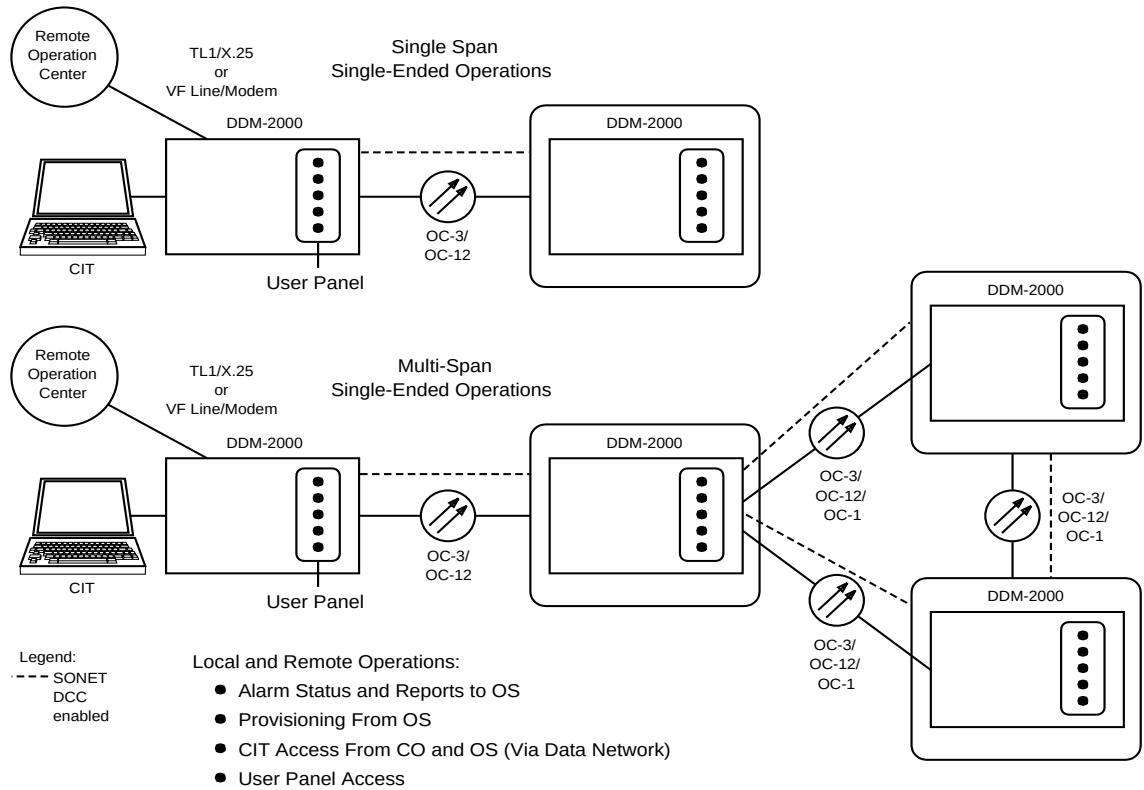


Figure 9-2. Single-Ended Operations

In-Service Upgrades

Software Upgrades

Table 9-1 lists the current software releases of the DDM-2000 OC-3 Multiplexer that can be directly upgraded while in-service. Specific procedures for upgrades are provided in the TOP section of this manual (Volume II).

Table 9-1. DDM-2000 OC-3 In-Service Software Upgrade Compatibility (Note)

Current Release	Upgrade to*						
	7.2	8.0	9.0	8.1	9.1	11.0	11.1
7.2 (Ring)	X	NA	C	NA	C	C	C
8.0 (Linear)	NA	X	C	X	C	C	C
9.0 (Ring)	NA	NA	X	NA	X	X	X
8.1 (Linear)	NA	NA	C	X	C	C	C
9.1 (Ring)	NA	NA	NA	NA	X	X	X
11.0 (Ring)	NA	NA	NA	NA	NA	X	X
11.1 (Ring)	NA	NA	NA	NA	NA	NA	X

Note: All DDM-2000 OC-3 shelves in a subnetwork should be using the same version of software.

- * When doing an upgrade, it is recommended that the latest point release of software be used, if possible.
- X Requires local or remote software download only to upgrade the system.
- C Requires an upgrade procedure with on-site equipment/fiber changes as well as software download to upgrade the system. Additional changes to software and equipment provisioning may be needed to use features of the new release. See TOP section of this manual (Volume II) for upgrade procedures.
- NA Not Applicable. If an NA conversion is required, contact your local Technical Support Organization.

Application Upgrades

Table 9-2 lists the applications that can be upgraded in-service and the required software releases. See Table 9-1 for more information and the TOP section of this manual (Volume II) for upgrade procedures.

Table 9-2. DDM-2000 OC-3 In-Service Upgrades

Application	Linear	Ring
	R8.0/8.1	R9.0/9.1/11.0/11.1
Point-to-Point to Hub	Yes	
Point-to-Point to A/D	Yes	
Hub to A/D	Yes	
Point-to-Point to Ring		Yes
OC-3 P-P to OC-12 Ring	Yes*	
OC-3 Hub to OC-12 Ring	Yes*	
OC-3 Ring to OC-12 Ring		Yes*

* Requires OC-12 Release 5.0/5.1 software or the 24G-U OLIU in the OC-3 shelf.

One shelf and only one shelf in a subnetwork must be provisioned as a directory services network element (DSNE) using the **set -ne** command. See Section 11, "Commands and Reports," and the TOP section of this manual (Volume II) for provisioning procedures.

Software Compatibility

Table 9-3 lists the software compatibility within a subnetwork for the DDM-2000 OC-3 and OC-12 Multiplexers. All configurations listed support SEO. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-3. DDM-2000 OC-3 and OC-12 Software Compatibility (Note)

OC-3 Release	OC-12 Release	Interconnection Method	Notes
7.2	5.0/5.1	22-type † or 21G/21G-U/ 21D/21D-U ‡ OLIU	Supports OC-3/OC-12 interworking, 0x1 interfaces, and DRI
8.0	5.0/5.1	22-type † or 21G/21G-U/ 21D/21D-U ‡ OLIU	Supports OC-3/OC-12 interworking
8.1	5.0	22-type † or 21G/21G-U/ 21D/21D-U ‡ OLIU	Supports OC-3/OC-12 interworking,
9.0 *	5.0	22-type † or 21G/21G-U/ 21D/21D-U ‡ OLIU	Supports OC-3/OC-12 interworking, 0x1 interfaces, and DRI
9.1 *	5.0/5.1/ 5.2	22-type † or 21G/21G-U/ 21D/21D-U ‡ OLIU	Supports OC-3/OC-12 interworking, 0x1 interfaces, and DRI
11.0 *	5.1/5.2	22-type † or 21G/21G-U/ 21D/21D-U ‡, 24G-U § OLIU	Supports OC-3/OC-12 interworking, 0x1 interfaces, and DRI
11.1 *	5.1/5.2	22-type † or 21G/21G-U/ 21D/21D-U ‡, 24G-U § OLIU	Supports OC-3/OC-12 interworking, 0x1 interfaces, and DRI

Note: All NEs in a ring network, which may be part of a larger network, must be running the same software. Similarly, all NEs in a linear network, which may be part of a larger network, must be running the same software. In a subnetwork, which may consist of a mixture of ring and linear networks, all NEs must be running compatible software according to the table.

- * 22-type OLIUs must be used in DDM-2000 OC-3 ring shelves in main and function unit slots for optical extensions. 21-type OLIUs are used in OC-12.
- † The 22-type OLIUs can only be used in the DDM-2000 OC-3 shelf in place of the 21G/21G-U OLIU. The 22-type OLIUs cannot be used in the DDM-2000 OC-12 shelf.
- ‡ The 21D/21D-U OLIU can be used in the DDM-2000 OC-3 shelf in place of the 21G/21G-U OLIU for short-reach applications. The 21D/21D-U OLIU can be used in the DDM-2000 OC-12 shelf in place of the 21G/21G-U OLIU for short-reach applications.
- § 24G-U in main only.

Table 9-4 lists the ring and linear software compatibility for the DDM-2000 OC-3 Multiplexers. All configurations listed support SEO. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-4. DDM-2000 OC-3 Software Compatibility

OC-3 Release	OC-3 Release	Interconnection Method	Notes
7.2 (Ring) *	8.0/8.1 (Linear)	22-type OLIU	Supports OC-3/IS-3 interworking between OC-3 ring and linear networks.
9.0 (Ring) *	8.0/8.1 (Linear)	22-type OLIU	As above
9.1 (Ring) *	8.0/8.1 (Linear)	22-type OLIU	As above
11.0 (Ring) *	8.0/8.1 (Linear)	22-type OLIU	As above
11.1 (Ring) *	8.0/8.1 (Linear)	22-type OLIU	As above

* Requires 22-type OLIUs in main and function unit slots for DDM-2000 OC-3 ring shelves. Linear shelves may contain 22-type or 21-type OLIUs.

Table 9-5 lists the DDM-2000 FiberReach software compatibility for the DDM-2000 OC-3 Multiplexers. All configurations listed support SEO. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-5. DDM-2000 OC-3 and DDM-2000 FiberReach Software Compatibility

Software Release (ring)		Interconnecting Circuit Pack	
DDM-2000 OC-3	DDM-2000 FiberReach	DDM-2000 OC-3	DDM-2000 FiberReach
9.0/9.1	2.1*	27G-U/27G2-U OLIU	26G-U/26G2-U OLIU
11.0/11.1	2.1*/2.2	26G2-U‡/27G-U/27G2-U OLIU	26G-U/26G2-U OLIU

* FiberReach Releases 1.0/2.0 replaced by Release 2.1.

‡ 26G2-U when running R11.1 or later.

Table 9-6 lists the dual ring interworking (DRI) software compatibility for the DDM-2000 OC-3 Multiplexer for both EC-1 and OC-3 interfaces. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-6. DDM-2000 OC-3 Multiplexer Dual Ring Interworking Software Compatibility

DDM-2000 OC-3	DDM-2000 OC-12 and FT-2000	Notes
Release 7.2	OC-12 Release 5.0/5.1/5.2 and FT-2000 Releases 4.1, 5.0, 6.0, 7.0, 7.1, and 7.2	FT-2000 Releases 4.1 and 5.0 have no DCC connectivity.
Release 9.0	OC-12 Release 5.0 and FT-2000 Releases 4.1, 5.0, 6.0, and 7.0	As above
Release 9.1	OC-12 Release 5.0/5.1/5.2 and FT-2000 Releases 7.0, 7.1, and 7.2	As above
Release 11.0	OC-12 Release 5.1/5.2 and FT-2000 Releases 7.1 and 7.2	
Release 11.1	OC-12 Release 5.1/5.2 and FT-2000 Releases 7.1 and 7.2	

See 824-102-147, *Lucent 2000 Product Family Operations Interworking Guide*, for more information on operations interworking.

Maintenance Signaling

The DDM-2000 OC-3 Multiplexer provides maintenance signaling compliant with the SONET standard (ANSI * T1.105). The DDM-2000 OC-3 Multiplexer generates and detects the following alarm indication signals (AISs), which notify downstream equipment that a failure has been detected and alarmed by some upstream equipment:

- SONET line AIS
- STS-1 path AIS
- Virtual tributary (VT) path AIS
- DS3 AIS
- DS1 AIS (generated, not reported).

The DDM-2000 OC-3 Multiplexer also generates and detects the following signals, which notify upstream equipment of a failure detected downstream:

- Line far-end-receive failure (FERF)
- STS-1 path yellow and VT path yellow
- An STS-1/VT AIS signal is inserted on paths that are not cross-connected; however, the user can provision a shelf to insert STS-1/VT unequipped instead of AIS on paths that are not cross-connected.

For ring interfaces, the DDM-2000 OC-3 Multiplexer detects STS-1 and VT unequipped signals. Figure 9-3 is an example of the AIS, yellow, and FERG signals generated in response to an unprotected incoming OC-3 line failure.

* Registered trademark of American National Standards Institute.

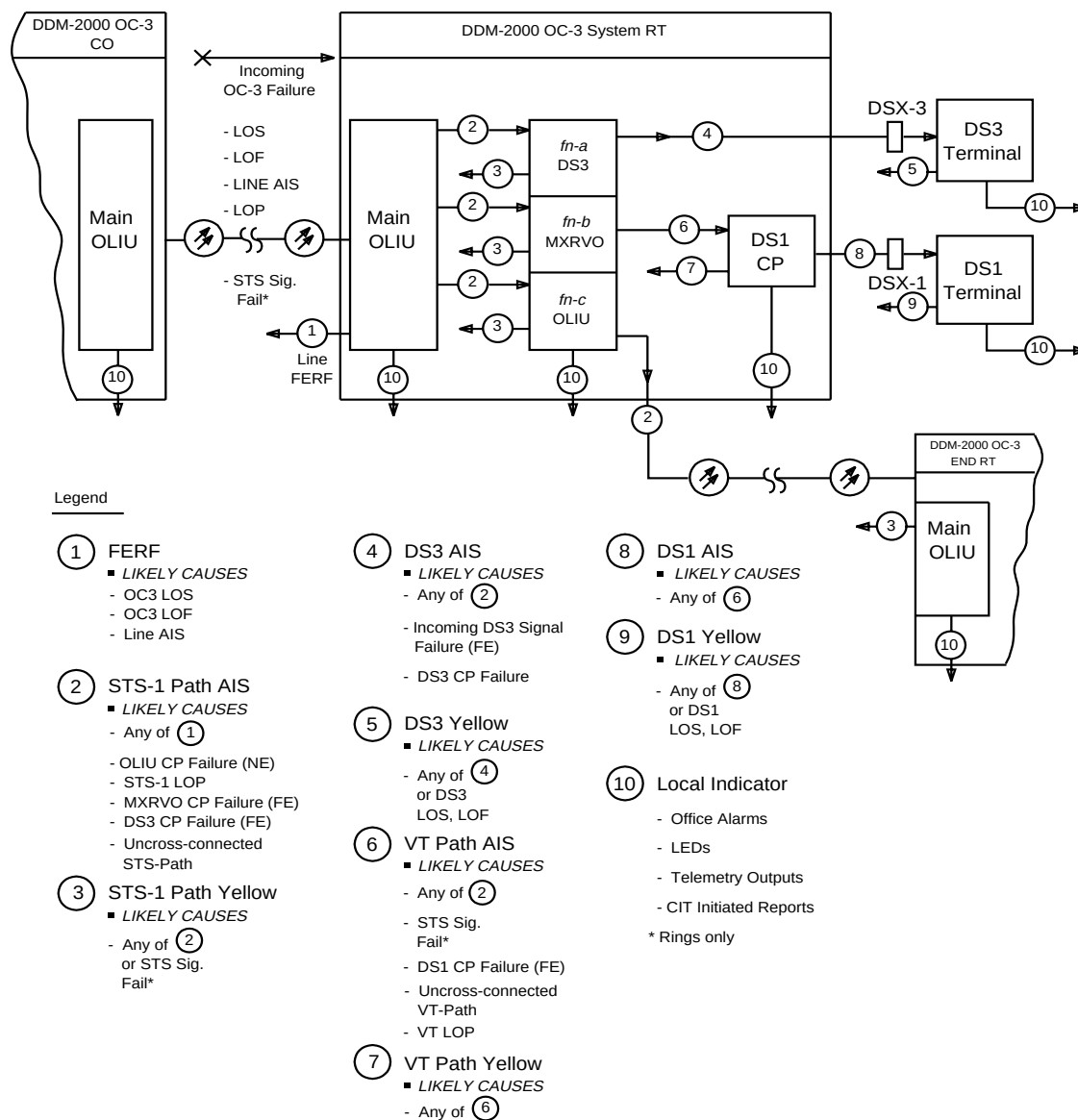


Figure 9-3. Example of Maintenance Signals as a Result of Unprotected Incoming OC-3 Failure

Non-Ring Applications

Figure 9-4 through Figure 9-7 are examples of the maintenance signals used by the DDM-2000 OC-3 Multiplexer. In these figures, the labels on the arrows pointing into the DDM-2000 OC-3 Multiplexer indicate the maintenance signals and failure conditions recognized by the DDM-2000 OC-3 Multiplexer. The labels on the arrows pointing out of the DDM-2000 OC-3 Multiplexer indicate the signals generated by the DDM-2000 OC-3 Multiplexer in response to the indicated incoming signals or failure conditions. The **Xs** indicate points of failure, either within the DDM-2000 OC-3 Multiplexer or in upstream equipment. Unlabeled arrows indicate normal transmission except for OC-3 line AIS; maintenance signaling is in response to unprotected failures.

The DS1, DS3, EC-1, STS, and VT interfaces in Figure 9-4 through Figure 9-6 are cross-connected to function unit slots. The DS1, DS3, EC-1, STS, and VT interfaces in Figure 9-7 through Figure 9-9 are cross-connected to main OLIUs.

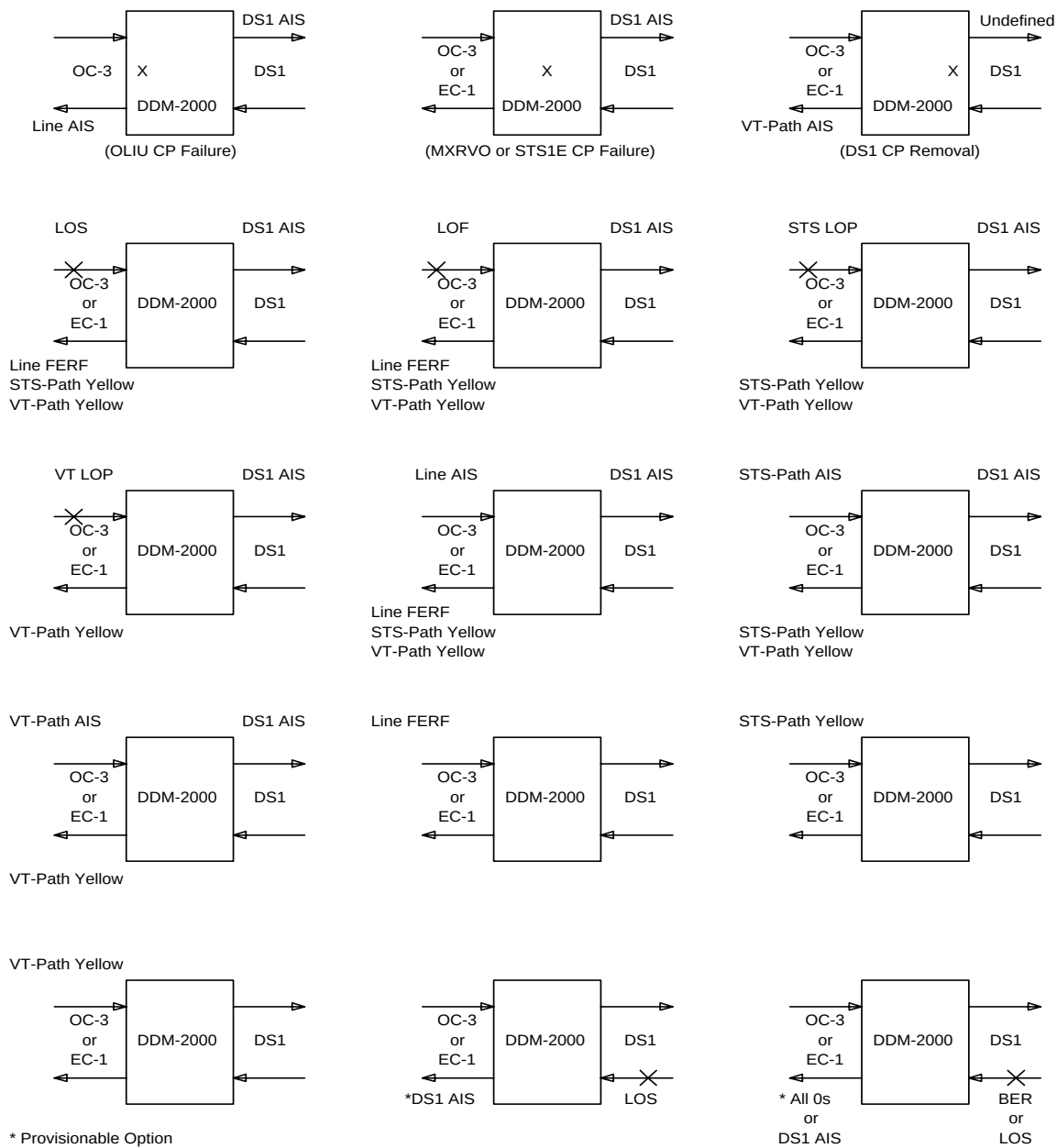


Figure 9-4. DS1 Maintenance Signaling — Non-Ring Application

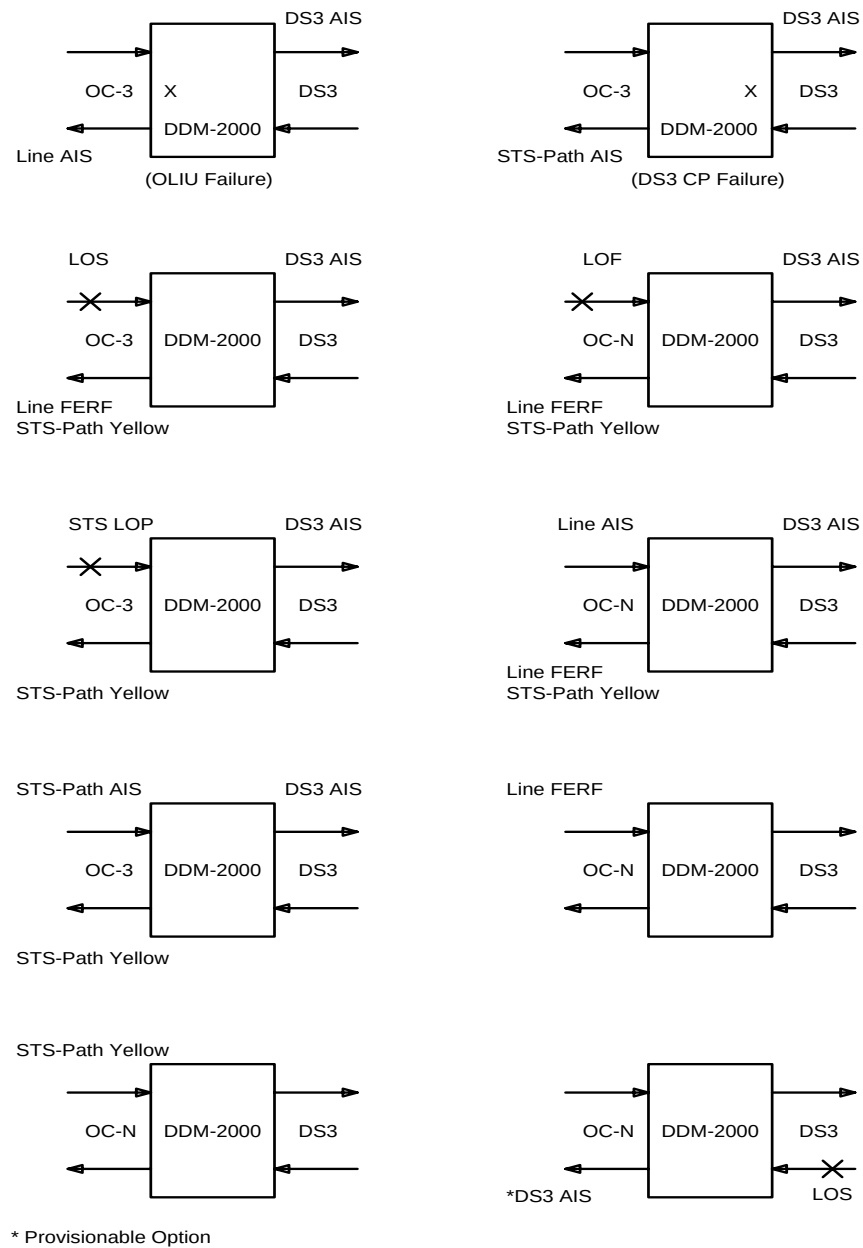
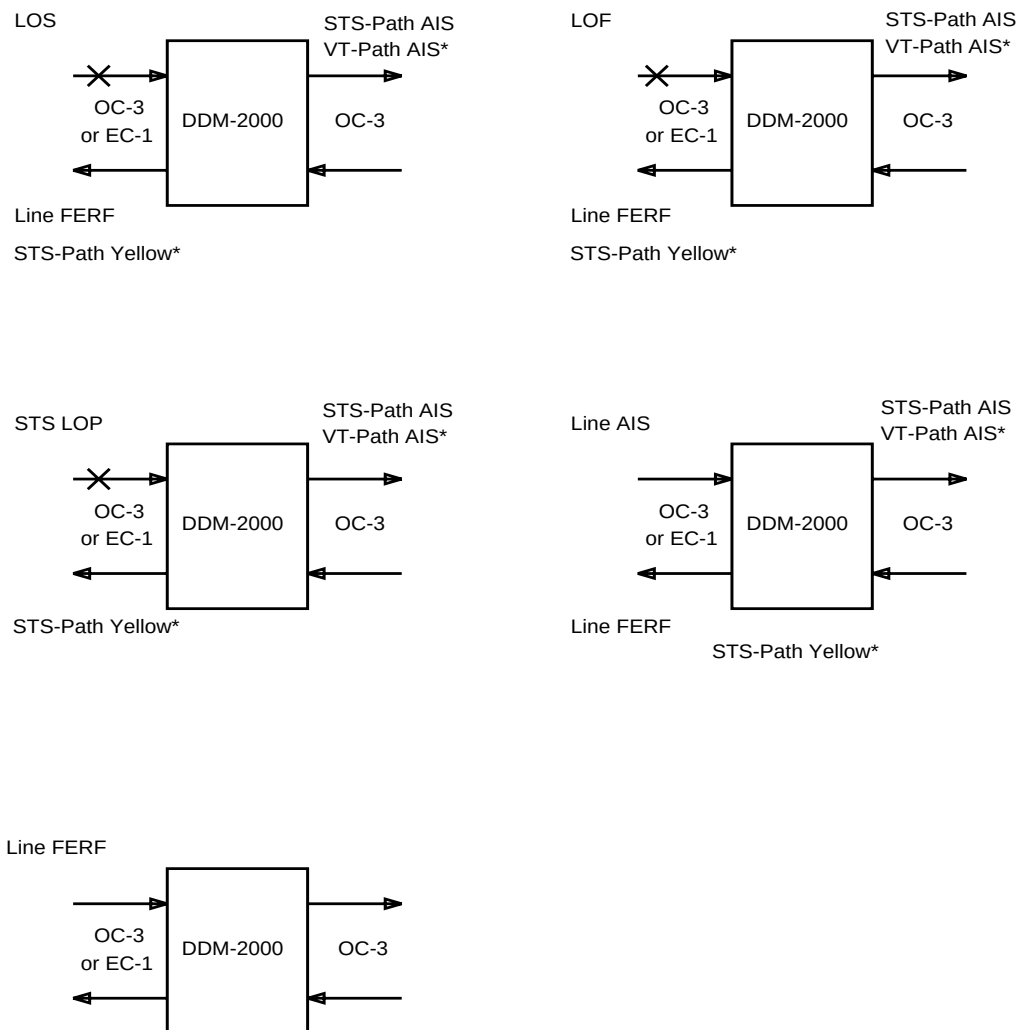


Figure 9-5. DS3 Maintenance Signaling — Non-Ring Application



* VT-Path AIS and STS-Path Yellow are sent when shelf is equipped with 22F OLIU or STS1E provisioned for the VT-1.5 cross-connect mode.

Figure 9-6. OC-3 or EC-1 Line Maintenance Signaling — Non-Ring Application

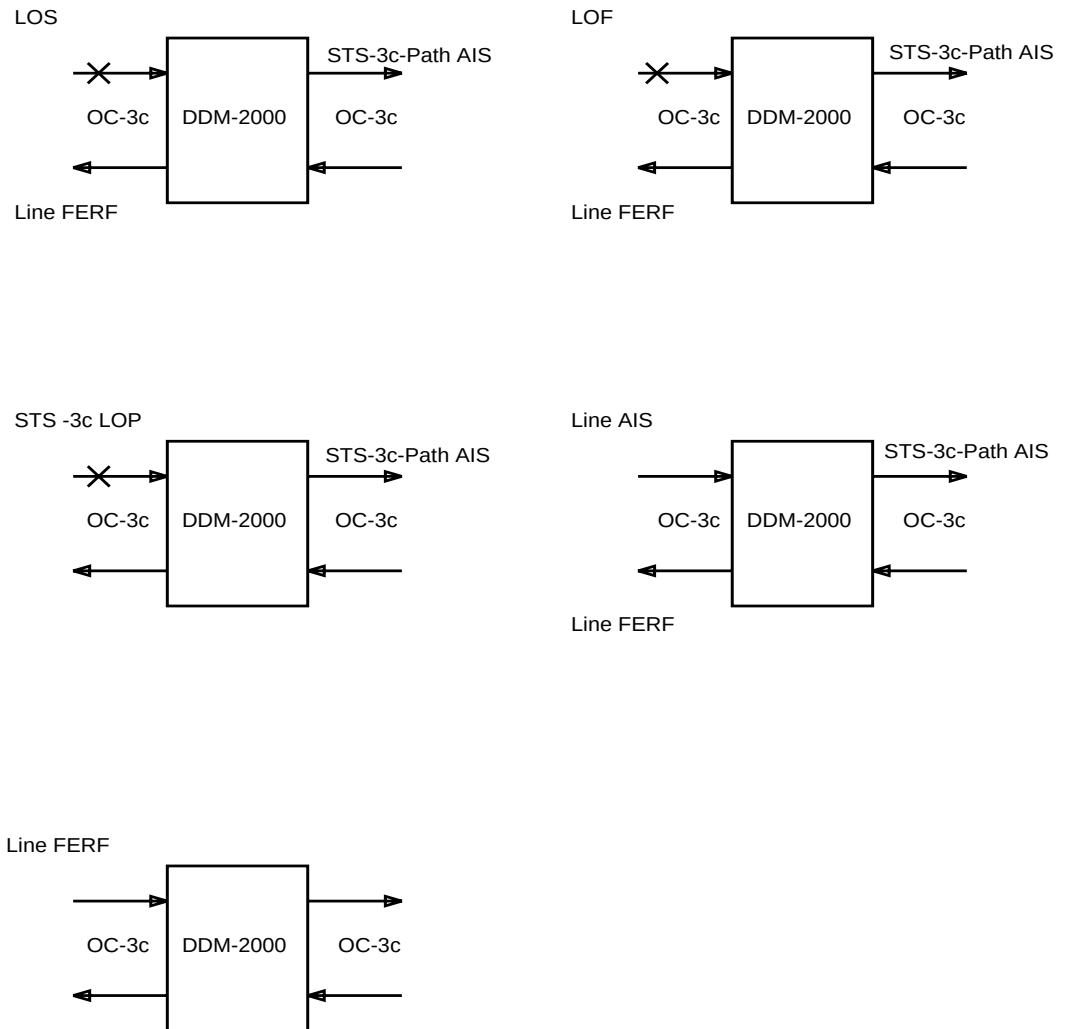


Figure 9-7. OC-3c (STS-3c) Line Maintenance Signaling — Non-Ring Application

Ring Applications

Figure 9-8 through Figure 9-10 are examples of the maintenance signals used by the DDM-2000 OC-3 Multiplexer in VT, VT unequipped, and TMUX circuit pack path-switched ring applications.

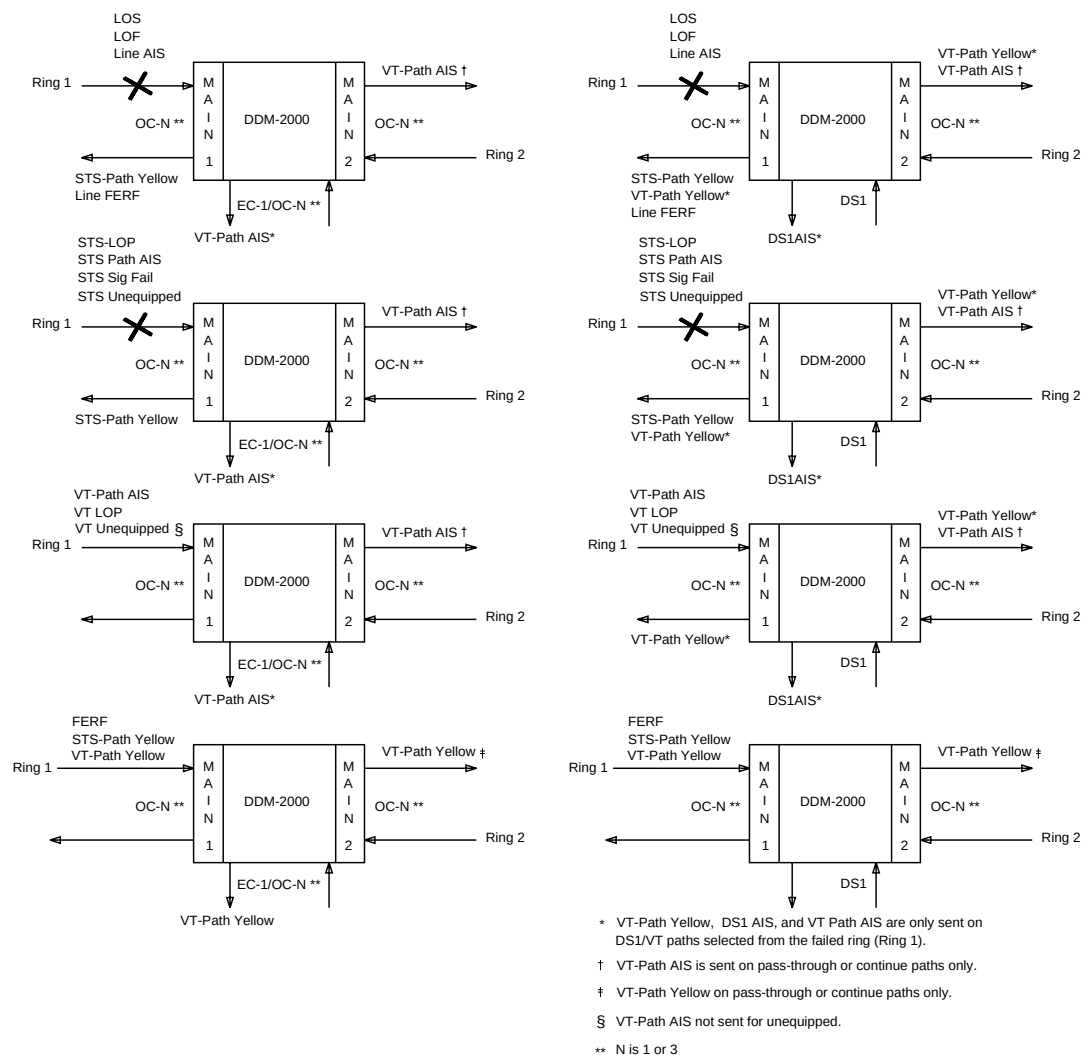


Figure 9-8. Maintenance Signaling — VT Ring Application

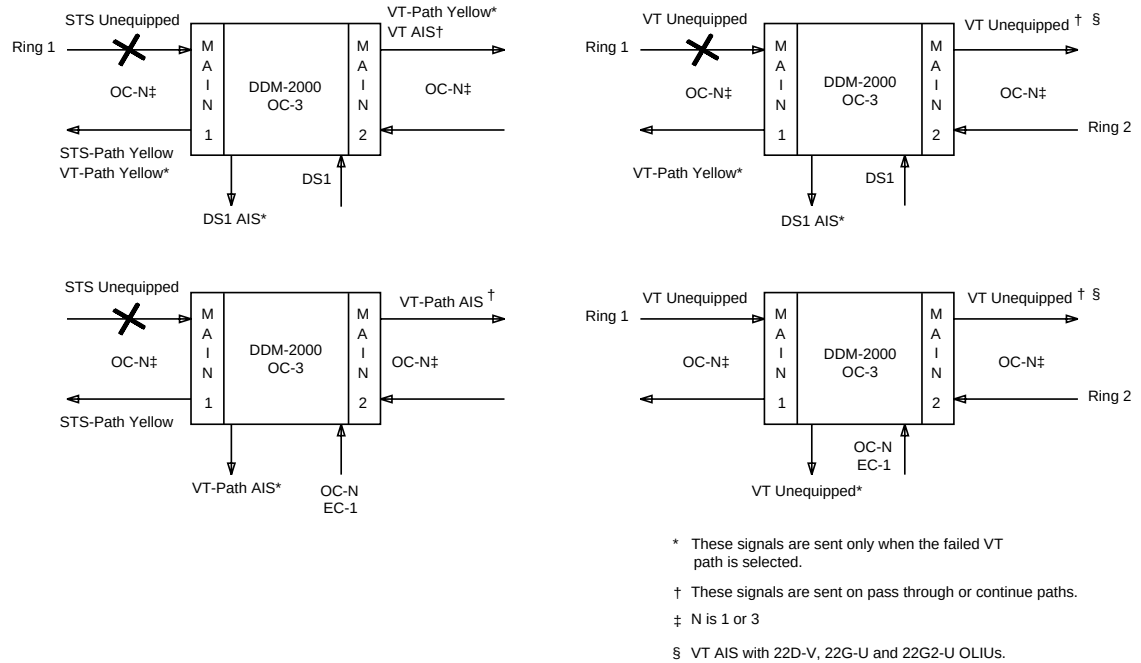


Figure 9-9. Maintenance Signaling — VT Ring Application, Unequipped

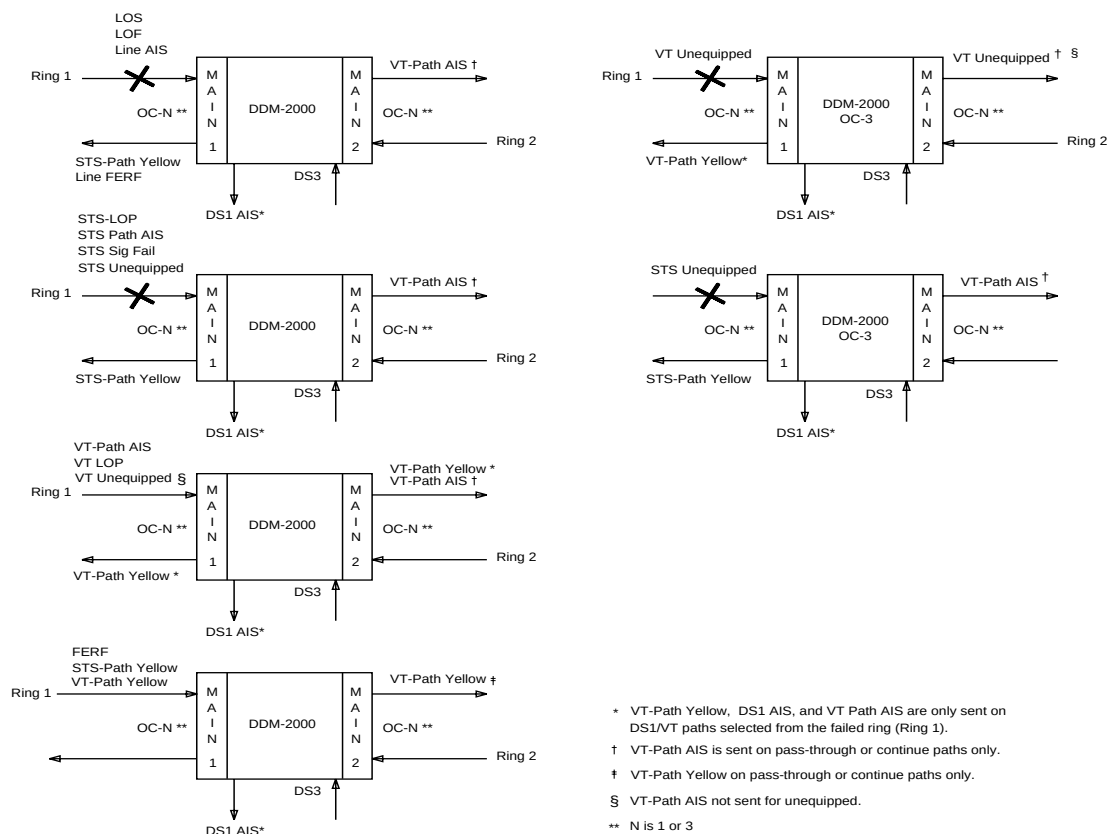


Figure 9-10. Maintenance Signaling — VT Ring Application, TMUX circuit pack

Figure 9-11 and Figure 9-12 are examples of the maintenance signals used by the DDM-2000 OC-3 Multiplexer in STS and STS unequipped, respectively, path switched ring applications.

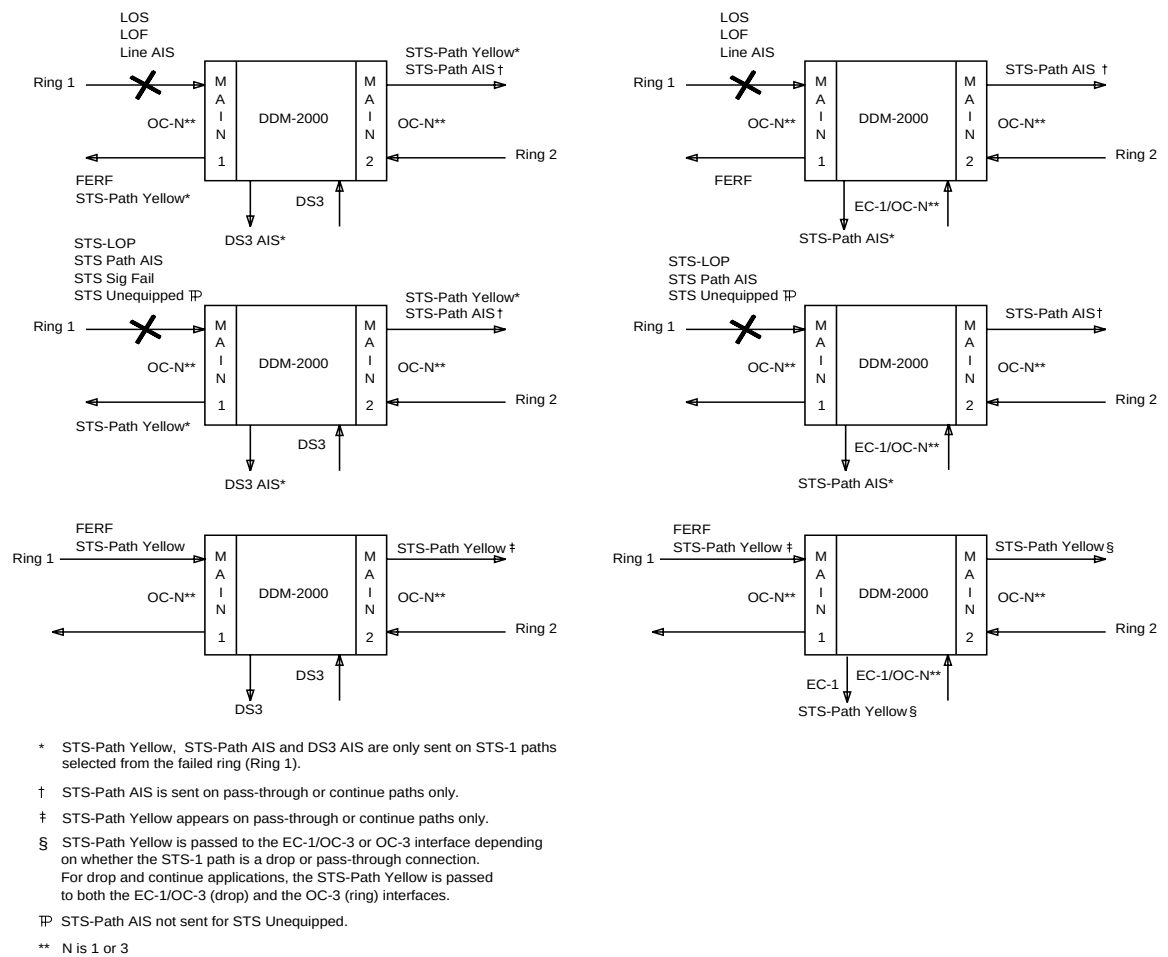


Figure 9-11. Maintenance Signaling — STS Ring Application

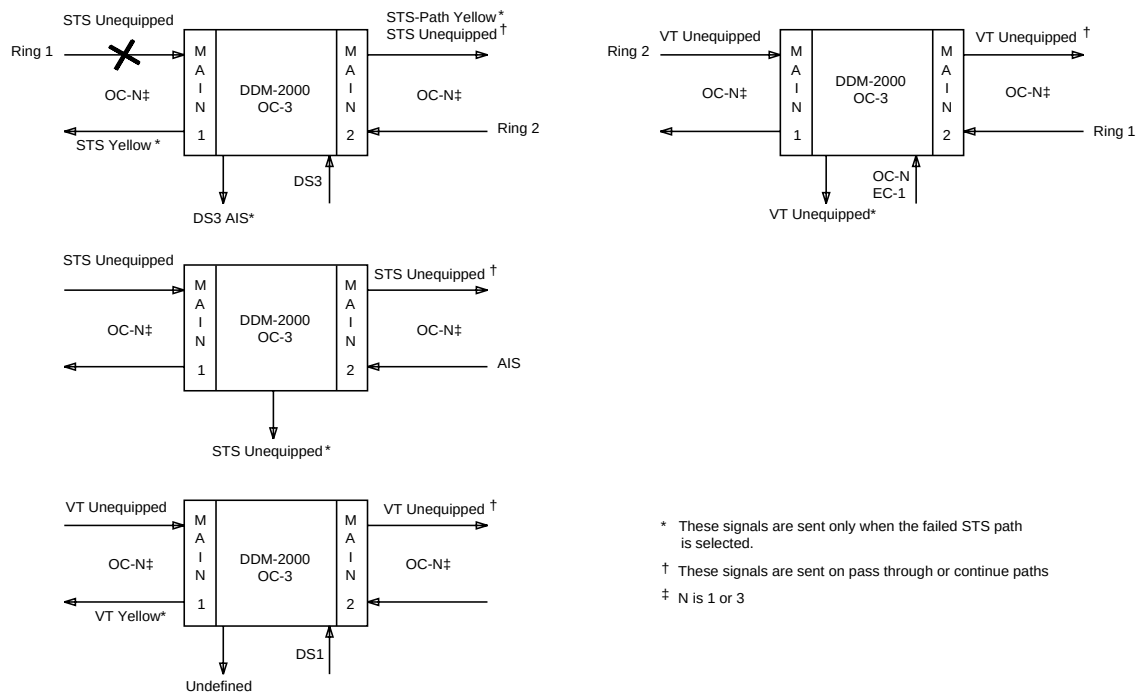


Figure 9-12. Maintenance Signaling STS Ring Application — Unequipped

Fault Detection, Isolation, and Reporting

Detection

The DDM-2000 OC-3 Multiplexer continuously monitors all circuit packs and incoming signals for faults. Incoming SONET signals are monitored for loss of signal (LOS), loss of frame (LOF), loss of pointer (LOP), and bit error ratio (BER) thresholds, and for the maintenance signals described in the preceding pages. Incoming DS1 and DS3 signals are monitored for LOS and BER thresholds. The BER thresholds for DS1 are based on bipolar 8-zero substitution (B8ZS) or alternate mark inversion (AMI) violations depending on line coding. The BER thresholds for DS3 are based on bipolar 3-zero substitution (B3ZS) coding violations. The DS3 signals received from the fiber are monitored for AIS and out-of-frame (OOF) conditions, unless they are provisioned for clear channel mode. DS1 timing references are monitored for AIS, BER, excessive out-of-frame (EOOF), LOF, LOS, and out-of-lock (OOL) conditions.

Isolation

When a fault is detected, the DDM-2000 OC-3 Multiplexer uses automatic diagnostics to isolate the fault to a particular signal or circuit pack.

Reporting

The system automatically and autonomously reports all alarm and status conditions through the appropriate user panel and equipment indicators, office alarm relays, telemetry interfaces, and through the TL1/X.25 interface. The system stores a record of all fault conditions and reports them on demand through the CIT and the TL1/X.25 interface. The DDM-2000 OC-3 Multiplexer also stores a history of the past 500 alarm and status conditions and CIT events and reports them on demand through the CIT interface. Each event is real time and date stamped.

If the diagnostic determines that a circuit pack has failed, the red FAULT LED on that circuit pack is turned on. If an incoming electrical signal from the DSX fails, the red FAULT LED on the affected circuit pack flashes on and off in one-second intervals. A failed incoming optical signal has the same effect.

The DDM-2000 OC-3 Multiplexer provides alarm holdoff and clear delays. The alarm holdoff delays prevent transient failures from causing unnecessary maintenance activity. The office alarms are not activated, and the OSs are not notified through the telemetry interfaces until a failure lasts at least as long as the alarm holdoff delay. Alarm clear delays prevent premature clearing of alarms. Alarm indications are not cleared until a fault condition

has been clear for at least as long as the alarm clear delay. Incoming signal failure conditions, AIS, and FERF signals are subject to the provisionable holdoff delay and a fixed 15-second clear delay. Yellow signals are not subject to holdoff or clear delays. Circuit pack failures (except control circuit pack failures) are subject to the provisionable holdoff and clear delays. Refer to the **set-attr-alm** and **rtrv-attr-alm** commands in Section 11, "Commands and Reports."

Protection Switching

The DDM-2000 OC-3 Multiplexer provides equipment protection switching of all transmission and synchronization circuit packs, and SONET standard line protection switching for OC-3 lines. Installation of protection equipment is optional. Protection switches are caused by automatically detected faults in the circuit packs or OC-3 lines, and by external commands from a CIT or TBOS interface. Refer to the **switch-line**, **switch-fn**, **switch-ls**, and **switch-sync** commands in Section 11, "Commands and Reports." The **switch-line** command is not applicable to OC-3 lines configured for path switched rings or to EC-1 interfaces. For path switched rings, path protection switching is used. Refer to "Path Protection Switching (Path Switched Rings)" paragraphs in this section and the **switch-path-vt1** or **switch-path-sts1** commands in Section 11, "Commands and Reports."

Automatic Line Protection

The DDM-2000 OC-3 Multiplexer uses optional SONET 1+1 unidirectional, nonrevertive automatic line protection switch (APS) procedures. This means that after a cut service fiber is repaired, a location **does not** switch back (revert) and select the service set as its active fiber/OLIU set. Line switching is not applicable to OC-3 lines in a path switched ring or to EC-1 interfaces.

Status of ACTIVE LED on OLIUs

Figure 9-13 illustrates examples of unidirectional and nonrevertive line protection switches. Note the squares at locations A and C. Each square represents the transmit or receive section of an OLIU. Figure 9-13(a) and Figure 9-13(b) are associated with the Service (S) OLIU and Figure 9-13(d) and Figure 9-13(e) with the Protection (P) OLIU. Four optical fibers are associated with the service and protection OLIUs that interconnect the OLIUs at locations A and C. The two fibers connecting the service OLIUs are the service fibers and the two fibers connecting the protection OLIUs are the protection fibers. Fibers and OLIUs shown in **bold** are active and carrying service.

In Figure 9-13(a), transmitted optical signals in each direction are permanently bridged to the service and protection fibers. The same signal is transmitted on both fibers. Each service and protection fiber and its associated OLIU are monitored as a set. The fiber/OLIU set selected by the receiving location is the active set and the ACTIVE LED, which in this figure is on the service OLIU circuit packs, is lit. The fiber/OLIU set not selected is the standby set, and the ACTIVE LED on its corresponding OLIU is not lit.

Contrary to other transmission circuit packs, ACTIVE LEDs on both OLIUs may be lit at the same time on the same shelf. For example, in Figure 9-13(b) the receive fiber going to location C has been cut. Location C selects the protection fiber/OLIU set as active, resulting in the lighting of ACTIVE LEDs on both the OLIUs at location C. Location A did not switch to its protection set but continues to remain on the service set. This example illustrates the SONET standard of unidirectional APS. Since each location sends APS information to the other end, both ACTIVE LEDs on the OLIUs at location A are also lit.

After the cut service fiber is repaired, location C **does not** switch back (revert) and select the service set as its active fiber/OLIU set. This example, Figure 9-13(c), illustrates the SONET standard of nonrevertive APS.

Figure 9-13(d) and Figure 9-13(e) illustrate a second fiber failure and the resulting changes to the active OLIUs thus showing that both protection sets could be active and carrying service.

APS Initiation Criteria

The APS is initiated by signal fail and signal degrade conditions on the received optical signal. The BER of the received optical signal is calculated from violations in the SONET line overhead B2 parity bytes. Signal fail is declared for:

- OC-3 incoming LOS
- OC-3 LOF
- OC-3 line AIS
- OC-3 line BER exceeding 10^{-3} .

An OC-3 line BER exceeding a provisionable 10^{-5} to 10^{-9} threshold causes the signal degrade condition. An APS is completed within 60 milliseconds of the beginning of a hard failure such as a fiber cut. The DDM-2000 OC-3 Multiplexer APS is "span independent." In multispan applications, such as hubbing, an automatic or manual protection switch on one span does not cause a protection switch on any other span.

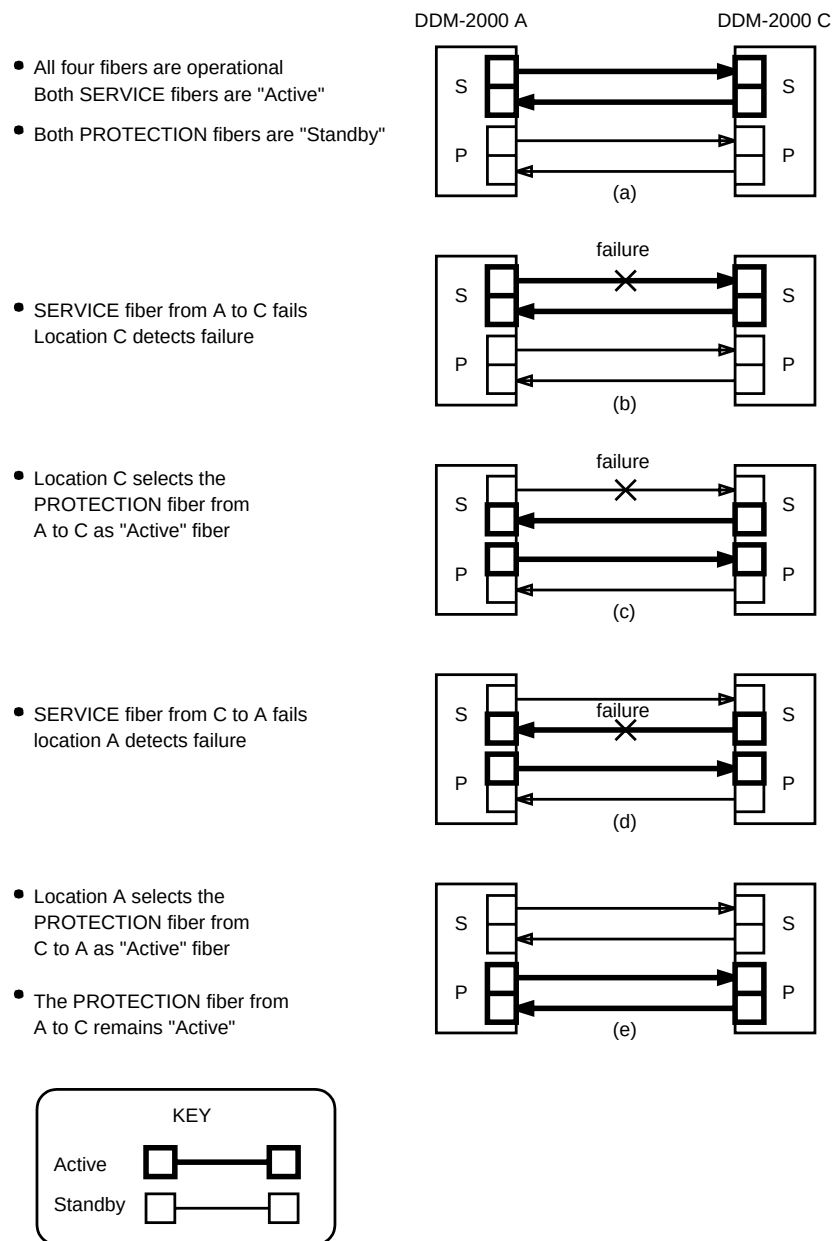


Figure 9-13. Unidirectional Line Protection Switching

Path Protection Switching (Path Switched Rings)

The path switched ring application is based on the Bellcore TR-TSY-000496/GR-1400 path protection switching scheme. The DDM-2000 OC-3 Multiplexer must be equipped with 22-type, 24-type (OC-12) or 27-type (OC-1) OLIUs in the main slots for ring applications. The 22G-U, 22G2-U, 22F2-U, and 22D-U OLIUs support path protection switching based on STS/VT unequipped and STS/VT signal degrade, and are recommended for OC-3 ring applications.

The path protection switched ring has two single-fiber counter-rotating rings as shown in Figure 9-14. This architecture has distinct advantages over a linear architecture. Each node on the ring terminates four fibers: a transmit and receive fiber in each direction. Eight fibers are needed to connect the same NE in a nonterminal position of a linear add/drop 1+1 protected arrangement: two transmit and two receive in each direction, without providing the same level of protection that the ring provides. The architecture of the ring is designed to protect against any single point of failure, including a node failure, single fiber cut, or dual fiber cut. Node failure or dual fiber failure in a linear network affects traffic to all downstream nodes. A node failure in a ring only affects traffic dropped at the failed node.

The signal that enters the ring is protected on a SONET path basis as switching is performed independently for each path. Because of the ring's unidirectional operation, time slots must be reserved all the way around the ring for all ring traffic, limiting the capacity of the ring to the OC-N line rate. DDM-2000 OC-3 can provide both VT1.5 and/or STS-1 path protection, and DDM-2000 OC-12 can provide STS-1 path protection. A single DDM-2000 OC-3 shelf can support a mix of STS-1 and VT1.5 path switched rings. VT1.5 path protection is available at the OC-12 rate by using DDM-2000 OC-3 systems colocated with a DDM-2000 OC-12 system.

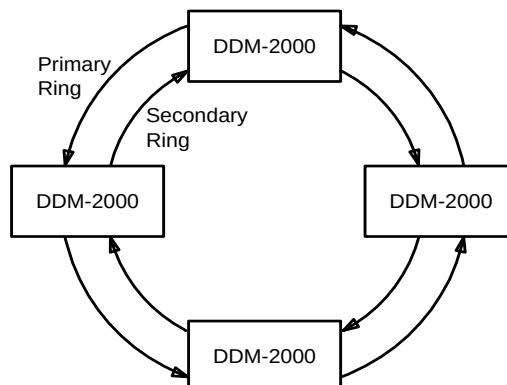


Figure 9-14. Two-Fiber Unidirectional Ring

Path Protection Scheme

Path protection rings feed a SONET payload (STS or VT) from the ring entry point, simultaneously in both rotations of the ring, to the signal's ring drop or exit point as shown by traffic AC and CA in Figure 9-15(a). This duplication of the signal that enters the ring is called a "head-end bridge." The node that drops the signal from the ring monitors both ring rotations and is responsible for selecting the signal that has the highest quality based on LOS/LOF, path AIS, LOP, STS/VT unequipped, and STS/VT path BER performance. This function at the ring exit point is called a "tail-end switch." Path switching is non-revertive. All detected hard failures (LOS, LOF, LOP, line AIS, or STS-1 path AIS) and in VT path switched rings, an STS-1 path signal failure based on BER or an STS path unequipped results in path AIS insertion in the outgoing signals. This allows the drop node to detect VT path failures and select the good path.

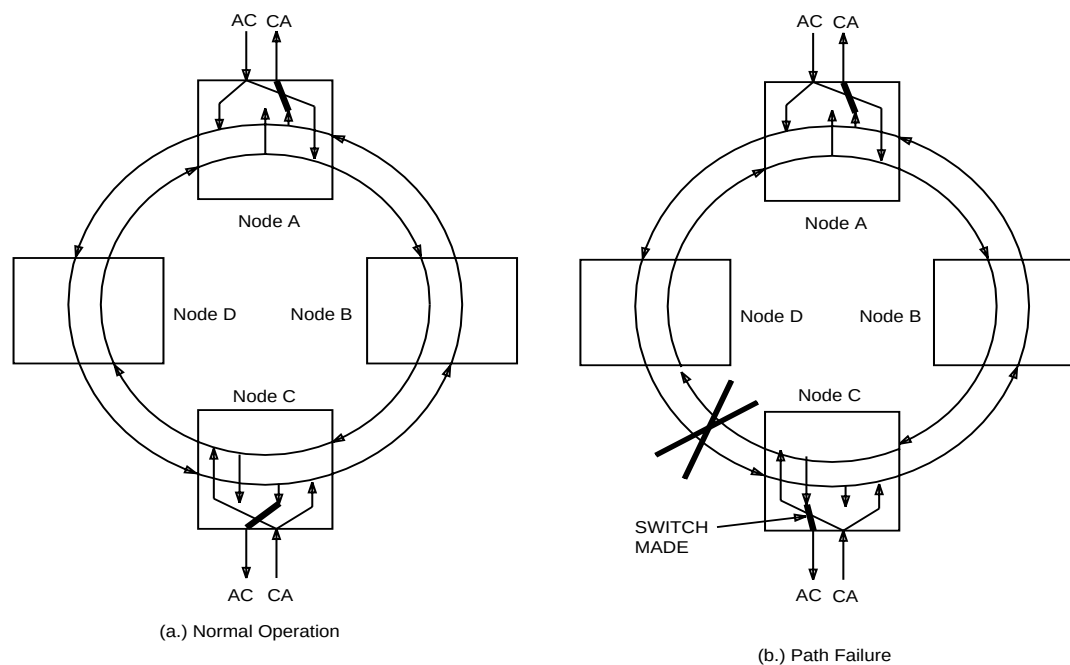


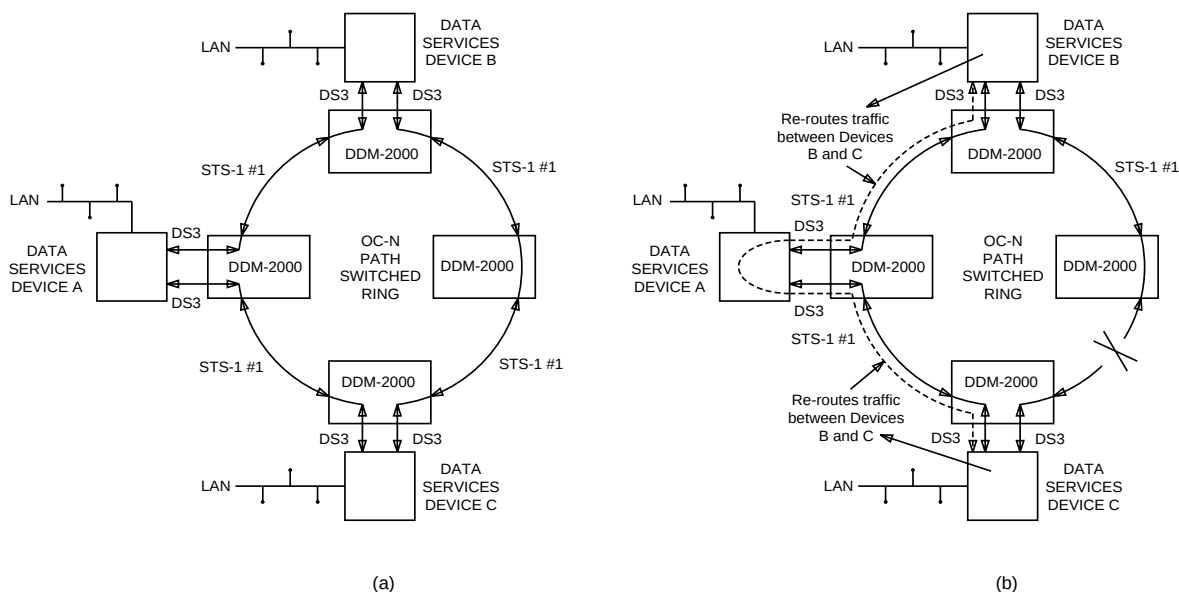
Figure 9-15. Path Protection Switching

The user can set a VT1.5 signal degrade threshold using the **set-vt1** and **rtrv-vt1** commands at a **drop** node on a VT path protected ring. Similarly, the user can set an STS-1 signal degrade threshold using the **set-sts1** and **rtrv-sts1** commands at a **drop** node on an STS path protected ring. Note that although previous equipage-based restrictions on the provisioning of these parameters have been removed, the signal degrade threshold will only be active on OLIUs that support it (22D-U, 22G-U/22G2-U, 27G-U/27G2-U, 22F2-U, 24G-U).

Under normal conditions, both incoming SONET path signals to the switch selection point are of high quality, and the signal can be selected from either ring. A failure or a transmission degradation on one of the rings requires that the other ring path be selected, and requirements specify that this path selection must occur within 60 milliseconds after a hard failure condition. Figure 9-15(b) shows how traffic is switched when a dual-fiber cut occurs. Ring releases provide nonrevertive switching to minimize the impact on critical customer services by giving the service provider control when, and if, the critical service should revert to a particular ring. A manual path protection switching command allows switching back to the original path for ease of ring maintenance. Refer to the **switch-path-vt1** or **switch-path-sts1** commands in Section 11, "Commands and Reports."

Path Protection - Locked DS3 Cross-Connect

Figure 9-16(a) illustrates path-switched protection for a locked DS3 cross-connect. In this example, full multimedia data services, such as Ethernet, Token Ring, ATM, etc., are routed around the ring and through each Data Services Device on STS-1 #1. In the event of a service interruption, as indicated by the "X" in Figure 9-16(b), Data Services Device A reroutes traffic between itself and Data Services Devices B and C.



tpa 852267-01

Figure 9-16. Locked DS3 Cross-Connect Path Protection Switching

Dual Ring Interworking (DRI)

The DDM-2000 OC-3 Multiplexers support DRI which provides end-to-end protection from loss of service on traffic traveling over interconnected rings. This is achieved by connecting the two rings at two dual-homing offices and by provisioning the multiplexers at these nodes to "drop and continue" all necessary paths. This provides a redundant path in case of a catastrophic failure at one of the two DRI offices or one of the nodes in each DRI office. The end nodes perform standard path protection switching on the signals from these two redundant paths.

Dual Ring Interworking (DRI) Path Protection Scheme

Figure 9-17 shows DRI path protection switching. Note that the upper ring could be an FT-2000 OC-48 Lightwave System bidirectional line switched ring. In the receive direction, a DRI node that passes a signal between rings performs two steps:

1. The VT1.5 and/or STS-1 signals to be passed between rings are "dropped and continued." This means the signal is dropped at that node and simultaneously copied into the OC-3 signal in the outgoing direction of the same ring rotation.
2. The VT1.5 and/or STS-1 signal that was dropped in Step 1 and the corresponding VT1.5 and/or STS-1 signal incoming from the other ring direction are compared, and the signal with the highest quality is selected as in single ring topologies.

In the transmit direction, a DRI node feeds VT1.5 or STS-1 signals in the direction opposite to the "continue" portion of the drop and continue signal (Step 1 previously) to only one rotation of the ring as shown in Figure 9-14. This routing is to only one rotation as distinguished from how an ordinary path switched ring bridges incoming low-speed traffic onto both rotations.

The drop and continue routing necessary for DRI is established with a cross-connection command.

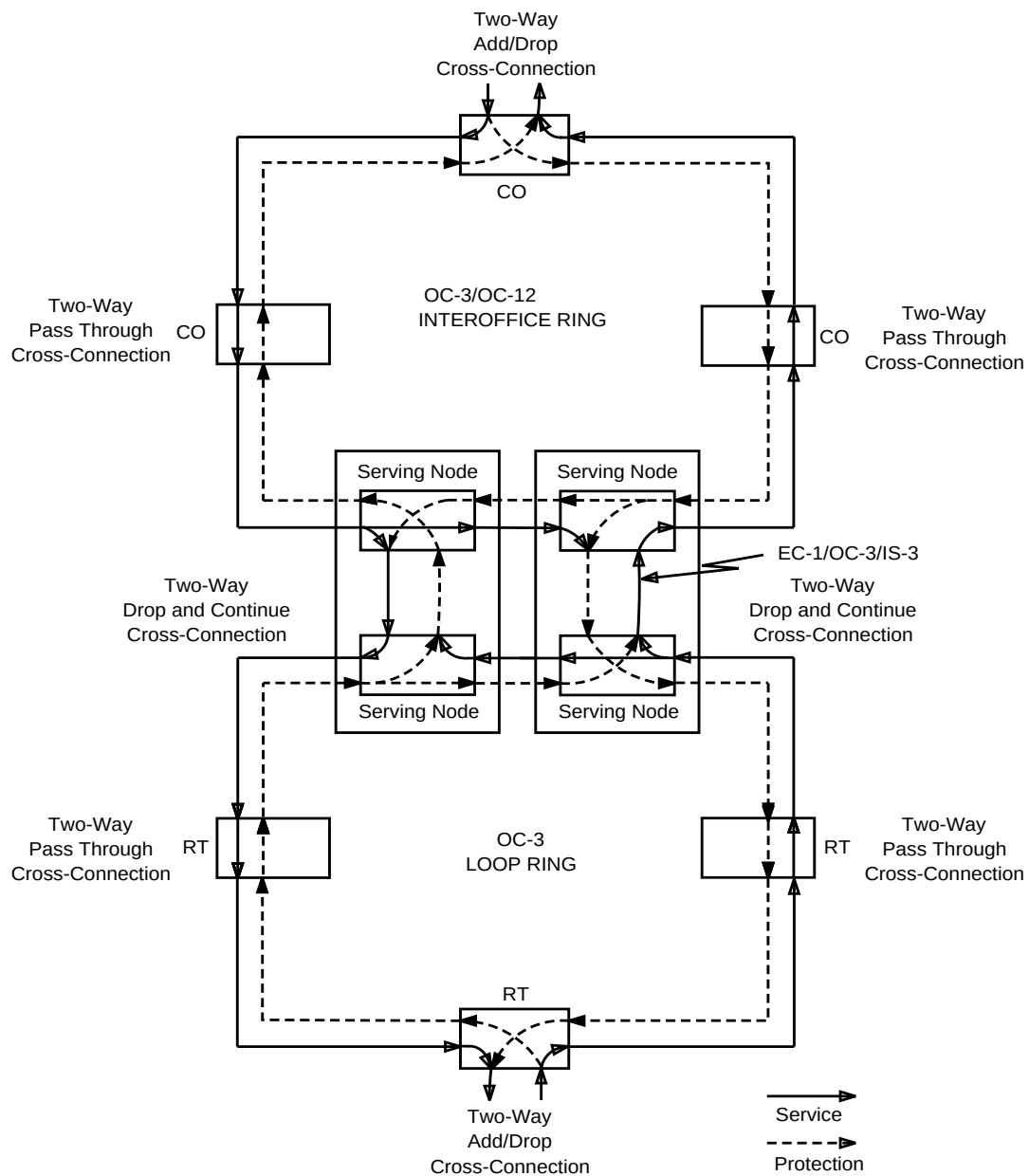


Figure 9-17. DRI Path Protection Switching

OC-3/OC-12 Path Switched Ring (0x1)

A DDM-2000 OC-3 ring shelf can function in a ring-on-ring application using the 0x1 interface capability of the OC-12 or FT-2000 OC-48 Lightwave System ring. The OC-3 shelf functions in the normal path switched ring mode. VT/STS path protection switching is done on the OC-3 shelf as previously described for an OC-3 ring.

In single homing, the OC-3 ring shelf interconnects through its main-1/main-2 ring interface either directly or through another OC-3 ring shelf to the low-speed OC-3 0x1 interface on a single OC-12 or FT-2000 OC-48 Lightwave System shelf.

In dual homing, the OC-3 ring shelf interconnects directly or through another OC-3 ring shelf with the OC-3 interfaces on two separate and normally non-colocated OC-12 or FT-2000 OC-48 Lightwave System shelves.

OC-3/OC-1 Path Switched Ring (0x1)

The OC-3/OC-1 path switched ring is similar to the OC-3/OC-12 ring-on-ring. A DDM-2000 FiberReach shelf interconnects with a DDM-2000 OC-3 ring host shelf through low-speed OC-1 interfaces on the OC-3 ring shelf. VT/STS path protection switching is done on the DDM-2000 FiberReach shelf.

In single homing, the DDM-2000 FiberReach ring interconnects through a pair of low-speed OC-1 0x1 interfaces on the OC-3 shelf.

In dual homing, the OC-1 ring interconnects through the low-speed OC-1 0x1 interfaces on two separate and normally non-colocated OC-3 shelves.

Status of ACTIVE LED on Rings

In all ring applications, ACTIVE LEDs on each main OLIU are always lit because it is not known if a signal on that OLIU is currently being selected by a far-end NE.

Equipment Protection

The DS3, MXRVO, STS1E, and TG circuit packs are 1x1 protected and use nonrevertive switching. Green ACTIVE LEDs are provided on the faceplates of these circuit packs to indicate which ones are active (carrying service).

The DS1 circuit packs are 1x7 protected and use revertive switching. To prevent frequent protection switches caused by intermittent failures of a DS1 circuit pack, the system provides an "automatic lock" feature. If four automatic protection switches are done on the same DS1 circuit pack within a 10-minute interval, traffic

is automatically locked onto the protection DS1 circuit pack, and the automatic lock is reported as a minor alarm. The automatic lock can be reset manually using the **switch-ls** command. It resets automatically at midnight or if the affected DS1 circuit pack is replaced. The DDM-2000 OC-3 Multiplexer supports unprotected equipment configurations.

The DS1 protection circuit pack is automatically provisioned with the same user-settable options as the service DS1 circuit pack it protects except for the line build-out (LBO) value which is set by hardware switches (not by CIT or TL1).

Synchronization Reference Protection

In external timing and line timing modes, the synchronization references are 1×1 protected. If neither reference is available, the system automatically switches to "holdover" timing mode. When the TG is provisioned for synchronization messaging, the system can determine the quality of the line timing references by reading the synchronization messages in the OC-N transport overhead bytes. If the quality is not adequate, the TG will switch to holdover until manually switched to a good reference.

If automatic synchronization reconfiguration is enabled, the TG will automatically select the highest quality reference. See "Synchronization Messaging" in Section 5 and, "Transmission and Synchronization Interfaces" and the **set-sync** command in Section 11, "Commands and Reports."

The system can be provisioned to revertive or nonrevertive timing mode switching. The default is revertive. If provisioned for revertive mode switching, the system automatically switches from holdover mode to the provisioned timing mode (external timing or line timing) when an unprotected timing reference failure clears. If provisioned for nonrevertive mode switching, the system must be manually switched from holdover mode to the provisioned timing mode (external timing or line timing) when an unprotected timing reference failure clears. Refer to the **rtrv-sync**, **set-sync** and **switch-sync** commands in Section 11, "Commands and Reports."

Loopbacks

The DDM-2000 OC-3 Multiplexer allows technicians to set up loopbacks on all low- and high-speed interfaces. Low-speed DS1, DS3, and EC-1 electronic loopbacks, directed toward the high-speed OC-3, can be individually controlled from the CIT. Facility loopbacks can also be set up towards the DSX on all low-speed DS1, DS3, and EC-1 interfaces. DS1 facility loopbacks can only be set up in groups of four on the BBF1(B) and BBF3 circuit packs. Quad DS1 loopbacks are available in Release 9.1 and later. Beginning in R11.1, individual DS1 facility loopbacks are available with the BBF3B and the BBG20 (TMUX) circuit packs. Active electronic loopbacks are noted by the user panel's abnormal (ABN) indicator and in the Alarm and Status report. Refer to the **opr - lpbk** and **rls - lpbk** commands in Section 11, "Commands and Reports."

Front access to the OLIU optical connectors allows an easy manual OC-3 or OC-1 optical loopback. This loopback is set up by connecting a fiber jumper from the OLIU output to its input. An optical attenuator is required for this loopback if the 22G-U OLIU is used. Other types of OLIUs do not require attenuators for this loopback. The optical output power switch on the 21G/21G-U OLIU circuit pack should be set for low output power to prevent receiver overload when an optical loopback is set up.

Tests

Transmission Tests

Technicians can use DDM-2000 OC-3 Multiplexer internal testing capabilities for installation and manual troubleshooting. DS1 and DS3 test signal generators and detectors are integrated in the system, eliminating the need for external test equipment to do DS1/DS3 transmission testing.

The DDM-2000 OC-3 Multiplexer lets technicians test specific signals and system components. For example, technicians can manually enable the integrated test signal generators and detectors for a DS1 or DS3 low-speed interface. These signal tests can be run selectively in the multiplex or demultiplex direction. Refer to the **test - trmsn** commands in Section 11, "Commands and Reports."

Automatic Turnup Tests

Automatic turnup tests are mechanisms that allow rapid turnup of DDM-2000 OC-3 systems without the use of external test equipment.

Automatic turnup tests are not currently available for path switched ring applications but software for a nonring release can be used to perform local equipment and local wiring cross-connect tests. Manual automatic turnup tests can be done using the procedures listed in the TOP section of this manual (Volume II).

The installation tests can be controlled via either the user panel or the CIT. Three different turnup procedures are provided and should be done in the order listed:

1. **Local Equipment Test** — The local equipment test verifies the integrity of the transmission and synchronization circuit packs and the OC-3 backplane. In the test, high-speed signals are looped back (manual optical loopback or EC-1 electrical loopback) towards the low-speed interfaces (see Figure 9-18).
2. **Local Wiring Cross-Connect Test** — The local wiring cross-connect test verifies the integrity of the cross-connect or wiring that is established. This assumes local equipment tests have been performed and any problems or failures have been corrected before this test is done. In the test, all low-speed signals are looped back (manual loopbacks at the STSX or DSX, see Figure 9-19).
3. **Optical Span Test** — The optical span test verifies the end-to-end transmission across an optical span. In this test, the OC-3 signals are monitored at both ends of the optical span and the results reported back on the same line using the line overhead. Loopbacks are not required (see Figure 9-20).

Each of the tests described previously returns a good/fail result. If any circuit pack failures are detected during the tests, the FAULT indicator on the failed circuit packs are lit. If the wiring to the cross-connect panel is defective, the red FAULT indicators on the low-speed circuit packs that detect incoming signal failures blink for 1 minute. If the test passes, the green ACO indicator on the user panel is lit. Good/fail is also reported to the CIT at the end of the test. Refer to the **test-auto** command in Section 11, "Commands and Reports."

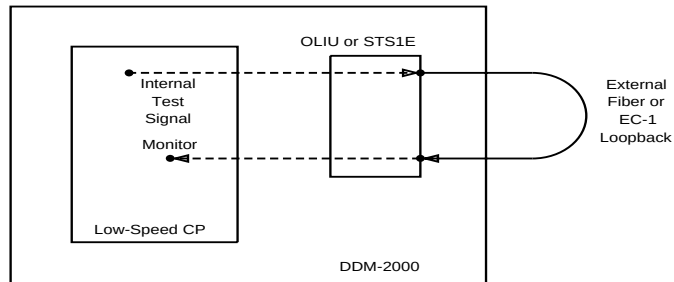


Figure 9-18. Local Equipment Test

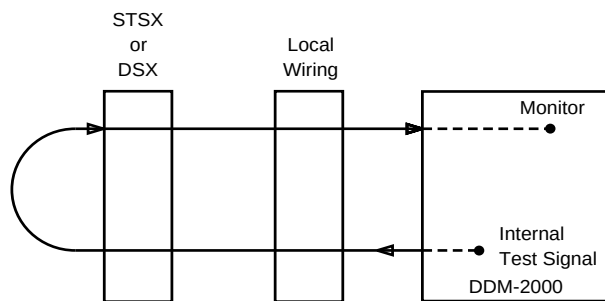


Figure 9-19. Local Wiring Cross-Connect Test

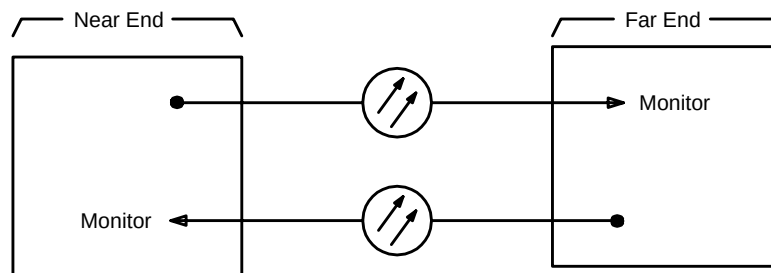


Figure 9-20. Optical Span Test

Operations Interface Tests

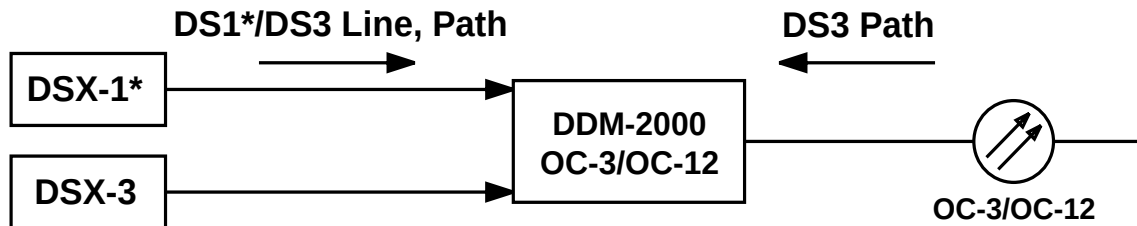
The DDM-2000 OC-3 Multiplexer provides tests for LED indicators, parallel telemetry and TBOS interfaces, office alarms, and the system controller. Refer to the **test-led**, **test-tlm-par**, **test-tlm-ser**, **test-alm**, and **test-sysctl** commands in Section 11, "Commands and Reports."

Performance Monitoring (PM)

The DDM-2000 OC-3 Multiplexer uses PM to support proactive maintenance of the network and tariffed service performance verification. Proactive maintenance refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming but indicative of an impending hard or soft failure. Hard and soft failures result in reactive maintenance.

Proactive maintenance consists of monitoring performance parameters associated with the SONET sections, lines, and paths within the SONET network. Table 9-7 lists the SONET performance parameters monitored by the DDM-2000 OC-3 Multiplexer. These parameters are thresholded to indicate degraded performance. When a PM threshold is crossed, it is reported to the OS connected to an X.25 or TBOS link as a threshold crossing alert (TCA). For an X.25 link, all threshold crossings associated with a particular path can be correlated, and the likely source of the degradation can be identified. For a TBOS link, all threshold crossings are indicated by a single point.

Figure 9-21 shows DS1/DS3 line and path and DS3 path PM.



* OC-3 Shelves Only.

Figure 9-21. DS1/DS3 Line and Path and DS3 Path Performance Monitoring (PM)

The following are definitions and explanations for the terms used in the figure:

- **Line** — A line is a physical transport vehicle that provides the means of moving digital information between two points in a network. The line is characterized by a metallic transmission medium and its specific coding type. A line is bounded by its two end points, known as line terminations. A line termination is the point where the electrical, bipolar line signal is generated and transmitted, or received and decoded.
 - **DS1** — DS1 line for AMI or B8ZS coding is monitored and the errored second (ES-L) data is displayed for the incoming signal from the DSX-1.
 - **DS3** — DS3 line for B3ZS coding is monitored and the data is displayed in CV-L, ES-L, and SES-L registers for the incoming signal from the DSX-3.
- **Path** — A path is a framed digital stream between two points in a network and represents digital signal transport at a specified rate, independent of the equipment and media providing the physical means of transporting the signal. A path is defined by its two end points, called path terminations, where its frame structure is generated and decoded. A path may be carried wholly within one transport segment (line), or it may span a sequential arrangement of two or more transport segments.

- DS1 — DS1 near-end path is monitored for SF framing and both near-end and far-end paths are monitored for ESF framing. The data is displayed in ES-P, SES-P, and UAS-P categories. CV-P is also displayed.
- DS3 — DS3 path incoming from the fiber (high-speed side) is monitored for P-bit and F&M bit and the data is displayed in CV-P, ES-P, SES-P, and UAS-P registers. In addition, severely errored frame second (SEFS) is also monitored and displayed.

DS3 path incoming from the DSX-3 (low-speed side) is also monitored, in addition to monitoring the path from the fiber, for P-bit and F&M bit. The same registers are also displayed for the data from the DSX-3. DS3 path from both the fiber and the DSX-3 are monitored for C-bit and are displayed in the same registers as above. The far-end data (FEBE bits) is monitored and displayed as well.

VT Performance Monitoring

VT PM provides performance monitoring of the V5 byte for ES, SES, and UAS. VT PM is a feature package option that requires feature package software licensed by Lucent and the use of the **set-feat** command to enable the feature.

The counts are retrieved using the **rtrv-pm-vt1** command by the message-based OS or through the CIT to determine if the service is operating within tariffed limits.

DS1 Performance Monitoring

DS1 PM is a feature package option that requires feature package software licensed by Lucent and the use of the **set-feat** command to enable the feature. DS1 PM measures near-end performance and ESF format far-end performance report of the incoming DS1, allowing service providers to determine the end-to-end performance of a DS1 signal. Tariffed service verification consists of monitoring performance parameters that can be associated with the customer's end-to-end service. The DDM-2000 OC-3 Multiplexer provides this capability for DS1 services with the DS1 PM feature. Based on the *ANSI T1.403* ESF format, this capability retrieves performance report messages written into the ESF data link by the customer's terminal equipment.

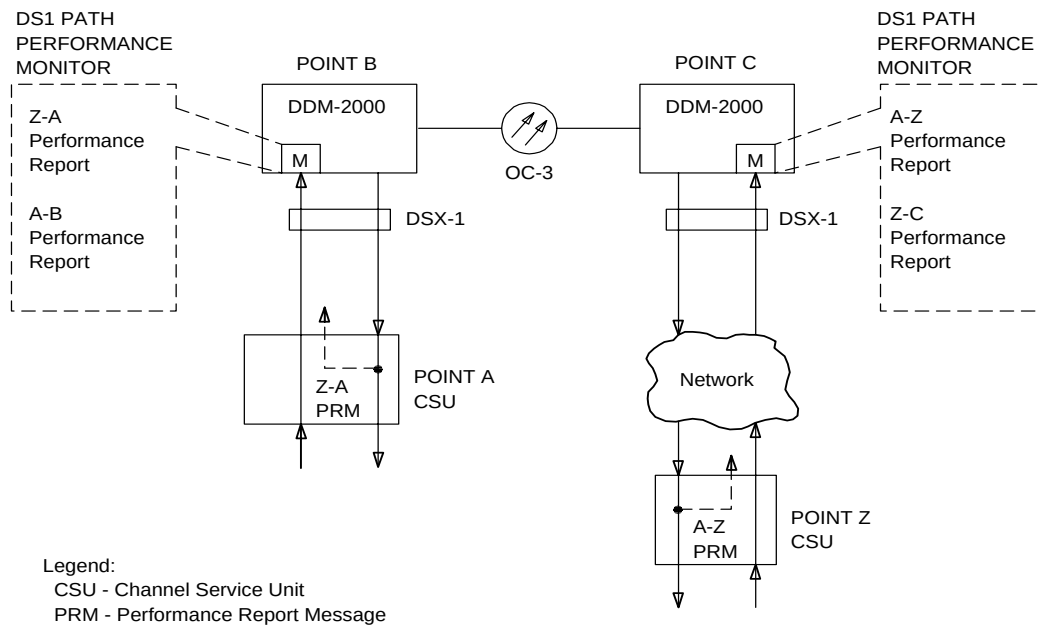


Figure 9-22. DDM-2000 OC-3 Multiplexer DS1 Path Performance Monitoring

From these messages, the DDM-2000 OC-3 Multiplexer can determine and report the end-to-end error performance of the entire DS1 link *as seen by the customer*. These parameters, listed in Table 9-7, are thresholded and reported to indicate degraded performance. The counts are retrieved using the **rtrv-pm-t1** command by the message-based OS to determine if the service is operating within tariffed limits.

Application of the OC-3 DS1 PM feature for tariffed service verification is shown in Figure 9-22. Figure 9-22 shows an ANS/T1.403 ESF format DS1 service carried between points A and Z, using a DDM-2000 OC-3 system and terminated at the customer's premises with channel service units (CSUs). At the "A" end, the received error performance (Z-A) is detected and written by the customer's CSU onto the outgoing (A-Z) ESF data link, as shown by the dashed lines, as a performance report message (PRM). The DS1PM circuit pack interfacing the "A" end reads the incoming DS1 signal's PRM (received from the customer's premises) and reports the Z-A performance. Likewise, the OC-3 system interfacing the Z end reports the A-Z performance by reading the PRM from the customer's "Z" CSU. By reviewing the data from each OC-3 system, the service provider can determine the complete end-to-end performance (A-Z and Z-A) of the customer's service.

Additionally, each DS1PM circuit pack measures the near-end performance of the incoming DS1, allowing the service provider to determine if a good DS1 signal was received from the customer before transporting it through the network. This information can then aid in sectionalizing any reported performance problems. The DS1PM circuit pack can also provide this same near-end information for SF formatted (sometimes known as "D4 framing") DS1 services, but complete end-to-end performance verification is limited due to the lack of the PRM in the SF format.

DS3 Performance Monitoring

DS3 Path PM

With the BBG4B DS3 and BBG20 TMUX circuit packs, the DDM-2000 OC-3 Multiplexer provides three DS3 path PM options: P-bit (parity bit), adjusted F&M bit (frame and multiframe bit), and C-bit. The options are selected using a command that also sets the PM mode to "on" (default) or "off," which enables or disables the monitoring and reporting of DS3 path PM data (see Table 9-7).

P-Bit

When provisioned for P-bit, the system calculates and provides counts of DS3 CV-P, ES-P, SES-P, and UAS-P incoming from the fiber and DSX. Quarter-hour and current day registers are provided with provisionable TCAs on a per-shelf basis. SEFS are also monitored.

Because P-bits can be corrected at nodes provisioned for VMR along a DS3 path, the DS3 P-bit PM data may not provide a complete report of the end-to-end DS3 path errors.

Adjusted F&M Bit

Adjusted F&M bit PM provides an alternative method for determining and accumulating DS3 path performance data based on an error estimation technique using errors on the F&M framing bits to approximate the actual error counts in the DS3 path payload. F&M bits are not corrected at nodes provisioned for VMR along a DS3 path. When provisioned for adjusted F&M bit, the system calculates and provides estimated counts of DS3 adjusted F&M bit CVs, ESs, SESs, and UASs incoming from the fiber and DSX. Quarter-hour and current day registers are provided with provisionable TCAs on a per-shelf basis. SEFS are also monitored.

C-Bit

When the DS3 path PM C-bit option is selected, both near-end and far-end (far-end block errors — FEBE) PM data are monitored and displayed.

The system provides counts of DS3 C-bit parity coding violations (CV-P), ES-P, SES-P, and UAS-P incoming from both the DSX-3 and the fiber. The type of PM is provisioned per DS3 service by a CIT command.

For C-bit PM, the DS3 service can be provisioned in violation monitor (VM) or violation monitor and removal (VMR) modes. In VMR mode, the C-bit errors are not corrected as in the P-bit option.

Quarter-hour and day registers are provided with provisionable TCAs. The TCAs are provisionable on a per-shelf basis. SEFS counts are also provided.

DS3 Line

DS3 line parameters include line coding violations (CVL), errored seconds (ESL), and severely errored seconds (SESL). DS3 line PM provides provisionable bit error ratios (TCAs) for all DS3 line parameters. For CVL parameters, bit errors can also be provisioned in ratios such as 10^{-7} , 10^{-8} and 10^{-9} .

Performance Parameters

Table 9-7 lists the performance parameters monitored by the DDM-2000 OC-3 Multiplexer. The collection of performance parameters depends directly on slot state transitions, port states, and cross-connections.

Table 9-7. Performance Monitoring Parameters

Facility	Measured Parameter
OC-3 Optics	Laser Bias Current * Laser Transmit Power *
OC-12 Section †	Severely Errored Frame Seconds (SEFS)
OC-3 Section	Severely Errored Frame Seconds (SEFS)
OC-1 Section	Severely Errored Frame Seconds (SEFS)
OC-12 Line †	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS) STS Pointer Justification (PJC)
OC-3 Line	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS) Line Protection Switch Counts (PSC-L) STS Pointer Justification (PJC)
OC-1 Line	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS) STS Pointer Justification (PJC)
EC-1 Line	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS) STS Pointer Justification (PJC)
STS-1 Path	B3 Coding Violations (CV) B3 Errored Seconds (ES) B3 Errored Seconds Type A (ESA) B3 Errored Seconds Type B (ESB) B3 Severely Errored Seconds (SES) B3 Unavailable Seconds (UAS)

Facility	Measured Parameter
VT1.5 Path	V5 Errored Seconds (ES) V5 Severely Errored Seconds (SES) V5 Unavailable Seconds (UAS)
DS1 Path	Errored Seconds, Path (ESP) Errored Seconds, Path Far-end (ESPFE) Severely Errored Seconds, Path (SESP) Severely Errored Seconds, Path Far-end (SESPFE) Unavailable Seconds, Path (UASP) Unavailable Seconds, Path Far-end (UASPFE)
Enhanced DS1 Path	Coding Violations, Path (CVP) Coding Violations, Path Far-end (CVPFE)
DS1 Line	Errored Seconds, Line (ESL) Enhanced Line Signal Threshold (BERL)
DS3 Path for P-Bit, F&M Bit, and C-Bit from Fiber and DSX	CV-P Coding Violations Severely Errored Frame Seconds (SEFS) ES-P Errored Seconds SES-P Severely Errored Seconds UAS-P Unavailable Seconds
DS3 Line	Line Coding Violations (CVL) Errored Seconds (ESL) Severely Errored Seconds (SESL)

* 21G-U OLIU only

† Release 11.0 and later and when used with a 24G-U in main slots.

Optical Parameters

Performance Monitoring Enabling

Collection of optical parameters are initiated when a slot is equipped with an OLIU circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Laser Bias Current

The laser bias current is monitored continuously to detect degraded performance of the laser. A TCA is generated if the laser bias current exceeds a fixed threshold of 1.5 times the nominal value. Laser bias current is monitored independently for service and protection optical facilities. This parameter is monitored only by the 21G/21G-U OLIU.

Optical Transmit Power

The optical transmit power is monitored continuously to detect degraded performance of the laser. Threshold-crossing alerts (TCAs) are generated if the optical transmit power falls below fixed thresholds of –1 dB and –2 dB. Optical transmit power is monitored independently for service and protection optical facilities. This parameter is monitored only by the 21G/21G-U OLIU.

OC-3 Section Parameters

Performance Monitoring Enabling

Collection of section parameters for OC-3 interfaces are initiated when a slot is equipped with an OLIU circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Severely Errored Frame Seconds (SEFS)

This parameter counts the number of seconds during which an OOF, LOS, or OLIU circuit pack failure occurred. SEFSs are counted and thresholded independently for the service and the protection lines.

OC-3/EC-1 Line Parameters

Performance Monitoring Enabling

Collection of line parameters for OC-3 interfaces are initiated when a slot is equipped with an OLIU circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Collection of line parameters for an EC-1 high speed interface is initiated when the slot is equipped with an STS1E circuit pack set for high-speed.

Collection of line parameters for EC-1 low-speed interfaces are initiated when a slot is equipped with an STS1E circuit pack set for low-speed and the port is in the in service (IS) state. Parameters continue to be available in reports and generate appropriate TCAs until the input signal is removed and the **update** command or the UPD/INIT button is pressed. Alternatively, the EC-1 low-speed line parameters can be disabled by setting the EC-1 port state to not monitored (NMON) using the **set-state-ec1** command.

Line Coding Violations (B2 Parity)

To monitor the performance of the OC-3 (or EC-1) line, the line BIP-8 (B2 parity) is calculated, written, and checked for errors. The line B2 parity violation counter is incremented for each line BIP error detected. Each line BIP-8 can detect up to eight errors per STS-1 frame. The contents of the three line B2 parity violation counters associated with the OC-3 line are added to form a composite B2 parity violation count. Coding violations are not counted during seconds that contain a line AIS, LOS, LOF, or during a UAS. The B2 parity violations are counted and thresholded independently for the service and protection lines.

Errored Seconds (ES)

An "errored second" is a second in which one or more B2 parity violations are detected. An ES "type A" is a second in which exactly one B2 parity violation is detected. An ES "type B" is a second in which more than one and less than 32 for OC-3, or 12 for EC-1, B2 parity violations are detected. Seconds that are UAS are not counted as ES. A second that contains a line AIS, LOS, LOF or is a UAS is not counted as a type A or type B ES. All three of these parameters are counted and thresholded independently for the service and protection lines.

Severely Errored Seconds (SES)

A "severely errored second" is a second in which 32 or more for OC-3 or, 12 or more for EC-1, B2 parity violations are detected or one in which a LOS, LOF or line AIS occurs. A UAS is not counted as an SES. SESs are counted and thresholded independently for the service and protection lines.

Unavailable Seconds (UAS)

An "unavailable second" is a second during which the OC-3 line is "unavailable." A line is considered unavailable from the beginning of X consecutive SESs until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the line signal failure. Y is equal to 10 seconds of no SESs or line signal failure. UAS are counted and thresholded independently for OC-3 interface service and protection lines.

Line Protection Switch Counts

Line protection switch counts is the count of the number of protection switches FROM the working OC-3 interface line. The count is independently counted and thresholded for both the service and the protection line.

STS Pointer Justification Count (PJC)

This feature provides a TCA from a Lucent DDM-2000 shelf when the STS pointer justification count in a performance bin exceeds a user provisioned threshold value. STS PJCs for each SONET line interface are accumulated in 15 minute and 24 hour performance monitoring bins. The TCA is sent via TL1 autonomous message to the OS and is available through CIT and TL1 PM reports. PJCs are not accumulated during second intervals in which an STS-1 is in the LOP or AIS state.

For each SONET line interface the system accumulates counts from only one STS-1 tributary during a 1 second monitoring interval. Excessive pointer justifications indicate a frequency error in the network or other potential synchronization problem. For example, a frequency error could be caused by a shelf in holdover or by a frequency offset in an external timing reference in networks with more than one shelf externally timed. The TCA can be provisioned in the frequency offset range from approximately .01 ppm to 10 ppm by setting a threshold for the PJC equivalent to the frequency offset.

STS-1 Path Parameters

Performance Monitoring Enabling

- OC-3 Interfaces

Collection of STS-1 path parameters depends on the application. For systems using default STS-1 cross-connections, monitoring is initiated only when either slot pair is equipped with a DS3 or MXRVO circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the DS3 or MXRVO is removed and the **update** command or the UPD/INIT button is pressed.

For systems using manual STS-1 cross-connections, monitoring is initiated only when an STS-1 cross-connection is made to a DS3 or MXRVO circuit pack and the channel is in the IS state. Parameters continue to be available in reports and generate appropriate TCAs until the STS-1 cross-connection is deleted. Removal of a circuit pack without removal of the cross-connection are reported as "unavailable time."

For systems using manual VT1.5 cross-connections, monitoring is initiated only when the first VT1.5 cross-connection associated with that STS-1 signal is made and the VT channel is in the IS state. This applies to STS-1 paths on both OLIU and STS1E low-speed circuit packs. Parameters continue to be available in reports and generate appropriate TCAs until the last VT1.5 signal associated with that STS-1 cross-connection is deleted.

- **EC-1 Low-Speed Interfaces**

For EC-1 low-speed interfaces, collection of STS-1 path parameters are initiated only when a slot is equipped with an STS1E circuit pack set for low-speed and a VT1.5 cross-connection is made.

- **EC-1 High-Speed Interfaces**

For EC-1 high-speed interfaces, collection of STS-1 path parameters are initiated only when a slot is equipped with an STS1E circuit pack set for high-speed.

STS-1 Path Coding Violations (B3 Parity)

To monitor the performance of the STS-1 path, the "B3" byte in the STS-1 path overhead is written when the path is originated, and checked for errors when the path is terminated. Beginning with R11.1, STS-1 path performance information is extended to monitor all incoming OC-n and EC-1 low-speed interfaces to an NE independent of whether the STS-1 terminates on that NE.

The B3 coding violation counter is incremented for each error detected. Up to eight errors per STS-1 frame can be detected in each STS-1 synchronous payload envelope (SPE). B3 coding violations are counted and thresholded separately for each STS-1 path terminated by the system. Coding violations are not counted during seconds that contain a line AIS, LOS, LOF, LOP, STS path AIS, or during a UAS.

Errored Seconds (ES)

An "errored second" is a second in which one or more B3 parity violations are detected. Seconds that are UAS are not counted as ES. An ES "type A" is a second in which exactly one B3 parity violation is detected. An ES "type B" is a second in which more than one and less than nine B3 parity violations are detected. All three of these parameters are counted and thresholded independently for each STS-1 path terminated by the system.

Severely Errored Seconds (SES)

An SES is a second in which nine or more B3 parity violations are detected. SES are counted and thresholded separately for each STS-1 path terminated by the system. A UAS is not counted as an SES.

Unavailable Seconds (UAS)

An STS-1 path is considered "unavailable" from the beginning of X consecutive SES until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the STS signal failure. Y is equal to 10 seconds of no SES or STS signal failure. If there is an unprotected STS-1 path terminating equipment failure (STS1E, MXRVO, DS3, or OLIU), UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery.

VT1.5 Path Parameters

Performance Monitoring Enabling

- EC-1 High-Speed Interfaces

For EC-1 high-speed, VT1.5 monitoring is initiated when a DS1 slot is equipped with a DS1 or DS1PM circuit pack (assuming an associated STS1E circuit pack set for high-speed is present). Parameters continue to be available in reports and generate appropriate TCAs until the DS1 or DS1PM circuit packs are removed and the **update** command or the UPD/INIT button is pressed.

- OC-3 Interfaces

VT1.5 monitoring is initiated when the associated VT1.5 or STS-1 cross-connection is made to a DS1 or DS1PM circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the VT1.5 or STS-1 cross-connection is deleted.

Errored Seconds (ES)

An "errored second" is a second that is not an "unavailable second" in which one or more V5 parity violations or an AIS or LOP is detected. This parameter is counted and thresholded independently for each VT1.5 path terminated by the system.

Severely Errored Seconds (SES)

A "severely errored" second is a second that is not an "unavailable second" in which four or more V5 violations or an AIS or LOP is detected. SES are counted and thresholded separately for each VT1.5 path terminated by the system.

Unavailable Seconds (UAS)

A VT1.5 path is considered "unavailable" from the beginning of X consecutive SES until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the VT signal failure. Y is equal to 10 seconds of no SES or VT signal failure. If there is an unprotected VT path terminating equipment failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery.

DS1 Path Parameters

Performance Monitoring Enabling

Collection of DS1 path parameters are initiated only when a slot is equipped with a DS1PM circuit pack (assuming associated MXRVO or STS1E circuit packs are present), the DS1 port is in the IS or NMON state, and the DS1 port is provisioned for PM. Parameters continue to be available in reports and generate appropriate TCAs until the input signal to the DS1 interface is removed and the **update** command or the UPD/INIT button is pressed. Alternatively, the DS1 path parameter can be disabled by setting the DS1 port to turn off DS1PM by using the **set - t1** command.

DS1 path parameters are also applicable to the TMUX when the individual DS1s are provisioned for PM by the **set - t1** command.

Errored Seconds (ES)

An "errored second" for a DS1 SF format is a second in which one or more FEs (frame errors), or a DS1 AIS, or a DS1 OOF is detected. A near-end "errored second" for a DS1 ESF path is a second in which one or more CRC-6 violations, or a DS1 AIS, or OOF is detected. ES are not counted during "unavailable seconds." For a DS1 path with the ESF format, the far-end "errored seconds" values are obtained from the performance report message (PRM) in the DS1 ESF data link.

Severely Errored Second (SES)

For the DS1 SF format, a "severely errored second" is a second in which eight or more FEs are detected, or an OOF, or DS1 AIS is detected. For the DS1 ESF format, a near-end SES is a second in which 320 or more CRC-6 violations, or a DS1 AIS, or DS1 OOF are detected. For a DS1 path with the ESF format, the far-end "severely errored seconds" values are obtained from the PRM in the DS1 ESF data link. SES are not counted during "unavailable seconds." For a DS1 path with ESF format, the far-end "severely errored seconds" values are obtained from the PRM.

Unavailable Seconds (UAS)

A DS1 path is considered "unavailable" from the beginning of 10 consecutive SES until the beginning of 10 consecutive seconds, none of which is severely errored. If there is a DS1 pack failure, then UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. UAS are counted and thresholded separately for each DS1 path monitored by the system.

For a DS1 path with ESF format, the far-end "unavailable second" performance is obtained from the PRM.

CV-P Coding Violations

This indicates the number of DS1 near-end path coding violations during the data collection interval. For a DS1 in SF format, this is a count of framing bit errors. For a DS1 in ESF format, this is a count of CRC-6 bit errors.

CV-PFE Coding Violations

This indicates the number of DS1 far-end path coding violations during the data collection interval. This parameter is only applicable to a DS1 signal in ESF format. This is a count of CRC-6 bit errors as reported in the G bits of the PRM.

DS1 Line Parameters

ES-L Errored Seconds

This parameter is a count of seconds containing one or more bipolar violations (for both AMI and B8ZS types of coding) or one or more LOS defects from the DSX-1.

DS3 Parameters

Performance Monitoring Enabling

Collection of DS3 path parameters are initiated only when a slot is equipped with a DS3 circuit pack, the port is in the IS or NMON state, the DS3 port is provisioned for P-Bit violation monitoring (VM mode) or P-Bit violation monitoring and removal (VMR mode), and a default or manual STS-1 cross-connection is present. Parameters continue to be available in reports and generate appropriate TCAs until the input signal to the DS3 interface is removed and the **update** command or the UPD/INIT button is pressed (transitioning to the AUTO state). Alternatively, the DS3 path parameter can be disabled by setting the DS3 port to the clear channel mode (CC) using the **set - t3** command. The PM mode parameter should be set to "on" (default) using the **set - t3** command to start PM data monitoring and reporting.

For the TMUX circuit pack, DS3 PM is always enabled if the DS3 port is in the IS state.

DS3 Performance Monitoring (PM)

The DS3 PM is enabled as specified in Table 9-8.

Table 9-8. DS3 Performance Monitoring Enabling

DS3 Port State	Mode		
	VMR	VM	CC
IS (In Service)	Yes	Yes	No
AUTO	No	No	No
NMON (Not Monitored)	Yes	Yes	No

DS3 Path

CV-P Coding Violations

CV-P coding violations are a count of the number of P-bit, adjusted F&M bit, or near-end and far-end C-bit parity errors in the DS3 signal received from the fiber and the DSX-3. To detect degradation of the signal, these errors are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode. By provisioning all NEs in the DS3 path to the VM mode, CV-Ps can be used as a DS3 path performance parameter when the P-bit option is selected. When the F&M-bit or C-bit option is selected, NEs could be provisioned in VMR or VM mode (see Table 9-9).

Severely Errored Frame Seconds (SEFS)

SESF are a count of the number of seconds during which an OOF or AIS condition exists for a DS3 signal received from the fiber or the DSX-3, or during an unprotected DS3 circuit pack failure. SEFSs are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode.

Errored Seconds (ES-P)

An "errored second" is a second in which one or more DS3 P-bit, adjusted F&M-bit, or near-end and far-end C-bit coding violations are detected. ES are not counted during UAS. ES are counted and thresholded independently for each DS3 path terminated by the system.

Severely Errored Seconds (SES-P)

A "severely errored second" is a second in which 44 or more DS3 P-bit, adjusted F&M-bit, or near-end and far-end C-bit coding violations are detected. SES-P are not counted during UAS. SES are counted and thresholded independently for each DS3 path terminated by the system.

Unavailable Seconds (UAS-P)

An "unavailable second" is a second during which the DS3 path is "unavailable." A DS3 path is considered "unavailable" from the beginning of X consecutive SES until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the DS3 signal failure. Y is equal to 10 seconds of no SES or DS3 signal failures. If there is an unprotected DS3 circuit pack failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. UAS are counted and thresholded independently for each DS3 path terminated by the system. This applies to P-bit, adjusted F&M bit, and near-end and far-end C-bit options.

C-Bit

When the DS3 path PM C-bit option is selected, both near-end and far-end (far-end block errors) PM data are monitored and displayed.

The system provides counts of DS3 C-bit CV-P, ES-P, SES-P, and UAS-P incoming from both the DSX-3 and the fiber. The type of PM is provisioned per DS3 service by a CIT command.

For C-bit PM, the DS3 service can be provisioned in VM or VMR modes. In VMR mode, the C-bit errors are not corrected as in the P-bit option.

Quarter-hour and day registers are provided with provisionable TCAs. The TCAs are provisionable on a per shelf basis. SEFS counts are also provided.

Table 9-9. DS3 Performance Monitoring (PM) Modes

Mode	PM Option	Monitor P-Bits	Monitor F&M Bits	Monitor C-Bits	Correct P-Bits	Correct F&M Bits	Correct C-Bits	Monitor Line PM
VMR	P-Bit	Yes	No	No	Yes	No	No	Yes
VMR	F&M-bit	No	Yes	No	Yes	No	No	Yes
VMR	C-Bit	No	No	Yes	Yes	No	No	Yes
VM	P-Bit	Yes	No	No	No	No	No	Yes
VM	F&M-bit	No	Yes	No	No	No	No	Yes
VM	C-Bit	No	No	Yes	No	No	No	Yes
CC	P-Bit	No	No	No	No	No	No	Yes
CC	F&M-bit	No	No	No	No	No	No	Yes
CC	C-Bit	No	No	No	No	No	No	Yes

DS3 Line

CV-L Coding Violations

This parameter is a count of B3ZS bipolar violations (BPV) occurring over the accumulation period. BPVs that are part of the zero substitution code are excluded.

ES-L Errored Seconds

This parameter is a count of seconds containing one or more BPVs, or one or more LOS (from the DSX-3) defects.

SES-L Severely Errored Seconds

This parameter is a count of seconds during which BPVs exceed 44 or one or more LOS defects occur.

OC-1 Section Parameters

Performance Monitoring Enabling

Collection of section parameters for OC-1 interfaces are initiated when a slot is equipped with a 27G-U OLIU circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the 27G-U OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Severely Errored Frame Seconds (SEFS)

This parameter counts the number of seconds during which an OOF, LOS, or OLIU circuit pack failure occurred. SEFSs are counted and thresholded independently for each OC-1 interface.

OC-1 Line Parameters

Performance Monitoring Enabling

Collection of line parameters for OC-1 interfaces are initiated when a slot is equipped with an 27G-U OLIU circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the 27G-U OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Line Coding Violations (B2 Parity)

To monitor the performance of the OC-1 line, the line BIP-8 (B2 parity) is calculated, written, and checked for errors. The line B2 parity violation counter is

incremented for each line BIP error detected. Each line BIP-8 can detect up to eight errors per STS-1 frame. CV-Ls are not counted during seconds that contain a line AIS, LOS, LOF, or during a UAS. The B2 parity violations are counted and thresholded independently for each OC-1 line.

Errored Seconds (ES)

An "errored second" is a second in which one or more B2 parity violations are detected. An ES "type A" is a second in which exactly one B2 parity violation is detected. An ES "type B" is a second in which more than one and less than 12 B2 parity violations are detected. Seconds that are UAS are not counted as ES. A second that contains a line AIS, LOS, LOF or is a UAS is not counted as a type A or type B ES. All three of these parameters are counted and thresholded independently for each OC-1 line.

Severely Errored Seconds (SES)

A SES is a second in which 12 or more B2 parity violations are detected or one in which a LOS, LOF or line AIS occurs. A UAS is not counted as a SES. SES are counted and thresholded independently for each OC-1 line.

Unavailable Seconds (UAS)

A UAS is a second during which the OC-1 line is "unavailable." A line is considered "unavailable" from the beginning of X consecutive SES until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the line signal failure. Y is equal to 10 seconds of no SES or line signal failure. UAS are counted and thresholded independently for each OC-1 line.

STS Pointer Justification Count (PJC)

This feature provides a TCA from a Lucent DDM-2000 shelf when the STS pointer justification count in a performance bin exceeds a user provisioned threshold value. STS PJCs for each SONET line interface are accumulated in 15 minute and 24 hour PM bins. The TCA is sent via autonomous message to the OS and is available through CIT and TL1 PM reports. PJCs are not accumulated during second intervals in which an STS-1 is in the LOP or AIS state.

For each SONET line interface, the system accumulates counts from only one STS-1 tributary during a 1 second monitoring interval. Excessive pointer justifications indicate a frequency error in the network or other potential synchronization problem. For example, a frequency error could be caused by a shelf in holdover or by a frequency offset in an external timing reference in networks with more than one shelf externally timed. The TCA can be provisioned in the frequency offset range from approximately .01 ppm to 10 ppm by setting a threshold for the pointer justification count equivalent to the frequency offset.

OC-12 Line Parameter

Performance Monitoring Enabling

Collection of line parameters are initiated when the main slots are equipped with 24G-U OLIU circuit packs. Parameters continue to be available in reports and generate appropriate TCAs until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Line Coding Violations (B2 Parity)

To monitor the performance of the OC-3 and OC-12 lines, the line BIP-8 (B2 parity) is calculated, written, and checked for errors. The line B2 parity violation counter is incremented for each line BIP error detected. Each line BIP-8 can detect up to eight errors per STS-1 frame. The contents of the three or 12 line B2 parity violation counters associated with the OC-3 and OC-12 line are added to form a composite B2 parity violation count. CVs are not counted during seconds that contain a line AIS, LOS, LOF, or during a UAS. The B2 parity violations are counted and thresholded independently for the service and protection lines.

Errored Seconds (ES)

An "errored second" is a second in which one or more B2 parity violations are detected. An ES "type A" is a second in which exactly one B2 parity violation is detected. An ES "type B" is a second in which more than one and less than 32 for OC-3, or more than one and less than 124 for OC-12, B2 parity violations are detected. Seconds that are UAS are not counted as ES. A second that contains a line AIS, LOS, LOF, or is a UAS is not counted as a type A or type B ES. All three of these parameters are counted and thresholded independently for the service and protection lines.

Severely Errored Seconds (SES)

A SES is a second in which 32 or more for OC-3, or 124 or more for OC-12, B2 parity violations are detected, or one in which a loss of signal, loss of frame or line AIS occurs. A UAS is not counted as a SES. SESs are counted and thresholded independently for the service and protection lines.

Unavailable Seconds (UAS)

A UAS is a second during which the OC-3 or OC-12 line is "unavailable." A line is considered "unavailable" from the beginning of X consecutive SESs until the beginning of Y consecutive seconds, none of which is severely errored. An X is equal to 10 seconds or, in the case of a failure, the line signal failure. A Y is equal

to 10 seconds of no SES or line signal failure. If there is an unprotected circuit pack failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. UAS are counted and thresholded independently for the service and protection lines.

Line Protection Switch Counts

Line protection switch count is the count of the number of protection switches FROM the working line. The count is independently counted and thresholded for both the service and the protection line. This does not apply to main OC-N lines in ring releases.

STS Pointer Justification Count (PJC)

This feature provides a TCA from a Lucent DDM-2000 shelf when the STS pointer justification count in a performance bin exceeds a user provisioned threshold value. STS PJCs for each SONET line interface are accumulated in 15 minute and 24 hour PM bins. The TCA is sent via autonomous message to the OS and is available through CIT and TL1 PM reports. PJCs are not accumulated during second intervals in which an STS-1 is in the LOP or AIS state.

For each SONET line interface, the system accumulates counts from only one STS-1 tributary during a 1 second monitoring interval. Excessive pointer justifications indicate a frequency error in the network or other potential synchronization problem. For example, a frequency error could be caused by a shelf in holdover or by a frequency offset in an external timing reference in networks with more than one shelf externally timed. The TCA can be provisioned in the frequency offset range from approximately .01 ppm to 10 ppm by setting a threshold for the pointer justification count equivalent to the frequency offset.

Performance Monitoring Data Storage and Reports

The DDM-2000 OC-3 Multiplexer provides current quarter-hour and current day registers for all accumulated performance parameters. Previous day and previous quarter-hour registers for the preceding 8 hours also are provided for all accumulated performance parameters.

The DDM-2000 OC-3 Multiplexer has the capability to initialize the current registers through the CIT locally or remotely at any time, as well as to report the contents of any register at any time. Refer to the **init-pm**, **rtrv-pm-line**, **rtrv-pm-sect**, **rtrv-pm-sts1**, **rtrv-pm-t1**, **rtrv-pm-t3**, and **rtrv-pm-tca** commands in Section 11, "Commands and Reports."

Performance Monitoring During Failed Conditions

When the DDM-2000 OC-3 Multiplexer detects a trouble condition, the system stops accumulating affected performance parameters. Parameters that continue to provide useful information are accumulated during the trouble condition.

Performance Parameter Thresholds

The DDM-2000 OC-3 Multiplexer provides performance thresholds to alert maintenance staff of degraded transmission. Whenever the threshold for a parameter is exceeded, the DDM-2000 OC-3 Multiplexer generates a TCA to alert the OS (via the TBOS or TL1/X.25 interface) to the condition. A summary of all TCAs is available in the PM TCA summary report. Current quarter-hour and current day thresholds for each parameter are provisionable, via the CIT, on a per-shelf basis. Therefore, if values other than the defaults are to be used, only one value needs to be set for each parameter. Generation of TCAs can be disabled independently for each performance parameter. Performance data is still collected if thresholding is disabled. Refer to the **rtrv-pmthres-line**, **rtrv-pmthres-sect**, **rtrv-pmthres-sts1**, **rtrv-pmthres-t3**, **set-pmthres-line**, **set-pmthres-sect**, **set-pmthres-sts1**, **set-pmthres-t3**, **rtrv-pm-tca**, **rtrv-pmthres-vt1**, **rtrv-pmthres-t1**, **set-pmthres-vt1**, and **set-pmthres-t1** commands in Section 11, "Commands and Reports."

TCA Transmission to OS

To trigger proactive maintenance activity at the OS, each DDM-2000 OC-3 Multiplexer TBOS display contains one summary level PM TCA (threshold crossing alert) point. When the TL1/X.25 interface to the NMA OS is used, threshold crossings are reported to NMA via **REPT - EVT** messages.

Performance Monitoring Reports

TCA Summary Report

The TCA summary report lists the sum of the number of threshold crossings within the last 8 hours for quarter-hour thresholds and the number of threshold crossings for the current day and current quarter hour for daily thresholds. This snapshot provides an overall view of system performance. If there are TCAs identified, it identifies which performance status report to look at for a detailed view of those parameters. See the **rtrv-pm-tca**, command in Section 11, "Commands and Reports."

Performance Status Reports

The system provides reports that contain a snapshot of all current and previous PM registers. The time at which registers were last reinitialized is included. The option to display a specified subset of parameters (for example, line parameters only, data for only one OC-3 line or DS3 port, etc.) is also provided. See the **rtrv-pm-sect**, **rtrv-pm-line**, **rtrv-pm-sts1**, **rtrv-pm-vt1**, **rtrv-pm-t1**, and **rtrv-pm-t3** commands in Section 11, "Commands and Reports." Equivalent reporting information is available through TL1/X.25 commands. Refer to 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

Reports

This section provides information in reports available through the CIT. For reports available through the X.25 link, refer to 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

Alarm and Status Report

The system provides a report that lists all active alarm and status conditions. The identity of the condition (circuit pack failure, incoming OC-3 signal failure, etc.) is included in the report along with a time stamp indicating when the condition was detected.

See the **rtrv-alm** command in Section 11, "Commands and Reports," for a complete list of the alarm and status conditions that are reported by the system.

Provisioning Reports

Provisioning reports list the current state of all provisionable options in the system. See the **rtrv-attr-alm**, **rtrv-attr-cont**, **rtrv-attr-env**, **rtrv-crs-sts1**, **rtrv-crs-vt1**, **rtrv-fecom**, **rtrv-lgn**, **rtrv-link**, **rtrv-ne**, **rtrv-oc3**, **rtrv-pmthres-line**, **rtrv-pmthres-sect**, **rtrv-pmthres-sts1**, **rtrv-pmthres-t1**, **rtrv-pmthres-t3**, **rtrv-pmthres-vt**, **rtrv-secu**, **rtrv-passwd**, **rtrv-ec1**, **rtrv-oc1**, **rtrv-sts1**, **rtrv-sync**, **rtrv-t1**, **rtrv-t3**, **rtrv-ulsdcc**, **rtrv-trace-sts1** and **rtrv-vt1** commands in Section 11, "Commands and Reports."

Database Change Transmission to OS

All provisioning changes are automatically reported to the OS over the TL1/X.25 interface.

Maintenance History Report

A maintenance history report containing the past 500 alarm, status, protection switching, and CIT (for example, provisioning, loopback request, manual protection, etc.) events is provided. This summary contains real time and date stamps indicating when each condition was detected and when it cleared; CIT events contain a time stamp indicating when the command was entered. Alarm and status entries in the retrieve history report are not subject to holdoff and clear delay. See the **rtrv-hsty** command in Section 11, "Commands and Reports."

State Reports

The state reports list the states of all slots, channels, low-speed ports, and OC-1 lines on the system. The **rtrv-state-eqpt** report includes the protection switching state ("active" or "standby") and protection switching priority of all protected lines and equipment in the system. The **rtrv-state-path** command includes protection status information for STS-1 paths. See the **rtrv-state-eqpt**, **rtrv-state-oc1**, **rtrv-state-sts1**, **rtrv-state-path**, and **rtrv-state-vt1** commands in Section 11, "Commands and Reports."

Equipment Report

This report displays the equipage and version information for one or more slots. Refer to the **rtrv-eqpt** command in Section 11, "Commands and Reports."

Network Map Report

This report shows the names ("Target Identifiers" or "TIDs") of other DDM-2000 systems in the subnetwork, the GNE, and the DSNE for the subnetwork. Refer to the **rtrv-map-network** and **rtrv-map-neighbor** commands in Section 11, "Commands and Reports."

Table of Contents

Overview	10-1
DDM 2000 OC-3 Multiplexer	10-1
■ External Transmission Interfaces	10-1
■ Electrical Interfaces	10-2
DS1 Low-Speed (BBF1B)	10-3
DS1PM Low-Speed (BBF3/BBF3B)	10-4
HDSL Interface (BBF8)	10-5
DS3 Low-Speed (BBG4/4B)	10-6
EC-1 High-Speed and Low-Speed (BBG6)	10-8
DS3 Data Services Interface (BBG19)	10-9
Transmultiplexer (BBG20)	10-10
Lightguide Jumpers	10-12
■ Optical Interfaces	10-13
Long Reach OC-3 Interface (21G/21G-U/ 21G2-U OLIU)	10-13
Intermediate Reach OC-3 Interface (22F/22F-U/22F2-U OLIU)	10-14
Long Reach OC-3 Interface (22G-U/22G2-U/ 22G3-U OLIU)	10-15
Long Reach OC-12 Interface (24G-U)	10-16
Intra-office (IS-3) OC-3 Rate Interface (21D/21D-U and 22D-U OLIUs)	10-17
Long Reach OC-1 Interface (26G2-U/27G-U/27G2-U OLIU)	10-18
OC-3 Optical Interface Mixing	10-33
Universal Optical Connector Attenuators	10-37

Table of Contents

■ SONET Overhead Bytes	10-38
■ Performance	10-38
Wander/Jitter	10-38
Signal Performance	10-38
Synchronization	10-39
Protection Switching	10-40
Transient Performance	10-40
Delay	10-41
Performance Monitoring	10-41
■ Operations Interfaces (OI)	10-44
Craft Interface Terminal (CIT)	10-44
Personal Computer (PC) Specifications for Software Download	10-45
Compatible Modems	10-46
CPro-2000 Graphical User Interface and Provisioning Tool	10-47
User Panel	10-48
Equipment Indicators	10-48
Office Alarms	10-48
Serial Telemetry	10-48
Parallel Telemetry	10-49
User-Definable Miscellaneous Discrete Environmental Alarms and Controls	10-49
Order Wire	10-50
TL1/X.25 Interface	10-51
■ Physical Specifications	10-53
Shelf Physical Characteristics	10-53
Network Bay and Cabinet Mounting	10-53
■ Environmental Specifications	10-54
Temperature and Humidity	10-54
EMC Requirements	10-54
Earthquake Requirements	10-54
Fire Resistance	10-55
Underwriters Laboratories (UL)	10-55
Canadian Standards Association	10-55

Table of Contents

■ Power Requirements	10-56
Shelf Fuses	10-56
Power Dissipation	10-57
■ DDM-2000 OC-3 Reliability	10-59
Summary	10-59
Transmission Availability	10-59
Operation System Interface Availability	10-60
Optical Module Maintenance Objective	10-60
Infant Mortality	10-60
DDM-2000 OC-3 System Reliability Predictions	10-61

Table of Contents

Overview

This section contains the technical specifications for the DDM-2000 OC-3 Multiplexer.

DDM 2000 OC-3 Multiplexer

External Transmission Interfaces

The DDM-2000 OC-3 Multiplexer transmission interfaces adhere to industry standards as listed in Table 10-1.

Table 10-1. Transmission Interface Standards

Interface	Standard	Comments
DS1 low-speed	CB-119, <i>ANSI</i> * T1.102-1993	B8ZS/AMI option
	TR-499, Iss. 5, <i>ANSI</i> T1.403-1989	SF, ESF
DS3 low-speed	CB-119, <i>ANSI</i> T1.102-1993, TR-499, Iss. 5	VMR, VM, or clear channel
OC-1/OC-3/OC-12	<i>ANSI</i> T1.106/88, <i>ANSI</i> T1.105/91 GR-253, Iss. 2, TR-496, Iss. 3	
EC-1	<i>ANSI</i> T1.102-1993, & GR-253, Iss. 2	

* Registered trademark of American National Standards Institute, Inc.

Electrical Interfaces

The DDM-2000 OC-3 Multiplexer supports DS1 electrical, DS3 electrical, and EC-1 electrical high-speed and low-speed interfaces.

DS1 Low-Speed (BBF1B)

■ Electrical Specification

The DS1 low-speed interface transmits and receives a standard electrical DS1 signal as specified in *ANSI T1.102-1993*, Section 2 (1.544 Mb/s nominal rate, DSX-1 interconnect specification). Line coding is provisionable to alternate mark inversion (AMI) with or without bipolar 8-zero substitution (B8ZS). Line buildout (LBO) is provisionable as follows:

- 613C (22 gauge): 30 to 655 ft.
- 1249-C (26 gauge): 30 to 450 ft.

■ Format Specification

The DS1 low-speed interface provides clear channel transport of any DSX-1 compatible signal. There are no format constraints on this interface.

■ Alarm Thresholding

The following parameters are monitored at the DS1 interface:

- Loss of signal (LOS)
- Line coding violations (CV-L).

The alarm level for each of the monitored parameters can be provisioned to critical (CR), major (MJ), minor (MN), or status. B8ZS and AMI coding violation failure thresholds are user settable to 10^{-3} or 10^{-6} BER. For Release 8.0 and later releases, 10^{-7} and 10^{-8} BER are also available.

■ Loopback

- Single DS1 terminal loopback
- Quad DS1 facility loopback.

DS1PM Low-Speed (BBF3/BBF3B)

■ Electrical Specification

The DS1PM low-speed interface transmits and receives a standard electrical DS1 signal as specified in *ANSI T1.102-1993*, Section 2 (1.544 Mb/s nominal rate, DSX-1 interconnect specification). Line coding is provisionable to AMI with or without B8ZS. Line buildout is provisionable as follows:

- 613C (22 gauge): 30 to 655 ft.
- 1249-C (26 gauge): 30 to 450 ft.

■ Format Specification

The DS1PM low-speed interface can be provisioned for the following DS1 formats: clear channel (default), superframe (SF) as specified in *ANSI T1.403-1989*, or extended superframe (ESF) as specified in *ANSI T1.403-1989*. In the case of SF or ESF format selections, DS1 performance information is collected by monitoring the associated DS1 framing format.

■ Alarm Thresholding

The following parameters are monitored at the DS1PM interface:

- Loss of signal (LOS)
- Line coding violations (CV-L).

The alarm level for each of the monitored parameters can be provisioned to CR, MJ, MN, or status. B8ZS and AMI coding violation failure thresholds are user settable to 10^{-3} or 10^{-6} and in Release 8.0 and later releases 10^{-7} or 10^{-8} BER.

■ Loopback

- Quad DS1 facility loopback (BBF3)
- Single DS1 terminal loopback
- Single DS1 facility loopback (BBF3B) (Release 11.1 and later).

■ Performance Monitoring (see Table 10-19)

DS1 Path Parameters:

- Errored Seconds (ES-P)
- Severely Errored Second (SES-P)
- Unavailable Seconds (UAS)
- CV-P Coding Violations (Release 7.2 and later)
- CV-PFE Coding Violations (Release 7.2 and later)

DS1 Line Parameters:

- ES-L Errored Seconds (Release 7.2 and later)

HDSL Interface (BBF8)

■ Electrical Specification

The High bit-rate Digital Subscriber Line (HDSL) circuit pack transmits and receives a 2B1Q signal as specified in Bellcore TA-NWT-001210.

- Data is scrambled/descrambled with a pseudo-random sequence
- Line buildout is automatically provisioned
- Compensated for data inversion caused by tip-ring reversals

■ Format Specification

The HDSL allows for clear channel transport of a framed or unframed DS1. Its data stream consists of two 784 Kb/s signals transported on separate wire pairs. Together, the aggregate bi-directional bit rate is 1.544 Mb/s. The remaining 24 Kb/s is used for training and diagnostic information.

- Compatible with PairGain™ equipment

■ Alarm reporting

- LOS

A LOS is reported if either HDSL line experiences a synchronization failure

■ Loopback

DS1 terminal loopback for each HDSL interface

■ Performance Monitoring (PM) — Available through the HDSL link management port only.

- User-configurable alarm thresholds
- 15-minute, 24-hour, and 7-day performance histories
- Asynchronous serial interface for provisioning and PM

■ Management

- SONET Management

This link is accessible via the SONET DCC and DDM-2000 CIT. It allows the HDSL circuit pack to be provisioned for DS1 facility loopbacks.

- HDSL Link Management

This link is accessible via a faceplate mounted RS-232 interface. It allows management of each HDSL port only (management of the DDM-2000 is not accessible through this interface). This management port supports a menu driven interface for each HDSL port; managed features include:

- PM features listed above
- Local and remote loopbacks
- Programmable loopback time-out
- Alarm status.

DS3 Low-Speed (BBG4/4B)

■ Electrical Specification

The low-speed DS3 interface transmits/receives a standard electrical DS3 signal as specified in *ANSI T1.102-1993*, Section 5 (44.736 Mb/s rate, DSX-3 interconnect specification, B3ZS encoding). However, the signal does not have to contain a standard DS3 frame.

LBO is provisionable as follows:

- 734A/D: 0 to 450 ft.
- Mini-coax (KS-19224, L2): 0 to 150 ft.
- 735A: 0 to 250 ft.

■ Format Specification

The DS3 low-speed interface provides clear channel transport of any DSX-3 compatible signal (M13 mode, framed clear channel, unframed clear channel). Thus, there are no format requirements on this interface.

■ Alarm Thresholding

The following parameters are monitored at the DS3 interface to the DSX-3:

- LOS
- CV-L.

The alarm level for each of the monitored parameters can be provisioned to CR, MJ, MN, or status. B3ZS coding violation failure threshold is user settable to 10^{-3} or 10^{-6} BER.

■ PM (see Table 10-19)

- DS3 parity errors (P-Bits)
- SEFS.

If provisioned in the VMR or VM modes (Table 10-2), DS3 P-bit violations and SESF are counted, and the counts are thresholded to flag detected performance degradation of the DS3 signal incoming from the fiber.

Table 10-2. DS3 Interface Modes

	Monitor P-Bits	Correct P-Bits
VMR mode	Yes	Yes
VM mode	Yes	No
CC mode	No	No

■ Enhanced DS3 PM (see Table 10-19)

— CV-P Coding Violations

These errors are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode. When the F&M bit or C-bit option (C-bit is Release 8.0 and later releases) is selected, NEs could be provisioned in VMR or VM mode. See Table 10-3.

— Errored Seconds (ES-P)

— Severely Errored Seconds (SES-P)

— Unavailable Seconds (UAS-P)

— Severely Errored Frame Seconds (SEFS)

— CV-L Coding Violations Line (Release 7.2 and later)

— ES-L Errored Seconds (Release 7.2 and later)

— SES-L Severely Errored Seconds Line (Release 7.2 and later)

Table 10-3. Enhanced DS3 Performance Monitoring Modes

Mode	PM Option	Monitor P-Bits	Monitor F&M Bits	Monitor C-Bits	Correct P-Bits	Correct F&M Bits	Correct C-Bits	Monitor Line PM
VMR	P-bit	Yes	No	No	Yes	No	No	Yes
VMR	F&M-bit	No	Yes	No	Yes	No	No	Yes
VMR	C-bit	No	No	Yes	Yes	No	No	Yes
VM	P-bit	Yes	No	No	No	No	No	Yes
VM	F&M-bit	No	Yes	No	No	No	No	Yes
VM	C-bit	No	No	Yes	No	No	No	Yes
CC	P-bit	No	No	No	No	No	No	Yes
CC	F&M-bit	No	No	No	No	No	No	Yes
CC	C-bit	No	No	No	No	No	No	Yes

EC-1 High-Speed and Low-Speed (BBG6)

■ Electrical Specification

The EC-1 high-speed and low-speed interface transmits and receives a standard electrical EC-1 signal as specified in *ANSI T1.102-1993* (51.844 Mb/s rate, STSX-1 interconnect specification (B3ZS encoded and scrambled)).

LBO is provisionable as follows:

- 734A/D: 0 to 450 ft.
- Mini-Coax (KS-19224, L2): 0 to 150 ft.
- 735A: 0 to 250 ft.

■ Format Specification

The EC-1 high-speed port interfaces with an EC-1 signal compatible with the electrical STS-1 interface specification in *ANSI T1.102* and containing a VT1.5 structured STS-1 with an asynchronous DS1 mapping. The EC-1 high-speed interface provides both line and STS-1 path termination functions.

The EC-1 low-speed interface provides clear channel transport of any STS-1 signal compatible with the electrical STS-1 interface specification in *ANSI T1.102*. The EC-1 low-speed port can be provisioned to provide the path termination functions for a VT1.5 structured STS-1 with an asynchronous DS1 mapping.

■ Alarm Thresholding

The following parameters are monitored at the EC-1 interface to the STSX-1:

- LOS
- LOF
- LOP
- Line AIS
- B2 thresholding signal fail
- B2 thresholding signal degrade.

The alarm level for each of the monitored parameters can be provisioned for CR, MJ, MN, or status. B2 signal degrade thresholds are user settable in the range from 10^{-6} to 10^{-9} BER.

■ PM (see Table 10-19)

- EC-1 line PM.

DS3 Data Services Interface (BBG19)

■ Electrical Specification

The low-speed DS3 interface transmits/receives a standard electrical DS3 signal as specified in *ANSI T1.102-1993*, Section 5 (44.736 Mb/s rate, DSX-3 interconnect specification, bipolar 3-zero substitution [B3ZS] encoding). However, the signal does not have to contain a standard DS3 frame.

LBO is provisionable as follows:

- 734A/D: 0 to 450 ft.
- Mini-coax (KS-19224, L2): 0 to 150 ft.
- 735A: 0 to 250 ft.

■ Format Specification

The DS3 low-speed interface provides clear channel transport of any DSX-3 compatible signal (M13 mode, framed clear channel, unframed clear channel). Thus, there are no format requirements on this interface.

■ Alarm Thresholding

The following parameters are monitored at the DS3 interface to the DSX-3:

- LOS
- CV-L.

The alarm level for each of the monitored parameters can be provisioned to CR, MJ, MN, or status. B3ZS coding violation failure threshold is user settable to 10^{-3} or 10^{-6} BER.

■ Performance Monitoring (see Table 10-19)

- DS3 parity errors (P-Bits)
- SEFS.

If provisioned in the VMR or VM modes (Table 10-2), DS3 P-bit violations and SEFS are counted, and the counts are thresholded to flag detected performance degradation of the DS3 signal incoming from the fiber.

■ Enhanced DS3 Performance Monitoring (see Table 10-19 and Table 10-3)

The Enhanced DS3 PM for the BBG19 is the same as for the BBG4/BBG4B. Refer to the DS3 Low-Speed (BBG4/4B) Enhanced DS3 Performance Monitoring section for a list of parameters.

Transmultiplexer (BBG20)

■ Electrical Specification

The DS3 Transmux interface transmits/receives a standard electrical DS3 signal as specified in *ANSI T1.102-1993*, Section 5 [44.736 Mb/s rate, DSX-3 interconnect specification, bipolar 3-zero substitution (B3ZS) encoding].

Line buildout is provisionable as follows:

- 734A/D: 0 to 450 ft.
- Mini-coax (KS-19224, L2): 0 to 150 ft.
- 735A: 0 to 250 ft.

■ Format Specification

The DS3 Transmux interface provides termination for DS3 signals in both M13 and C-bit parity formats. In the M13 format the “X” frame bits are set to “1” (default). The “X” bit value user settable (set-t3).

■ Alarm Thresholding

The following parameters are monitored at the DS3 interface from the DSX-3:

- Loss of signal (LOS)
- Out Of Frame (OOF)
- AIS
- BER (based on P-bit or C-bit parity)

The alarm level for each of the monitored parameters can be provisioned to CR, MJ, MN, or status. Coding violation failure threshold is user settable to 10^{-3} or 10^{-6} BER.

■ Loopback

- DS1 and DS3 terminal and facility loopback

■ DS3 Line and Path (from DSX-3) Performance Monitoring (see Table 10-19)

- DS3 parity errors (P-Bits, F&M Bits, C-bits) (CV-P)
- Severely Errored Frame Seconds (SEFS)
- Errored Seconds (ES-P)
- Severely Errored Seconds (SES-P)
- Unavailable Seconds (UAS-P)
- Code Violations Line (CV-L)
- Errored Seconds Line (ES-L)
- Severely Errored Seconds Line (SES-L)

- DS1 Path Performance Monitoring (see Table 10-19)
 - CV-P
 - ES-P
 - SES-P
 - UAS-P
 - CV-PFE (Far-end ESF paths)
 - ES-PFE (Far-end ESF paths)
 - SES-PFE (Far-end ESF paths)
 - UAS-PFE (Far-end ESF paths)
- STS and VT Performance Monitoring (see Table 10-19)
 - All STS and VT PM is supported.

Lightguide Jumpers

The DDM-2000 Multiplexers provide Lucent Technologies' universal optical connector on all OLIUs. The universal optical connectors are receptacles on the faceplate of the OLIUs that allow a single OLIU to support either *ST*[®], FC-PC, or SC connectors as needed. Both 0 dB and attenuating buildouts are supported.

The OC-1 and OC-3 lightguide interfaces use both single-mode and multimode jumpers for connecting to and from the outside plant *LGX*[®] panel and the DDM-2000 OC-3 Multiplexer.

When the outside plant lightguide is multimode, a single-mode or multimode jumper can be used between the *LGX* panel and the DDM-2000 OC-3 Multiplexer on the transmit (OUT) side. Multimode must be used on the receive (IN) side of all OLIUs.

When the outside plant lightguide is single-mode, a single-mode jumper must be used for the transmit side and either single-mode or multimode jumpers can be used for the receive side of all OLIUs.

Regardless of the type of fiber in the outside plant, the 21D/21D-U and 22D-U OLIUs, used for intershell OC-3/OC-12 interconnection, must be used with multimode jumpers on the transmit side.

The 24G-U OLIU must be used with single mode fiber.

Lightguide jumpers can be ordered from Lucent. See the "OC-3 Ordering — Miscellaneous Equipment and Tools" section of 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers Applications, Planning, and Ordering Guide*, for ordering information.

Optical Interfaces

Long Reach OC-3 Interface (21G/21G-U/ 21G2-U OLIU)

■ Optical Specification

The 21G/21G-U/21G2-U OLIU photonics meet or exceed SONET long reach specifications (TR 253-LR-1 MLM category). The multilongitudinal mode (MLM) laser transmitter supplies a non-return-to-zero (NRZ) coded signal. The positive intrinsic negative field effect transistor (PINFET) receiver allows direct optical loopback without the use of an external attenuator when the TRANSMIT POWER switch is on the low setting.

The 21G/21G-U/21G2-U OLIU long reach OC-3 interface supports span lengths up to 55 km, assuming 0.45 dB/km single-mode fiber (including splices) and the span engineering rules outlined in Table 10-5. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Table 10-4, Table 10-5, and Table 10-8 provide detailed specifications and link budget information for the 21G/21G-U/21G2-U OLIU.

■ Alarm Thresholding

The following parameters are monitored at the OC-3 interface:

- LOS
- LOF
- LOP
- Line AIS
- B2 thresholding signal fail
- B2 thresholding signal degrade. (B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.)

■ Performance Monitoring (PM) (see Table 10-19)

- Section severely errored frame seconds (SEFS)
- Line parameter B2
- Laser bias current (21G/21G-U only)
- Transmit power (21G/21G-U only)
- Receive power.

Intermediate Reach OC-3 Interface (22F/22F-U/ 22F2-U OLIU)

- **Optical Specification**

The 22F/22F-U/22F2-U OLIU photonics meet or exceed SONET intermediate reach specifications (TR 253-IR-1 MLM category). The MLM laser transmitter supplies an NRZ-coded signal. The PINFET receiver allows direct optical loopback without the use of an external attenuator.

The 22F/22F-U/22F2-U OLIU intermediate reach OC-3 interface supports span lengths up to 33 km, assuming 0.45 dB/km single-mode fiber and the span engineering rules outlined in Table 10-7. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Table 10-6, Table 10-7, and Table 10-8 provide detailed specifications and link budget information for the 22F OLIU.

- **Alarm Thresholding**

The following parameters are monitored at the OC-3 interface.

- LOS
- LOF
- LOP
- Line AIS
- B2 thresholding signal fail
- B2 thresholding signal degrade. (B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.)

- **Line PM (see Table 10-19)**

- Section SEFS
- Line parameter B2
- STS pointer justification
- STS-1 Path PM (see Table 10-19).

Long Reach OC-3 Interface (22G-U/22G2-U/ 22G3-U OLIU)

■ Optical Specification

The multilongitudinal mode laser transmitter supplies an NRZ-coded signal. For direct optical loopbacks, at least 7.0 dB (use 10 dB attenuator, see Table 10-17) of attenuation is needed for the 22G-U. No attenuation is needed for the 22G2-U or 22G3-U.

The 22G-U/22G2-U OLIU long reach OC-3 interface supports span lengths up to 51 km, assuming 0.45 dB/km single-mode fiber and the span engineering rules outlined in Table 10-7. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Table 10-6, Table 10-7, and Table 10-8 provide detailed specifications and link budget information for the 22G-U/22G2-U OLIU.

The 22G3-U OLIU is a SONET compliant long reach OC-3 interface supporting span lengths up to 55 km, assuming 0.45 dB/km single-mode fiber and the span engineering rules outlined in Table 10-7. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Table 10-6, Table 10-7, and Table 10-8 provide detailed specifications and link budget information for the 22G3-U OLIU.

■ Alarm Thresholding

The following parameters are monitored at the OC-3 interface.

- Loss of signal (LOS)
- Loss of frame (LOF)
- Loss of pointer (LOP)
- Line AIS
- B2 thresholding signal fail
- B2 thresholding signal degrade. (B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.)

■ Line PM (see Table 10-19)

- Section SEFS
- Line parameter B2
- STS pointer justifications
- STS-1 Path PM (see Table 10-19).

Long Reach OC-12 Interface (24G-U)

■ Optical Specification

The distributed feedback laser supplies a NRZ-coded signal. For direct optical loopbacks, at least 15 dB of optical attenuation is needed for the 24G-U.

The 24G-U OLIU long reach OC-12 interface supports span lengths up to 51 km, assuming 0.45 dB/km single-mode fiber (including splices) and the span engineering rules outlined in Table 10-10. Transmit and receive powers are referenced to points S and R as shown in Figure 10-1. Table 10-9 and Table 10-10 provide detailed specifications and link budget information for the 24G-U OLIU. Note that the 24G-U OLIU is not specified to operate over multimode fiber.

■ Alarm Thresholding

The following parameters are monitored at the OC-12 interface.

- Loss of signal (LOS)
- Loss of frame (LOF)
- Loss of pointer (LOP)
- Line AIS
- B2 thresholding signal fail
- B2 thresholding signal degrade. (B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.)

■ Line PM (see Table 10-19)

- Section SEFS
- Line parameter B2
- STS pointer justifications
- STS-1 Path PM (see Table 10-19).

Intra-office (IS-3) OC-3 Rate Interface (21D/21D-U and 22D-U OLIUs)

■ Optical Specification

The 21D/21D-U and 22D-U OLIUs are short-reach optical interfaces used to interconnect between the DDM-2000 OC-3 and OC-12 Multiplexers. The nominal line rate is 155.520 Mb/s. The LED transmitter supplies an NRZ-coded signal.

Table 10-4, Table 10-5, and Table 10-8 provide detailed specifications and link budget information for the 21D/21D-U and 22D-U OLIUs.

■ Alarm Thresholding

The following parameters are monitored at the OC-3 interface:

- LOS
- LOF
- LOP
- Line AIS
- B2 thresholding signal fail
- B2 thresholding signal degrade. (B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.)

■ Line PM (see Table 10-19)

- Section SEFS
- B2 parameters
- STS-1 Path PM (see Table 10-19).

Long Reach OC-1 Interface (26G2-U/27G-U/27G2-U OLIU)

■ Optical Specification

The multilongitudinal mode laser transmitter supplies an NRZ-coded signal. For direct optical loopbacks, at least 13.8 dB (use 15.0 dB, attenuator, see Table 10-17) of attenuation is needed for the 26G2-U/27G-U/27G2-U.

The 26G2-U/27G-U/27G2-U OLIU long reach OC-1 interface supports span lengths up to 44 km, assuming 0.45 dB/km single-mode fiber and the span engineering rules outlined in Table 10-12. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Table 10-11, Table 10-12, and Table 10-13 provide detailed specifications and link budget information for the 26G2-U/27G-U/27G2-U OLIU.

■ Alarm Thresholding

The following parameters are monitored at the OC-1 interface.

- Loss of signal (LOS)
- Loss of frame (LOF)
- Loss of pointer (LOP)
- Line AIS
- B2 thresholding signal fail
- B2 thresholding signal degrade. (B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.)

■ Line PM (see Table 10-19)

- Section SEFS
- Line parameter B2
- STS pointer justifications
- STS-1 Path PM (see Table 10-19).

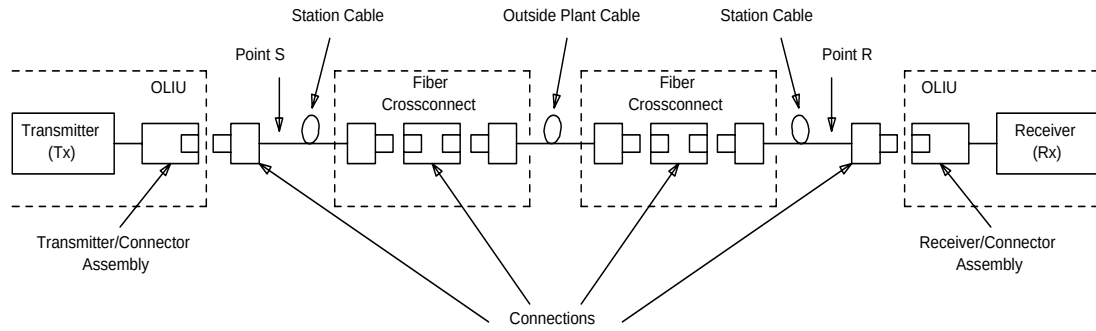


Figure 10-1. Optical System Interfaces (Points S and R)

Table 10-4 lists the 21G/21G-U/21G2-U and 21D/21D-U/22D-U OLIU specifications.

Table 10-4. 21G/21G-U/21G2-U and 21D/21D-U/22D-U OLIU Specifications

System Information:		
Terminal Equipment Identification	21G/21G-U/21G2-U OLIU	21D/21D-U/22D-U OLIU
Optical Line Rate (Mb/s)	155.520 Mb/s	155.520 Mb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1310 nm	1310 nm
Performance	SONET LR-1 MLM (Long Reach)	Not applicable
Transmitter Information:		
Optical Device Temperature Controller	TEC *	No TEC
FDA Classification	Class I	Class I
Optical Source	InGaAsP Laser, MLM Structure †	LED
Faceplate Optical Connector	Lucent ST [®] C3000-A-2 (21G) UOC buildout assembly ‡ (21G-U/21G2-U) Single Mode	Lucent ST C2000-A-2 (21D) UOC buildout assembly ‡ (21D-U, 22D-U) Multimode
Receiver Information:		
Optical Device Temperature Controller	None	None
Optical Detector	InGaAsP PIN	InGaAsP PIN
Faceplate Optical Connector	ST C2000-A-2 (21G) UOC buildout assembly ‡ (21G-U/21G2-U) Multimode	Lucent ST C2000-A-2 (21D) UOC buildout assembly ‡ (21D-U, 22D-U) Multimode

Notes:

- * The 21G2-U uses an uncooled laser.
- † A tighter specification DFB laser (part #1243TAFA) may be supplied instead of the MLM laser. The DFB laser meets all the requirements of the MLM laser and DFB requirements in GR-253-CORE, Issue 2, December 1995.
- ‡ The universal optical connector (UOC) buildout assembly consists of a faceplate-mounted block assembly and either 0 dB, 5 dB, 10 dB, or 15 dB buildout in either ST, SC, or FC-type connectors.

Table 10-5. 21G/21G-U/21G2-U and 21D/21D-U/22D-U OLIU Link Budgets (Note 1)

Parameter	21G2-U (Note 3)	21G/21G-U (Note 2)		21D/21D-U/22D-U
		Tx High	Tx Low	
Minimum Wavelength (λ_{Tmin})	1280 nm	1280 nm	1280 nm	1270/1260* nm
Maximum Wavelength (λ_{Tmax})	1335 nm	1335 nm	1335 nm	1380 nm
Spectral Width ($\delta\lambda_{rms}$)	4.0 nm	4.0 nm	4.0 nm	170 nm ¶¶
Maximum Transmitter Power (P_{Tmax})	0.0 dBm	-2.5 dBm	-7.5 dBm	-14.0 dBm
Minimum Transmitter Power (P_{Tmin})	-5.0 dBm	-5.0 dBm	-11.4 dBm	-18.8/-21.8 dBm
Maximum Received Power (P_{Rmax})	0.0 dBm	-7.0 dBm	-7.0 dBm	-14.0 dBm
Minimum Received Power (P_{Rmin})	-34.0 dBm	-34.0 dBm	-34.0 dBm	-33.8/-31.8* dBm
Minimum System Gain (S-R)‡	29.0 dB	29.0 dB	22.6 dB	15/10.0* dB
Optical Path Penalty (P_O)§	1.0 dB	1.0 dB	1.0 dB	1.6 dB
Connector Loss¶	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Unallocated Margin**	1.5 dB	1.5 dB	1.5 dB	2.0 dB
Minimum Loss Budget	0.0 dBm	4.5 dB††	0.0 dB	0.0 dB
Maximum Loss Budget‡‡	25.0 dB	25.0 dB	18.6 dB	9.9/4.9* dB
Maximum Span Length§§	55 km	55 km	41 km	(Note 4)

Notes:

1. All terminology is consistent with TR-253, Issue 2. All specifications for 21G/21G-U/21G2-U OLIU meets or exceeds long reach (LR) values described in TR-253, Iss. 2.
 2. The High/Low transmitted power switch on the 21G/21G-U OLIU circuit pack allows for loopbacks or small outside plant (OSP) budgets without external attenuators.
 3. The 21G2-U does not have a High/Low transmitter power switch. When transmitting from a 21G2-U to a 21G-U, 22F, 22D-U or 22G-U OLIU, an external attenuator may be required. An attenuator is not required when transmitting to a 22F-U/22F2-U or 22G2-U OLIU.
 4. Multimode only (see Table 10-8).
- * When two numbers are given, the number before the slash is the specification for operating under controlled environmental conditions. The number following the slash is the specification for uncontrolled environmental conditions. If only one number is given, it applies to both controlled and uncontrolled environmental conditions.
- † Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.
- ‡ The minimum system gain for the DDM-2000 already takes into account aging, temperature, and manufacturing tolerances as these figures are built into the minimum transmitter power. The DDM-2000 system gain can, thus, not be directly compared with the DDM-1000 system gain because the DDM-1000 system gain does not include all of these effects. A similar penalty, called eye margin, is subtracted from the DDM-1000 loss budget after the value of system gain is determined.

Table 10-5. 21G/21G-U/21G2-U and 21D/21D-U/22D-U OLIU Link Budgets (Contd)

- § Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path.
- ¶ One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.
- ** Unallocated margin, or safety margin, is typically specified from 0 dB to 3 dB.
- †† If the loss budget is less than 6.0 dB, use low power. Includes a 1.5 dB safety margin.
- ‡‡ Budget available for both station and transmission cable and splices.
- §§ Attenuation and dispersion can be the limiting factors in span length. For OC-3 single-mode fiber systems, dispersion is not a factor and all applications are attenuation limited. For OC-12 systems, the maximum distance could be either attenuation limited or dispersion limited. The limits must be calculated based on both factors and the lesser of the two defines the actual maximum span length. A rough rule of thumb for attenuation-limited systems is 0.45 dB/km. This estimate includes typical cable loss (0.4 dB/km) and splice loss (0.2 dB per splice, 11 total splices) associated with single-mode fiber.
- Maximum span length can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.
- ¶¶ Full width at half maximum (FWHM) spectral width.
-

Table 10-6 lists the 22F/22F-U/22F2-U, 22G-U, 22G2-U and 22G3-U OLIU specifications.

Table 10-6. 22F/22F-U/22F2-U, 22G-U/22G2-U, and 22G3-U OLIU Specifications

System Information:			
Terminal Equipment Identification	22F/22F-U/22F2-U OLIU	22G-U/22G2-U OLIU	22G3-U OLIU
Optical Line Rate (Mb/s)	155.520 Mb/s	155.520 Mb/s	155.520 Mb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1310 nm	1310 nm	1310 nm
Performance	SONET IR-1 MLM (Intermediate Reach)	Not applicable	SONET LR- (Long Reach)
Transmitter Information:			
Optical Device Temperature Controller	No TEC	No TEC	No TEC
FDA Classification	Class I	Class I	Class I
Optical Source	InGaAsP Laser, MLM Structure *	InGaAsP Laser, MLM Structure *	InGaAsP Laser, MLM Structure *
Faceplate Optical Connector	Lucent ST [®] C3000-A-2 (22F) UOC buildout assembly † (22F-U/22F2-U) Single Mode	UOC buildout assembly † Single Mode	UOC buildout assembly † Single Mode
Receiver Information:			
Optical Device Temperature Controller	None	None	None
Optical Detector	InGaAsP PIN	InGaAsP PIN (22G-U) InGaAs PIN (22G2-U)	InGaAs PIN
Faceplate Optical Connector	Lucent ST [®] C2000-A-2 (22F) UOC buildout assembly † (22F-U/22F2-U) Multimode	UOC buildout assembly † Multimode	UOC buildout assembly † Multimode

Notes:

- * A tighter specification DFB laser (part #1243TAFa) may be supplied instead of the MLM laser. The DFB laser meets all the requirements of the MLM laser and DFB requirements in GR-253-CORE, Issue 2, December 1995.
- † The universal optical connector (UOC) buildout assembly consists of a faceplate-mounted block assembly and either 0 dB, 5 dB, 10 dB, or 15 dB buildout in either ST, SC, or FC-type connectors.

Table 10-7. 22F/22F-U/22F2-U, 22G-U, 22G2-U, and 22G3-U OLIU Link Budgets (Note 1)

Parameter	22F/22F-U/ 22F2-U	22G-U	22G2-U	22G3-U*
Minimum Wavelength (λ_{Tmin})	1260 nm	1272 nm	1272 nm	1280 nm
Maximum Wavelength (λ_{Tmax})	1360 nm	1350 nm	1350 nm	1335 nm
Spectral Width ($\delta\lambda_{rms}$)	7.7 nm	3.0 nm	3.0 nm	4.0 nm
Maximum Transmitter Power* (P_{Tmax})	-8.0 dBm	0.0 dBm	0.0 dBm	0.0 dBm
Minimum Transmitter Power (P_{Tmin})	-15.0 dBm	-7.0 dBm	-7.0 dBm	-5.0 dBm
Maximum Received Power (P_{Rmax})	-7.0 dBm	-7.0 dBm	0.0 dBm	0.0 dBm
Minimum Received Power (P_{Rmin})	-34.0 dBm	-34.0 dBm	-34.0 dBm	-34.0 dBm
Minimum System Gain (S-R)†	19.0 dB	27.0 dB	27.0 dB	29.0 dB
Optical Path Penalty (P_O)§	1.0 dB	1.0 dB	1.0 dB	1.0 dB
Connector Loss¶	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Unallocated Margin**	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Minimum Loss Budget	0.0 dB	7.0 dB	0.0 dB	0.0 dB
Maximum Loss Budget‡	15.0 dB	23.0 dB	23.0 dB	25.0 dB
Maximum Span Length§§	33 km	51 km	51 km	55 km

Notes:

1. All terminology is consistent with TR-253, Issue 2. All specifications for the 22F OLIU meet or exceeds intermediate reach (IR) values described in TR-253, Iss. 2.
- * The 22G3-U OLIU is fully compliant with SONET long reach applications. It is fully compatible with the 22F-type, 22G-U, and 22G2-U OLIUs and will replace them.
- † Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.
- ‡ The minimum system gain for the DDM-2000 already takes into account aging, temperature, and manufacturing tolerances as these figures are built into the minimum transmitter power. The DDM-2000 system gain can, thus, not be directly compared with the DDM-1000 system gain because the DDM-1000 system gain does not include all of these effects. A similar penalty, called eye margin, is subtracted from the DDM-1000 loss budget after the value of system gain is determined.
- § Optical path penalty includes effects of dispersion, reflection and jitter that occur on the optical path.
- ¶ One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.
- ** Unallocated margin, or safety margin, is typically specified from 0 dB to 3 dB.

Table 10-7. 22F/22F-U/22F2-U, 22G-U, 22G2-U, and 22G3-U OLIU Link Budgets (Contd)

‡‡ Budget available for both station and transmission cable and splices.

§§ Attenuation and dispersion can be the limiting factors in span length. For OC-3 single-mode fiber systems, dispersion is not a factor and all applications are attenuation limited. For OC-12 systems, the maximum distance could be either attenuation limited or dispersion limited. The limits must be calculated based on both factors and the lesser of the two defines the actual maximum span length. A rough rule of thumb for attenuation-limited systems is 0.45 dB/km. This estimate includes typical cable loss (0.4 dB/km) and splice loss (0.2 dB per splice, 11 total splices) associated with single-mode fiber.

Maximum span length can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

Table 10-8. OC-3 OLIU Link Budget - Multimode Operation

Fiber Bandwidth	Maximum Span Length (km)			
	21G/21G-U/ 21G2-U (Note 1)	22F/22F-U/ 22F2-U (Note 2)	21D/21D-U/ 22D-U (Note 3)	22G/22G-U/ 22G2-U/22G3-U (Note 4)
1000 MHz-km	6.5	6.5	3.6/3.4	6.5
800 MHz-km	5.1	5.1	3.4/3.3	5.1
500 MHz-km	3.1	3.1	2.7	3.1
300 MHz-km	1.8	1.8	1.9	1.8

Notes:

1. Maximum 21G/21G-U/21G2-U MM Link Budget (dB) for multimode operation is 22.0 dB for high power and 15.6 for low power (21G/21G-U only).
2. Maximum 22F-type MM Link Budget (dB) for multimode operation is 12.0 dB.
3. When two numbers are given, the number before the slash is the specification for operating under controlled environmental conditions. The number following the slash is the specification for uncontrolled environmental conditions. If only one number is given, it applies to both controlled and uncontrolled environmental conditions.
4. The 22G3-U will replace the 22F-type and the 22G/22G-U and 22G2-U OLIUs.

The system is dispersion limited for all the fiber bandwidths listed in Table 10-8.

Multimode fiber operation on the DDM-2000 OC-3 Multiplexer requires a minimum exit bandwidth of 120 MHz to ensure that dispersion loss is kept below acceptable levels. If the fiber is already installed and the exit bandwidth is measured to be 120 MHz or greater, then the maximum link budget values (see Notes 1 and 2) can be used to determine if the loss budget is sufficient for that fiber.

If planning a new fiber installation, the values at the end of the table, given for a number of commercially available fiber bandwidth-distance products, can be used. Fiber distances are calculated using the 120 MHz exit bandwidth limit; however, actual exit bandwidths may be higher for these distances due to the existence of splices. This may permit longer span lengths to be achieved, for the given fiber bandwidths, than those specified in the table. In this case, however, the span length can only be increased to the point where the system is loss limited as specified by the maximum multimode link budget given in the table (1 dB/km cable is assumed).

Table 10-9. 24G-U OLIU Specifications

System Information:

Terminal Equipment Identification	24G-U OLIU
Optical Line Rate (Mb/s)	622.080 Mb/s
Optical Line Coding	Scrambled NRZ
Optical Wavelength (nm)	1310 nm
Performance	SONET LR-1 DFB (Long Reach)

Transmitter Information:

Optical Device Temperature Controller	None
FDA Classification	Class I
Optical Source	InGaAsP Laser, SLM Structure
Faceplate Optical Connector	UOC Buildout Assembly (single-mode) *

Receiver Information:

Optical Device Temperature Controller	None
Optical Detector	InGaAs PIN
Faceplate Optical Connector	UOC Buildout Assembly (multi-mode) *

- * The universal optical connector (UOC) buildout assembly consists of a faceplate-mounted block assembly and either 0 dB, 5 dB, 10 dB, or 15 dB buildout in either ST, SC, or FC-type connectors.
-

Table 10-10. 24G-U OLIU Link Budgets

Parameter	24G-U
Minimum Wavelength (λ_{Tmin})	1280 nm
Maximum Wavelength (λ_{Tmax})	1335 nm
Spectral Width ($\delta\lambda_{20}$)	1.0 nm
Maximum Transmitter Power $*(P_{Tmax})$	+1.9 dBm
Minimum Transmitter Power (P_{Tmin})	−3.0 dBm
Maximum Received Power (P_{Rmax})	−8.0 dBm
Minimum Received Power (P_{Rmin})	−30.0 dBm
Minimum System Gain (S-R) †	27.0 dB
Optical Path Penalty (P_O) ‡	1.0 dB
Connector Loss §	1.5 dB
Unallocated Margin ¶	1.5 dB
Minimum Loss Budget **	8.0 dB
Maximum Loss Budget ††	23.0 dB
Maximum Span Length ‡‡	51 km

Notes:

1. All terminology is consistent with TR-253, Issue 2. All values are worst-case end of life.
 2. All specifications for the 24G-U meet or exceed long reach (LR) values described in TR-253, Iss. 2.
- * Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.
- † The minimum system gain for the DDM-2000 already takes into account aging, temperature, and manufacturing tolerances as these figures are built into the minimum transmitter power. The DDM-2000 system gain can, thus, not be directly compared with the DDM-1000 system gain because the DDM-1000 system gain does not include all of these effects. A similar penalty, called eye margin, is subtracted from the DDM-1000 loss budget after the value of system gain is determined.
- ‡ Optical path penalty includes effects of dispersion, reflection and jitter that occur on the optical path. The 24G-U has 4.0 dB of total margin. Optical path penalty is normally 1.0 dB.
- § One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.
- ¶ Unallocated margin, or safety margin, is typically specified from 0 dB to 3 dB.
- ** The 24G-U requires an external lightguide buildout as part of the connector assembly for loopbacks and for loss budgets less than 10 dB.
- †† Budget available for both station and transmission cable and splices.

- ‡‡ Attenuation can be the limiting factors in span length. A rough rule of thumb for attenuation-limited systems operating in the 1310 nm wavelength range is 0.45 dB/km. This estimate includes typical cable loss (0.4 dB/km) and splice loss (0.2 dB per splice, 11 total splices) associated with single-mode fiber in the 1310 nm range.

For the 24G-U, the maximum distance is not dispersion limited because single longitudinal mode laser is used. Given the attenuation assumption, the maximum span length for the 24G-U is 51 km.

Maximum span length can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

Table 10-11, Table 10-12, and Table 10-13 lists the 26G2-U/27G-U/27G2-U OLIU specifications.

Table 10-11. 26G2-U/27G-U/27G2-U OLIU Specifications

System Information:

Terminal Equipment Identification	26G2-U/27G-U/27G2-U OLIU
Optical Line Rate (Mb/s)	51.84 Mb/s
Optical Line Coding	Scrambled NRZ
Optical Wavelength	1310 nm
Performance	Not applicable

Transmitter Information:

Optical Device Temperature Controller	No TEC
FDA Classification	Class I
Optical Source	InGaAsP Laser, MLM Structure *
Faceplate Optical Connector	UOC buildout assemble Single Mode †

Receiver Information:

Optical Device Temperature Controller	None
Optical Detector	InGaAsP PIN
Faceplate Optical Connector	Lucent ST C2000-A-2 Multimode †

Notes:

- * A tighter specification DFB laser (part #1243TAFA) may be supplied instead of the MLM laser. The DFB laser meets all the requirements of the MLM laser and DFB requirements in GR-253-CORE, Issue 2, December 1995.
 - † The universal optical connector (UOC) buildout assembly consists of a faceplate-mounted block assembly and either 0 dB, 5 dB, 10 dB, or 15 dB buildout in either ST, SC, or FC-type connectors.
-

Table 10-12. 26G2-U/27G-U/27G2-U OLIU Link Budgets

Parameter	Value
Minimum Wavelength (λ_{Tmin})	1272 nm
Maximum Wavelength (λ_{Tmax})	1350 nm
Spectral Width ($\delta\lambda_{rms}$)	3.0 nm
Maximum Transmitter Power (P_{Tmax}) *	-0.0 dBm
Minimum Transmitter Power (P_{Tmin}) *	-7.0 dBm
Maximum Received Power (P_{Rmax})	-13.8 dBm
Minimum Input Power (P_{Rmin})	-30.8 dBm
Minimum System Gain (S-R)‡	23.8 dB
Optical Path Penalty (P_O) †	1.0 dB
Connector Loss ‡	1.5 dB
Unallocated Margin	1.5 dB
Minimum Loss Budget	13.8 dB
Maximum Loss Budget	19.8 dB
Maximum Span Length§	44 km

Notes:

1. All values are for both controlled and uncontrolled environmental conditions.
- * Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.
- † Optical path penalty includes effects of dispersion, reflection and jitter that occur on the optical path.
- ‡ One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.
- § The 26G2-U/27G-U/27G2-U OLIUs are dispersion limited at 44 km, due to the wider wavelength range. Assuming fiber with zero dispersion wavelength between 1300 and 1320 nm, the worst case dispersion over the transmitter wavelength range of 1272 to 1350 nm is 4.88 psec/nm km. This implies a 44 km span would have a total dispersion of about 215 psec/nm.

Table 10-13. 26G2-U/27G-U/27G2-U OLIU Link Budgets — Multimode Operation

Fiber Bandwidth	Maximum Span Length (km)
1000 MHz-km	19.8
800 MHz-km	19.8
500 MHz-km	19.8
300 MHz-km	13.6

Notes:

The maximum Link Budget loss is 19.8 dB

Multimode fiber operation requires a minimum exit bandwidth of 44 MHz to ensure that dispersion loss is kept below acceptable levels. If the fiber is already installed and the exit bandwidth is measured to be 44 MHz or greater, then the maximum link budget values can be used to determine if the loss budget is sufficient for that fiber.

If planning a new fiber installation, the values given in the table (given for a number of commercially available fiber bandwidth-distance products) can be used. Fiber distances are calculated using the 44 MHz exit bandwidth limit; however, actual exit bandwidths may be higher for these distances due to the existence of splices. This may permit longer span lengths to be achieved for the given fiber bandwidths than those specified in the table. In this case, however, the span length can only be increased to the point where the system is loss limited as specified by the maximum multimode link budget given in the table (1 dB/km cable is assumed).

OC-3 Optical Interface Mixing

Mixing different OC-3 rate OLIUs at opposite ends of an optical link is often necessary for technical reasons or for convenience. The following information will aid in planning and engineering optical links having different types of OC-3 rate OLIUs at each end of the fiber. Table 10-14 details the minimum link budget necessary for each pairing of OC-3 rate OLIUs.

To use Table 10-14, locate the number at the intersection of the transmitter/receiver pair of interest. This number is the minimum attenuation necessary for proper operation of that transmitter/receiver pair. The link must have at least this much attenuation either from fiber loss, splice loss, connector loss, external attenuators, or a combination of these, or the receiver will be overdriven and the link will not operate properly.

Table 10-14. OC-3 Rate OLIU Mixes - Minimum Link Budgets (dB)

Transmitter	Receiver						
	21G/21G-U	21G2-U	22F	22F-U/ 22F2-U	22G-U*	22G2-U/ 22G3-U	21D/21D-U/ 22D-U (Ctrl'd/ Unctrl'd Env.)
21G/21G-U (high power)	4.5	0.0	4.5	0.0	4.5	0.0	11.5
21G/21G-U (low power)	0.0	0.0	0.0	0.0	0.0	0.0	6.5
21G2-U	7.0	0.0	7.0	0.0	7.0	0.0	14.0
22F	0.0	0.0	0.0	0.0	0.0	0.0	6.0
22F-U/22F2-U	0.0	0.0	0.0	0.0	0.0	0.0	6.0
22G-U*	7.0	0.0	7.0	0.0	7.0	0.0	14.0
22G2-U/22G3-U	7.0	0.0	7.0	0.0	7.0	0.0	14.0
21D/21D-U/ 22D-U (ctrl'd. unctrl'd. env.)	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0

* The LAA10 FT-2000 OC-3 Optical Interface has the same optical loss budget as the 22G-U and therefore should follow the same optical mixing rules.

Note that the minimum link budget is not always symmetrical. A transmitter/receiver pair may have one minimum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) OLIU transmitting to a 21D/21D-U (controlled environment) OLIU has a minimum link budget of 6.5 dB. In the opposite direction, though, a 21D/21D-U (controlled environment) OLIU transmitting to a 21G/21G-U (low power) OLIU has a minimum link budget of 0.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs.



NOTE:

When using universal optical buildout attenuators for OLIUs equipped with Universal Optical Connectors (for example, 22G-U and 22D-U), the buildout must have the same type fiber on both sides, that is, single-mode to single-mode or multimode to multimode. The buildout must also match the mode of the fiber. Therefore, when a single-mode jumper is used, the buildout would be on the transmit side (OUT) of the OLIU and when a multimode jumper is used, the buildout would be on the receive side (IN) of the OLIU. When using in-line attenuators for non-U OLIUs, place the attenuator in the bay frame PANDUIT. Make sure that the mode type of the attenuator matches the mode of the fiber to ensure proper attenuation.

Table 10-15 details the maximum link budgets for each pairing of OC-3 rate OLIUs when operating on single-mode (SM) fiber. These numbers give the maximum attenuation acceptable for proper operation of each transmitter/receiver pair. The link must have no more than this much attenuation either from fiber loss, splice loss, connector loss, external attenuators or a combination of these or the link will not operate properly. The maximum link budgets for SM fiber were calculated using the following margins:

- Optical Path Penalty (dB) 1.0
- Connector Loss (dB) 1.5

Table 10-15. OC-3 Rate OLIU Mixes - Maximum Link Budgets for SM Fiber (dB)

Transmitter	Receiver				
	21G/21G-U/ 21G2-U	22F	22G-U*/ 22G2-U/ 22G3-U	21D/21D-U/ 22D-U (Ctrld. Env.)	21D/21D-U/ 22D-U (Unctrld. Env.)
21G/21G-U/21G2-U (high power)	25.0	25.0	25.0	24.8	22.8
21G/21G-U (low power)	18.6	18.6	18.6	18.4	16.4
22F	15.0	15.0	15.0	14.8	12.8
22G-U*/22G2-U	23.0	23.0	23.0	22.8	20.8
22G3-U	25.0	25.0	25.8	24.8	22.8
21D/21D-U/22D-U (ctrld. env.)	n/a	n/a	n/a	n/a	n/a
21D/21D-U/22D-U (unctrld. env.)	n/a	n/a	n/a	n/a	n/a

* The LAA10 FT-2000 OC-3 Optical Interface has the same optical loss budget as the 22G-U and therefore should follow the same optical mixing rules.



NOTE:

The maximum link budget is not always symmetrical. A transmitter/receiver pair may have one maximum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) OLIU transmitting to a 22F OLIU has a maximum SM link budget of 18.6 dB. In the opposite direction, though, a 22F OLIU transmitting to a 21G/21G-U (low power) OLIU has a maximum SM link budget of 15.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs. Note also that 21D/21D-U and 22D-U OLIUs will not operate when transmitting into single-mode fiber.

Table 10-16 details the maximum link budgets for each pairing of OC-3 rate OLIUs when operating on multimode (MM) fiber. These numbers give the maximum attenuation acceptable for proper operation of each transmitter/receiver pair. The link must have no more than this much attenuation either from fiber loss, splice loss, connector loss, external attenuators or a combination of these or the link will not operate properly. The maximum link budgets for MM fiber were calculated using the following margins. The first column of margins applies to any link where there is at least one OC-3 OLIU (21G/21G-U, 22F or 22G-U/22G2-U). The second column of margins applies to links having two IS-3 (21D/21D-U or 22D-U) OLIUs.

	At Least One OC-3 OLIU	IS-3 OLIUs Only
MM Optical Path Penalty (dB)	4.0	1.6
Connector Loss (dB)	1.5	1.5
Unallocated Margin (dB)	1.5	2.0

⇒ **NOTE:**
The maximum link budget is not always symmetrical. A transmitter/receiver pair may have one maximum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) transmitting to a 22F has a maximum MM link budget of 15.6 dB. In the opposite direction, though, a 22F transmitting to a 21G/21G-U (low power) has a maximum SM link budget of 12.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs.

Table 10-16. OC-3 Rate OLIU Mixes—Maximum Link Budgets for MM Fiber (dB)

Transmitter	Receiver				
	21G/21G-U/ 21G2-U	22F/ 22F-U/ 22F2-U	22G-U*/ 22G2-U/ 22G3-U	21D/21D-U/ 22D-U (Ctrl'd. Env.)	21D/21D-U/ 22D-U (Unctrl'd. Env.)
21G/21G-U/21G2-U (high power)	22.0	22.0	22.0	21.8	19.8
21G/21G-U (low power)	15.6	15.6	15.6	15.4	13.4
22F/22F-U/22F2-U	12.0	12.0	12.0	11.8	9.8
22G-U*/22G2-U	20.0	20.0	20.0	19.8	17.8
22G3-U	22.0	22.0	22.0	21.8	19.8
21D/21D-U/22D-U (ctrl'd. env.)	8.2	8.2	8.2	9.9	7.9
21D/21D-U/22D-U (unctrl'd. env.)	5.2	5.2	5.2	6.9	4.9

* The LAA10 FT-2000 OC-3 Optical Interface has the same optical loss budget as the 22G-U and, therefore, should follow the same optical mixing rules.

Universal Optical Connector Attenuators

The DDM-2000 OC-3 and OC-12 Multiplexers provide Lucent's universal optical connector on all OLIUs. This connector is a two-part connector consisting of a faceplate-mounted block and an optical buildout. The faceplate block optionally supports an *ST*, *SC*, or *FC*-type optical buildout.

A 0 dB *ST*-type connector is shipped as standard with each OLIU. Optional *SC* or *FC* 0 dB or attenuated buildouts can be ordered separately as listed in Table 10-17. Table 10-17 lists *SM* and *MM* attenuated buildouts.

Table 10-17. Universal Buildout Attenuators

Description	Connection	Loss (dB)	Comcode
A3060 SC 0 dB buildout	SM-SM & MM-MM	0	106708951
A3060B1 SC 5 dB buildout	SM-SM	5	107406142
A3060D1 SC 10 dB buildout	SM-SM	10	107406159
A3060F1 SC 15 dB buildout	SM-SM	15	107406167
A3070 <i>ST</i> ® 0 dB buildout	SM-SM & MM-MM	0	106795354
A3070B1 <i>ST</i> 5 dB buildout	SM-SM	5	107406183
A3070D1 <i>ST</i> 10 dB buildout	SM-SM	10	107406191
A3070F1 <i>ST</i> 15 dB buildout	SM-SM	15	107406209
A3080 FC 0 dB buildout	SM-SM & MM-MM	0	106795404
A3080B1 FC 5 dB buildout	SM-SM	5	107406225
A3080D1 FC 10 dB buildout	SM-SM	10	107406233
A3080F1 FC 15 dB buildout	SM-SM	15	107406241
A2060B SC 5 dB buildout	MM-MM	5	106795271
A2060D SC 10 dB buildout	MM-MM	10	106795289
A2060F SC 15 dB buildout	MM-MM	15	106795297
A2070B <i>ST</i> 5 dB buildout	MM-MM	5	106795313
A2070D <i>ST</i> 10 dB buildout	MM-MM	10	106795321
A2070F <i>ST</i> 15 dB buildout	MM-MM	15	106795339

SONET Overhead Bytes

The DDM-2000 OC-3 Multiplexer currently uses the K2 byte in the SONET format for synchronization signaling. The reserved V4 byte in the VT1.5 superframe is used for internal fault detection in a DDM-2000 OC-3 Multiplexer shelf. This internal usage of the V4 byte may cause the value of the transmitted V4 byte to vary.

The DDM-2000 OC-3 Multiplexer does not depend on, and always ignores, the value of the V4 byte received from another DDM-2000 or other shelf with an OC-3 interface.

Performance

Wander/Jitter

- For SONET optical interfaces, the maximum time interval error (MTIE) does not exceed 60 nanoseconds phase variation when timed with a wander-free reference
- Jitter transfer, tolerance, and generation requirements are met as specified in GR-253-CORE and GR-499-CORE
- The SONET interfaces meet the T1.101 OC-N output short-term stability mask.

Signal Performance

The following specifications apply given the standard networks defined in GR-499-CORE.

- For systems interfacing at the DS1 rate, the number of errored seconds, during a 2-hour, one-way loopback test, is less than 10
- For systems interfacing at the DS3 rate, the number of errored seconds, during a 2-hour, one-way loopback test, is less than 72
- The BER is less than 10^{-9} for both the DS1 and DS3 rates. Burst-errored seconds are excluded
- The frequency of burst-errored seconds, other than those caused by protection switching induced by hard equipment failures, averages less than four per day.

Synchronization

Synchronous Timing Generator (BBF2/BBF2B)

The TGS circuit pack meets the specifications of GR-253-CORE, SONET Transport Systems Generic Criteria. The TGS circuit pack supports three timing modes:

- External timing: Locked to external Stratum 3 (± 4.6 ppm) or better DS1 reference.
- Line-timing: Locked to recovered clock from an OC-N signal.
- Free-running: Timing derived from high-stability temperature-compensated voltage-controlled crystal oscillator (TCVCXO) with a long-term accuracy of ± 15 ppm and temperature stability of ± 8.8 ppm (-40°C to $+75^{\circ}\text{C}$).

Holdover mode is entered on failure of external timing or line-timing reference, providing a temperature stability of ± 8.8 ppm (-40°C to $+75^{\circ}\text{C}$). Holdover capability for 24 hours will be better than ± 4.6 ppm.

The DS1 timing output used for network synchronization (BBF2B only) provides long-term accuracy traceable to the OC-N signal.

SONET synchronization messaging is used to output DS1 AIS when clock traceability is lost (Release 5 and later). Jitter on the DS1 output is less than 0.06 unit interval peak-to-peak.

Protection Switching

Linear Networks

Automatic line switches are initiated by signal fail and signal degrade conditions on the received OC-3 signal and are completed within 50 milliseconds of a signal failure. This signal's BER is calculated from violations of the SONET line overhead B2 parity bytes. Signal fail is declared for incoming LOS, LOF, line AIS, or a BER exceeding 10^{-3} , while a BER exceeding a provisionable threshold between 10^{-5} and 10^{-9} causes a signal degrade to be declared.

Ring Networks

Path protection rings feed a SONET payload (STS or virtual tributary [VT]) from the ring entry point, simultaneously in both rotations of the ring, to the signal's ring exit point. The node that terminates the signal from the ring monitors both ring rotations and is responsible for selecting the signal that has the highest quality based on LOS, path AIS, and path BER performance. On pass-through paths, all detected hard failures (LOS, LOF, LOP, line AIS, STS-1 path AIS, or STS-1 path signal failure based on BER) result in VT AIS insertion in the outgoing signals. This allows the terminating node to be aware of the failure and to switch to protection. Protection switching is completed within 50 milliseconds of failure detection.

Under normal conditions, both incoming SONET path signals to the switch selection point are of high quality, and the signal can be selected from either ring. A failure or a transmission degradation on one of the rings requires that the other ring path be selected. Release 5.1 provides nonrevertive switching to minimize the impact on critical customer services by giving the service provider control, when and if, the critical service should revert to a particular ring. A manual path protection switching command allows switching back to the original path for ease of ring maintenance.

Transient Performance

Power Loss Restart

After system shutdown due to power loss, the system will exhibit a 2-second error free transmission interval which begins within 1 minute of restoration of power.

Transmission Start-Up on Signal Application

The system, after having no signal applied for greater than 1 minute at the DSX-n interface, will exhibit a 2-second error free transmission interval which begins within 5 seconds of the reapplication of a signal.

Delay

Table 10-18 lists the worst-case measured one-way transmission delay within a DDM-2000 OC-3 Multiplexer.

Table 10-18. DDM-2000 OC-3/OC-1 Transmission Delay in Microseconds

Mode (High-Speed)	Low-Speed Interface					
	OC-3/EC-1 (STS-1)*	OC-3/EC-1 (VT)*	DS3	DS1	OC-1 STS	OC-1 VT
Terminal (OC-3)	7	27	7	40		
EC-1				40		
ADM (OC-3)	7	27	7	100		
Ring (OC-3/OC-12) †	7 †	27 †	7	100	7	27
Ring (OC-1)				100	7	27

* STS-1 or EC-1 cross-connected.

† Ring delay is based on high-speed and low-speed or between Main-1 and Main-2.

Performance Monitoring

Table 10-19 shows the provisionable range of the thresholds for monitored parameters and, in brackets, the default thresholds. Thresholding of any parameter(s) can be disabled.

Table 10-19. Performance Monitoring Parameters (PM) Provisionable via the CIT

Parameter Definition		Threshold Range (Default)		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres-
OC-3 Optics	Optical Transmit Power* (21G/21G-U only) Laser Bias Current* (21G/21G-U only)	-1 dB, -2 dB enable/disable	-1 dB, -2 dB enable/disable	sect sect
OC-12 Section §	SE Frame Seconds (SEFS)	1-63 [10]	1-4095 [30]	sect
OC-3 Section	SE Frame Seconds (SEFS)	1-63 [10]	1-4095 [30]	sect
OC-1 Section	SE Frame Seconds (SEFS)	1-63 [10]	1-4095 [30]	line
OC-12 Line §	B2 Coding Violations (CV)	1-55365 [5537]	1-5315040 [531504]	line
	B2 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	line
	B2 Errored Seconds Type A (ESA)	1-900 [30]	1-65535 [90]	line
	B2 Errored Seconds Type B (ESB)	1-900 [30]	1-65535 [90]	line
	B2 Severely Errored Seconds (SES)	1-63 [20]	1-4095 [60]	line
	B2 Unavailable Seconds (UAS)	1-63 [30]	1-4095 [90]	line
	STS Pointer Justification (PJC)	1-65535 [60]	1-9999999 [5760]	line
OC-3 Line	B2 Coding Violations (CV)	1-13841[1384]	1-1328736 [132874]	line
	B2 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	line
	B2 Errored Seconds Type A (ESA)	1-900 [30]	1-65535 [90]	line
	B2 Errored Seconds Type B (ESB)	1-900 [30]	1-65535 [90]	line
	B2 Severely Errored Seconds (SES)	1-63 [20]	1-4095 [60]	line
	B2 Unavailable Seconds (UAS)	1-63 [30]	1-4095 [90]	line
	Line Protection Switch Counts (PSC-L) STS Pointer Justification (PJC)	1-63 [2] 1-65535 [60]	1-255 [4] 1-9999999 [5760]	line line
OC-1 Line	B2 Coding Violations (CV)	1-4613 [461]	1-442848 [44285]	line
	B2 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	line
	B2 Errored Seconds Type A (ESA)	1-900 [30]	1-65535 [90]	line
	B2 Errored Seconds Type B (ESB)	1-900 [30]	1-65535 [90]	line
	B2 Severely Errored Seconds (SES)	1-63 [20]	1-4095 [60]	line
	B2 Unavailable Seconds (UAS)	1-63 [30]	1-4095 [90]	line
	STS Pointer Justification (PJC)	1-65535 [60]	1-9999999 [5760]	line
EC-1 Line §§	B2 Coding Violations (CV) EC-1	1-4613 [461]	1-442848 [44285]	line
	B2 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	line
	B2 Errored Seconds Type A (ESA)	1-900 [30]	1-65535 [90]	line
	B2 Errored Seconds Type B (ESB)	1-900 [30]	1-65535 [90]	line
	B2 Severely Errored Seconds (SES)	1-63 [20]	1-4095 [60]	line
	B2 Unavailable Seconds (UAS)	1-63 [30]	1-4095 [90]	line
	STS Pointer Justification (PJC)	1-65535 [60]	1-9999999 [5760]	line
STS-1 Path	B3 Coding Violations (CV)	1-4510 [451]	1-432960 [43296]	sts1
	B3 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	sts1
	B3 Errored Seconds Type A (ESA)	1-900 [30]	1-65535 [90]	sts1
	B3 Errored Seconds Type B (ESB)	1-900 [30]	1-65535 [90]	sts1
	B3 Severely Errored Seconds (SES)	1-63 [20]	1-4095 [60]	sts1
	B3 Unavailable Seconds (UAS)	1-63 [30]	1-4095 [90]	sts1

Parameter Definition		Threshold Range (Default)		Command
Facility	Measure	Current Quarter Hour	Current Day	set - pmthres -
DS3 Path ¶	P-Bit Error Counts	1-4026 [403]	1-386500 [38650]	t3
	SE Frame Seconds (SEFS)	1-63 [10]	1-4095 [30]	t3
Enhanced DS3 Path for P-Bits, F&M Bits, and C-Bits from Fiber and DSX**	CV-P Coding Violations	1-16383 [40]	1-1048575 [3820]	t3
	ES-P Errored Seconds	1-900 [25]	1-65535 [250]	t3
	SES-P Severely Errored Seconds	1-63 [4]	1-4095 [40]	t3
	UAS-P Unavailable Seconds	1-63 [10]	1-4095 [10]	t3
	SEFS	1-63 [2]	1-4095 [8]	t3
DS3 Line ††	CV-L Coding Violations	1-16383 [40]	1-1048575 [3865]	t3
	Errored Seconds, Line (ES-L)	1-900 [25]	1-65535 [250]	t3
	Severely Errored Seconds, Line (SES-L)	1-63 [4]	1-4095 [40]	t3
VT1.5 Path †	V5 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	vt1
	V5 Severely Errored Seconds (SES)	1-63 [20]	1-4095 [60]	vt1
	V5 Unavailable Seconds (UAS)	1-63 [30]	1-4095 [90]	vt1
DS1 Path ‡, §§	ES-P Errored Seconds	1-900 [65]	1-65535 [648]	t1
	SES-P Severely Errored Seconds	1-63 [10]	1-4095 [100]	t1
	UAS-P Unavailable Seconds	1-63 [10]	1-4095 [10]	t1
	ES-PFE Errored Seconds	1-900 [65]	1-65535 [648]	t1
	SES-PFE Severely Errored Seconds	1-63 [10]	1-4095 [100]	t1
	UAS-PFE Unavailable Seconds	1-63 [10]	1-4095 [10]	t1
	CV-P (SF) Coding Violations ††	1-16383 [72]	1-1048575 [691]	t1
	CV-P (ESF) Coding Violations ††	1-16383 [13296]	1-1048575 [132960]	t1
	CV-PFE Coding Violations ††	1-16383 [13296]	1-1048575 [132960]	t1
DS1 Line ††, §§	ES-L Line Errored Seconds	1-900 [65]	1-65535 [648]	t1

* Threshold is set once for both current quarter hour and current day.

† Release 6.0 and later linear releases; Release 7.0 and later ring releases (feature package option).

‡ Release 5.1 and later ring releases; Release 6.0 and later linear releases (feature package option).

§ Release 11.0 and later and when used with 24G-U OLIU in main slots.

¶ Prior to Release 7.1

** From the fiber Release 7.1 and later; from the fiber and DSX Release 7.2 and later. C-Bit option is Release 8.0 and later releases.

†† Release 7.2 and later releases.

‡‡ Release 9.1 and later in OC-3 systems support quarter-hour thresholding and reporting of DS1 PM.

§§ Release 5.1 and later ring releases; Release 6.0 and later linear releases.

Operations Interfaces (OI)

This section presents the OIs that are required to support technician access to the system and allow alarms and status information generated by the system to be reported. The local OIs include the CIT interface, the user panel, and the equipment indicators. The DDM-2000 OC-3 Multiplexer supports office alarms, parallel telemetry, user-definable miscellaneous discretes, serial (TBOS) telemetry interfaces, and TL1/X.25.

Craft Interface Terminal (CIT)

The system provides two EIA-232-D compatible CIT interfaces — a front access interface, configured as data communications equipment (DCE), and a rear access CIT interface, configured as data terminal equipment (DTE), to allow a permanent modem connection without requiring a null modem. A null modem is required to connect an ASCII terminal to the DTE interface or a modem to the DCE interface. The CIT interfaces provide data rates of 300, 1200, 2400, 4800, 9600, and 19,200 baud.

Both CIT interfaces operate full duplex using 1 start bit, 8 data bits, and 1 stop bit. Table 10-20 describes the pins supported on the CIT interfaces.

Table 10-20. CIT Interface Pin Connections

EIA-232-D Pin	Front Access CIT (DCE)	Rear Access CIT (DTE)
Pin 2 — Circuit BA Transmitted Data	carries data from terminal to DDM-2000 OC-3	carries data from DDM-2000 OC-3 to modem or terminal
Pin 3 — Circuit BB Received Data	carries data from DDM-2000 OC-3 to terminal	carries data from modem or terminal to DDM-2000 OC-3
Pin 7 — Circuit AB Signal Ground	signal ground	signal ground
Pin 8 — Circuit CF Received Line Signal Detector	not used	indicates to DDM-2000 OC-3 that modem or terminal is connected
Pin 20 — Circuit CD DTE Ready	indicates to DDM-2000 OC-3 that modem or terminal is connected	indicates to modem or terminal that DDM-2000 OC-3 is connected (always ON when SYSCTL is powered)

A CIT is recommended for installation, maintenance and administrative activities. A personal computer (PC) is required for software download and to run the CPro-2000 software. The DDM-2000 OC-3 Multiplexer CIT port (mounted on the user panel) is a standard EIA-232-D (supersedes RS-232C specification) interface configured as DCE for direct connection to a CIT. The CIT port will support rates of 300, 1200, 2400, 4800, 9600, and 19,200 baud and should be

compatible with most *ANSI* 3.64 ASCII terminals; however, it is optimized for standard screens with display areas of 24 lines by 72 (or more) columns. A pager function is included in the DDM-2000 OC-3 Multiplexer to accommodate screen lengths from 3 lines to 150 lines.

Those CITs compatible with DDM-1000 (see 363-206-100 for a list of DDM-1000 compatible terminals) should be directly compatible with the DDM-2000 OC-3 Multiplexer, although some may not be as convenient to use with the DDM-2000 OC-3 Multiplexer.

If the multishelf bus cables (ED-8C724-20, G354 or G356) are connected between shelves in a bay, a CIT may then be connected to the user panel CIT port on any shelf and may address any other shelf in that bay (as well as the remote terminal shelves associated with that shelf in the bay). Any terminal compatible with the *ANSI* 3.64 standard should be compatible with the DDM-2000 OC-3 Multiplexer.

Personal Computer (PC) Specifications for Software Download

The PC used for software download should have:

- A minimum of 640K of random access memory (RAM)
- *MS-DOS*^{*} version 2.0 or newer
- Hard disk
- At least one floppy disk drive of 360K or larger capacity. Although software download can be done with either floppy or hard disk, a hard disk is preferred for its better performance. The disk requirement is met with most portable *MS-DOS* PCs with a single 3.5-inch disk (720K or larger capacity). An *MS-DOS* PC with a hard disk and either a 3.5-inch 720K or 5.25-inch 360K (or larger) floppy disk may also be used.

* Registered trademark of Microsoft Corporation.

Compatible Modems

A compatible modem must meet the following minimum requirements:

- 300, 1200, 2400, 4800, 9600, or 19200 baud
- Full duplex
- 8 data bits
- No parity bits
- 1 start bit
- 1 stop bit
- No flow control.

The following stand-alone modems meet the modem requirements and can be used with the DDM-2000 system. *Western Electric*® 103-compatible and 212A-compatible modems are also suitable for use with the DDM-2000 system. This is not an exhaustive list of compatible modems:

- *Paradyne*®* 2224-CEO modem (at 1200 and 2400 baud)
- *Paradyne* 2224 modem (at 1200 and 2400 baud)
- *Paradyne* 4024 modem (at 1200 and 2400 baud)
- *Paradyne* 2296 modem (at 4800 and 9600 baud)
- Hayes *V-series*† Smartmodems
- *Penril*‡ Alliance V.32 modem.

The *NCR* 3170 computer and the AT&T *Safari*® computer have a built-in modem and meet the modem requirements.

* Trademark of AT&T.

† Trademark of Hayes Microcomputer Products, Inc.

‡ Registered trademark of Penril Corporation.

CPro-2000 Graphical User Interface and Provisioning Tool

The CPro-2000 Graphical User Interface (GUI) and Provisioning Tool is a *Microsoft^{*} Windows* based user interface that can optionally be used with the DDM-2000 OC-3 Multiplexer. The tool simplifies and mechanizes administration, maintenance, and provisioning operations. CPro-2000 supports DDM-2000 OC-3 Multiplexers, DDM-2000 OC-12 Multiplexers, and FT-2000 OC-48 Lightwave Systems. A minimum platform configuration is:

- 486 SX *IBM[†]* compatible desktop or laptop PC
- Disk drive — one 1.44 Megabyte (3.5 inch)
- Hard disk with at least 40 Megabytes of available space
- 8 Megabyte RAM
- *MS-DOS* operating system version 5.0 or later
- *Windows* version 3.1, *Windows NT*, or *Windows 95*
- Serial port (EIA-232-D) — configured as COM1 or COM2
- Mouse
- VGA color monitor.

CPro-2000 has been tested with AT&T, *NCR*, *IBM*, *NEC[‡]*, and *Gateway-2000[§]* personal computers. For more information, see 365-576-125, *CPro-2000 User Manual*, Release 6.1. See Section 10, "Technical Specifications," for PC requirements to use the tool.

* Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation.
† IBM is a registered trademark of International Business Machines Corporation.
‡ NEC is a registered trademark of NEC Corporation.
§ Gateway 2000 is a trademark of Gateway 2000, Inc.

User Panel

The user panel contains red LEDs for CR and MJ alarms, yellow LEDs for MN and PMN alarms, and for abnormal (ABN), far-end activity (FE-ACTY), and near-end activity (NE-ACTY) status. These LEDs are used in conjunction with the far-end identification (FE-ID) 7-segment display on the front panel of the adjacent SYSCTL circuit pack to provide CIT-less single-ended operations.

A green PWR ON LED is lit when the shelf is receiving –48 V power. A green ACO LED is lit when the ACO function is active.

The FE SEL test, ACO/TEST, and UPD/INIT push-buttons are provided to control system operation.

Equipment Indicators

A red LED FAULT indicator is provided on all circuit packs. A green LED ACTIVE indicator is provided on all 1x1 protected circuit packs to indicate which circuit packs are actively carrying traffic.

Office Alarms

The office alarms interface is a set of discrete relays that control office audible and visual alarms. Separate relays handle CR, MJ, and MN alarms. Each contact closure is rated at 1 A, 60 V maximum. The CR and MJ alarms can be wire-ORed. The CR alarm relays are fail safe against unprotected power failures.

Serial Telemetry

Serial telemetry is provided using the telemetry byte-oriented serial (TBOS) protocol. TBOS telemetry provides detailed alarm, status, and control (AS&C) information to and from a remote maintenance center via a 2400 baud RS-422 port. The AS&C TBOS link can be shared among multiple DDM-2000 OC-3 Multiplexer shelves. A TBOS link can support up to eight displays or four OC-3 point-to-point networks.

Parallel Telemetry

Parallel telemetry brings a minimum set of alarm and status information to an operations center. Four alarm closures indicate CR, MJ, MN, and PMN alarms.

The following status closures identify alarms as far-end (FE) or near-end (NE) and as failures on received OC-3 signals or incoming low-speed interfaces, and provide system identification when alarms are paralleled among several shelves in a bay.

- NE status
- FE status (six closures)
- Carrier line failure (CLF) status
- Incoming (INC) status
- System identification (SID) status
- ACO output (ACOO).

The parallel telemetry outputs tolerate –60 V maximum open circuit voltage and 35 mA maximum current. Transient voltages up to –135 V are tolerated for up to 1 ms. The parallel telemetry ACO input provides –48 V nominal (–60 V maximum) open circuit voltage and 2 mA maximum current.

The parallel telemetry output closures generated by the optoisolator require external voltage and ground to operate.

User-Definable Miscellaneous Discrete Environmental Alarms and Controls

The user-definable miscellaneous discrete environmental alarm and control interface allows the DDM-2000 OC-3 Multiplexer to monitor and control colocated equipment at the remote site. At the remote terminal (RT) site, 21 alarm or status environmental inputs can monitor environmental conditions (for example, open door, high temp); these inputs are activated by contact closures. The 15th environmental alarm or status input is provided to monitor the condition of the power shelf and fans at the RT site; this closure is activated by –48 V DC. Prior to Release 8.0, only 15 discretes are available. Four environmental control outputs are provided to control external equipment (for example, pumps or generators). The miscellaneous discrete outputs (control outputs at an RT, alarm/status outputs at a CO) tolerate –60 V maximum open circuit voltage and 35 mA maximum current. Transient voltages up to –135 V are tolerated for up to 1 ms. The miscellaneous discrete inputs (control inputs at a CO, alarm/status inputs in an RT) provide –48 V nominal (–60 V maximum) open circuit voltage and 2 mA maximum current. The miscellaneous discrete output closures generated by the optoisolator require external voltage and ground to operate.

The 21 alarm or status inputs can be reported through a TL1/X.25 interface. The first ten of these can also be reported through discrete telemetry outputs at the CO end. The first 15 of these inputs can also be reported through TBOS scan points.

Order Wire

The DDM-2000 OC-3 Multiplexer uses the E1 byte in the SONET overhead and provides a 64 kb/s complementary metal oxide semiconductor (CMOS) or transistor-transistor logic (TTL) compatible interface to an external order wire shelf to provide point-to-point voice communication between DDM-2000 OC-3 systems.

MegaStar^{*} applications using the BBG10 OHCTL and Release 8.1 or 9.1 also provide a multiplexed order wire capability, whereby six 64Kb/s overhead channels (E1, E2, and F1 from two different optical interfaces) are multiplexed onto a DS1 interface. The DS1 interface is accessible at the same backplane connector (J51) used for the E1-Only order wire. The multiplexed order wire DS1 is designed to interface with a Channel Service Unit available from the Farinon division of Harris Corporation.

The DDM-2000 OC-3 Multiplexer system has been tested with the *DANTEL*[†] Order wire Assembly A18-04588-02.

See the "OC-3 Ordering — Miscellaneous Equipment and Tools" section of 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers Applications, Planning, and Ordering Guide*, for ordering information.

* Registered trademark of Harris, Corporation.

† Registered trademark of Dantel, Inc.

TL1/X.25 Interface

The DDM-2000 Multiplexer supports a TL1/X.25 interface for communication between local and remote DDM-2000s and alarm surveillance and provisioning operations systems (OS) such as Bellcore's Network Monitoring and Analysis (NMA) and Operations Systems/Intelligent Network Element (OPS/INE) OSs. The DDM-2000 OC-3 Multiplexer TL1/X.25 interface is based on Bellcore TR-TSY-000833, Issue 5. In Releases 8.0, 9.0, and later, the DDM-2000 OC-3 Multiplexer supports up to nine X.25 permanent virtual circuits (PVCs) and up to nine switched virtual circuits (SVCs) assigned by default as shown in Table 10-21. The user may assign a maximum of nine VCs using any combination of PVCs and SVCs.

Table 10-21. TL1/X.25 Interface — Default VC Assignments

PVC ID	SVC ID	Logical Group #	Logical Channel #	Default Use
1		0	1	User Definable ‡
2		0	2	Autonomous Maintenance Messages, (User Definable ‡)
3*		0	3	Autonomous Provisioning Messages (REPT DBCHG), (User Definable ‡)
	1†	0	16	Autonomous Maintenance and Provisioning Messages §, (User Definable ‡)
	2 ‡	0	17	User Definable ‡
	3 ‡	0	18	User Definable ‡
	4 ‡	0	19	User Definable ‡
	5 ‡	0	20	User Definable ‡
	6 ‡	0	21	User Definable ‡

* Releases 6.1 (linear), 5.1 (rings), and later

† Releases 6.2 (linear), 7.1 (rings), and later

‡ Releases 8.0 (linear), 9.0 (rings), and later

§ Releases 6.2 (linear), 7.1 and 7.2 (rings) only.

All VCs support command/response messages (except PVC #2 prior to Release 6.0, is limited to autonomous maintenance messages only). The autonomous maintenance messages are all TL1 autonomous messages except REPT DBCHG.

If the default assignments in Table 10-21 do not meet the user's OS needs, Releases 8.0, 9.0, and later of DDM-2000 OC-3 allows users to specify the routing of TL1 autonomous message types to VCs. This is done in two steps:

1. Each TL1 autonomous message type (for example, REPT ALM, REPT DBCHG, REPT PM, etc.) can be mapped to any OS type (using the `ent - t1msgmap` command at every NE in the subnetwork). The OS types are: `t1Maintenance`, `t1MemoryAdministration`, `t1test`, `t1PeerComm`, `t1Other1` and `t1Other2`.
2. Each OS type can be mapped to any of the VCs (using the `ent - osacmap` command at the TL1 GNE). The combination of Step #1 (mapping TL1 autonomous message types to OS types) and Step #2 (mapping OS types to VCs) accomplishes the desired mapping of TL1 autonomous message types to VCs.

At the packet layer, the DDM-2000 OC-3 Multiplexer is configured as a passive DTE with the following parameters as shown in Table 10-22.

Table 10-22. TL1/X.25 Interface — X.25 Packet Layer Parameters

Parameter	Value
Packet Size	128 bytes* or 256 bytes
Window Size	2 packets
D bit support	NO
M bit support	YES

* Releases 8.0 (linear), 7.2 (rings) and later.

At the link layer, the DDM-2000 OC-3 Multiplexer uses the standard link access procedure "B" (LAPB) protocol with the following parameters as shown in Table 10-23.

Table 10-23. TL1/X.25 Interface — LAPB Link Layer Parameters

Parameter	Value
Maximum Frame Size	2104 bits
Module	8
Window Size	7 frames
n2	7 retries
T1	3 seconds
T3*	20 seconds

* Release 3.2 and later.

The DDM-2000 OC-3 Multiplexer uses synchronous, full duplex, continuous carrier communication. Data rates of 1200, 2400, 4800, 9600, and 19,200 baud are supported. The EIA-232-D interface is configured as DTE, using the pin connections specified in Table 10-24.

Table 10-24. TL1/X.25 Interface — EIA-232-D Pin Connections

Pin	Description
2	Transmitted Data
3	Received Data
4	Request to Send
5	Clear to Send
6	DCE Ready
7	Signal Ground
8	Received Line Signal Detector
15	Transmitter Signal Element Timing (DCE to DTE)
17	Receiver Signal Element Timing (DCE to DTE)
20	DTE Ready*

* Always on when the DDM-2000 OC-3 Multiplexer is powered.

Physical Specifications

Shelf Physical Characteristics

- Dimensions: 8.5 in. H x 21.25 in. W x 12 in. D (Group 1 or Group 3)
Dimensions: 8.5 in. H x 21.25 in. W x 13.25 in. D (Group 4)
- Weight (Max.): 44 lb. (20 kg)
- Appearance: Coordinated with other equipment in the Lucent 2000 Product Family.

Network Bay and Cabinet Mounting

The DDM-2000 OC-3 Multiplexer can be mounted in both ED-8C500 and ED-8C501 network bay frames. A maximum of six shelves may be mounted in a 7-foot bay. In addition to bay mounting, the DDM-2000 OC-3 Multiplexer can be packaged with other equipment in 80A, 80D, and 80E cabinets, 51A cabinets, 90-type business RTs, controlled environment vaults (CEVs), or huts.



NOTE:

The mounting brackets on the DDM-2000 OC-3, OC-12, heat baffle, and fan shelf are designed to allow for mounting in standard 23-inch wide network bay frames and 23-inch wide EIA-type bay frames.

Environmental Specifications

Temperature and Humidity

A DDM-2000 OC-3 Multiplexer shelf meets Bellcore Network Equipment Building System (NEBS^{*}) requirements for use in CO environments without fans.

A fan shelf is required in uncontrolled environments or cabinet applications either above or below any DDM-2000 OC-3 shelf. Refer to ED-8C724-10, "Typical Bay Arrangements," for detailed information on placement of fans and heat baffles in typical bay arrangements.

The DDM-2000 OC-3 Multiplexer operates in uncontrolled environments at temperatures of –40°C to +75°C and humidity of 5 to 95 percent (noncondensing). Forced convection cooling (fans) is required when the air inlet temperature is above 50°C. The DDM-2000 OC-3 Multiplexer provides optional control and alarming of the 2-type fan units used in Lucent's cabinets and alarming of the DDM-2000 fan shelf.

EMC Requirements

The DDM-2000 OC-3 Multiplexer has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy; and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residence is likely to cause harmful interference; in which case, the user will be required to correct the interference at the user's own expense.

Earthquake Requirements

The DDM-2000 OC-3 Multiplexer meets the earthquake requirements defined in Bellcore GR-000063, Issue 1, and Pacific Bell Standard PBS-000-102PT. Installation in Zone 4 regions requires that the ED-8C800-50, G1 or ED-8C801-50, G1 seismic Network Bay Frame, and ED-8C812-50, G11 or ED-8C812-50, G12 seismic Network Bay Frame Kit meet the above requirements. For ordering and engineering application information for these frames see drawing ED-8C800-70 and document #065-215-200, respectively.

* "NEBS Generic Equipment Requirements," GR-000063, Issue 1.

Fire Resistance

The DDM-2000 OC-3 Multiplexer meets the ignitability requirements specified in ANSI T1.307-1997. In addition, the DDM-2000 OC-3 Multiplexer meets the fire resistance requirements of UL 1459, 2nd Edition.

Underwriters Laboratories (UL)

The DDM-2000 OC-3 Multiplexer is UL-recognized for restricted access installations in business and customer premises applications installed in accordance with Articles 110-16 and 110-17 of the *National Electrical Code*^{*}, ANSI/NFPA Number 70-87. Other installations exempt from the requirements of the *National Electric Code* may be engineered according to the accepted practices of the local telecommunications utility.

Canadian Standards Association

The DDM-2000 OC-3 Multiplexer has been certified by the Canadian Standards Association per standard C22.2 Number 225-M90.

* Registered trademark of the National Fire Protection Association, Inc.

Power Requirements

Shelf Fuses

The two –48 V feeders (A and B) are required for each DDM-2000 OC-3 shelf. Shelf power is protected by 5-amp fuses provided with the shelf.

It is recommended that a supply of spare fuses be provided at DDM-2000 OC-3 Multiplexer locations. Fuses for the Group 1 shelf may be ordered through Lucent using COMCODE 405697442 or through Littlefuse, Inc., 800 East Northwest Highway, Des Plaines, IL 60016, or call 708-824-1188. Order:

Fuse, 5-amp, Part No. 334005.

Fuses and a fuse extraction tool for the Group 3 or Group 4 shelf may be ordered through Lucent using COMCODE 406203976 for fuses, and COMCODE 406420273 for the extraction tool, or through SAN-O Industrial Corporation, 91-3 Colin Drive, Sherwood Corporation Center, Holbrook, NY 11741 or by calling 516-472-6666 and ordering:

Fuse, 5-amp, Part No. AX-1-5A or
Fuse Extraction Tool, Part No. F-0431.

Power Dissipation

Table 10-25 lists the power dissipation and current drains for the listed configurations.

Table 10-25. Power Dissipation and Current Drains

Configuration	Power Dissipation (Watts)	DC Current Drains (Amps)	
		List 1 (-48 VDC)	List 2 (-40 VDC)
OC-3 terminating shelf with 24 DS1 circuit packs (84 DS1s)	66	1.4	1.7
OC-3 terminating shelf with 24 DS1PM circuit packs (84 DS1s)	79	1.6	2.0
OC-3 terminating shelf with 6 DS3 circuit packs (3 DS3s)	58	1.2	1.5
OC-3 STS-1 add/drop shelf with 16 DS1 circuit packs (56 DS1s)	80	1.7	2.0
OC-3 hub shelf with 8 21G/21G-U OLIU circuit packs	100	2.1	2.5
OC-3 DS1 add/drop shelf with 16 DS1PM circuit packs (56 DS1s)	87	1.8	2.2
OC-3 DS1 add/drop shelf with 8 22F/22F-U/22F2-U OLIU circuit packs	114	2.4	2.9
EC-1 electrical multiplexer shelf with 24 DS1 circuit packs (84 DS1s)	66	1.4	1.7
EC-1 electrical multiplexer shelf with 24 DS1PM circuit packs (84 DS1s)	73	1.5	1.8
OC-3 terminating shelf with 6 STS1E circuit packs (3 EC-1s)	60	1.3	1.5
OC-3/OC-12 (24G-U) DS1 self-healing ring shelf with 24 DS1 circuit packs (84 DS1s)	73	1.5	1.8
OC-3/OC-12 (24G-U) DS1 self-healing ring shelf with 24 DS1PM circuit packs (84 DS1s)	80	1.7	2.0
OC-3/OC-12 (24G-U) self-healing ring shelf with 6 STS1E circuit packs (3 EC-1s)	63	1.3	1.6

Table 10-25. Power Dissipation and Current Drains

Configuration	Power Dissipation (Watts)	DC Current Drains (Amps)	
		List 1 (-48 VDC)	List 2 (-40 VDC)
OC-3 terminating shelf with 24 DS1 circuit packs (84 DS1s)	66	1.4	1.7
OC-3/OC-12 (24G-U) self-healing ring shelf with 2 OC-3 optical extensions (22G-U/22G2-U) and 8 DS1PM circuit packs (28 DS1s)	102	2.1	2.5
OC-3/OC-12 (24G-U) self-healing ring shelf with 6 27G-U/27G2-U dual OC1 OLIUs	111	2.3	2.8
DDM-2000 Fan shelf	53	1.1	1.3

The following items should be noted:

- The DDM-2000 OC-3 shelf accommodates two –48 V power feeders ("A" and "B" office power feeders).
- Loss of one power feeder does not cause a loss of service.
- All supply voltages other than –48 V required by DDM-2000 OC-3 Multiplexer are generated by DC-to-DC converters within the DDM-2000 OC-3 shelf.
- The DDM-2000 OC-3 Multiplexer meets all performance requirements when the DC input voltage varies between –40.0 V and –60.0 V.
- The DDM-2000 OC-3 Multiplexer tolerates DC input voltages between 0 V and –60 V without damage.
- The DDM-2000 OC-3 Multiplexer complies with electrical noise tolerance requirements in Section 13.2 of TR-TSY-000499.



CAUTION:

This information is for a typical application only. Consult 801-525-168, DDM-2000 Floor Plan Data Sheets, and T82046-30, Power Systems DC Distribution Circuit for Digital Transmission System, for proper engineering of battery plant and feeders.

DDM-2000 OC-3 Reliability

Summary

This section describes the Bellcore reliability requirements that apply to the DDM-2000 OC-3 Multiplexer and the calculations used to predict how the DDM-2000 OC-3 Multiplexer meets those standards.

The DDM-2000 OC-3 Multiplexer meets all the applicable Bellcore reliability requirements that cover transmission availability, OS availability, optical module maintenance, and infant mortality. A summary of the reliability predictions and requirements is shown in Table 10-26. The applicable Bellcore requirements and objectives were clarified through interactions with Bellcore during their audit of the DDM-2000 OC-3 Multiplexer. The basis for these requirements comes from TA-TSY-000418, "*Generic Reliability Assurance Requirements for Fiber Optic Transport Systems*." The method and assumptions used to calculate DDM-2000 OC-3 Multiplexer reliability predictions are described in the following paragraphs. Each paragraph is devoted to one of the reliability parameters which must meet a Bellcore requirement or objective.

Transmission Availability

Bellcore *requirements* state that the probability of a hardware caused outage on a two-way channel within a SONET multiplexer should be less than 1.75 minutes per year in a CO environment^{*} and 5.25 minutes per year in a RT environment.[†] Bellcore *objectives* for outages are 0.25 minutes per year for the CO[‡] and 0.75 minutes per year for RT environments.[§]

The outage requirements and objectives apply to any part of the product needed to process an incoming high-speed or low-speed signal (DS1 to OC-3 or OC-3 to DS1). An outage is defined, for this and all other outage requirements, as any 1-second interval with a bit error rate of 10^{-3} or worse.[¶] The predicted hardware outages for various configurations of the DDM-2000 OC-3 system are given in Table 10-26.

A Markov model was used to calculate the predicted system outage. The model assumes a mean time to repair of 2 hours for the CO environment and 4 hours for the RT environment. Individual circuit pack failure rates used in the model were

* TA-NWT-000418, Issue 3, November 1991, p. 17.
† TA-NWT-000418, Issue 3, November 1991, p. 28.
‡ TA-NWT-000418, Issue 3, November 1991, p. 18.
§ TA-NWT-000418, Issue 3, November 1991, p. 28.
¶ TR-TSY-000009, Issue 1, May 1986, p. 4-11.

calculated using the method described in TR-TSY-000332, Issue 4, "*Reliability Prediction Procedure for Electronic Equipment (RPP)*." A summary of the circuit pack and fan shelf failure rates is shown in Table 10-27 and Table 10-28, respectively.

Operation System Interface Availability

The Bellcore objective states that the OS outage should be less than 28 minutes per year (50 percent hardware, 50 percent software).^{*} Therefore, the objective applies to the TBOS and TL1/X.25 interfaces. This objective applies to circuitry needed to maintain communication from the DDM-2000 OC-3 Multiplexer to the CO's telemetry equipment for access by an OS. Since the OS interface is used in the CO, the reliability model assumes the mean time to repair is 2 hours and the environmental factor is 1.0. Table 10-26 lists the predicted outages for the TBOS and TL1/X.25 interfaces.

Optical Module Maintenance Objective

According to Bellcore, the objective for mean time between failure (MTBF) of a one-way regenerator is a minimum of four years[†]. A regenerator is defined as any circuit pack that performs the electrical-to-optical and optical-to-electrical conversion. Table 10-27 lists the failure rate and MTBFs of the OLIU circuit packs. All OLIU circuit packs meet Bellcore objectives.

Infant Mortality

Bellcore requires that the number of circuit pack failures in the first year of operation should not exceed 2.5 times the number of failures per year beyond the first year. The ratio of first year failures to failures in subsequent years is known as the infant mortality factor (IMF). The requirement is to have an IMF of less than 2.5[‡].

DDM-2000 OC-3 Multiplexer circuit packs are subjected to an environmental stress testing (EST) program. The purpose of the program is to eliminate early life failures, conduct failure mode analysis on defective circuit packs, and use corrective action to make the product more reliable. All new circuit pack codes in manufacturing are subjected to EST. However, based on field return data, when the early life failures for any circuit pack codes have been minimal and the infant mortality factor is below 2.5, these circuit pack codes may be subjected only to sampling EST.

* TA-NWT-000418, Issue 3, November 1991, p. 36.

† TA-NWT-000418, Issue 3, November 1991, p. 37.

‡ TA-NWT-000418, Issue 3, November 1991, p. 40.

DDM-2000 OC-3 System Reliability Predictions

Table 10-26. DDM-2000 OC-3 System Reliability Prediction (Note 1)

Application	Environment (Note 2)	Bellcore Criteria (Note 3)		Prediction (Outage, min/yr)	MTBF Years (Note 4)
		Requirement	Objective		
DS1 to OC-3	CO	1.75	0.25	0.098	1230
DS1 to OC-3	RT	5.25	0.75	0.297	802
DS3 to OC-3	CO	1.75	0.25	0.102	1180
DS3 to OC-3	RT	5.25	0.75	0.308	774
OC3 to OC-3	CO	1.75	0.25	0.0012	72,520
OC3 to OC-3	RT	5.25	0.75	0.0111	16,120
EC-1 to OC-3	CO	1.75	0.25	0.253	473
EC-1 to OC-3	RT	5.25	0.75	0.764	314
DS1 to EC-1	CO	1.75	0.25	0.324	370
DS1 to EC-1	RT	5.25	0.75	0.975	246
DS1 to OC-1	CO	1.75	0.25	0.098	1230
DS1 to OC-1	RT	5.25	0.75	0.297	802
OC-1 to OC-3	CO	1.75	0.25	0.012	72,520
OC-1 to OC-3	RT	5.25	0.75	0.111	16,120
DS1 to OC-12	CO				
DS1 to OC-12	RT				
OS Interface TBOS	CO		14	5.1	23.5
OS Interface TL1/X.25	CO		14	7.1	16.9

Example:

The unavailability of one 2-way DS3 channel within one DDM-2000 OC-3 system configured to multiplex DS3 to OC-3, located in an uncontrolled environment, is 0.308 minutes per year (that is, fraction of time per year when the DS3 channel is unavailable). The mean time between outage of the DS3 channel is 774 years (that is, average length of time until a DS3 outage occurs).

Notes:

1. Hardware failure rates are calculated per the RPP method, TR-NWT-000332, Issue 4, "Reliability Prediction Procedure."
2. The environmental factor for the CO = 1.0 and for the RT = 1.5, per TR-NWT-000332, Issue 4, "Reliability Prediction Procedure."
3. Bellcore criteria (Outage Requirements and Objectives) is based on TA-TSY-000418, Issue 3, "Generic Reliability Assurance Requirements for Fiber Optic Transport Systems." Outage is in minutes per year.
4. Mean time to repair is assumed to be 2 hours for the CO and 4 hours for RT environments.

Table 10-27. DDM-2000 OC-3 Circuit Pack Reliability (Note 1)

Circuit Pack	CO		RT	
	FITS (Note 2)	MTBF (Years)	FITS (Note 2)	MTBF (Years)
BBF1B (DS1)	1114	102.47	1671	68.32
BBF2B (TGS)	2311	49.40	3467	32.93
BBF3 (DS1PM)	2156	52.95	3234	35.30
BBF3B (DS1PM)	*	-	-	-
BBF8 (HDSL)	6548	17.43	9822	11.62
BBG2 (MXRVO)	902	126.56	1353	84.37
BBG4 (DS3)	1556	73.36	2334	48.91
BBG4B (DS3)	1556	73.36	2334	48.91
BBG5 (SYSCTL)	5284	21.60	7926	14.40
BBG6 (STS1E)	2193	52.05	3290	34.70
BBG7 (OHCTL)	3433	33.25	5150	22.17
BBG8/BBG8B (SYSCTL)	12806	8.91	19208	5.94
BBG9 (OHCTL)	18053	6.32	27079	4.22
BBG10 (OHCTL)	19040	6.00	28559	4.00
BBG19 (DS3)	1602	73.36	2403	48.91
BBG20 (TMUX)	6550	17.43	9825	11.62
21D/21D-U (IS-3 OLIU)	1599	71.39	2399	47.59
21G/21G-U (OLIU)	6348	17.98	9522	11.99
21G2-U (OLIU)	4087	27.93	6131	18.62
22D-U (IS-3 OLIU)	2388	47.80	3582	31.87
22F/22F-U/22F2-U (OLIU)	3317	34.42	4976	22.94
22G-U (OLIU)	2880	39.64	4320	26.42
22G2-U (OLIU)	2880	39.64	4320	26.42
22G3-U (OLIU)	4078	27.99	6117	18.66
24G-U (OLIU)	3680	31.02	5520	20.68
26G2-U (OLIU)	2470	46.22	3705	30.81
27G-U/27G2-U (Dual OC-1 OLIU)	3180	35.90	4770	23.93

See notes on following page.

Notes:

1. Calculations are based on Bellcore RPP Issue 4 data. All KS and Lucent components considered as quality level III. All components evaluated at 40°C ambient and 50 percent electrical stress.
 2. FITS is the number of failures per billion hours of operation (10^9).
 - * Reliability data not available at time of issue.
-

Table 10-28. DDM-2000 Fan Shelf Steady State Failure Rates (Based on Bellcore RPP, Issue 4, Data)

DDM-2000 Fan Shelf	Failures / 10^9 hrs.	MTBF (years)
	RPP Prediction	
ED-8C733-30,G7 Fan Shelf	9879 *	11.56
ED-8C733-30,G6 Fan Unit	2000	57.08

* Includes failure rates for individual fan units.

Commands and Reports

11

Contents

Overview	11-1
Reason for Issue	11-1
Command Page Format	11-1
Input Format	11-2
Addresses	11-3
Command Mode and Prompt Mode	11-8
Special Control Characters	11-9
Paged Reports	11-9
Confirmation Requests	11-10
Output Descriptions	11-10
Alarm Level Prompt	11-10
Security	11-10
OC-3 Command Menu	11-12
Starting a CIT Session	11-19
CPro-2000	11-19

Commands

APPLY	Locally Overwrite Executing Software	11-21
CNVT-CRS	Convert Cross-Connection	11-30
CPY-PROG	Copy Program	11-35
DLT-CRS-STs1	Delete Cross-Connection STS-1	11-43
DLT-CRS-STs3c	Delete Cross-Connection STS-3c	11-47
DLT-CRS-VT1	Delete Cross-Connection VT1.5	11-49
DLT-OSACMAP	Delete OS Application Context Map	11-54
DLT-TADRMAP	Delete TID Address Map	11-57
ENT-CRS-STs1	Enter Cross-Connection STS-1	11-60
ENT-CRS-VT1	Enter Cross-Connection VT1.5	11-75
ENT-OSACMAP	Enter OS Application Context Map	11-91
ENT-TL1MSGMAP	Enter TL1 Message Map	11-94

Contents

ENT-ULSDCC	Enter Upper Layer Section DCC	11-98
?	Help	11-101
INIT-PM	Initialize Performance Monitoring	11-102
INIT-SYS	Initialize System	11-103
INS-PROG	Install Program	11-109
LOGOUT	Logout	11-118
OPR-ACO	Operate Alarm Cutoff	11-119
OPR-LPBK-EC1	Operate Loopback EC1	11-120
OPR-LPBK-T1	Operate Loopback T1	11-122
OPR-LPBK-T3	Operate Loopback T3	11-127
RESET	Reset	11-132
RLGN	Remote Login	11-134
RLS-LPBK-EC1	Release Loopback EC1	11-137
RLS-LPBK-T1	Release Loopback T1	11-138
RLS-LPBK-T3	Release Loopback T3	11-140
RSTR-PASSWD	Restore Logins, Passwords, & User Types	11-142
RTRV-ALM	Retrieve Alarm & Status	11-145
RTRV-ATTR-ALM	Retrieve Attribute Alarm	11-146
RTRV-ATTR-CONT	Retrieve Attribute Control	11-148
RTRV-ATTR-ENV	Retrieve Attribute Environment	11-150
RTRV-CRS-ST1	Retrieve Cross-Connection STS-1	11-152
RTRV-CRS-VT1	Retrieve Cross-Connection VT1.5	11-155
RTRV-EC1	Retrieve EC-1	11-158
RTRV-EQPT	Retrieve Equipment	11-160
RTRV-FEAT	Retrieve Feature	11-164
RTRV-FECOM	Retrieve Far End Communications	11-165
RTRV-HSTY	Retrieve History	11-167
RTRV-LGN	Retrieve Login	11-168
RTRV-LINK	Retrieve Link	11-170
RTRV-MAP-NEIGHBOR	Retrieve Map Neighbor	11-172
RTRV-MAP-NETWORK	Retrieve Network Map	11-178
RTRV-NE	Retrieve Network Element	11-183
RTRV-OC1	Retrieve OC-1	11-189
RTRV-OC3	Retrieve OC-3	11-191
RTRV-OC12	Retrieve OC-12	11-195
RTRV-OSACMAP	Retrieve Operation Systems Application Context Map	11-197
RTRV-OW	Retrieve Order Wire	11-200
RTRV-PASSWD	Retrieve Passwords	11-202
RTRV-PM-LINE	Retrieve Performance Monitoring Line	11-204
RTRV-PM-SECT	Retrieve Performance Monitoring Section	11-208
RTRV-PM-ST1	Retrieve Performance Monitoring STS-1	11-211
RTRV-PM-T1	Retrieve Performance Monitoring T1	11-215

Contents

RTRV-PM-T3	Retrieve Performance Monitoring T3	11-219
RTRV-PM-TCA	Retrieve Performance Monitoring TCA	11-223
RTRV-PM-VT1	Retrieve Performance Monitoring VT1.5	11-227
RTRV-PMTHRES-LINE	Retrieve Performance Monitoring Threshold Line	11-230
RTRV-PMTHRES-SECT	Retrieve Performance Monitoring Threshold Section	11-233
RTRV-PMTHRES-STS1	Retrieve Performance Monitoring Threshold STS-1	11-235
RTRV-PMTHRES-T1	Retrieve Performance Monitoring Threshold T1	11-237
RTRV-PMTHRES-T3	Retrieve Performance Monitoring Threshold T3	11-241
RTRV-PMTHRES-VT1	Retrieve Performance Monitoring Threshold VT1.5	11-244
RTRV-SECU	Retrieve Security	11-246
RTRV-STATE-EQPT	Retrieve State Equipment	11-248
RTRV-STATE-OC1	Retrieve State OC-1	11-254
RTRV-STATE-PATH	Retrieve State Path	11-256
RTRV-STATE-STS1	Retrieve State STS1	11-259
RTRV-STATE-VT1	Retrieve State VT1.5	11-262
RTRV-STS1	Retrieve STS-1	11-265
RTRV-SYNC	Retrieve Synchronization	11-269
RTRV-TL1MSGMAP	Retrieve TL1 Message Map	11-281
RTRV-TRACE-STS1	Retrieve STS-1 Path Trace Characteristics	11-284
RTRV-T1	Retrieve T1	11-287
RTRV-T3	Retrieve T3	11-290
RTRV-ULSDCC	Retrieve Upper Layer Section DCC 3	11-295
RTRV-VT1	Retrieve VT1.5	11-297
RTRV-X25	Retrieve X.25 Link	11-300
SET-ATTR-ALM	Set Attribute Alarm	11-304
SET-ATTR-CONT	Set Attribute Control	11-306
SET-ATTR-ENV	Set Attribute Environment	11-308
SET-DATE	Set Date	11-310
SET-EC1	Set EC-1	11-312
SET-FEAT	Set Feature	11-313
SET-FECOM	Set Far End Communications	11-316
SET-LGN	Set Login	11-320
SET-LINK	Set Link	11-327
SET-NE	Set Network Element	11-328
SET-OC1	Set OC-1 Characteristics	11-335
SET-OC3	Set OC-3 Characteristics	11-337
SET-OC12	Set OC-12 Characteristics	11-343
SET-OW	Set Order Wire Routing	11-346
SET-PASSWD	Set Password	11-348
SET-PMTHRES-LINE	Set Performance Monitoring Threshold Line	11-352
SET-PMTHRES-SECT	Set Performance Monitoring Threshold Section	11-358
SET-PMTHRES-STS1	Set Performance Monitoring Threshold STS-1	11-360
SET-PMTHRES-T1	Set Performance Monitoring Threshold T1	11-363

Contents

SET-PMTHRES-T3	Set Performance Monitoring Threshold T3	11-368
SET-PMTHRES-VT1	Set Performance Monitoring Threshold VT1.5	11-375
SET-SECU	Set Security	11-377
SET-STATE-EC1	Set EC-1 Port State	11-380
SET-STATE-OC1	Set OC-1 Line State	11-383
SET-STATE-STs1	Set State of STS-1 Channels	11-385
SET-STATE-T1	Set T1 Port State	11-389
SET-STATE-T3	Set T3 Port State	11-391
SET-STATE-VT1	Set State of VT1.5 Channels	11-393
SET-STs1	Set STS-1 Characteristics	11-396
SET-SYNC	Set Synchronization Characteristics	11-401
SET-T1	Set T1 Characteristics	11-412
SET-T3	Set T3 Characteristics	11-416
SET-TRACE-STs1	Set STS Path Trace Characteristics	11-423
SET-VT1	Set VT1.5 Characteristics	11-426
SET-X25	Set X.25 Link	11-430
SWITCH-FN	Protection Switch Function Unit	11-432
SWITCH-LINE	Protection Switch Line	11-434
SWITCH-LS	Protection Switch Low Speed	11-436
SWITCH-PATH-STs1	Switch Path STS-1	11-440
SWITCH-PATH-VT1	Switch Path VT1.5	11-444
SWITCH-SYNC	Protection Switch Synchronization	11-447
TEST-ALM	Test Office Alarm	11-451
TEST-AUTO	Test Auto Turnup	11-453
TEST-LED	Test LED Indicators	11-462
TEST-SYSCTL	Test System Controllers	11-463
TEST-TLM-PAR	Test Parallel Telemetry	11-467
TEST-TLM-SER	Test Telemetry Serial	11-469
TEST-TRMSN-T1	Test Transmission T1	11-471
TEST-TRMSN-T3	Test Transmission T3	11-475
TOGGLE (Ctl-T)	Toggle Between Local and Remote Sessions	11-481
UPD	Update Equipment List	11-483

Detailed Alarm and History Reports

Introduction	11-489
RTRV-ALM	11-490
RTRV-HSTY	11-514

Overview

This chapter describes the command and report features of the American Standard Code for Information Interchange (ASCII) terminal interface to a DDM-2000 OC-3 Multiplexer. It provides detailed information about each command, as well as system report outputs and explanations.

Command Page Format

This chapter includes DDM-2000 commands that are presented as one- or multiple-page entries in alphabetical order. The name of each command appears at the top of each page.

Each entry is presented in a common format:

- The **NAME** part gives the name of the command and summarizes its function.
- The **INPUT FORMAT** provides the syntax for each command. Each command starts with a command name followed by a colon. Parameters follow the colon. Optional parameters are enclosed in square brackets [].
- The **DESCRIPTION** part provides detailed information about each command.
- The **RELATED COMMANDS** part identifies commands that affect or are affected by the named command or sets the conditions displayed by a report. Some commands are not affected by any other command and will not have this part included on the command page.

Entries which are to be typed exactly as shown are printed in **bold** type. System responses are printed in `courier` type. Descriptive names entry values are shown in *italic* type.

Input Format

All commands have a common input format:

command name[:Address][:parameters]

Address identifies a slot, channel, or operations interface within the shelf. In commands which require an address, it must appear immediately after the command name.

Parameters identifies a variable name assigned to some provisionable attribute of the command. The value of the parameter is defined on each command page.

Parameters are separated with commas (,). The parameters may be entered in *any* order, but they must be entered in the *name=value* format.

Brackets ([]) are not part of the command line. Parameters enclosed in brackets are optional. Default values are provided for these parameters.

Any command can be entered on a single line.

DDM-2000 is case sensitive. Commands may be entered in upper- and lower-case letters. Entries other than commands may be case sensitive (for example, passwords). DDM-2000 addresses and logins are sensitive to white space (that is, blanks between characters). For example, the address parameters "**m1-all**" and "**m1- all**" may be interpreted differently by DDM-2000. As a general rule, white space should not be included in commands.

Addresses

Table 11-1 specifies the valid addresses for slots, lines, ports, channels, paths, cross-connections, and operations interfaces. Where lists of items appear in braces { }, and one (and only one) of these items may be used to form the address.

Each address is made up of several components that are combined to indicate a specific location on the DDM-2000. The following list shows the potential values for each address component. Refer to this list when reviewing Table 11-1:

slot type: Possible values are: main, m, fn, ls, tg, sysctl, auxctl, tsi, userpanel, and all.

group: Possible values are: m, a, b, c, and all.

Note carefully in Table 11-1 when this value is followed by a dash (-) and when it is not.

slot within a group (abbreviated as slot):

Possible values are: 1-8, and all.

line: Possible values are: 1, 2 and all.

This identifies a line within a slot. For optical interfaces, it is only used to identify OC-1 lines on the 27-type OLIU. Note carefully in Table 11-1 when all is not allowed.

STS-1: Possible values are: 1-12, and all.

VTG: Possible values are: 1-7, and all.

VT1.5: Possible values are: 1-4, and all.

special: Possible values are: cit, dcc, tbos, partlm, x25, env, cont, and ref.

environmental alarm or control point (abbreviated as alm/cont point):

Possible values are: 1-21, and all.

Table 11-1. DDM-2000 OC-3 Address Table

Object	Entity	Address	Example
<i>Slots</i>	Entire System	all	all
	Main slot	main-{1,2,all}	main-all
	Function unit slot	fn-all fn-{a,b,c}-{1,2,all}	fn-all fn-b-all fn-c-all
	Function unit pair	fn-{a,b,c}	fn-a
	Low speed slot	ls-all ls-{a,b,c}-{1-8,all}	ls-all ls-b-2
	Timing slot	tg-{1,2,all}	tg-all
	Sys. control slot	sysctl	sysctl
	Aux. control slot	auxctl	auxctl
<i>Lines</i>	OC-3 line pair	all {main, fn-{a,b,c,all}}	all main-1
	OC-3 line	all {main, fn-{a,b,c,all}-{1,2,all}} fn-all	all main-1 fn-c-2 fn-all
	OC-1 line pair (27-type OLIU)	all main-all main-{1,2,all} fn-all fn-{a,b,c}-{1,2,all}	all main-all main-2 fn-all fn-a-all fb-b-2
	OC-1 line (27-type OLIU)	all main-all main-{1,2}-{1,2} fn-all fn-{a,b,c}-all fn-{a,b,c}-{1,2}-{1,2}*	all main-all main-2-2 fn-all fn-b-all fb-a-2-2
	OC-12 line pair	all main	all main
	OC-12 line	all main-{1,2,all}	all main-2
	EC-1 line	a,b,c,all	c

* For OC-1 line addresses, the address is configured as {func. unit}-{slot}-{line in slot}.

(Table continues on the following page)

Table 11-1. DDM-2000 OC-3 Address Table

Object	Entity	Address	Example
<i>Ports</i>	DS-3 (BBG4 or BBG4B only), EC-1 port, or TMUX (BBG20) port	a,b,c,all	a
	Front-Access DS3 (BBG19) Port	{a,b,c,all*}-{1-2,all}	a-1
	DS1 port (including TMUX)	{a,b,c,all*}-{1-7,all}-{1-4,all}	all b-all b-2-all c-1-4
	DS1 sync. ref. port	ref-{1,2}	ref-1
<i>Channels</i>	STS-1 channel (within OC-3)	{m,c,all*}-{1-3,all}, {a,b}-{1,2,all} m{1,2}-{1-3,all} (Rings Only)	m-3 a-2 m2-3
	STS-1 channel (within OC-12 using 24G-U OLIUs)	m{1,2}-{1-12,all} (Rings Only)	m-2-7
	STS-1 channel (within OC-1 using 27-type OLIUs)	all {m,a,b,c}-{1,2}-{1-2,all}	all m2-2
	STS-1 channel for DS3, MXRVO, STS1E, TMUX	a,b,c,all	a
	STS-3c channel (within OC-12 using 24G-U OLIUs)	m{1,2}-{1-4-7-10,all} (Rings)	m1-1
	VT1.5 channel (within OC-3)	{m,c,all*}-{1-3,all*}-{1-7,all*}-{1-4,all} {a,b,all*}-{1,2,all}-{1-7,all*}-{1-4,all} m{1,2}-{1-3,all*}-{1-7,all*}-{1-4,all} (RingsOnly)	m-1-2-1 b-2-7-4 m1-3-2-3
	VT1.5 channel (within OC-12 using 24G-U OLIUs)	m{1,2}-{1-12,all*}-{1-7,all*}-{1-4,all} (Rings)	m1-4-3
	VT1.5 channel for DS1, STS1E, or TMUX	{a,b,c,all*}-{1-7,all*}-{1-4,all}	a-1-2 b-7-4
	VT1.5 channel (within OC-1 using 27-type OLIUs)	all {m,a,b,c}-{1,2}-all {m,a,b,c}-{1,2}-{1,2}-all {m,a,b,c}-{1,2}-{1,2}-{1-7}-{1-4,all}	all b1-all c2-2-all c2-1-7-4

* If *all* is chosen as any part of an address, no subsequent address fields should be defined.
(Table continues on the following page)

Table 11-1. DDM-2000 OC-3 Address Table

Object	Entity	Address	Example
<i>STS-1 Cross-connections</i>	Main port	m-{1-3,all} m-{1-12,all} (For 24G-U OLIUs in Rings) m-{1-2,all} (For 27-type OLIUs)	m-3 m-2 m-2
	STS-3c channel (within OC-12 using 24G-U OLIUs)	m-{1-4-7-10,all} (Rings)	m-1
	Function unit (OC-3 OLIU)	{a,b}-{1-2,all} c-{1-3,all}	a-2 c-3
	Function unit (27-type OLIU)	{a,b,c}-{1,2}	b-2
	Function unit (DS3, STS1E, MXRVO, or TMUX)	{a,b,c}	b
<i>VT1.5 Cross-connections</i>	Main port	m-{1-3,all*}-{1-7,all*}-{1-4,all} m-{1,2,all*}-{1-7,all*}-{1-4,all} (For 27-type OLIUs) m-{1-12,all*}-{1-7,all*}-{1-4,all} (For 24G-U OLIU)	m-3-4-4 m-2-4-4 m-1-2-1
	DS1 low speed port (including TMUX)	{a,b,c}-{1-7,all*}-{1-4,all}	b-2-4
	Function unit (OC-3 OLIU)	{a,b}-{1-2,all*}-{1-7,all*}-{1-4,all} {c}-{1-3,all*}-{1-7,all*}-{1-4,all}	b-1-1-4 c-3-7-1
	Function unit (27-type OLIU)	{a,b,c}-{1,2,-}all {a,b,c}-{1,2,-}{1-7}-{1-4,all}	b-1-all b-1-6-4

* If *all* is chosen as any part of an address, no subsequent address fields should be defined.
(Table continues on the following page)

Table 11-1. DDM-2000 OC-3 Address Table

Object	Entity	Address	Example
<i>Operation Interfaces</i>	User Panel	userpanel	userpanel
	CIT	cit-{1,2,all}	cit1
	Section Data Comm Channel	dcc-{m,a,b,c,all} (OC-3 linear fecom) dcc-all (OC-3 linear/rings security only) dcc-{m1,m2,a,b,c,all} (OC-3 Rings only fecom) dcc-all (OC-1 rings security only) dcc-{m,a,b,c,all*}{1,2} (OC-1 interfaces fecom using 27-type OLIUs)	
	TBOS	tbos-1	tbos-1
	Parallel Telemetry	partlm	partlm
	X.25 link	x25	x25
	IAO LAN interface	lan	lan
	Environmental Alarm Input	env-{1-21,all}	env-2
	Environmental Control Input	cont-{1-4,all}	cont-1
<i>Other</i>	Faceplate Connector on 24G-U OLIUs	fac-main	fca-main

* If *all* is chosen as any part of an address, no subsequent address fields should be defined.

The 2000 Product Family includes many SONET products that are capable of interworking with each other. At times, references to other SONET products may appear in DDM-2000 reports. The following list shows standard abbreviations for the various members of the 2000 family.

<u>Complete Product Name</u>	<u>Abbreviated Product Name</u>
unknown	unknown*
DDM-2000 OC-3	DDM-OC3
DDM-2000 OC-12	DDM-OC12
DACS IV-2000	DACS-IV
FT-2000	FT-2000
SLC-2000 Access System	SLC-2000
DDM-2000 FiberReach	FbrRch
Foreign	Foreign**

* Indicates the type of product is unknown.

** Indicates that the product is not compatible with other SONET products.

Command Mode and Prompt Mode

There are two entry modes: command mode (no prompts) and prompt mode. In the command mode (the default), the command line and any user responses are terminated by the semicolon (;) or carriage return (<cr>).

The prompt mode is designed for users that are not familiar with DDM-2000. To enter the prompt mode, terminate any line with a carriage return (**ENTER** or **RETURN** key) or question mark (?). Prompts generally appear in the form:

Prompt Message [Default value]=

with the default value enclosed in square brackets ([.]). There are two types of default values:

Static default values, which assume the same value each time the command is invoked.

Current default values, which reflect the mode recent value entered into the system. In the case of an address containing the value "all", the prompt will display the value [CurrentValues]. When "Current Values" is selected, the current setting of that parameter is not changed.

To reenter the command mode from the prompt mode, answer the current prompt, then continue entering input on the same line after typing a comma (.). When the input is completed, terminating the command with a semicolon (;) will return the session to the command mode. If a command is terminated with a semicolon (;), the system will use default values for all optional parameters for which a value has not been given.

The **help** command provides in-context help during a dialog with DDM-2000. Help is provided automatically when an invalid input is entered and can also be requested anytime by typing a question mark (?).

Special Control Characters

- Backspace characters control H (^H), BACKSPACE key is used to erase character input.
- At sign (@) is used to erase an entire line of input.
- Question mark (?) is used to get help and to enter prompt mode at any time.
- Comma (,) is used to separate parameters from each other.
- Equal sign (=) is used to separate parameter names from parameter values.
- Control T (^T) is the **toggle** command. See the **toggle** command page for additional details.
- Carriage return (ENTER or RETURN key) or exclamation point (!) are used to end a line of input.
- Semicolon (;) is used to end a command. The system will use default values for all optional parameters for which a value has not been given.
- CANCEL, DELETE, and CTRL-x are used to abort a command which has been entered but has not yet started to execute. All commands can be aborted anytime before the "In Progress..." message is printed. Test commands (except **test-sysctl**) can be aborted at any time during execution using these keys. Reports may be aborted at any time using these keys.
- Colon (:) is used to separate the command name, address, and parameters.

Paged Reports

Reports are paged. When the end of the page has been reached, the prompt "more? [yes]= " is displayed if more report text remains. Page length can be set with the **set-link** command.

Confirmation Requests

NOTE: Some commands can be service-affecting if their default parameters are ignored.

After all parameters have been entered, a caution message followed by the command name, the selected values of parameters, and the prompt "Execute? (y/n or CAnceL/DELeTe to quit)" is printed. To execute the command, enter "y" and carriage return. To change the value of any of the parameters, enter "n" and carriage return and you will be reprompted for all parameters. To abort the command, enter CAnceL or DELeTe.

Output Descriptions

The output for most commands is described on the following manual pages. Refer to the "Detailed Alarm and History Reports" part of this section for more complete examples and explanations of the alarm and status report (**rtrv-alm**) and the history report (**rtrv-hsty**).

Alarm Level Prompt

When the system is ready to accept a new command, it prints the system prompt "<". If there is an active alarm or status condition, the level of the highest level active alarm in the system is printed before the "<". For example, the system prompt is "MN<" when a minor alarm condition exists in the system.

Security

The option of system security is provided for DDM-2000 systems. Three privileged user logins and a maximum of 100 nonprivileged user logins, consisting of general users, maintenance users, and Reports-Only users, are available. Privileged users may set system security on all data communication channels (DCC) and each craft interface terminal (CIT) interface (using the **set-secu** command) and assign login and password pairs to general users (using the **set-lgn** command). General users may execute commands that are not restricted to privileged users and obtain reports. Maintenance users may only execute commands that access the system, extract reports, and execute maintenance functions. Reports-Only users may only obtain reports and execute several basic commands.

When system security is enabled, all users are then required to enter a valid login and password pair to access the system.

The following commands are always restricted to privileged users only:

- **init-sys** (initialize system)
- **rstr-passwd** (restore password)
- **rtrv-lgn** (retrieve login)
- **rtrv-passwd** (retrieve password)
- **set-fecom** (set far-end communication)
- **set-lgn** (set login)
- **set-secu** (set security)
- **set-feat** (set feature)
- **set-sync** (set synchronization)

When security is enabled on a system, the following commands become restricted to privileged users only:

- **cpy-prog** (copy program)
- **dlt-osacmap** (delete OS application context ID map entry)
- **ent-osacmap** (enter OC application context ID map entry)
- **ent-ulsdcc** (enter upper layer section DCC)
- **ent-tl1msgmap** (enter TL1 message map for Operations Systems)
- **init-pm** (initialize performance monitoring)
- **ins-prog** (install program)
- **reset** (reset system software)
- **set-date** (set date)
- **set-ne** (set network element)
- **set-x25** (set X.25 link)

When security is enabled on a system, only the following commands may be executed by Reports-Only users:

- **?** (help)
- **logout** (log out)
- **rlgn** (remote login)
- **set-link** (set link)
- **set-passwd** (set password)
- **T** (toggle)
- all **rtrv** commands except **rtrv-lgn** and **rtrv-passwd**

Refer to the **set-secu** command for more details on system security.

DDM-2000 OC-3 Command Menu

Table 11-2 lists the DDM-2000 OC-3 commands by category and indicates what type of user is able to execute each command.

Table 11-2. DDM-2000 OC-3 Command Menu

Command Category	Verb	Modifier	Security Level
CONFIGURATION	rtrv-	alm	Privileged, General, Maintenance, Reports only
		state-eqpt	Privileged, General, Maintenance, Reports only
		state-path	Privileged, General, Maintenance, Reports only
		state-sts1	Privileged, General, Maintenance, Reports only
		state-vt1	Privileged, General, Maintenance, Reports only
		state-oc1	Privileged, General, Maintenance, Reports only
		eqpt	Privileged, General, Maintenance, Reports only
		feat	Privileged, General, Maintenance, Reports only
		fecom	Privileged, General, Maintenance, Reports only
		hsty	Privileged, General, Maintenance, Reports only
		oc1	Privileged, General, Maintenance, Reports only
		oc3	Privileged, General, Maintenance, Reports only
		oc12	Privileged, General, Maintenance, Reports only
		t1	Privileged, General, Maintenance, Reports only
		t3	Privileged, General, Maintenance, Reports only
		ec1	Privileged, General, Maintenance, Reports only
		sync	Privileged, General, Maintenance, Reports only
		link	Privileged, General, Maintenance, Reports only

Table 11-2. DDM-2000 OC-3 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
CONFIGURATION (Continued)	rtrv-	attr-alm	Privileged, General, Maintenance, Reports only
		attr-cont	Privileged, General, Maintenance, Reports only
		attr-env	Privileged, General, Maintenance, Reports only
		ne	Privileged, General, Maintenance, Reports only
		map-neighbor	Privileged, General, Maintenance, Reports only
		map-network	Privileged, General, Maintenance, Reports only
		osacmap	Privileged, General, Maintenance, Reports only
		ow	Privileged, General, Maintenance, Reports only
		crs-sts1	Privileged, General, Maintenance, Reports only
		crs-sts3c	Privileged, General, Maintenance, Reports only
		crs-vt1	Privileged, General, Maintenance, Reports only
		ulsdcc	Privileged, General, Maintenance, Reports only
		sts1	Privileged, General, Maintenance, Reports only
		sts3c	Privileged, General, Maintenance, Reports only
		tl1msgmap	Privileged, General, Maintenance, Reports only
		trace-sts1	Privileged, General, Maintenance, Reports only
		vt1	Privileged, General, Maintenance, Reports only
		x25	Privileged, General, Maintenance, Reports only
	set-	oc1	Privileged, General
		oc3	Privileged, General
		oc12	Privileged, General
		t1	Privileged, General

Table 11-2. DDM-2000 OC-3 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
		t3	Privileged, General
		ec1	Privileged, General
		sync	Privileged
CONFIGURATION (Continued)	set-	date	Privileged only if Security enabled. Privileged, General if Security disabled.
		link	Privileged, General, Maintenance, Reports only
		attr-alm	Privileged, General
		attr-cont	Privileged, General
		attr-env	Privileged, General
		ne	Privileged only if Security enabled. Privileged, General if Security disabled.
		ow	Privileged, General, Maintenance,
		state-t1	Privileged, General
		state-t3	Privileged, General
		state-ec1	Privileged, General
		state-oc1	Privileged, General
		state-oc3	Privileged, General
		state-sts1	Privileged, General
		state-vt1	Privileged, General
		fecom	Privileged
		feat	Privileged
		sts1	Privileged, General
		sts3c	Privileged, General
		trace-sts1	Privileged, General
		vt1	Privileged, General
		x25	Privileged only if Security enabled. Privileged, General if Security disabled.
	upd		Privileged, General
	init-	sys	Privileged
	switch-	line	Privileged, General, Mainenance
		ls	Privileged, General, Mainenance
		fn	Privileged, General, Mainenance
		sync	Privileged, General, Mainenance

Table 11-2. DDM-2000 OC-3 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
CONFIGURATION (Continued)	switch-	path-vt1	Privileged, General, Maintenance
		path-sts1	Privileged, General, Maintenance
		path-sts3c	Privileged, General, Maintenance
	opr-	lpbk-t1	Privileged, General, Maintenance
		lpbk-t3	Privileged, General, Maintenance
		lpbk-ec1	Privileged, General, Maintenance
	rls-	lpbk-t1	Privileged, General, Maintenance
		lpbk-t3	Privileged, General, Maintenance
		lpbk-ec1	Privileged, General, Maintenance
	test-	auto	Privileged, General, Maintenance
		iaolan	Privileged, General, Maintenance
		trmsn-t1	Privileged, General, Maintenance
		trmsn-t3	Privileged, General, Maintenance
		alm	Privileged, General, Maintenance
		led	Privileged, General, Maintenance
		sysctl	Privileged, General, Maintenance
	ins-	prog	Privileged only if Security enabled. Privileged, General if Security disabled.
	ent-	crs-sts1	Privileged, General
		crs-sts3c	Privileged, General
		crs-vt1	Privileged, General
		usldcc	Privileged only if Security enabled. Privileged, General if Security disabled.
		tl1msgmap	Privileged only if Security enabled. Privileged, General if Security disabled.
		osacmap	Privileged only if Security enabled. Privileged, General if Security disabled.
	dlt-	crs-sts1	Privileged, General
		crs-sts3c	Privileged, General
		crs-vt1	Privileged, General
		osacmap	Privileged only if Security enabled. Privileged, General if Security disabled.

Table 11-2. DDM-2000 OC-3 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
Configuration (Continued)	cnvt-	crs	Privileged, General
	cpy-	prog	Privileged only if Security enabled. Privileged, General if Security disabled.
FAULT	rtrv-	alm	Privileged, General, Mainenance, Reports-Only
		state-eqpt	Privileged, General, Mainenance, Reports-Only
		state-path	Privileged, General, Mainenance, Reports-Only
		eqpt	Privileged, General, Mainenance, Reports-Only
		hsty	Privileged, General, Mainenance, Reports-Only
	opr-	aco	Privileged, General, Mainenance, Reports-Only
	reset		Privileged, General, Mainenance, Reports-Only
PERFORMANCE	rtrv-	pm-tca	Privileged, General, Mainenance, Reports-Only
		pm-sect	Privileged, General, Mainenance, Reports-Only
		pm-line	Privileged, General, Mainenance, Reports-Only
		pm-t1	Privileged, General, Mainenance, Reports-Only
		pm-t3	Privileged, General, Mainenance, Reports-Only
		pm-sts1	Privileged, General, Mainenance, Reports-Only
		pm-vt1	Privileged, General, Mainenance, Reports-Only.
		pmthres-sect	Privileged, General, Mainenance, Reports-Only.
		pmthres-line	Privileged, General, Mainenance, Reports-Only.

Table 11-2. DDM-2000 OC-3 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
PERFORMANCE (Continued)	rtrv-	pmthres-sts1	Privileged, General, Mainenance, Reports-Only.
		pmthres-vt1	Privileged, General, Mainenance, Reports-Only.
		pmthres-t3	Privileged, General, Mainenance, Reports-Only.
		pmthres-t1	Privileged, General, Mainenance, Reports-Only.
		alm	Privileged, General, Mainenance, Reports-Only.
		state-eqpt	Privileged, General, Mainenance, Reports-Only.
		state-path	Privileged, General, Mainenance, Reports-Only.
		eqpt	Privileged, General, Mainenance, Reports-Only.
		hsty	Privileged, General, Mainenance, Reports-Only.
	set-	pmthres-sect	Privileged, General, Mainenance, Reports-Only.
		pmthres-line	Privileged, General, Mainenance, Reports-Only.
		pmthres-sts1	Privileged, General, Mainenance, Reports-Only.
		pmthres-vt1	Privileged, General, Mainenance, Reports-Only.
		pmthres-t3	Privileged, General, Mainenance, Reports-Only.
		pmthres-t1	Privileged, General, Mainenance, Reports-Only.
	init-	pm	Privileged only if Security enabled. Privileged, General if Security disabled.

Table 11-2. DDM-2000 OC-3 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
SECURITY	rtrv-	lgn	Privileged
		secu	Privileged, General, Mainenance, Reports-Only.
		passwd	Privileged
	set-	lgn	Privileged
		secu	Privileged
		passwd	Privileged, General, Mainenance, Reports-Only.
	rstr-	passwd	Privileged
MISCELLANEOUS	apply-		Privileged
	help		Privileged, General, Mainenance, Reports-Only.
	logout		Privileged, General, Mainenance, Reports-Only.
	rlgn		Privileged, General, Mainenance, Reports-Only.
	toggle (^T)		Privileged, General, Mainenance, Reports-Only.

Starting a CIT Session

Procedures in the "Operation and Maintenance" section of this manual describe how to "Connect a CIT and Establish a Session" with the DDM-2000.

CPro-2000

CPro-2000 is a software package from Lucent Technologies to help users of DDM-2000 Multiplexer systems set up and use an advanced, yet simple, craft operations environment on a personal computer using *Microsoft* Windows*3.1* in the enhanced mode. CPro-2000 provides the user with the normal CIT access to DDM-2000 as well as a mouse-driven graphical user interface (GUI). The user may issue commands to DDM-2000 by using the mouse to select items from a menu and/or objects from the graphics display.

CPro-2000 Release 3.0 and later supports DDM-2000 OC-3, OC-12 and FiberReach Multiplexers, as well as FT-2000 OC-48 Systems. For complete information on CPro-2000, refer to the *CPro-2000 User Manual*, 190-253-101 (for CPro-2000 Release 3.0) or 365-576-1xx (for CPro-2000 Release 4.0 and later).

Commands

The following pages provide detailed information about the user interface commands supported by DDM-2000. Detailed report information is located at the end of this chapter.

* Registered trademark of Microsoft Corporation.

NAME

apply: Locally Overwrite the Executing Software Generic with a New Software Generic

INPUT FORMAT

apply; (Release 9.1)

apply[:[time=*time*][, [date=*date*][, action=*action*]]];
(Release 11.0 and later)

DESCRIPTION **NOTE:**

The function and options for this command have changed for OC-3 Release 11.0 and later. Please read this command page carefully!

This command can be issued by the user to initiate the installation of a dormant copy of a software generic stored in the network element's flash memory; therefore replacing the currently executing software generic.

Once the **apply** command completes, the software in flash memory is left undisturbed, so that it can be copied to other like network elements.

This command is available with OC-3 Release 9.1 and later releases.

 CAUTION:

Normal alarming and protection switching are disabled for the DDM-2000 system while this command is used to copy the dormant program.

 NOTE:

This command is available to privileged users only for all CIT or DCC ports on the system.

For Release 9.1 only, when the **apply** command is submitted, a thirty minute delay is automatically started (from the time the command is submitted) before the command begins executing.

For Release 11.0 and later, users can schedule a date and time for this command to be executed. If no date and time is supplied, the command will execute 15 minutes after it is received.

All users can remotely apply the dormant software generic to be the executing one by first remotely logging into the target network element and then initiating this command.

The input parameters available in Release 11.0 and later are:

time The time parameter is supplied in order to identify the time at which the software is to be installed on the network element. If no *time* parameter is entered, and the *action* parameter has the value of **install** or is **NULL**, and the software will be scheduled for installation 15 minutes after receiving the **apply** command. The fifteen-minute interval is designed to give the user a chance to cancel the command and/or to issue similar command(s) to other network element(s) in the subnetwork. Furthermore, the *date* parameter is not prompted for in this case (if no *time* value is provisioned); *date* will have the value of the current system's date.

This parameter is entered as six digits **HHMM[SS]**. **HH** expresses the hour on a 24-hour clock basis and the allowed values range from **00** to **23**, with leading zeros required. **MM** expresses the minutes and the allowed values range from **00** to **59** with leading zeros required. **SS** expresses the seconds and the allowed values are **NULL** or a value ranging from **00** to **59** with leading zeros required.

date Date is entered as six digits YYMMDD, where YY represents the last two digits of the year, MM is the month, and DD is the day. Default is the current system day. If no *date* parameter is entered, and **action** has the value of **install** or is **NULL**, and the entered value for *time* has already passed the 24-hour interval in the current system's date, *date* will default to the next system's day (current system's day + 1). (As an example, if the current time is 23:46 but the provisioned time is set for 21:00, the execution of the command will occur at 21:00 the next system's day.)

action The action parameter enables the execution of this command to be either confirmed, or canceled. The allowed values are:

install This action causes the installation of software at the time and date supplied in the *time* and *date* parameters. The installation will take place in 15 minutes if *time* and *date* are not provisioned.

cancel Cancel the scheduled installation.

NULL No value. When no value is entered, the default value is **install**.

If a software installation was already scheduled, and a **cancel** value was received, the software installation is canceled.

**CAUTION:**

For Release 11.0 and later, if this command is scheduled for execution (*action=install*), the **set-date** command should never be issued before program installation is invoked and completed. In this case, the user is advised to wait until program installation is completed, and the system is reset.

**NOTE:**

For Release 11.0 and later, if this command is issued with (*action=install*), while there is an outstanding apply command, the newly issued command will replace the old request with the newly entered values of **date** and **time**.

If this command is entered by a non-privileged user, the following denial message is displayed:

```
PICC
/* Privileged, Illegal Command Code. */
```

If the command syntax is correct, the following message will be displayed:

```
/* Testing for program copy ... */
```

For Release 11.0 and later, if an **apply** command is issued to schedule (install or NULL) a software installation and **time** is entered with invalid syntax, the following message is displayed:

```
IDNV
/* Input Data Not Valid */
/* Invalid time parameter syntax. */
```

For Release 11.0 and later, if an **apply** command is issued to schedule (install or NULL) a software installation and **date** is entered with invalid syntax, the following message is displayed:

```
IDNV
/* Input Data Not Valid */
/* Invalid date parameter syntax. */
```

For Release 11.0 and later, if the time specified is unknown to the local system, the following denial message will be displayed:

```
IDNV
/* Input Data Not Valid */
/* Unknown time specified. */
```

For Release 11.0 and later, if the date specified is unknown to the local system, the following denial message will be displayed:

```
IDNV
/* Input Data Not Valid */
/* Unknown date specified. */
```


If this command is issued and the dormant copy of software generic is either missing (does not reside in the flash memory) or is determined to have been corrupted, the following denial message is displayed:

```
SR0F
/* Status, Requested Operation Failed */
/* Dormant file corrupted or missing. */
```

For Release 11.0 and later, if an otherwise valid command with action equal to **cancel** is initiated, but with no outstanding apply command, the request will be denied and the following message displayed:

```
SR0F
/* Status, Requested Operation Failed */
/* No apply command to cancel. */
```

For Release 9.1, after testing for program apply, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m. If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any active CIT and TL1 sessions.
This command will take time to install the new program. Check
the Software Release Description for the time estimates. */

Execute? (y/n or CANCEL/DELETE to quit) =
```

For Release 11.0 and later, after testing for program apply, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m. If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any active CIT and TL1 sessions.
This command will take time to install the new program. Check
the Software Release Description for the time estimates. */
```

You have selected the apply command with these parameters:

```
date = date
time = time
action = action
```

Execute? (y/n or CANCEL/DELETE to quit) =

In Release 9.1, when this command is used to install a new release of program that is significantly different from the program currently running on the system, the following confirmation message will be displayed after testing for program apply:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m. If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any active CIT and TL1 sessions.
Check the Software Release Description for the time estimates. */
```

```
/* Caution! Major changes exist between these two generics such
that they may not be compatible. Check the TOPS and program
compatibility information for additional information or actions
needed. */
```

Execute? (y/n or CANCEL/DELETE to quit) =

In Release 11.0 and later, when this command is used to install a new release of program that is significantly different from the program currently running on the system, the following confirmation message will be displayed after testing for program apply:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m. If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any active CIT and TL1 sessions.
Check the Software Release Description for the time estimates. */
```

```
/* Caution! Major changes exist between these two generics such
that they may not be compatible. Check the TOPS and program
compatibility information for additional information or actions
needed. */
```

You have selected the apply command with these parameters:

```
date = date
time = time
action = action
```

Execute? (y/n or CANCEL/DELETE to quit) =

See "Install New Generic Program" in the TOP section (Volume 2) of this manual for complete instructions before using this command. Use the **rtrv-map-network** command to obtain the exact TID for the target system. The current program version may also be obtained from the initial screen when logged into the system with a craft interface terminal (CIT).

When the user gives a positive response to the confirmation message, the following message is displayed:

```
In progress; Program installation will start on <date>, at
<time>.
System will Reset when program installation is complete.
```

After displaying the above message, the program apply will begin at the provisioned **date** and **time** (for Release 11.0 and later), or 30 minutes after the command is submitted (for Release 9.1). Once the new generic is installed, the system will reset and wait for the user to login again.

If the program apply fails, the following failure message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Program apply failed. Target Identifier
   will restart its current program, if possible.
   Before attempting another apply, check the User's Manual
   to review a list of possible problems and their solutions. */
```

In Release 11.0 and later, if this command is issued with action equal to **cancel**, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will cancel the scheduled
   software installation at Target Identifier.
```

You have selected the apply command with this parameter:

action = **cancel**

Execute? (y/n or CAnceL/DELeTe to quit) =

⇒ NOTE:

In Release 11.0 and later, when the value **cancel** is entered for Action, the user will not be prompted for the (date and time) parameters. As soon as the scheduled program installation is canceled as a result of this option, the Date and Time are initialized to zero (0) values.

When the user gives a positive response to the confirmation message, the following message is displayed:

```
Program installation is being canceled.
```

Once the program installation is canceled, the following message is displayed:



COMPLD

RELATED COMMANDS

cpy-prog

ins-prog

rtrv-ne

NAME

cnvt-crs: Convert Cross-Connection

INPUT FORMAT

cnvt-crs:*Address1,Address2;*

DESCRIPTION**CAUTION:**

Execution of this command will affect service. This command should only be executed when existing STS-1 cross-connections are supporting either no services or DS1 services. Executing this command will cause a service interruption of approximately 25 milliseconds on associated DS1 services. Refer also to the note on the next page.

This command converts an existing STS-1 cross-connection to 28 individual VT1.5 cross-connections with the same endpoints. VT1.5 signals carried within the original STS-1 will appear in the same time slots in the upstream or downstream DDM-2000 multiplexers before and after the conversion takes place. This conversion enables an easy upgrade of existing STS-1 networks to DS1 networks. This command will reconfigure all hardware.

This command is available with OC-3 linear and ring releases. For ring releases where the cross-connection type (CrSTYPE) is defined, the CrSTYPE of all converted VT1.5 cross-connections will be the same as the CrSTYPE of the STS-1 cross-connection before conversion. That is, if CrSTYPE=dc for the STS-1 cross-connection, all VT1.5 cross-connections will be CrSTYPE=dc also. The 22-type, 24-type or 27-type OLIU circuit packs must be used to convert cross-connections. The 24-type OLIU is available in OC-3 Release 11.0 and later OC-3 ring releases.

The input parameters are:

Address1 and *Address2* These are the addresses of the two STS-1 channels that are currently cross-connected and will be converted to 28 VT1.5 cross-connections.

Valid STS-1 Addresses: {a,b,c},
{m,c}-{1-3}, {a,b}-{1-2}

If the shelf is equipped with 24-type OLIU in its Main units, the valid STS-1 addresses are:

m-{1-12}, {a,b,c}, {a,b}-{1,2}, c-{1-3}

⇒ NOTE:

No inverse capability is available to convert 28 VT1.5 cross-connections back to a single STS-1 cross-connection. In order to achieve this, the user must delete each of the 28 VT1.5 cross-connections using the **dlt-crs-vt1** command and then enter the STS-1 cross-connection using the **ent-crs-sts1** command.

In linear systems, if the cross-connect mode, set by the **set-ne** command, has a value of default, execution of this command will be denied with the following denial message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for default cross-connections. */
```

Address1 and *Address2* must match an existing STS-1 cross-connection or execution of the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified STS-1 cross-connection does not exist. */
```

The 22-type, 24-type or 27-type OLIU circuit packs must be used in the Main slots of the shelf to convert cross-connections, and function units must have circuit packs that support VT1.5 cross-connections (for example, the 22-type OLIU, MXRVO, TMUX, or STS1E circuit packs). If a user executes this command with 21-type OLIUs in the main slots, or if DS3s or 21-type OLIUs exist in the function unit addressed, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* <address> is not equipped for VT connections. */
```

If the convert cross-connection request is for a drop-and-continue connection and the ring identification of the STS-1 cross-connection does not agree with the assigned value for VT1.5 cross-connections (defined by the first VT1.5 drop and continue connection), the request is denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Ring Identification already provisioned to be ring <value>. */
```

If a user executes this command on an EC-1 port that is in the NMON state, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* EC-1 port is in NMON state. */
```

If a user executes this command on an OC-1 line that is in the NMON state, the following warning will be displayed:

```
/* Cross-connects may use an OC-1 line that is in the NMON state */
```

If the maximum number of STS-1s (3) has already been reached and the user attempts to convert one or more additional STS-1s (which would exceed the allowed STS-1 bandwidth) the request will be denied and the following denial message displayed:

```
SNVS
/* Status, Not in Valid State */
/* Cross connect capacity is not available. */
```


An attempt to convert any of the following types of cross-connections will be denied.

- STS-1 pass-through in a function unit
- STS-1 function unit to function unit 0x1
- STS-1 path-protection-switched local drop from a function unit
- STS-1 0x1 DS3

The denial message is as follows:

```
SNVS
/* Status, Not in Valid State */
/* Cross connect cannot be converted. */
```

If an attempt is made to execute this command when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation is displayed. If fewer than 28 cross-connections are created, only the equipped slots will be shown in the **rtrv-crs-vt1** report.

```
/* CAUTION! Execution of this command may affect service.  
This command will convert an existing STS-1 cross-connection into  
28 new VT1.5 cross-connections. Proceed with EXTREME CAUTION!  
You have selected the cnvt-crs command with these parameters:
```

```
Address1 = address  
Address2 = address      */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

dlt-crs-vt1

ent-crs-vt1

rtrv-crs-vt1

NAME

cpy-prog: Copy Program

INPUT FORMAT

cpy-prog: *TID*;

DESCRIPTION **NOTE:**

Starting with OC-3 Release 9.1, the copy function of this command has changed to a 2-step process. Please read this command page carefully to understand how each software release operates.

For OC-3 Release 9.0 and earlier: **CAUTION:**

It is strongly recommended that the user does not attempt to issue this command to a network element that has an **apply** command pending execution.

 NOTE:

Normal alarming and protection switching are disabled for the selected DDM-2000 system while this command is used to copy program to a DDM-2000 system.

For OC-3 Release 9.0 and earlier, this command copies the system controller program from the local network element to a remote network element.

The controller program is copied directly from the local controller's memory to a remote controller's memory. The local and remote systems must have DCC connectivity.

This command provides remote program copy capability from the local controller's memory to a remote controller's memory. The **ins-prog** command has been enhanced to support local program installation to a network element from a personal computer (PC) connected to the CIT port of the target system.

The **ins-prog** command also supports a remote program installation to a DDM-2000 OC-3 or a DDM-2000 FiberReach system from a PC connected to the CIT port of another DDM-2000 or *SLC*®-2000 system.

⇒ NOTE:

For OC-3 Release 9.0 and earlier, If security is enabled on any CIT or DCC port on a system, then this command is available to privileged users only for all CIT or DCC ports on the system. If security is not enabled on *some* systems in the network, users on unsecured systems will be able to copy controller program onto systems with security enabled.

For OC-3 Release 9.1 and later:

Starting with OC-3 Release 9.1, the software to be copied may be a non-executing, dormant copy of a software generic. When executing this command, the local network element will internally check whether the currently executing software generic or a dormant software generic should be copied into the memory of the target network element, where it would reside as a dormant copy also. The **apply** command is used later to overwrite the currently executing generic with a copy of the generic included in the dormant software.

To review this command's functionality in OC-3 Release 9.0 and earlier, the user should refer to the beginning of this command page or the appropriate User/Service Manual.

⇒ NOTE:

If security is enabled on any CIT or DCC port on a system, then this command is available to privileged users only for all CIT or DCC ports on the system. If security is not enabled on *some* systems in the network, users on unsecured systems will be able to copy either executing or dormant program onto systems with security enabled.

The input parameter for all releases of this command is:

TID The Target Identifier (system name) of the system into which the program will be loaded. TIDs are case insensitive.

If the command syntax is correct, the following message will be displayed:

```
/* Testing for program copy ... */
```

If the system name specified is the name of the local system instead of the remote system, the following error message will be displayed and the user will be asked to reenter the TID:

```
/* Invalid Target Identifier (TID) */  
/* Enter the name (TID) of the far end system. */  
TID=
```

If the system name specified is unknown to the local system, the following error message will be displayed: and the user will be asked to reenter the TID.

```
/* Unknown Target Identifier (TID) */  
/* Enter the name (TID) of the far end system. */  
TID=
```

If the system name specified currently has a duplicate TID alarm condition, the following denial message will be displayed:

```
IITA  
/* Input, Invalid Target identifier (TID) */  
/* Duplicate Target Identifier. */
```

If a user attempts to copy program from one product type to a different product type (for example, DDM-2000 OC-12 program into an FT-2000 system), the following denial message will be displayed:

```
IITA  
/* Input, Invalid Target identifier (TID) */  
/* <TID> is a different product type;  
   Incompatible software. */
```

The above message is displayed before any association is established between the local and target network elements (NEs).

If the remote system has a communication failure or a "P" is displayed in the SYSCTL 7-segment LED display, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication failure. */
```

For OC-3 Release 9.0 and earlier, after testing for program copy, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m. If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any other active CIT sessions.
This command will take time to install the new program. Check
the Software Release Description for the time estimates. */

Execute? (y/n or CANCEL/DELETE to quit) =
```

For OC-3 Release 9.0 and earlier, when this command is used to copy a new release of program that is significantly different from the program currently running on the system, the following confirmation message will be displayed after testing for program copy:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m. If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any other active CIT sessions.
This command will take time to install the new program. Check
the Software Release Description for the time estimates. */
```

```
/* Caution! Major changes exist between these two generics such
that they may not be compatible. Check the TOPS and program
compatibility information for additional information or actions
needed. */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

For OC-3 Release 9.1 and later releases, if the dormant copy is either corrupted or not found, and it is the only software generic that can be copied, the following denial message is displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Dormant file corrupted or missing. */
```

A user should not attempt to copy program from an OC-3 shelf using Release 9.1 or later (a release capable of receiving, storing, or sending compressed files) into a remote OC-3 shelf using Release 9.0 or earlier (a release that is not capable of receiving compressed files). The currently executing software generic cannot be copied to the destination network element because it has a different release number from the dormant copy. The copy request will be denied and the following message is displayed:

```
SR0F
/* Status, Requested Operation Failed */
/* Execute APPLY command locally first and then try again. */
```

The above request is denied because no copy from the source NE to the destination NE is possible until the executing software release number matches the dormant software release number. To correct this problem, the **apply** command must be issued in the source NE first before trying again.

For OC-3 Release 9.1 and later, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will overwrite the current
   dormant generic (if any) at Target Identifier. */

Execute? (y/n or CANCEL/DELETE to quit) =
```


For OC-3 Release 9.1 and later, when this command is used to copy a new release of program (into the dormant memory of remote system) that is significantly different from the program currently running on the system, the following confirmation message will be displayed after testing for program copy:

```
/* Caution! Execution of this command will overwrite the current
dormant generic (if any) at Target Identifier. */

/* Caution! Major changes exist between these two generics such
that they may not be compatible. Check the TOPS and program
compatibility information for additional information or actions
needed. */

Execute? (y/n or CANCEL/DELETE to quit) =
```

See "Install New Generic Program" in the TOP section (Volume 2) of this manual for complete instructions before using this command. Use the **rtrv-map-network** command to obtain the exact TID for the target system. The current program version may also be obtained from the initial screen when logged into the system with a craft interface terminal (CIT).

When the user gives a positive response to the confirmation message, the program copy begins and the following message is displayed:

```
In progress .....
```

The number of dots and how fast they are displayed depend on the size of the program to be copied, number of DCC spans between the local and remote systems, and DCC traffic.

If the program copy fails, the following failure message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Program copy failed to Target Identifier
   Before attempting another copy, check the User's Manual
   to review a list of possible problems and their solutions. */
```

When the program has successfully been copied to the remote system, the following message is displayed:

```
/* Generic program m.m.m is copied. */
```

For OC-3 Release 9.1 and later, if this command experiences memory space problems at the target network element (that is, the software will not fit in the space allocated in flash memory reserved for it), the currently executing software generic will be overwritten.

RELATED COMMANDS

rtrv-map-network

rtrv-ne

ins-prog

NAME

dlt-crs-sts1: Delete Cross-Connection STS-1

INPUT FORMAT

dlt-crs-sts1:*Address1,Address2*[*cct*=Crstype];

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command deletes STS-1 cross-connections.

**NOTE:**

In linear systems, this command can only be executed if the cross-connect mode is set to manual (**crs=manual**) as provisioned by the **set-ne** command.

The input parameters are:

Address1 and *Address2* These are the addresses of the two STS-1 channels, or one STS-1 channel and one DS3, EC-1, OC-3, MXRVO, TMUX (in Release 11.1) or MXRVO port or OC-1 line where the existing STS-1 cross-connection is to be deleted. In ring applications, pass-through connections are deleted by using the same address for *Address1* and *Address2*.

Valid OC-3 STS-1 Addresses:

{m,c}-{1-3}, {a,b,c}, {a,b}-{1-2}

If the shelf is equipped with 24-type OLIUs in its Main units, the valid STS-1 Addresses are:

m-{1-12}, c-{1-3}, {a,b,c}, {a,b}-{1,2}

cct

Crstype specifies the cross-connection type. This parameter is available with all OC-3 ring releases. The valid values are:

twoway Two-way cross-connections apply to terminating, hubbing, add/drop, hairpin, pass-through, 0x1 ring, and 0x1 DS3 configurations. This is the default value. In 0x1 ring configurations, two-way cross-connections support dual- and single-homed OC-1 ring applications. For more information, refer to **ent-crs-sts1**.

⇒ NOTE:

For 24G-U OLIU circuit packs, STS-1 pass-through cross-connections will be deleted *only* if the STS-1 contains STS-1 AIS in both directions. Adjacent shelves should have *idle* set to **ais** (via the **set-ne** command) to insure AIS is inserted on STS-1 channels that are not cross-connected.

dc Drop and continue connections support dual ring applications. Drop and continue connections are only allowed if the function unit address is equipped with the STS1E or 22-type OLIU low-speed circuit packs.

⇒ NOTE:

The *cct* parameter is an optional parameter if the cross-connection type to be deleted is **twoway**. The *cct* parameter is required for other CrsType values.

Address1, *Address2*, and *CrsType* must match an existing STS-1 cross-connection or execution of the command will complete with the following message:

```
/* The specified STS-1 cross-connection does not exist  
and cannot be deleted. */
```

In linear systems, if the cross-connect mode is set to default (**crs=default**), as provisioned by the **set-ne** command, this command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for default cross-connections
   by the CrsMode parameter in the set-ne command. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

Users may not delete an STS-1 pass-through cross-connect containing traffic VT1.5 traffic from the 24G-U OLIU. To remove the pass-through cross-connect, users should first delete the associated VT1.5 or STS-3 cross-connect at the ring drop nodes. Otherwise, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path must be in the AIS state
   to delete the cross-connect. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.  
You have selected the dlt-crs-sts1 command with these parameters:  
  
Address1 = address  
Address2 = address  
Crstype = value */  
  
Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

ent-crs-sts1

rtrv-crs-sts1

rtrv-ne

set-ne

NAME

dlt-crs-sts3c: Delete Cross-Connection STS-3c

INPUT FORMAT

dlt-crs-sts3c:*Address1,Address2*[:*cct*=Crstype];

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command deletes STS-3c cross-connections. STS-3c signals are identified by the first STS-1 address in the STS-3c signal. The following chart shows the mapping for STS-3c addresses to the internal STS-1 signal structure:

STS-3c Mapping		
Interface	Address	Internal STS-1 #s
Main	m-1	1,2,3
	m-4	4,5,6
	m-7	7,8,9
	m-10	10,11,12

This command can be used in an OC-3 shelf with ring release software and ONLY if the shelf is equipped with 24-type OLIU circuit packs in its Main unit slots. The only valid cross-connect type is **twoway (pass-through)**; all other cross-connect types are not valid at this time.

The input parameters are:

Address1* and *Address2

These are the addresses of the two STS-3c channels that are to be deleted. Valid connections are listed below. Where items appear in braces { }, any one (and only one) of these items may be used to form the address.

m-{1,4,7,10} to m-{1,4,7,10}

Allowed if the OC-3 shelf is equipped with 24-type OLIU circuit packs in its Main unit slots.

For pass through signals, Address1 and Address2 must be the identical time slot.

cct

Crstype specifies whether the cross-connection is two-way. The valid values are:

twoway

Two-way applies to pass through cross-connections. This is the default value.

The *cct* parameter is an optional parameter if the cross-connection type to be deleted is **twoway**.

Address1, *Address2*, and *Crstype* must match an existing STS-3c cross-connection, or execution of the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified STS-3c cross-connection does not exist. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
You have selected the dlt-crs-sts3c command with these parameters:

Address1 = address
Address2 = address
Crstype = value */

Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

ent-crs-sts3c

rtrv-crs-sts3c

NAME

dlt-crs-vt1: Delete Cross-Connection VT1.5

INPUT FORMAT

dlt-crs-vt1:*Address1,Address2[:cct=Crstype];*

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command deletes VT1.5 signal cross-connections within a DDM-2000 OC-3 system.

**NOTE:**

In linear systems, this command can only be executed if the cross-connect mode is set to manual (**crs=manual**) as set by the **set-ne** command.

The input parameters are:

Address1 and *Address2*

These are the addresses of the two VT1.5 channels, or one VT1.5 channel and one DS1 port, where existing cross-connections are to be deleted. In ring applications, pass-through connections are deleted by using the same address for *Address1* and *Address2*.

Valid Linear Addresses:

{m,c}-{1-3,all}-{1-7,all}-{1-4,all},
{a,b}-{1-2}-{1-7,all}-{1-4,all},
{a,b,c}-{1-7,all}-{1-4,all}

Valid Ring Addresses:

m-{1-3,all}-{1-7,all}-{1-4,all},
{a,b,c}-{1-7,all}-{1-4,all},
a-{1,2,all}-{1-7,all}-{1-4,all},
b-{1,2,all}-{1-7,all}-{1-4,all},
c-{1-3,all}-{1-7,all}-{1-4,all}

If the shelf is equipped with 24-type OLIUs in its Main units, the valid OC-12 Main unit Addresses are:

m-{1-12}-{1-7,all}-{1-4,all}

cct CrsType specifies cross-connection type. The valid values are:

- twoway** Two-way cross-connections apply to add/drop, hairpin, and 0x1 ring configurations. Two-way is the default value.
- dc** Drop and continue connections support dual ring applications.
- locked** Locked cross-connections support nonpath-switched DS1 drop applications. Locked cross-connections are only allowed if the function unit address is equipped with the MXRVO interface.

If the address includes the value *all*, the value for *cct* applies to every cross-connection within the range of the addresses.

The *Address1*, *Address2*, and *CrsType* parameters must match an existing VT1.5 cross-connection or execution of the command will complete with the following message:

```
/* The specified VT1.5 cross-connection does not exist
and can not be deleted. */
```

In linear systems, if the cross-connect mode is set to default (**crs=default**) as provisioned by the **set-ne** command, this command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for default cross-connections
by the CrsMode parameter in the set-ne command. */
```

If the cross-connection request address includes the value **all** and the addresses do not have a one-to-one relationship, this command will be denied with the following denial message:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

If this command is entered with several addresses or an address of **all** is used and one or more of these addresses cannot be processed, the command will complete but the following message will be displayed:

```
/* The following cross-connections not processed.
Cross-connect exists with different address:
Address1 Address2
Address1 Address2
.          .
.          .
.          . */
```

When *CrsType* is used and the command is entered with one or more addresses that cannot be processed or an address of **all** that cannot be processed, the command will complete but the following message will be displayed:

```
/* The following cross-connections were not processed
because the address or cross-connection type did not match.
Address1 Address2 CrsType
Address1 Address2 CrsType
.          .          .
.          .          . */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
You have selected the dlt-crs-vt1 command with these parameters:

Address1 = address
Address2 = address
Crstype = value */

Execute? (y/n or CANCEL/DELETE to quit) =
```

If this command is entered with all as part of the address, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
Multiple cross-connections may be affected.
You have selected the dlt-crs-vt1 command with these parameters:

Address1 = address
Address2 = address
Crstype = value */

Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

ent-crs-vt1

rtrv-crs-vt1

rtrv-ne

set-ne

NAME

dlt-osacmap: delete OS application context ID map entry

INPUT FORMAT

dlt - osacmap : vc=VCType,snpa=SNPA;

DESCRIPTION

This command deletes data terminal equipment (DTE) calling addresses of operations systems (OS) that are assigned to the switched virtual circuit (SVC) and/or the permanent virtual circuit (PVC) in the X.25 subnetwork application context map. This map lists both the PVCs and the DTE calling addresses for the SVC available in the X.25 channel and maps them to OS application contexts. The DTE entries of both SVC and the PVC can be deleted. The PVC entries can be deleted and replaced by SVC entries, or can be changed using the **ent - osacmap** command.

⇒ NOTE 1:

If security is enabled on any craft interface terminal (CIT) or data communication channel (DCC) port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

⇒ NOTE 2:

While this command is allowed at all network elements in the subnetwork, only the table at the active gateway network element (GNE) node is active.

The input parameters are:

vc VCType is the virtual circuit type X.25 attachment for the OS and may be one of the following values:

PVC permanent virtual circuit (default value)

SVC switched virtual circuit.

snpa SNPA is the X.25 subnetwork point of attachment for the OS. It is either the logical channel number (LCN) corresponding to the PVC or the DTE calling address corresponding to the SVC entries in the table. SNPA is 1 to 15 digits and must match an existing entry in the table.

If the **vc** or **snpa** entered is not known by the NE, the command will be denied with the following message:

```
IDNV
/* Input, Data Not Valid, invalid data entered. */
/* The corresponding VCType/SNPA value is not found in OSACMAP. */
```

When this command is entered at an active GNE, the following confirmation message will be displayed:

```
/* Caution! Operations System access is affected by this command.

Caution! When executed, this command causes the NE's affected
VC to be reset. This action will drop all currently active
logins on the affected VC.

You have selected the dlt-osacmap command with these parameters:

VCType = x
SNPA = x */

Execute? (y/n or CANCEL/DELeTe to quit) =
```

When this command is entered at a network element that is not an active GNE, the following confirmation message will be displayed:

```
/* Caution! This NE is not an active GNE. Entries in this table are
not active. Only the information at an active GNE is valid.

You have selected the dlt-osacmap command with these parameters:

VCType = x
SNPA = x */

Execute? (y/n or CANCEL/DELeTe to quit) =
```

RELATED COMMANDS

ent-tl1msgmap

rtrv-tl1msgmap

ent-osacmap

rtrv-osacmap

NAME

dlt-tadrmmap: Delete TID Address Map

INPUT FORMAT

dlt-tadrmmap:tid=TID;

DESCRIPTION

This command is used to remove an entry from the directory services network element (DSNE) network map. The DSNE node (where **DSNE=yes**) stores and maintains the network map, listing all active nodes in the network.

When a node is removed from an OSI network, the DSNE must be updated to reflect that the node is no longer active. Entering this command at the DSNE will remove the obsolete node entry from the DSNE network map and from all **rtrv-map-network** reports at all nodes. This command will also remove any communication failure alarms related to removing the node from the network.

This command can only be executed at the DSNE and will only succeed if the communication status of the network element (NE) being deleted is "FAILED." The command **rtrv-map-network** may be used to list the communication status of a network element.

⇒ NOTE:

When security is enabled, this command is available to privileged users only.

The input parameter is:

tid TID (Target IDentifier) is a character string consisting of up to 20 alphabetic, numeric, and hyphenated characters. The TID identifies the network element to be removed from the DSNE's network map.

This command may only be executed at the DSNE. If a user attempts to execute this command at any other network element, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* This command can only be executed at DSNE */
```

If the TID to be deleted is not listed in the DSNE network map, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System name does not exist. */
```

Only network elements whose communication status is "FAILED" may be removed from the network map. If a user attempts to remove a network element whose communication status is not "FAILED," the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Can only delete network elements with
   FAILED communication status. */
```

When more than one network element is defined as the DSNE, an alarm will result. If a user attempts to remove a network element while the network has more than one DSNE defined, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Due to a network provisioning problem (duplicate DSNE),
   this TID can not be deleted from the network map at this time. */
```

If the user attempts to execute this command while the DSNE is in a busy state (for example, handling initial registration), the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/*DIB is currently locked, try again later. */
```

RELATED COMMANDS

rtv-map-network

NAME

ent-crs-sts1: Enter Cross-Connection STS-1

INPUT FORMAT

ent-crs-sts1:*Address1,Address2[:cct=CrSType][,ring=RingId];*

DESCRIPTION

This command sets bidirectional STS-1 cross-connections between Main and function unit slots and may be applied to OC-3 systems with various arrangements, including hubbing, add/drop, terminating STS-1, and rings.

All cross-connections require the presence of OLIU circuit packs in the Main slots. In ring applications, 22-type, 24-type, or 27-type OLIU circuit packs must be present in order to establish STS-1 cross-connections. The 27-type OLIU is available in OC-3 Release 9.0 and later ring releases. The 24-type OLIU is available in OC-3 Release 11.0 and later ring releases for Main units only.

The 27G2-U or 26G2-U OLIU circuit packs are required in order to establish OC-1 pass-through cross-connections within a function unit and OC-1 0x1 cross-connections between function units and OC-1 hairpin local drop cross-connections (Release 11.0 and later) and 26G2-U (Release 11.1 and later).

In linear applications, 22-type, 21G, or 21D OLIU circuit packs may be used to establish STS-1 cross-connections. Additionally, in linear applications, cross-connections may only be entered if **crs=manual**, as set by the **set-ne** command.

⇒ NOTE:

The 24G-U OC-12 interface circuit pack will allow up to three STS-1s to be STS or VT cross-connected. The remaining STS-1 channels (if any) will have to continue as STS-1 ring pass-through cross-connections, otherwise the request will be denied as specified later in this document.

Figures 11-1, 11-2, 11-3, 11-4, 11-5, and 11-6 show sample cross-connections.

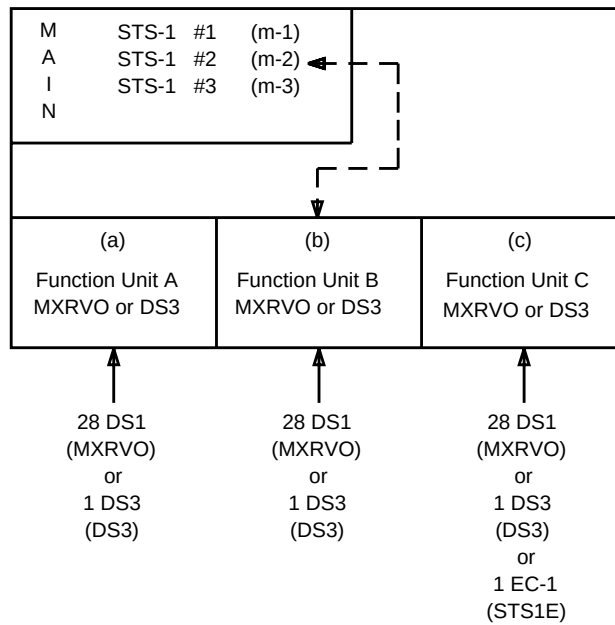


Figure 11-1. Terminating STS-1 m-2 to b

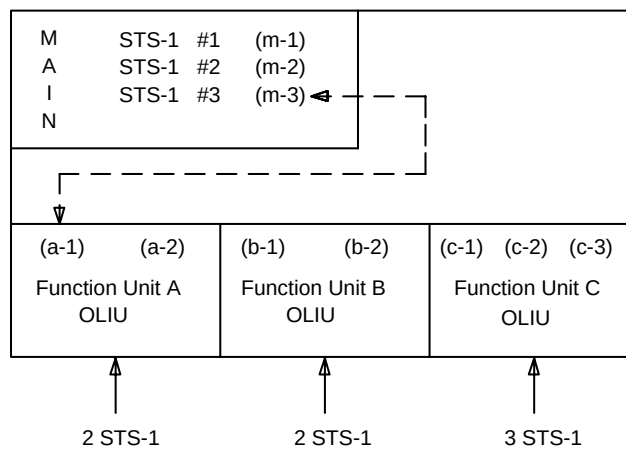


Figure 11-2. Hub Application m-3 to a-1

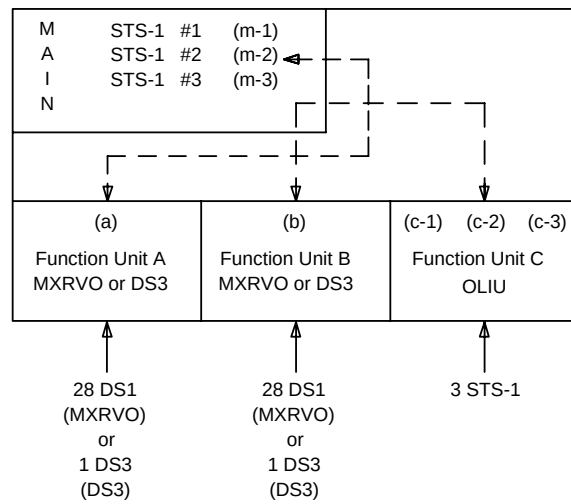


Figure 11-3. Linear Add/Drop Application m-2 to a, c-2 to b

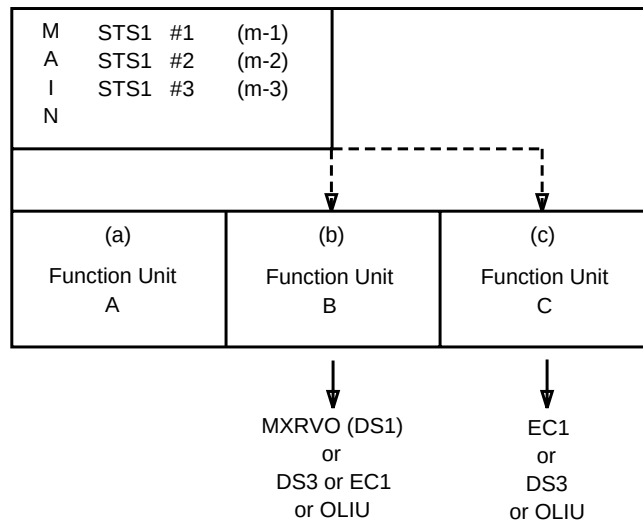


Figure 11-4. Ring Hairpin Application b to c

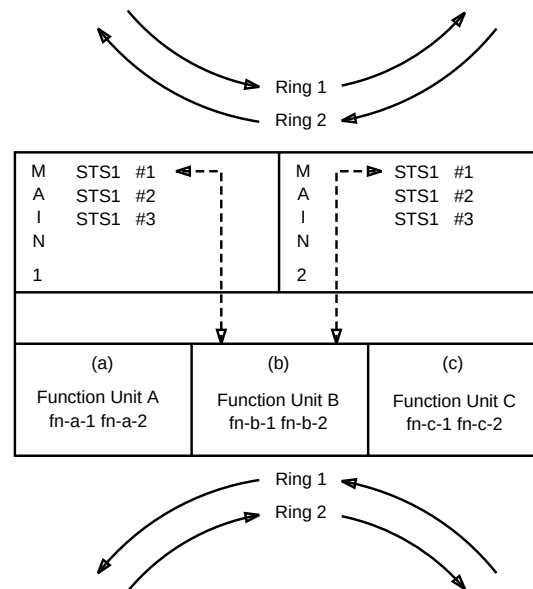


Figure 11-5. 0x1 Ring Configuration, Single-Homed Application m-1 to b-1

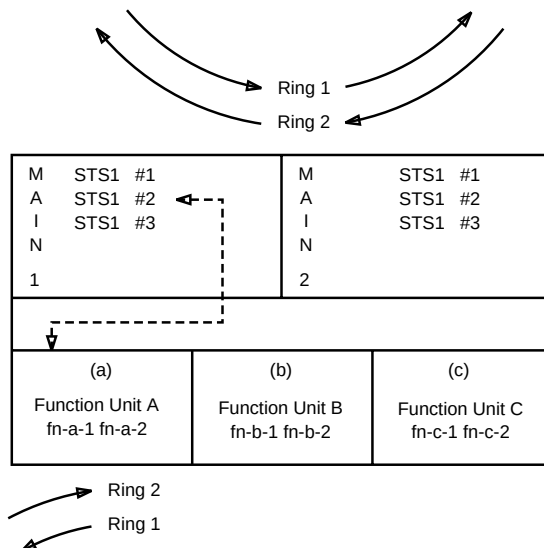


Figure 11-6. 0x1 Ring Configuration, Dual-Homed Application m-2 to a-1

The input parameters are:

Address1 and *Address2*

These are the addresses of the two STS-1 channels or one STS-1 channel and one DS3/EC-1/OC-3/OC-1/MXRVO or TMUX (in Release 11.1) port that are to be cross-connected. For STS-1 ring pass-through traffic, *Address1* and *Address2* must be the same time slot. Valid addresses are listed on the following pages.

 NOTE:

All cross-connections are bidirectional.

cct CrsType specifies the cross-connection type. The valid values are:

twoway Twoway cross-connections apply to terminating, hubbing, add/drop, pass-through, hairpin, 0x1 ring, and 0x1 DS3 configurations. Twoway is the default value. The 0x1 ring configurations support both dual and single homed OC-1 ring applications.

Starting with Release 9.1, 0x1 ring configurations include main-to-function unit, and function unit-to-function unit interconnections. See the following pages for detailed listings of allowed equipment combinations and corresponding valid addresses. Also starting with Release 9.1, pass-through cross-connections within function units equipped with 27G2-U OLIUs may be established.

Starting with Release 11.0, hairpin local drop cross-connections may be used to drop path-protected traffic from an OC-1 ring terminating on a pair of 27G2-U OLIU circuit packs in a function unit to DS1 ports or to STS-1 channels on an OC-3/IS-3 or STS1E facility. The pair of 27G2-U OLIUs in a single function unit will support a mix of hairpin local drop cross-connections and main-to-FN 0x1 or FN-to-FN 0x1 cross-connections.

Starting with Release 11.1, hairpin local drop cross-connections may be used to drop path-protected traffic from an OC-1 ring terminating on a pair of 26G2-U OLIU circuit packs in a function unit slot to DS1 ports in the same or a different function unit or to STS-1 channels on an OC-3/IS-3 or STS1E facility.

Also starting with OC-3 Release 11.1, a two-way STS-1 hairpin cross-connect is available between a function unit with a linear OC-3 interface or EC-1 port and another function unit with an EC-1/DS3 or OC-3 linear

port.

A 0x1 DS3 cross-connection is established when the addressed function unit contains one or two BBG19 circuit packs. In this case, the addressed STS-1 channel received by the OLIU in Main-1 is connected to the DS3 port in slot 1 of the addressed function unit and the addressed STS-1 received by the OLIU in Main-2 is connected to the DS3 port in slot 2 of the addressed function unit. One of the function slots may be unequipped.

- dc** Drop and continue cross-connections support dual ring interworking applications. Drop and continue connections are only allowed if the function unit address is equipped with the STS1E or 22-type OLIU low-speed circuit packs.
- locked** Locked cross-connections support non-path-switched EC-1 or DS3 drop applications. These connections are only allowed if the function unit address is equipped with the DS3 or STS1E interface. This connection type will be available with all OC-3 ring releases.

If the addresses indicate a pass-through cross-connection, the CrsType is not prompted for but is automatically set to **twoway**. The confirmation message indicates that a CrsType of **twoway** has been selected for the user. If a CrsType other than **twoway** is entered on the command line when the addresses indicate a pass-through cross-connection, the request is rejected. If the CrsType is not **locked** or **dc**, the RingId is not requested and is not displayed in confirmation messages. If the CrsType is not **locked** or **dc**, and RingId is entered, the system will ignore any value entered for RingId.

ring This parameter is available with all ring releases. RingId is the ring identification for drop and continue or locked connections.

For **dc** type connections, it specifies which ring rotation will be continued as well as dropped at this network element. The valid values are:

- m1** Ring **m1** is the ring that is received on the Main-1 OLIU and is transmitted on the Main-2 OLIU.
- m2** Ring **m2** is the ring that is received on the Main-2 OLIU and is transmitted on the Main-1 OLIU.

In linear releases, shelves may be placed into the default or manual cross-connect mode using the **set-ne** command. If no cross-connect mode is specified, each shelf will be in default mode, which provides a fixed mapping between STS-1 signals embedded in the OC-3 line signal and the STS-1s

associated with signals terminating on the shelf. When the manual cross-connect mode is selected, the cross-connect map may be changed by the user. All cross-connections must be entered by the user with this **ent-crs-sts1** command.

For STS-1 cross-connections, there is a one-to-one correspondence between the VT Group number and the low-speed slot number. There is also a one-to-one correspondence between the VT number and the low speed port number.

Valid default and manual cross-connection addresses are listed on the following pages. To successfully perform any cross-connection, the user *must* equip the Main slots with 22-type, 21D, 21G, or 27-type OLIU circuit packs. For additional examples and restrictions on cross-connections, refer to the "Cross-Connection Provisioning" information located in Chapter 8.

Default Linear Release Cross-Connect Addresses:

m-1 to a	Default when function group A is equipped with DS3, STS1E, or MXRVO circuit packs
m-2 to b	Default when function group B is equipped with DS3, STS1E, or MXRVO circuit packs
m-3 to c	Default when function group C is equipped with DS3, STS1E, or MXRVO circuit packs
m-1 to a-1	Default when function group A is equipped with OLIU circuit packs
m-2 to b-2	Default when function group B is equipped with OLIU circuit packs
m-3 to c-3	Default when function group C is equipped with OLIU circuit packs

For DDM-2000 OC-3, manual cross-connections may be entered if the cross-connect mode is set to manual (**crs=manual**), as provisioned by the **set-ne** command. Valid manual cross-connections are listed below. Where items appear in braces { }, any one (and only one) of these items may be used to form the address.

Manual Linear Release Cross-Connect Addresses:

m-{1-3} to {a,b,c}	Allowed when function groups A and/or B and/or C are equipped with DS3, STS1E, or MXRVO circuit packs
{a,b} to c-{1-3}	Allowed when function groups A and/or B are equipped with DS3, STS1E, or MXRVO and when function group C is equipped with OLIU circuit packs.

m-{1-3} to {a,b}-{1,2}

Allowed when function groups A and/or B are equipped with OLIU circuit packs

{a,b}-{1,2} to c-{1-3}

Allowed when function groups A or B and C are equipped with OLIU circuit packs. No more than 1 STS-1 channel may be routed between function groups A and C, and no more than 1 STS-1 channel may be routed between function groups B and C.

m-{1-3} to c-{1-3}

Allowed when function group C is equipped with OLIU circuit packs

In DDM-2000 OC-3 ring releases, the cross-connect mode is always manual (**crs=manual**). Valid manual cross-connections are listed below. Where items appear in braces { }, any one (and only one) of these items may be used to form the address.

Ring Release Cross-Connect Addresses:**m-{1-3} to {a,b,c}**

Allowed when Main slots are equipped with 22-type OLIU circuit packs, and function groups A and/or B and/or C are equipped with DS3 (BBG4, BBG4B, and BBG19), STS1E, MXRVO, or TMUX circuit packs.

m-{1,2} to {a,b,c}

Allowed when Main slots are equipped with 27-type OLIU circuit packs, and function groups A and/or B and/or C are equipped with DS3 (BBG4, BBG4B, and BBG19), STS1E, MXRVO, or TMUX circuit packs.

m-{1,12} to {a,b,c}

Allowed when Main slots are equipped with 24-type OLIU circuit packs, and Allowed when Main unit slots are equipped with 24-type OLIU circuit packs, and function unit groups A and/or B and/or C are equipped with DS3 (BBG4, BBG4B, and BBG19), STS1E, MXRVO, or TMUX circuit packs.

m-{1-3} to a-{1,2}

For rings Release 9.0 and later, allowed when Main slots are equipped with 22-type OLIU circuit packs, and function group A is equipped with 22-type circuit packs

m-{1-3} to b-{1,2}

Allowed when Main slots are equipped with 22-type OLIU circuit packs, and function group B is equipped with 22-type circuit packs

m-{1-12} to {a,b}-{1,2}

Allowed when Main slots are equipped with 24-type OLIU circuit packs, and function groups A and/or B are equipped with 22-type circuit packs

m-{1-3} to c-{1-3}

Allowed when Main slots are equipped with 22-type circuit packs, and function group C is equipped with 22-type circuit packs

m-{1-12} to c-{1-3}

Allowed when Main slots are equipped with 24-type OLIU circuit packs, and function group C is equipped with 22-type circuit packs

m-{1-3} to m-{1-3}

Allowed to cross-connect pass-through signals when Main slots are equipped with 22-type circuit packs. Address1 and Address2 must be the identical time slot.

m-{1,2} to m-{1,2}

Allowed to cross-connect pass-through signals when Main slots are equipped with 27-type OLIU circuit packs. Address1 and Address2 must be the identical time slot.

{a,b,c}-{1,2} to {a,b,c}-{1,2}

Allowed to cross-connect pass-through signals when function unit slots are equipped with 27G2-U OLIU circuit packs. Address1 and Address2 must be the identical time slot.

m-{1,12} to m-{1,12}

Allowed to cross-connect pass-through signals when Main slots are equipped with 24-type OLIU circuit packs. Address1 and Address2 must be the identical time slot.

m-{1-3} to {a,b,c}-{1,2}

Allowed when Main slots are equipped with 22-type circuit packs, and function groups A and/or B and/or C are equipped with 27-type OLIU circuit packs.

m-{1-12} to {a,b,c}-{1,2}

Allowed when Main slots are equipped with 24-type OLIU circuit packs, and function groups A and/or B and/or C are equipped with 27-type OLIU circuit packs.

m-{1,2} to {a,b,c}-{1,2}

Allowed when Main slots are equipped with 27-type OLIU circuit packs, and function groups A and/or B and/or C are equipped with 27-type OLIU circuit packs.

m-{1,2} to {a,b}-{1,2}

Allowed when Main slots are equipped with 27-type OLIU circuit packs, and function groups A and/or B are equipped with 22-type OLIU circuit packs.

m-{1,2} to c-{1-3}

Allowed when Main slots are equipped with 27-type OLIU circuit packs, and function group C is equipped with 22-type OLIU circuit packs.

{a,b}-{1,2} to c-{1,2}

Allowed when both addressed function unit slots are equipped with 27G2-U OLIU circuit packs. In this situation, a function unit to function unit OC-1 0x1 cross-connection is established.

{a,b}-{1,2} to c-{1-3}

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B is equipped with 27G2-U OLIU circuit packs and when function group C is equipped with 22-type OLIU circuit packs.

{a,b}-{1,2} to c-{1,2}

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B is equipped with 22-type OLIU circuit packs and when function group C is equipped with 27G2-U OLIU circuit packs.

{a,b}-{1,2} to c

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B is equipped with 27G2-U OLIU circuit packs and when function group C is equipped with MXRVO, TMUX (in Release 11.1), or STS1E low-speed circuit packs.

{a,b} to c-{1,2}

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B are equipped with MXRVO, TMUX (in Release 11.1), or STS1E low-speed circuit packs and when function group C is equipped with 27G2-U OLIU circuit packs.

{a,b}-1 to c-{1-3}

Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B is equipped with 26G2-U OLIU circuit packs and when function group C is equipped with 22-type OLIU circuit packs.

{a,b}-{1,2} to c-1

Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B are equipped with 22-type OLIU circuit packs and when function group C is equipped with 26G2-U OLIU circuit packs.

- {a,b}-1 to c** Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B is equipped with 26G2-U OLIU circuit packs and when function group C is equipped with MXRVO, TMUX, or STS1E low-speed circuit packs.
- {a,b} to c-1** Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B are equipped with MXRVO, TMUX, or STS1E low-speed circuit packs and when function group C is equipped with 26G2-U OLIU circuit packs.
- {a,b} to c-{1-3}**
Starting with Release 11.1, allowed when function groups A and/or B are equipped with DS3, STS1E, and when function group C is equipped with 22-type OLIU circuit packs.
- {a,b}-{1,2} to c-{1-3}**
Starting with Release 11.1, allowed when function groups A or B and C are equipped with 22-type OLIU circuit packs. Noe more than 1 STS-1 channel may be routed between function groups A and C, and not more than 1 STS-1 channel may be routed between function groups B and C.
- {a,b} to c** Starting with Release 11.1, allowed when function groups A and/or B are equipped with DS3, STS1E, and when function group C is equipped with STS1E circuit packs.
- {a,b}-{1,2} to c**
Starting with Release 11.1, allowed when function groups A or B are equipped with 22-type OLIU circuit packs and function group C is equipped with DS3 or STS1E circuit packs.

If this command is invoked using addresses where active cross-connections already exist, the following denial message will be displayed:

```
SACC
/* Status, Already Cross-Connected */
/* Establishing new cross-connections requires that
existing cross-connections associated with these
addresses be deleted. */
```

If the cross-connection request includes an invalid circuit pack type, invalid port address, or specifies a cross-connection not supported by the system, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

If the cross-connection request is to an STS1E low-speed interface, the EC-1 port state *cannot* be set to NMON or the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* The addressed port is in NMON state. */
```

In ring systems, if this command is issued and one of the Main slots is not equipped, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped */
```

Starting with Release 11.0, when setting up a path-protected hairpin local drop cross-connection, both slots of the function unit to which the OC-1 ring is terminated must be equipped with 27G2-U OLIU circuit packs. Otherwise the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both FN slots terminating the OC-1 ring must be
   equipped with 27G2-U OLIU circuit packs. */
```

Starting with Release 11.1, when setting up a path-protected hairpin local drop cross-connection, both slots of the function unit to which the OC-1 ring is terminated must be equipped with 27G2-U or 26G2-U circuit packs. Otherwise the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both FN slots terminating the OC-1 ring must be
equipped with 27G2-U or 26G2-U OLIU circuit packs. */
```

A pair of 27G2-U OLIUs in a single FN group cannot support a mix of hairpin local drop cross-connections and Main-to-FN 0x1 or FN-to-FN 0x1 cross-connections. If the requested cross-connection would cause such a mix, it will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* A mix of hairpin local drop and 0x1 cross-connections
in the same FN group is not allowed. */
```

If the addresses indicate a pass-through cross-connection and the CrsType is not **twoway**, the request is denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request */
```


In linear systems, if the cross-connect mode is set to default (**crs=default**), as provisioned by the **set-ne** command, this command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for default cross-connections
   by the CrsMode parameter in the set-ne command. */
```

If the maximum number of STS-1s (3) has already been reached when the user attempts to provision an additional STS-1 cross-connect to be dropped (which would exceed the allowed STS-1 bandwidth), the request will be denied and the following denial message displayed:

```
SNVS
/* Status, Not in Valid State */
/* Cross connect capacity is not available. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed. The RingId parameter is displayed in the confirmation message only if the CrsType parameter is set to **dc** or **locked**.

```
/* Caution! Network cross-connections are affected by this command.  
You have selected the ent-crs-sts1 command with these parameters:  
  
Address1 = address  
Address2 = address  
CrsType = value  
RingId = value */  
  
Execute? (y/n or CANCEL/DELeTe to quit) =
```

RELATED COMMANDS

dlt-crs-sts1

rtrv-crs-sts1

rtrv-ne

set-ne

NAME

ent-crs-vt1: Enter Cross-Connection VT1.5

INPUT FORMAT

ent-crs-vt1:*Address1,Address2[:cct=Cr sType][,ring=RingId];*

DESCRIPTION

This command sets bidirectional VT1.5 cross-connections among Main and function unit slots and may be applied to OC-3 systems with various arrangements.

All cross-connections require the presence of OLIU circuit packs in the Main slots. The 22-type, 24-type, or 27-type OLIU circuit packs must be present in order to establish VT1.5 cross-connections. Additionally, in linear systems, cross-connections may only be entered if **crs=manual**, as set by the **set-ne** command.

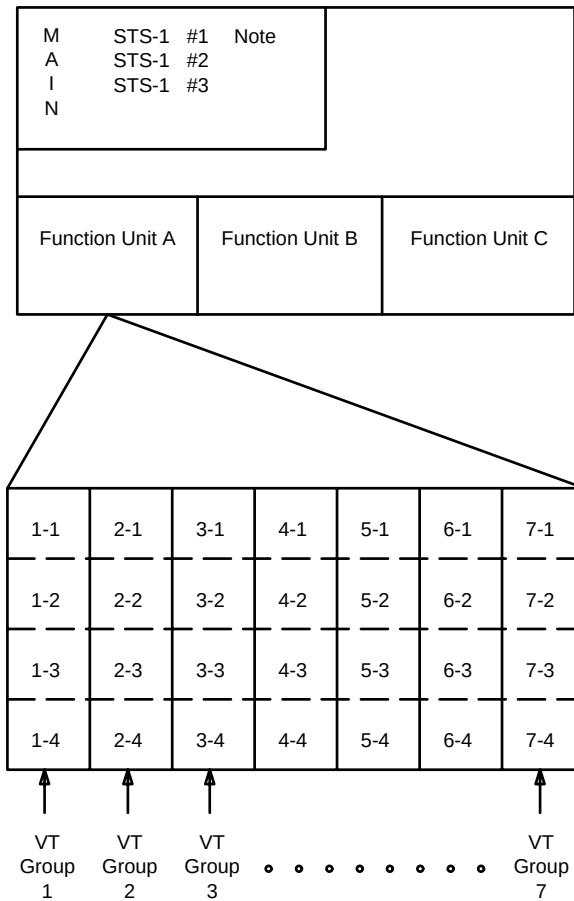
The 27-type OLIU circuit pack is available with OC-3 Release 9 software, and later ring releases. The 24-type OLIU circuit pack is available with OC-3 Release 11.0 software and later ring releases.

⇒ NOTE:

The 24G-U OC-12 interface circuit pack will allow up to three STS-1s to be VT cross-connected; the remaining STS-1 channels (if any) will have to continue as STS-1 ring pass-through cross-connects.

27G2-U or 26G2-U OLIU circuit packs must be used to establish OC-1 pass-through cross connections within a function unit, OC-1 0x1 cross connections within and between function unit slots, and OC-1 hairpin local drop cross-connections.

Figure 11-7 shows a DDM-2000 OC-3 shelf and highlights a function unit with 28 VT1.5 signals.



Note: Each STS-1 signal contains 28 VT1.5 signals.

Figure 11-7. DDM-2000 Shelf with VT1.5 Signals

As highlighted in Figure 11-7, each OC-3 signal contains three STS-1 signals. Each STS-1 signal contains seven VT Groups of signals. Each VT Group contains four VT1.5 signals, and each VT1.5 signal corresponds to an individual DS1 or T1 port.

In a 27-type OLIU pack, each of the two OC-1 signals contains 1 STS-1 signal.

The input parameters are:

Address1 and *Address2*

These are the addresses of the two VT1.5 channels, or one VT1.5 channel and one DS1 port that are to be cross-connected. For VT1.5 ring pass-through traffic, *Address1* and *Address2* must be the same. Valid addresses are listed on the following pages.



NOTE:

All cross-connections are bidirectional.

cct

CrsType specifies the cross-connection type. This parameter is available with all OC-3 ring releases. The valid values are:

twoway Two-way applies to add/drop, hairpin and 0x1 ring configurations. In linear configurations, Twoway applies to add/drop, hairpin, point-to-point and pass-through cross-connections.

0x1 ring configurations support both dual and single homed OC-1 ring applications.

Starting with Release 9.1, OC-1 0x1 ring configurations include Main-to-function unit, function unit-to-function unit, and intra-function unit interconnections. See the following pages for detailed listings of allowed equipment combinations and corresponding valid addresses. Also in Release 9.1 and later, pass-through cross-connections within function units equipped with 27G2-U OLIU circuit packs may be established.

Starting with Release 11.0, hairpin local drop cross-connections may be used to drop path protection switched traffic from an OC-1 ring terminating on a pair of 27G2-U OLIUs in a function unit slot to DS1 ports or to VT1.5 channels on an OC-3/IS-3 or STS1E facility. The pair of 27G2-U OLIUs in a single function unit will support a mix of hairpin local drop cross-connections and Main-to-FN 0x1 or FN-to-FN 0x1 cross-connections.

Starting with Release 11.1, hairpin local drop cross-connections may be used to drop path protection switched traffic from an OC-1 ring terminating on a pair of 26G2-U OLIUs in a function unit slot to DS1 ports in the same or a different function unit or to VT1.5 channels on an OC-3/IS-3 or STS1E facility.

Also starting with Release 11.1, the TMUX (BBG20) circuit pack will be allowed in the function unit slots of an OC-3 system. All types of VT1.5 cross-connections that are supported for the MXRVO interface will also be supported for the TMUX interface.

Also starting with Release 11.1, VT1.5 cross-connections 3 and 4 will not be allowed for HDSL (BBF8) circuit packs.

Twoway is the default value for *cct*.

- dc** Drop and continue connections are allowed only from Main to function unit. Drop and continue connections support dual ring applications. Drop and continue connections are only allowed if the function unit address is equipped with the STS1E or OC-3 OLIU low-speed interface.
- locked** Locked cross-connections support nonpath-switched DS1 drop applications. Locked cross-connections are only allowed if the function unit address is equipped with the MXRVO or TMUX interfaces.

If the addresses indicate a pass-through cross-connection, the CrsType is not prompted for but is automatically set to **twoway**. The confirmation message indicates that a CrsType of **twoway** has been selected for the user. If a CrsType other than **twoway** is entered on the command line when the addresses indicate a pass-through cross-connection, the request is rejected. If the value *all* is used in the address, the *cct* applies to every cross-connection within the range of the addresses.

ring

RingId is the ring identification for drop and continue and locked cross-connections. For **dc** type connections this parameter specifies which ring rotation will be continued as well as dropped at this network element. The valid values are:

- m1** Ring **m1** is the ring that is received on the Main-1 OLIU and is transmitted on the Main-2 OLIU.
- m2** Ring **m2** is the ring that is received on the Main-2 OLIU and is transmitted on the Main-1 OLIU.

All VT drop and continue cross-connections in a network element must be assigned to the same ring. The assigned value will be set to the ring specified in the first completed drop and continue cross-connection. If *cct* is set to **dc**, this parameter is only prompted for if this is the first assignment. The user may continue to enter the RingId value for other drop and continue connections but the value must agree with the value set by the first drop and continue connection. If the CrsType is **locked**, the RingId is always prompted for and is displayed in confirmation messages. If the CrsType is not **dc** or **locked**, the RingId is not prompted for and it is not displayed in confirmation messages. If the CrsType is not **dc** or **locked**, and RingId is entered anyway, the value entered for RingId is ignored.

The following is a list of valid cross-connections. To successfully perform any cross-connection, the user *must* equip the Main slots with 22-type, 24-type or 27-type OLIU circuit packs. For linear systems, cross-connections may be entered if **crs=manual**, as set by the **set-ne** command. Where items appear in braces {}, any one (and only one) of these items may be used to form the address. The value **all** may be used as part of an address (allowed as indicated below) to cross-connect entire groups of signals. When **all** is used, no subsequent address fields should be defined.

Linear Release Cross-Connection Addresses:

m-{1-3}-{1-7,all}-{1-4,all} to {a,b,c}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed (LS) port is equipped with a DS1 circuit pack or an STS1E (EC-1) low-speed circuit pack.

{a,b}-{1-7,all}-{1-4,all} to c-{1-3}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed port in function groups A or B are equipped with DS1 or STS1E low-speed circuit packs, and when function group C is equipped with 22-type OLIU circuit packs.

{m,c}-{1-3}-{1-7,all}-{1-4,all} to {a,b}-{1,2}-{1-7,all}-{1-4,all}

Allowed when both addressed groups are equipped with 22-type or 22D OLIU circuit packs.

m-{1-3,all}-{1-7,all}-{1-4,all} to c-{1-3,all}-{1-7,all}-{1-4,all}

Allowed when function group C is equipped with 22-type OLIU circuit packs.

Ring Release Cross-Connection Addresses:

m-{1-3}-{1-7,all}-{1-4,all} to {a,b,c}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed (LS) port is equipped with a DS1 or STS1E low-speed, or TMUX circuit pack and the Main slots are equipped with 22-type OLIU circuit packs. This address is also applicable for HDSL circuit packs, although only 2 DS1 interfaces may be specified in the address.

m-{1-3}-{1-7,all}-{1-4,all} to {a,b,c}-{1,2}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed (LS) port is equipped with a 27-type OLIU, and the Main slots are equipped with 22-type OLIU circuit packs.

m-{1-12}-{1-7,all}-{1-4,all} to {a,b,c}-{1,2}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed (LS) port is equipped with a 27-type OLIU, and the Main slots are equipped with 24-type OLIU circuit packs.

m-{1,2}-{1-7,all}-{1-4,all} to {a,b,c}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed (LS) port is equipped with a DS1 or STS1E low-speed, or TMUX circuit pack and the Main slots are equipped with 27-type OLIU circuit packs.

m-{1,12}-{1-7,all}-{1-4,all} to {a,b,c}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed (LS) port is equipped with a DS1 or STS1E low-speed, or TMUX circuit pack and the Main slots are equipped with 24-type OLIU circuit packs.

m-{1,2}-{1-7,all}-{1-4,all} to {a,b,c}-{1,2}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed (LS) port is equipped with a 27-type OLIU circuit pack and the Main slots are equipped with 27-type OLIU circuit packs.

m-{1-3,all}-{1-7,all}-{1-4,all} to m-{1-3,all}-{1-7,all}-{1-4,all}

For ring releases, when the Main slots are equipped with 22-type OLIUs, these addresses provide pass-through cross-connections. The two VT1.5 channel addresses must be the same.

m-{1,2}-{1-7,all}-{1-4,all} to m-{1,2}-{1-7,all}-{1-4,all}

For ring releases, when the Main slots are equipped with 27-type OLIUs, these addresses provide pass-through cross-connections. The two VT1.5 channel addresses must be the same.

{a,b,c}-{1,2}-{1-7,all}-{1-4,all} to {a,b,c}-{1,2}-{1-7,all}-{1-4,all}

For ring releases, when the addressed function unit slots are equipped with 27G2-U OLIU circuit packs, these addresses provide either pass-through or intra-function unit 0x1 cross-connections. Pass-through cross-connections are established when the two VT1.5 channel addresses are the same. Intra-function unit 0x1 cross-connections are established when the function unit portion of the addresses are the same but the STS-1 numbers are different.

m-{1-12}-{1-7,all}-{1-4,all} to m-{1-12}-{1-7,all}-{1-4,all}

For ring releases, when the Main slots are equipped with 24-type OLIUs, these addresses provide pass-through cross-connections. The two VT1.5 channel addresses must be the same.

m-{1-3}-{1-7,all}-{1-4,all} to a-{1,2}-{1-7,all}-{1-4,all}

For rings Release 9.0 and later, allowed when function group A is equipped with 22-type OLIU circuit packs.

m-{1-3}-{1-7,all}-{1-4,all} to b-{1,2}-{1-7,all}-{1-4,all}

Allowed when function group B is equipped with 22-type OLIU circuit packs.

m-{1-12}-{1-7,all}-{1-4,all} to {a,b}-{1,2}-{1-7,all}-{1-4,all}

Allowed when function groups A and/or B is equipped with 22-type OLIU circuit packs and Main slots are equipped with 24-type OLIUs.

m-{1-3,all}-{1-7,all}-{1-4,all} to c-{1-3,all}-{1-7,all}-{1-4,all}

Allowed when function group C is equipped with 22-type OLIU circuit packs.

m-{1-12}-{1-7,all}-{1-4,all} to c-{1-3,all}-{1-7,all}-{1-4,all}

Allowed when function group C is equipped with 22-type OLIU circuit packs and Main slots are equipped with 24-type OLIUs.

{a,b}-{1,2}-{1-7,all}-{1-4,all} to c-{1-3}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed port in function groups A or B are equipped with 22-type OLIU circuit pack and when function group C is equipped with 22-type OLIU circuit pack.

{a,b}-{1,2}-{1-7,all}-{1-4,all} to c-{1-3}-{1-7,all}-{1-4,all}

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B are equipped with 27G2-U OLIU circuit packs and when function group C is equipped with 22-type OLIU circuit packs.

{a,b}-{1,2}-{1-7,all}-{1-4,all} to c-{1,2}-{1-7,all}-{1-4,all}

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B are equipped with 22-type OLIU circuit packs and when function group C is equipped with 27G2-U OLIU circuit packs.

{a,b}-1-{1-7,all}-{1-4,all} to c-{1-3}-{1-7,all}-{1-4,all}

Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B are equipped with 26G2-U OLIU circuit packs and when function group C is equipped with 22-type OLIU circuit packs.

{a,b}-{1,2}-{1-7,all}-{1-4,all} to c-1-{1-7,all}-{1-4,all}

Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B are equipped with 22-type OLIU circuit packs and when function group C is equipped with 26G2-U OLIU circuit packs.

{a,b}-{1,2}-{1-7,all}-{1-4,all} to c-{1,2}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed port in function groups A or B are equipped with 27G2-U OLIU circuit pack and when function group C is equipped with 27G2-U OLIU circuit pack. In this situation, function unit to function unit OC-1 0x1 cross-connections are established.

{a,b}-{1-7,all}-{1-4,all} to c-{1-3}-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed port in function groups A or B are equipped with MXRVO or STS1E low-speed, or TMUX circuit packs and when function group C is equipped with 22-type OLIU circuit pack.

{a,b}-{1,2}-{1-7,all}-{1-4,all} to c-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed port in function groups A or B are equipped with 22-type OLIU circuit pack and when function group C is equipped with MXRVO or STS1E low-speed, or TMUX, circuit packs.

{a,b}-{1-7,all}-{1-4,all} to c-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed port in function groups A or B are equipped with MXRVO or STS1E low-speed, or TMUX circuit packs and when function group C is equipped with STS1E circuit pack.

{a,b}-{1-7,all}-{1-4,all} to c-{1-7,all}-{1-4,all}

Allowed when the addressed low-speed port in function groups A or B are equipped with STS1E low-speed circuit packs and when function group C is equipped with MXRVO, STS1E low-speed, or TMUX circuit packs.

{a,b}-{1,2}-{1-7,all}-{1-4,all} to c-{1-7,all}-{1-4,all}

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B are equipped with 27G2-U OLIU circuit packs and when function group C is equipped with MXRVO, STS1E low-speed, or TMUX (in Release 11.1) circuit packs.

{a,b}-{1-7,all}-{1-4,all} to c-{1,2}-{1-7,all}-{1-4,all}

Starting with Release 11.0, allowed when the addressed low-speed port in function groups A or B are equipped with MXRVO or STS1E low-speed, or TMUX (in Release 11.1) circuit packs and when function group C is equipped with 27G2-U OLIU circuit packs.

{a,b}-1-{1-7,all}-{1-4,all} to c-{1-7,all}-{1-4,all}

Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B are equipped with 26G2-U OLIU circuit packs and when function group C is equipped with MXRVO, STS1E low-speed, or TMUX circuit packs.

{a,b}-{1-7,all}-{1-4,all} to c-1-{1-7,all}-{1-4,all}

Starting with Release 11.1, allowed when the addressed low-speed port in function groups A or B are equipped with MXRVO, STS1E low-speed, or TMUX circuit packs and when function group C is equipped with 26G2-U OLIU circuit packs.

{a,b,c}-1-{1-7,all}-{1-4,all} to {a,b,c}-{1-7,all}-{1-4,all}

Starting with Release 11.1, allowed when the addressed 'from' port in function group A, B, or C is equipped with 26G2-U OLIU circuit packs and when the corresponding low-speed slots are equipped with DS1 or DS1PM circuit packs. This case is distinguished by having the same function group in both the source and destination addresses. A path-protected hairpin local drop connection is established between the ring terminating on the 26G2-U OLIU circuit packs and DS1/DS1PM ports in the same fn group, using the MXRVO functionality on the 26G2-U OLIU circuit packs.

m-{1-3}-{1-7,all}-{1-2,all} to {a,b,c}-{1-7,all}-{1-2,all}

Starting with Release 11.1, when addressing ports on a BBF8 HDSL circuit pack, only port numbers 1 and 2 are valid. Specifying all selects ports 1 and 2 only.

If the cross-connection request includes an invalid circuit pack type, invalid port address, or specifies a cross-connection not supported by the system, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

If the cross-connection request includes **all** in the addresses and the addresses do not have a one-to-one relationship, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

In linear releases, if the cross-connect mode is set to default (**crs=default**), as provisioned by the **set-ne** command, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for default cross-connections
   by the CrsMode parameter in the set-ne command. */
```

In ring systems, if this command is issued and one of the Main slots is not equipped, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped. */
```

When setting up a path-protected hairpin local drop cross-connection, both slots of the function unit to which the OC-1 ring is terminated must be equipped with 27G2-U OLIU circuit packs. Otherwise the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both FN slots terminating the OC-1 ring must be
   equipped with 27G2-U OLIU circuit packs. */
```

A pair of 27G2-U OLIUs in a single FN group cannot support a mix of hairpin local drop cross-connections and Main-to-FN 0x1 or FN-to-FN 0x1 cross-connections. If the requested cross-connection would cause such a mix, it will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* A mix of hairpin local drop and 0x1 cross-connections
   in the same FN group is not allowed. */
```

When setting up a path-protected hairpin local drop cross-connection, both slots of the function unit to which the OC-1 ring is terminated must be equipped with 27G2-U or 26G2-U OLIU circuit packs. Otherwise the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both FN slots terminating the OC-1 ring must be
   equipped with 27G2-U or 26G2-U OLIU circuit packs. */
```

If this command is invoked using addresses where active cross-connections already exist, the following denial message will be displayed:

```
SACC
/* Status, Already Cross-Connected */
/* Establishing new cross-connections requires that existing
   cross-connections associated with these addresses must
   be deleted first. */
```

If the cross-connect request is to a 27-type interface, and either OC-1 line at the specified address is in the NMON state, the following warning will be displayed:

```
/* Cross-connect may use an OC-1 line that is in the NMON state */
```

If the cross-connect request is to an STS1E low-speed interface, the EC-1 port state cannot be set to NMON or the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* EC-1 port is in NMON state. */
```

If this command is entered with several addresses (for example, when an address of **all** is used) and one or more of these addresses are already cross-connected, the command will complete but send the following message indicating the requested cross-connections that could not be completed because of previously existing cross-connections:

```
/* The following cross-connections not processed.
Cross-connect exists with different address:
Address1 Address2
Address1 Address2
:           :
:           : */
```

When the command is entered with several addresses (for example, when an address of **all** is used), but one or more of these addresses is already cross-connected, the following response message will be displayed:

```
/* The following cross-connections were not processed
because the address or cross-connection type did not match
Address1 Address2 CrsType
Address1 Address2 CrsType
      .           .           .
      .           .           .
```

If the addresses indicate a pass-through cross-connection and the CrsType is not **twoway**, the request is denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request */
```

If the cross-connect request is for a drop and continue connection and the Ring Identification does not agree with the assigned value (defined by the first drop and continue connection), the request is denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Ring Identification already provisioned to be ring <value> */
```


If the shelf is equipped with 24G-U OLIU packs in both Main slots and the maximum number of STS-1s has already been reached (that is, 3 STS-1s already have VT cross-connects) when the user attempts to provision VT-1.5 cross connects within an additional STS-1, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Cross connect capacity is not available. */
```

If an attempt is made to execute this command when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed. If CrsType is not **dc** or **locked**, RingId is not displayed in the following confirmation message:

```
/* Caution! Network Cross-connections are affected by this command.
You have selected the ent-crs-vt1 command with these parameters:

Address1 = address
Address2 = address
CrsType = value
RingId = value */

Execute? (y/n or CAnCel/DElete to quit) =
```

If this command is entered with the parameter *all* as part of the address, the following confirmation message is displayed. If CrsType is not **dc** or **locked**, RingId is not displayed in the confirmation message.

```
/* Caution! Execution of this command may affect service.
Multiple cross-connections may be affected.
You have selected the ent-crs-vt1 command with these parameters:

Address1 = address
Address2 = address
CrsType = value
RingId = value */

Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

dlt-crs-vt1

rtrv-crs-vt1

rtrv-ne

set-ne

NAME

ent-osacmap: enter OS application context ID map

INPUT FORMAT

ent - osacmap: **vc**=*VCType*,**snpa**=*SNPA*,**acid**=*ACID*;

DESCRIPTION

This command creates entries in the X.25 subnetwork application context map. This map lists the permanent virtual circuits (PVCs) and switched virtual circuit (SVC) available in the X.25 channel and maps them to operation systems (OS) application contexts. For the SVC, this command lists the data terminal equipment (DTE) calling addresses used by the various OS application contexts. Defaults for the PVCs are provided, which should apply to most situations.

⇒ NOTE 1:

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

⇒ NOTE 2:

While this command is allowed at all network elements in the subnetwork, only the table at the active GNE node is active.

The input parameters are:

vc	This parameter is the virtual circuit type X.25 attachment for the OS. <i>PVC</i> permanent virtual circuit (default value). <i>SVC</i> switched virtual circuit.
snpa	SNPA is the X.25 subnetwork point of attachment address for the OS. It is either logical channel number (LCN) 1, 2, 3, 4, 5, 6, 7, 8, or 9 if <i>VCType</i> is <i>PVC</i> or it is the Data Terminal Equipment (DTE) calling address, which is 1 to 15 digits if <i>VCType</i> is <i>SVC</i> . Up to nine VCs can be mapped to any combination of PVCs and SVCs (that is, PVCs could be removed and replaced by SVCs).
acid	ACID is a string of up to 23 alphanumeric characters, which is the application context ID to be assigned to a particular SNPA address. Each OS has a value of ACID assigned. Default values exist for OS applications supported by DDM-2000. Supported values are: <i>t11CR</i> (Assigned to PVC "1" as default value) <i>t11Maintenance</i> (Assigned to PVC "2" as default value)

tl1MemoryAdministration
(Assigned to PVC "3" as default value)

**NOTE:**

The values *tl10ther1*, *tl1Test*, and *tl10ther2* are provided as additional ACID values for the OS application that are supported by DDM-2000.

If a user attempts to enter an additional SNPA (LCN/DTE calling address), when the maximum supported number already exists, the following denial message will appear:

```
SLEM
/* Status, List Exceeds Maximum */
/* Maximum number of SNPA entries (LCN/DTE address)
   already exists. */
```

When this command is entered at an active GNE, the following confirmation message will be displayed:

```
/* Caution! Operations System access is affected by this command.

Caution! When executed, this command causes the NE's affected
VC to be reset. This action will also drop all currently
active logins on the affected VC.

You have selected the ent-osacmap command with these parameters:

VCType = x
SNPA = x
ACID = x */

Execute? (y/n or CANCEL/DElete to quit) =
```

When this command is entered at a network element that is not an active GNE, the following confirmation message will be displayed:

```
/* Caution! This NE is not an active GNE. Entries in this table are
not active. Only the information at an active GNE is valid.
```

```
You have selected the ent-osacmap command with these parameters:
```

```
VCType = x
SNPA = x
ACID = x */
```

```
Execute? (y/n or CAnCel/DELeTe to quit) =
```

**NOTE:**

The same ACID can appear more than once in the table.

RELATED COMMANDS

ent-tl1msgmap

rtrv-tl1msgmap

dlt-osacmap

rtrv-osacmap

NAME

ent-tl1msgmap: Enter TL1 Message Map for Operation Systems

INPUT FORMAT

ent - tl1msgmap: acid=ACID,msgtype=MessageType,action=Action;

DESCRIPTION**⇒ NOTE:**

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

This command maps the DDM-2000 TL1 message types to the operations systems (OS) for this network element in the subnetwork. This command provides a filter for TL1 messages by specifying TL1 message classes (known as *MessageTypes*) and allowing the user to determine which message classes should be received at each type of OS (specified in the *ACID* parameter).

There are default message classes that exist for the ACIDs supported by DDM-2000. The following table shows the default mappings supported by DDM-2000. Most users should be able to use these mappings as defined. However, users may change the default mapping by using this command. Users may check the current provisioning by using the **rtrv-tl1msgmap** command.

For OC-3 Release 8.0, 9.0, and earlier releases, the following table displays the default mappings:

```

/* DDM-2000 TL1 Autonomous Message Map
=====
      ACID              ALM  ENV  CON  DB   EVT  PM   SW
=====
tl1Maintenance         | x  | x  | x  |   | x  | x  | x  |
tl1MemoryAdministration |   |   |   | x  |   |   |   |
tl1Test                 |   |   |   |   |   |   |   |
tl1PeerComm             |   |   |   |   |   |   |   |
tl1Other1               | x  | x  | x  | x  | x  | x  | x  |
tl1Other2               |   |   |   |   |   |   |   |

      x - enabled
      <blank> - disabled
*/

```

For OC-3 Release 8.1, 9.1 and later releases, the following table displays the default mappings:

```

/* DDM-2000 TL1 Autonomous Message Map
=====
      ACID                ALM  ENV  CON  DB   EVT  PM   SW
=====
tl1Maintenance           | x | x | x |   | x | x | x |
tl1MemoryAdministration  |   |   |   | x |   |   |   |
tl1Test                  |   |   |   |   |   |   |   |
tl1PeerComm              |   |   |   |   |   |   |   |
tl10ther1                 | x | x | x | x | x |   | x |
tl10ther2                |   |   |   |   |   |   |   |

      x - enabled
<blank> - disabled
*/

```

Each message type can be assigned to more than one ACID. However, if more than one assignment is made, a 9600 or higher baud x.25 link is recommended.

The input parameters are:

- ACID** Application Context ID (ACID) is a string of up to 23 alphanumeric characters, which is the OS function. The valid ACID values are:
- tl1Maintenance*
(This identifies the *maintenance* OS type).
 - tl1MemoryAdministration*
(This identifies the *memory-administration* OS type).
 - tl1Test* (This identifies the *testing* OS type).
 - tl1PeerComm*
(This identifies the OS type for peer TL1 communications. This ACID is also used for incoming X.25 SVC DTE calling addresses that do not match any of the user-provisioned X.25 SVC DTE calling addresses).
 - tl10ther1*
(This identifies the *RIDES* OS type).
 - tl10ther2*
(This identifies an OS type for future use)..
- msgtype** MessageType is one of the supported classes of TL1 messages that the system generates. These message types are *not* sent to the OS unless they are enabled and associated with an ACID. The supported message types are:

<i>ALM</i>	To report the occurrence of an event that requires immediate attention by the craft at the OS. Report is sent via the REPT ALM message.
<i>ENV</i>	To report the occurrence of an environmental alarm to the OS. Report is sent via the REPT ALM ENV message.
<i>CON</i>	To report the active status conditions at the network element. Report is sent via the REPT COND message.
<i>DB</i>	To report database changes that have occurred as a result of line termination and cross-connection provisioning commands and changes due to external events such as circuit pack insertion or removal. Report is sent via the REPT DBCHG message.
<i>EVT</i>	To report events that do not require alarmed notifications or to report a status change of the network element. Report is sent via the REPT EVT message.
<i>PM</i>	To report performance monitoring data from the network element. Report is sent via the REPT PM message.
<i>SW</i>	To report equipment protection switches at the network element. Report is sent via the REPT SW message.

action Action is either **enabled** or **disabled** and associates the MessageType to the OS.

When this command is entered, the following confirmation message will be displayed:

```
/* Caution! Operations Systems Autonomous message mapping is
affected by this command.

You have selected the ent-tl1msgmap command with these parameters:

ACID = x
MessageType = x
Action = x          */

Execute? (y/n or CANCEL/DELeTe to quit) =
```


RELATED COMMANDS

ent-osacmap

dlt-osacmap

rtrv-osacmap

rtrv-tl1msgmap

NAME

ent-ulsdcc: Enter Upper Layer Section DCC

INPUT FORMAT

ent-ulsdcc:[**L3org**=*OrganizationID*][,**L3res**=*Reserved*][,**L3rou**=*RoutingData*];

DESCRIPTION**CAUTION:**

Execution of this command with parameters other than the default values at the directory services network element (DSNE) will disrupt all DCC communications. Errors in provisioning this command could result in silent alarm failures. Command parameters should *only* be changed by users who intend to provision the SONET subnetwork and partition DCC communications.

This command provisions parameters of Layers 3 through 7 of the open systems interconnection (OSI) 7-layer protocol stack. This stack refers to the OSI reference model which is a logical structure for network operations. This model defines a standard communication protocol between network elements as specified by the International Standards Organization (ISO).

This command is used to provision the user-settable fields of the Layer 3 network service access point (NSAP) address. The NSAP address is a 20-byte address required by OSI to provide unique identification within the OSI network. Each DDM-2000 is programmed with a unique NSAP address at the factory. For current software releases, only a single routing area can be supported and it is not possible to establish DCC connections between separate routing areas. Therefore, the default factory values are adequate to operate current networks. NSAP provisioning, using this command, will be used as part of future upgrade procedures. However, this command may be used now to change the user-settable portions of the NSAP to further uniquely identify the network element and to begin setting the addressing and routing structure of the SONET subnetwork. To facilitate future software upgrades, parameters should be set to the same values at each network element in the subnetwork.

**NOTE:**

If security is enabled, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

The input parameters are:

- L3org** OrganizationID is a 6-digit hexadecimal field used to provision into the NSAP address the allocated company code assigned by the *ANSI**-administered USA Registration Authority for OSI Organization Names. The original value for this parameter is 000000.
- L3res** Reserved is a 4-digit hexadecimal field that currently has not been assigned a specific purpose by the SONET standards. Users may populate this field to further uniquely identify the NSAP address. The original value for this parameter is 0000.
- L3rou** RoutingData is an 8-digit hexadecimal parameter that covers two logical fields of the NSAP address. They are:
- Routing Domain This field identifies a unique routing domain within an administrative domain.
- Area This field identifies the area within the routing domain to which the NSAP address belongs.
- The original value for this parameter is 00000000.

If an incorrect number of digits is entered for a specific parameter, the following message is issued and the user is reprompted:

```
/* Invalid data entry
   Enter a <num> digit hexadecimal number */
```

The <num> specifies four, six, or eight digits, as required.

* Registered trademark of the American National Standards Institute, Inc.

After entering this command, the following confirmation message is displayed:

```
/* Caution! Network Element access is affected by this command.  
  
Caution! When executed, this command causes the NE to  
restart the program. This action will erase all of  
the performance monitoring data and the history file.  
If possible, it will reinitialize the date and time with  
the far end via the DCC. Otherwise, the  
date and time will assume default values.  
You have selected the ent-ulsdcc command with these parameters:  
  
L3org = xxxxxx  
L3res = xxxx  
L3rou = xxxxxxxx */  
Execute? (y/n or CAnCel/DELeTe to quit) =
```

The full confirmation message is displayed if a change is made to any of the three parameters.

If the user enters the same parameter values as currently defined, the system does not reset. The following brief confirmation message is displayed:

```
/* Caution! Network Element access is affected by this command.  
You have selected the ent-ulsdcc command with these parameters:  
  
L3org = xxxxxx  
L3res = xxxx  
L3rou = xxxxxxxx */  
Execute? (y/n or CAnCel/DELeTe to quit) =
```

RELATED COMMANDS

rtrv-ulsdcc

NAME

help: Provide In-context Help

INPUT FORMAT

?

DESCRIPTION

Help (?) provides help within a craft dialog on the CIT. Help is provided automatically when an invalid input is entered and can also be requested at any time by typing "?". The "?" displays a help message and then displays another prompt.

The help message is either a description of format of the required entry or a menu of choices.

NAME

init-pm: Initialize Performance Monitoring (PM)

INPUT FORMAT

init-pm:reg=Register;

DESCRIPTION

This command initializes all current day and/or all current quarter-hour performance-monitoring storage registers. Registers for previous day and previous quarter-hours are not affected.

⇒ NOTE:

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

The input parameter is:

reg Register is the class of registers to be initialized and may be one of the following:

day Day registers

qh Quarter-hour registers

all Day and quarter-hour registers

RELATED COMMANDS

rtrv-pm-line

rtrv-pm-sect

rtrv-pm-sts1

rtrv-pm-t3

rtrv-pm-tca

NAME

init-sys: Initialize System

INPUT FORMAT

init-sys:*Address*;

DESCRIPTION**CAUTION:**

Execution of this command may affect service. The command **init-sys:all** should NOT be used on an in-service system. This command should only be used at the end of installation before system turnup.

This command initializes provisionable parameters to their default values. The time and date parameters are reset from the far end.

**NOTE:**

After entering the **init-sys** command, the system will show transient DCC failures that are recorded in the Alarm and History reports. This is a normal, expected system response.

The command **init-sys:all** should be used only at the end of installation before system turnup. The command **init-sys:sysctl** should only be used after a SYSCTL is replaced. To clear a system problem, the **reset** command should be used, since it resets the system software without changing the provisioned parameters except for the page parameter in **set-link**, which is reset to default value in this case.

**NOTE:**

This command is available to privileged users only.

The input parameter is:

Address Address determines whether just system controller parameters are initialized or whether all parameters on the entire system are initialized. Address may have the following values:

sysctl The address **sysctl** can be used after a system controller is replaced on an in-service system. It is the equivalent of pressing the UPD/INIT button within 10 seconds of the processor start-up sequence (while the CR LED on the user panel is flashing). This command restores the following list of parameters to their default values:

**NOTE:**

Parameters can be provisioned using the following commands listed below the parameters.

Alarm delays

set-attr-alm

NSAP

ent-ulsdcc

Security

set-lgn

set-passwd

set-secu

CIT link configuration

set-link

Protection Switching

(inhibit, forced, lockout, manual)

switch-fn

switch-line

switch-ls

switch-sync

Performance monitoring thresholds

set-pmthres-sect

set-pmthres-line

set-pmthres-t3

set-pmthres-sts1

set-pmthres-t1

set-pmthres-vt1

Environmental alarm names and alarm levels

set-attr-env

Environmental control names

set-attr-cont

Far-end communications enabled/disabled

set-fecom

STS-1 Trace Value

set-trace-sts1

Idle value, Alarm Group and AGNE

set-ne

ACID, VCType, SNPA

ent-osacmap

ent-tl1msgmap

all The address **all** is used only at the end of an installation before turning over the system. This ensures that all parameters in the system have the proper default values before any system-specific provisioning is done.

**CAUTION:**

The address **all** should NOT be used on an in-service system.

**NOTE:**

The **init-sys:all** command is available to privileged users only.

This parameter initializes all the parameters listed under **sysctl** PLUS the following:

Loopbacks

opr-lpbk-ec1**opr-lpbk-t1****opr-lpbk-t3**

Cross-connections

dlt-crs-sts1**dlt-crs-vt1****ent-crs-sts1****ent-crs-vt1**

OC-3 signal degrade threshold

set-oc3**set-ec1****set-sts1** (all rings releases)**set-vt1** (all rings releases)**set-oc1** (all rings releases)**set-ne**

Signal failure thresholds

set-ec1**set-state-ec1****set-t1****set-t3**

Protection Switching (manual)

switch-fn**switch-line****switch-ls****switch-sync**

Feature Options

set-feat

System name (TID)

set-ne

PMN

set-attr-alm

Site Id, NE Id and Shelf Id

set-ne

TBOS and CO/RT selection

set-ne

UserSide/NetworkSide settings on DCC

set-fecom

In addition to initializing parameters, entering the address **all** will clear all performance monitoring data and alarms. For failure conditions that still exist after parameters are initialized, the alarms will be redeclared. Time and date parameters are not affected by this command.

Executing an **init-sys:sysctl** with no TGS packs equipped will set the following parameters to default values:

Feature Options

Directory Services Network Element (DSNE)

System name (TID)

PMN

Site Id, NE Id and Shelf Id

TBOS Address

TBOS Enabled

TBOS link

CO/RT selection

UserSide/NetworkSide settings on DCC

DCC channel enable/disable

When the command **init-sys:sysctl** is entered, the following confirmation message will be displayed:

```
/* CAUTION!  
Execution of this command will set ALL parameters on the  
controller to their original default values.  
This may disrupt this system's operations interfaces.  
Refer to the DDM-2000 User/Service Manual before executing  
this command.  
  
Caution! When executed, this command causes the NE to  
restart the program. This action will erase all of  
the performance monitoring data and the history file,  
and reinitialize the date and time with the far end  
system.  
  
Proceed with EXTREME CAUTION!  
  
You have selected the init-sys command with these parameters:  
  
Address = sysctl */  
Execute? (y/n or CAncel/DElete to quit) =
```

⇒ NOTE:

Executing **init-sys:sysctl** may cause the system to respond with the following message: Parameters set to default values. This means that the circuit pack in a specified slot has failed or has been removed, and the parameters for ports associated with that slot have been set to their default values.

Entering the command **init-sys:all** will cause the following confirmation message to be displayed:

```
/* CAUTION!
```

```
THIS COMMAND SHOULD NEVER BE EXECUTED ON AN IN-SERVICE SYSTEM!
```

```
This command will set ALL parameters in the whole system  
to their original default values.  
This may result in a lengthy service outage and may disrupt  
this system's operations interfaces.
```

```
Caution! When executed, this command causes the NE to  
restart the program. This action will erase all of  
the performance monitoring data and the history file,  
and reinitialize the date and time with the far end  
system.
```

```
PROCEED WITH EXTREME CAUTION!
```

```
You have selected the init-sys command with these parameters:
```

```
Address = all */  
Execute? (y/n or CANCEL/DElete to quit) =
```

RELATED COMMANDS

reset

upd

NAME

ins-prog: Install Program

INPUT FORMAT

ins-prog: *TID*;

DESCRIPTION **NOTE:**

Starting with OC-3 Release 9.1, the function of this command has changed. Please read this command page carefully to understand how each software release operates.

For OC-3 Release 9.0 and Earlier Upgrades to Later Releases: **CAUTION:**

Normal alarming and protection switching are disabled for the *TID* specified while this command is in progress.

For OC-3 Release 9.0 and earlier, this command installs a new program into the system controller. This command supports a local program installation to a network element from a personal computer (PC) connected to the CIT port of the target system. The command **cpy-prog** is used to copy the system controller program from a local network element to a remote network element.

 NOTE:

This command cannot be executed during a remote login session.

This command also supports remote program installation to a DDM-2000 controller from a PC connected to the CIT port of another DDM-2000 system.

 NOTE:

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf. If security is not enabled on *all* shelves in the network, users on unsecured shelves will be able to install software that affects shelves with security enabled.

For OC-3 Release 9.1 and Later Upgrades to Later Releases:

Starting with OC-3 Release 9.1, the software to be installed may be a non-executing dormant copy of a software generic. When executing this command, the local network element will support local or remote program installation into the memory of the target network element where it will reside as a dormant copy.

The **apply** command is used later to overwrite the currently executing generic with a copy of the generic included in the dormant software.

⇒ NOTE:

This command cannot be executed during a remote login session.

OC-3 Release 9.1 and later releases also support a remote program installation to flash memory as standby copy from a PC connected to the CIT port of another DDM-2000 system.

⇒ NOTE 1:

This command must be executed from a PC with the program to be installed in its hard disk or on a set of floppy disks.

⇒ NOTE 2:

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf. If security is not enabled on *all* shelves in the network, users on unsecured shelves will be able to install software into the dormant memory of shelves with security enabled.

The input parameter for all software releases is:

TID The Target Identifier (system name) of the shelf into which the program will be loaded. TIDs are case insensitive.

If the command syntax is correct, the following message will be displayed:

```
/* Testing for program installation ... */
```

This command can only be completed successfully if it is executed from a CIT or modem port but not if it is received over the DCC. This command cannot be executed during a remote login session. If this command is executed during a remote login session, the following message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* This command cannot be executed from within a rlgn session. */
```

If the system name specified is unknown to the local system, the following error message will be displayed and the user will be asked to reenter the TID.

```
/* Unknown Target Identifier (TID) */
/* Enter the name (TID) of the local or far end system. */
TID=
```

If the system name specified currently has a duplicate TID alarm condition, the following denial message will be displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* Duplicate Target Identifier. */
```

If this command is not executed from a PC, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* PC communication link could not be established.
   Please connect PC with program to be installed and start again. */
```

If this command is used to install a program for a certain product type while the TID of the shelf into which the program will be loaded identifies a different product type (for example, a program to be installed is for DDM-2000 OC-3 product type, while the target product type is FT-2000), the request will be denied and the following message is displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* <TID> is a different product type;
   Incompatible software. */
```

If this command is used to install a program locally to a DDM-2000 but the PC contains DLC Subsystem program, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Incompatible program. */
```

If the communication link between the PC and the system that it connects to fails, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* PC communication link failure. */
```


To support remote program installation from a PC, the PC, the local system that the PC connects to, and the target system must be running compatible programs. To support local program installation from a PC, the PC, and the local (target) system that the PC connects to must be running compatible programs. If the programs are not compatible, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication protocol failure. */
```

For remote program installation, if the target system has a communication failure, has a "P" displayed in its SYSCTL 7-segment LED display, or does not support remote program installation from a PC, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication failure. */
```

If communication cannot be established when attempting to download software to a local site from a PC, the following message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication link cannot be established.
Please connect PC with DDM-2000 upgrade
program and start again. */
```

If a user attempts to download software that is incompatible with the shelf type (for example, DDM-2000 OC-12 software into a DDM-2000 OC-3 system), or controller type for OC-3 shelves equipped with BBG8/BBG9 controllers, the following denial message will be displayed:

```
SCSN
/* Status, invalid Command Sequence */
/* Incompatible Software */
```

For OC-3 Release 9.0 and earlier, when this command is used to download software in an upgrade for Release 9.0 or earlier to a local site from a PC or to download software to a remote site, the following confirmation message will be displayed after testing for program installation:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m. If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any other active CIT sessions.
This command will take time to install the new program. Check
the Software Release Description for the time estimates. */

Execute? (y/n or CANCEL/DELETE to quit) =
```

When upgrading software in OC-3 Release 9.1 and later, the following confirmation message will be displayed after testing for program installation:

```
/* Caution! Execution of this command will overwrite the current  
dormant generic (if any) at Target Identifier. */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

For OC-3 Release 9.0 and earlier, when this command is used to download a new release of software that is significantly different from software currently running on the remote system, or to download software to a local system from a PC where the software to be downloaded is significantly different from software currently running on the local system, the following confirmation message is displayed:

```
/* Caution! Execution of this command will erase the current  
generic n.n.n at Target Identifier and replace it with  
generic m.m.m. If this fails prior to completion,  
the control system will likely become inoperable  
until another install program attempt is successful.  
This command will terminate any other active CIT sessions.  
This command will take time to install the new program. Check  
the Software Release Description for the time estimates. */
```

```
/* Caution! Major changes exist between these two generics such  
that they may not be compatible. Check the TOPS and software  
compatibility information for additional information or actions  
needed. */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

For OC-3 Release 9.1 and later, when this command is used to download a new release of software (into the dormant memory of remote system) that is significantly different from software currently running on the remote system, or to download software into the dormant memory of a local system from a PC where the software to be downloaded is significantly different from software currently running on the local system, the following confirmation message is displayed:

```
/* Caution! Execution of this command will overwrite the current
dormant generic (if any) at Target Identifier. */

/* Caution! Major changes exist between these two generics such
that they may not be compatible. Check the TOPS and software
compatibility information for additional information or actions
needed. */

Execute? (y/n or CANCEL/DELETE to quit) =
```

When a user gives a positive response to the confirmation message, the following message is displayed:

```
In progress .....
```

The number of dots and how fast they are displayed depend on the size of the program to be installed, baud rate, and for remote program installation, number of DCC spans between the local and remote systems, and DCC traffic.

See "Install New Generic Program" in the TOP section (Volume 2) of this manual for complete instructions before using this command. Use the **rtrv-ne** or **rtrv-map-network** commands to obtain the exact TID for the system. The command **rtrv-eqpt** provides the current program version. The current program version may also be obtained from the initial screen and every report header line when logged into the system with a craft interface terminal (CIT). The current program version is also available on the user panel.

Each time a carriage return is entered, the system will also print a header line containing the TID and program version.

RELATED COMMANDS

rtrv-eqpt

rtrv-ne

NAME

logout: Terminate CIT Session

INPUT FORMAT

logout;

DESCRIPTION

This command terminates a user CIT session.

If this command is entered during a local session, it will terminate all sessions established by the user. If entered during a remote session, this command will terminate the remote session and return the user to the local session.

RELATED COMMANDS

rlgn

toggle

NAME

opr-aco: Operate Alarm Cutoff

INPUT FORMAT

opr -aco;

DESCRIPTION

This command silences the audible office alarms. Alarms remain silent until a new alarm condition arises.

If this command is executed while there is an active alarm condition in the system, it will:

- Silence active audible office alarms
- Light the alarm cut-off (ACO) LED on the user panel
- Set the parallel telemetry ACO output point
- Clear all parallel telemetry outputs except the system ID and ACO outputs.

This command is equivalent to pushing the ACO button on the user panel, activating the TBOS ACO control point, or activating the parallel telemetry ACO input.

For any DDM-2000 Multiplexer shelf in a network that has co-located DDM-2000 shelves (same *site* parameter settings), any one of the following actions will silence audible office alarms on all shelves at the same site:

- Pressing the ACO button
- Executing the OPR-ACO command
- Activating the parallel telemetry ACO input
- Setting the TBOS ACO control point.

NAME

opr-lpbk-ec1: Operate-Loopback-EC1

INPUT FORMAT

opr - lpbk-ec1:*Address[:lpbktype=LoopbackType];*

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command executes a loopback on a low-speed STS1E interface towards the optical fiber (terminal) or DSX (facility), as shown in Figure 11-8.

Both the terminal and facility loopback can be set at the same time. The loopback remains in place until it is released by the **rls-lpbk-ec1** command.

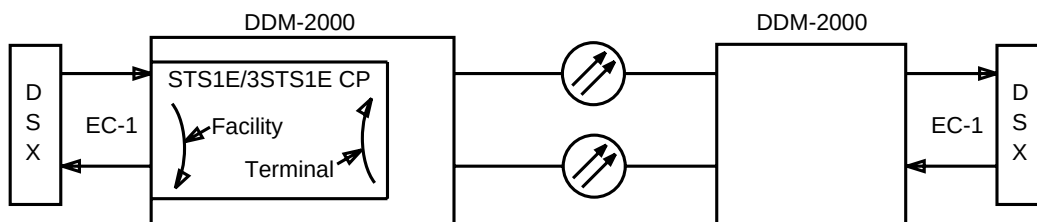


Figure 11-8. EC1 Loopback

The input parameters are:

Address Address of EC-1 port(s) to be looped back.
Valid EC-1 Port Addresses: **{a,b,c,all}**

lpbktype loopbacktype specifies whether the loopback is terminal or facility

terminal terminal loopback directed towards the high-speed facility. This is a default value.

facility facility loopback directed towards the DSX.

If a slot is determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Address not equipped for STS1E */  
/* Enter low-speed EC-1 port address: {a,b,c,all} */
```

If the command cannot be completed due to hardware problems on the SYSCTL, the following message is displayed:

```
/* SYSCTL failed - no loopback established */
```

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect service.  
You have selected the opr-lpbk-ec1 command with these parameters:  
  
Loopbacktype=loopbacktype  
Address=address */  
  
Execute? (y/n or CAnceL/DELeTe to quit) =
```

RELATED COMMANDS

rls-lpbk-ec1

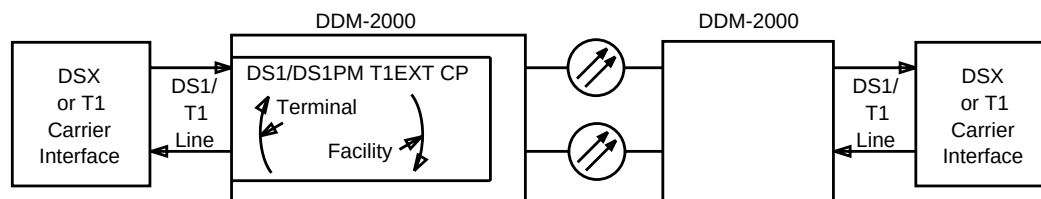
NAME

opr-lpbk-t1: Operate-Loopback-T1

INPUT FORMAT**opr - lpbk - t1:***Address[:lpbktype=LoopbackType];***DESCRIPTION****CAUTION:**

Execution of this command may affect service.

This command executes a loopback on a DS1 port. Also, beginning with OC-3 Release 11.1, this command executes a loopback on an "internal" DS1 port within a BBG20 TMUX circuit pack towards the optical fiber (terminal) or the DSX (facility) as shown in Figures 11-9 and 11-10. The loopback remains in place until released by the **rls-lpbk-t1** command. 11-9. The facility loopback is available in Release 9.1 and later releases. The loopback remains in place until released by the **rls-lpbk-t1** command.

**Figure 11-9. DS1 Loopback**

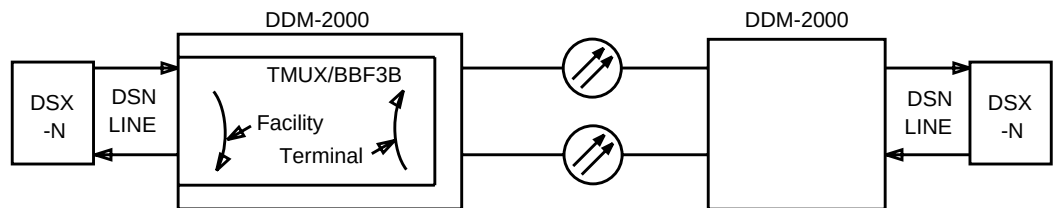


Figure 11-10. BBF3B/TMUX Loopback

The input parameters are:

- Address** Address of DS1 port(s) to be looped back.
 For a terminal loopback, valid addresses are:
all, {a,b,c}-all, {a,b,c}-{1-7}-{1-4,all}
- For a facility loopback, valid addresses are:
all, {a,b,c}-all, {a,b,c}-{1-7}-all
- For the TMUX (BBG20) or BBF3B circuit pack, valid addresses are:
all, {a,b,c}-all, {a,b,c}-{1-7}-{1-4,all}
- lpbktype** Loopbacktype specifies whether the loopback is terminal or facility.
 The valid values for this parameter are:
- terminal** Terminal loopback directed towards the high-speed facility. This is a default value.
- facility** Facility loopback directed towards the DSX. For the BBF1, BBF1B, and BBF3 circuit packs, operation of the loopback causes all four incoming DS1 signals to be looped back towards the DSX. This loopback type is available with Release 9.1 and later. In Release 11.1, individual DS1 facility loopback is supported for the BBF3B and also each one of the 28 DS1 signals on the TMUX (BBG20) circuit pack.

If the loopback type is not consistent with the address, the following denial message is displayed:

```
SNVS
/* Status, Not in Valid State */
/* loopback type is not consistent with the address. */
```

If the command cannot be completed due to hardware problems on the circuit pack, the following message is displayed:

```
/* Address CPname CP failed */
```

Address and *CPname* refer to the slot address and provisioned circuit pack type for the slot, respectively.

If a slot is in AUTO state or determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Slot is in AUTO state or Address is not equipped - no
   loopback established */
/* Enter DS1 port Address: */
```

If the command cannot be completed due to hardware problems on the SYSTCL, the following message is displayed:

```
/* SYSTCL failed - no loopback established */
```

If this command is invoked to establish other than an existing loopback type (that is, if a facility loopback is requested when a terminal loopback already exists or vice versa) for the same address, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Establishing new loopback type (facility/terminal) requires that
existing loopback type (terminal/facility) associated with this
address must be released. */
```

⇒ NOTE:

The above denial message is not applicable to the TMUX (BBG20) circuit pack. Both types of loopbacks can be active on the same DS1 address on this pack simultaneously. However, if the "all" AID is used, but one loopback of the opposite type exists, the command will be denied.

When input for a terminal loopback, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect the DS1
performance monitoring data and may affect service.
You have selected the opr-lpbk-t1 command with these parameters:

    Loopbacktype=loopbacktype
    Address=address */

Execute? (y/n or CAnCel/DElete to quit) =
```

When input for a facility loopback, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect the DS1 and VT
performance monitoring data and may affect service.
You have selected the opr-lpbk-t1 command with these parameters:
```

```
Loopbacktype=loopbacktype
Address=address */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rls-lpbk-t1

NAME

opr-lpbk-t3: Operate-Loopback-T3

INPUT FORMAT

opr - lpbk - t3:*Address*[:**lpbktype**=*LoopbackType*];

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command executes a loopback on a DS3 port towards the optical fiber (terminal) or DSX (facility), as shown in Figure 11-11. For OC-3 Release 11.1, a TMUX loopback is also available, as shown in figure 11-12.

The terminal and facility loopback cannot be set at the same time. The loopback remains in place until released by the **rls - lpbk - t3** command.

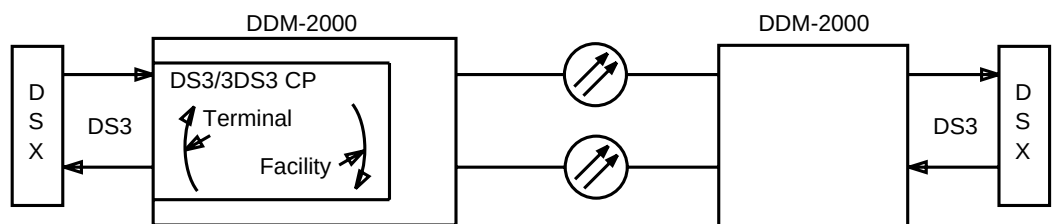


Figure 11-11. DS3 Loopback

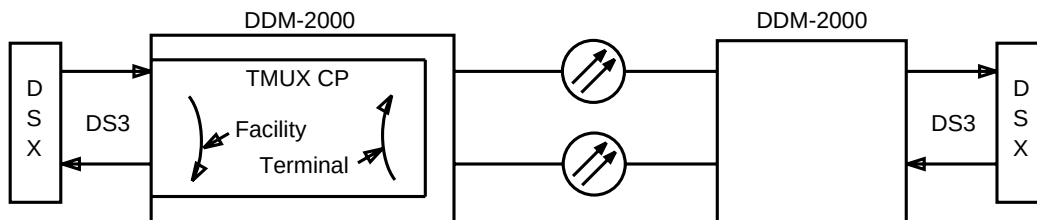


Figure 11-12. TMUX Loopback

The input parameters are:

- Address** Address of DS3 port(s) to be looped back.
Valid DS3 Port Addresses (BBG4, BBG4B, BBG20 TMUX):
{a,b,c,all}
Valid DS3 Port Addresses (BBG19): **all, {a,b,c}-{1-2,all}**
- lpbktype** loopbacktype specifies whether the loopback is terminal or facility
- terminal** terminal loopback directed towards the high-speed facility. This is a default value.
- facility** facility loopback directed towards the DSX.

If the loopback type is not consistent with the address, the following denial message is displayed:

```
SNVS
/* Status, Not in Valid State */
/* loopback type is not consistent with the address. */
```

If the command cannot be completed due to hardware problems on the circuit pack, the following message is displayed:

```
/* Address CPname CP failed */
```

Address and *CPname* refer to the slot address and provisioned circuit pack type for the slot, respectively.

If a slot is in AUTO state or determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Slot is in AUTO state or Address is not equipped - no
   loopback established */
/* Enter DS3 port Address: */
```

If the command cannot be completed due to hardware problems on the SYSCTL, the following message is displayed:

```
/* SYSCTL failed - no loopback established */
```

If this command is invoked to establish other than an existing loopback type (that is, if a facility loopback is requested when a terminal loopback already exists or vice versa) for the same address, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Establishing new loopback type (facility/terminal) requires that
existing loopback type (terminal/facility) associated with this
address must be released. */
```

⇒ NOTE:

The above denial message is not applicable to the TMUX (BBG20) circuit pack. Both types of loopbacks can be active on the same DS3 address on this pack simultaneously.

When input for terminal loopback, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect the DS3
performance monitoring data and may affect service.
You have selected the opr-lpbk-t3 command with these parameters:

Loopbacktype=loopbacktype
Address=address */

Execute? (y/n or CANCEL/DELeTE to quit) =
```

When input for facility loopback, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect the DS3
performance monitoring data and may affect service.
You have selected the opr-lpbk-t3 command with these parameters:

Loopbacktype=loopbacktype
Address=address */

Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rls-lpbk-t3

NAME

reset: Reset the System Software Program

INPUT FORMAT

reset;

DESCRIPTION**CAUTION:**

Execution of this command may affect performance-monitoring data.

This command resets the system software program. All history and performance-monitoring data is lost. All alarm information is lost and "rediscovered." The date and time are lost and "rediscovered" from the far end or set to default (**70-01-01** for date and **00:00:00** for time). No provisioning information is lost or changed, except for the *page* length parameter in **set-link**, which is reset to the default value.

An automatic date and time recovery process takes place by reading the date and time from the remote shelf connected to the main interface of the local shelf (in linear applications). In ring applications, the date and time data is recovered from the remote shelf connected to main-1 the local shelf.

**NOTE 1:**

Unlike other commands, an abbreviated version of this command name may not be entered. The user must type the complete command name when entering this command or the command request will be denied.

**NOTE 2:**

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

**NOTE 3:**

If a reset is done on any shelf, all adjacent shelves (shelves at the other ends of the optical interfaces that terminate on the shelf being reset) may show transient "section DCC channel failed" alarms. This is a normal system response.

When input, this command displays the following confirmation message:

```
/* Caution! When executed, this command causes the NE to
restart the program. This action will erase all of
the performance monitoring data and the history file.
If possible, it will reinitialize the date and time with
the far end system.
You have selected the reset command. */

Execute? (y/n or CANCEL/DELeTe to quit) =
```

During system start-up after reset or other initialization, the user who is connected to a CIT port cannot log in. When the user presses RETURN, the following message is issued:

```
/* System Initialization is in progress.
Try to log in again later. */
```

NAME

rlgn: Remote Login

INPUT FORMAT

r lgn: *TID*;

DESCRIPTION

This command establishes a remote login session via the SONET data communications channel (DCC). Any network element (NE) which is part of the same maintenance subnetwork and has a compatible product type may be accessed with this command.

The alarm and status report for the far end system is printed automatically when this command is executed.

The input parameter is:

TID TID is the target identifier (system name) of the desired remote shelf.

If the command is successfully completed and security is enabled the user will be prompted for login and password (similar to a local login session).

⇒ NOTE:

A remote login session may be terminated unexpectedly if a user elsewhere in the network enables or disables the DCC.

If a user attempts to login to a remote shelf where another remote session is already established, the following denial message will be displayed:

```
RNBY
/* Resource, Ne is BusY */
/* A remote session is not allowed.
   Try again later. */
```

In OC-3 Release 11.0 and earlier releases, if the far end is not communicating, the following denial message will be displayed:

```
/* No communication with the TID entered. */
```

In OC-3 Release 11.0 and earlier releases, if the far end communication request fails, the following denial message will be displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Far end communication failure. */
```

If a user is logged into a shelf and then tries to remotely login to the same shelf, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Local session already established.
   A remotd login to this TID is not allowed. */
```

If a user has toggled back to the local NE after establishing a remote session and tries to return to the remote session using this command, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Remote session already established.
   A second remote session is not allowed. */
```

If the user attempts to log into a system whose product type does not support remote logins from the local NE, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Remote session cannot be established.
   A remotd login to this product type is not allowed. */
```

If a nonprivileged user remotely logs into a remote NE through a DCC in **lockout** state, the following denial message will be displayed:

```
PIPW
/* Privilege, Illegal Password */
/* Access Blocked. */
```

If an unknown TID (or a TID that could not be found) is entered, the following message will be displayed and the user will be reprompted for the TID:

```
/* TID entered is not found. */
```

RELATED COMMANDS

logout

toggle

rtrv-map-neighbor

rtrv-map-network

NAME

rls-lpbk-ec1: Release-Loopback-EC1

INPUT FORMAT

rls-lpbk-ec1:Address[:lpbktype=LoopbackType];

DESCRIPTION

This command releases a previously established loopback on a low-speed STS1E interface.

The input parameters are:

Address Address of EC-1 port(s) where a loopback is to be released.
Valid EC-1 Port Addresses: **{a,b,c,all}**

lpbktype loopbacktype specifies whether the loopback is terminal or facility

terminal terminal loopback directed towards the high speed facility. This is a default value.

facility facility loopback directed towards the DSX.

If the user attempts to release a **facility** loopback type at a valid address when only a **terminal** loopback type has been established, or attempts to release a **terminal** loopback type at a valid address when only a **facility** loopback type has been established, the attempt will be denied and the following denial message displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Specified loopback does not exist. */
```

RELATED COMMANDS

opr-lpbk-ec1

NAME

rls-lpbk-t1: Release-Loopback-T1

INPUT FORMAT

rls-lpbk-t1:Address;

rls-lpbk-t1:Address[:lpbktype=LoopbackType];
(Release 11.1 and later)

DESCRIPTION

This command releases a previously established loopback on a DS1 or T1 port, or an "internal" DS1 port in a BBF3B or in a TMUX (BBG20) circuit pack in OC-3 Release 11.1 and later. Since establishing both types of loopbacks on the same address is allowed for the TMUX circuit pack, this command has been enhanced to include the type of loopback to be released.

The input parameters are:

Address Address of DS1 port(s) where a loopback is to be released.
For a terminal loopback, valid addresses are:

all, {a,b,c}-all, {a,b,c}-{1-7}-{1-4,all}

For a facility Loopback on the BBF3B in Release 11.1, valid addresses are:

all, {a,b,c}-all, {a,b,c}-{1-7}-{1-4,all}

For a facility loopback for DS1 ports on DS1 packs other than the BBF3B, valid addresses are:

all, {a,b,c}-all, {a,b,c}-{1-7}-all

For the TMUX (BBG20) pack in OC-13 Release 11.1 and later, valid addresses are:

all, {a,b,c}-all, {a,b,c}-{1-7}-{1-4,all}

lpbktype Loopbacktype specifies whether the loopback is terminal or facility. This parameter is only applicable to the BBF3B or the TMUX (BBG20) circuit pack in DDM-2000 OC-3 R11.1 and later releases. For DS1 or T1EXT circuit packs, this parameter is not used for these circuit packs.

terminal terminal loopback is directed towards the high speed facility. This is the default value.

facility facility loopback is directed towards the DSX.

For the TMUX (BBG20) circuit pack, if the user attempts to release a **facility** loopback type at a valid address when only a **terminal** loopback type has been established, or attempts to release a **terminal** loopback type at a valid address when only a **facility** loopback type has been established, the attempt will be denied and the following denial message will be displayed:

```
SR0F
/* Status, Requested Operation Failed */
/* Specified loopback does not exist. */
```

If the loopback type is not consistent with the address, the following denial message is displayed:

```
SNVS
/* Status, Not in Valid State */
/* loopback type is not consistent with the address. */
```

⇒ NOTE:

If the address "all" is used, the command will be denied if the loopback type is inconsistent with any existing loopback.

RELATED COMMANDS

opr-lpbk-t1

NAME

rls-lpbk-t3: Release-Loopback-T3

INPUT FORMAT

rls-lpbk-t3:Address;

rls-lpbk-t3:Address[:lpbktype=LoopbackType];
(Release 11.1 and later)

DESCRIPTION

This command releases a loopback on a DS3 port previously established by an **opr-lpbk-t3** command.

The input parameter is:

Address Address of DS3 port(s) where a loopback is to be released.
Valid DS3 Port Addresses (BBG4, BBG4B, and BBG20):
{a,b,c,all}

Valid DS3 Port Addresses (BBG19): **all, {a,b,c}-{1-2,all}**

lpbktype Loopbacktype specifies whether the loopback is terminal or facility.
This parameter is only applicable to the TMUX (BBG20) circuit pack in DDM-2000 OC-3 R11.1 and later releases. For BBG4/BBG4B/BBG19 circuit packs, only one type of loopback at a time is allowed on a given address.

terminal terminal loopback/f1 is directed towards the high speed facility. This is the default value.

facility facility loopback is directed towards the DSX-3.

For the TMUX (BBG20) circuit pack, if the user attempts to release a **facility** loopback type at a valid address when only a **terminal** loopback type has been established, or attempts to release a **terminal** loopback type at a valid address when only a **facility** loopback type has been established, the attempt will be denied and the following denial message will be displayed:

```
SR0F
/* Status, Requested Operation Failed */
/* Specified loopback does not exist. */
```

If the loopback type is not consistent with the address, the following denial message is displayed:

```
SNVS
/* Status, Not in Valid State */
/* loopback type is not consistent with the address. */
```

RELATED COMMANDS

opr-lpbk-t3

NAME

rstr-passwd: Restore Logins, Passwords, and User Types

INPUT FORMAT

rstr-passwd: *login,password,user_type,clr;*

DESCRIPTION **NOTE:**

This command is available to privileged users only.

This command is *only* used to restore the login, password (in encrypted and encoded form), and user type information from an external workstation into the network element (NE). The restored information is information that would have been previously loaded from the NE into the external workstation through the **rtrv-passwd** command.

This command is intended to be used *only* in expert mode by an external personal computer or workstation and not at a CIT.

The input parameters are:

login This is the login name that was established by the security administrator on the NE before the **rtrv-passwd** command was executed.

passwd This is the current encrypted and encoded password selected by the owner of the login before the **rtrv-passwd** command was executed.

user_type This is the user access class assigned to this login by the security administrator before the **rtrv-passwd** command was executed. This parameter may have one of the following values:

privileged

The privileged user may execute any commands including restricted commands.

general The general user may execute any commands that are not restricted to privileged users.

maintenance

The maintenance user may only execute commands that access the system, extract reports, and execute maintenance functions through a specific set of commands. No privileged commands are allowed to be executed by maintenance users.

reports-only

The reports-only user may only execute basic commands that extract reports from the system.

clr

This parameter indicates whether the login data existing on the NE should be deleted before the login, password, and user type information can be restored. This parameter may have one of the following values:

- clear** Clear the NE login file before restoring the login information (used only when *user_type* is privileged).
- noclear** Append the restored login information to the network element login file.

If this command is executed with the parameter **clr** set to **clear**, all login information in the NE login file will be cleared. Then the new login information is restored from the external workstation. However, all active login sessions will not be terminated.

Attempts to input invalid parameter(s) data will result in the user being denied execution of this command. The following denial message is displayed:

```
IDNV
/* Input Data Not Valid, invalid data entered. */
```

An invalid parameter indicates that either a login does not match the valid login definition, the length of the encrypted password (after decoding it into encrypted form) is invalid, a *user_type* is invalid (for example, a misspelled *user_type*), or a **clr** value is invalid (that is, other than clear or noclear).

If this command attempts to restore another login line when the NE's maximum number of supported logins is reached, the following denial message will appear:

```
SLEM
/* Status, List, Exceeds Maximum */
/* Maximum number of logins already exists.
  Cannot enter another login. */
```

If the user attempts to restore another **privileged** user when the maximum number of **privileged** users has already been reached, this attempt will be denied and the following message will be displayed:

```
SLOM
/* Status, List, Over Maximum allowed */
/* Maximum number of privileged users already exists. */
```

If an attempt is made to restore an already existing **privileged** user's login/password information with a *user_type* of either **general**, **maintenance**, or **reports-only**, this attempt is denied and the following message is displayed:

```
SDNC
/* Status, Data Not Consistent */
/* Privileged user logins cannot be restored as
   General, maintenance or Reports-only. */
```

If an attempt is made to restore a user's login/password information, with a *user_type* of either **general**, **maintenance** or **reports-only** and *clr=clear*, the attempt will be denied and the following message is displayed:

```
SDNC
/* Status, Data Not Consistent */
/* for clr=clear, user_type must be set to privileged. */
```

RELATED COMMANDS

rtrv-passwd

set-lgn

set-passwd

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

rtrv-alm[:**alm**=*AlarmLevel*];

DESCRIPTION

This command displays a report of active alarm and status conditions at the local network element. The report includes the source address of the alarm as well as date and time of the alarm, whether or not the condition is service-affecting, and a short description of the condition.

The input parameter is:

alm AlarmLevel for which a report is desired. This parameter may have one of the following values:

all (default)

cr

mj

mn

pmn

other (abnormal, ne-acty, status conditions)

Alarms are listed from greatest to least severity. Within a severity level, newer alarms are listed first.

⇒ NOTE:

Due to the large number of conditions reported, the RTRV-ALM report pages have been located at the end of this section for easier reference. Please refer to the RTRV-ALM table (Table 11-3) for a complete description of report outputs.

RELATED COMMANDS

rtrv-hsty

rtrv-ntalm

NAME

rtrv-attr-alm: Retrieve Attribute Alarm

INPUT FORMAT

rtrv-attr-alm;

DESCRIPTION

This command displays current alarm attributes, as provisioned by the **set-attr-alm** command.

The output report appears as follows:

```
/* System Alarm Attributes Report
=====
Alarm Delay (almdel)=almdel, Clear Delay (clrdel)=clrdel, PMN=pmn
*/
```

The output parameters are:

Alarm Delay	This shows the alarm holdoff delay in seconds for incoming signal and equipment failures. This parameter is an integer with a range of 0 through 30.
Clear Delay	This shows the alarm clear delay in seconds for equipment failures. This parameter is an integer with a range of 0 through 30.
PMN	PMN is the office alarm level to be raised during a power minor alarm condition. This parameter has the values MJ (major) or MN (minor) indicating the alarm level.

⇒ NOTE:

Incoming signal failure conditions, AIS, and FERF signals are subject to the provisionable alarm holdoff delay and a fixed 15-second clear delay. Yellow signals are not subject to holdoff or clear delays. Circuit pack failures (except control circuit pack failures) are subject to the provisionable alarm holdoff and clear delays.

RELATED COMMANDS

set-attr-alm

NAME

rtrv-attr-cont: Retrieve Attribute Control

INPUT FORMAT

rtrv-attr-cont[:*Address*];

DESCRIPTION

This command displays the provisioned name of miscellaneous discrete environmental control points, as set by the **set-attr-cont** command.

The input parameter is:

Address Address of the environmental control point. The default address is **cont-all**.

Valid Addresses: **cont-{1-4,all}**

The output report appears as follows:

```
/* Control Point Provisioning Report
=====
Address  Description
=====
cont-1   StartGenerator
cont-2   StartPump
cont-3   control3
cont-4   control4
*/
```

The output parameters are:

Address This is the address of the control point.

Description This is the provisioned description of the environmental control point.

 NOTE:

This command will be denied if it is entered in a system whose SYSCTL CO/RT parameter is set to CO (via the **set-ne** command). Use the **rtrv-ne** command to determine the switch setting. The following denial message will be displayed:

```
ENRI
/* Equipage, Not equipped for Retrieving specified Information */
/* Environmental controls can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-env

rtrv-ne

set-attr-cont

set-attr-env

NAME

rtrv-attr-env: Retrieve Attribute Environment

INPUT FORMAT

rtrv-attr-env[:*Address*];

DESCRIPTION

This command displays the provisioned alarm and provisioned name and provisioned alarm type of miscellaneous discrete environmental alarm/status points, as set by the **set-attr-env** command.

The input parameter is:

Address The address of the environmental input point.
Valid Addresses: **env-{1-21}**, **env-{all}** (default)

The output report appears as follows:

```
/* Environmental Alarm Provisioning Report
```

```
=====
```

Address	Alarm	Alarm Type	Description

```
=====
```

env-1	CR	MISC	Fire
env-2	NA	Power	OpenDoor
env-3	MN	code-7	environment3
.	.	.	.
.	.	.	.
.	.	.	.
env-15	MN	Misc	externalMinor
env-21	MN	Misc	generatorOn

```
*/
```

The output parameters are:

Address	The address of the environmental alarm/status point.

Alarm	Alarm is the provisioned alarm level of the environmental input and has the following values: CR Critical alarm MJ Major alarm MN Minor alarm NA Not alarmed, but reported
Alarm Type	This is the user-defined classification of the environmental alarm/status point.
Description	Provisioned description of the environmental alarm/status point.

 NOTE:

This command will be denied if it is entered in a system whose SYSCTL CO/RT parameter is set to CO (via the **set-ne** command). Use the **rtrv-ne** command to determine the switch setting. The following denial message will be displayed:

```
ENRI
/* Equipage, Not equipped for Retrieving specified Information */
/* Environmental alarms can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

rtrv-ne

set-attr-cont

set-attr-env

NAME

rtrv-crs-sts1: Retrieve Cross-Connection STS-1

INPUT FORMAT

rtrv-crs-sts1[:*Address*];

DESCRIPTION

This command retrieves STS-1 cross-connections within the DDM-2000 system. Cross-connections are entered using the **ent-crs-sts1** command.

For OC-3 linear releases, STS-3c cross-connections are possible between Main slots and FN-C slots, and will also be displayed in this report. The STS-3c mode must be set to **enabled** using the **set-oc3** command.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

STS-3c cross-connections are an optional feature that requires a special license from Lucent Technologies. See Chapter 8, "Administration and Provisioning," for additional information.

This report also indicates if any VT1.5 cross-connections exist. A VT1.5 cross-connection map report, obtained by using the **rtrv-crs-vt1** command, will show the specific VT1.5 cross-connections.

The input parameter is:

Address The address of one or more STS-1 channels for which cross-connections are to be reported. The default address is **all** STS-1 channels in the system.

Valid Linear Addresses: **all**, {**a,b,c**},
{**m,c**}-**{1-3,all}**, {**a,b**}-**{1-2,all}**

Valid Ring Addresses: **all**, {**m,c**}-**{1-3,all}**,
b-**{1,2,all}**, **a**-**{1,2,all}**

If the shelf is equipped with 24-type OLIUs in its Main units, the valid addresses are: **m**-**{1-12,all}**

The output report appears as follows:

/* Cross-Connection Map Report			
Address	Address	Cross Connect	Ring Id
1	2	Type	
-----STS-3C-----			
m-10	m-10	twoway	-
-----STS-1-----			
m-1	a	twoway	m1
m-2	b-1	twoway	-
m-3	VT1.5 Cross-Connection		
*/			

⇒ NOTE:

Starting with OC-3 Release 11.1, each cross-connection is reported only in one direction, not once for each direction.

The above report lists both STS-1 and STS-3c cross connections (if applicable) in separate sections. The output report shows the channels in an order that reflects the physical layout of the system (for example, the high-speed slots are shown first, followed by those associated with function unit A, function unit B, etc.).

Also the STS-3c section within the OC-3 report is applicable if the main unit slots are equipped with OC-12 interfaces (24G-U OLIU circuit packs).

The output parameters are:

Address 1 Address 1 is the address of an STS-1 channel.

Address 2 Address 2 is the address of an STS-1 channel.

Cross Connect Type

This parameter is available with all ring releases. This column specifies whether the cross-connection is two-way (**twoway**) or drop and continue (**dc**). Two-way cross-connections apply to terminating, hub, add/drop, pass-through, hairpin, 0x1 ring, and 0x1 DS3 configurations. For detailed information on the mentioned cross-connection types, refer to **ent-crs-sts1** command page.

Ring Id

This parameter is available with all ring releases. This column identifies the ring for drop and continue connections, specifying which ring will be continued as well as dropped at the network element. The valid values are **m1** and **m2**.

This report indicates if any VT1.5 or STS-3c cross-connections exist. A VT1.5 cross-connection map report, obtained by using the **rtrv-crs-vt1** command, will show the specific VT1.5 cross-connections.

RELATED COMMANDS

dlt-crs-sts1

ent-crs-sts1

rtrv-crs-vt1

NAME

rtrv-crs-vt1: Retrieve Cross-Connection VT1.5

INPUT FORMAT

rtrv-crs-vt1[:*Address*];

DESCRIPTION

This command retrieves VT1.5 signal cross-connections within a DDM-2000 OC-3 system, as set by the **ent-crs-vt1** command.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the output report for this command will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Following is the list of valid addresses:

Valid Linear Addresses:

{m,c}-{1-3,all}-{1-7,all}-{1-4,all},
{a,b}-{1,2}-{1-7,all}-{1-4,all},
{a,b,c}-{1-7,all}-{1-4,all}

Valid Ring Addresses:

m-{1-3,all}-{1-7,all}-{1-4,all},
{a,b,c}-{1-7,all}-{1-4,all},
a-{1,2,all}-{1-7,all}-{1-4,all}
c-{1-3,all}-{1-7,all}-{1-4,all},
b-{1,2,all}-{1-7,all}-{1-4,all}

If the shelf is equipped with 24-type OLIUs in its Main units, the valid Main unit Addresses are:

m-{1-12,all}-{1-7,all}-{1-4,all}

The output report appears as follows. Only existing ports or channels that are cross-connected will be displayed in the report.

```
/* VT1 Cross Connect Report
```

```
=====
Address 1      Address 2      Cross Connect      Ring Id
              Type
=====
m-1-7-4      c-2-7-1      twoway             -
m-2-1-2      c-1-1-2      twoway             m1
m-2-6-1      b-6-1        dc                 m2
m-2-6-3      b-6-3        dc                 m2
m-3-2-4      c-2-4-1      twoway             -
.            .            .                 .
.            .            .                 .
*/
```

⇒ NOTE:

Starting with OC-3 Release 11.1, each cross-connection is reported only once (not once in each direction).

The output parameters are:

Address 1 Address1 is the address of a VT1.5 channel or DS1 port.

Address 2 Address2 is the address of a VT1.5 channel or DS1 port.

Cross Connect Type

This parameter specifies the cross connection type. It also specifies whether the cross-connection is two-way, drop and continue (**dc**), or locked. Two-way applies to add/drop, hairpin and 0x1 ring configurations. In linear configurations, Twoway applies to hubbing, add/drop, point-to-point and pass-through cross-connections.

Ring Id This column identifies the ring for drop and continue, and locked connections.

The report shows the current state of VT1.5 cross-connections in the NE. When the address of multiple VT1.5 channels or DS1 ports are specified in the execution of this command, the report will show the addresses in the first column in numerical order reflecting the physical layout of the shelf.

The report will also indicate if any STS-1 cross-connections exist. An STS-1 cross-connection map report, obtained by using the **rtrv-crs-sts1** command, shows the specific STS-1 cross-connections.

RELATED COMMANDS

dlt-crs-vt1

ent-crs-vt1

rtrv-crs-sts1

rtrv-state-path

NAME

rtrv-ec1: Retrieve EC-1

INPUT FORMAT

rtrv-ec1[:*Address*];

DESCRIPTION

This command retrieves information about each EC-1 port. This information includes attributes set by the **set-ec1** command, as well as parameters set by switches on the circuit pack.

The input parameter is:

Address This is the address of one or more EC-1 ports. The default address is **all** EC-1 ports in the system.

Valid Addresses: **{a,b,c,all}**

The output report appears as follows:

/* EC1 Port Provisioning Report				
Port Address	CP Transmission Mode (hw)	Alarm Level	Signal Degrade Threshold	State
<i>address</i>	<i>mode</i>	<i>alarm</i>	<i>nn</i>	<i>state</i>
<i>address</i>	<i>mode</i>	<i>alarm</i>	<i>nn</i>	<i>state</i>
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
*/				

The output parameters are:

Port Address This column lists the address of one or more EC-1 ports.

CP Transmission Mode (hw)

This column reports the hardware provisioned transmission mode of the circuit pack that provides the EC-1 interface. The valid values are **High Speed** and **Low Speed**.

Alarm Level	This column shows the alarm level for an incoming EC-1 signal failure and may have one of the following values: <table><tr><td>CR</td><td>Critical</td></tr><tr><td>MJ</td><td>Major</td></tr><tr><td>MN</td><td>Minor</td></tr><tr><td>NA</td><td>Not Alarmed</td></tr></table>	CR	Critical	MJ	Major	MN	Minor	NA	Not Alarmed
CR	Critical								
MJ	Major								
MN	Minor								
NA	Not Alarmed								
Signal Degrade	This column shows a signal degrade threshold for the EC-1 port as a BER in terms of a logarithm to the base 10. The value may be an integer ranging from -9 through -5.								
State	This column shows the memory administrative state of the port. When the mode is set for High Speed, the state is always is (in-service). When the mode is set for Low Speed, the state may be one of the following values: <table><tr><td>is</td><td>In-service</td></tr><tr><td>auto</td><td>Automatic</td></tr><tr><td>nmon</td><td>Not Monitored</td></tr></table>	is	In-service	auto	Automatic	nmon	Not Monitored		
is	In-service								
auto	Automatic								
nmon	Not Monitored								

RELATED COMMANDS

set-ec1

NAME

rtrv-eqpt: Retrieve Equipment

INPUT FORMAT

rtrv-eqpt[:Address];

DESCRIPTION

This command displays the circuit pack type and version information for one or more slots on a network element (NE).

The input parameter is:

Address Address identifies one or more slot(s). The default is **all** slots.
Valid Slot Addresses: **all**, **main-{1,2,all}**, **fn-all**,
fn-{a,b,c}-{1,2,all}, **ls-all**, **tg-{1,2,all}**,
ls-{a,b,c}-{1-8,all}, **sysctl**, **auxctl**, **shelf**

A sample output report appears on the following page.

/* Equipage and Version Report

Slot Address	Circuit Pack	Apparatus Code	Series Number	CLEI Code	ECI Code	Serial Number
tg-1	TGS	BBF2B	S1:1	SNPQAJCAAA PID=AEKCG	680153	93MV01616399
tg-2	TGS	BBF2B?	S1:1?	SNPQAJCAAA? PID=AGAEC	680153?	92MV09625399
main-1	OLIU	22G-U	S1:1	SNTRFBXDAA	200320	94MV11057853
main-2	OLIU	22G-U	S1:1	SNTRFBXDAA	200320	94MV11057867
fn-a-1	MXRVO	BBG2	S2:2	SNCMAA2AAA	670744	92MV08488635
fn-a-2	MXRVO	BBG2	S1:1	SNCMAA0AAA	663642	90MV08461815
fn-b-1	MXRVO			SNCMAA2AAA	670?	
fn-b-2	MXRVO			SNCMAA2AAA	670Y	
fn-c-1	DS3	BBG4	S1:1	SNCLBBBAAA	663938	90MV11065997
fn-c-2	DS3			SNCLBBBAAC	681?	
ls-a-1	DS1	BBF1B	S3:4	SNCLAA1AAB	682891	92MV09578358
ls-a-2	DS1	BBF1B	S3:4	SNCLAA1AAB	682891	92MV09578358
ls-a-3	DS1	BBF1B	S3:4	SNCLAA1AAB	682891	92MV07648136
ls-a-4	-	-	-	-	-	-
ls-a-5	-	-	-	-	-	-
ls-a-6	-	-	-	-	-	-
ls-a-7	-	-	-	-	-	-
ls-a-8	DS1PM	BBF3	S1:1	SNPQAM4AAA	682269	92MV11637497
ls-b-1	-	-	-	-	-	-
ls-b-2	-	-	-	-	-	-
ls-b-3	-	-	-	-	-	-
ls-b-4	-	-	-	-	-	-
ls-b-5	-	-	-	-	-	-
ls-b-6	-	-	-	-	-	-
ls-b-7	-	-	-	-	-	-
ls-b-8	-	-	-	-	-	-
ls-c-1	-	-	-	-	-	-
ls-c-2	-	-	-	-	-	-
ls-c-3	-	-	-	-	-	-
ls-c-4	-	-	-	-	-	-
ls-c-5	-	-	-	-	-	-
ls-c-6	-	-	-	-	-	-
ls-c-7	-	-	-	-	-	-
ls-c-8	-	-	-	-	-	-
sysctl	SYSCTL	bbg8	S1:1	SNC11W0AAA	205700	94MV00000075
auxctl shelf	OHCTL	bbg9 ED-8C724-30,G3 or earlier	S1:1	SNC11VLAAA	205701	94MV00000049

Program version X.X.X

*/

The output parameters are:

Address	This is the address of the slot. An address of shelf requests information about the group id for the shelf.
Circuit Pack	Circuit pack is the mnemonic name that identifies the general type function provided by a circuit pack. For example, Optical Line Interface Units are all named OLIU; SYStem ConTrolLers are named SYSCTL.
Apparatus Code	Apparatus code uniquely identifies the specific function provided by a circuit pack. Circuit packs with different apparatus codes are not interchangeable even if they have the same name.
Series Number	This is used to indicate interchangeability among circuit packs with the same circuit pack name and apparatus code but different manufacturing versions. In general, a circuit pack can be replaced by another circuit pack that has the same apparatus code and the same or later series number.
CLEI Code	<i>CLEI</i> * code is the 10-character code identifying each circuit pack.
ECI Code	Equipment catalog item (ECI) code is a 6-character code identifying each circuit pack. This code corresponds to the bar-coded label on the faceplate of the circuit pack, and is uniquely equivalent to the <i>CLEI</i> code.
Serial Number	This is a 12-character code uniquely identifying each circuit pack and indicating the date and place of manufacture.
Program Version	Program version is the version of software that is currently stored on the circuit pack.
PID	Program identification code identifies the version of firmware on one or more socketed devices on the circuit pack.

The report always contains a line for every slot included in the range of the address whether or not the slot is equipped.

Hyphens (-) indicate information in that field is not applicable (that is, type and version information for slots that are not equipped).

Question marks (?) indicate that the information is unknown (for example, an unrecognized circuit pack, because the system is unable to read version information from a circuit pack inserted into a slot in the AUTO state)

* COMMON LANGUAGE is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

If an incorrect circuit pack is inserted in a slot, the report will show the expected circuit pack name for that slot and indicate that the current circuit pack does not match inventory.

If an unpowered circuit pack is placed in a slot, the report will indicate that the circuit pack is unpowered and version information is unavailable.

If the system cannot report complete and correct version information for a circuit pack because of a field upgrade, then the information that may be incorrect (apparatus code, series, *CLEI* code, and ECI code) is followed by a "?".

RELATED COMMANDS

rtrv-state

NAME

rtrv-feat: Retrieve Feature

INPUT FORMAT

rtrv-feat;

DESCRIPTION

This command retrieves a list of active feature options enabled by the **set-feat** command.

The output report appears as follows:

```
/* Feature Options Enabled Report
```

```
=====
```

Feature Option	Description

```
=====
```

<i>feature</i>	<i>description</i>
<i>feature</i>	<i>description</i>

.	.
.	.
.	.
.	.

```
*/
```

The output parameters are:

Feature Option This is the name of the feature currently enabled.

Description Description of the feature.

RELATED COMMANDS

set-feat

NAME

rtrv-fecom: Retrieve Far-end Communications

INPUT FORMAT

rtrv-fecom: [*Address*];

DESCRIPTION

This command displays the provisioned state of a network element's (NE's) section data communication channels (DCC), as set by the **set-fecom** command.

The DCC is an embedded overhead communications channel in the SONET line used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between NEs.

The input parameter is:

Address Address is the address of the DCC. The default value is **dcc-all**.

Valid Linear Addresses: **dcc-{m,a,b,c,all}**

Valid Ring Addresses: **dcc-{m1,m2,a,b,c,all}**

Valid OC-1 Ring Addresses (for 27-type OLIU):
dcc-{m,a,b,c}{1,2}-{1,2}

Valid OC-1 Ring Addresses (for 26G2-U OLIU):
dcc-{a,b,c}{1,2}-1

The far-end communication output report appears as follows:

```
/* Far End Communication Configuration Report
```

```
=====
DCC      Communications      DCC
Address      NS/US
=====
dcc-m      enabled      us
dcc-c      disabled     ns
dcc-b      disabled     ns
```

```
*/
```

The output parameters for this report are:

DCC/LAN Address	This column displays the address of a DCC.
Communication	This column shows whether communication over the DCC is enabled or disabled.
DCC NS/US	DCC network side/user side (NS/US) parameter settings are available with the BBG8 controller to identify the setting of each end of the DCC in the network element. This identification is needed for OSI communications and is required for all nodes in the subnetwork. To avoid alarms, only one end of a span may be designated as the user side and only one end of a span may be designated as the network side.

RELATED COMMANDS

rtrv-map-neighbor

rtrv-map-network

rtrv-x25

set-fecom

NAME

rtrv-hsty: Retrieve History

INPUT FORMAT

rtrv-hsty;

DESCRIPTION

This command displays an event-history report. This report contains a list of the most recent system events. This report will contain up to 500 events. The events are listed in last-in, first-out order, and are date- and time-stamped.

 NOTE:

Due to the large number of conditions reported, the RTRV-HSTY report pages have been located at the end of this section for easier reference. Please refer to the RTRV-HSTY table (Table 11-4) for a complete description of report outputs.

RELATED COMMANDS

rtrv-alm

NAME

rtrv-lgn: Retrieve Login

INPUT FORMAT

rtrv-lgn;

DESCRIPTION

This command retrieves login authorization information. This report lists each user's login and privileges. The report does not contain passwords.

⇒ NOTE:

This command is available to privileged users only.

The output report appears as follows:

```
/* Login Provisioning Report
```

```
=====
Login      User Type
=====
name       privileged
name       privileged
name       privileged
-----
name       general
.          .
.          .
-----
name       maintenance
.          .
.          .
-----
name       reports-only
.          .
.          .
*/
```

The output parameters are:

Login This column lists the login names.

User Type This column indicates the type of authorization each user is assigned. The valid values are **privileged**, **general**, **maintenance**, and **reports-only**.

Privileged logins are listed first in the report, followed by general logins, maintenance logins, and then reports-only logins. Each category of logins is separated by a row of hyphens.

**NOTE:**

There are always three (and only three) privileged logins on the DDM-2000 system.

RELATED COMMANDS

set-lgn

set-secu

rtrv-secu

NAME

rtrv-link: Retrieve CIT Link Configuration

INPUT FORMAT

rtrv-link;

DESCRIPTION

This command displays the currently-provisioned parameters for the user's craft interface link, as set by the **set-link** command. This includes the link which the user is logged into, the baud rate, and the page length of reports.

In OC-3 Releases 8.0 and 9.0 and later, the baud rate is set by autobaud and is not a provisionable parameter.

The output report appears as follows:

```
/* Interface Link Configuration Report
=====
Link=link, PageLength (pg)=pg, Baud=baud (auto)
*/
```

The output parameters are:

Link	Link identifies the CIT link from which the command was executed and may have the following values: cit-1 This indicates the front-access port. cit-2 The rear-access port. dcc-x A SONET DCC port used for remote access (dcc-m , dcc-a , dcc-b , or dcc-c).
PageLength	This is the number of lines displayed in one page of a report. Reports with a number of lines greater than one page will be paged.
Baud	Baud identifies the data rate for this link. For the BBG8 SYSTL, the CIT data rate is automatically set to agree with the terminal or workstation connected to the link. The (auto) after the data rate indicates that the data rate is set by the autobaud routine on the SYSTL circuit pack. After connecting to the CIT

port, press <enter><enter> or <CR><CR> (double carriage return) or "AA" or "aa" to allow the system to automatically set its baud rate to the rate of the terminal or workstation attached to the port.

RELATED COMMANDS

set-link

rtrv-ne

NAME

rtrv-map-neighbor: Retrieve Neighbor Map

INPUT FORMAT

rtrv-map-neighbor;

DESCRIPTION

This command displays network elements (NEs) that can be accessed by the local NE, and its immediate DCC neighbors.

The output report appears as follows:

```
/* Neighbor Map for local_system
```

```
=====
System Name      Connected      Link
(TID)            Through      Comm.
                  Status      Product
                  Type
=====
local_system
Site7NE1         main-1
Site3NE1         main-2         FAILED   FT-2000
*/
```

The above report contains one line for each neighbor system with which the local system is communicating via SONET section DCC. The local system name is listed first in the report.

⇒ NOTE:

If the local system is connected through a local area network (LAN) to a remote NE, the Neighbor Map report will not show the remote (LAN-connected) NE.

If multiple DSNEs are accidentally provisioned in a subnetwork, a warning message is displayed followed by the Neighbor Map report, which may display inaccurate information (for example, if this command is executed from a DSNE node, another DSNE and a NE might be listed as neighbors. If this command is executed from a non-DSNE node, a DSNE and another non-DSNE node might be listed as neighbor to the local system). In these events, the user must always check the **rtrv-alm** and **rtrv-map-network** reports for more details. In such cases, the output report might appear as follows:

```
/* Neighbor Map for local_system
```

```
=====
System Name      Connected   Link
(TID)           Through    Comm.
                        Status   Product
=====
```

```
-----
WARNING! The information displayed may be incomplete. Check
Rtrv-Alm report for further details.
-----
```

```
local_system      DDM-2000 OC-3
Site7NE1          main-1      FT-2000
Site3NE1          main-2      FAILED FT-2000
*/
```

The multiple DSNE situation is transparent in the above report (because the *NE Type* is not listed) and would have already created an alarm event. To recover from the above condition, the user must reprovision the incorrect DSNE as a non-DSNE, reset it, and obtain the **Network Map** report, which shows the *NE_Types* of NEs listed in the report. Furthermore, the user is reminded that if at a certain NE, the multiple DSNE situation is not detected, the warning message will not be displayed and the report will show that there is only a single DSNE. To avoid confusing situations, the user is encouraged to *always* check the **rtrv-alm** report.

In the event no DSNE is provisioned for a subnetwork or because of a DCC failure, none of the NEs in the subnetwork can be identified as a DSNE, and the Neighbor Map report appears as follows:

```
/* Neighbor Map for local_system
```

```
=====
System Name      Connected   Link
(TID)           Through    Comm.
                        Status   Product
=====
```

```
Notice: No DSNE can be identified; local system is displayed.
```

```
local_system      DDM-2000 OC-3
*/
```

The above situation must have already created an alarm event in the **rtrv-alm** report.

If the "DSNE not reachable" alarm condition exists, none of the NEs in the subnetwork can be identified as a DSNE.

When this condition exists, remote operations and the neighbor map reporting continue operating using the local last known good information. (Note the "Notice message" in the following report).

As a result of the above, the Neighbor Map report appears as follows:

```
/* Neighbor Map for local_system
```

```
=====
```

System Name (TID)	Connected Through	Link Comm. Status	Product Type

```
=====
```

Notice: No DSNE can be reached; last known information is displayed.

<i>local_system</i>			DDM-2000 OC-3
Site7NE1	main-1		FT-2000
Site3NE1	main-2	FAILED	FT-2000
*/			

⇒ NOTE:

When the DSNE is not reachable and the user changes TID on local NE, this local NE will complete the TID change request only locally. Other NEs within the same subnetwork will still recognize local NE under the old TID.

The above note applies to **rtrv-map-neighbor** and **rtrv-map-network** reports and the CIT remote operations.

The following sample report will be displayed for an NE that has a duplicate Site/NE parameter setting (the DSNE did not register the NE that it considered duplicate):

```
/* Neighbor Map for local_system
```

```
=====
System Name      Connected  Link
(TID)            Through    Comm.
                  Status    Product
                  Type
=====
```

```
Notice: No DSNE can be identified; local system is displayed.
```

```
local_system
*/
```

```
DDM-2000 OC-3
```

If the user were to run the rtrv-map-neighbor report from a certain node in a subnetwork after a DCC link failure condition, the local node's neighbor map report will not show the node at the other end of the failed DCC link.

The user is always encouraged to check the **rtrv-alm** report.

The output report parameters are:

System Name	This column contains the system name (or TID) of the local NE's direct DCC neighbors.
Connected Through	This column indicates the address of the OC-1 or OC-3 lines through which the local system is connected to the system identified in the System Name column.
Link Comm. Status	This column contains the word FAILED if there is a communication failure with the system identified in first line, first column of the report. If communication with the system identified as local NE is good, it is illustrated by a blank in this column.
Product Type	Product Type identifies the members of the Lucent Technologies 2000 Product Family that could be listed in this report. In larger subnetworks, various product families will interwork. The Lucent Technologies 2000 Product Family product types capable of interworking are listed after Table 11-1.

When the OC-3 shelf serves as a host to the DDM-2000 FiberReach Multiplexer, this will be reflected in the report. For example, if within the OC-1 host (OC-3 shelf), slot 1 in FN-a and slot 2 in FN-b were equipped with 27-type OLIU packs to be used in a dual-homed 0X1 ring application (where each one of the 27-type packs is being used to connect local host to a different DDM-2000 FiberReach wideband shelf node through FN-a-1-2 and FN-b-2-2 respectively), the report from the OC-3 host node will appear as follows:

```
/* Neighbor Map for NE1
```

```
=====
System Name      Connected      Link
(TID)            Through        Comm.
                  Status        Type
=====
NE1
NE2              fn-a-1-2        FiberReach
NE3              fn-b-2-2        FiberReach
NE4              main-1          FT-2000
NE5              main-2          FT-2000
*/
```

⇒ NOTE 1:

The **rtrv-map-neighbor** report may be incomplete if there are network elements with the same TBOS or Site/NE parameter settings. These duplicate parameter settings will cause an alarm to be raised. Refer to the TOP section (Volume 2) for additional information.

⇒ NOTE 2:

Any time local network element is unable to recognize its neighbor's TID, the neighbor map report will indicate this by showing a "?" under the TID column. Also, if the rest of the information (Connected Through, Link Comm. Status, and Product Type) is not known, each corresponding field or column will display a "?".

RELATED COMMANDS

rtrv-fecom

rtrv-map-network

rtrv-ne

set-fecom

set-ne

NAME

rtrv-map-network: Retrieve Network Map

INPUT FORMAT

rtrv-map-network;

DESCRIPTION

This command causes the display of all network elements (NEs) that are registered in the DSNE and can be accessed through DCC by the local NE.

The output report appears as follows:

```
/* Network Map for local-system
```

System Name (TID)	Comm. Status	Product Type	NE Type	Alarm Group
Site4NE1	FAILED	DACS IV-2000		56
local_system		DDM-2000 OC-3		3
Site3NE1		DDM-2000 OC-12		56
Site5NE1		FiberReach		201
Site6NE1		FiberReach		201
Site8NE1		FiberReach		201
Site9NE1		FiberReach		250
Site10NE1		FiberReach		250
Site11NE		FiberReach		250
Site7NE1		FT-2000	DSNE	3
*/				

The above report contains one line for each system with which the local system is communicating via the SONET section DCC. The local system name is listed first in the report.

⇒ NOTE:

NEs that are connected through LAN are also registered by the DSNE, and are listed in the Network Map report similarly to the DCC connected NEs. Furthermore, if communication fails with the LAN-connected NE(s), the corresponding Comm. Status column in the report will show a FAILED status.

If multiple DSNEs are accidentally provisioned for a subnetwork, a warning message is displayed followed by the Network Map report, which may display inaccurate information. (For example, if this command is executed from a DSNE node, multiple DSNEs and other NEs of the same subnetwork are listed.)

If this command is executed from a non-DSNE node, only one DSNE may be listed, along with non-DSNE nodes). If these events occur, the user must always check the **rtrv-alm** report.

The output report may appear as follows:

```

/* Network Map for local-system
=====
System Name      Comm.  Product      NE      Alarm
(TID)           Status Type          Type    Group
=====
-----
WARNING! The information displayed may be incomplete. Check
        Rtrv-Alm report for further details.
-----
Site4NE1          FAILED  DACS IV-2000          3
local_system      DDM-2000 OC-3         3
Site3NE1          DDM-2000 OC-12        3
Site6NE1          DDM-2000 OC-12       201
Site8NE1          FiberReach            201
Site9NE1          FiberReach            250
Site10NE1         FiberReach            250
Site11NE          FiberReach            250
Site5NE1          FT-2000              DSNE    201
Site7NE1          FT-2000              DSNE     3
*/

```

The above situation would have already created the "Duplicate DSNE" alarm event. To recover from the above (multiple DSNE) condition, the user must reprovision the incorrect DSNE as a non-DSNE and reset it. Furthermore the user is reminded that if at a certain NE the multiple DSNE situation is not detected, the warning message will not be displayed and the report will show that there is only a single DSNE. Again, to avoid confusing situations, the user is encouraged to *always* check the **rtrv-alm** report.

In the event no DSNE is provisioned for a subnetwork or (because of a DCC failure) none of the NEs in the subnetwork can be identified as a DSNE, the Network Map report appears as follows:

```

/* Network Map for local-system
=====
System Name      Comm.  Product      NE      Alarm
(TID)           Status Type         Type     Group
=====
Notice: No DSNE can be identified; local system is displayed.

local_system                DDM-2000 OC-3                3
*/

```

The above situation will have already created a corresponding alarm event. Check the **rtrv-alm** report. If the "DSNE not reachable" alarm condition exists, none of the NEs in the subnetwork can be identified as a DSNE. When this condition exists, remote operations and the network map reporting continue operating using their local last known good information. (Note the "Notice message" in the following report).

As a result of the above, the output report appears as follows:

```

/* Network Map for local-system
=====
System Name      Comm.  Product      NE      Alarm
(TID)           Status Type         Type     Group
=====
Notice: No DSNE can be reached; last known information is displayed.

local_system                DDM-2000 OC-3                3
Site3NE1                  DDM-2000 OC-12              56
Site5NE1                  FiberReach                  201
Site6NE1                  FiberReach                  201
Site8NE1                  FiberReach                  201
Site9NE1                  FiberReach                  250
Site10NE1                 FiberReach                  250
Site11NE                  FiberReach                  250
Site7NE1                  FT-2000                     DSNE      3
*/

```

⇒ NOTE:

When the DSNE is not reachable because of a "DSNE not reachable" condition and the user changes TID on local NE, the local NE will complete

the TID change request only locally. Other NEs within the same subnetwork will still recognize local NE under the old TID. This note applies to **rtrv-map-neighbor** and **rtrv-map-network** reports and the CIT remote operations.

The following sample report might be displayed for an NE that has a duplicate Site/NE parameter setting (the DSNE did not register the NE that it considered duplicate):

```

/* Network Map for local-system
=====
System Name      Comm.  Product      NE      Alarm
(TID)           Status Type          Type      Group
=====
Notice: No DSNE can be identified; local system is displayed.

local_system          DDM-2000 OC-3              3
*/

```

The output report parameters are:

System Name This column contains the system name (or TID) of the local system and other systems in the subnetwork.

Communication Status This column contains the word FAILED if there is a communication failure with the system identified in the first line, first column of the report. If communication with the system identified as local NE is good, it is illustrated by a blank in this column.

Product Type Product Type identifies the members of the Lucent Technologies 2000 Product Family that could be listed in this report. In larger subnetworks, various product families will interwork. The 2000 Product Family product types capable of interworking are listed at the beginning of this chapter after Table 11-1.

NE Type The possible value for this parameter is:
DSNE Specified for the NE designated by the user as the Directory Services Network Element.

Alarm Group Alarm Group is a set of NEs grouped together. Their alarms are reported through an NE (known as an alarm gateway network element [AGNE]) which is a member of the same Alarm Group. Valid values are 1

to 255. This parameter can have the value of "0", indicating that the corresponding NE belongs to no Alarm Group.

⇒ NOTE 1:

The **rtrv-map-network** report may be incomplete if there are network elements with the same TBOS parameter settings. These duplicate parameter settings will cause an alarm to be raised. Refer to the TOP section (Volume 2) for additional information.

⇒ NOTE 2:

Any time the local NE is unable to recognize a TID, the network map report will indicate this by showing a "?" under the TID column; also if the rest of the information is not known, each corresponding field or column will display a"?."

RELATED COMMANDS

rtrv-fecom

rtrv-map-neighbor

rtrv-ne

set-fecom

set-ne

NAME

rtrv-ne: Retrieve Network Element

INPUT FORMAT

rtrv-ne;

DESCRIPTION

This command displays the information that is provisioned by the **set-ne** command and set by switches on the SYSTCL pack. It also displays TIDs of the network elements currently provisioned to be alarm gateway network elements (AGNEs) and the directory services network element (DSNE) serving this local NE.

The output report appears as follows:

```
/* System Provisioning Report
=====
TID=system_name
Alarm Group=number
AGNE=yes/no
AGNE Address=TID1
AGNE Address=TID2    ****entry if more AGNEs exist****
GNE=active/not active
DSNE=yes/no
DSNE Address=TID
Crs Mode=default/manual
Site=number
NE=number
IDLE=ais/unequipped
Shelf=number
CO/RT Selector=location
TBOS:  Address=number
       Link=setting   (Link Active only if Selector = CO)
       Remote Reporting=setting
Product=value   (hw)
Dormant_Release=dormant_release
Apply:Action=action   Schedule:Date=date Time:time
*/
```

The (hw) after a parameter value indicates that the parameter is set by hardware switches on the BBG8 SYSTCL.

The output parameters are:

TID	This is the system name, indicated by a string of up to 20 alphanumeric characters. The default value for TID is that set by the site and NE values and is a string of the form "Site ~~m~~ NE ~~n~~ ". The TID must be unique for each element in a subnetwork.
Alarm Group	Alarm group is used to identify all network elements that should be sharing NE Status, alarm information and telemetry information with each other. For small networks of similar NEs, all NEs might be in the same alarm group. For larger applications such as DDM-2000 with FiberReach rings, one Alarm group might be assigned to DDM-2000 shelves and one or more different alarm groups might be assigned for FiberReach.
AGNE	AGNE indicates whether this system is an alarm gateway network element (AGNE) that provides the NE alarm status communications for all NEs in this alarm group. It has a value of yes or no.
AGNE Address	The AGNE Address is the target identifier (TID) of the AGNE for this alarm group. It can be the TID of this NE or any other NE in the alarm group. More than one NE can be an AGNE for backup reasons. If more than one AGNE exists for this alarm group, it is also listed here. AGNE Addresses for NEs in other alarm groups are not listed here. If an AGNE is not defined, this parameter is left blank.
GNE	The GNE field is used to identify whether this system is the gateway network element (GNE), providing TL1 interface. It has a value of either active or not active.
DSNE	The DSNE is used to identify whether this system is the Directory Services Network Element. There should be one and only one DSNE provisioned for a network. In mixed product networks, refer to the User/Service Manual for further instructions on DSNE provisioning.
DSNE Address	The DSNE Address is the target identifier (TID) of the DSNE. It can be the TID of this NE or any other NE in the subnetwork. If a DSNE is not defined, this parameter is left blank.
Crs Mode	Crs Mode is the cross-connect mode. The values may be default (original value) or manual for linear systems. In ring applications, this parameter is always set to manual.
Site	Site is the site address. The value is 1 through 64 (1-64).
NE	NE is the network element address (1-5).

IDLE	If value is <code>ais</code> , the system will insert an alarm indication signal toward the SONET line when channels are not cross-connected or not equipped with path terminating equipment. If value is <code>unequipped</code> , the system will insert the unequipped signal toward the SONET line when channels are not cross-connected or not equipped with path terminating equipment.	
Shelf	Shelf is the shelf address (1-8). It identifies the physical position of the shelf in a bay.	
CO/RT Selector	Two types of TBOS displays are provided to support central office and remote terminal applications. The CO/RT Selector identifies either a central office (CO) shelf or a remote terminal (RT) shelf to control the TBOS display formats and operation of the miscellaneous discrete points and fan control relays.	
TBOS:	Address	Address specifies the TBOS display address (1-8). This number identifies the TBOS display associated with a shelf and determines the TBOS poll to which a DDM-2000 will respond.
	Link	When multiple CO DDM-2000s are connected to the same TBOS link, this parameter is used to provision a backup function. The TBOS backup function assures that each DDM-2000 on the TBOS link is polled for its TBOS display even if one or more of the DDM-2000s fails to respond to the telemetry remote when polled. Link may be set to the following values:
	normal primary	The DDM-2000 has a TBOS link but does not provide any backup functions. Of the four shelves connected to the TBOS link, only one may be set to primary and only one may be set to secondary. The remaining two should be set to normal. The DDM-2000 serving as the primary TBOS backup will respond for any other DDM-2000 on the same TBOS link if the polled DDM-2000 fails to respond to the telemetry remote poll within 50 msec. The primary backup DDM-2000 will respond for the nonresponsive DDM-2000 by reporting TBOS point 59 (communications failure) and reporting all other TBOS points polled in the display as clear.

secondary The DDM-2000 serving as the secondary TBOS backup responds the same as the primary TBOS backup, except the secondary backup does not respond to polls for other DDM-2000s until about 100 msec after the poll is received. If after 100 msec neither the polled DDM-2000 or the primary backup DDM-2000 has responded to the telemetry remote poll, the secondary TBOS backup DDM-2000 will respond for the nonresponsive DDM-2000.

no TBOS link
No TBOS interface is directly connected to the shelf.

TBOS Remote Reporting

This parameter has the possible values of enabled and disabled. When the TBOS remote reporting is set to enabled, the shelf will report all its status and alarm conditions to other shelves via the SONET DCC. When the TBOS remote reporting is set to disabled, the shelf will not report its status and alarm conditions to other shelves. The disabled option is used when there are more than 8 DDM-2000 shelves in a SONET network.

Product

Product is a keyword that is set by switches on the BBG8 SYSCTL and the value of the SHELF ID pin (DDM shelf or ARM shelf) of the backplane to identify the product to be supported.

DDM-2000 OC-3

The shelf is part of a DDM-2000 network. The software also checked for the OHCTL and determined that the product is OC-3 (BBG9 or BBG10).

DDM-2000 OC-12

The shelf is part of a DDM-2000 network. The software also checked for the OHCTL and determined that the product is OC-12 (BCP4).

SLC-2000 ARM

The shelf is part of a *SLC*®-2000 Access System ARM network. The software also checked for the OHCTL and determined that the product is OC-3 (BBG9 or BBG10).

DDM-2000 FiberReach

The shelf is part of a FiberReach network. The OHCTL is not a part of the shelf.

MegaStar 2000

The shelf is part of a *MegaStar** 2000 network. The software also checked for the OHCTL and determined that the product is OC-3 (BBG10).

Dormant_Release

This parameter is reported starting with OC-3 Release 11.0. If a dormant software generic or release is currently stored by the network element, this parameter will report the release number in the form XX.XX.XX. The value of this parameter can be either one of the following:

XX.XX.XX A dormant software generic exists locally.

none No dormant software generic exists locally or the dormant software is corrupted.

Apply

If a software generic is currently stored by the network element, this value will indicate if/when a program installation is scheduled.

Action This parameter, listed after **Apply**, is reported starting with OC-3 Release 11.0. The valid values for **action** are **install** (indicating an installation is scheduled) or a blank, indicating no program installation is scheduled yet. If no program installation is scheduled yet, **Date** and **Time** will also be blank.

If a dormant software generic is currently stored by the network element, and the **apply** command is scheduled with **Action=cancel**, a blank is reported for **Action**. **Date** and **Time** will also be blank.

Schedule

This value indicates when a program installation is scheduled, and has the following parameters associated with it:

Date This parameter is reported starting with OC-3 Release 11.0. If the **apply** command is scheduled for program installation with **Action=install** on **Date=date**. This parameter is reported as a 6 digit YYMMDD.

* Registered trademark of Harris Corporation.

Time

This parameter is reported starting with OC-3 Release 11.0. if the **apply** command is scheduled for program installation with Action=**install**. This parameter is reported as HH:MM:SS

RELATED COMMANDS

rtrv-map-network

set-ne

NAME

rtrv-oc1: Retrieve OC1

INPUT FORMAT

rtrv-oc1[:*Address*];

DESCRIPTION

This command displays the configuration of OC-1 line(s), as set by the set-oc1 command.

The input parameter is as follows:

Address Address identifies the OC-1 line(s). The default is **all**.

Valid OC-1 Addresses (for 27-type OLIU): **all**, **main-all**,
main-{1,2}-{1,2}, **fn-all**, **fn-{a,b,c}-{1,2}-{1,2}**,
fn-{a,b,c}-all

Valid OC-1 Addresses (for 26G2-U OLIU): **fn-all**, **fn-**
{a,b,c}-{1,2}-1, **fn-{a,b,c}-all**

The output report appears as follows:

```
/* OC-1 Line Provisioning Report
```

```
=====
```

Line Address	Signal Degrade Threshold	AIS Alarm

```
=====
```

<i>address</i>	<i>n</i>	<i>alm</i>

<i>address</i>	<i>n</i>	<i>alm</i>

<i>*/</i>	<i>.</i>	<i>.</i>

The output parameters are:

Line Address Address of the OC-1 line.

Signal Degrade Threshold

This is the bit error rate (BER) threshold shown as a logarithm to the base 10. The value of n is an integer with a range of -5 through -9 corresponding to BERs of 10^{-5} through 10^{-9} , respectively.

aisalm

This parameter indicates the the provisioned alarm level of the NSA OC-1 line AIS and has the following values:

cr Critical alarm

mj Major alarm

mn Minor alarm

na Not alarmed, but reported (default).

RELATED COMMANDS

set-oc1

NAME

rtrv-oc3: Retrieve OC3

INPUT FORMAT

rtrv-oc3[:*Address*];

DESCRIPTION

This command displays the configuration of OC-3 lines, as set by the **set-oc3** command.

The input parameter is as follows:

Address Address identifies the OC-3 line(s). The default is **all**.
Valid Addresses: **all**, **main-{1,2,all}**,
fn-{a,b,c}-{1,2,all}, **fn-all**

The output report for Releases 8.0 and 9.0 appears as follows:

```
/* OC-3 Line Provisioning Report
```

```
=====
Line   Signal Degrade   Optical   Kbyte   Concat   AIS
Address Threshold   Power (hw) Message  Mode     Alarm
=====
address      n             x        message  mode     alm
address      n             x        message  mode     alm
.            .             .          .         .         .
.            .             .          .         .         .
*/
```


For OC-3 Release 8.1 and later linear releases, the output report appears as follows:

```
/* OC-3 Line Provisioning Report
```

```
=====
Line      Signal Degrade   Optical   Sync   Concat   AIS
Address   Threshold             Power (hw) Message  Mode    Alarm
=====
address    n                x      message  mode    alm
address    n                x      message  mode    alm
.          .                .          .      .      .
.          .                .          .      .      .
*/
```

For OC-3 Release 9.1 and later ring releases, the output report appears as follows:

```
/* OC-3 Line Provisioning Report
```

```
=====
Line      Signal Degrade   Optical   Sync   AIS
Address   Threshold             Power (hw) Message  Alarm
=====
address    n                x      message  alm
address    n                x      message  alm
.          .                .          .      .
.          .                .          .      .
*/
```

If this command is executed from a *MegaStar* 2000 shelf, the output report appears as follows:

/* OC-3 Line Provisioning Report						
Line Address	Signal Degrade Threshold	Optical Power (hw)	Kbyte Message	Concat Mode	AIS Alarm	Radio
1234567	12345678911234	1234567891	12345678	123456789	12345	123
<i>address</i>	<i>n</i>	<i>x</i>	<i>message</i>	<i>mode</i>	<i>alm</i>	<i>yes</i>
<i>address</i>	<i>n</i>	<i>x</i>	<i>message</i>	<i>mode</i>	<i>alm</i>	<i>no</i>
.	.	.	.	.	.	.
*/	.	.	.	.	.	.

The Radio parameter is visible only in *MegaStar* 2000 applications and with OC-3 linear releases. The Concat mode is only visible in linear DDM-2000 releases where the STS-3c mode has been enabled with the **set-feat** command.

The output parameters are:

Line Address Address of the OC-3 line.

Signal Degrade Threshold

This is the bit error rate (BER) threshold shown as a logarithm to the base 10. The value of *n* is an integer with a range of -5 through -9 corresponding to BERs of 10^{-5} through 10^{-9} , respectively.

Optical Power This is the current setting of the optical power switch on the OLIU circuit pack carrying the specified OC-3 signal. The (hw) after Optical Power indicates that the optical power setting is determined by a hardware switch on the OLIU circuit pack. This parameter may have the following values:

high High optical power

low Low optical power

— A hyphen indicates that optical power is not settable by switches on the OLIU circuit pack.

Kbyte Message	The valid values for this parameter are enabled , indicating that proprietary Sync messages are used, and disabled , indicating that proprietary Sync messages are not used. The Sync messages use the K2 byte in the SONET overhead to determine synchronization quality. These values are set by the set-oc3 command.
Sync Message	Beginning with OC-3 Releases 8.1 and 9.1, this parameter indicates the type of synchronization messaging that has been provisioned for that OC-3 optical interface by the set-oc3 command. The valid values for this parameter are Kbyte (default value), Sbyte , and disabled . The sync messages use the K2 byte or the S1 byte in the SONET line overhead to determine synchronization quality.
Concat Mode	This parameter is used in linear releases only. This report parameter is visible only if the STS3c mode is enabled via the set-feat command. This indicates if the addressed line is concatenated or not. The valid values are enabled and disabled . For OC-3, only function unit C slots can report concatenated values.
Radio	This parameter is available with linear releases only and is reported if this a <i>MegaStar</i> 2000 system. It has a value of yes or no , and it indicates whether there is a Radio Frequency Unit (RFU) connected to the SONET subsystem through an IS-3 interface.
AIS Alarm	This parameter specifies the alarm level of a non-service-affecting OC-3 line AIS failure condition. The valid values are: cr Critical alarm mj Major alarm mn Minor alarm na Not alarmed, but reported (default).

RELATED COMMANDS

rtrv-sync

NAME

rtrv-oc12: Retrieve OC12

INPUT FORMAT

rtrv-oc12[:*Address*];

DESCRIPTION

This command displays the configuration of OC-12 lines provisioned by the **set-oc12** command.

This command is available with OC-3 Release 11.0 and later.

The input parameter is as follows:

Address Address identifies the OC-12 line(s). The default is **all**.
Valid addresses: **all**, **main-b-{1,2,all}**

If the OC-3 shelf is equipped with 24-type OLIUs in its Main unit slots (in a ring application), the valid addresses are:
all (default), **main-{1,2,all}**

⇒ NOTE:

If slot 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

For OC-3 Release 11.0 and later ring releases, the output report appears as follows:

```
/* OC-12 Line Provisioning Report
```

```
=====
Line   Signal Degrade   Sync   AIS
Address Threshold   Message Alarm
=====
address      -n      message  alm
address      -n      message  alm
```

```
  .           .           .           .
  .           .           .           .
  .           .           .           .
```

```
*/
```

The output parameters are:

Line Address	Address of the OC-12 line.
Signal Degrade Threshold	This is the bit error rate (BER) threshold as a logarithm to the base 10. The value of n is an integer with a range of -5 through -9 corresponding to BERs of 10^{-5} through 10^{-9} . If a slot is empty or equipped with something other than an OC-12 optical unit, a hyphen (-) will appear in this column.
Sync Message	For OC-3 Release 11.0 and later ring releases, this parameter indicates the type of synchronization messaging that has been provisioned for that OC-12 optical interface by the set-oc12 command. The valid values for this parameter are Kbyte (default value), Sbyte, and disabled. The sync messages use the K2 byte or the S1 byte in the SONET line overhead to determine synchronization quality.
AIS Alarm	This parameter specifies the alarm level of a non-service-affecting OC-12 line AIS failure condition. The valid values are cr Critical alarm mj Major alarm mn Minor alarm na Not alarmed, but reported (default)

RELATED COMMANDS

set-oc3

set-oc12

NAME

rtrv-osacmap: Retrieve Operation Systems Application Context Map

INPUT FORMAT

rtrv-osacmap;

DESCRIPTION

This command displays the Operation Systems Application Context Map information that is created by the **ent -osacmap** command. This information provides association information between OS application contexts and X.25 channel assignments.

⇒ NOTE:

While this command is allowed at all network elements in the subnetwork, only the table at a GNE node is active.

The output report appears as follows:

```
/* OS Application Context Map Report
=====
VC Type  SNPA Address      ACID
=====
pvc      1              tl1_application_context
pvc      2              tl1_application_context
pvc      3              tl1_application_context
svc      address      tl1_application_context
svc      address      tl1_application_context
svc      address      tl1_application_context
*/
```

The above report shows allocation of PVCs for LCNs 1, 2, and 3. The other SNPA addresses contain some allocated SVCs.

⇒ NOTE:

The above report is sorted by the VC Type, and then by SNPA within the VC Type parameters.

The output parameters are:

VC Type VCType is the X.25 SubNetwork Virtual Channel Type. The valid values are:

PVC Permanent Virtual Circuit
SVC Switched Virtual Circuit.

SNPA Address

SNPA Address is the X.25 SubNetwork Point of Attachment address for the OS. It is either the Logical Channel Number (LCN) if VCType is *PVC*, or it is the Data Terminal Equipment (DTE) calling address (which is 1 to 15) digits if VCType is *SVC*.



NOTE:

Up to nine VCs can be mapped to any combination of PVCs and/or SVCs (that is, the allocation of PVCs can be removed and replaced by SVCs).

ACID ACID is a string of up to 23 alphanumeric characters, which is the Application Context ID to be assigned to a particular SNPA Address. Each OS has a value of ACID assigned. Default values exist for OS applications supported by DDM-2000. The supported applications types are:

t l1Maintenance
t l1MemoryAdministration
t l1Test
t l1CR
t l10ther1
t l10ther2.

When this command is entered at a node that is not an active GNE, the following caution message will be displayed before the report is printed:

```
/* Caution! This OS Application Context Map Report is not active.  
Only the map at a GNE is active. */
```

RELATED COMMANDS

ent-tl1msgmap

rtrv-tl1msgmap

ent-osacmap

dlt-osacmap

NAME

rtrv-ow: Retrieve Order Wire

INPUT FORMAT

rtrv-ow:

DESCRIPTION

This command reports the order wire routing and mode for this network element.

This command is only available with the BBG10 OHCTL circuit pack.

⇒ NOTE:

This command is only available with the *MegaStar* 2000 SONET subsystem.

The output report appears as follows:

```
/* Orderwire Routing Report */  
<valid message>
```

Valid messages for the output report include the following:

- order wire in pass through mode
- E1 drop connect to Main (func) (For OC-3 linear releases)
- E1 drop connect to Main-1 (Main-2) (For OC-3 rings releases)
- MUX drop connect to Main and func (For OC-3 linear releases)
- MUX drop connect to Main-1 and Main-2 (For OC-3 rings releases).

If this command is executed from a NE equipped with an OHCTL that does not support enhanced order wire, the request will be denied with the following message:

```
EQWT
/* Equipage Wrong Type */
/* BBG10 OHCTL needed. */
```

RELATED COMMANDS

set-ow

NAME

rtrv-passwd: Retrieve Passwords

INPUT FORMAT

rtrv-passwd;

DESCRIPTION

This command displays the logins, passwords (in encrypted form), and user type for all logins in the system. This command should *only* be used to back up this information to an external workstation.

Additional workstation software and the **rstr-passwd** command will be used to re-create this information on the network element when a new controller is installed.

⇒ NOTE:

This command is available to privileged users only.

The output report appears as follows:

```
/* Password Provisioning Report
=====
Login : Password : User Type :
=====
ATT01:08:sdfsdt-g:privileged:
ATT02:08:67&&8#1g:privileged:
ATT03:08:57s&8#1g:privileged:
DDM-2000:07:kds5-:general:
george:09:RVoc6*bQ1:maintenance:
pete:08:RTnu8*bB:reports-only:
*/
```

The output parameters are:

Login	The login name established by the security administrator.
Password	The length and current encrypted password selected by the user of the login.
User Type	The access class assigned to this login by the security administrator.

RELATED COMMANDS

rstr-passwd

rtrv-lgn

set-lgn

set-passwd

NAME

rtrv-pm-line: Retrieve Performance Monitoring Line

INPUT FORMAT

rtrv-pm-line:*Address*;

DESCRIPTION

This command displays performance-monitoring data associated with the OC-1, OC-3, OC-12 (with 24-type OLIUs in Main units), or EC-1 lines terminated on the system.

⇒ NOTE:

If Main slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the output report for this command will include data for what is considered at the time as the valid system pack type.

The input parameters are:

Address Address of the OC-1, OC-3, OC-12, or EC-1 lines.
 Valid OC-3 Line Addresses: **all**, **main-{1,2,all}**,
 fn-{a,b,c,all}-{1,2,all}
 Valid EC-1 Line Addresses: **a,b,c,all**
 Valid OC-1 Line Addresses (for 27-type OLIU): **all**, **main-all**,
 main-{1,2}-{1,2}, **fn-all**, **fn-{a,b,c}-all**,
 fn-{a,b,c}-{1,2}-{1,2}
 Valid OC-1 Line Addresses (for 26G2-U OLIU): **fn-all**,
 fn-{a,b,c}-all, **fn-{a,b,c}-{1,2}-1**
 If the shelf is equipped with 24-type OLIUs in its Main unit slots (in
 a ring configuration), the valid addresses are: **main-{1,2,all}**

For OC-3 Release 9.1 and earlier, the output report appears as follows:

```

/* Line Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
                   quarter hour registers at yy-mm-dd hh:mm:ss
=====
Address  Start  B2 CV  B2 ES  B2 ES  B2 ES  B2 SES  B2 UAS  PSC-L
        Time
=====
address  time    nn...  nn...  nn...  nn...  nn...  nn...  nn...
.        .      .      .      .      .      .      .      .
.        .      .      .      .      .      .      .      .
-----
address  time    nn...  nn...  nn...  nn...  nn...  nn...  nn...
.        .      .      .      .      .      .      .      .
.        .      .      .      .      .      .      .      .
*/

```

For OC-3 Release 11.0 and later releases the output report appears as follows:

```

/* Line Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
                   quarter hour registers at yy-mm-dd hh:mm:ss
456789112345678921234567893123456789412345678951234567896123456789712
=====
Address  Start  B2 CV  B2 ES  B2 ESA  B2 UAS  PSC-L  PJC
        Time      B2 SES  B2 ESB
=====
address  time    nn...  nn...  nn...  nn...  nn...  nn...
.        .      .      .      .      .      .      .
.        .      .      .      .      .      .      .
-----
address  time    nn...  nn...  nn...  nn...  nn...  nn...
.        .      .      .      .      .      .      .
.        .      .      .      .      .      .      .
*/

```

The output parameters are:

Address	This column shows the address of the monitored signal.
Start Time	This column indicates the time on the system clock when the data collection started.
B2 CV	This parameter shows the number of coding violations for the data collection interval that started at the time reported in the previous column.
B2 ES	This parameter shows the number of errored seconds in the data collection interval.
B2 SES	This parameter shows the number of severely errored seconds.
B2 ESA	This parameter shows the number of Type A errored seconds in the data collection interval. A Type A errored second is a second with a single error.
B2 ESB	This parameter shows the number of Type B errored seconds in the data collection interval. A Type B errored second is a second with more than one error but less than the number of errors in a severely errored second. An OC-1 severely errored second contains 12 or more errors. An OC-3 severely errored second contains 32 or more errors. An OC-12 severely errored second contains 124 or more errors.
B2 UAS	This parameter shows the number of unavailable seconds.
PSC-L	This parameter shows the number of protection switches from this line. This parameter does not apply to EC-1 lines.
PJC	This parameter is applicable to OC-3 R11.0 and later. This parameter shows the number of outgoing STS pointer justifications not caused by incoming STS pointer justifications. An accumulation of STS pointer justifications indicates a possible frequency error on the incoming line or a frequency error in the timing reference selected by the shelf.

 NOTE:

Rows that are all zeros are not printed, except for the current day and current quarter, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the OLIU/EC-1 circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

rtrv-pmthres-line

set-pmthres-line

NAME

rtrv-pm-sect: Retrieve Performance Monitoring Section

INPUT FORMAT

rtrv-pm-sect:*Address*;

DESCRIPTION

This command displays performance-monitoring data associated with the OC-3 and OC-12 (if shelf is equipped with 24-type OLIUs in Main unit slots) optics and the STS-1 (within an OC-1 line only), STS-3, and STS-12 (if shelf is equipped with 24-type OLIUs in Main unit slots) section.

 NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address of the OC-1 or OC-3 or OC-12 (if shelf is equipped with 24-type OLIUs in Main unit slots) line(s). The address **all** may be used to retrieve all performance-monitoring information.

Valid OC-3 Line Addresses: **all**, **main-{1,2,all}**,
fn-{a,b,c,all}-{1,2,all}

Valid OC-1 Line Addresses (for 27-type OLIU): **all**, **main-{1,2}-{1,2}**,
main-all, **fn-{a,b,c}-all**, **fn-{a,b,c}-{1,2}-{1,2}**,
fn-all

Valid OC-1 Line Addresses (for 26G2-U OLIU): **fn-{a,b,c}-all**,
fn-{a,b,c}-{1,2}-1, **fn-all**

If the shelf is equipped with 24-type OLIUs in its Main unit slots, the valid addresses are: **main-{1,2,all}**.

The output report appears as follows:

```

/* Optics and Section Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
                   quarter hour registers at yy-mm-dd hh:mm:ss
=====
Address  Start  Transmit  Transmit  Laser  SEFS
        Time   Pwr -1dB   Pwr -2dB   Bias
              TCA      TCA      TCA
=====
address  time    aaa      aaa      aaa      nnn
.        .      .        .        .        .
.        .      .        .        .        .
-----
address  time    aaa      aaa      aaa      nnn
.        .      .        .        .        .
.        .      .        .        .        .
*/

```

The output parameters are:

Address	This indicates the address of the OC-1, OC-3, or OC-12 line (if equipped with 24-type OLIUs in both Main unit slots).
Start Time	This indicates the time on the system clock when the data collection started.
Transmit Power -1dB	This column shows whether a -1 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack, and has a value of yes or no .
Transmit Power -2dB	This column shows whether a -2 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack, and has a value of yes or no .
Laser Bias	This column indicates the TCA of the OLIU laser bias threshold setting. This parameter applies only to the 21G circuit packs.
SEFS	This column displays the number of severely errored frame seconds.

 NOTE:

Rows that are all zeros or "no's" are not printed except for current day and current quarter hour, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition or the parameter is not applicable for current equipage.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the OLIU circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

rtrv-pmthres-sect

set-pmthres-sect

NAME

rtrv-pm-sts1: Retrieve Performance Monitoring STS-1

INPUT FORMAT

rtrv-pm-sts1:*Address*;

DESCRIPTION

This command reports path performance-monitoring data associated with STS-1 signals terminating on the network element. For most STS-1 cross-connected paths, data is collected on the active path of the signals and only the active path is reported. For STS-1 cross-connections, path termination exists if one of the interfaces is not SONET (for example, a BBG4B DS3 interface). Starting with OC-3 Release 11.0, data is collected on both STS-1 ring paths connected to BBG19 DS3 circuit packs, and both paths are reported.

For all VT1.5 cross-connections, there is an STS-1 path that is terminated. For OC-1, OC-3, and OC-12 ring applications, data is collected on *both* STS-1 ring paths and both paths are reported.

For the STS1E high-speed interface, path performance-monitoring data is collected also. Signal names are the default signal assignments based on equipage.

This command extends STS-1 performance monitoring from STS-1 termination points to all STS-1 signals, whether terminated, passed-through, or dropped.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address This parameter identifies the address of STS-1 channels. It is the address of the incoming STS-1 signal before it is cross-connected.

Valid Linear Addresses:

**all, {m}-{1-3,all}, {a,b}-{1-2,all},
c-{1-3,all}**

(to OLIU with VT1.5 cross-connections *or* to OLIU from DS3, MXRVO, or TMUX)

all, {a,b,c}

(to STS1E with VT1.5 cross-connections *or* to STS1E from DS3, TMUX, or MXRVO *or* to high-speed STS1E with low-speed DS1)

Valid Ring Addresses:

all, {m1,m2}-{1-3,all}

(to OC-3 OLIUs in main slots with VT1.5 cross-connections or STS-1 cross-connections to BBG19 DS3 packs)

If the shelf is equipped with 24-type OLIUs in its Main unit slots, the valid ring Addresses are:

all, {m1,m2}-{1-12,all}

(to 24-type OLIUs in main slots with VT1.5 cross-connections or STS-1 cross-connections to BBG19 DS3 packs)

{m1,m2}-{1,2}

(to 27-type OLIUs in main slots with VT1.5 cross-connections or STS-1 cross-connections to BBG19 DS3 packs)

{a,b,c}{1,2}-{1,2}

(to 27-type OLIUs in FN slots)

{a,b,c}{1,2}-1

(to 26G2-U OLIUs in FN slots)

{a,b}-{1-2,all}, c-{1-3,all}

(to 22-type OLIU with VT1.5 cross-connections)

all, m-{1-3,all}, {a,b}-{1-2,all},**c-{1-3,all}**

(to OLIU from BBG4B DS3, MXRVO)

all, {a,b,c}

(to STS1E with VT1.5 cross-connections or to STS1E from BBG4B DS3, MXRVO)

⇒ NOTE:

For most ring STS-1 cross-connections, the address "m" is the active path just as "m" in linear systems is the active path.

The output report appears as follows:

```

/* STS-1 Path Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
                   quarter hour registers at yy-mm-dd hh:mm:ss
=====
Address  Start   B3 CV   B3 ES   B3 ES   B3 ES   B3 SES   B3 UAS
        Time
=====
address  time    nn...   nn...   nn...   nn...   nn...   nn...
.        .      .      .      .      .      .      .
.        .      .      .      .      .      .      .
-----
address  time    nn...   nn...   nn...   nn...   nn...   nn...
.        .      .      .      .      .      .      .
.        .      .      .      .      .      .      .
*/

```

The output parameters are:

Address	This column shows the address of the monitored signal.
Start Time	This column indicates the time on the system clock when the data collection started.
B3 CV	This column shows the number of coding violations.
B3 ES	This column shows the number of errored seconds.
B3 ES Type A	This column shows the number of Type A errored seconds. A Type A errored second is a second with a single error.
B3 ES Type B	This column shows the number of Type B errored seconds. A Type B errored second is a second with more than one error but less than the number of errors in a severely errored second.
B3 SES	This column shows the number of severely errored seconds. A severely errored second contains 9 or more errors.
B3 UAS	This column shows the number of unavailable seconds of service. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred.

⇒ NOTE:

Rows that are all zeros are not printed except for current day and current quarter hour, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the DS3, EC1, OLIU or MXRVO circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-tca

rtrv-pmthres-sts1

set-pmthres-sts1

NAME

rtrv-pm-t1: Retrieve Performance Monitoring T1

INPUT FORMAT

rtrv-pm-t1:Address;

DESCRIPTION

This command displays the parameter data associated with one or more DS1 signals passing through the system and is available only if the DS1 performance monitoring feature is set via the **set-feat** command.

In OC-3 Release 9.1 and later releases, quarter-hour registers are available for DS1 PM, in addition to daily registers.

The input parameter is:

Address Address is the address of DS1 ports.

Valid Addresses:

all, {a,b,c}-{1-7,all}-{1-4,all}

The output report appears as follows:

```

/* DS1 Path Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
=====
Address  Start   ES-L    CV-P    ES-P    SES-P    UAS-P
Time     CV-PFE  ES-PFE  SES-PFE UAS-PFE
=====
address  time     n       n       n       n       n
address  time     n       n       n       n       n
.         .       .       .       .       .       .
.         .       .       .       .       .       .
.         .       .       .       .       .       .

```

The output parameters are:

Address This shows the address of the DS1 signal.

Start Time This indicates the time on the system clock when the data collection started.

ES-L This indicates the number of errored second line (ES-L) counts during the data collection interval that started at the time reported in the second column.
This column does not apply to the TMUX (BBG20) circuit packs in OC-3 R11.1 and later releases. For the DS1 ports on this

	pack, this column will be blank.
CV-P	This indicates the number of path coding violations (CV-P) during the data collection interval that started at the time reported in the second column.
ES-P	This indicates the number of errored second path (ES-P) counts during the data collection interval that started at the time reported in the second column.
SES-P	This indicates the number of severely errored second path (SES-P) counts during the data collection interval that started at the time reported in the second column.
UAS-P	This indicates the number of unavailable second path (UAS-P) counts during the data collection interval that started at the time reported in the second column.
CV-PFE	This indicates the number of far-end path coding violations (CV-PFE) during the data collection interval that started at the time reported in the second column.
ES-PFE	This indicates the number of errored second path far-end (ES-PFE) counts during the the data collection interval that started at the time reported in the second column.
SES-PFE	This indicates the number of severely errored second path far-end (SES-PFE) counts during the data collection interval that started at the time reported in the second column.
UAS-PFE	This indicates the number of unavailable second path far-end (UAS-PFE) counts during the data collection interval that started at the time reported in the second column.

⇒ NOTE 1:

There are two rows of output for each address. The first row reports ES-L and near-end parameters. The second row reports far-end parameters.

⇒ NOTE 2:

Rows that are all zeros are not printed except for current day, which is always printed.

⇒ NOTE 3:

In OC-3 Release 9.1 and later, rows that are all zeros are not printed except for current quarter-hour and current day, which are always printed. Any rows containing partial counts will always be printed as well.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the DS1 circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

This command may only be used if the **ds1pm** feature is enabled via the **set-feat** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available, feature disabled */
```

If this command is entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available in this release */
```

RELATED COMMANDS

init-pm

rtrv-feat

rtrv-pmthres-vt1

set-feat

NAME

rtrv-pm-t3: Retrieve Performance Monitoring T3

INPUT FORMAT

rtrv-pm-t3:Address;

DESCRIPTION

This command displays performance-monitoring data associated with one or more DS3 signals passing through the system. This report is enhanced to display the performance monitoring data for the DS3 line and path incoming from the DSX-3, in addition to the previously displayed data for the DS3 path incoming from the fiber.

The line and path PM data from the DSX-3, as well as all near-end and far-end C-bit parity PM data are available ONLY when a BBG4B or BBG19 (in Release 11.0 and later) pack is active (in-service) in a function unit slot. When a function unit slot is equipped with one of these new circuit packs, the DS3 line performance monitoring data will always be displayed regardless of what type of mode the DS3 service has been provisioned for. If the *clear channel (cc)* mode is selected, the report will display the DS3 line PM data and dash lines (-) for both directions of all DS3 path PM data.

The input parameters are:

Address Address of the DS3 signal(s).
Valid DS3 Port Addresses (BBG4, BBG4B, BBG20):
{a,b,c,all}

Valid DS3 Port Addresses (BBG19):
all, {a,b,c}-{1-2,all}

The output report appears as follows:

/* DS3 Performance Monitoring Status Report							
Last initialized: day registers at yy-mm-dd hh:mm:ss							
quarter hour registers at yy-mm-dd hh:mm:ss							
Address	Type	Start	SEFS	CV	ES	SES	UAS
	Direction	Time					
address	line	time		n	n	n	
	dsx-p		n	n	n	n	n
	dsx-pfe		n	n	n	n	n
address	fiber-p		n	n	n	n	n
	fiber-pfe		n	n	n	n	n
*/							

The output parameters are:

Address	This shows the address of the DS3 signal incoming from the DSX-3 or the fiber.
Type Direction	This shows the type of the PM data (line, path, path far-end) and the direction from which the signal is received (dsx-3 or fiber). For the TMUX (BBG20) circuit pack in OC-3 release 11.1 and later, only the dsx-3 direction will be applicable.
Start Time	This indicates the time on the system clock when the data collection started. The parameters are reported as a combination of their type and direction from which they are received. For <i>line</i> parameters, refer to CV-L, ES-L, and SES-L definitions. For <i>dsx-p</i> and <i>fiber-p</i> parameters, see SEFS, CV-P, ES-P, SES-P, and UAS-P definitions. For far-end <i>dsx-pfe</i> and <i>fiber-pfe</i> path parameters, refer to SEFS, CV-PFE, ES-PFE, SES-PFE, and UAS-PFE definitions.
CV-L	This indicates the number of B3ZS coding violations occurring over the accumulation period for the DS3 signal incoming from the DSX-3.
ES-L	This indicates the number of seconds with at least one B3ZS coding violation or LOS for the DS3 signal incoming from the DSX-3.
SES-L	This indicates the number of seconds with greater than 44 B3ZS coding violations or LOS for the DS3 signal incoming from the DSX-3.
SEFS	This indicates the number of out of frame seconds or AIS seconds for the DS3 signal incoming from the DSX-3 or the fiber.

CV-P	This shows the number of P-bit, adjusted F&M bit, or C-bit parity coding violations for the DS3 signal incoming from the DSX-3 or the fiber.
ES-P	This shows the number of path errored seconds for the DS3 signal incoming from the DSX-3 or the fiber.
SES-P	This shows the number of path severely errored seconds for the DS3 signal incoming from the DSX-3 or the fiber. A severely errored second contains 44 or more errors.
UAS-P	This shows the number of path unavailable seconds of service for the DS3 signal incoming from the DSX-3 or the fiber. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred.
CV-PFE	This shows the number of FEBE bits path coding violations at the far-end for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the set-t3 command. This applies to a DS3 signal incoming from the DSX-3 or the fiber.
ES-PFE	This shows the number of far-end path errored seconds for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the set-t3 command. This applies to a DS3 signal incoming from the DSX-3 or the fiber.
SES-PFE	This shows the number of far-end path severely errored seconds for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the set-t3 command. This applies to a DS3 signal incoming from the DSX-3 or the fiber. A severely errored second contains 44 or more errors.
UAS-PFE	This shows the number of far-end path unavailable seconds for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the set-t3 command. This applies to a DS3 signal incoming from the DSX-3 or the fiber. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred.

 NOTE:

Rows that are all zeros are not printed except for current day and current quarter, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the DS3 circuit pack is inserted or removed, or a terminal or a facility loopback is established. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pmthres-t3

set-pmthres-t3

set-t3

NAME

rtrv-pm-tca: Retrieve Performance Monitoring TCA

INPUT FORMAT

rtrv-pm-tca;

DESCRIPTION

This command displays the number of threshold crossing alerts (TCAs) associated with signals terminating in or passing through the system. A TCA occurs when a performance-monitoring counter exceeds a user-selected threshold.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the output report for this command will include data for what is considered at the time as the valid system pack type.

The output report appears as follows:

```
/* TCA Performance Monitoring Summary Report
=====
Address   Optics   Section   Line   STS-1   DS3   DS3
          Path   Path      Line
=====
address   n        n        n
address   n        n        n
address           n
address           n        n        n
address           n        n
```


If the **ds1pm** feature is enabled (via the **set-feat** command), the following additional lines will appear in the TCA report:

```
=====
DS1      TCA  DS1      TCA  DS1      TCA  DS1      TCA
Address  Count Address  Count Address  Count Address  Count
=====
address  count address  count address  count address  count
:         :         :         :         :         :         :         :
:         :         :         :         :         :         :         :
```

If the **vtpm** feature is enabled (via the **set-feat** command), the following additional lines will appear in the TCA report:

```
=====
VT1.5    TCA  VT1.5    TCA  VT1.5    TCA  VT1.5    TCA
Address  Count Address  Count Address  Count Address  Count
=====
address  count address  count address  count address  count
:         :         :         :         :         :         :         :
:         :         :         :         :         :         :         :
```

The output report shows the address and type of parameters that are generating TCAs. Blanks in the report indicate that the output parameter does not apply for the specified address.

The output parameters are:

Address	Address of the monitored signal. This can be the address of an OC-1, OC-3, or OC-12 (24G-U in main unit slots) line, STS-1 channel, EC-1 port or DS3 port.
Optics	This shows the total number of TCAs associated with optical performance-monitoring parameters (Transmit Pwr -1dB, Transmit Pwr -2dB, Laser Bias).
Section	This shows the total number of TCAs associated with section performance monitoring parameters (severely errored frame seconds).

Line	This shows the total number of TCAs associated with line performance monitoring parameters (B2 CV, B2 ES, B2 ES Type A, B2 ES Type B, B2 SES, B2 UAS, PSC, or PJC).
STS-1 Path	This shows the total number of TCAs associated with STS-1 path performance monitoring parameters (B3 CV, B3 ES, B3 ES Type A, B3 ES Type B, B3 SES, or B3 UAS).
DS3	This shows the total number of TCAs associated with DS3 path performance monitoring parameters (severely errored frame seconds, P-bit, adjusted F&M bit, or C-bit parity CV-P, ES-P, SES-P, UAS-P) incoming from the fiber and the DSX-3. The report will also show the total number of TCAs for DS3 line performance monitoring parameters (CV-L, ES-L, SES-L). For ports on the BBG4B or TMUX circuit packs, path and line TCAs for the DS3 signal incoming from the DSX-3 will be displayed with a port address (a,b-3,...). Path TCAs for the DS3 signal incoming from the fiber, will be displayed with a channel address (m-1, mb-10,...). Starting with OC-3 Release 11.0, all non-terminated STS cross-connected services at both ring OLIU, non-ring OLIU, and EC-1 interfaces will be monitored and reported. For the ring OLIU interfaces, independent TCA counts are reported for each of the two STS-1 channels, one from each ring. For the non-ring OLIU and EC-1 interface, only TCA counts of the active interface is reported.
DS1 Address	This column shows the address of the DS1 signal.
VT1.5 Address	This column shows the address of the VT1.5 signal.
TCA Count	This column indicates the total number of TCAs associated with the addressed signal.

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-sect

rtrv-pm-t3

set-pmthres-line

set-pmthres-sect

set-pmthres-t3

NAME

rtrv-pm-vt1: Retrieve Performance Monitoring VT1.5

INPUT FORMAT

rtrv-pm-vt1:*Address*;

DESCRIPTION

This command displays the parameter data associated with one or more VT1.5 channels terminating on a DS1 or DS1PM, circuit pack. This command is available only if the VT1.5 performance monitoring feature is set via the **set-feat** command.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the output report for this command will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address is the address of VT1.5 channels.

Valid Addresses: **all**,

m-{1-3,all}-{1-7,all}-{1-4,all}

(For 22-type OLIUs in main slots)

{a,b}-{1,2,all}-{1-7,all}-{1-4,all}

(For 22-type OLIUs in FN-a or FN-b slots)

c-{1-3,all}-{1-7,all}-{1-4,all}

(For 22-type OLIUs in FN-c slot)

m-{1,2,all}-{1-7,all}-{1-4,all}

br (For 27-type OLIUs in MAIN slots)

{a,b,c}-{1,2,all}-{1-7,all}-{1-4,all}

(For 27G2-U OLIUs in FN slots, Release 11.0 and later)

{a,b,c}-1-{1-7,all}-{1-4,all}

(26G2-U OLIU in FN slots, Release 11.1)

{a,b,c}-{1-7,all}-{1-4,all}

(For low-speed STS-1E in FN slots to MXRVO/TMUX)

m-{1-12,all}-{1-7,all}-{1-4,all}

(For 24-type OLIUs in MAIN slots).

The output report appears as follows:

```
/* VT1.5 Path Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                    quarter hour registers at yy-mm-dd hh:mm:ss
```

```
=====
Address  Start   V5 ES   V5 SES  V5 UAS
        Time
=====
```

```
address time    n      n      n
address time    n      n      n
.        .      .      .      .
.        .      .      .      .
```

The output parameters are:

Address This shows the address of the VT1.5 signal.

Start Time This indicates the time on the system clock when the data collection started.

V5 ES This indicates the number of VT1.5 errored seconds (ES) during the data collection interval that started at the time reported in the previous column.

V5 SES This indicates the number of VT1.5 severely errored seconds (SES) during the data collection interval that started at the time reported in the previous column.

V5 UAS This indicates the number of VT1.5 unavailable seconds (UAS) during the data collection interval that started at the time reported in the previous column.

⇒ NOTE:

Rows that are all zeros are not printed except for current day and current quarter, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the DS1 or DS1PM circuit pack is

inserted or removed or a facility loopback is established. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

This command may only be used if the `vtpm` feature is enabled via the **set-feat** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available, feature disabled */
```

If this command is entered on a DDM-2000 system loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available in this release */
```

RELATED COMMANDS

`init-pm`

`rtrv-pmthres-vt1`

NAME

rtrv-pmthres-line: Retrieve Performance Monitoring Threshold Line

INPUT FORMAT

rtrv-pmthres-line;

DESCRIPTION

This command displays the system's current OC-1, OC-3, and OC-12 line performance parameter thresholds, as set by the **set-pmthres-line** command.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The output report appears as follows:

```

/* Line Performance Monitoring Thresholds Report
=====
Parameter                                Thresholds
                                      Quarter   Day
                                      Hour
=====
B2 Coding Violations OC12 (B2CVOC12)    n         n
B2 Coding Violations OC3 (B2CVOC3)      n         n
B2 Coding Violations OC1 (B2CVOC1)      n         n
B2 Coding Violations EC1 (B2CVEC1)      n         n
B2 Errored Seconds (B2ES)                n         n
B2 Errored Seconds Type A (B2ESA)        n         n
B2 Errored Seconds Type B (B2ESB)        n         n
B2 Severely Errored Seconds (B2SES)      n         n
B2 Unavailable Seconds (B2UAS)           n         n
Line Protection Switch Counts (PSCL)     n         n
STS Pointer Justification Counts (PJC)   n         n
*/

```

The first column of the report contains the names of the line performance monitoring parameters. The second and third columns contain the quarter hour and day thresholds for each parameter. The output parameters are:

B2 Coding Violations OC12

This parameter displays the threshold values for the B2 coding violation counts for OC-12 lines. This parameter is available with Release 11.0 and later.

B2 Coding Violations OC3	This parameter displays the threshold values for the B2 coding violation counts for OC-3 lines.
B2 Coding Violations OC1	This parameter displays the threshold values for the B2 coding violation counts for OC-1 lines. This parameter is available with Release 9 and later.
B2 Coding Violations EC1	This parameter displays the threshold values for the B2 coding violation counts for EC-1 lines.
B2 Errored Seconds	This parameter displays the threshold values for the B2ES count.
B2 Errored Seconds Type A	This parameter displays the threshold values for the B2ESA count.
B2 Errored Seconds Type B	This parameter displays the threshold values for the B2ESB count.
B2 Severely Errored Seconds	This parameter displays the threshold values for the B2SES count.
B2 Unavailable Seconds	This parameter displays the threshold values for the B2UAS count.
Line Protection Switch Count	This parameter displays the threshold values for the line protection switch count.
STS Pointer Justification Count	This parameter displays the threshold values for the STS pointer justification count. This parameter is available with Release 11.0 and later.

A parameter threshold of zero indicates that thresholding is disabled.

A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^{-n} .

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

set-pmthres-line

NAME

rtrv-pmthres-sect: Retrieve Performance Monitoring Threshold Section

INPUT FORMAT

rtrv-pmthres-sect;

DESCRIPTION

This command displays the system's current section performance parameter thresholds, as set by the **set-pmthres-sect** command.

The output report appears as follows:

```

/* Optics and Section Performance Monitoring Thresholds Report
=====
Transmit Power 1dB (TxPwr1dB) = x
Transmit Power 2dB (TxPwr2dB) = x
Laser Bias = x
=====
Parameter                                Thresholds
                                      Quarter   Day
                                      Hour
=====
Severely Errored Frame Seconds (SEFS)   n         n
*/

```

Values for the first three output parameters are **enabled** and **disabled**. The output parameters are:

Transmit Power 1dB	OLIU transmit power threshold setting. This parameter applies only to the 21G OLIU circuit pack.
Transmit Power 2dB	OLIU transmit power threshold setting. This parameter applies only to the 21G OLIU circuit pack.
Laser Bias	OLIU laser bias threshold setting. This parameter applies only to the 21G circuit pack.
Severely Errored Frame Seconds	This parameter displays the threshold values for the SEFS count. A parameter threshold of zero indicates that the thresholding is disabled.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

set-pmthres-sect

NAME

rtrv-pmthres-sts1: Retrieve Performance Monitoring Threshold STS-1

INPUT FORMAT

rtrv-pmthres-sts1;

DESCRIPTION

This command retrieves the system's STS-1 path performance monitoring thresholds, as set by the **set-pmthres-sts1** command.

The output report appears as follows:

```

/* STS-1 Path Performance Monitoring Thresholds Report
=====
Parameter                                Thresholds
                                      Quarter   Day
                                      Hour
=====
B3 Code Violations (B3CV)                n         n
B3 Errored Seconds (B3ES)                n         n
B3 Errored Seconds Type A (B3ESA)        n         n
B3 Errored Seconds Type B (B3ESB)        n         n
B3 Severely Errored Seconds (B3SES)      n         n
B3 Unavailable Seconds (B3UAS)           n         n
*/

```

The first column of the report contains the names of the path performance monitoring parameters. The second and third columns contain the quarter-hour and day thresholds for each parameter. The output parameters are:

Quarter Hour	This column contains the quarter-hour thresholds for each performance monitoring parameter.
Day	This column contains the day thresholds for each performance-monitoring parameter.
B3CV	This parameter shows the threshold for coding violations. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^n . A threshold of zero indicates that the thresholding is disabled.
B3ES	This parameter shows the threshold for errored seconds.
B3ESA	This parameter shows the threshold for type A errored seconds.

B3ESB	This parameter shows the threshold for type B errored seconds.
B3SES	This parameter shows the threshold for the number of severely errored seconds.
B3UAS	This parameter shows the threshold for unavailable seconds of service.

RELATED COMMANDS

init-pm

set-pmthres-sts1

rtrv-pm-sts1

rtrv-pm-tca

NAME

rtrv-pmthres-t1: Retrieve Performance Monitoring Threshold T1

INPUT FORMAT

rtrv-pmthres-t1;

DESCRIPTION

This command displays the current DS1 path and line performance parameter thresholds set for a shelf by the **set-pmthres-t1** command, and it is available only if the DS1 performance monitoring feature is set via the **set-feat** command.

This command will also display the current DS1 path PM thresholds on a BBG20 TMUX circuit pack in OC-3 R11.1.

For OC-3 Release 9.0 and earlier, the output report appears as follows:

```
/* DS1 Path Performance Monitoring Thresholds Report
```

```
=====
Parameter                                Thresholds
                                      Day
=====
```

```
Errorred Seconds-Line (ESL)                n
Code Violations-Path SF (CVPSF)            n
Code Violations-Path ESF (CVPESF)          n
Errorred Seconds-Path (ESP)                 n
Severely Errorred Seconds-Path (SESP)       n
Unavailable Seconds-Path (UASP)             n
Code Violations-Path Far End (CVPFE)        n
Errorred Seconds-Path Far End (ESPFE)       n
Severely Errorred Seconds-Path Far End (SESPFE) n
Unavailable Seconds-Path Far End (UASPFE)   n
*/
```

For OC-3 Release 9.1 and later, the output report appears as follows:

```

/* DS1 Path Performance Monitoring Thresholds Report
=====
Parameter                                Thresholds
                                      Quarter   Day
                                      Hour
=====
Errored Seconds-Line (ESL)                n          n
Code Violations-Path SF (CVPSF)           n          n
Code Violations-Path ESF (CVPEsf)         n          n
Errored Seconds-Path (ESP)                n          n
Severely Errored Seconds-Path (SESP)      n          n
Unavailable Seconds-Path (UASP)           n          n
Code Violations-Path Far End (CVPFE)      n          n
Errored Seconds-Path Far End (ESPFE)      n          n
Severely Errored Seconds-Path Far End (SESPFE) n          n
Unavailable Seconds-Path Far End (UASPFE)  n          n
*/

```

The output parameters are:

Errored Seconds-Line This parameter shows the daily threshold for DS1 line errored seconds. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value.

Code Violations-Path SF
This parameter shows the daily threshold for DS1 path code violations for SF encoded paths. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n .

This parameter is not applicable to the BBG20 TMUX circuit pack in OC-3 R11.1.

Code Violations-Path ESF
This parameter shows the daily threshold for DS1 path code violations for ESF encoded paths. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n .

Errored Seconds-Path This parameter shows the daily threshold for DS1 path errored seconds. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour

threshold value.

Severely Errored Seconds-Path

This parameter shows the daily threshold for DS1 path severely errored seconds. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value.

Unavailable Seconds-Path

This parameter shows the daily threshold for DS1 path unavailable seconds. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value.

Code Violations-Path Far End

This parameter shows the daily threshold for DS1 path code violations at the far end. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n .

Errored Seconds-Path Far End

This parameter shows the daily threshold for DS1 path errored seconds at the far end. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value.

Severely Errored Seconds-Path Far End

This parameter shows the daily threshold for DS1 path severely errored seconds at the far end. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value.

Unavailable Seconds-Path Far End

This parameter shows the daily threshold for DS1 path unavailable seconds at the far end. Beginning with OC-3 Release 9.1, this parameter will also show the quarter-hour threshold value.

A threshold of zero indicates that thresholding is disabled.

A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^n .

This command may only be used if the ds1pm feature is enabled via the **set-feat** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available, feature disabled */
```

If this command is entered on a DDM-2000 system loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available in this release */
```

RELATED COMMANDS

rtrv-feat

set-feat

set-pmthres-t1

NAME

rtrv-pmthres-t3: Retrieve Performance Monitoring Threshold T3

INPUT FORMAT

rtrv-pmthres-t3;

DESCRIPTION

This command displays the system's current DS3 performance parameter thresholds, as set by the **set-pmthres-t3** command.

The output report appears as follows:

⇒ NOTE:

All DS3 line parameters, in addition to DS3 C-bit parity and all other path parameters for the incoming signal from the DSX-3, are only applicable when a BBG4B or BBG19 (Release 11.0 and later) pack is active (in-service) in a function unit slot.

```
/* DS3 Performance Monitoring Thresholds Report
```

Parameter	Thresholds	
	Quarter Hour	Day
Coding Violations-Line (CVL)	<i>n</i>	<i>n</i>
Errored Seconds-Line (ESL)	<i>n</i>	<i>n</i>
Severely Errored Seconds-Line (SESL)	<i>n</i>	<i>n</i>
Severely Errored Frame Seconds (SEFS)	<i>n</i>	<i>n</i>
P-bit Coding Violations-Path (PCV)	<i>n</i>	<i>n</i>
F&M bit Coding Violations-Path (FMCV)	<i>n</i>	<i>n</i>
C-bit Coding Violations-Path (CP)	<i>n</i>	<i>n</i>
Errored Seconds-Path (ESP)	<i>n</i>	<i>n</i>
Severely Errored Seconds-Path (SESP)	<i>n</i>	<i>n</i>
Unavailable Seconds-Path (UASP)	<i>n</i>	<i>n</i>
Severely Errored Frame Seconds-Far End (SEFSFE)	<i>n</i>	<i>n</i>
C-bit Coding Violations-Path Far End (CPFE)	<i>n</i>	<i>n</i>
Errored Seconds-Path Far End (ESPFE)	<i>n</i>	<i>n</i>
Severely Errored Seconds-Path Far End (SESPFE)	<i>n</i>	<i>n</i>
Unavailable Seconds-Path Far End (UASPFE)	<i>n</i>	<i>n</i>
*/		

A threshold of zero indicates that thresholding is disabled.

The output parameters are:

CVL	These parameters display the threshold for the coding violations count of the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent bit error ratio (BER) of 10^N .
ESL	These parameters display the threshold for the errored seconds count of the DS3 line with at least one B3ZS coding violation.
SESL	These parameters display the threshold for the severely errored seconds count of the DS3 line with greater than 44 B3ZS coding violations.
SEFS	These parameters display the threshold values for severely errored frame seconds. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
PCV	These parameters display the threshold for the DS3 P-bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent BER of 10^N .
FMCV	These parameters display the threshold for the DS3 F&M bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent BER of 10^N .
CP	These parameters display the threshold for the DS3 C-bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent BER of 10^N .
ESP	These parameters display the threshold for the DS3 P-bit, adjusted F&M bit, or C-bit errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
SESP	These parameters display the threshold for the DS3 P-bit, adjusted F&M bit, or C-bit severely errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
UASP	These parameters display the threshold for the DS3 P-bit, adjusted F&M bit, or C-bit unavailable seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

SEFSFE	These parameters display the threshold values for the far-end DS3 C-bit severely errored frame seconds. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
CPFE	These parameters display the threshold for the DS3 far-end C-bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent BER of 10^n .
ESPFE	These parameters display the threshold for the DS3 far-end C-bit errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
SESPFE	These parameters display the threshold for the DS3 far-end C-bit severely errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
UASPFE	These parameters display the threshold for the DS3 far-end C-bit unavailable seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

RELATED COMMANDS

init-pm

rtrv-pm-t3

rtrv-pm-tca

set-pmthres-t3

set-t3

NAME

rtrv-pmthres-vt1: Retrieve Performance Monitoring Threshold VT1.5

INPUT FORMAT

rtrv-pmthres-vt1;

DESCRIPTION

This command displays the current VT1.5 path performance parameter thresholds set for a shelf by the **set-pmthres-vt1** command, and it is available only if the VT1.5 performance monitoring feature is enabled via the **set-feat** command.

The output report appears as follows:

```
/* VT1.5 Path Performance Monitoring Thresholds Report
```

```
=====
```

```
Parameter                                Thresholds
                                         Quarter Day
                                         Hour
=====
```

```
V5 Errored Seconds (V5ES)                nnnn    nnn
```

```
V5 Severely Errored Seconds (V5SES)      nnnn    nnn
```

```
V5 Unavailable Seconds (V5UAS)           nnnn    nnn
```

```
*/
```

In the report, a threshold of zero indicates that thresholding is disabled. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n .

The output parameters are:

V5 Errored Seconds

This parameter shows the quarter hour and daily threshold for VT1.5 errored seconds.

V5 Severely Errored Seconds

This parameter shows the quarter hour and daily threshold for VT1.5 severely errored seconds.

V5 Unavailable Seconds

This parameter shows the quarter hour and daily threshold for VT1.5 unavailable seconds of service.

This command may only be used if the `vtpm` feature is enabled via the **set-feat** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available, feature disabled */
```

If this command is entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available in this release */
```

RELATED COMMANDS

`rtrv-feat`

`set-feat`

`set-pmthres-vt1`

NAME

rtrv-secu: Retrieve Security

INPUT FORMAT

rtrv-secu;

DESCRIPTION

This command retrieves CIT and DCC ports security and timeout information.

This command will also report on the users who are currently logged onto the Network Element via the CIT, and DCC ports.

The output report appears as follows:

/* Port Security Configuration Report			
Access Link	Security	Timeout, minutes	Active User
cit-1	lockout	0	LUC01
cit-2	enabled	60	
dcc	disabled	15	

TL1			
Access Link	SNPA		Active User

dcc			user1
x25 (PVC)	1		user7
x25 (PVC)	2		user8
x25 (PVC)	3		user9
x25 (SVC)	146782229996		user10
*/			

The output parameters are:

Access Link	Access link is the address of a CIT or DCC interface. Valid OC-3 Addresses: dcc-{m,a,b,c} , cit-{1,2} Valid OC-1 Interface Addresses: dcc-{m,a,b,c}-{1,2}
Security	Security shows whether security is enabled, disabled, or in lockout state on the listed CIT or DCC port. The valid values are enabled, disabled, or lockout. When security is enabled, a user must enter a valid login and password to begin a session. When security is in lockout state, only a privileged user is permitted to access the system

	through the locked out CIT/DCC ports.
Timeout	This parameter shows the time duration, in minutes, before an inactive session is terminated on a specified CIT or DCC interface.
Active User	This parameter is available starting with OC-3 Release 11.1. This parameter reports on the user's login id that is currently logged into the NE via the communication port identified by the Address column. If no user is currently logged in at the time of the report, this parameter is reported as a dash ("-").
TL1	This parameter is available with OC-3 Release 11.1. This section of the report will list the users logged in to the NE via the X.25 PVCs and/or SVCs (only if local NE is a GNE) or TL1 dcc and it is sorted by TL1 dcc first, the VC type (PVC and then SVC) and then by SNPA. This X.25 section of the report is displayed after the CIT, DCC and TL1 DCC information and it includes the following columns:
Access Link	This parameter is available starting with OC-3 Release 11.1. Access link is the address of a TL1 interface. Valid TL1 Interface Addresses: (C0x25 (PVC), x25 (SVC) .
SNPA	This parameter is available starting with OC-3 Release 11.1. Contains the X.25 Subnetwork Point of Attachment for the OS. It is either the PVC Logical Channel Number (LCN) or SCV Data Terminal Equipment (DTE) calling address, which is 1 to 15 digits. Up to nine VCs can be mapped to any combination of PVCs and SVCs.
Active User	This parameter is available starting with OC-3 Release 11.1. This parameter reports the login id for a user that is currently logged into the NE via the communication port identified by the Address column. If no user is currently logged in at the time of the report this parameter is reported as a dash (-). If timeout is zero (0), then there is no timeout.

RELATED COMMANDS

rtrv-lgn

set-secu

NAME

rtrv-state-eqpt: Retrieve State Equipment

INPUT FORMAT

rtrv-state-eqpt[:*Address*];

DESCRIPTION

This command displays slot, port, and protection switching state information for the network element (NE).

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the report will include data for what is considered at the time as the valid system pack type.

This command is used with all ring releases and should be used instead of the **rtrv-state** command with all later linear releases.

The input parameter is:

Address Address identifies one or more slots. The default is **all** for all slots in the system.

Valid OC-3 Addresses: **all**, **main-{1,2,all}**,
fn-all, **fn-{a,b,c}-{1,2,all}**, **ls-all**,
ls-{a,b,c}-{1-8,all}, **tg-{1,2,all}**

The output report appears on the following page.

```

/* Equipment State Report
=====
Address      Circuit      Port      Switch      Switch
      Pack      State(s)      State      Priority
=====
address      pack      p      s      priority
address      pack      p      s      priority
.      .      .      .      .
.      .      .      .      .
-----
address      pack      p      s      priority
.      .      .      .      .
.      .      .      .      .
address      pack      p      s      priority
*/

```

In the output report, slot types are separated by a row of dashes. Within each slot type, slots are listed in order of their addresses, with protection slots listed last. Slots for control circuit packs (SYSCTL, AUXCTL) are not listed in this report.

The output parameters are:

Address Address is the address of a slot.

Circuit Pack Circuit pack is the circuit pack name. A hyphen (-) means not applicable or not equipped.

Port State(s) The state of the signal, from the DSX for DS-1, DS-3, or EC-1 signals is reported.

Port State (p) may be blank or have one of the following values:

- i (In-Service) In this state, the port is monitored for failures, and the appropriate alarm is generated if a failure is detected. To retire the alarm and transition the associated port to the auto state, the update function must be performed after the input signal is removed.
- a (Automatic) In this state, the port will automatically be put in-service if a good signal is detected. This state is not allowed for OC-N signals.
- n (Not Monitored)
In this state, the signal is not monitored or alarmed. The port will not automatically go to the in-service state when a signal is detected.

— Not applicable (not equipped).

The port state is always blank for timing circuits, for protection slots for 1x1 and 1xn protected circuit packs, and for OLIU circuit packs. Note that the BBG19 DS3 circuit pack is 0x1 protected and thus has independent port states for the service and protection slots. The port state is always a hyphen (-) for low-speed slots in the auto state.

Switch State

This indicates whether the circuit pack is active or standby, corresponding to the state of the protection switching relays. Switch state(s) may be one of the following:

active For OC-N lines in a 1+1 line-protected configuration, active means the signal being received on this line is selected by the near end protection switch and the signal being transmitted on this line is selected by the far end. For ring applications, each OLIU in the main slots is feeding its ring channels incoming from the fiber to the other side for pass-through connections and is sending drop channels to the function units. Some or all of the received ring channels incoming from this OLIU may be active. This can be determined using the **rtrv-state-path** command on this system. Some or all of the transmitted ring channels outgoing to the fiber may also be active. This can be determined by using the **rtrv-state-path** command on *all* remote systems.

With the addition of pass-through cross-connections in function units in Release 9.1, and path-protected hairpin local drop cross-connections in Release 11.0, the above discussion applies to OLIUs in function unit slots supporting such cross-connections.

active-fn For a main OLIU slot in ring applications, this means that the ring path protection switching is currently being done on this pack, and this pack is choosing each active ring channel from either ring and sending it to the function units.

	For other pack types, active means the signal is being transmitted and received from this pack. Even if the pack is removed, the slot will remain active unless there is a protection circuit pack that service can be switched to.
active-tx	For the function unit's OC-3 lines, the signal being transmitted is selected by the far end, but the received signal is not selected by the near end protection switch.
active-rx	For the function unit's OC-3 lines, the signal being received on this line is selected by the near end protection switch, but the signal being transmitted is not selected by the far end.
active-?	For the function unit's OC-3 lines, the protection line is failed in the receive direction. The state of the protection line in the transmit direction is unknown; the signal transmitted on the protection line <i>might</i> be selected by the far end.
standby	The circuit pack or optical line is not currently active.
—	Not applicable or not equipped.

For ring applications because of pass-through connections, the switch state will always be active for both main OLIUs. For function units provisioned for pass-through, path-protected hairpin local drop (Release 11.0 and later), or 0x1 ring applications, the switch state will always be active for both OLIUs.

Switch Priority Switch priority is the currently active protection switch request. Only a higher priority protection switch request can cause a protection switch to be done. For ring applications, the switch priority in this report applies only to the equipment switching of the main to function unit signals. See the **rtrv-state-path** command for path protection switching information. Switch priority may be one of the following:

inhibit	No protection switches will be done until the switch is reset.
lockout of protection	This prevents access to the protection pack for the group.

lockout of service	This prevents access to the protection circuit pack for the specified service slot.
forced	No automatic or manual switches will be done until the forced switch is reset.
APS-signal degrade	Automatic protection switching has occurred due to a signal degrade.
APS-pack failure	Automatic protection switching has occurred due to a circuit pack failure.
APS-automatic lock	Traffic is forced and held onto the protection pack, unable to revert to the service pack until midnight. This occurs following four automatic switches from service to protection during a 10-minute interval.
manual	Traffic has been manually switched to protection.
—	No manual or automatic switch requests are active.

For ring applications, the switch priority in this report applies only to the equipment switching of the main OLIUs to function unit signals. See the **rtrv-state-path** command for path protection switching information.

The switch priority is always blank for protection slots, with one exception. For 1xn protected slots, the protected slot may have a switch priority of lockout of protection.

The state of the timing reference is reported in the **rtrv-sync** command.

RELATED COMMANDS

rtrv-alm

rtrv-state-path (Rings only)

rtrv-sync

set-state-t1

set-state-t3

switch-fn

switch-line

switch-ls

switch-sync

upd

NAME

rtrv-state-oc1: Retrieve State of OC-1 Lines

INPUT FORMAT

rtrv-state-oc1[:*Address*];

DESCRIPTION

This command retrieves OC-1 line states.

The input parameter is:

Address Address is the address of the OC-1 lines whose state is to be reported. The default is **all** OC-1 lines. Other valid addresses are:

**main-all, main-{1,2}-{1,2}, fn-{a,b,c}-all,
fn-all, fn-{a,b,c}-{1,2}-{1,2}**
(For 27-type OLIUs)

fn-{a,b,c}-all, fn-all, fn-{a,b,c}-{1,2}-1
(For 26G2-U OLIUs)

The output report appears as follows. Only lines that are cross-connected will be displayed in the output report.

```
/* OC-1 Line State Report
```

```
=====
```

Address	Line State
=====	
main-1-1	is
main-2-1	is
main-2-2	nmon
fn-a-1-1	is
fn-c-2-2	nmon
.	.
.	.
.	.
*/	

```
=====
```

The output parameters are:

Address	Address is the address of an OC-1 line.
Line State	Line state is the state of the OC-1 line identified in the address field. It may have one of the following values:
is	In-service. The line is monitored. Alarm and status conditions are reported normally.
nmon	Not Monitored. The line is not being monitored. Alarm and status conditions are not reported for this line. Performance monitoring is not done for the line. The line will remain in this state until the state is changed (with the set-state-oc1 command) or until the cross-connection involving this line is deleted.

RELATED COMMANDS

set-state-oc1

upd

NAME

rtrv-state-path: Retrieve State Path

INPUT FORMAT

rtrv-state-path[:*Address*];

DESCRIPTION

This command displays signal path state information for path-protected signals dropped at the network element (NE). To determine which of the transmitted ring channels outgoing to the fiber are active, it may be necessary to also use the **rtrv-state-eqpt** command on all remote systems.

Any application that is path protected is reported.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the report will include data for what is considered at the time as the valid system pack type.

Any application that is path protected is reported.

The input parameter is:

Address The *address* is any connected VT1.5 or STS-1 path. The default is **all** for all paths in the system.

Valid OC-3 VT1.5 Addresses:

all, {m1,m2}-{1-3,all}-{1-7,all}-{1-4,all}

Valid STS-1 Addresses for OC-3 OLIUs:

all, {m1,m2}-{1-3,all}

Valid VT1.5 Addresses for 27-type OLIUs:

{m}{1,2}-{1,2}-{1-7,all}-{1-4,all}

{a,b,c}{1,2}-{1,2}-{1-7,all}-{1-4,all}

(Release 11.0 and later - 27G2-U OLIUs only)

Valid STS-1 Addresses for 27-type OLIUs:

{m}{1,2}-{1,2}

{a,b,c}{1,2}-{1,2}

(Release 11.0 and later - 27G2-U OLIUs only)

Valid VT1.5 Addresses for 26G2-U OLIUs:

{a,b,c}{1,2}-1-{1-7,all}-{1-4,all}

(Release 11.1 and later)

Valid STS-1 Addresses for 26G2-U OLIUs:

{a,b,c}{1,2}-1 (Release 11.1 and later)

If the shelf is equipped with 24-type OLIUs in its Main unit slots the valid VT1.5 Main addresses are:

m{1,2}-{1-12,all}-{1-7,all}-{1-4,all}

The valid STS-1 Main addresses are:

m{1,2}-{1-12,all}

The output report appears as follows:

```

/* Path Protection Switch State Report
=====
----- Ring 1 ----- Ring 2 -----
Address Act APS Condition Address Act APS Condition
=====
address x condition address x condition
address x condition address x condition
. . . . .
. . . . .
*/

```

The output parameters are:

Address The address could be an STS-1, STS3c (if Main slots are equipped with 24G-U OLIUs), or VT1.5 path. The report always displays both the Ring 1 and Ring 2 addresses.

Act This column indicates whether the associated Ring 1 path (receive into local main-1) [receive into local main-1 or fn-{a,b,c}-1 (Release 11.0 and later)] or Ring 2 path (receive into local main-2) Ring 2 path [receive into local main-2 or fn-{a,b,c}-2 (Release 11.0 and later)] is active.

This column may contain one of the following:

Y The path is provisioned as drop, or drop and continue, and this side is active (path protection switching is allowed).

(blank) The path is provisioned as drop, or drop and continue, and this side is in standby.

APS Condition	This column lists the condition that caused the automatic protection switch to occur and appears on the path where the condition was detected. (The manual protection switch request is not shown because the system is nonrevertive.) The condition may be one of the following: - signal failure - pack removal - pack failure - signal degrade Only manual or automatic protection switch (APS) requests that are higher priority than the currently active requests will cause a protection switch to occur. Currently, only the manual protection switch request is allowed, and because it is a lower priority than the APS requests, only APS requests will appear in the report. The APS conditions will remain active while the condition that caused the switch still exists. When that failure clears, the APS condition is changed to blank if no other APS requests exist.

⇒ NOTE:

Whenever a VT1.5 cross-connection is made, the STS-1 path is actually terminated. When an STS-1 address is entered, this command does not report any STS-1 signals because individual VT1.5s within that STS-1 can be active on different rings. In general both rings are normally active.

To really know the state of VT cross-connected STS-1 signals, it is necessary to look at the states of all the constituent VT1.5 signals.

RELATED COMMANDS

rtrv-state-eqpt

switch-path-vt1

switch-path-sts1

NAME

rtrv-state-sts1: Retrieve State of STS-1 Channels

INPUT FORMAT

rtrv-state-sts1[:Address];

DESCRIPTION

This command retrieves STS-1 channel states.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during and upgrade), the report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address is the address of the STS-1 channels whose state is to be reported. The default is **all** STS-1 channels. Other valid addresses are: **{m,c}-{1-3,all}**, **{a,b}-{1-2,all}**

{a,b,c} (For EC-1s)

{m,a,b,c}-{1,2,all} (For 27-type OLIUs)

{a,b,c}-1 (For 26G2-U OLIUs)

If the shelf is equipped with 24-type OLIUs in both Main unit slots, the valid addresses are:

m-{1-12,all}

The output report appears as follows. An example of a VT1.5 cross-connected hairpin between an OLIU in slot C (aid=c-3) and an MXRVO in slot B (aid=b-1) is shown. Only channels that are cross-connected will be displayed in the output report.

```
/* STS-1 Channel State Report
```

```
=====
```

Address	Channel State
m-1	AUTO
m-2	IS
a-1	AUTO
b-2	IS
c-3	NMON
.	.
.	.
*/	.

```
=====
```

⇒ NOTE:

An empty report is displayed if there are no cross-connections.

The output parameters are:

Address Address is the address of an STS-1 channel.

Channel State Channel State is the state of the STS-1 channel identified in the address field. It may have one of the following values:

auto Automatic. There is not a good signal on this channel. (STS-1 AIS or STS-1 loss of pointer [LOP] condition may be present.) Alarm or status conditions associated with this channel are not reported. Performance monitoring is not done for the channel. If a good signal is detected on this channel, then the channel will be put in the in-service state automatically.

is In-service. The channel is monitored. Alarm and status conditions are reported normally.

nmon Not Monitored. The channel is not being monitored. Alarm and status conditions are not reported for this channel. Performance monitoring is not done for the channel. The channel will remain in this state until the state is changed (with the **set-state-sts1** command) or until the cross-connection involving this channel is deleted.

RELATED COMMANDS

dlt-crs-sts1

ent-crs-sts1

rtrv-crs-sts1

rtrv-state-vt1

set-state-sts1

upd

NAME

rtrv-state-vt1: Retrieve State of VT1.5 Channels

INPUT FORMAT

rtrv-state-vt1[:*Address*];

DESCRIPTION

This command retrieves VT1.5 channel states.

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address is the address of VT1.5 channels whose state is to be reported. The default address is **all**.

Valid VT1.5 channel(s) addresses are:

**{m,a,b,c}-all, {m,c}-{1-3}-all,
{a,b}-{1,2,all}-{1-7,all}-{1-4,all},
{m,c}-{1-3}-{1-7}-{1-4,all}**

Valid VT1.5 channel(s) addresses within EC-1 are:

{a,b,c}-{1-7,all}-{1-4,all}

Valid VT1.5 channel(s) addresses for 27-type OLIUs are:

**m-all, m-{1,2}-all, m-{1,2}-{1-7,all}-{1-4,all},
{a,b,c}-all, {a,b,c}-{1,2}-all, all,
{a,b,c}-{1,2}-{1-7}-{1-4,all}**

(Requires 27G2-U OLIUs, Release 11.0 and later)

Valid VT1.5 channel(s) addresses for 26G2-U OLIUs are:

**{a,b,c}-all, {a,b,c}-1-all, all,
{a,b,c}-1-{1-7}-{1-4,all}**

(Release 11.1 and later)

If the shelf is equipped with 24-type OLIUs in its Main unit slots, the valid VT1.5 channel addresses are:

main-{1-12,all}-{1-7,all}-{1-4,all}.

The output report appears as follows. Only channels that are cross-connected will be displayed in the output report. (This includes VT1.5 channels that are implicitly cross-connected as part of an STS-1 cross-connection.) An example of a VT cross-connected hairpin between an OLIU in slot C (aid=c-1-1-2) and a MXRVO in slot B (aid=b-1-1-1) is shown.

```
/* VT1.5 Channel State Report
```

```
=====
```

Address	Channel State
m-1-1-1	auto
m-1-1-2	is
m-1-1-3	nmon
m-1-1-4	auto
c-1-1-2	is

```
=====
```

```
*/
```

The output parameters are:

Address Address is the address of a VT1.5 channel.

Channel State Channel State is the state of the VT1.5 channel identified in the address field. It may have one of the following values:

- auto** Automatic. There is not a good signal on this channel. (The VT AIS or a VT loss of pointer condition may be present.) Alarm or status conditions associated with this channel are not reported. Also, performance monitoring is not reported. If a good signal is detected on this channel, then the channel will be put in the in-service state automatically.
- is** In-service. The channel is monitored. Alarm and status conditions are reported normally.
- nmon** Not Monitored. The channel is not being monitored. Alarm and status conditions are not reported for this channel. Performance monitoring is not done for the channel. The channel will remain in this state until the state is changed (with the **set-state-vt1** command) or until the cross-connection involving this channel is deleted.

RELATED COMMANDS

dlt-crs-sts1

dlt-crs-vt1

ent-crs-sts1

ent-crs-vt1

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-state-sts1

set-state-vt1

upd

NAME

rtrv-sts1: Retrieve STS1

INPUT FORMAT

rtrv-sts1[:*Address*];

DESCRIPTION

This command retrieves three types of provisioned parameters for STS-1 channels. The parameter types are:

- signal degrade alarm threshold
- signal fail alarm threshold
- alarm level for sa/nsa STS path AIS condition

 NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address is the address of the STS-1 channels whose parameters are to be reported. The default is **all** STS-1 channels.

Other valid addresses are:

{m,c}-{1-3,all}, {a,b}-{1-2,all}

{a,b,c} (EC-1 addresses)

{m,a,b,c}-{1,2,all} (27-type OLIU addresses)

{a,b,c}-1 (26G2-U OLIU addresses)

If the shelf is equipped with 24-type OLIUs in its Main unit slots, the valid addresses are: **m-{1-12,all}**

Only STS-1 channels that are cross-connected will be displayed in the output report.

When the default address is entered, the output report appears as follows:

```

/* STs1 Channel Provisioning Report
=====
SignalDegrade = value
SignalFailure = value

STs-1 AIS Alarm Information
Address      AIS Alarm      AIS Alarm
              Service Affecting  Non Service Affecting
=====
address      sa              nsa
address      sa              nsa
.             .              .
.             .              .
*/

```

For releases prior to 9.1, if the signal degrade value is zero (0), as set by the **set-sts1** command, then signal degrade is disabled and the following output report appears:

```

/* STs-1 Channel Provisioning Report
=====
SignalDegrade=0 (disabled)
SignalFailure=-3

STs-1 AIS Alarm Information
Address      AIS Alarm      AIS Alarm
              Service Affecting  Non Service Affecting
=====
address      sa              nsa
address      sa              nsa
.             .              .
.             .              .
.             .              .
*/

```

For releases 9.1 and later, a signal degrade value of zero (0) cannot be provisioned and thus will not appear in the report.

If the address is anything but **all**, then the report appears as follows:

```

/* STS-1 Channel Provisioning Report
=====
Address      AIS Alarm      AIS Alarm
             Service Affecting Non Service Affecting
=====
address      sa              nsa
address      sa              nsa
.            .              .
.            .              .
.            .              .
*/

```

If the **nsa** parameter is not valid for the application, for example a non-ring application, then the report appears as:

```

/* STS-1 Channel Provisioning Report
=====
Address      AIS Alarm
             Service Affecting
=====
address      sa
address      sa
.            .
.            .
.            .
*/

```

The output parameters are:

SignalDegrade This is the signal degrade threshold value.

SignalFailure This is the signal failure threshold value.

address This is the address of the provisioned channel.

AIS Alarm

One or more columns of information will show the AIS alarm values for service affecting (SA) and non-service affecting (NSA) alarms. SA alarms may have one of the following values:

- cr** Critical alarm (default for ring channels)
- mn** Minor alarm (non-ring channels only, default)
- na** Not alarmed, but reported
- nr** not alarmed and not reported (non-ring channels only).

NSA alarms may have one of the following values:

- mn** Minor alarm (default)
- nr** Not alarmed and not reported.

RELATED COMMANDS

set-sts1

NAME

rtrv-sync: Retrieve Synchronization

INPUT FORMAT

rtrv-sync;

DESCRIPTION

This command displays the provisioning and operational information on the synchronization attributes of the DDM-2000, as set by the **set-sync** command.

⇒ NOTE 1:

Synchronization provisioning is the same, whether the OC-3 shelf is equipped with OC-3 (22-type) or OC-12 (24-type) OLIU circuit packs in its Main unit slots.

⇒ NOTE 2:

Prior to Release 9.1, line timing from OC-1 OLIU circuit packs, whether from Main or Function unit slots is not provided. Starting with Release 9.1, line timing from OC-1 line #1 on 27-type OLIU circuit packs in Main slots is supported.

⇒ NOTE 3:

This command may be used with the new Stratum 3 timing circuit pack, TG3 (BBF4), available in 1999. This pack can not be used in combination with either of the two TGS circuit packs (BBF2/BBF2B) in the same network element. The BBF4 circuit pack can be used in any BBF2B application. Care must be taken to ensure that a system equipped with these new BBF4 circuit packs will not receive its sync source for line-timing from another system that is equipped with either BBF2 or BBF2B TGS packs.

The following pages show output reports for this command and explain the various fields on the reports. Output reports will vary according to the provisioned timing mode and the software release.

The (hw) after a parameter value on the following reports indicate that the parameter is set by hardware switches on the TGS or TG3 circuit pack.

The synchronization output report on the following page is the general format for a system equipped with TGS or TG3 circuit packs that include DS1 timing outputs in the sync mode.

The following report is for OC-3 Release 8.0, 9.0, and earlier:

```

/* Synchronization Report
=====
Parameter                      Value(s)
=====
Sync Source (src)              address  timing_message

DS1 Line Code/Format           tg-1=xxxx/xxx (hw)  tg-2=xxxx/xxx (hw)

Shelf Timing
  Provisioned Mode              mode (hw)
  Active Timing Mode           mode (hw)
  DS1 Reference Input State    ref-1=mode      ref-2=mode
  Active Circuit Pack          pack
  Active Reference/Line        ref
  Mode Switching (mdsw)        mode
  Last Reference Switch        YY-MM-DD HH:MM:SS

DS1 Outputs
  Provisioned Mode              mode (hw)
  DS1 Output Mode (omd)        mode
  DS1 Output State             refout-1=state  refout-2=state
  Active Reference              ref

Sync Message Information
  OC-N Line      Input Message      Output Message
-----
  address        Message            Message
  address        Message            Message
  address        Message            Message

Sync Autoreconfiguration      mode
*/

```

The following report is for OC-3 Releases 8.1, 9.1 and later. In Release 8.1 (linear), the AIS Threshold parameter will not be displayed.

```

/* Synchronization Report
=====
Parameter                      Value(s)
=====
Sync Source (src)               address  timing_message

DS1 Line Code/Format            tg-1=xxxx/xxx (hw)  tg-2=xxxx/xxx (hw)

Shelf Timing
Provisioned Mode                mode (hw)
Active Timing Mode              mode (hw)
DS1 Reference Input State       ref-1=mode          ref-2=mode
Active Circuit Pack             pack
Active Reference/Line           ref
Mode Switching (mdsw)           mode
Last Reference Switch           YY-MM-DD HH:MM:SS

DS1 Outputs
Provisioned Mode                mode (hw)
DS1 Output Mode (omd)           mode
AIS Threshold (aisthres)        thres (Message)
DS1 Output State                refout-1=state      refout-2=state
Active Reference                 ref

Sync Message Information
OC-N Line      Input Message      Output Message      Type
-----
address        Message            Message            Type
address        Message            Message            Type
address        Message            Message            Type

Sync Autoreconfiguration        mode
*/

```

The output parameters for the reports are as follows. Some parameters may not apply to all the reports. The output parameters are:

Sync Source The sync source is the optical line provisioned from which shelf (and optionally, DS1 sync output) timing is derived. If the shelf timing mode is set for LineTimed and DS1 sync output timing is also selected, Sync Source is both the source for shelf timing and DS-1 sync outputs. If the shelf timing mode is set for External and DS1 sync output timing is also selected, Sync Source is only the source for DS-1 sync outputs. The valid values for this parameter are:

main	OC-3 Linear Releases (default)
main-1	OC-3 Ring Releases (default) Starting with Release 9.1, if Main-1 contains a 27-type OLIU, this value indicates timing derived from OC-1 line #1.
main-2	OC-3 Ring Releases Starting with Release 9.1, if Main-2 contains a 27-type OLIU, this value indicates timing derived from OC-1 line #1.
fn-c	Linear Releases and Rings optical extensions

⇒ NOTE:

Shelf timing cannot be sourced from fn-c, if it is equipped with 27-type OLIU circuit packs.

— (dash)	Timing mode is hardware provisioned to be FreeRunning or External without DS1 sync outputs (mu lt).

The choices for Sync Source (except the dash) are followed by one of these messages:

for Shelf only Sync Source is set for LineTimed shelf.

for Shelf and DS1 Outputs
Sync Source is set for LineTimed shelf/Sync Out.

for DS1 Outputs only
Sync Source is set for External shelf timing/Sync Out.

DS1 Line Code/Format

This refers to the signal format and line coding of the DS1 External timing references (as set with option switches on the TGS or TG3 circuit pack). The valid values are:

DS1 Line Code

ami	Alternate Mark Inversion
b8zs	Bipolar with 8 Zeros Substitution
— (dash)	Unequipped
?	Unreadable

DS1 Line Format

sf	Super Frame format (D4)
esf	Extended Super Frame format
— (dash)	Unequipped
?	Unreadable

Provisioned Mode

Provisioned Mode is the provisioned synchronization mode of the timing generator circuit packs, as set with option switches on the TGS or TG3 circuit pack. The valid values are:

External	Timing derived from DS1 External reference.
FreeRunning	Timing derived from internal oscillator.
LineTimed	Timing derived from OC-3 payload-carrying signal in the Main or FN-C slots.

Starting with Release 9.1, timing can be derived from OC-1 line #1 on 27-type OLIU circuit packs in Main slots.

If the OC-3 shelf is equipped with 24G-U OLIU circuit packs in its Main slots, then the timing is derived from OC-12 payload-carrying signal in the Main slots only.

Active Timing Mode

Active timing mode is the active timing synchronization mode of the system. The value may be any of the values listed previously in Provisioned Mode or one of the following:

Holdover	Timing generator is operating in holdover mode because the provisioned references are not available or because the system has been manually switched to holdover mode.
No Timing	Timing circuit packs have been removed.
?	Timing mode is unreadable.

DS1 Reference Input State

Input State refers to the primary state of the DS1 External timing reference ports, with values as follows:

is	in-service
auto	automatic

Active Circuit Pack

Active Circuit Pack indicates which timing generator circuit pack is currently active. The value is tg-1, tg-2, or - (empty slot).

Active Reference/Line

Active Reference is the active external reference for the timing generator. When Active Reference is reported, Active Line is not reported. When the Provisioned Mode is External, Active Reference has the following values:

- ref-1 The active timing reference is set to the timing reference "one".
- ref-2 The active timing reference is set to the timing reference "two".
- Not applicable, DS1 references are in auto input state.

Active Line is the active LineTimed reference for the timing generator. When Active Line is reported, Active Reference is not reported. When Provisioned Mode is LineTimed, Active Line has the following values:

main-1

main-2

fn-c-1

fn-c-2

NA Neither timing reference is active.

When the active timing mode is Holdover, Active Reference/Line is the timing reference that will provide timing if the system switches out of holdover mode.

When the Provisioned Mode is FreeRunning, Active Reference and Active Line are not reported.

Mode Switching

Mode Switching indicates whether the mode switching for the timing generator is revertive or nonrevertive.

Revertive Revertive mode switching. If the system is provisioned for revertive mode switching, it will automatically switch from holdover mode to the provisioned mode (LineTimed or External timing) when a good reference becomes available.

- Nonrevertive Nonrevertive mode switching. If the system is provisioned for nonrevertive mode, it will switch to holdover mode (as a result of a timing reference failure) and remain in this mode until it is manually switched back to the provisioned timing mode by the **switch-sync** command.
- (dash) Not applicable. Provisioned mode is FreeRunning.

Last Reference Switch

Last Reference Switch Time is the date and time of the last switch of the External timing reference. It has an initial power-up value of "NA" which is retained until a reference switch occurs. The value of Switch Time (the instant a switch occurs) is obtained from the system clock. This parameter is reported only when the Provisioned Mode is External.

DS1 Outputs

DS1 Outputs is the DS1 timing outputs and can be provisioned by hardware switches on the circuit pack. If the DS1 outputs are mult, then only Provisioned Mode is reported for this section.

Provisioned Mode

mult In the External timing mode, the mult is used to distribute the incoming DS1 reference to other shelves in the bay.

sync out

This mode indicates that timing is derived from a terminating OC-1 (Release 9.1 and later) or OC-3 or OC-12 (if Main slots equipped with 24G-U OLIU circuit packs) line and is used for network synchronization. (This mode is only available with the BBF2B or BBF4 circuit pack.)

DS1 Output Mode

Output Mode identifies whether the DS1 timing output derivation will track transmission or lock on a particular line (1 or 2) with values:

track

lock1

lock2

DS1 Output Mode is not reported for ring releases unless

the `src` parameter is set to `fn-c` and the DS1 synchronization output is provisioned for `SYNC OUT` mode.

In addition to the condition mentioned above, in OC-3 Release 9.1 and future ring releases, DS1 Output Mode will not be reported when `Sync Autoreconfiguration` parameter is enabled. This will prevent any confusion in reading the report when the autoreconfiguration forces the `Active Reference/Line` parameter to switch to a better source.

AIS Threshold

In OC-3 Release 9.1 and later ring releases, this parameter indicates the provisioned sync message quality level and its equivalent sync message phrase for the active reference at which, or greater incoming quality level numbers, DS1 AIS will be transmitted on the sync output of the BBF2B TGS or BBF4 TG3 circuit pack. If the `syncmsg` parameter within the **`set-oc3`** or **`set-oc12`** command is set to `disabled`, then the word `disabled` will be reported with the provisioned value of this parameter. It may be set to one of the following options:

<code>level5</code>	default value. (K2: Internal Clock, S1: Traceable SONET Clk, or disabled)
<code>level4</code>	(K2: Stratum 3, S1: Traceable Stratum 3, or disabled)
<code>level3</code>	(K2: Stratum 2, S1: Traceable Stratum 2, or disabled)
<code>level2</code>	(K2: Sync Quality Unknown, S1: Sync Trace Unknown, or disabled)

For a definition of quality levels, refer to the Sync Message Information section of this command pages.

DS1 Output State

The output state is the status of the DS1 output when in the `sync out` mode, and may be one of the following:

`good` This status indicates that the DS1 output is traceable to the incoming OC-1 (Release 9.1 and later), OC-3 signal, or OC-12 (if Main unit slots are equipped with 24G-U OLIU packs). line.

AIS	DS1 AIS is inserted if a failure exists that prohibits tracing of the DS1 output to the incoming optical line. It is also inserted due to certain incoming synchronization message quality levels on the active timing source.
—	Indicates the slot is in the auto state.
?	The circuit pack is unreadable, or slot is equipped and empty.

Active Reference

This shows the actual line that the DS1 timing output is being derived from, with the following values:

main-1

main-2

fn-c-1

fn-c-2

Sync Message Information

This heading identifies the section of the report where input and output messages used to determine the timing source quality are listed. This section of the report is available only if the `kbyte` message parameter is set to **enabled**. In OC-3 Releases 8.1, 9.1, and later releases, this section of the report is available only if any of the optical interfaces has been provisioned for `kbyte` (default) or `Sbyte` sync messaging (using the **set-oc3** command) or the **set-oc3/set-oc12** (when Main has 24-type OLIUs).

OC-N Line

This parameter identifies the addresses of optical interfaces that can carry sync messages.

Input Message

disabled	Indicates that the field is not applicable (for example, if synchronization messaging is disabled).
?	Indicates that the message is not readable (for example, due to a line failure).

This column identifies the `Kbyte` input message received on each optical interface line, and may have one of the following values:

Don't Use The interface is not suitable for synchronization timing (Quality Level 7).

Timing Looped Back

The network element connected to this interface is line-timed from it (Quality Level 7).

Stratum 4 The interface is receiving timing from a Stratum 4 clock source (Quality Level 6).

Internal Clock

This interface is receiving timing from a system in holdover or free running (Quality Level 5). This is applicable to the DDM-2000 systems equipped with TGS (BBF2 or BBF2B) circuit packs.

Stratum 3 The interface is receiving timing from a Stratum 3 clock source (Quality Level 4) or from a DDM-2000 system equipped with TG3 (BBF4) circuit packs that is either in holdover or free running.

Stratum 2 The interface is receiving timing from a Stratum 2 clock source (Quality Level 3).

Sync Quality Unknown

This interface is receiving timing from a good quality clock source (Quality Level 2).

Stratum 1 The interface is receiving timing from a Stratum 1 clock source (Quality Level 1).

In OC-3 Releases 8.1, 9.1, and later releases, the type of sync messaging can be provisioned to Kbyte or Sbyte using the **set -oc3** command. In these releases, both versions of sync messages could appear in the report if the optical interfaces have been provisioned for the two types of messages. If Sbyte is selected, the following input messages will be applicable for the optical interface:

Don't Use The interface is not suitable for synchronization timing (Quality Level 7). This message is equivalent to **Don't Use** in Kbyte messaging. There is no message equivalent to **Timing Looped Back** in Sbyte messaging.

Reserved	The interface is receiving the Reserved message on S1 byte (Quality Level 7). Upon receiving this message, the system treats it the same as Don't Use message.
Undefined	The interface is receiving a message on S1 byte that is not defined by the standards (Quality Level 7). Upon receiving this message, the system treats it the same as Don't Use message.
Traceable SONET Clk	The interface is receiving timing from a system in holdover or free running (Quality Level 5). This message is equivalent to Internal Clock in Kbyte messaging. This is applicable to the DDM-2000 systems equipped with TGS (BBF2 or BBF2B) circuit packs.
Traceable Stratum 3	The interface is receiving timing from a Stratum 3 clock source (Quality Level 4) or from a DDM-2000 system equipped with TG3 (BBF4) circuit packs that is either in holdover or free running. This message is equivalent to Stratum 3 in Kbyte messaging.
Traceable Stratum 2	The interface is receiving timing from a Stratum 2 clock source (Quality Level 3). This message is equivalent to Stratum 2 in Kbyte messaging.
Sync Trace Unknown	This interface is receiving timing from a good quality clock source (Quality Level 2). This message is equivalent to Sync Quality Unknown in Kbyte messaging.
PRS Traceable	The interface is receiving timing from a Stratum 1 clock source (Quality Level 1). This message is equivalent to Stratum 1 in Kbyte messaging.
Output Message	This identifies the output message sent out on each OC-N interface line. The valid values for this parameter are the same as those listed for Input Message. For

systems provisioned in line timing, in addition to the above Input Messages, beginning with OC-3 Releases 8.1, 9.1, and later releases, if the sync source is provisioned for Sbyte type of sync messaging and is receiving Traceable Stratum 3, Traceable Stratum 2, or PRS Traceable messages, then the output messages on any of the optical interfaces provisioned for Kbyte will be Stratum 3, Stratum 2, or Stratum 1, respectively.

Type In OC-3 Releases 8.1, 9.1, and later releases, this column identifies the type of sync messaging the optical interface was provisioned for using the **set-oc3** command. The valid values are:

Kbyte

Sbyte

disabled

 NOTE:

For OC-1 interfaces, this column will only display Kbyte.

Sync Autoreconfiguration

This capability allows the system to choose the best timing source to use when it is provisioned for line timing. The valid values are **enabled** and **disabled**.

RELATED COMMANDS

rtrv-oc3

rtrv-state

set-sync

set-oc3

switch-sync

NAME

rtrv-tl1msgmap: Retrieve Message Map for Operation Systems

INPUT FORMAT

rtrv-tl1msgmap;

DESCRIPTION

This command displays the table that associates the OS Application Context Identifier (ACID) to TL1 autonomous message types. This allows the DDM-2000 network element to direct messages to the proper OS destination.

For OC-3 Release 8.0, 9.0 and earlier releases, the output report appears as follows:

```
/* TL1 Autonomous Message Map
```

```
=====
      ACID                ALM ENV CON DB  EVT PM  SW
=====
tl1Maintenance           | x | x | x |  | x | x | x |
tl1MemoryAdministration  |  |  |  | x |  |  |  |
tl1Test                   |  |  |  |  |  |  |  |
tl1PeerComm               |  |  |  |  |  |  |  |
tl10ther1                 | x | x | x | x | x | x | x |
tl10ther2                 |  |  |  |  |  |  |  |
=====
```

```
      x - enabled
<blank> - disabled
*/
```

For OC-3 Release 8.1, 9.1, and later releases, the output report appears as follows:

```
/* TL1 Autonomous Message Map
```

ACID	ALM	ENV	CON	DB	EVT	PM	SW
tl1Maintenance	x	x	x		x	x	x
tl1MemoryAdministration				x			
tl1Test							
tl1PeerComm							
tl10ther1	x	x	x	x	x		x
tl10ther2							

```

      x - enabled
<blank> - disabled
*/

```

The output parameters are:

ACID ACID is the Application Context ID to be assigned to a particular SNPA or SubNetwork Point of Attachment on the x.25 channel. Each ACID defines the type of TL1 messages to be sent by the network element. Default MessageType mappings exist for ACIDs supported by DDM-2000. Supported ACID values are:

tl1Maintenance

tl1MemoryAdministration

tl10ther1

tl1Test

tl1PeerComm

tl10ther2.

msgtype MessageType is one of the supported classes of TL1 messages that the system generates. These message types are not sent to the OS unless they are enabled and associated to an ACID. The supported message types are:

ALM - REPT ALM

ENV - REPT ALM ENV

CON - REPT COND

DB - REPT DBCHG

EVT - REPT EVT

PM - REPT PM

SW - REPT SW

RELATED COMMANDS

ent-osacmap

dlt-osacmap

rtrv-osacmap

ent-tl1msgmap

NAME

rtrv-trace-sts1: Retrieve Path Trace Characteristics

INPUT FORMAT

rtrv-trace-sts1:*Address*;

DESCRIPTION

This command retrieves the provisioned transmit and receive path traces for the STS cross-connected STS-1 channel. The command also outputs the actual receive path trace, and the status of the path trace.

⇒ NOTE:

For OC-3 and OC-12, this feature is only applicable to the STS path terminated to a BBG4B circuit pack.

The input parameter is:

Address This is a STS-1 channel address of the SONET path terminating signal for which the path trace is assigned.

Valid Addresses (within OC-3): **{m,c,all}-{1-3,all},
{a,b}-{1,2}**

Valid Rings Only Addresses: **m-{1-3,all}**

Valid 27-type OLIU Addresses: **m-{1,2}**

Valid 24-type OLIU Addresses: **m-{1-12,all}**

The output report appears as follows:

```

/* STS-1 Path Trace Report
=====
Address
Parameter Value
=====
m-1
Status: MISMATCH
INCTRC: ActualReceiveTraceWhichDoesNotMatchProvisionedReceiveTrace789123
EXPTRC: ProvisionedTransmitTraceyzabcdefghijklmnopqrstuvwxyz1234567891
TRC   : ProvisionedReceiveTracexyzabcdefghijklmnopqrstuvwxyz1234567891
-----
m-2
Status: GOOD
INCTRC: AID2ReceiveLmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
EXPTRC: AID2Transmitmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
TRC   : AID2ReceiveLmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
-----
m-3
Status: MISMATCH
INCTRC:
EXPTRC: AID2Transmitmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
TRC   : AID2ReceiveLmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz1234567891
-----
*/

```

The output parameters are:

<i>Address</i>	This is a channel address of the SONET path terminating signal for which the path trace is assigned.
<i>Status</i>	STS path trace status. This is a status report of the incoming trace. For rtrv-trace-sts1 messages, <i>status</i> may have one of the following values:
<i>GOOD</i>	Good. This indicates that the <i>INCTRC</i> and the <i>EXPTRC</i> match.
<i>MISMATCH</i>	Mismatch. This indicates that the <i>INCTRC</i> and the <i>EXPTRC</i> do not match.
<i>UNAVAILABLE</i>	Unavailable. This indicates that there is no <i>INCTRC</i> because there has been a path interruption. This is also true for the STS path terminating to other than a BBG4B or BBG11B circuit pack for which the path trace is unavailable.

<i>INCTRC</i>	Incoming Path trace message. This indicates the incoming Path Trace (J1) content.
<i>EXPTRC</i>	Expected incoming Path trace message. This indicates the expected Path Trace (J1) content.
<i>TRC</i>	Outgoing Path trace message. This identifies the path trace message to be transmitted.

If the STS-1 channel for which the **rtrv-trace-sts1** command was issued is not available, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Address points to a non-existent channel. */
```

RELATED COMMANDS

set-pthtrc-sts1

NAME

rtrv-t1: Retrieve T1

INPUT FORMAT

rtrv-t1[:*Address*];

DESCRIPTION

This command displays the configuration information and attributes of one or more DS1 ports, as set by the **set-t1** command.

The input parameter is:

Address Address identifies the DS1 port(s). One or more ports may be specified. The default address is **all**.

Valid Addresses: **all, {a,b,c}-{1-7,all}-{1-4,all}**

The output report appears as follows:

```

/* T1 Port Provisioning Report
=====
Port   Line Coding   Alarm  AIS  Failure  BPV   State  PM   Format
Address                               Level  Thrshld to LOS  Mode
=====
a-1-1   ami  (hw)         na   yes   -3       no    is   off  none
a-1-2   ami  (hw)         na   yes   -3       no   auto off  none
a-1-3   ami  (hw)         na   yes   -3       no   auto off  none
a-1-4   ami  (hw)         na   yes   -3       no   auto off  none
.        .             .    .    .        .    .    .    .
.        .             .    .    .        .    .    .    .
.        .             .    .    .        .    .    .    .
*/

```

The output parameters are:

Port Address	Port Address is the address of the DS1 port.
Line Coding	Line Coding is the DS1 line coding which may have the value ami (alternate mark inversion) or b8zs (AMI with bipolar 8-zero substitution). If a previous set-t1 command has set this parameter to a value that overrides the circuit pack switch setting, either of these values will be followed with the string "override." Otherwise, it will be followed by the string "(hw)" to indicate that the line coding for the port is determined by the hardware switches.

Alarm Level

Alarm Level describes the alarm level for an incoming DS1 signal failure and may have one of the following values:

MJ	Major alarm
MN	Minor alarm
NA	No alarm

If the system is provisioned for and reporting no alarm but an alarm exists, the NE ACTY LED on the user panel will be illuminated and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near-end activity.

AIS

Alarm Indication Signal indicates whether an AIS is to be inserted toward the fiber when a loss of an incoming DS1 signal is detected. The values are yes and no.

 NOTE:

When the "BPV to LOS" DLC parameter is set to yes, the AIS parameter is ignored. (An all zeros signal, not AIS, is transmitted to the far end even if the AIS parameter is set to yes.)

Failure Thrshld

Failure threshold is the BER threshold in terms of a logarithm to the base 10. The value may be -8, -7, -6, or -3, corresponding to BERs of 10^{-8} , 10^{-7} , 10^{-6} , and 10^{-3} , respectively.

BPVtoLOS

This column indicates whether an incoming DS1 signal failure (a bit error ratio above the threshold set by the failure threshold parameter) will be translated into an outgoing all-zeros signal at the far end. The values are yes and no.

State

State is the state of the port. It may be one of the following:

is	In-service. A valid T1 signal from the DSX-1 that is being monitored.
auto	Automatic. The system is waiting for a valid T1 signal from the DSX-1.
nmon	Not Monitored

PM Mode	This column indicated the performance-monitoring (PM) mode of the DS1 interface and may be one of the following values: <table><tr><td>on</td><td>DS1 PM enabled on this port</td></tr><tr><td>off</td><td>DS1 PM disabled on this port</td></tr></table>	on	DS1 PM enabled on this port	off	DS1 PM disabled on this port				
on	DS1 PM enabled on this port								
off	DS1 PM disabled on this port								
Format	This column indicates the PM format of the DS1 interface and may be one of the following values: <table><tr><td>none</td><td>No DS1 PM possible on this port due to equipage (PM Mode always off.)</td></tr><tr><td>sf</td><td>Superframe</td></tr><tr><td>esf</td><td>Extended superframe, near-end and far-end</td></tr><tr><td>esfn</td><td>Extended superframe, near-end only</td></tr></table>	none	No DS1 PM possible on this port due to equipage (PM Mode always off.)	sf	Superframe	esf	Extended superframe, near-end and far-end	esfn	Extended superframe, near-end only
none	No DS1 PM possible on this port due to equipage (PM Mode always off.)								
sf	Superframe								
esf	Extended superframe, near-end and far-end								
esfn	Extended superframe, near-end only								

RELATED COMMANDS

set-state-t1

set-t1

NAME

rtrv-t3: Retrieve T3

INPUT FORMAT

rtrv-t3[:*Address*];

DESCRIPTION

This command displays a port provisioning report for one or all DS3 ports, as set by the **set-t3** command.

The input parameter is:

Address Address identifies the DS3 ports. One port or all ports may be specified. The default address is **all**.

Valid DS3 Port Addresses (for BBG4, BBG4B, and BBG20):
{a,b,c,all}

Valid DS3 Port Addresses (for BBG19):
all, {a,b,c}-{1-2,all}

The output report for Release 11.0 and earlier is as follows:

```

/* T3 Port Provisioning Report
=====
Port   Mode   AIS   Alarm   Failure   State   PM   PM   PM
Address                               Mode   Frame Format
=====
address mode   ais   alarm   fth   state  pmmd  frame  fmt
.       .     .     .       .     .     .     .     .
.       .     .     .       .     .     .     .     .
.       .     .     .       .     .     .     .     .
.       .     .     .       .     .     .     .     .
*/

```

The output report for Release 11.1 is as follows:

```

/* T3 Port Provisioning Report
=====
Port   Mode  AIS  Alarm  AIS  Failure  State  PM   PM   PM   Xbit
Address                               Level Alarm Thresh  Mode Frame Fmt
=====
address mode  ais  alarm alarm  fth  state pmmd frame fmt  xbit
.      .    .   .    .    .    .    .   .   .   .   .
.      .    .   .    .    .    .    .   .   .   .   .
.      .    .   .    .    .    .    .   .   .   .   .
*/

```

The output parameters are:

Port Address	Port Address is the address of the DS3 port
Mode	Mode is the violation monitor removal mode of the DS3 signal. It may have one of the following values: - vmr Monitor and remove DS3 P-bit errors (default value). - vm Monitor but do not remove DS3 P-bit errors. - cc Clear channel. Do not monitor or remove DS3 P-bit errors. - This parameter does not apply to the BBG20 TMUX circuit pack. — This parameter does not apply to the TMUX (BBG20) circuit pack.
AIS	AIS indicates whether or not a DS3 alarm indication signal (AIS) should be inserted. The value may be yes or no. This parameter is not applicable to the TMUX (BBG20) circuit packs, therefore, a dash (—) will be displayed. When AIS is set to yes: — DS3 AIS is inserted towards the DSX-3 upon detection of an OC-N loss of signal or STS path AIS incoming from the fiber. — DS3 AIS is inserted towards the fiber upon detection of DS3 LOS incoming from the DSX-3.

NOTE:

AIS is always inserted if the violation monitor removal mode is provisioned for vmr or vm.

Alarm Level

Alarm describes the alarm level for an incoming DS3 signal failure and has the following values:

CR	Critical alarm
MJ	Major alarm
MN	Minor alarm
NA	No alarm

If the system is provisioned for and reporting no alarm but an alarm exists, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near-end activity. For TMUX circuit packs in OC-3 Release 11.1, this parameter refers to the alarm level for the following

AIS Alarm Level

This is only applicable to the TMUX (BBG20) circuit packs in OC-3 Release 11.1 It describes the alarm level for an incoming DS3 (from DSX) AIS and has the following values:

CR	Critical alarm
MJ	Major alarm
MN	Minor alarm
NA	No alarm level
-	This parameter is not applicable to any other non-TMUX DS3 ports.

Failure Threshold

Failure threshold is the BER threshold in terms of a logarithm to the base 10. The value may be either -6 or -3, corresponding to BERs of 10^{-6} and 10^{-3} , respectively.

For the BBG20 TMUX circuit pack, the DS3 BER threshold is based on p-bit or -bit parity violations; a failure threshold value of 10^{-3} will cause a "BER signal fail" alarm of the DS3 BER exceeds 10^{-4} .

State

State is the state of the port with the values:

is	In-service. A valid T3 signal from the DSX-3 is being monitored.
auto	Automatic. The system is waiting for a valid T3 signal from the DSX-3.
nmon	Not Monitored

PM Mode	This column shows the performance monitoring (PM) mode of the DS3 interface, and may be one of the following values: on DS3 PM enabled on this port (default value). off DS3 PM disabled on this port (PM data is not monitored or reported). — Indicates no DS3 path PM because cc was selected for Mode. The DS3 PM report will display the line PM data and dash lines (-) for both directions of the DS3 path PM data when a BBG4B or BBG19 pack is active (in-service) in a function unit slot.
PM Frame	This parameter indicates the type of framing for the incoming DS3 signal from both the fiber and the DSX-3. For the TMUX (BBG20) circuit pack, this parameter will indicate the type of DS3 signal that is received from the DSX-3 only and is transmitted towards the DSX-3. It may have one of the following values: m13 The incoming DS3 signal is in M13 framing type (default value). cbit The incoming DS3 signal is in C-bit framing type. — Indicates no DS3 path PM because cc was selected for Mode. The DS3 PM report will display the line PM data and dash lines (-) for both directions of the DS3 path PM data when a BBG4B or BBG19 pack is active (in-service) in a function unit slot.
PM Format	This parameter indicates the type of path PMON that will appear in the DS3 PM report. This parameter will appear only if the vmr or vm mode has already been selected. For the BBF20 TMUX BBG20 circuit pack, this parameter will always appear. This parameter may have one of the following values: pbit When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 P-bit CV, ES, SES, and UAS (default value). fmbit When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 adjusted F&M bit CV, ES, SES, and UAS.

- `cpbit` When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 CP-bit parity near-end and far-end CV, ES, SES, and UAS.
- Indicates no DS3 path PM because `cc` was selected for `Mode`. The DS3 PM report will display the line PM data and dash lines (-) for both directions of the DS3 path PM data when a BBG4B or BBG19 pack is active (in-service) in a function unit slot.

`Xbit`

This is only applicable to the BBG20 TMUX circuit packs in OC-3 Release 11.1. It displays the values for both X-bits in the outgoing (towards DSX) DS3 signal. This parameter is valid only if the Frame has been set to "m13". This parameter is valid only if the Frame has been set to "m13". The value may be one (default), zero, or - (for when the TMUX circuit pack has been provisioned for "cbit" framing or any other non-TMUX DS3 ports).

RELATED COMMANDS

`set-state-t3`

`set-t3`

NAME

rtrv-ulsdcc: Retrieve Upper Layer Section DCC

INPUT FORMAT

rtrv-ulsdcc;

DESCRIPTION

This command retrieves the network service access point (NSAP) as provisioned by the **ent-ulsdcc** command. The NSAP is a 20-byte address that provides unique identification for each network element in the system. Only certain portions of this address are user-settable.

The output report appears as follows:

```

/* Upper Layer Section DCC Provisioning Report
=====
Parameter      Value      Provisionable
=====
NSAP address:  L3idp      value      no
                L3dfi      value      no
                L3org      value      YES
                L3res      value      YES
                L3rou      value      YES
                L3sys      value      no
                L3sel      value      no
*/

```

The output parameters are:

NSAP Address This is the 20-byte address assigned to a network element.

Parameter This identifies the following seven parameters that make up the NSAP address:

- L3idp** This part of the NSAP address is assigned according to the International Standards Organization (ISO) standards. For SONET systems, the value is set to 39/0840 to indicate that U.S. American National Standards Institute (ANSI) is the registration authority responsible for the assignment of the NSAP address.
- L3dfi** This part of the NSAP address specifies the format for the rest of the NSAP address. For SONET systems, the value is set to 128.

- L3org** This part of the NSAP address contains the allocated hexadecimal company code assigned by the ANSI-administered USA Registration Authority for OSI Organization Names.
- L3res** This part of the NSAP address currently has not been assigned a specific purpose by the SONET standards.
- L3rou** This part of the NSAP address indicates the routing domain, identifying a unique routing domain within an Administrative Domain, and the area, identifying the area within the routing domain to which the NSAP address belongs. Both parts of this address are hexadecimal values.
- L3sys** This part of the NSAP address is assigned by IEEE administrators to U.S.-manufactured systems to guarantee a globally-unique NSAP.
- L3sel** This part of the NSAP address is used to differentiate multiple NSAP addresses within a system. For DDM-2000, this parameter is always set to zero and is not user-settable.

Value This field indicates the numerical value of each portion of the NSAP Address.

Provisionable This field indicates whether each portion of the NSAP address is user-settable. The valid values are **YES** or **no**.

RELATED COMMANDS

ent-ulsdcc

NAME

rtrv-vt1: Retrieve VT1.5

INPUT FORMAT

rtrv-vt1[:*Address*];

DESCRIPTION

This command retrieves two types of provisioned parameters for VT1.5 channels. The parameter types are:

- Signal degrade alarm threshold
- Alarm level for sa/nsa VT1.5 path AIS condition

⇒ NOTE:

If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address is the address of VT1.5 channels whose state is to be reported. The default is **all** addresses. Other valid ring and linear addresses are:

m-{1-3,all}-{1-7,all}-{1-4,all},
c-{1-3,all}-{1-7,all}-{1-4,all},
{a,b}-{1-2,all}-{1-7,all}-{1-4,all}, **all**

Valid EC-1 Addresses: **{a,b,c}**-{1-7,all}-{1-4,all}, **all**

Valid 27-type OLIU Addresses:
{m,a,b,c}-{1,2,all}-{1-7,all}-{1-4,all}, **all**

Valid 26G2-U OLIU Addresses:
{a,b,c}-1-{1-7,all}-{1-4,all}, **all**

If the shelf is equipped with 24-type OLIUs in its Main unit slots, the valid Main unit addresses are:
m-{1-12,all}-{1-7,all}-{1-4,all}

Only VT1.5 channels that are cross-connected will appear in the output report.

The output report appears as follows:

```

/* VT1.5 Channel Provisioning Report
=====
SignalDegrade = value

VT AIS Alarm Information
Address      AIS Alarm      AIS Alarm
              Service Affecting  Non Service Affecting
=====
address      sa              nsa
address      sa              nsa
.            .              .
.            .              .
.            .              .
*/

```

For Release 9.0 and earlier, if the signal degrade value is zero (0) (as set by the **set-vt1** command), then signal degrade is disabled and the following output report appears:

```

/* VT1.5 Channel Provisioning Report
=====
SignalDegrade=0 (disabled)

VT AIS Alarm Information
Address      AIS Alarm      AIS Alarm
              Service Affecting  Non Service Affecting
=====
address      sa              nsa
address      sa              nsa
.            .              .
.            .              .
.            .              .
*/

```

For Release 9.1 and later, a signal degrade value of zero (0) cannot be provisioned and thus will not appear in the report.

If the signal degrade parameter and non-service affecting AIS parameters are not valid for the application, for example a non-ring application, then the report appears as follows:

```

/* VT1.5 Channel Provisioning Report
=====
Address      AIS Alarm
              Service Affecting
=====
address      sa
address      sa
.            .
.            .
.            .
*/

```

The output parameters are:

SignalDegrade	This is the signal degrade threshold value.
address	This is the VT1.5 address of the provisioned channel.
AIS Alarm	One or more columns of information will show the AIS alarm values for service affecting (SA) and non-service affecting (NSA) alarms. SA alarms may have one of the following values:
	mj Major alarm (default for ring channels)
	mn Minor alarm (non-ring channels only, default)
	na Not alarmed, but reported
	nr not alarmed and not reported (non-ring channels only)
	NSA alarms may have one of the following values:
	mn Minor alarm (default)
	nr not alarmed and not reported

RELATED COMMANDS

set-vt1

NAME

rtrv-x25: Retrieve X.25 link

INPUT FORMAT

rtrv-x25;

DESCRIPTION

Three output reports are displayed when this command is entered. The first report displays the X.25 link packet size information provisioned by the **set-x25** command, and the second report shows the status of the X.25 communication. The third report provides an X.25 event history.

The X.25 link packet size output report appears as follows:

```
/* X.25 Link Provisioning Report
=====
TID=system_name
GNE=x

-----
PKT=pkt
*/
```

The output parameters are:

TID	This is the system name, indicated by a string of up to 20 alphanumeric characters. The default value for TID is that set by the site and NE values and is a string of the form "SitemNE". The TID must be unique for each element in a subnetwork.
GNE	This parameter indicates whether this system is a gateway network element (GNE), providing a TL1 interface. It has a value of active or not active.
PKT	Pkt is a string with possible values of 128 or 256 (default value). The X.25 packet size is active only if this system is a GNE, otherwise it is inactive.

The second report shows the state of various X.25 communication entities. The output report appears as follows:

```

/* X.25 Communication Report
=====
Entity                State    DTE Calling Address    Code (hex)
=====
X.25 lcn 1 (pvc)      up
X.25 lcn 2 (pvc)      up
X.25 lcn 3 (pvc)      up
X.25 lcn 16 (svc)     up        5086901234          06
X.25 lcn 17 (svc)     down
X.25 lcn 18 (svc)     down
X.25 lcn 19 (svc)     down
X.25 lcn 20 (svc)     down
X.25 lcn 21 (svc)     down
X.25 interface        down
lapb                  down
physical line         down
*/

```

The output parameters for this report are:

Entity This column shows the various X.25 communication entities.
The entities are:

X.25 lcn 1 (pvc)

This communication channel is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

X.25 lcn 2 (pvc)

This communication channel is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

X.25 lcn 3 (pvc)

This communication channel is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

X.25 lcn 16 (svc)

This communication channel is considered to be **up** upon the successful acknowledgement of the CALL_REQ_IND packet with a CALL_ACC_CONN packet. This does *not* imply that TL1 communication is active.

X.25 interface

This communication channel is considered to be **up** upon the successful acknowledgement of the RESTART_PACKET packet and the RESTART_CONFRM packet. This means that layer 3 is active and ready to establish the pvc or svc communication channel.

lapb

When this communication channel is **up**, layer 2 is active and ready to send or receive a RESTART_PACKET.

physical line

This X.25 physical line is up only if the lapb is up. A **down** physical line does not necessarily mean that the physical connection (for example, a cable) is broken but that the interfacing equipment does not acknowledge the communication with the DDM-2000.

State This parameter is explained in each one of the above entities.

DTE Calling Address

SVCs are defined by their X.25 DTE Calling Address. The allowed values for this parameter are defined as 1 to 15 Binary Coded Decimal (BCD) digits. Furthermore, this parameter would only be displayed when the SVC State is **up** and would not be shown when the SVC State is **down** or if the X.25 Communication Entity is a PVC, X.25 interface, lapb, or a physical line. (no default value)

Code (hex)

This column shows a hexadecimal output of the protocol states in the DDM-2000 software. This is used by technicians for diagnostic purposes.

A third output report lists an X.25 event history. The output report appears as follows:

```
/* X.25 Event History
```

```
=====
Date      Time      Entity  Event      Data (hex)
=====
01-01    00:18:48    lcn 16  xmt    CLR_CONFIRM    10 10 17
01-01    00:18:47    lcn 16  rcv    CLR_REQ_IND    10 10 13 00 00
01-01    00:18:03    lcn 16  xmt    CALL_ACC_CONN  10 10 0f
01-01    00:00:21    lcn 2   rcv    RESET_CONFIRM  10 03 1f
01-01    00:00:21    lcn 3   rcv    RESET_CONFIRM  10 03 1f
01-01    00:00:21    lcn 1   xmt    RESET_REQ_IND  10 01 1b 00 00
01-01    00:00:21    lcn 2   xmt    RESET_REQ_IND  10 02 1b 00 00
*/
```

The output parameters for this report are:

Date This column shows the date the X.25 event occurred.

Time This column shows the time the X.25 event occurred.

Entity This column shows the X.25 communication entity where the event occurred.

Event This column lists the event and whether it was transmitted (**xmt**) or received (**rcv**) by the DDM-2000.

Data This column shows a hexadecimal representation of frame or packet information related to the event. This is used by RTAC personnel for diagnostic purposes.

RELATED COMMANDS

set-x25

NAME

set-attr-alm: Set Alarm Attribute

INPUT FORMAT

set-attr-alm[:**almdel**=*AlarmDelay*][,**clrdel**=*ClearDelay*][,**pmn**=*PMN*];

DESCRIPTION

This command sets the alarm holdoff and clear delays.

The input parameters are:

almdel AlarmDelay is the delay for incoming signal and equipment failures. It sets an interval of time that a fault condition is present before an alarm is declared. The delay is in seconds, between 0 and 30, with a default value of 2.

 NOTE:

If a signal degrade threshold is exceeded, the recovery interval for the signal degrade condition may be longer than the provisioned holdoff delay, and an alarm will result. For example, suppose an OC-3 interface with an alarm delay of 20 seconds and a signal degrade threshold of 10^{-6} has a signal degrade failure of 10 seconds. Since the recovery interval for a 10^{-6} error rate threshold is 15 seconds, the total length of the alarm condition (10 seconds of failure plus 15 seconds of recovery) will exceed the provisioned alarm delay of 20 seconds, and an alarm will be declared.

clrdel ClearDelay is the delay in time before an alarm can be declared to be clear. For equipment failures and signal failures (including AIS and FERF), the clear delay time interval begins when the alarm failure clears. For equipment failures, the delay is between 0 and 30 seconds, with a default value of 15 seconds. For signal failures, clear delay is fixed at 15 seconds.

pmn PMN is the Power Minor alarm level, which can be either minor (**MN**) or major (**MJ**). The default is Minor.

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
You have selected the set-attr-alm command with these parameters:
```

```
AlarmDelay = nn  
ClearDelay = nn */  
PMN = nn */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rtrv-attr-alm

NAME

set-attr-cont: Set Attribute Control

INPUT FORMAT

set-attr-cont:*Address:desc=Description;*

DESCRIPTION

This command is used to provision (define) the name of the environmental control points.

The input parameters are:

Address Address identifies the control point to be provisioned. There is no default for this parameter.

Valid Addresses: **cont - {1-4}**

desc Description is a descriptive name for the control point. The description may be an alphanumeric string, upper- and lower-case with no spaces, up to 26 characters long. Symbolic characters may be included in the descriptive name of the control point.

The following symbolic characters have special meanings either for the CIT interface or for the X.25 TL1 interface and cannot be included in the description:

;	semicolon	?	question mark
@	at sign		space
\	back slash	!	exclamation point
:	colon	=	equal sign
"	double quote	,	comma

All control characters and special keys cannot be included in the description.

 NOTE:

This command will be denied if entered in a system whose CO/RT parameter is set to CO (via the **set -ne** command). The following denial message will be displayed:

```
ENSI
/* Equipage, Not equipped for Setting specified Information */
/* Environmental controls can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

NAME

set-attr-env: Set Attribute Environment

INPUT FORMAT

set-attr-env:*Address***[:***alm=Alarm***][***almtype=AlarmType***][***desc=Description***];**

DESCRIPTION

This command is used to provision (set) the alarm level of the environmental input points. Active inputs appear as entries in the alarm and history reports of the local network element (NE) and generate autonomous TL1 messages through the gateway network element (GNE). Inputs 1 through 21 also appear in the TBOS alarm display. Parallel telemetry outputs appear at the central office (CO) NE and are limited to inputs 1 through 10.

The input parameters are:

Address Address identifies the environmental point to be provisioned. There is no default value for this parameter.

Valid Addresses: **env-{1-21}**, **env-{all}**

⇒ NOTE:

The address **env-{all}** is allowed only when **alm** is the only parameter used for this command. The address **env-{all}** is not allowed when the **almtype** and/or **desc** parameters are used.

alm Alarm is the provisioned alarm level of the environmental input and has the following values:

cr Critical alarm

mj Major alarm

mn Minor alarm (default)

na Not alarmed, but reported.

almtype AlarmType. This parameter is used to classify the type of alarm. The description may be an alphanumeric string, upper- and lowercase with no spaces, up to 10 characters long. The original value of AlarmType is "Misc."

desc Description is a descriptive name for the point. The description may be an alphanumeric string, upper- and lowercase with no spaces, up to 26 characters long.

The following symbolic characters have special meanings either for the CIT interface or for the X.25/TL1 interface and cannot be included in the description:

;	semicolon	?	question mark
@	at sign		space
\	back slash	!	exclamation point
:	colon	=	equal sign
"	double quote	,	comma

All control characters and special keys cannot be included in the description.

 NOTE:

This command will be denied if entered in a system that has the CO/RT parameter is set to CO (via the **set-ne** command). The following denial message will be displayed:

ENSI

```
/* Equipage, Not equipped for Setting specified Information */  
/* Environmental alarms can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

rtrv-attr-env

rtrv-ne

set-attr-cont

NAME

set-date: Set Date and Time

INPUT FORMAT

set-date:[**date**=*Date*][,**time**=*Time*];

DESCRIPTION

This command sets the date and time. Executing this command will corrupt the current quarter hour and day performance-monitoring (PM) bins.

**CAUTION:**

If an **apply** command is scheduled for execution (*action=install*), the **set-date** command should NOT be issued before program installation is invoked and completed. The user is advised to wait until program installation is completed and the system is reset.

**NOTE 1:**

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

**NOTE 2:**

In the event of a shelf reset, an automatic date and time recovery process takes place by reading the date and time from the remote shelf connected to the main interface of the local shelf (in linear applications). In ring applications, the date and time data is recovered from the remote shelf connected to Main-1 of the local shelf. In both linear and ring applications, if the automatic recovery fails, both date and time are set to default (**70-01-01** for date and **00:00:00** for time).

The input parameters are:

- date** Date is entered as six digits YYMMDD, where YY is the last two digits of the year, MM is the month, and DD is the day. Default is the current system day.
- time** Time is entered as six digits HHMMSS, where HH is hours (00-23), MM is minutes (00-59), and SS is seconds (00-59). Default is the current system time.

When input, this command will cause the following confirmation message to be displayed:

```
/*Caution! Execution of this command will corrupt the  
current quarterhour and current day performance monitoring data.  
You have selected the set-date command with these parameters:
```

```
  Date = YYMMDD  
  Time = HHMMSS */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

apply

NAME

set-ec1: Set EC-1

INPUT FORMAT

set -ec1:*Address:[a***l***m=AlarmLevel][,dgr=SignalDegradThreshold];*

DESCRIPTION

This sets the characteristics of an EC-1 port.

The input parameters are:

address Address is the address of one or more EC-1 ports.

Valid Addresses: **{a,b,c,all}**

a**l****m** AlarmLevel describes the alarm level for an incoming EC-1 signal failure, and has the following values:

cr Critical alarm (default value)

mj Major alarm

mn Minor alarm

na Not alarmed

dgr SignalDegradThreshold specifies the bit error rate (BER) threshold for the EC-1 port in terms of a logarithm to the base 10 as an integer with values from -9 to -5, with a default of -6. When this threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated.

Entering this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the set-ec1 command with these parameters:
   Address = address
   AlarmLevel = alarmlevel
   SignalDegrad= signaldegradethreshold */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rtrv-ec1

NAME

set-feat: Set Feature

INPUT FORMAT

set - feat:feat=Feature,act=Action;

DESCRIPTION

This command enables a user to configure the network element for feature options that are licensed for use.

 NOTE:

This command is available to privileged users only.

The input parameters are:

feat	Feature is the feature option available to the user, and it may have one of the following values:
st s3c	This feature provides STS-3c service (concatenated signals). The 21-type OLIU circuit packs must be in the Main and FN-C slots to support this feature.
vt pm	This feature provides performance-monitoring of cross-connected VT1.5 services.
ds1pm	This feature provides performance-monitoring of cross-connected (dropped) DS1 services in ring systems.
act	Action is the action the user wants to perform on the listed feature, and it may have one of the following values:
enabled	This enables a feature option. This action will also unblock the use of commands needed by this feature.
disabled	This disables a feature option. This action will also block the use of commands needed by this feature. The user may be required to reprovision the shelf before disabling a feature.

If a user fails to remove all equipment or reprovision parameters associated with a feature before disabling that feature, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System must be reprovisioned to disable <Feature>. */
```

If this command is entered and no timing packs are equipped, there is no place to store a backup copy of the feature options. Thus, the command will be denied with the following message:

```
EQWT
/* Equipage, Wrong Type */
/* No change in provisioning - both timing slots are unequipped */
```

Enabling a feature will cause the following confirmation message to be displayed:

```
/* ACCESS TO, AND USE OF THIS <feature> FEATURE IS PERMITTED ONLY
   IF SPECIFICALLY AND EXPRESSLY AUTHORIZED UNDER THE RELEVANT
   DDM-2000 SOFTWARE AGREEMENT BETWEEN AT&T AND CUSTOMER.

   You have selected the set-feat command with the parameters:
   Feature = feature
   Action = action */

Execute? (y/n or CANCEL/DElete to quit) =
```

Disabling a feature will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command will disable all of the
system capabilities associated with the <feature> feature
and circuit packs which support that feature will no longer
provide access to that feature.

You have selected the set-feat command with these parameters:
Feature = feature
Action = action */

Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rtrv-feat

NAME

set-fecom: Set Far-End Communications

INPUT FORMAT

set - fecom: *Address*[:**com**=*Communications*][,**nsus**=*NS/US*];

DESCRIPTION

This command enables or disables communication over the section data communication channels (DCC). A DCC is an embedded overhead communications channel in the SONET line used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements (NEs).

⇒ NOTE:

This command is available to privileged users only.

The input parameters are:

Address	Address identifies the address of the DCC. Valid Linear Addresses: dcc-{m,a,b,c,all} Valid Ring Addresses: dcc-{m1,m2,a,b,c,all} Valid OC-1 Addresses (for 27-type or 26-type OLIUs): dcc-all, dcc-{m,a,b,c}{1,2}-{1,2}
com	This parameter indicates whether communication over a specified DCC is enabled or disabled. The valid values are enabled or disabled. The default value is enabled. Communication must be enabled/disabled per DCC-all, or specific DCC. As an example, at some point, communication over some DCC channels might have to be enabled at the same time.
nsus	NetworkSide/UserSide (NS/US) is the identification of the DCC identity for the NE. Each DCC on the NE must define its NS/US identity in the OSI network. When the NS/US parameter is the same at both ends, an alarm is active. <i>nsus</i> is not prompted for. NetworkSide/UserSide may have the following parameter values: <i>ns</i> Network Side (NS) defines this end of the DCC to be a network site. For DDM-2000 networks either termination of the DCC can be this value as long as the other termination is different. Default values are listed on the following page.

us User Side (US) defines this end of the DCC to be a user site. For DDM-2000 networks, either termination of the DCC can be this value as long as the other termination is different. Default values are listed on the following page.

The following chart shows default settings for the NS/US parameter:

Linear Appl.	dcc-m		dcc-a		dcc-b		dcc-c	
21-type/ 22-type OLIUs	us		ns		ns		ns	
Rings Appl.	dcc-m1	dcc-m2	dcc-a		dcc-b		dcc-c	
22-type OLIUs	us	ns	ns		ns		ns	
Ring Appl.	dcc-m1-1 m1-2	dcc-m2-1 m2-2	dcc-a1-1 a1-2	dcc-a2-1 a2-2	dcc-b1-1 b1-2	dcc-b2-1 b2-2	dcc-c1-1 c1-2	dcc-c2-1 c2-2
27-type OLIUs	us	ns	ns	us	ns	us	ns	us
Ring Appl.			dcc-a1-1	dcc-a2-1	dcc-b1-1	dcc-b2-1	dcc-c1-1	dcc-c2-1
26G2-U OLIUs			ns	us	ns	us	ns	us

This command can only be completed successfully if it is executed from a CIT or modem port. This command cannot be executed during a remote login session. If the command is executed during a remote login session, it will be denied with one of the following messages:

```
SNVS
/* Status, Not in Valid State */
/* This command cannot be executed from within a rlgn session. */
```

```
SNVS
/* Status, Not in Valid State */
/* Farend communication can not be set from a remote session. */
```

Starting with Release 11.1, this command can be executed from a remote login session.

When this command is input, the following confirmation message will be displayed:

```
/* Caution! Network element access is affected by this command.
   You have selected the set-fecom command with these parameters:

   Address = address
   Communications = enabled
   NS/US = value */

Execute? (y/n or CANCEL/DELeTE to quit) =
```

If the **nsus** parameter is changed, the following caution message will be displayed before the confirmation message:

```
/* Caution! Network Element access is affected by this command.

Caution! When executed, this command causes the NE to
restart the program. This action will erase all of
the performance monitoring data and the history file.
If possible, it will reinitialize the date and time with
the far end via the DCC. Otherwise, the
date and time will assume default values.
You have selected the set-fecom command with these parameters:

Address = address
Communications = enabled
NS/US = value */
```

The **nsus** (NetworkSide/UserSide) parameter can only be changed if the DCC is disabled or alarmed (down), otherwise this command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* NS/US can not be changed when DCC is active and unalarmed. */
```

Changing the **nsus** parameter may require the user to execute the **set - fecom** command to disable the DCC.

RELATED COMMANDS

rtrv-fecom

rtrv-map-neighbor

rtrv-map-network

NAME

set-lgn: Set Login

INPUT FORMAT

set -lgn[:act=Action];

DESCRIPTION

This command enters, edits, and deletes logins and passwords. Prior to the first use of this command, the three default logins are ATT01, ATT02, and ATT03 (all upper-case letters) for Releases 8.0, 9.0, and earlier. For Releases 8.1, 9.1, and later, the 3 default logins are LUC01, LUC02, and LUC03. The default password is DDM-2000.

⇒ NOTE 1:

Some situations (for example, a software upgrade or a new circuit pack installation) may cause the default login to change. Users who may no longer gain system access with the ATTXX login should try LUCXX.

⇒ NOTE 2:

This command is available to privileged users only.

⇒ NOTE 3:

To enable security, a privileged user must execute the **set -secu** command. Creating logins and passwords does *not* automatically enable security.

A maximum of 100 (general, maintenance and reports-only user) logins is supported. When security is enabled, the following four types of users are permitted to access the system with a valid login and password:

privileged user	The privileged user may execute any commands, including restricted commands.
general user	The general user may execute any commands that are not restricted to privileged users.
maintenance	The maintenance user may only execute commands that access the system, extract reports, and execute maintenance functions through a specific set of commands. No privileged commands are allowed to be executed by maintenance users.
reports-only	The reports-only user may only execute commands that access the system and extract reports.

All users may use the **set-passwd** command to modify their own passwords.

The input parameters are:

act Action has one of the following values:

enter Enter a new login and password pair (default value). Login is a case-sensitive alphanumeric string consisting of a minimum of five and a maximum of ten alphabetic characters and/or numbers. When entering a new login, the type of user (privileged user, general user, maintenance or reports-only) must be specified and a password should also be assigned to the new user. A user may then use the **set-passwd** command to modify his/her own password after the login has been activated.

Password is a case-sensitive string of alphanumeric and symbolic characters. Password may have a minimum of six and a maximum of ten characters. Additionally, the password must include at least two numeric characters and one symbolic (non-alphabetic and non-numeric) character. The following symbolic characters have special meanings either for the User Interface or for the X.25 TL1 interface and cannot be included in a password:

;	semicolon	space
@	at sign	? question mark
\	back slash	! exclamation point
:	colon	= equal sign
"	double quote	, comma

Additionally, the following control characters and special keys CANNOT be included in a password:

<CR>	carriage return	<tab>	tab key
<bksp>	backspace key	<esc>	escape key
<del>	delete key		

edit Change an existing login and/or password

delete Delete an existing login.

The **set-lgn** command executes in prompt mode. Based on the action selected, there are three different dialogs shown on the following pages. In these dialogs, the user input is indicated with bold type.

The following screen shows the dialog to enter a login:

```
set-lgn:act=enter;  
enter the new login = new_login  
enter password for new login = new_password  
reenter password for new login = new_password  
enter user type for this login = user_type  
  
/* Caution! Network Element access is affected by this command.  
   You have selected the set-lgn command with these parameters:  
  
   Action = enter  
   Login = new_login  
   User Type = user_type */  
  
Execute? (y/n or CANCEL/DELETE to quit) =  
;
```

**NOTE:**

Passwords will not be displayed when they are entered.

The following screen shows the dialog to edit a login:

```
set-lgn:act=edit;  
enter the login to be changed = old_login  
enter the new login = new_login  
enter password for new login = new_password  
reenter password for new login = new_password  
enter user type for this login = user_type  
  
/* Caution! Network Element access is affected by this command.  
   You have selected the set-lgn command with these parameters:  
  
   Action = edit  
   Old Login = old_login  
   New Login = new_login  
   Old User Type = user_type  
   New User Type = user_type */  
  
Execute? (y/n or CANCEL/DELETE to quit) =  
;
```

The following screen shows the dialog to delete a login:

```
set-lgn:act=delete;  
enter the login to be deleted = user_login  
/* Caution! Network Element access is affected by this command.  
   You have selected the set-lgn command with these parameters:  
  
   Action = delete  
   Login = user_login */  
  
Execute? (y/n or CANCEL/DELETE to quit) =  
;
```

If the login value does not match the valid login definition (syntactically incorrect), the following message will appear:

```
/* Entry does not follow rules for logins. */  
/* Logins must be 5 to 10 alphabetic characters and/or numbers;  
   characters allowed are A..Z, a..z and/or 0..9 */
```

The user may try once again to enter a login. If the user enters a login that does not match the valid login definition, the following denial message will be displayed:

```
IDEI  
/* Input, Data Entry Invalid */  
/* Entry does not follow rules for passwords and logins. */
```

If the entered password value does not match the valid password definition (syntactically incorrect), the following message will appear:

```
/* Entry does not follow rules for passwords. */
/* Passwords must be 6 to 10 characters, with at least 2 non
   alphabetic characters and additionally, at least 1 symbolic.
   Characters allowed are: A..Z or a..z, 0..9, all symbolic
   characters, EXCEPT the following:

           ; semicolon           ? question mark
           @ at sign             space
           : colon               = equal sign
           " double quote        , comma
           \ back slash          ! exclamation point

*/
```

The user may try once again to enter a password. If the user enters a password that does not match the valid password definition, the following denial message will be displayed:

```
IDEI
/* Input, Data Entry Invalid */
/* Entry does not follow rules for passwords and logins. */
```

Privileged user logins can be edited to change the login name, password, or both. However, privileged logins cannot be deleted. If an attempt is made to delete a privileged user login, the following denial message will be displayed:

```
SDNC
/* Status, Data Not Consistent */
/* Privileged user logins cannot be deleted. */
```

If an attempt is made to add a privileged user login, the following message will keep displaying until a valid user type (general, maintenance, or reports-only) is entered:

```
/* Not a valid response */
/* Select from: */
1. general
2. maintenance
3. reports-only
enter user type for this login [general] =
```

When a user selects the `edit` or `delete` option for a login but the login entered does not exist, the following message will be displayed:

```
IIUS
/* Input, Invalid USer identifier */
/* login <value> is unknown. */
```

If a user invokes this command with **Action=enter** and the entered login matches the login definition (syntactically correct) but *also* matches an already existing valid login, the attempt will be denied and the following denial message will be displayed:

```
IIUS
/* Input, Invalid USer identifier */
/* login <value> is unknown. */
```

If a user attempts to enter another login when the maximum supported logins already exists, the following denial message will appear:

```
SLEM
/* Status, List, Exceeds Maximum */
/* Maximum number of logins already exists.
   Cannot enter another login. */
```

RELATED COMMANDS

rtrv-lgn

set-passwd

set-secu

NAME

set-link: Set CIT Link Configuration

INPUT FORMAT

set - link:pg=*page length*;

DESCRIPTION

This command sets the configuration of the current user's craft interface terminal (CIT) link.

The input parameter is:

pg PageLength is the vertical size of the displayed page in lines. The value may be an integer between 3 and 150 with a default of 24. If the page length is set to zero, no pager is used and system output is sent directly to the screen. The page length is set to the default value each time a new CIT session is started.

RELATED COMMANDS

rtrv-link

NAME

set-ne: Set Network Element

INPUT FORMAT

```
set-ne:tid=TID[,dsne=DSNE][,almgrp=AlarmGroup][,agne=AGNE]
[,site=Site][,ne=NE][,shelf=Shelf][,crs=CrsMode]
[,cort=CO/RT][,tbaddr=TBOSAddress][,tblink=TBOSLink]
[,tbrem=TBOSRemote][,idle=IdleChannelSignal]; (Linear Releases)
```

```
set-ne:tid=TID[,dsne=DSNE][,almgrp=AlarmGroup][,agne=AGNE]
[,site=Site][,ne=NE][,shelf=Shelf][,cort=CO/RT]
[,tbaddr=TBOSAddress][,tblink=TBOSLink][,tbrem=TBOSRemote]
[,idle=IdleChannelSignal]; (Ring Releases)
```

DESCRIPTION

This command sets the network element (NE) characteristics (parameters) of a DDM-2000.

⇒ NOTE:

If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

In a steady-state network with an existing DSNE, a user should allow 5 minutes between changes to individual nodes. After a reset of the DSNE, wait 20 to 30 minutes before issuing the **set-ne** command to any remote network element.

The input parameters are:

tid TID is a string of up to 20 characters and may include upper- and lowercase letters, numbers, and the following characters: "-", "+", "%", "#", ".". Prior to the first use of this command, the initial value is Site x NE y , where x and y are the site and network element numbers. The *TID* will be printed at the beginning of the output for all commands. For proper operation of TL1/X.25 OS interfaces, the *TID* must be unique for each NE.

⇒ NOTE:

Changing the TID (system name) does not change the network address, which is determined by the NSAP but does affect proper TL1 message reporting.

**CAUTION:**

Changing the TID will cause all active TL1 logins to this NE to be dropped. New TL1 logins to this NE will have to be activated using the new TID value.

- dsne** DSNE has a value of *yes* or *no*, which indicates whether this system is the directory services network element (DSNE). The DSNE is the network element for OSI releases where the map listing all active nodes in the network is maintained. The default value for this parameter is *no*. One (and only one) NE in the subnetwork must be designated as a DSNE for proper DCC communication between nodes.
- almgrp** Alarm Group (AG) has a numeric value of 1 through 255. All NEs in the subnetwork, whether nearby or not, that have the same AG number are members of the same group. All members of the AG will share NE Status information with each other and with any alarm status NE (ASNE) monitoring this alarm group but not with NEs of different alarm Groups. The default AG number for DDM-2000 is 255 and may not have to be changed if a single AG is desired.
- The default AG number for FT-2000 is also 255. When a subnetwork with mixed Product Family 2000 network elements is first engineered, both DDM-2000 and FT-2000 by default will belong to the same AG. The default AG number for FiberReach is 255, which means that by default FiberReach nodes are also in the same AG as DDM-2000 and FT-2000.
- agne** AGNE (Alarm Gateway NE) has a value of *yes* or *no*, which indicates whether this system is an alarm gateway network element. The default value for this parameter is *no*. One AGNE is needed for each alarm group to support the message communications for NE Status features (FE activity, office alarms, parallel telemetry, miscellaneous discretes, remote ACO, and FE user panel status). Any member of the alarm group can be an AGNE but some may be preferred because of their position in the subnetwork or location near a maintenance center. Other NEs of the same alarm group may be provisioned as backup AGNEs if required. At least one NE in each alarm group must be designated as an **agne**. Alarm groups without an AGNE have "AGNE communication failure" alarms.
- site** Site is the numeric identification (1-64) used by all NEs at the same location or site. The default value is 64.
- ne** Network Element is the numeric identification (1-5) of the system at a site. NEs at the same site must have unique NE settings. The default value is 5.

⇒ **NOTE:**

Refer to the TOP section (Volume II) for specific procedures for setting Site and NE values at multiple network elements.

shelf	Shelf is the numeric identification (1-8) of the system in a bay arrangement at a site. NEs at the same site must have unique shelf settings. The shelf parameter is used by the local CIT interface to identify which system to connect to the CIT. The default value is 1.				
crs	CrsMode is the cross-connect mode. This parameter may be set to <i>default</i> (default value) or <i>manual</i> . The <i>default</i> mode sets default cross-connections. See the ent-crs-sts1 command for a list of default and valid manual cross-connections. In the <i>manual</i> mode, all cross-connections must be entered manually, using the ent-crs-sts1 , ent-crs-vt1 , dlt-crs-sts1 , and dlt-crs-vt1 commands. This parameter is available in Release 3 and later. In ring applications (Release 5.1 and later), this parameter is set to <i>manual</i> and cannot be changed by the user.				
cort	The CO/RT parameter for "CO" (Central Office) or "RT" (Remote Terminal) identifies the system as having characteristics of a CO or an RT. The values for CO/RT are <i>co</i> and <i>rt</i> with <i>rt</i> as the default value. The value of CO/RT controls the TBOS display type, the operation of the miscellaneous discretes, and the external fan control.				
tbaddr	TBOSAddr sets the TBOS display address (1-8) of the NE. This address is used if the TBOS link is enabled. The default value is 1 but must be changed if it conflicts with existing settings of other enabled TBOS displays.				
tblink	TBOSLink sets the TBOS link function. The default value is noTBOS . A TBOS link can support up to 8 displays within an alarm group. <i>Note:</i> each alarm group can have only one TBOS link. Link may be set to the following values: <table> <tr> <td>normal</td><td>The NE has a TBOS link but does not provide any backup functions. Of all the shelves connected to the TBOS link, only one may be set to primary and only one may be set to secondary. The remaining NEs (up to 6) should be set to normal.</td></tr> <tr> <td>primary</td><td>The NE is serving as the primary TBOS backup and will respond for any other NE on the same TBOS link if the polled NE fails to respond to the telemetry remote poll within 50 msec. The primary backup NE will respond for the nonresponsive NE by reporting TBOS point 59</td></tr> </table>	normal	The NE has a TBOS link but does not provide any backup functions. Of all the shelves connected to the TBOS link, only one may be set to primary and only one may be set to secondary. The remaining NEs (up to 6) should be set to normal.	primary	The NE is serving as the primary TBOS backup and will respond for any other NE on the same TBOS link if the polled NE fails to respond to the telemetry remote poll within 50 msec. The primary backup NE will respond for the nonresponsive NE by reporting TBOS point 59
normal	The NE has a TBOS link but does not provide any backup functions. Of all the shelves connected to the TBOS link, only one may be set to primary and only one may be set to secondary. The remaining NEs (up to 6) should be set to normal.				
primary	The NE is serving as the primary TBOS backup and will respond for any other NE on the same TBOS link if the polled NE fails to respond to the telemetry remote poll within 50 msec. The primary backup NE will respond for the nonresponsive NE by reporting TBOS point 59				

(communications failure) and reporting all other TBOS points polled in the display as clear.

secondary The NE is serving as the secondary TBOS backup and responds the same as the primary TBOS backup, except the secondary backup does not respond to polls for other NEs until about 100 msec after the poll is received. If after 100 msec neither the polled NE nor the primary backup NE has responded to the telemetry remote poll, the secondary TBOS backup NE will respond for the nonresponsive NE.

noTBOS No TBOS interface is directly connected to the shelf.

tbrem TBOSRemote sets the TBOS Remote reporting status. TBOS Remote may be set to the following values:

enabled The shelf will report all its status and alarm conditions to other shelves via the SONET DCC.

disabled The shelf will not report its status and alarm conditions to other shelves. This option is used when there are more than 8 NEs in a SONET network. The default value is **disabled**.

idle IdleChannelSignal determines whether or not an AIS or Unequipped signal should be inserted toward the SONET line in VT1.5 and STS-1 channels that are not cross-connected. The value may be one of the following:

ais STS-1 or VT1.5 AIS is inserted towards the SONET line from SONET interfaces (OLIUs and STS1Es) if the channel is not cross-connected or if a low-speed slot is not equipped but the function unit is STS-1 cross-connected.

unequipped The STS-1 or VT1.5 Unequipped signal is inserted towards the SONET line from SONET interfaces (OLIUs and STS1Es) if the channel is not cross-connected or if a low-speed slot is not equipped but the function unit is STS-1 cross-connected.

If CrsMode is currently set to *manual* and cross-connections other than the default cross-connections have been entered into the system, then an attempt to change the Crs Mode to *default* and execute the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned with manual cross-connections. */
```

If the user executes this command while the DSNE is in a busy state (for example, handling an initial registration), the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* DIB is currently locked, try again later. */
```

If the user enters a duplicate TID (within the same subnetwork), the following denial message will be displayed (after entering *y* for the confirmation message):

```
SRCN
/* Status, Requested CoNdition already exists */
/* The system name entered (TID) already exists.
   Enter a unique system name. */
```

Some of these parameters are backed up on the TGS packs (dsne, TID, site, ne, shelf, cort, tbaddr, tblink, tbrem). Starting with OC-3 Release 9.1, an attempt to provision any of these parameters with no TGS packs equipped will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System must be equipped with at least one TGS circuit
   pack to provision selected parameters. */
```

When this command is entered, the following confirmation message will be displayed:

```
/* Caution! Network Element access is affected by this command.

You have selected the set-ne command with these parameters:

TID = SitenNEn
DSNE = yes/no
AlarmGroup = number
AGNE = yes/no
Site = site
NE = ne
IDLE = ais/unequipped
Shelf = shelf
CrsMode = mode
CO/RT = co/rt
TBOSAddress = number
TBOSLink = value
TBOSRemote = enabled/disabled */

Execute? (y/n or CANCEL/DELETE to quit) =
```

Changing the **dsne**, **cort**, **tbaddr**, **tblink**, **tbrem**, **site**, **ne**, or **shelf** parameters will cause the network element to reset. Before these parameters are changed, the following caution message will be displayed prior to the confirmation message:

```
/* Caution! Network Element access is affected by this command.
```

```
Caution! When executed, this command causes the NE to
restart the program. This action will erase all of
the performance monitoring data and the history file.
If possible, it will reinitialize the date and time with
the far end via the DCC. Otherwise, the
date and time will assume default values.
You have selected the set-ne command with these parameters:
```

RELATED COMMANDS

ins-prog

reset

rlgn

rtrv-ne

rtrv-map-network

NAME

set-oc1: Set OC-1 Characteristics

INPUT FORMAT

```
set-oc1:Address[:dgr=SignalDegradeThreshold]
[,aisalm=Alarm];
```

DESCRIPTION

This command sets the characteristics (parameters) of a specified OC-1 line.

The input parameters are:

Address Address identifies the OC-1 line(s).

Valid OC-1 Addresses (for 27-type OLIUs): **all**, **main-all**,
main-{1,2}-{1,2}, **fn-all**, **fn-{a,b,c}-{1,2}-{1,2}**,
fn-{a,b,c}-all

Valid OC-1 Addresses (for 26G2-U OLIUs): **fn-all**,
fn-{a,b,c}-{1,2}-1, **fn-{a,b,c}-all**

dgr SignalDegradeThreshold specifies the signal degrade threshold as a BER in terms of a logarithm to the base 10. When this threshold is crossed, an alarm will be raised. The value of this parameter has a range of -9 to -5. The default value is -6.

⇒ NOTE:

The signal degrade value for both addresses of each OC-1 line pair *must* be the same. Therefore, any change to signal degrade for one address will automatically be made to the other by the software.

aisalm This parameter is available in OC-3 Release 9.0 and later. Alarm is the provisioned alarm level of the nonservice affecting (NSA) OC-1 line AIS and has the following values:

cr Critical alarm

mj Major alarm

mn Minor alarm

na Not alarmed, but reported (default).

When input, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds and sync messages
are affected by this command.
You have selected the set-oc1 command with these parameters:

Address = x
SignalDegradeThreshold = -n
NonServiceAffectingAis=value

Execute? (y/n or CANCEL/DElete to quit) =
```

RELATED COMMANDS

rtrv-oc1

NAME

set-oc3: Set OC-3 Characteristics

INPUT FORMAT

set-oc3:*Address*[:**dgr**=*SignalDegradeThreshold*][,**kbyte**=*Kbyte*]
[,**aisalm**=*Alarm*][,**radio**=*Radio*][,**concat**=*ConcatenationMode*];
(Linear Release 8.0 Only)

set-oc3:*Address*[:**dgr**=*SignalDegradeThreshold*]
[,**syncmsg**=*SynchronizationMessaging*][,**aisalm**=*Alarm*]
[,**radio**=*Radio*][,**concat**=*ConcatenationMode*];
(Linear Release 8.1 and later)

set-oc3:*Address*[:**dgr**=*SignalDegradeThreshold*][,**kbyte**=*Kbyte*]
[,**aisalm**=*Alarm*]; (Rings Release 9.0 Only)

set-oc3:*Address*[:**dgr**=*SignalDegradeThreshold*]
[,**syncmsg**=*SynchronizationMessaging*][,**aisalm**=*Alarm*];
(Rings Release 9.1 and later)

DESCRIPTION

This command sets several characteristics (parameters) of a specified OC-3 line or line pair. If the address refers to an OC-3 shelf in a linear topology, the address is expressed as a line pair for Main and FN slots.

If the address refers to an OC-3 shelf in a ring topology, the address for Main is expressed as line (main-1 or main-2), and for FN slots it is expressed as a line pair.

The input parameters are:

Address Address identifies the OC-3 line(s) or line pair(s).
Valid OC-3 Linear Addresses: **main**, **fn-{a,b,c,all}**, **all**
Valid OC-3 Ring Addresses: **main-{1,2,all}**, **all**,
 fn-{a,b,c,all} (Optical extensions)

⇒ NOTE:

If the shelf is equipped with 24-type OLIU circuit packs in both slots of its Main unit, the only OC-3 valid addresses will belong to function units.

dgr SignalDegradeThreshold specifies the signal degrade threshold as a BER in terms of a logarithm to the base 10. When this threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated. The value of this parameter has a range of -9 to -5. The default value is -6.

For ring releases, the signal degrade value for addresses of main-1 and main-2 *must* be the same. Therefore, any change to signal degrade for one address will automatically be made to the other by the software.

kbyte

⇒ NOTE:

This parameter is only applicable to Releases 8.0 and 9.0. This parameter is no longer be used for DDM-2000 OC-3 Releases 8.1, 9.1, and later releases. For later releases, the **syncmsg** parameter is used in place of the **kbyte** parameter.

Kbyte specifies the usage of the K byte overhead for Sync Messages. Both the sending and receiving messages are affected. If Kbyte is enabled, proprietary Sync Messages are used. If Kbyte is disabled, proprietary Sync Messages are not used. The default value is enabled. For main slots m1 and m2 in ring applications, the kbyte value could be different on both rotations of the ring.

syncmsg

This parameter is available in OC-3 Releases 8.1, 9.1, and later releases. Synchronization messaging allows timing to be reconfigured in a network upon a node or fiber failure. This parameter has one of the following values:

Kbyte	This is the default value. When this option is selected, both K2 and S1 byte sync messages are transmitted, but only K2 byte is received and interpreted for sync messaging.
Sbyte	When this option is selected, only the S1 byte is sent and received for sync messaging. K2 byte will always send a "Don't Use" message.

⇒ NOTE:

To minimize the amount of time that DDM-2000 is in holdover mode when upgrading a ring network from **Kbyte** to **Sbyte** messages, it is recommended that the user first upgrade the nodes farthest away from the external timing source, and then proceed to nodes closer to the timing source.

disabled	When this option is selected, interpretation of both K2 and S1 bytes will be disabled and hence a "Don't Use" message will be transmitted on both bytes at all times.

- concat** This parameter is available in linear systems only. ConcatenationMode provisions the concatenation mode of the OC-3 line from Main to FN-C in linear systems to be independent channels or to be an sts-3c channel. The 21-type OLIU circuit packs must be in both the Main and FN-C slots. The valid values are **enabled** and **disabled** (default value). If ConcatenationMode is **disabled** the channels in the OC-3 line are independent. If ConcatenationMode is **enabled**, the 3 STS-1 channels recovered from the OC-3 signal at the Main slots are passed as an sts-3c signal to the FN-C slots where they are converted back to an OC-3 signal. Both the FN-C and Main slots must be equipped before ConcatenationMode can be enabled. The only valid address to enable the ConcatenationMode parameter is FN-C. Also, the user must be sure that the proper cross-connections exist from Main to FN-C for transmission to exist. These cross-connections are:
 $m-1 \leftrightarrow c-1$; $m-2 \leftrightarrow c-2$; $m-3 \leftrightarrow c-3$.
- The change of mode takes place after the confirmation is accepted. The value is not displayed or prompted for if the STS-3c feature is not first enabled using the **set-feat** command. This parameter is not applicable to rings applications.
- radio** This parameter is prompted for if this is a *MegaStar* 2000 system. This parameter has a value of **yes** or **no** (default value), indicating whether there is a Radio Frequency Unit (RFU) connected to the SONET subsystem through an IS-3 interface. If this parameter is set to **yes** then the address should be either **main**, indicating there is an IS-3 signal connection between the OLIU in Main and the RFU interface, or **fn-c**, indicating there is an IS-3 signal connection between the OLIU in Fn-c and the RFU interface.
- ⇒ NOTE:**
 If the desired system's configuration is such that there is an IS-3 connection between Main and the RFU, and Fn-c and the RFU, this command needs to be entered twice.
- aisalm** Alarm is the provisioned alarm level of the NSA OC-3 line AIS and has the following values:
- cr Critical alarm
 - mj Major alarm
 - mn Minor alarm
 - na Not alarmed, but reported (default).

The ConcatenationMode parameter requires that the Main slots be equipped. If they are not equipped the request will be denied with the following message:

```
ENEQ
/* Equipage, Not Equipped */
/* Main slots must be equipped also. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

The ConcatenationMode parameter requires cross-connections from Main to FN-C to be m-1 <-> c-1, m-2 <-> c-2, m-3 <-> c-3. If these cross-connects do not exist the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Required cross-connects not established. */
```

If this is a *MegaStar* 2000 application and the specified AID slot(s) are incorrectly equipped, the command will be denied and the following message displayed:

```
EQWT
/* Equipage, Wrong Type */
/* specified AID slot(s) are not equipped with proper hardware. */
```

The parameter enabling the concat function is allowed only when 21-type OLIUs are installed in both Main and FN-C. If this is violated the following message is output.

```
EQWT
/* Equipage, Wrong Type */
/* address is not equipped with proper hardware. */
```

When input, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds and sync messages
are affected by this command.
You have selected the set-oc3 command with these parameters:

Address = x
SignalDegradeThreshold = -n
Kbyte = value
NonServiceAffectingAIS= value
Radio = value */
ConcatenationMode = value */

Execute? (y/n or CANCEL/DElete to quit) =
```

For OC-3 Releases 8.1, 9.1, and later releases, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds and sync messages
are affected by this command.
You have selected the set-oc3 command with these parameters:

Address = x
SignalDegradeThreshold = -n
SynchronizationMessaging = value
NonServiceAffectingAIS= value
Radio = value */
ConcatenationMode = value */

Execute? (y/n or CANCEL/DElete to quit) =
```

RELATED COMMANDS

rtrv-oc3

rtrv-sync

NAME

set-oc12: Set OC-12 Characteristics

INPUT FORMAT

```
set-oc12:Address[:dgr=SignalDegrade][,syncmsg=SynchronizationMessaging]
[,aisalm=Alarm];
```

DESCRIPTION

This command sets the Signal Degrade (DGR) threshold, the line AIS alarm level and the K byte message status of the specified OC-12 line pair.

This command is available with OC-3 Release 11.0 and later.

The input parameters are:

Address	Address identifies the OC-12 line or line pair. When the shelf is equipped with 24-type OLIU circuit packs in its Main unit slots, the valid Main unit addresses for OC-3 are: main-{1,2,all},all
dgr	SignalDegrade specifies the signal degrade threshold as a BER in terms of a logarithm to the base 10. The value of this parameter has a range of -5 to -9. The default value is -6. When using the 24-type OLIU circuit packs in the OC-3 shelf's Main unit slots, the degrade values for main-1 and main-2 must be the same. Any change to one address will also be made automatically to the other by the software.
kbyte	Kbyte specifies the usage of the K byte overhead for synchronization messages. Both the sending and receiving messages are affected. If Kbyte is enabled (default), proprietary sync messages are used. If Kbyte is disabled , proprietary sync messages are not used.

- syncmsg** This parameter is available in OC-3 Release 11.0 and later rings releases. Synchronization messaging allows timing to be reconfigured in a network upon a node or fiber failure. Parameter value is one of the following:
- Kbyte** This is the default value. When this option is selected, both K2 and S1 byte sync messages are transmitted, but only K2 byte is received and interpreted for sync messaging.
 - Sbyte** When this option is selected, only the S1 byte is sent and received for sync messaging. K2 byte will always send a "Don't Use" message.
 - disabled** When this option is selected, interpretation of both K2 and S1 bytes will be disabled and hence a "Don't Use" message will be transmitted on both bytes at all times.
- aisalm** For ring releases, the AIS alarm values for Main-1 and Main-2 (when using the 24-type OLIU circuit packs in the Main unit slots) must be the same. Any change to one address will also be made automatically to the other by the software. Alarm is the provisioned alarm level of the non-service affecting (NSA) OC-12 line AIS and has the following values:
- cr** Critical alarm
 - mj** Major alarm
 - mn** Minor alarm
 - na** Not alarmed, but reported (default)

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

For OC-3 Release 11.0 and later ring releases, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
   You have selected the set-oc12 command with these parameters:  
  
   Address = x  
   SignalDegradeThreshold = -n  
   SynchronizationMessaging = x  
   NonServiceAffectingAIS= value */  
  
Execute? (y/n or CANCEL/DELeTe to quit) =
```

RELATED COMMANDS

rtrv-oc12

rtrv-sync

NAME

set-ow: Set Order Wire Routing

INPUT FORMAT

set-ow[:owrt=OrderWireRouting];

DESCRIPTION

This command sets the order wire routing for this network element.

This command is only available with the BBG10 OHCTL circuit pack.

⇒ NOTE:

This command is only available with the *MegaStar* 2000 SONET subsystem.

The input parameter is:

owrt The order wire routing parameter determines the order wire routing for this network element. The valid values for this parameter depend upon the position of the jumpers on the BBG10 OHCTL circuit pack. Valid values are listed below:

Jumper Position - JP(1-5)	Linear Systems	Ring Systems
E1 (A position)	thru e1dropmain (<i>default</i>) e1dropfnc	thru (<i>default</i>) e1dropmain1 e1dropmail2
Multiplexed (B position)	thru muxdrop (<i>default</i>)	thru muxdrop (<i>default</i>)

In the chart above, "thru" refers to the pass-through mode. The order wire channels (E1, E2, and F1 bytes of the transport overhead) are passed from one interface to the other. "Muxdrop" refers to dropped channel E1, E2, and F1 of all valid optical interfaces (main and fn-c for linear or main-1 and main-2 for rings). "E1drop" refers to dropped channel E1 from the interface specified.

If this command is executed from a NE not equipped with an OLIU, the request will be denied with the following message:

```
EQWT
/* equipage, Equipage Wrong Type */
/* The slot must contain an OLIU. */
```

If this command is executed from a NE not equipped with a BBG10 OHCTL, the request will be denied with the following message:

```
EQWT
/* equipage, Equipage Wrong Type */
/* BBG10 OHCTL needed.. */
```

Upon completion of this command, the following confirmation message is displayed:

```
M set-ow COMPLD
```

RELATED COMMANDS

rtv-ow

NAME

set-passwd: Set Password

INPUT FORMAT

set -passwd;

DESCRIPTION

This command changes a user's password. All users can change their own passwords. Privileged users can change other users' passwords by using the **set -lgn** command.

The following screen shows the dialog to change a password. In the dialog, the user input is shown in bold type.

**NOTE:**

Passwords will not be displayed when they are entered.

```
<set -passwd;
```

```
enter your old password = old_password  
enter your new password = new_password  
reenter your new password = new_password  
;
```

There are no default values for the old and new passwords.

A valid password is a case-sensitive ASCII string containing a minimum of six and a maximum of ten characters. The password must also include at least two numeric characters and one symbolic (non-alphabetic and non-numeric) character. The following symbolic characters have special meanings either for the User Interface or for the x.25 TL1 interface and cannot be included in a password:

;	semicolon	?	question mark
@	at sign		space
:	colon	=	equal sign
"	double quote	,	comma
\	back slash	!	exclamation point

Additionally, the following control characters and special keys CANNOT be included in a password:

<CR>	carriage return	<tab>	tab key
<bksp>	backspace key	<esc>	escape key
<del>	delete key		

If the entered password value does not match the valid password definition (syntactically incorrect), the following message will be displayed:

```
/* Entry does not follow rules for passwords. */
/* Passwords must be 6 to 10 characters, with at least 2 non
   alphabetic characters and additionally, at least 1 symbolic.
   Characters allowed are: A..Z or a..z, 0..9, all symbolic
   characters, EXCEPT the following:
```

;	semicolon	?	question mark
@	at sign		space
:	colon	=	equal sign
"	double quote	,	comma
\	back slash	!	exclamation point

```
*/
```

enter your new password:

The user may try once again to enter a password. If the user tries again to enter a password that does not match the valid password definition, the following denial message will be displayed:

```
IDEI
/* Input, Data Entry Invalid */
/* Entry does not follow rules for passwords and logins. */
```

If a user is changing a password and the password entered does not match the present valid password, it will be rejected and the user will be prompted to try again. The user is allowed only one retry. If the user attempts and fails a second time, the entry will be denied with the following message and the old password will remain in effect:

```
PIPW
/* Privilege, Illegal PassWord. */
/* The old password remains in effect. */
```

If the new password that a user enters when changing a password meets the password definition requirements (syntactically correct), but does not match on its two entries (enter your new password; reenter your new password), the following message will be displayed:

```
/* The first and second entries of new password did not match. */
```

The user may try once again to change the password. If the user fails a second time to match the two entries, the following denial message will be displayed and the old password will remain in effect:

```
IDNC
/* Input, Data Not Consistent */
/* First and second entries of new password did not match.
   The old password remains in effect. */
```

RELATED COMMANDS

rtv-lgn

set-lgn

set-secu

NAME

set-pmthres-line: Set Performance Monitoring Threshold Line

INPUT FORMAT

set - pmthres - line:

```
[QHB2CVOC12=nnnnn][,DayB2CVOC12=nnnnnn]
[QHB2CVOC3=nnnnn][,DayB2CVOC3=nnnnn]
[QHB2CVOC1=nnnnn][,DayB2CVOC1=nnnnn]
[QHB2CVEC1=nnnnn][,DayB2CVEC1=nnnnn]
[QHB2ES=nnn][,DayB2ES=nnnnnn]
[QHB2ESA=nnn][,DayB2ESA=nnnnnn]
[QHB2ESB=nnn][,DayB2ESB=nnnnnn]
[QHB2SES=nn][,DayB2SES=nnnnn]
[QHB2UAS=nn][,DayB2UAS=nnnnn]
[QHP SCL=nn][,DayP SCL=nn]
[QHPJC=nnnnn];
[QHPJC=nnnnn][,DayPJC=nnnnnnnn] ;
```

where *nnn . . .* is a numerical value in the range given in the following parameter descriptions.

⇒ NOTE:

Parameters are shown in uppercase letters for readability. Parameters may be entered in either upper- or lowercase letters.

DESCRIPTION

This command sets the performance parameter thresholds of OC-1, OC-3, or OC-12 lines and activates and deactivates the processing of threshold crossings for performance parameters.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHB2CVOC12	This parameter is available with OC-3 Release 11.0 and later. This parameter sets the threshold for the OC-12 coding violations count on a quarter-hourly basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 55365. The default value is 5537. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10.

DayB2CVOC12	This parameter is available with OC-3 Release 11.0 and later. A positive value of this parameter sets the threshold for the OC-12 coding violation count on a daily basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 5315040. The default value is 531504. A negative value of this parameter sets the parity count threshold in terms of an equivalent BER expressed as a logarithm to the base 10.
QHB2CVOC3	This parameter sets the threshold for the OC-3 coding violations count on a quarter-hourly basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 13841. The default value is 1384. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10.
DayB2CVOC3	A positive value of this parameter sets the threshold for the OC-3 coding violation count on a daily basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 1328736. The default value is 132874. A negative value of this parameter sets the parity count threshold in terms of an equivalent BER expressed as a logarithm to the base 10.
QHB2CVOC1	This parameter sets the threshold for the OC-1 coding violations count on a quarter-hourly basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 4613. The default value is 461. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10.
DayB2CVOC1	A positive value of this parameter sets the threshold for the OC-1 coding violation count on a daily basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 442848. The default value is 44285. A negative value of this parameter sets the parity count threshold in terms of an equivalent BER expressed as a logarithm to the base 10.
QHB2CVEC1	This parameter sets the threshold for EC-1 coding violation counts on a quarter-hourly basis.
DayB2CVEC1	This parameter sets the threshold for EC-1 coding violation counts on a daily basis.

QHB2ES	This parameter sets the threshold for the ES type A count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and a default value of 40.
DayB2ES	This parameter sets the threshold for the ES type A count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 900.
QHB2ESA	This parameter sets the threshold for the ES type A count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and default value of 30.
DayB2ESA	This parameter sets the threshold for the ES type A count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 90.
QHB2ESB	This parameter sets the threshold for the ES type B count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and default value of 30.
DayB2ESB	This parameter sets the threshold for the ES type B count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 90.
QHB2SES	This parameter sets the threshold for the SES count on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 20.
DayB2SES	This parameter sets the threshold for the SES count on a daily basis. This parameter is an integer with range 0 through 4095 and default value of 60.
QHB2UAS	This parameter sets the threshold for the UAS count on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 30.
DayB2UAS	This parameter sets the threshold for the UAS count on a daily basis. This parameter is an integer with range 0 through 4095 and default value of 90.
QHPSCl	This parameter sets the threshold for the line protection switch counts on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 2.
DayPSCl	This parameter sets the threshold for the line protection switch counts on a daily basis. This parameter is an integer with range 0 through 255 and default value of 4.
QHPJC	This parameter sets the threshold for the STS pointer justification counts on a quarter-hourly basis. The parameter is an integer with range 0 through 65535 and default value of 60.

DayPJC

This parameter is available with OC-3 Release 11.0 and later. This parameter sets the threshold for the STS pointer justification counts on a daily basis. The parameter is an integer with range 0 through 9999999 and default value of 5760.

The following tables show the error counts equivalent to different BER thresholds for OC-12, OC-3, OC-1, EC-1, and STS pointer justification.

B2 OC12 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVOC12)	Equivalent Day Threshold (DayB2CVOC12)
-7	55364	5315052
-8	5537	531505
-9	554	53151
-10	55	5315

B2 OC3 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVOC3)	Equivalent Day Threshold (DayB2CVOC3)
-7	13841	1328736
-8	1384	132874
-9	138	13287
-10	14	1329

B2 OC1 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVOC1)	Equivalent Day Threshold (DayB2CVOC1)
-7	4613	442848
-8	461	44285
-9	46	4428
-10	5	443

B2 EC1 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVEC1)	Equivalent Day Threshold (DayB2CVEC1)
-7	4613	442848
-8	461	44285
-9	46	4428
-10	5	443

The STS pointer justification count parameter (QHPJC and DayPJC) is useful in detecting a frequency error in the SONET synchronization network. The following table shows the PJC equivalent thresholds for a quarter-hour and a daily count resulting from a fixed frequency error.

PJC Count resulting from a Frequency Error

Frequency Error (+-ppm)	Equivalent 15 Min. Threshold (QHPJCL)	Equivalent Day Threshold (DayPJCL)
.01	56	5412
.02	112	10824
.03	169	16236
.04	225	21648
.05	281	27060
.06	338	32472
.07	394	37884
.08	451	43296
.09	507	48708
.1	563	54120
.2	1127	108241
.3	1691	162362
.4	2255	216483
.5	2818	270604
.6	3382	324725
.7	3946	378846
.8	4510	432967
.9	5073	487088
1	5637	541209
2	11275	1082419
3	16912	1623628
4	22550	2164838
10	56376	5412096

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

rtrv-pmthres-line

set-pmthres-sect

NAME

set-pmthres-sect: Set Performance Monitoring Threshold Section

INPUT FORMAT

set -pmthres -sect:[TxPwr1dB=*n*][,TxPwr2dB=*n*][,LaserBias=*n*]
[,Qhsefs=*nn*][,Daysefs=*nnnn*];

DESCRIPTION

This command sets the performance-monitoring thresholds of an OC-12, OC-3, and OC-1 sections, as well as activating and deactivating the processing of threshold crossings for performance parameters.

The input parameters are:

TxPwr1dB	This parameter enables/disables the -1 dB threshold for optical transmit power. The valid values are enabled (default value) and disabled . This parameter applies only to the 21G OLIU circuit pack.
TxPwr2dB	This parameter enables/disables the -2 dB threshold for optical transmit power. The valid values are enabled (default value) and disabled . This parameter applies only to the 21G OLIU circuit pack.
LaserBias	This parameter enables/disables the laser bias threshold. The valid values are enabled (default value) and disabled . This parameter applies only to the 21G OLIU circuit pack.
Qhsefs	This parameter sets the threshold for SEFS on a quarter-hourly basis. This parameter is an integer with range of 0 through 63 and default value of 10. Entering a parameter value of zero (0) will disable thresholding for this parameter.
Daysefs	This parameter sets the threshold for SEFS on a daily basis. This parameter is an integer with range of 0 through 4095 and a default value of 30. Entering a parameter value of zero (0) will disable thresholding for this parameter.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

rtrv-pmthres-sect

NAME

set-pmthres-sts1: Set Performance Monitoring Threshold STS-1

INPUT FORMAT

```
set -pmthres -sts1:[QHB3CV=nnnn][,DayB3CV=nnnnnn][,QHB3ES=nnn]
[,DayB3ES=nnnnnn][,QHB3ESA=nnn][,DayB3ESA=nnnnnn][,QHB3ESB=nnn]
[,DayB3ESB=nnnnnn][,QHB3SES=nn][,DayB3SES=nnnn][,QHB3UAS=nn]
[,DayB3UAS=nnnn];
```

where *nnn* . . . is the numerical value given in the following parameter descriptions.

⇒ NOTE:

Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command provisions STS-1 path performance parameter thresholds as well as enabling and disabling the processing of threshold crossings for the various parameters. Entering a parameter value of zero (0) will disable thresholding for that parameter.

The input parameters are:

QHB3CV	This parameter sets the threshold for the coding violations count on a quarter-hourly basis. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 4510. The default value is 451.
DayB3CV	This parameter sets the threshold for the coding violations count on a daily basis. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 432960. The default value is 43296.
QHB3ES	This parameter sets the threshold for errored seconds on a quarter-hourly basis. This parameter has an integer range of 0 through 900 and a default value of 40.
DayB3ES	This parameter sets the threshold for errored seconds on a daily basis. This parameter has an integer range of 0 through 65535 and a default value of 900.

QHB3ESA	This parameter sets the threshold for type A errored seconds on a quarter-hourly basis. A type A ES is a second with a single error. This parameter has an integer range of 0 through 900 and a default value of 30.
DayB3ESA	This parameter sets the threshold for type A errored seconds on a daily basis. A type A ES is a second with a single error. This parameter has an integer range of 0 through 65535 and a default value of 90.
QHB3ESB	This parameter sets the threshold for type B errored seconds on a quarter-hourly basis. A type B ES is a second with more than one error, but less than the number of errors in a severely errored second. This parameter has an integer range of 0 through 900 and a default value of 30.
DayB3ESB	This parameter sets the threshold for type B errored seconds on a daily basis. A type B ES is a second with more than one error, but less than the number of errors in a severely errored second. This parameter has an integer range of 0 through 65535 and a default value of 90.
QHB3SES	This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis. This parameter has an integer range of 0 through 63 and a default value of 20.
DayB3SES	This parameter sets the threshold for the severely errored frame seconds count on a daily basis. This parameter has an integer range of 0 through 4095 and a default value of 60.
QHB3UAS	This parameter sets the threshold for unavailable seconds on a quarter-hourly basis. This parameter has an integer range of 0 through 63 and a default value of 30.
DayB3UAS	This parameter sets the threshold for unavailable seconds on a daily basis. This parameter has an integer range of 0 through 4095 and a default value of 90.

The following table shows the error counts equivalent to different BER thresholds.

B3 STS-1 Path Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB3CV)	Equivalent Day Threshold (DayB3CV)
-7	4510	432960
-8	451	43296
-9	45	4330
-10	5	433

RELATED COMMANDS

init-pm

rtv-pmthres-sts1

rtv-pm-sts1

rtv-pm-tca

NAME

set-pmthres-t1: Set Performance Monitoring Threshold T1

INPUT FORMAT

set -pmthres - t1:[DayESL=nnnn][,DayCVPSF=nnnn][,DayCVPESF=nnnn]
[,DayESP=nnnnn][,DaySESP=nnnnnnn][,DayUASP=nnn][,DayCVPFE=nnnn]
[,DayESPFE=nnnnn][,DaySESPFE=nnn][,DayUASPFE=nnnnn]
(OC-3 Release 9.0 and earlier)

set -pmthres - t1:[QHESL=nnn][DayESL=nnnnn][,QHCVPSPF=nnnnn][,DayCVPSF=nnnnnnn]
[,QHCVPSF=nnnnn][,DayCVPESF=nnnnnnnn][,QHESP=nnn][DayESP=nnnnn]
[,QHSESP=nn][,DaySESP=nnnn][,QHUASP=nn][,DayUASP=nnnn]
[,QHCVPFE=nnnnn][,DayCVPFE=nnnnnnnn][,QHESPFE=nnn][,DayESPFE=nnnnn]
[,QHSESPFE=nn][,DaySESPFE=nnnn][,QHUASPFE=nn][,DayUASPFE=nnnn]
(OC-3 Release 9.1 and later)

where *nnn . . .* is a numerical value in the range given in the following parameter descriptions.

⇒ NOTE:

Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets DS1 path and line performance monitoring thresholds, and is available with the BBF3/BBF3B circuit pack. This command also enables and disables the processing of threshold crossing alerts (TCAs) for these parameters. In OC-3 Release 11.1, this command will also set the DS1 path PM thresholds on the BBG20 TMUX circuit pack.

This command may only be used if the **ds1pm** feature is enabled via the **set -feat** command.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

A negative integer threshold value indicates that the threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^n .

The input parameters are:

QHESL This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the errored second line (ESL) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 900 and a default value of 65. This parameter is not applicable to the BBG20 TMUX circuit

pack in OC-3 Release 11.1.

DayESL

This parameter sets the threshold for the errored second line (ESL) count on a daily basis. This parameter is an integer with a range of 0 through 65535 and a default value of 648. This parameter is not applicable to the BBG20 TMUX circuit pack in OC-3 Release 11.1.

QHCVPSPF

This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the code violations path SF (CVPSF) count on a quarter-hourly basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -7 through -5, corresponding to BERs of 10^{-7} through 10^{-5} , and an integer range of 0 through 16383. The default value is 72.

DayCVPSF

This parameter sets the threshold for the code violations path SF (CVPSF) count on a daily basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5} , and an integer range of 0 through 1048575. The default value is 691.

QHCVPESF

This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the code violations path ESF (CVPESF) count on a quarter-hourly basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5} , and an integer range of 0 through 16383. The default value is 13296.

DayCVPESF

This parameter sets the threshold for the code violations path ESF (CVPESF) count on a daily basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5} , and an integer range of 0 through 1048575. The default value is 132960.

QHESP

This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the errored second path (ESP) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 900 and a default value of 65.

DayESP	This parameter sets the threshold for the errored second path (ESP) count on a daily basis. This parameter is an integer with a range of 0 through 65535 and a default value of 648.
QHSESP	This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the severely errored second path (SESP) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 10.
DaySESP	This parameter sets the threshold for the severely errored second path (SESP) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 100.
QHUASP	This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the unavailable second path (UASP) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 10.
DayUASP	This parameter sets the threshold for the unavailable second path (UASP) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 10.
QHCVPFE	This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the code violations path far-end (CVPFE) count on a quarter-hourly basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5} , and an integer range of 0 through 16383. The default value is 13296.
DayCVPFE	This parameter sets the threshold for the code violations path far-end (CVPFE) count on a daily basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5} , and an integer range of 0 through 1048575. The default value is 132960.
QHESPFE	This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the errored second path far-end (ESPFE) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 900 and a default value of 65.

DayESPFE	This parameter sets the threshold for the errored second path far-end (ESPFE) count on a daily basis. This parameter is an integer with a range of 0 through 65535 and a default value of 648.
QHSESPFE	This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the severely errored second path far-end (SESPFE) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 10.
DaySESPFE	This parameter sets the threshold for the severely errored second path far-end (SESPFE) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 100.
QHUASPFE	This parameter applies to OC-3 Release 9.1 and later releases. This parameter sets the threshold for the unavailable second path far-end (UASPFE) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 10.
DayUASPFE	This parameter sets the threshold for the unavailable second path far-end (UASPFE) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 10.

The following tables show the error counts equivalent to different BER thresholds.

DS1 Coding Violations-Path (SF)		
BER Threshold	Equivalent 15 Min. Threshold (QHCVP)	Equivalent Day Threshold (DayCVP)
-5	72	6912
-6	7	691
-7	1	69
-8	--	7

DS1 Coding Violations-Path (ESF)

BER Threshold	Equivalent 15 Min. Threshold (QHCVP)	Equivalent Day Threshold (DayCVP)
-5	13842	1328832
-6	1384	132883
-7	138	13288
-8	14	1329

This command may only be used if the `ds1pm` feature is enabled via the **set-feat** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available, feature disabled */
```

If this command is entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available in this release */
```

RELATED COMMANDS

`rtrv-feat`

`rtrv-pmthres-t1`

`set-feat`

NAME

set-pmthres-t3: Set Performance Monitoring Threshold T3

INPUT FORMAT

```
set - pmthres - t3:[QHCVL=nnnnnn][,DayCVL=nnnnnnnn][,QHESL=nnn]
[,DayESL=nnnnnn][,QHSESL=nn][,DaySESL=nnnnn][,QHSEFS=nn]
[,DaySEFS=nnnnn][,QHPCV=nnnnnn][,DayPCV=nnnnnnnn]
[,QHFCV=nnnnnn][,DayFCV=nnnnnnnn][,QHCP=nnnnnn][,DayCP=nnnnnnnn]
[,QHESP=nnnn][,DayESP=nnnnnn][,QHSESP=nn][,DaySESP=nnnn]
[,QHUASP=nn][,DayUASP=nnnnn][,QHSEFSFE=nn][,DaySEFSFE=nnnn]
[,QHCPFE=nnnnnn][,DayCPFE=nnnnnnnn][,QHESPFE=nnnn][,DayESPFE=nnnnnn]
[,QHSESPFE=nn][,DaySESPFE=nnnnn][,QHUASPFE=nn][,DayUASPFE=nnnn];
```

⇒ NOTE:

All DS3 line parameters (in addition to DS3 C-bit parity and all other path parameters for the incoming signal from the DSX-3) are only applicable when a or BBG20 TMUX (in Release 11.1) pack is active (in-service) in a function unit slot.

where *nnn . . .* is a numerical value in the range given in the parameter description listed below.

⇒ NOTE:

Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets the performance parameter thresholds of a DS3 signal as well as activating and deactivating the processing of threshold crossings for error performance parameters. Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHCVL This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 16383. The default value is 40.

DayCVL	This parameter sets the threshold for the coding violations count on a daily basis for the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 1048575. The default value is 3865.
QHESL	This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for the DS3 line with at least one B3ZS coding violation. This parameter has an integer range of 0 through 900 with a default value of 25.
DayESL	This parameter sets the threshold for the errored seconds count on a daily basis for the DS3 line with at least one B3ZS coding violation. This parameter has an integer range of 0 through 65535 with a default value of 250.
QHSESL	This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for the DS3 line with greater than 44 B3ZS coding violations. This parameter has an integer range of 0 through 63 with a default value of 4.
DaySESL	This parameter sets the threshold for the severely errored seconds count on a daily basis for the DS3 line with greater than 44 B3ZS coding violations. This parameter has an integer range of 0 through 4095 with a default value of 40.
QHSEFS	This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63 with a default value of 2.
DaySEFS	This parameter sets the threshold for the severely errored frame seconds count on a daily basis. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095 with a default value of 8.
QHPCV	This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the pbit type of format. The type is selected using the set -t3 command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 16383. The default value is 40.

DayPCV	This parameter sets the threshold for the coding violations count on a daily basis for the pbit type of format. The type is selected using the set-t3 command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 1048575. The default value is 3820.
QHFCV	This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the fmbit type of format. The type is selected using the set-t3 command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 16383. The default value is 40.
DayFCV	This parameter sets the threshold for the coding violations count on a daily basis for the fmbit type of format. The type is selected using the set-t3 command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 1048575. The default value is 3820.
QHCP	This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the near-end cpbit type of format. The type is selected using the set-t3 command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 16383. The default value is 40.
DayCP	This parameter sets the threshold for the coding violations count on a daily basis for the near-end cpbit type of format. The type is selected using the set-t3 command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This

parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 1048575. The default value is 3820.

- QHESP** This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for **pbit**, **fmbit**, and **cpbit** type of formats. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 900, with a default value of 25.
- DayESP** This parameter sets the threshold for the errored seconds count on a daily basis for **pbit**, **fmbit**, and **cpbit** type of formats. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 65535 with a default value of 250.
- QHSESP** This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for **pbit**, **fmbit**, and **cpbit** type of formats. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63 with a default value of 4.
- DaySESP** This parameter sets the threshold for the severely errored seconds count on a daily basis for **pbit**, **fmbit**, and **cpbit** type of formats. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 40.
- QHUASP** This parameter sets the threshold for the unavailable seconds count on a quarter-hourly basis for **pbit**, **fmbit**, and **cpbit** type of formats. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63 with a default value of 10.
- DayUASP** This parameter sets the threshold for the unavailable seconds count on a daily basis for **pbit**, **fmbit**, and **cpbit** type of formats. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095 with a default value of 10.

- QHSEFSFE** This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This parameter is monitored by reading the received X-bits in the DS3 C-bit parity frame. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63 with a default value of 2.
- DaySEFSFE** This parameter sets the threshold for the severely errored frame seconds count on a daily basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This parameter is monitored by reading the received X-bits in the DS3 C-bit parity frame. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 8.
- QHCPFE** This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 16383. The default value is 40.
- DayCPFE** This parameter sets the threshold for the coding violations count on a daily basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7} , and an integer range of 0 through 1048575. The default value is 3820.
- QHESPF** This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 900 with a default value of 25.

- DayESPFE** This parameter sets the threshold for the errored seconds count on a daily basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 65535 with a default value of 250.
- QHSESPFE** This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63 with a default value of 4.
- DaySESPFE** This parameter sets the threshold for the severely errored seconds count on a daily basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095 with a default value of 40.
- QHUASPFE** This parameter sets the threshold for the unavailable seconds count on a quarter-hourly basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63 with a default value of 10.
- DayUASPFE** This parameter sets the threshold for the unavailable seconds count on a daily basis for the far-end **cpbit** type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095 with a default value of 10.

The following table shows the error counts equivalent to different BER thresholds.

DS3 P-bit, F&M bit, and C-bit Coding Violations		
BER Threshold	Equivalent 15 Min. Threshold (QHCV)	Equivalent Day Threshold (DayCV)
-7	3979	381972
-8	398	38197
-9	40	3820
-10	4	382

DS3 Line Coding Violations		
BER Threshold	Equivalent 15 Min. Threshold (QHCVL)	Equivalent Day Threshold (DayCVL)
-7	4026	386519
-8	402	38651
-9	40	3865
-10	4	386

RELATED COMMANDS

init-pm

rtrv-pm-t3

rtrv-pm-tca

rtrv-pmthres-t3

set-t3

NAME

set-pmthres-vt1: Set Performance Monitoring Threshold VT1.5

INPUT FORMAT

set -pmthres -vt1:[QHV5ES=nnnnn][,DayV5ES=nnnnnnnn][,QHV5SES=nnn]
[,DayV5SES=nnnnn][,QHV5UAS=nnn][,DayV5UAS=nnnnn];

where *nnn . . .* is a numerical value in the range given in the following parameter descriptions.

⇒ NOTE:

Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets VT1.5 path performance monitoring thresholds. This command also enables and disables the processing of threshold crossing alerts (TCAs) for these parameters.

This command may only be used if the `vt:pm` feature is enabled via the **set -feat** command. Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHV5ES	This parameter sets the threshold for the errored second (ES) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 900 and a default value of 40.
DayV5ES	This parameter sets the threshold for the errored second (ES) count on a daily basis. This parameter is an integer with a range of 0 through 65535 and a default value of 900.
QHV5SES	This parameter sets the threshold for the severely errored second (SES) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 20.
DayV5SES	This parameter sets the threshold for the severely errored second (SES) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 60.

QHV5UAS This parameter sets the threshold for the unavailable second (UAS) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 30.

DayV5UAS This parameter sets the threshold for the unavailable second (UAS) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 90.

This command may only be used if the `vtpm` feature is enabled via the **set-feat** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available, feature disabled */
```

If this command is entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution STopped */
/* Command not available in this release */
```

RELATED COMMANDS

`rtrv-feat`

`rtrv-pmthres-vt1`

`set-feat`

NAME

set-secu: Set Security

INPUT FORMAT

set-secu:address[:sec=Security][,to=Timeout];

DESCRIPTION

This command configures network element (NE) system security on each CIT and DCC interface.

The three default logins are ATT01, ATT02, and ATT03 (all upper-case letters) for OC-3 Release 9.0 and earlier. For OC-3 Release 9.1 and later, the three default logins are LUC01, LUC02, and LUC03 (all upper-case letters). The default password is DDM-2000. Privileged users should change these defaults before enabling security or setting security to a lockout state.

⇒ NOTE:

This command is available to privileged users only.

The input parameters are:

address Address is the address of one or more CIT and/or DCC ports. There is no default address.

Valid Addresses: **dcc-all, cit-{1,2,all}**

Valid Addresses (OC-1 interfaces): **dcc-all**

sec Security determines whether security is enabled, disabled, or in lockout state on the specified CIT and DCC port(s). Enabling security requires users to enter a valid login and password pair to access the system via the specified CIT or DCC-all.

The values for this parameter are **enabled**, **disabled** (default value), and **lockout**.

When security is in lockout state, the only user type permitted to access the system through the locked out CIT/DCC port is a privileged user; all non-privileged users, even with a valid login and password pair, are not allowed to access the system.

⇒ NOTE:

When security is in the lockout state, non-privileged users are not deleted from the login/password database, but are simply blocked from accessing the system. Existing lactive login sessions initiated by non-privileged users are not affected (that is, not dropped) if security is set to **lockout**.

to Timeout specifies the time, in minutes, before an inactive session is automatically terminated. This has a value ranging from 0 to 120 minutes and a default value of 15 minutes. Setting this parameter to 0 will disable the timeout function.

Execution of this command affects all subsequent attempts to establish login sessions but does not affect currently active sessions.

When security is enabled, the following four types of users are permitted to access the system with a valid login and password:

privileged	The privileged user may execute any commands, including restricted commands.
general	The general user may execute any commands not restricted to privileged users.
maintenance	The maintenance user may only execute commands that access the system, extract reports, and execute maintenance functions through a specific set of commands. This user may not execute any privileged commands.
reports-only	The reports-only user may only execute commands that extract reports from the system and several other basic commands.

When security is enabled on a system, only the following commands may be executed by reports-only users:

- **? (help)**
- **logout (logout)**
- **rlgn (remote login)**
- **set-passwd (set password)**
- **set-link (set link)**
- **^T (toggle)**
- all **rtrv** commands except **rtrv-lgn** and **rtrv-passwd**.

In addition to **set-secu**, the commands **init-sys**, **rtrv-lgn**, **set-fecom**, **set-feat**, **set-lgn**, **set-sync**, **rtrv-passwd**, and **rstr-passwd** are restricted to privileged users only. The following commands also become restricted to privileged users only when security is enabled on a system:

- **cpy-prog (copy program)**
- **dlt-tadrmap (delete TID address map)**

- **ent-ulsdcc** (enter upper layer section DCC)
- **init-pm** (initialize performance-monitoring)
- **ins-prog** (install program)
- **reset** (reset system software)
- **set-date** (set date)
- **set-ne** (set network element)
- **ent-tl1msgmap** (enter TL1 message map)
- **set-x25** (set X.25 link)
- **ent-osacmap** (enter OS application context id map)
- **dlt-osacmap** (delete OS application context id map)

Entering this command will cause the following confirmation message to be displayed:

```
/* Caution! Network Element access is affected by this command.
   You have selected the set-secu command with these parameters:

   Address = address
   Security = security
   Timeout = n */

Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rtrv-lgn

rtrv-secu

set-fecom

set-lgn

NAME

set-state-ec1: Set EC-1 Port State

INPUT FORMAT

set-state-ec1:Address:ps=PrimaryState;

DESCRIPTION

This command sets the state of the low speed EC-1 ports. This command is used to turn on and off the monitoring of signal failures from a specified port.

The input parameters are:

Address Address identifies the EC-1 port(s).

Valid Addresses: **all, a, b, c**

ps PrimaryState is the port state which may have one of the following values:

auto Set state to be monitored for good signal at the specified port.

nmon Set memory state to not monitored.

⇒ NOTE:

If a port is in the **nmon** state, it must be returned to the **auto** state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If an EC-1 port that is to be put into the **nmon** state is STS-1 cross-connected to a function unit equipped with MXRVO circuit packs, the VT1.5 channels within that EC-1 port should also be put in the **nmon** state.

If a primary state of **nmon** is entered, the following message will be displayed:

```
/* Port(s) address will not be monitored or alarmed in this state */
```

This command may be executed only if the specified addresses are not currently VT1.5 cross-connected. If a VT1.5 cross-connection already exists on the specified address, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* VT cross-connection exists.*/
```

If this command is entered with several addresses and one or more of these addresses are VT1.5 cross-connected, the command will complete but send the following message indicating that some of the cross-connections are not STS-1:

```
/* Following STS-1 channels not processed.
   VT cross-connection exists within STS address:
   address
   address
*/
```

If this command is entered with several addresses and one or more of these addresses is not properly equipped, the following message will be displayed:

```
/* Address not equipped properly -- provisioning unchanged. */
```

If this command is executed and an STS-1 cross-connection exists for the address entered, the cross-connection must be cross-connected to an OLIU. If no OLIU is present, the following denial message will be displayed:

```
EQWT
/* Equipage, Wrong Type */
/* STS1E must be cross-connected to OLIU */
```

The following confirmation message will be displayed after command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
You have selected set-state-ec1 command with these parameters:
```

```
Address = x  
PrimaryState = x */
```

```
Execute? (y/n or CAnCel/DELeTe to quit) =
```

RELATED COMMANDS

rtv-ec1

rtv-state

rtv-state-eqpt

rtv-state-vt1

set-state-vt1

NAME

set-state-oc1: Set OC-1 Line State

INPUT FORMAT

set-state-oc1:Address:ps=PrimaryState;

DESCRIPTION

This command sets the state of one or more OC-1 lines. This command is used to turn on and off the monitoring of signal failures from a specified line.

The input parameters are:

Address Address identifies the OC-1 line(s).

Valid OC-1 Line Addresses (for 27-type OLIU): **all**,
main-all, **main-{1,2}-{1,2}**,
fn-all, **fn-{a,b,c}-{1,2}-{1,2}**

Valid OC-1 Line Addresses (for 26G2-U OLIU): **fn-all**,
fn-{a,b,c}-{1,2}-1

ps PrimaryState is the line state which may have one of the following values:

nmon Set the line state to not monitored. Do not report alarm or status conditions for the line. Section and line performance monitoring data collection will be stopped in this state. Do not change the line state to in-service if a good signal is detected. The line will remain in this state until the state is changed again with this command.

⇒ NOTE:

When the line state is set to NMON, the data communication channel (DCC) will be disabled.

is In-service. Set the line state to be monitored for good signal at the specified line. Reporting of alarm, status conditions, and PMON data is in normal state.

If a line state of **nmon** is entered, the following message will be displayed:

```
/* Line(s) address will not be monitored or alarmed in  
this state */
```

If this command is entered with several addresses and one or more of these addresses is not equipped with a 27-type or 26G2-U OLIUs, the following message will be displayed:

```
/* Following OC-1 lines not processed.  
They are not equipped with 27-type or 26G2-U OLIUs:  
address  
address  
*/
```

The following confirmation message will be displayed after command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
You have selected the set-state-oc1 command with these parameters:  
  
Address = x  
PrimaryState =x */  
  
Execute? (y/n or CANCEL/DElete to quit) =
```

RELATED COMMANDS

rtrv-state-eqpt

rtrv-state-oc1

set-fecom

upd

NAME

set-state-sts1: Set State of STS-1 Channels

INPUT FORMAT

set-state-sts1:Address:ps=PrimaryState;

DESCRIPTION

This command sets the states of STS-1 channels. It is used to turn on and off the monitoring of signal failures and maintenance signals for specified channels.

The input parameters are:

Address Address identifies the STS-1 channel(s). Valid addresses are:

all, {m,c}-{1-3,all}, {a,b}-{1-2,all}
all, {a,b,c} (EC-1 Addresses)
all, {m,a,b,c}-{1,2,all} (27-type OLIU Addresses)
{a,b,c}-1 (26G2-U OLIU Addresses)

If the shelf is equipped with 24-type OLIU circuit packs in its Main unit slots, the valid Main unit Addresses are:

all,m-{1-12,all}

Channel states can be set for:

- STS-1 channels within OC-3 and OC-12 (If OC-3 shelf is equipped with 24G-U OLIUs in Main unit slots) interfaces that are cross-connected to DS3 or DS1 interfaces
- STS-1 channels that are dropped from an OC-1 ring interface to an OC-3, EC-1, or DS1 interface.
- STS-1 channels that are dropped from an OC-3 OC-3 shelf equipped with 24-type OLIUs in its Main unit slots ring interface to an OC-3, EC-1, DS1, or DS3 interface
- STS-1 channels within OC-3 or OC-1 or OC-12 (24G-U in Main unit slots) or EC-1 interfaces that are VT1.5 cross-connected to OC-3, OC-1, EC-1, or DS1 interfaces.

ps PrimaryState is the channel state which may have one of the following values:

auto Set the channel state to automatic. Monitor the channel, but do not report alarm or status conditions. When a good signal is detected, automatically change the channel state to in-service and begin normal reporting of alarm and status conditions.

nmon Set the channel state to not monitored. Do not report alarm or status conditions for the channel. Do not change the channel state to in-service if a good signal is detected. The channel will remain in this state until the state is changed again with this command or until the cross-connection involving this channel is deleted.

⇒ NOTE:

It is recommended that an STS-1 channel that is either STS-1 cross-connected to a function unit equipped with MXRVO circuit packs or an STS-1 channel that is VT1.5 cross-connected *not* be put in the **nmon** state. If an STS-1 channel is put in the **nmon** or **auto** state using this command, the VT1.5 channels within the specified STS-1 channel are also put in the **nmon** or **auto** state. This applies only to VT1.5 channels for which channel states are defined (for example, VT1.5 channels that are cross-connected to DS1 interfaces or dropped from a ring).

If a primary state of **nmon** is entered, the following message will be displayed:

```
/* Channel(s) address will not be monitored or  
   alarmed in this state */
```

If the path address specified in the command is an STS-1 channel that is part of an STS-3c cross-connected channel, the command will be denied with the following message:

```
SNVS  
/* Status, Not in Valid State */  
/* The specified path is not properly cross-connected. */
```

The following confirmation message will be displayed after the command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
You have selected set-state-sts1 command with these parameters:  
  
Address = x  
PrimaryState = x */  
  
Execute? (y/n or CAnCel/DElete to quit) =
```

If an attempt is made to execute this command when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS  
/* Status, Not in Valid State */  
/* Both main slots must be equipped with compatible OLIU packs. */
```

⇒ NOTE:

If an STS-1 address of **all** is provisioned, this command will skip silently all STS-1 channels that are cross-connected as passthrough, dropped not terminated, or not cross-connected at all.

RELATED COMMANDS

ent-crs-sts1

ent-crs-vt1

dlt-crs-sts1

dlt-crs-vt1

rtrv-crs-sts1

rtrv-state-sts1

set-state-vt1

upd

NAME

set-state-t1: Set T1 Port State

INPUT FORMAT

set-state-t1:Address:ps=PrimaryState;

DESCRIPTION

This command sets the state of DS1 ports. This command is used to turn on and off the alarm due to signal failures from a specified port.

The input parameters are:

Address Address identifies the DS1 port(s).

Valid Addresses: **all**, **{a,b,c}-{1-7,all}-{1-4,all}**

ps PrimaryState is the port state which may have one of the following values:

auto Set state to be monitored for good signal at the specified port.

nmon Set state to "not-alarmed" (not monitored).

 NOTE:

If a port is in the **nmon** state, it must be returned to the **auto** state (using this command) before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If a primary state of **nmon** is entered, the following message will be displayed:

```
/* Port(s) address will not be alarmed in this state */
```

The following confirmation message will be displayed after the command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
You have selected set-state-t1 command with these parameters:  
  
Address = x  
PrimaryState = x */  
  
Execute? (y/n or CAnCel/DElete to quit) =
```

RELATED COMMANDS

rtv-t1

rtv-state

upd

NAME

set-state-t3: Set T3 Port State

INPUT FORMAT

set-state-t3:Address:ps=PrimaryState;

DESCRIPTION

This command sets the state of one or more DS3 ports. This command is used to turn on and off the alarm due to signal failures from a specified port.

The input parameters are:

Address Address identifies the DS3 port(s).

Valid DS3 Port Addresses (BBG4 and BBG4B): **{a,b,c,all}**

Valid DS3 Port Addresses (BBG19): **all, {a,b,c}-{1-2,all}**

ps PrimaryState is the port state which may have one of the following values:

auto Set state to be monitored for good signal at the specified port.

nmon Set memory state to not-alarmed.

 NOTE:

If a port is in the **nmon** state, it must be returned to the **auto** state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the **update** command.

If a port state of **nmon** is entered, the following message will be displayed:

```
/* Port(s) address will not be alarmed in this state */
```


The following confirmation message will be displayed after command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
You have selected the set-state-t3 command with these parameters:  
  
Address = x  
PrimaryState =x */  
  
Execute? (y/n or CAnCel/DElete to quit) =
```

RELATED COMMANDS

rtv-state

rtv-t3

upd

NAME

set-state-vt1: Set State of VT1.5 Channels

INPUT FORMAT

set-state-vt1:Address:ps=PrimaryState;

DESCRIPTION

This command sets the states of VT1.5 channels within OC-12 (when using 24G-U OLIU CP), OC-3, OC-1, and EC-1 interfaces. It is used to turn on and off the monitoring of signal failures and maintenance signals for specified channels.

The input parameters are:

Address Address identifies the VT1.5 channel(s). Valid addresses for both linear and ring are:

**{m,a,b,c}-all, {m,c}-{1-3}-all,
{a,b}-{1-2,all}-{1-7,all}-{1-4,all},
{m,c}-{1-3,all}-{1-7,all}-{1-4,all}**

Valid addresses within EC-1 are:

{a,b,c}-{1-7,all}-{1-4,all}

Valid addresses within OC-1 (27-type OLIU) are:

**m-all, m-{1,2}-all, m-{1,2}-{1-7,all}-{1-4,all},
{a,b,c}-all, {a,b,c}-{1,2}-all,
{a,b,c}-{1,2}-{1-7}-{1-4,all}**

(Requires 27G2-U OLIUs, Release 11.0 and later)

Valid addresses within OC-1 (26G2-U OLIU) are:

**{a,b,c}-all, {a,b,c}-1-all,
{a,b,c}-1-{1-7}-{1-4,all}**

(Release 11.1 and later)

If the shelf is equipped with 24-type OLIU circuit packs in its Main unit slots, the valid Main unit addresses are:

m-{1-12,all}-{1-7,all}-{1-4,all}

Channel states can be set for VT1.5 channels within OC-12 (24G-U OLIU in Main unit), OC-3, OC-1, and EC-1 interfaces that are cross-connected to DS1 interfaces and for VT1.5 channels that are dropped from an OC-3, OC-12 (24G-U OLIUs in Main), or OC-1 ring to an OC-3 or EC-1 interface.

- ps** PrimaryState is the channel state which may have one of the following values:
- auto** Set the channel state to automatic. Monitor the channel, but do not report alarm or status conditions. Do not do performance monitoring for this channel. When a good signal is detected, automatically change the channel state to in-service.
 - nmon** Set the channel state to not monitored. Do not report alarm or status conditions for the channel. Do not do performance monitoring for this channel. Do not change the channel state to in-service if a good signal is detected. The channel will remain in this state until the state is changed again with this command or until the cross-connection involving this channel is deleted.

If a primary state of **nmon** is entered, the following message will be displayed:

```
/* Channel(s) address will not be monitored or  
   alarmed in this state */
```

The following confirmation message will be displayed after the command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
   You have selected set-state-vt1 command with these parameters:  
  
   Address = x  
   PrimaryState = x */  
  
Execute? (y/n or CANCEL/DELeTE to quit) =
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

⇒ NOTE:

If an STS-1 address of **all** is provisioned, this command will skip silently all STS-1 channels or VTs within those STS-1 channels that are cross-connected as passthrough, dropped not terminated or even not cross-connected at all.

RELATED COMMANDS

dlt-crs-vt1

ent-crs-vt1

rtrv-crs-vt1

rtrv-state-vt1

set-state-sts1

NAME

set-sts1: Set STS-1 Characteristics

INPUT FORMAT

set-sts1: *address:dgr=SignalDegrade:sfail=SignalFailure[,nsa=Alarm]*
[,sa=Alarm];

DESCRIPTION

This command provisions the following three types of parameters for STS-1 channels:

Signal Degrade Alarm Threshold:

This parameter is only provisioned for ring channels (for example, incoming STS-1 channels on optical linear extensions in ring systems are not monitored). Possible values are 10^{-5} through 10^{-9} , with a default value of zero (0) for Release 9.0 and earlier, and 10^{-6} for Release 9.1 and later. Only the 22-type, 27-type, and 22F2-U, and 24G-U (Release 11.0 and later) OLIU circuit packs support the provisionable signal degrade function.

Signal Fail Alarm Threshold:

This parameter is only provisioned for ring channels. Possible values are 10^{-3} and 10^{-6} , with a default value of 10^{-3} .

Alarm Level for SA/NSA STS Path AIS Condition:

The alarm level for a service affecting (SA) path AIS condition can be provisioned for both ring and non-ring channels. The alarm level for a non-service affecting (NSA) path AIS condition can only be provisioned for ring releases.

The input parameters are:

Address Address identifies the STS-1 channels.

Valid Ring and Linear Addresses:

all, **m-{1-3,all}**, **c-{1-3,all}**, **{a,b}-{1-2,all}**
{a,b,c} (EC-1 Addresses)
{m,a,b,c}-{1,2,all} (27-type OLIU Addresses)
{a,b,c}-1 (26G2-U OLIU Addresses)

If the shelf is equipped with 24-type OLIUs in its Main unit slots, the valid Main unit Addresses are: **m-{1-12,all}**

dgr

SignalDegrade specifies a bit error rate (BER) threshold for the STS-1 channel in terms of a logarithm to base 10. When this threshold is crossed, an alarm will be raised and automatic protection

switching to the STS-1 protection path will be initiated. The only valid address for the SignalDegrade parameter is **all**. For Release 9.0 and earlier, to provision the signal degrade function this command requires that the Main slot(s) be equipped with 22G-U, 27-type, or 22D-U OLIU CPs. For Release 9.1 and later, this parameter can be independent of OLIU equippage. Note, however, that the signal degrade function is only supported by 22G-U, 22D-U, 27-type, 24G-U, and 22F2-U OLIU circuit packs. and 24G-U OLIU circuit packs.

The signal degrade parameter is an integer with range -5 through -9. For Release 9.0 and earlier, the default or original value is 0, meaning that signal degrade is disabled. For Release 9.1 and later, the default value is -6, and the parameter cannot be set to "0". Thus, in Release 9.1 and later, the signal degrade function is always operational as long as OLIU circuit pack types that support the functionality are used.

sfail *SignalFailure* specifies the BER of the STS-1 channel in terms of a logarithm to the base 10. Meeting or exceeding this threshold in a "VT Path_Switched ring" is considered a signal fail condition, resulting in a VT AIS insertion and subsequently causing a VT path protection switching. Furthermore, in an "STS Path-Switched ring", meeting or exceeding this threshold causes an alarm and STS path protection switching, but no AIS insertion will take place. The only valid address for the SignalFailure parameter is **all**. This parameter can have one of the following values:

- 3 BER threshold resulting in VT AIS insertion in a "VT Path_switched ring" and causing the VT path protection switching (default). Exceeding this threshold will cause an alarm and an STS path protection switching in the "STS Path_Switched ring" (default).
- 6 If provisioned, this BER threshold will result in VT AIS insertion in a "VT Path_Switched ring", and will cause a VT path protection switching. This threshold will cause an alarm and an STS path protection switching in the "STS Path_Switched ring".

nsa This parameter is available in OC-3 ring releases. This parameter is the provisioned alarm level of the non-service affecting STS-1 path AIS and has the following values:

- mn** Minor alarm (default)
- nr** Not alarmed and not reported.

sa This parameter is the provisioned alarm level of the service affecting STS-1 path AIS and has the following values:

- cr** Critical alarm (default for ring channels)
- mn** Minor alarm (non-ring channels only, default)
- na** Not alarmed, but reported
- nr** Not alarmed and not reported (non-ring channels only)

If the signal degrade or signal fail threshold parameter is entered and the address used is any value other than "all" the command will be denied with the following message:

```
/* The only valid address for the signal degrade or the signal
   fail parameter is { all }.
   To set the signal degrade parameter enter
set-sts1:all:dgr=value; */
```

To provision the AIS parameters requires that either an STS-1 or at least one VT cross-connection exist in the specified address range or the command will not execute, and the following message will be displayed.

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected. */
```

For Release 9.0 and earlier, if the slots are not equipped at all or incorrectly equipped, the command will be denied with the following message:

```
ENEQ
/* Equipage, Not EQuipped */
/* Circuit pack type with signal degrade function is missing. */
```

Starting with Release 9.1, this denial is removed.

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

In OC-3 ring releases, the following confirmation message will be displayed after the command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.
You have selected the set-sts1 command with this parameter:

SignalDegrade = <value>
SignalFailure = <value>
ServiceAffectingAIS = <value>
NonServiceAffectingAIS = <value> */

Execute? (y/n or CANCEL/DELETE to quit) =
```


In linear releases, the following confirmation message will be displayed after command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.  
You have selected the set-sts1 command with this parameter:  
  
ServiceAffectingAIS = <value>  
  
Execute? (y/n or CAnCel/DELeTe to quit) =
```

⇒ NOTE:

If an STS-1 address of **all** is provisioned, this command will skip silently all STS-1 channels that are cross-connected as passthrough, dropped not terminated, or not cross-connected at all.

RELATED COMMANDS

rtrv-sts1

NAME

set-sync: Set Synchronization Characteristics

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

**NOTE:**

This command may be used with the new Stratum 3 timing circuit pack, TG3 (BBF4), available in 1999. This pack can not be used in combination with either of the two TGS circuit packs (BBF2/BBF2B) in the same network element. The BBF4 circuit pack can be used in any BBF2B application. Care must be taken to ensure that a system equipped with these new BBF4 circuit packs will not receive its sync source for line-timing from another system that is equipped with either BBF2 or BBF2B TGS packs.

This command provisions the synchronization mode switching, synchronization source, and output mode of timing signals when the TGS circuit pack hardware is provisioned to be externally timed, internally timed, or line timed.

**NOTE 1:**

Synchronization provisioning is the same whether the OC-3 shelf is equipped with OC-3 or OC-12 (24G-U) OLIU circuit packs in its Main unit slots.

**NOTE 2:**

Prior to Release 9.1, line timing from OC-1 OLIU circuit packs, whether from Main or Function unit slots is not provided. Starting with Release 9.1, line timing from OC-1 line #1 on 27-type OLIU circuit packs in main slots is supported.

Each DDM-2000 can be provisioned to one of these timing modes:

- Free running from an internal oscillator.
- Line-timed from an incoming optical interface. This timing reference is used to generate all outgoing signals. If the optical line is protected, the line selected for transmission is also the line selected as the timing reference. If equipped with a BBF2B timing generator (TGS) circuit pack, or with a BBF4 Stratum 3 timing circuit pack (TG3) the line in Function Unit C selected for transmission can optionally be selected for the timing reference. for the timing reference.

- External timing from a DS1 reference signal. Each TGS circuit pack receives one DS1 reference signal which it monitors and from which it recovers a clock signal. The recovered clock is cross-fed to the companion TGS circuit pack on the same shelf. If a DS1 reference failure is detected on one timing circuit pack, the other will take the reference from the companion TGS on the same shelf.

These timing modes are supported by the BBF2, BBF2B TGS circuit packs as well as BBF4 TG3 circuit packs. The BBF2B circuit pack can be used in any BBF2 application and is preferred for use in ring applications.

Use of this command may affect timing for other network elements of the timing network.

⇒ NOTE:

This command is available to privileged users only for all CIT or DCC ports on the shelf.

INPUT FORMAT

The following parameters are available for this command when provisioned for a specific synchronization reference. Parameters may vary depending upon whether the application is linear or rings.

LINEAR SYSTEMS - LINE TIMED

set - sync : [*mdsw=ModeSwitching*]; (BBF2 pack type)

set - sync : [*mdsw=ModeSwitching*][*,src=SynchronizationSource*]
[*,omd=OutputMode*][*,auto=SyncAutoreconfiguration*];
(BBF2B pack type)

When using the BBF2B TGS circuit pack, the *SynchronizationSource* parameter is used to select the optical line for *shelf* timing or DS1 output mode.

RING SYSTEMS - LINE TIMED

set - sync : [*mdsw=ModeSwitching*][*,src=SynchronizationSource*]
[*,omd=OutputMode*][*,auto=SyncAutoreconfiguration*];
(BBF2B pack type)

set - sync : [*mdsw=ModeSwitching*][*,src=SynchronizationSource*]
[*,omd=OutputMode*][*,aisthres=AISThreshold*]
[*,auto=SyncAutoreconfiguration*];
(BBF2B pack type ONLY for OC-3 R9.1 and later, and BBF4 pack in OC-3 Release 11.1).

When using the BBF2B TGS or BBF4 TG3 circuit pack, the *SynchronizationSource* parameter is used to select the optical line for *shelf* timing. If the BBF2B TGS or BBF4 TG3 circuit pack is used and hardware is provisioned for DS1 output in SYNC OUT mode and if the *SynchronizationSource* is provisioned for FN-C, then the *OutputMode* parameter may be used.

LINEAR SYSTEMS - EXTERNAL TIMING

set - sync : [mdsw=*ModeSwitching*];
(BBF2 pack type)

set - sync : [mdsw=*ModeSwitching*][,src=*SynchronizationSource*]
[,omd=*OutputMode*];
(BBF2B pack type)

RING SYSTEMS - EXTERNAL TIMING

set - sync : [mdsw=*ModeSwitching*]; (BBF2 pack type)

set - sync : [mdsw=*ModeSwitching*][,src=*SynchronizationSource*]
[,omd=*OutputMode*]; (BBF2B pack type)

set - sync : [mdsw=*ModeSwitching*][,src=*SynchronizationSource*]
[,omd=*OutputMode*][,aisthres=*AISThreshold*];
(BBF2B ONLY for OC-3 R9.1 and later, and BBF4 for OC-3 Release 11.1)

If the BBF2B TGS circuit pack is used and hardware is provisioned for DS1 output in SYNC OUT mode and if the *SynchronizationSource* is provisioned for FN-C, then the *OutputMode* parameter may be used.

⇒ NOTE:

For all applications, if the BBF2B or BBF4 TGS or TG3 circuit pack is hardware provisioned for DS1 output in SYNC OUT mode, the *SynchronizationSource* parameter is also used to select the optical line for DS1 output.

The input parameters are:

mdsw ModeSwitching may have one of the following values:

- revertive** Revertive mode switching (default value).
If the system switches to holdover timing mode due to a failure of the timing references, it will automatically switch back to the provisioned timing mode (External or LineTimed) after one of the references becomes good.
- nonrevertive** Nonrevertive mode switching.
If the system switches to holdover timing mode due to a failure of the timing references, it will *not* automatically switch back to the provisioned timing mode (External or LineTimed) after the reference becomes good. The **switch-sync** command must be used to restore the system to the provisioned timing mode (External or LineTimed).

src SynchronizationSource. This parameter selects the line from which shelf line timing and/or the DS1 synchronization output will be derived. This parameter may have one of the following values:

- main** For linear releases (default).
- main-1** For ring releases (default). Starting with Release 9.1, if Main-1 contains a 27-type OLIU, this value selects OC-1 line #1.
- main-2** For ring releases. Starting with Release 9.1, if Main-2 contains a 27-type OLIU, this value selects OC-1 line #1.
- fn-c** Linear Releases and rings optical extensions

omd OutputMode. This parameter is available with linear and rings releases when **src** equals **fn-c**. When a line protection switch occurs, **omd** determines whether the source of the DS1 synchronization output will always be derived from the active receive OC-3 line or is locked to a specified line, whether it is active or not. This parameter may have one of the following values:

- lock1** Lock to line 1
- lock2** Lock to line 2
- track** Track transmission to active receive line (Default for linear applications or for ring applications when **src** is FN-C).

aisthres

AISThreshold. This parameter is available with OC-3 Release 9.1 and Release 11.1 and later ring releases. It is applicable to the BBF2B and BBF4 circuit pack types. This parameter sets the incoming synchronization message quality level of the active reference upon receiving of which AIS signal is transmitted on the DS1 output of the

BBF2B TGS circuit packs. As long as the incoming quality level number is at or greater than the provisioned level, AIS will be transmitted. This parameter is listed in ascending quality order and may have one of the following values:

level15 This is the default value. Send DS1 AIS for incoming quality level 5 (K2: Internal Clock, S1: Traceable SONET Clk) or greater (that is, quality level 6 or 7).

level14 Send DS1 AIS for incoming quality level 4 (K2: Stratum 3, S1: Traceable Stratum 3) or greater.

level13 Send DS1 AIS for incoming quality level 3 (K2: Stratum 2, S1: Traceable Stratum 2) or greater.

level12 Send DS1 AIS for incoming quality level 2 (K2: Sync Quality Unknown, S1: Sync Trace Unknown) or greater.

auto SyncAutoreconfiguration allows the system to choose the best timing source to use when it is provisioned for Line Timing. The synchronization source selection is based on the synchronization messages received from the available timing (synchronization) sources. Automatic Protection Switching takes place to the standby timing source when the active source fails. The switch is nonrevertive, and there will not be an automatic switch back to the former timing reference.

When SyncAutoreconfiguration is enabled, the system automatically reconfigures between line timing sources **main** and **fn-c** in linear systems and **main-1** and **main-2** in ring systems. In ring releases, **fn-c** will also be a source option. Use the **switch-sync** command to manually switch to the other timing source.

enabled SyncAutoreconfiguration is active.

disabled SyncAutoreconfiguration is not active (default).

If hardware provisioning switches are set for FreeRunning timing mode, execution of this command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for free-running. */
```

When sync messages are active (as set by the **set-oc3** command) and a user requests to set the timing source to a LineTime source which has a sync message that does not support timing, the command will be completed, but the following message will be displayed:

```
/* Source selected currently is unusable for timing.  
Timing will switch to holdover or if Sync Autoreconfiguration is  
enabled, timing may switch to other source. */
```

Prior to Release 9.1, if the slot selected as a timing source (Main or FN-C) is not equipped with an OC-3 OLIU or if the **src** and **omd** parameter values selected refer to a slot that is not equipped or not properly equipped, or if **omd** is provisioned with a *lockx* value for a slot that is not properly equipped, the command request will be denied and the following denial message will be displayed:

```
EQWT  
/* Equipage, Wrong Type */  
/* address is not equipped with the proper hardware.*/
```

⇒ **NOTE 1:**

If **omd** is assigned a *lockx* value where slot *x* is not equipped or not properly equipped, the *address* mentioned in the above denial message will point to the exact slot number expressed by the *x* value.

⇒ **NOTE 2:**

Starting in Release 9.1, line timing from OC-1 line #1 in 27-type OLIU circuit packs in Main slots is available.

If this command is entered and both timing slots are empty, the command will be denied with the following message:

```
EQWT
/* Equipage, Wrong Type */
/* No change in provisioning - both timing slots are unequipped */
```

For SyncAutoreconfiguration, several other parameters must be set before this feature can be enabled. If these parameters are not set, the SyncAutoreconfiguration request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* <message reason>
Sync Autoreconfiguration cannot be enabled */
```

Valid message reasons include the following:

- K byte messages disabled
- Sync messages disabled (for OC-3 Releases 8.1, 9.1, and later releases). For DDM-2000 OC-3 Release 9.0 and later ring releases, at least two of the possible sources are required to have their synchronization messaging enabled before the sync autoreconfiguration feature can be enabled.
- Shelf not line timed
- Sync output mode set to lock

In a linear application, if the TGS slots are equipped with BBF2 circuit packs, and if **src**, **omd**, or **auto** parameters are provisioned, the request will be denied with the following message:

```
EQWT
/* Equipage, Wrong Type */
/* TGS slots are not equipped with proper hardware. */
```

In a ring application, if the TGS slots are equipped with BBF2-type circuit packs and FN-C is selected as the timing source, or autoreconfiguration is enabled on any timing source while FN-C is equipped with an OC-3 OLIU circuit pack, the command request will be denied with the following message:

```
EQWT
/* Equipage, Wrong Type */
/* TGS slots are not equipped with proper hardware. */
```

When SyncAutoreconfiguration is enabled, the OutputMode cannot be set to **lock** or the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Sync Autoreconfiguration is enabled. */
```

If an attempt is made to execute this command when a mix of incompatible OLIU packs exists in the Main slots, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

The following confirmation message will be displayed after the command entry:

```
/* Caution! Execution of this command may affect service.  
You have selected the set-sync command with these parameters:  
  
ModeSwitching = x  
SynchronizationSource = x  
OutputMode = x */  
  
Execute? (y/n or CANCEL/DELeTe to quit) =
```

When SyncAutoreconfiguration is available, the following confirmation message will be displayed after command entry:

```
/* Caution! Execution of this command may modify network  
synchronization and affect service.  
You have selected the set-sync command with these parameters:  
  
ModeSwitching = x  
SynchronizationSource = x  
OutputMode = x  
SyncAutoreconfiguration = x */  
  
Execute? (y/n or CANCEL/DELeTe to quit) =
```

In OC-3 Release 9.1 and later releases, the following confirmation message will be displayed after command entry:

```
/* Caution! Execution of this command may modify network
synchronization and affect service.
You have selected the set-sync command with these parameters:

ModeSwitching = x
SynchronizationSource = x
OutputMode = x
AISThreshold = x
SyncAutoreconfiguration = x */

Execute? (y/n or CANCEL/DELETE to quit) =
```

When SyncAutoreconfiguration is available and its value is being changed from **enabled** to **disabled**, the following confirmation message will be displayed after command entry:

```
/* Caution! Execution of this command may modify network
synchronization and affect service. Executing this command with
auto=disabled will disable autonomous selection of source for
shelf timing.
You have selected the set-sync command with these parameters:

ModeSwitching = x
SynchronizationSource = x
OutputMode = x
SyncAutoreconfiguration = disabled */

Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rtv-sync

set-oc3

set-oc12

switch-sync

NAME

set-t1: Set T1 Characteristics

INPUT FORMAT

```
set-t1: address[:lc=LineCode][,alm=AlarmLevel][,fth=FailureThreshold]
[,dlc=DLCBPVtoLOS][,ais=AlarmIndicationSignal][,pmmd=PMMode]
[,fmt=Format];
```

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command sets the parameters of one or more DS1 ports. These characteristics include alarm levels, line coding, failure thresholds, and AIS conditions.

**NOTE:**

The DS1 protection circuit pack is automatically provisioned with all the same user-settable options as the service pack it protects, except for the line buildout (LBO) value (which is not provisioned via the CIT).

The input parameters are:

Address	Address is the address of the DS1 port(s) to be provisioned. One port or more may be specified. Valid Addresses: all , {a,b,c} - {1-7,all} - {1-4,all}						
lc	LineCode is the DS1 line coding which may be one of the following: <table border="0"> <tr> <td>ami</td><td>Alternate Mark Inversion (overrides the linecode switch)</td></tr> <tr> <td>b8zs</td><td>Bipolar with 8 Zero Substitution (overrides the linecode switch)</td></tr> <tr> <td>noOverride</td><td>No override of the linecode switch (default value).</td></tr> </table>	ami	Alternate Mark Inversion (overrides the linecode switch)	b8zs	Bipolar with 8 Zero Substitution (overrides the linecode switch)	noOverride	No override of the linecode switch (default value).
ami	Alternate Mark Inversion (overrides the linecode switch)						
b8zs	Bipolar with 8 Zero Substitution (overrides the linecode switch)						
noOverride	No override of the linecode switch (default value).						

If either **ami** or **b8zs** is selected, the line code will be set to the selected value and a software override will be active even if the selected value matches the current switch setting. While the software override is active, changes in the switch settings will not affect the line code. A software override will remain active until the set-t1 command is executed again and the **noOverride** option is selected or until the associated circuit pack is removed from the equipment list. This parameter is not valid with HDSL circuit packs.

alm AlarmLevel sets the alarm level for an incoming DS1 Signal Failure and may be one of the following:

- mj** Major Alarm
- mn** Minor Alarm
- na** No Alarm (default value).

If the system is provisioned for no alarm, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near-end activity.

fth FailureThreshold sets the failure threshold in terms of a logarithm to the base 10. The value may be -8, -7, -6, or -3, corresponding to BERs of 10^{-8} , 10^{-7} , 10^{-6} , and 10^{-3} , respectively. The default value is -3. When the failure threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated.

d1c (bpv) DLCBPVtoLOS determines whether an incoming DS1 signal failure (a bit error rate above the failure threshold set by the failure threshold parameter, **fth**) will be translated to an outgoing DS1 loss of signal (all zeros) at the far end. The value is either **yes** or **no**. The default value is **no**. Setting this parameter to **yes** permits a digital loop carrier system terminal (such as the SLC® 96 carrier system) to detect the loss of signal and initiate protection switching of the DS1. When the parameter is set to **yes**, the **ais** parameter is automatically set to **no**. (An all zeros signal, not AIS, is transmitted to the far end even if the **AIS** parameter is set to **yes**.)

ais AlarmIndicationSignal determines whether an AIS should be inserted towards the optical fiber when a loss of incoming DS1 signal is detected. The values are **yes** and **no**; the default value is **yes**. This parameter is ignored if the **bpv** parameter (described above) is set to **yes**.

pmmd This parameter sets the mode for ports supported by the DS1 performance-monitoring circuit pack. **Pmmd** is only used for performance-monitoring. Setting this parameter does not affect the transmitted or received signal. This parameter may be one of the following values:

- off** DS1 PM turned off (default value)
- on** DS1 PM turned on (only if CP type is BBF3 or BBG20).

fmt Format supports the PMMode parameter. It is available only if CP type is BBF3. In OC-3 Release 11.1 and later, this parameter will also be applicable to the TMUX (BBG20) circuit pack to monitor the internal DS1 signals within the incoming (from DSX) DS3 signal. This parameter sets the format to be monitored by the DS1 performance-monitoring circuit pack. **Fmt** is only used for performance-monitoring. Setting this parameter does not affect the transmitted or received signal. This parameter may be one of the following values:

sf	Superframe
esf	Extended superframe, near-end and far-end. (default)
esfn	Extended superframe, near-end only.

If multiple addresses are specified, the following caution message will be displayed immediately before the confirmation request message:

```
/* Caution: This command addresses multiple objects within this
system. Selections other than CurrentValues will affect all
addressed objects. */
```

The following confirmation message will be displayed after the command entry, when addressing packs without performance-monitoring capability:

```
/* Caution! Execution of this command may affect service.
You have selected the set-t1 command with these parameters:

Address = x
LineCode = x
AlarmLevel = x
FailureThreshold = x
DLCBPVtoLOS = x
AlarmIndicationSignal = x */

Execute? (y/n or CANCEL/DELETE to quit) =
```

The following confirmation message will be displayed after the command entry when addressing packs with performance-monitoring capability or if addressing a group of packs using **all** in the address:

```
/* Caution! Execution of this command may affect service.  
You have selected the set-t1 command with these parameters:  
  
Address = x  
LineCode = x  
AlarmLevel = x  
FailureThreshold = x  
DLCBPVtoLOS = x  
AlarmIndicationSignal = x  
PMMode = x  
Format = x */  
  
Execute? (y/n or CAnceL/DELeTe to quit) =
```

RELATED COMMANDS

rtrv-t1

set-state-t1

NAME

set-t3: Set T3 Characteristics

INPUT FORMAT

```
set-t3:Address:[md=Mode][,ais=AlarmIndicationSignal][,alm=AlarmLevel]
[,fth=FailureThreshold][,pmmd=PMMode][,frame=Frame][,fmt=Format];
```

```
set-t3:Address:[alm=AlarmLevel][,aisalm=AISAlarmLevel]
[,fth=FailureThreshold][,pmmd=PMMode][,frame=Frame]
[,fmt=Format][,xbit=Xbit];
(For OC-3 Release 11.1 and later, BBG20 TMUX circuit pack)
```

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command sets the characteristic parameters of one or more DS3 ports. These characteristics include alarm levels, failure thresholds, AIS conditions, and performance monitoring.

The input parameters are:

Address Address is the address of the DS3 port(s) to be provisioned. One or all ports may be specified. Starting with Release 11.0, function groups equipped with BBG19 DS3 circuit packs have independent ports for each slot in the function group. Parameters provisioned for the function group are applied to both ports.

Valid DS3 Port Addresses: **{a,b,c,all}**

md Mode is the violation monitor removal mode of the DS3 signal. This parameter may have one of the following values:

vmr Monitor and remove DS3 P bit errors (default value).
vm Monitor but do not remove DS3 P bit errors.
cc Clear channel — Do not monitor or remove DS3 P bit errors.

If this parameter is set to **vmr** or **vm**, the **ais** parameter will not be prompted for.

If this parameter is set to **cc**, the **pmmd**, **frame**, and **fmt** parameters will not be used. Also in this case, the **pmmd**, **frame**, and **fmt** parameters will keep their current values. The current values for both parameters will be available to be used whether the value of **md** is set to **vm** or **vmr**.

ais AlarmIndicationSignal determines whether or not a DS3 AIS should be inserted. The value may be `yes` or `no`. This parameter is not applicable to the TMUX (BBG20) circuit pack, beginning with OC-3 release 11.1 and future OC-3 releases. When AIS is set to `yes`:

- DS3 AIS is inserted towards the DSX-3 upon detection of an OC-3 loss of signal or STS path AIS incoming from the fiber.
- DS3 AIS is inserted towards the fiber upon detection of DS3 LOS incoming from the DSX-3.



NOTE 1:

AIS is always inserted if the violation monitor removal mode is provisioned for `vmr` or `vm`.



NOTE 2:

If `md` value was set to `vmr` or `vm`, and it is set to `cc` the AIS always defaults to `off` value.

alm AlarmLevel sets the alarm level for an incoming DS3 Signal Failure and may be one of the following:

cr	Critical Alarm
mj	Major Alarm
mn	Minor Alarm
na	No Alarm

The default alarm level is critical. If the system is provisioned for no alarm and there is a loss-of-signal condition, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near end activity.

For the TMUX (BBG20) circuit pack in OC-3 Release 11.1 and later, this parameter will be applicable to the following three incoming DS3 (from DSX) alarms: LOS, out-of-frame (OOF), and signal failure BER.

aisalm	This parameter is only applicable to the TMUX (BBG20) circuit pack beginning with OC-3 Release 11.1. AISAlarmLevel sets the alarm level for an incoming DS3 (from DSX) AIS and may be one of the following: <table><tr><td>cr</td><td>Critical Alarm</td></tr><tr><td>mj</td><td>Major Alarm</td></tr><tr><td>mn</td><td>Minor Alarm</td></tr><tr><td>na</td><td>No Alarm Level (default)</td></tr></table>	cr	Critical Alarm	mj	Major Alarm	mn	Minor Alarm	na	No Alarm Level (default)
cr	Critical Alarm								
mj	Major Alarm								
mn	Minor Alarm								
na	No Alarm Level (default)								
fth	FailureThreshold sets the Failure Threshold in terms of a logarithm to the base 10. The value may be either -6 or -3, corresponding to BERs of 10^{-6} and 10^{-3}, respectively. The default value is -3. When the failure threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated.								
pmmd	PMMode is only used for performance-monitoring (PM). Setting this parameter does not affect the transmitted or received signal. This parameter will appear only if the vmr or vm mode has already been selected. For the TMUX (BBG20) circuit pack in OC-3 Release 11.1 and later, this parameter will always appear. Because the DS3 BER threshold for the TMUX circuit pack is based on p-bit or c-bit parity violations, a failure threshold of 10^{-4} will cause a This parameter may be one of the following values: <table><tr><td>on</td><td>DS3 PM turned on. This is the default value.</td></tr><tr><td>off</td><td>DS3 PM turned off. PM data is neither collected nor reported in this mode.</td></tr></table>	on	DS3 PM turned on. This is the default value.	off	DS3 PM turned off. PM data is neither collected nor reported in this mode.				
on	DS3 PM turned on. This is the default value.								
off	DS3 PM turned off. PM data is neither collected nor reported in this mode.								
frame	Frame is only used for performance-monitoring (PM) on the BBG4/BBG4B, BBG11/BBG11B, or BBG19 circuit packs. Setting this parameter does not affect the transmitted or received signal. This parameter will appear only if the vmr or vm mode has already been selected. For the TMUX (BBG20) circuit pack in OC-3 Release 11.1 and later, this parameter will always appear and is transmission-affecting. It is used to select the type of DS3 framed signal that is received from the DSX only and is transmitted towards the DSX. This parameter may have one of the following values: <table><tr><td>m13</td><td>The incoming DS3 signal from both the fiber and the dsx-3 is of the M13 framing type. This is the default value.</td></tr><tr><td>cbit</td><td>The incoming DS3 signal from both the fiber and the dsx-3 is of the C-bit framing type.</td></tr></table>	m13	The incoming DS3 signal from both the fiber and the dsx-3 is of the M13 framing type. This is the default value.	cbit	The incoming DS3 signal from both the fiber and the dsx-3 is of the C-bit framing type.				
m13	The incoming DS3 signal from both the fiber and the dsx-3 is of the M13 framing type. This is the default value.								
cbit	The incoming DS3 signal from both the fiber and the dsx-3 is of the C-bit framing type.								

- fmt** Format supports the PMMode and Frame parameters and sets the type of PMON that will appear in the DS3 PM report. This parameter will appear only if the **vmr** or **vm** mode has already been selected. If the **cc** mode is selected, these parameters will not be visible to the user. For the TMUX (BBG20) circuit pack in OC-3 Release 11.1 and later, this parameter will always appear. This parameter may have one of the following values:
- pbit** When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 P-bit CV, ES, SES, and UAS (default value). This option is valid for both **frame** types.
 - fmbit** When this value is selected, the DS3 PM report will provide counts of SEFS as well as DS3 adjusted F&M bit CV, ES, SES, and UAS. This option is valid for both **frame** types.
 - cpbit** When this value is selected, the DS3 PM report will provide counts of SEFS as well as DS3 CP-bit parity CV, ES, SES, and UAS for both near-end and far-end (FEBE) data. This option is valid ONLY for **cbit** type of **frame**.
- xbit** This parameter is only applicable to the TMUX (BBG20) circuit pack beginning with OC-3 Release 11.1. It will be prompted only if **m13** has been selected for **frame**. It sets the value of both X-bits in the outgoing DS3 signal (towards DSX). This parameter may have a value of one (default) or zero.

The following confirmation message will be displayed for DS3 ports on circuit packs other than the TMUX (BBG20) pack:

```
/* Caution! Execution of this command may affect service.  
You have selected the set-t3 command with these parameters:
```

```
    Address = x  
    Mode = x  
    AlarmIndicationSignal = x  
    AlarmLevel = x  
    FailureThreshold = x  
    PMMode = x  
    Format = x */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

⇒ NOTE:

The above display will only prompt for the alarm indication signal (AIS) if the Mode is set to cc. The above display will only prompt for the PMMode and Format if the Mode parameter is set to vmr or vm.

If the **m13** frame and **cpbit** format options have both been selected, the following denial message will be displayed:

```
/* <address> - invalid combination of frame and format --  
provisioning unchanged */
```

The following confirmation message will be displayed after command entry for DS3 ports on circuit packs other than the TMUX (BBG20) pack:

```
/* Caution! Execution of this command may affect service.  
You have selected the set-t3 command with these parameters:
```

```
    Address = x  
    Mode = x  
    AlarmIndicationSignal = x  
    AlarmLevel = x  
    FailureThreshold = x  
    PMMode = x  
    Frame = x  
    Format = x */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

⇒ NOTE:

The above display will only prompt for the alarm indication signal (AIS) if the Mode is set to cc. The above display will only prompt for the PMMode, Frame, and Format if the Mode parameter is set to vmr or vm.

In OC-3 Release 11.1, when this command is used to provision a TMUX (BBG20) circuit pack, the following confirmation message will be displayed after command entry:

```
/* Caution! Execution of this command may affect service.  
You have selected the set-t3 command with these parameters:
```

```
    Address = x  
    AlarmLevel = x  
    AISAlarmLevel = x  
    FailureThreshold = x  
    PMMode = x  
    Frame = x  
    Format = x  
    Xbit = x */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

In OC-3 Release 11.1, if the `cbit` frame and `xbit` options have both been selected (e.g., during expert mode provisioning), the following denial message will be displayed:

```
/* <address> - invalid combination of frame and xbit --  
provisioning unchanged */
```

The following confirmation message will be displayed after the command entry when addressing a group of packs using `all` in the address:

```
/* Caution! Execution of this command may affect service.  
You have selected the set-t3 command with these parameters:
```

```
Address = x  
Mode = x  
AlarmIndicationSignal = x  
AlarmLevel = x  
AISAlarmLevel = x  
FailureThreshold = x  
PMMode = x  
Frame = x  
Format = x  
Xbit = x */
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

If multiple addresses are specified, the following caution message will be printed out immediately before the confirmation request message:

```
/* Caution: This command addresses multiple objects within this  
system. Selections other than CurrentValues will affect all  
addressed objects. */
```

RELATED COMMANDS

`rtrv-t3`

`set-state-t3`

NAME

set-trace-sts1: Set STS Path Trace Characteristics

INPUT FORMAT

set-trace-sts1:*Address*[*EXPTRC=Expectedincomingpathtrace*]
[*, TRC=OutgoingPathTrace*];

DESCRIPTION

This command assigns user-selectable alphanumeric character strings to the transmit and receive path trace fields of an STS cross-connected STS-1 signal. The allowed ASCII characters include the letters "A" through "Z" and "a" through "z", numbers "0" through "9", and the following special characters:

# (pound sign)	\$ (dollar sign)
% (percent sign)	& (ampersand)
((open parenthesis)	) (close parenthesis)
+ (plus)	* (asterisk)
(pipe)	- (hyphen)
[(open square bracket)	] (close square bracket)
{ (open bracket)	} (close bracket)
' (apostrophe)	` (grave accent)
. (period)	/ (slash)
< (less than)	> (greater than).

⇒ NOTE:

This feature is only applicable to STS paths terminating to a BBG4B circuit pack.

The input parameters are:

Address	This is a STS-1 channel address of the SONET path terminating signal for which the path trace is assigned. Valid Addresses (within OC-3): {m, c} - {1-3}, {a, b} - {1, 2} Valid Rings Only Addresses: m - {1-3} Valid 27-type OLIU Addresses: m - {1, 2} If the shelf is equipped with 24-type OLIU circuit packs in its Main unit slots, the valid Main unit addresses are: m - {1-12}
EXPTRC	EXPTRC specifies the expected incoming path trace message. It is a string of 62 or less alphanumeric characters.
TRC	TRC specifies the outgoing path trace message. It is a string of 62 or less alphanumeric characters.

If the channel is not cross-connected to a STS-1 PTE, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Valid cross-connection does not exist. STS Path trace cannot be set. */
```

If the STS-1 channel for which this command was issued is not available, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Address points to a non-existent channel. */
```

If an attempt is made to set the path trace for an STS path other than the one terminated to a DS3 (BBG4B) circuit pack, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Check the equipage. BBG4B for OC-3 and BBG11B for
   OC-12 is required. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

When input, this command will cause the following confirmation request to be displayed:

```
/* You have selected the set-pthtrc command with these  
parameters:
```

```
Address = address  
EXPTRC = message  
TRC = message
```

```
Execute? (y/n or CANCEL/DELETE to quit) =
```

RELATED COMMANDS

rtrv-trace-sts1

rtrv-crs-sts1

set-sts1

NAME

set-vt1: Set VT1.5 Characteristics

INPUT FORMAT

set - vt1:address:dgr=SignalDegrade[, nsa=Alarm][, sa=Alarm];

DESCRIPTION

This command provisions two type of parameters for VT1.5 channels.

Signal Degrade Alarm Threshold

This parameter is provisioned only for ring channels (that is, incoming VT1.5 channels on optical linear extensions in ring systems are not monitored). Possible values are 10^{-5} through 10^{-8} , with a default value of 0 for releases prior to Release 9.1 and 10^{-6} for Release 9.1 and later. Only the 22-type, 27-type, 22F2-U, 26G2-U, and 24G-U (Release 11.0 and later) OLIU circuit packs support the provisionable signal degrade function.

Alarm Level for SA/NSA VT Path AIS Condition

The alarm level for a service affecting path AIS condition can be provisioned for both ring and non-ring channels. The alarm level for a non-service affecting path AIS condition can only be provisioned for ring releases.

The input parameters are:

Address

Address identifies the VT1.5 channels.

Valid Ring and Linear Addresses: **all**,
m-{1-3,all}-{1-7,all}-{1-4,all},
c-{1-3,all}-{1-7,all}-{1-4,all},
{a,b}-{1-2,all}-{1-7,all}-{1-4,all}

Valid EC-1 Addresses: **{a,b,c}-{1-7,all}-{1-4,all}**, **all**

Valid 27-type OLIU Addresses: **all**,
{m,a,b,c}-{1,2,all}-{1-7,all}-{1-4,all}

Valid 26G2-U OLIU Addresses: **all**,
{a,b,c}-1-{1-7,all}-{1-4,all}, **all**

If the shelf is equipped with 24-type OLIUs in its Main unit slots, the valid Main unit Addresses are:

m-{1-12,all}-{1-7,all}-{1-4,all}

dgr SignalDegrade specifies the bit error ratio (BER) threshold for the VT1.5 signals in terms of a logarithm to the base 10. When this threshold is crossed, an alarm will be raised and automatic protection switching to the protection path will be initiated. The only valid address for the SignalDegrade parameter is **all**.

For releases prior to Release 9.1, the values are 10^{-5} to 10^{-8} , with a default or original value of zero (0), meaning that signal degrade is disabled. For Release 9.1 and later, the default value is -6, and the parameter cannot be set to "0". Thus, in Release 9.1 and later, the signal degrade function is always operational as long as OLIU circuit pack types that support the functionality are used.

nsa This parameter is available in OC-3 ring releases. It is the provisioned alarm level of the non-service affecting VT path AIS and has the following values:

mn Minor alarm (default)

nr Not alarmed and not reported.

sa This is the provisioned alarm level of the service affecting VT path AIS and has the following values:

mj Major alarm (default for ring channels)

mn Minor alarm (non-ring channels only, default)

na Not alarmed, but reported

nr not alarmed and not reported (non-ring channels only)

If the signal degrade parameter is entered and the address used is any value other than **all** the command will be denied with the following message:

```
/* The only valid address for the signal degrade parameter is { all }.
   To set the signal degrade parameter enter
set-vt1:all:dgr=value; */
```

To provision the AIS parameters requires that at least one VT cross-connection exist in the specified address range or the command will not execute and the following message will be displayed.

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected. */
```

For Release 9.0 and earlier, provisioning of the signal degrade parameter requires that 22G-U, 22D-U, or 27-type OLIU circuit packs are present in the Main slots. If the slots are not equipped at all or are not equipped properly, the following denial message is displayed:

```
ENEQ
/* Equipage, Not Equipped */
/* Circuit pack type with signal degrade function is missing. */
```

Starting with Release 9.1, this denial is removed. The following confirmation message will be displayed after command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.
You have selected the set-vt1 command with these parameters: */

SignalDegrade = <value> */
ServiceAffectingAIS = <value>
NonServiceAffectingAIS = <value> */

Execute? (y/n or CANCEL/DELEte to quit) =
```

In linear releases, the following confirmation message will be displayed after command entry:

```
/* Caution! Alarm or maint. thresholds are affected by this command.
You have selected the set-vt1 command with these parameters: */

SignalDegrade = <value> */

Execute? (y/n or CANCEL/DELEte to quit) =
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in MAIN, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

⇒ NOTE:

If an STS-1 address of **all** is provisioned, this command will skip silently all STS-1 channels or VTs within those STS-1 channels that are cross-connected as passthrough, drop not terminated or even not cross-connected at all.

RELATED COMMANDS

rtrv-vt1

NAME

set-x25: Set X.25 Link

INPUT FORMAT

set -x25:PKT=*pkt*;

DESCRIPTION

This command sets the packet size of the X.25 link. The packet size may be set to either 128 or 256.

**CAUTION:**

Execution of this command may affect TL1 communication and will reset the GNE X.25 link. Also, this command will cause all active TL1 logins to be automatically dropped. In addition, all established SVCs on the affected X.25 link will need to be reestablished.

This command should be used at installation time, when network activities are at their minimum level or when the X.25 link can be disabled.

**NOTE 1:**

This command is available to privileged users only, if security is enabled.

**NOTE 2:**

While this command may be executed at all network elements in the subnetwork, it will only be active at the GNE.

The input parameter is:

pkt This parameter sets the packet size. The valid values are 128 or 256 (default value).

When this command is entered, the following confirmation message will be displayed:

```
/* Caution! If this shelf is an active GNE, X.25 link/TL1
communication is affected by this command. When executed,
this command causes the GNE x.25 link to be reset, all active
TL1 logins to be dropped, and all SVCs to be cleared.
```

You have selected the set-x25 command with this parameter:

```
PKT = 128/256 */
```

Execute? (y/n or CANCEL/DELETE to quit) =

RELATED COMMANDS

rtrv-x25

NAME

switch-fn: Protection Switch Function Unit

INPUT FORMAT

switch-fn:Address:pri=Priority;

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command controls operation of function unit circuit pack protection switching when equipped with termination packs such as MXRVO, STS1E, TMUX or DS3 circuit packs. This command does not support the BBG19 circuit pack.

The input parameters for this command are:

Address Address of the function unit slot pair.

Valid Addresses: **fn-{a,b,c}**

pri Priority indicates the priority of the protection switching request and has the following values:

reset	Clear active external switch requests.
inhibit	Prevent further switches (automatic, manual, or forced) until the switch is reset.
forced	Switch to the standby slot, whether it is good or not, and prevent further switches (automatic or manual) until the switch is reset.
manual	Switch to the standby slot only if it is good.

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
You have selected the switch-fn command with these parameters:

Address = x
Priority = pri */

Execute? (y/n or CAncel/DElete to quit) =
```

If this command is executed with priority **inhibit** or **forced**, then automatic protection switching will be disabled until this command is executed again with priority **reset**.

RELATED COMMANDS

rtv-state

switch-line

NAME

switch-line: Protection Switch Line

INPUT FORMAT

switch-line:Address:pri=Priority;

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command controls the operation of OC-3 line protection switching. DDM-2000 provides unidirectional (one-way) line switching. This command affects only the selection of one of the pair of incoming OC-3 signals at the local network element. This command is primarily used for maintenance.

The input parameters are:

Address Address of the pair of OC-3 lines.

Valid linear Addresses: **main**, **fn-{a,b,c}**

Valid ring Addresses: **fn-{a,b,c}**

pri Priority indicates the priority of the protection switching request and has the following values:

reset Removes existing external switch requests

inhibit Freezes the protection switching mechanism so that the current active line remains selected regardless of the subsequent failures.

lockout Prevents selection of the protection line. If the protection line is currently selected at the near end as the active line, service will be switched to the service line unless there is an existing **inhibit** protection switching request.

forced Selects the standby line unless there is an existing **inhibit**, **lockout**, or **forced** protection switching request.

manual Selects the standby line for the active line provided the standby line is good and there are no existing protection switching requests.

On entry, the following confirmation message is displayed:

```
/* The line protection switching request is unidirectional.  
   It may be necessary to perform a switch-line at the far end  
   to switch both transmit and receive to the same line */  
  
/* Caution! Execution of this command may affect service.  
   You have selected the switch-line command with these parameters:  
  
   Address = x  
   Priority = pri */  
  
Execute? (y/n or CANCEL/DELETE to quit) =
```

If this command is executed with priority **inhibit**, **lockout**, or **forced**, then automatic protection switching will be disabled until this command is executed again with priority **reset**.

RELATED COMMANDS

rtrv-state

rtrv-state-eqpt

rtrv-state-oc3

NAME

switch-ls: Protection Switch Low Speed

INPUT FORMAT

switch-ls:Address:pri=Priority;

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command controls the operation of low-speed circuit pack protection switching.

The input parameters are:

Address The address of the low-speed slot(s). Addresses may either be a single low-speed slot (for example, **ls-a-1**) or all low-speed slots in a single group (for example, **ls-b-all**). The address **ls-all** is *not* valid for this command.

Valid Low-Speed Slot Addresses for **manual** and **forced**:

ls-{a,b,c}-{1-7} (Note: **all** not allowed)

Valid Low-Speed Service Slot Addresses for **reset** and **lockout**:

ls-{a,b,c}-{1-7,all}

Valid Low-Speed Protection Slot Addresses for **reset** and **lockout**:

ls-{a,b,c}-8 (Protection slot only)

pri Priority indicates the priority of the protection switching request and has the following values:

reset Clear active external switch requests (**lockout**, **forced**, or **manual**) and return any traffic on the protection slot to the service slot.

lockout Locks out protection switching requests (except the reset request). If the lockout is directed to the protection slot, any traffic that is currently on the protection line is unconditionally switched back to the service line and no traffic from any service line will be switched to the protection line. If the lockout is directed to a service slot, traffic on that service line that was previously switched to protection is unconditionally switched back to the service line and no further traffic can be switched from that specific service line to the protection line. The lockout request for either condition

will remain in effect until a low-speed protection switch reset is entered.

- forced** Force switch to the protection low-speed slot unless there is an outstanding lockout or forced switch request. For a forced switch, the address must be a single slot. The forced switch will remain in effect until a low-speed protection switch reset or lockout request is entered.
- manual** Manual switch to the protection low-speed slot only if the protection slot is good and not in use (service slot only). For a manual switch, the address must be a single slot. The failure or removal of a DS1 circuit pack, or a forced, lockout, or reset request will preempt a manual switch request.

If the protection switch request changes the protection switching condition to a condition lower or equal to the priority of the pre-existing protection switching condition, execution of this command will be denied with the following denial message:

```
SPSP
/* Status, Protection Switch Priority */
/* The CIT-initiated protection switch request has a lower priority
   than the existing protection switching condition. */
```

If an address of **all** is used with a priority of **manual**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Manual switch not allowed for multiple slots. */
```

If an address of **all** is used with a priority of **forced**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Forced switch not allowed for multiple slots. */
```

If a protection slot address is used with a priority of **manual**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Manual switch not allowed for protection slot. */
```

If a protection slot address is used with a priority of **forced**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Forced switch not allowed for protection slot. */
```

If the switch request would place service onto a slot currently holding a circuit pack type that is not allowed ("CP not allowed" alarm active), the request will be denied with the following denial message:

```
SPFA
/* Status, Protection unit FAiled */
```

On entry, the following confirmation message is displayed:

```
/*Caution! Execution of this command may affect service.  
You have selected the switch-ls command with these parameters:  
  
Address = x  
Priority = x */  
  
Execute? (y/n or CAncel/DElete to quit) =
```

If this command is executed with priority **lockout** or **forced**, then automatic protection switching will be disabled until this command is executed again with priority **reset**.

RELATED COMMANDS

rtv-state

rtv-state-eqpt

NAME

switch-path-sts1: Switch Path STS-1

INPUT FORMAT

switch-path-sts1:Address:pri=Priority;

DESCRIPTION

This command controls STS-1 path switching on path protected ring configurations. Path switching is always unidirectional (one-way).

The input parameters are:

Address Address is the address of the STS-1 channel currently carrying dropped or drop and continue traffic. When this command is executed, traffic will be switched away from this path to the other path on the ring. There is no default for this parameter. Connections provisioned as 0x1 ring or 0x1 DS3 cannot be switched.

Valid OC-3 Addresses:

m{1,2}-{1-3,all}

(OC-3 OLIU)

Valid OC-1 Addresses:

m{1,2}-{1-2}

(27-type OLIU in Main)

{a,b,c}{1,2}-{1-2}

(27G2-U OLIU in FN, Release 11.0 and later)

{a,b,c}{1,2}-1

(26G2-U OLIU, Release 11.1 and later)

Valid OC-12 Addresses: **m{1,2}-{1-12,all}**

(24G-U OLIU in Main)

pri Priority indicates the priority of the protection switch request. The one and only valid value is *manual*. This requests a switch from the addressed path to the standby path unless a path signal fail or path signal degrade exists on the standby path.

⇒ NOTE:

A drop and continue path is simultaneously dropped to a low-speed interface and passed through.

If the path address specified in the command is not equipped or the STS-1 channel is not drop, add/drop, or drop and continue cross-connected, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not equipped and/or cross-connected. */
```

The following message applies only if the Main unit slots of an OC-3 shelf are equipped with 24G-U OLIU circuit packs. If the path address specified in the command is an STS-1 channel that is part of an STS-3c cross-connected channel, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected. */
```

If the addressed path is associated with a connection of type

- pass-through
- 0x1 ring
- 0x1 DS3

the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path cannot be switched. */
```

⇒ NOTE:

A pass-through path passes directly from the OC-N receiver to the OC-N transmitter. The service carried with this path is not dropped at this node.

If an equal or higher priority switch already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If **-all** appears in the address and if an equal or higher priority switch already exists on some of the addressed paths, the path is part of an STS-3c cross-connected channel (only if Main unit slots are equipped with 24-type OLIUs) or if the path is VT1.5 add/drop cross-connected, the command will list these exceptions as follows:

```
/* sts1 address equal or higher priority switch exists
   sts1 address vt cross-connected signals exist
   .
   .
*/
```

If **-all** appears in the address and the path is not equipped, not cross-connected, or is a pass-through or 0x1 ring connection, or 0x1 DS3 connection, the path will be silently skipped.

Since DDM-2000 path switching is unidirectional, the user will receive the following notification message immediately before the confirmation request:

```
/* The path protection switching request is unidirectional.
   It may be necessary to perform a switch-path-sts1 at the far end
   to switch both transmit and receive to the same path. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.  
You have selected the sw-path-sts1 command with these parameters:  
  
Address=  
Priority=          */  
  
Execute? (y/n or CAnCel/DELeTe to quit) =
```

RELATED COMMANDS

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-state-eqpt

rtrv-state-path e

NAME

switch-path-vt1: Switch Path VT1.5

INPUT FORMAT

switch-path-vt1:Address:pri=Priority;

DESCRIPTION

This command controls VT1.5 path switching on path protected ring configurations. Path switching is always unidirectional (one-way).

The input parameters are:

Address Address is the address of the VT1.5 path currently carrying drop or drop and continue traffic. When this command is executed, traffic will be switched away from this path to the other path on the ring. There is no default for this parameter.

Valid Addresses:

m{1,2}-{1-3,all}-{1-7,all}-{1-4,all}
(OC-3 OLIU in Main slots)

m{1,2}-{1-2}-{1-7,all}-{1-4,all}
(27-type OLIU in Main slots)

{a,b,c}{1,2}-{1,2}-{1-7,all}-{1-4,all}
(27G2-U OLIU in FN slots, Release 11.0 and later)

{a,b,c}{1,2}-1-{1-7,all}-{1-4,all}
(26G2-U OLIU in FN slots, Release 11.1 and later)

m{1,2}-{1-12,all}-{1-7,all}-{1-4,all}
(24-type OLIU in Main slots)

Connections provisioned as **0x1 ring** or **locked** cannot be switched.

⇒ NOTE:

A drop and continue path is simultaneously dropped to a low-speed interface and passed through.

pri Priority indicates the priority of the protection switch request. The one and only valid value is:

manual This parameter requests a switch from the addressed path to the standby path unless a path signal failure or path signal degrade exists on the standby path.

If the path address specified in the command is not equipped or VT1.5 cross-connected, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not equipped and/or cross-connected. */
```

If the path address specified in the command is a pass-through path, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path cannot be switched. */
```

⇒ NOTE:

A pass-through path passes directly from the OC-N receiver to the OC-N transmitter. The service carried with this path is not dropped at this node.

If the path address specified in the command is a 0x1 ring or a locked path, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path cannot be switched. */
```

If an equal or higher priority switch already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If **-all** appears in the address and if an equal or higher priority switch already exists on some of the addressed paths, the command will list these exceptions. If **-all** appears in the address and the path is STS-1 add/drop cross-connected, it will be listed as an exception.

```
/* vt address equal or higher priority switch exists
   vt address sts cross-connected signal exists
   . . . . .
   . . . . .
   */
```

Since DDM-2000 path switching is unidirectional, the user will receive the following notification message and confirmation request:

```
/* The path protection switching request is unidirectional.
   It may be necessary to perform a switch-path-vt1 at the far end
   to switch both transmit and receive to the same path. */

/* Caution! Execution of this command may affect service.
   You have selected the sw-path-vt1 command with these parameters:

   Address=
   Priority=          */

Execute? (y/n or CANCEL/DElete to quit) =
```

RELATED COMMANDS

rtrv-state-eqpt

rtrv-state-path

NAME

switch-sync: Protection Switch Synchronization

INPUT FORMAT

switch-sync:s=SyncFunction,pri=Priority,

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command controls operation of the synchronization protection switching. This command lets the user control which synchronization reference is used and enables the user to switch a synchronization reference when needed.

The input parameters are:

- s** SyncFunction specifies the synchronization function and may be one of the following:

reference	Selects protection switching of DS1 timing references. Specify only if the system is provisioned for External DS1 timing.
mode	Selects protection switching of timing mode. Specify only if the system is provisioned for External DS1 or LineTimed.
circuitpack	Selects protection switching of timing circuit packs.
src	Selects the optical line from which shelf line-timing and/or the DS1 synchronization output will be derived. This parameter is available with OC-3 ring releases. This parameter is only applicable if SyncAutoreconfiguration is enabled using the set -sync command. The SynchronizationSources that can be switched are main-1 , main-2 , and fn-c .

- pri** Priority indicates the priority of the protection switching request. For SyncFunction values of **reference** and **circuitpack**, priority values are:

reset	Clear active protection switch requests
inhibit	Freeze the protection switching mechanism
manual	Switch from active timing reference to standby timing reference

For a SyncFunction value of **mode**, the priority (**pri**) values are:

reset	Clear any active manual switch. This will allow the system to switch back to <code>External</code> or <code>LineTimed</code> if the system is provisioned for non-revertive mode switching or if it has been manually switched to holdover mode.
manual	Switch from the provisioned timing mode, <code>External</code> or <code>LineTimed</code> , to holdover mode. The system will remain in holdover mode until the switch is reset.

For a SyncFunction value of **src**, the priority (**pri**) value is:

manual	Switch from the active SynchronizationSource to the standby source.

For Releases 8.0 and 9.0, any slot equipped with an OC-1 OLIU is not a valid synchronization source. Thus, a manual synchronization source switch will never select a slot with an OC-1 OLIU.

Starting with Release 9.1, a 27-type OLIU is a valid synchronization source when in a Main slot, but not FN-C. OC-1 line #1 is used as the synchronization source in such a case.

If no synchronization source switch can be completed due to the equippage of the alternate sources, the command will be denied with the following message:

```
EQWT
/* Equipage, Wrong Type */
/* Alternate sync sources improperly equipped */
```

If this command is executed with `Priority=inhibit` or with `SyncFunction=mode`, then automatic protection switching will be disabled until this command is executed again with the same SyncFunction and with `Priority=reset`.

If an equal or higher priority switch (for example, **pri=inhibit**) already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If the SyncFunction is **src** and the priority of **reset** or **inhibit** is entered, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Reset not allowed for source switching. */
```

or

```
IDNC
/* Input, Data Not Consistent */
/* Inhibit not allowed for source switching. */
```

If the switch request is issued for the SyncFunction value of **src** and SyncAutoreconfiguration is not enabled, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* SyncAutoreconfiguration is not enabled. */
```

The reference switching (reset, inhibit, manual) applies only to DS1 references. The command will not be executed if **reference** is entered for the synchronization function and the provisioned synchronization mode is not External.

If this command is entered and both timing slots are empty, the command will be denied and the following denial message will be displayed:

```
ENEQ
/* Equipage, Not EQuipped */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
You have selected the switch-sync command with these parameters:

SyncFunction=s
Priority=pri */

Execute? (y/n or CAnCel/DElete to quit) =
```

RELATED COMMANDS

rtrv-state-eqpt

rtrv-sync

set-sync

NAME

test-alm: Test Office Alarms

INPUT FORMAT

test - alm:[*md=Mode*][,*r=Repeat*];

DESCRIPTION

This command tests the audible and visible office alarms and associated user panel LEDs.

The specific office alarm test turns on a specific alarm for 10 seconds and turns it off for 10 seconds, after which the office alarm reverts to its normal operation.

The general office alarm test cycles through the various alarm levels (CR, MJ, MN) at 4-second intervals as shown in the following table:

General Alarm Test

Step	Time (Seconds)	ALARM LEVEL		
		CR	MJ	MN
1	0-4	<i>off</i>	<i>off</i>	<i>off</i>
2	4-8	ON	<i>off</i>	<i>off</i>
3	8-12	<i>off</i>	ON	<i>off</i>
4	12-16	<i>off</i>	<i>off</i>	ON
5	16-20	<i>off</i>	<i>off</i>	<i>off</i>

The alarm cutoff (ACO) button functions normally while this test is executing. Depressing ACO silences audible office alarms.

Input parameters are:

md Mode identifies the office alarm test to be performed. It takes the following values:

all General test of all office alarms (default)

cr Specific test of critical alarm

mj Specific test of major alarm

mn Specific test of minor alarm.

r Repeat specifies the number of times that Steps 2 through 4 should be repeated. It is an integer with a range of **1** through **10** and a default value of **1**.

This command can be aborted by pressing the "CANcel" or "DELeTe" key while the command is in progress.

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
test-alm: DENY
SSRB
/* Status, System Resource Busy */
```

NAME

test-auto: Test Auto Turnup

INPUT FORMAT

test-auto:md=*Mode*;

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command performs automatic turnup testing of the DDM-2000.

**NOTE:**

Automatic turnup tests are not currently available for ring applications. However, software for any nonring release may be used to perform local equipment and local wiring cross-connect tests. Manual automatic turnup tests can be done using the procedures listed in the TOP section (Volume 2) of this document.

The input parameter is:

md Mode specifies the type of turnup test and has the following values:

local Local test

dsx Cross-connect test

optics Optical span test

**NOTE:**

Loopbacks on the fiber will cause an "inconsistent DCC switches" alarm condition. The alarm should be ignored during the loopback testing. To avoid this alarm, the user may disable the DCC prior to performing this test.

When the **local** or **dsx** test is input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this test may interrupt service.  
You have selected the test-auto command with these parameters:  
  
Mode=mode */  
  
Execute? (y/n or CANCEL/DELETE to quit) =
```

The following denial message will be output if the **local** or **dsx** test cannot be performed due to other activity in the system:

```
SSRB  
/* Status, System Resource Busy */
```

When the **local** or **dsx** test is in progress, other commands entered at the **cit** will be denied until the test completes.

```
SSRB
/* Status, System Resource Busy */
/* Automatic <md value> turn up test active */
```


LOCAL TEST**CAUTION:**

This test will affect all existing service carried on a shelf. This test should only be executed on an out-of-service shelf.

The local test checks an out-of-service shelf to verify that the transmission and timing circuit packs are operating error-free and that the SYSC TL can communicate with the other circuit packs. Optical loopbacks must be set up manually on the OLIU circuit packs before this test is run as shown in Figure 11-13. If the shelf is equipped as an electrical high speed multiplexer, then EC-1 electrical loopbacks must be set up manually at the STSX-1 cross-connection or through the coaxial connectors provided on the shelf backplane.

**NOTE:**

Before performing this test, the user should remove the shelf from loop-timed mode. If the shelf is in loop-timed mode during this test, a ? will result, indicating the status of the test results cannot be determined.

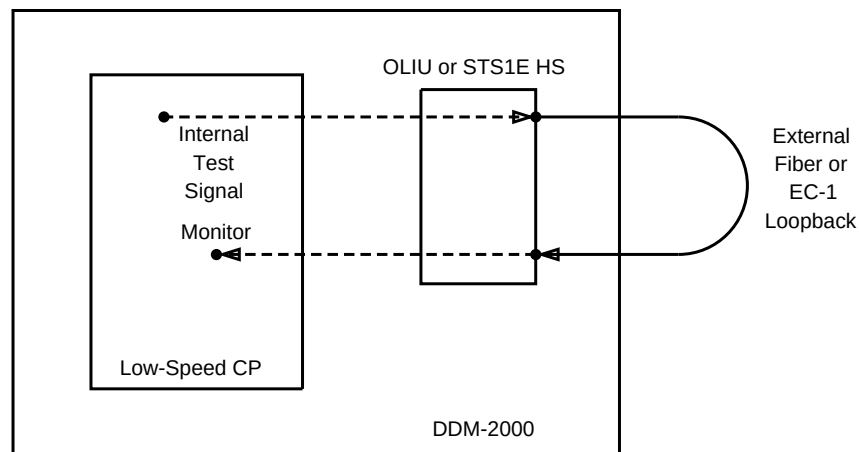


Figure 11-13. Automated Internal Test of Local Equipment (test-auto:md=local)

**NOTE:**

If this test is interrupted by removing the controller circuit pack, loopbacks automatically removed at the end of a completed test will remain in place. The test may be repeated or the loopbacks may be removed using the **rls-lpbk-t1** or **rls-lpbk-t3** command.

The local test report appears as follows:

```

/* Auto-Turnup Report  --  Local Equipment Test and Timing Ref. Check
=====
-----Timing-----      -----Main-----      -----Function Units-----
tg-1 tg-2 ref-1 ref-2    main-1 main-2    a-1 a-2 b-1 b-2 c-1 c-2
g    F    g    ?        g        g        g    g    g    F    -    -

Low Speed Group A  Low Speed Group B  Low Speed Group C  --Control--
 1 2 3 4 5 6 7 8    1 2 3 4 5 6 7 8    1 2 3 4 5 6 7 8  sysctl auxctl
- - - g g F g g    - - - - - - - - - - - - - - - - - - - - - -
*/

```

In the report, g stands for good, F stands for failed, "?" stands for unknown due to other failures, and "-" stands for not applicable (that is, slots not equipped). In addition to the output report, a circuit pack LED indicator will light if the circuit pack has failed.

CROSS-CONNECT TEST**CAUTION:**

This test will affect all existing service carried on a shelf. This test should only be executed on an out-of-service shelf.

The cross-connect test checks the low speed DS1 and DS3 interfaces to detect cross-connect wiring or internal equipment problems. If the cross-connect mode is set to manual (**crs=manual**), as set by the **set-ne** command, then manual cross-connections must be entered before this test is run. Loopbacks must also be set up at the DSX before this test is run as shown in Figure 11-14. Additionally, all DS3s under test must be provisioned for clear channel (CC) mode to avoid any alarms during the test.

**NOTE:**

Before performing this test, the user should remove the shelf from loop-timed mode. If the shelf is in loop-timed mode during this test, a ? will result, indicating the status of the test results cannot be determined.

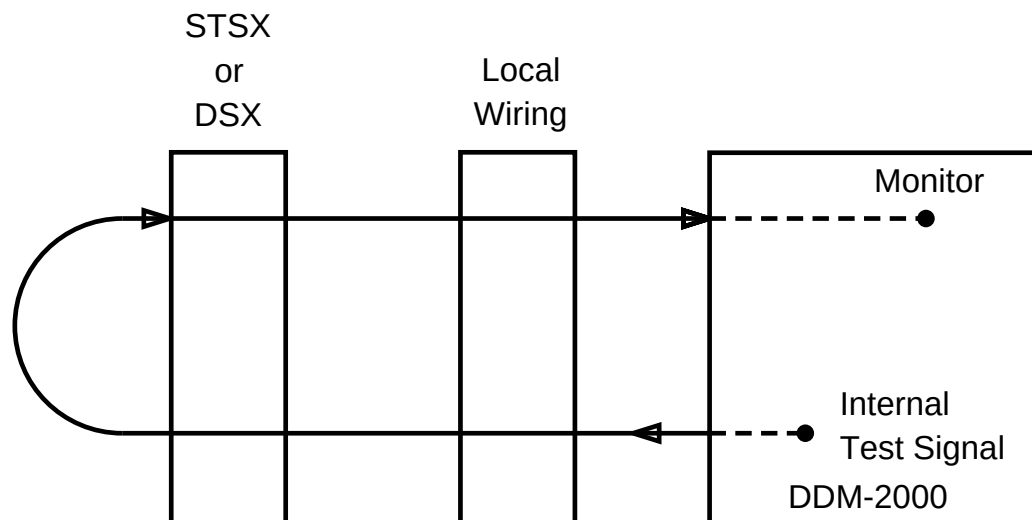


Figure 11-14. Automated Test of Local Wiring to Cross-Connect (test-auto:md=dsx)

The cross-connect test report appears as follows:

```

/* Auto-Turnup Report -- Local Wiring Cross-Connect Test
=====
--Function Units--
fn-a  fn-b  fn-c
-      F      -

      Low Speed Group A      Low Speed Group B      Low Speed Group C
port  1 2 3 4 5 6 7      1 2 3 4 5 6 7      1 2 3 4 5 6 7
1      - - - g g ? g      - - - - - -      - - - - - -
2      - - - g F ? g      - - - - - -      - - - - - -
3      - - - g g ? g      - - - - - -      - - - - - -
4      - - - g F ? g      - - - - - -      - - - - - -
*/

```

In the report, g stands for good, F stands for failed, "?" stands for unknown due to other failures, and "-" stands for not applicable (that is, slots not equipped).

In addition to the output report, a circuit pack LED indicator will flash if the port associated with a circuit pack has failed.

OPTICAL SPAN TEST

The optical span test checks the transmission across the optical interfaces. Signals are monitored at both ends of the span. Results from the far end are sent back to the near end for reporting. No manual loopbacks are required for this test. Execution of this test will not affect service. See Figure 11-15.

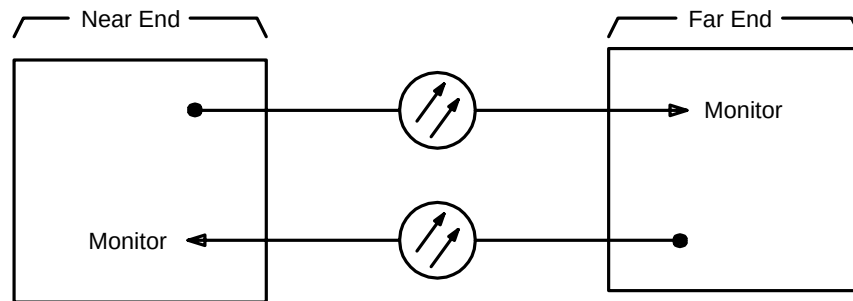


Figure 11-15. Automated Optical Span Test (test -auto:md=optics)

The output for the optical span test is as follows:

```

/* Auto-Turnup Report -- Optical Span Test
=====
EQUIPMENT  -----Main-----  -----Function Units-----
            main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g      g      g   g   g   F   -   -

TRANSMIT   -----Main-----  -----Function Units-----
            main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g      g      g   g   g   F   -   -

RECEIVE    -----Main-----  -----Function Units-----
            main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g      g      g   g   g   F   -   -

DCC         -----Main-----  -----Function Units-----
              g              a      b      c
                        g      g      -

*/

```

In the optical span test report, g stands for good, F stands for failure (EQUIPMENT, TRANSMIT, RECEIVE, or DCC), "?" stands for unknown failure due to other causes, and "—" stands for not applicable (that is, slots not equipped). In addition to the output report, a circuit pack LED indicator will light if the circuit pack has failed.

RELATED COMMANDS

rtrv-pm-line

test-trmsn-t1

test-trmsn-t3

NAME

test-led: Test LED Indicators

INPUT FORMAT

test - led:[Address]:[r=Repeat];

DESCRIPTION

This command activates circuit pack or user panel LEDs for 10 seconds on, then 10 seconds off, after which the LED reverts to normal operation. This command does not affect office alarms.

This test can also be done by pressing the alarm cutoff (ACO) button on the user panel.

The input parameters are:

Address This is the address of any slot(s) or **userpanel**, with a default value of **all**.

Valid Addresses: **all**, **main-{1,2,all}**,
fn-{a,b,c,all}-{1,2,all},
ls-{a,b,c,all}-{1-8,all}, **tg-{1,2,all}**,
sysctl, **auxctl**, **userpanel**

r Repeat specifies the number of times that the test should be repeated. It is an integer with the range **1** through **10** and a default value of **1**.

This command can be aborted by pressing the "CANcel" or "DELeTe" key while the command is in progress.

When this command is entered while an alarm test is in progress, the following denial message will be output if the test cannot be done due to other activity in the system.

```
test-led:address DENY
SSRB
/* Status, System Resources Busy */
```

NAME

test-sysctl: Test System Controllers

INPUT FORMAT

test-sysctl;

DESCRIPTION

This command causes the entire control system (system controller and overhead controller) to perform a self-test. If this command is entered while a transmission test (**test-trmsn-t1** or **test-trmsn-t3**) is in progress, the following denial message will be displayed:

```
SSRB
/* Status, System Resources Busy */
```

At the end of the test, one of the following messages will be displayed.

If the test passes, the following message will be displayed:

```
test-sysctl: COMPLD
/* Controller Diagnostic Test Report
=====
Test PASSED
*/
```


 NOTE:

In the event this command was submitted from a *MegaStar* 2000 SONET Subsystem, and if the test passes, the following message will be displayed:

```
test-sysctl: COMPLD
/* SONET Controller Diagnostic Test Report
=====
Test PASSED
*/
```

If the test fails, one of the following messages may be displayed, indicating that one or both controller circuit packs have failed:

```
test-sysctl: COMPLD
/* Controller Diagnostic Test Report
=====
SYSCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* Controller Diagnostic Test Report
=====
OHCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* Controller Diagnostic Test Report
=====
SYSCTL CP FAILED
OHCTL CP FAILED
*/
```

⇒ NOTE:

In the event this command was submitted from a *MegaStar* 2000 SONET Subsystem, and if the test fails, one of the following messages may be displayed, indicating that one or both controller circuit packs have failed:

```
test-sysctl: COMPLD
/* SONET Controller Diagnostic Test Report
=====
SYSCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* SONET Controller Diagnostic Test Report
=====
OHCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* SONET Controller Diagnostic Test Report
=====
SYSCTL CP FAILED
OHCTL CP FAILED
*/
```

In addition to a failure message, the Fault LED on the failed circuit pack(s) and the Major alarm LED on the user panel will be illuminated, and the MJ office alarm will be activated.

NAME

test-tlm-par: Test Parallel Telemetry

INPUT FORMAT

test - t l m - p a r:[*md=Mode*][,*r=Repeat*];

DESCRIPTION

This command provides for general and specific tests of the parallel telemetry outputs. The general test turns all parallel telemetry points on for 20 seconds, then off for 20 seconds, and then reverts to normal operation. The specific test performs similarly, but on only one parallel telemetry point.

The input parameters are:

md	Mode identifies the parallel telemetry output(s) to be tested. It takes the following values:
all	- General test of ALL parallel telemetry outputs (static default)
cr	- Specific test of the CRitical alarm
mj	- Specific test of the MaJor alarm
mn	- Specific test of the MiNor alarm
pmn	- Specific test of the Power MiNor alarm
aco	- Specific test of the Alarm Cutoff indicator
clf	- Specific test of the Carrier Line Failure
inc	- Specific test of the INComing status
ne	- Specific test of the Near-End indicator
fe1	- Specific test of the Far-End indicator #1
fe2	- Specific test of the Far-End indicator #2
fe3	- Specific test of the Far-End indicator #3
fe4	- Specific test of the Far-End indicator #4
fe5	- Specific test of the Far-End indicator #5
fe6	- Specific test of the Far-End indicator #6
sid	- Specific test of the Shelf IDentifier
output{1-10}	Specific test of miscellaneous discrete point number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

r Repeat specifies the number of times that the test should be repeated. It is an integer with a range of 1 through 10 and a static default value of 1.

This command can be aborted by pressing the "CANcel" or "DELeTe" key while the command is in progress.

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB  
/* Status, System Resources Busy */
```

NAME

test-tlm-ser: Test Telemetry Serial

INPUT FORMAT

test-tlm-ser:*[d=Display][,p=Point][,r=Repeat];*

DESCRIPTION

This command initiates specific and general tests of the TBOS outputs. During the test, the telemetry points addressed by the command are turned ON and all other points are turned OFF for 20 seconds. When the test completes, all points return to normal operation.

The input parameters are:

- d** Display is the particular TBOS display being used and has a provisionable value between 1 and 8. For a central office (CO) and the associated remotes, the TBOS display values may be provisioned. For a remote terminal (RT), only the current values may be used for this test.
- p** Point is the particular TBOS point(s) to be tested and has the following values:
 - 1-63**
 - even**
 - odd**
 - all** (default)
- r** Repeat is the number of times the test is to be repeated and has a range of 1-10 and a default of 1.

This command may be aborted by pressing the "CANcel" or "DElete" key while the command is in progress.

The following denial message will be displayed if the test cannot be performed due to other activity in the system:

```
SSRB  
/* Status, System Resources Busy */
```

RELATED COMMANDS

test-tlm-par

test-alm

NAME

test-trmsn-t1: Test Transmission T1

INPUT FORMAT

test-trmsn-t1:Address:[dirn=Direction][,dur=Duration];

DESCRIPTION**CAUTION:**

Execution of this command will affect service. This command causes the insertion of a test signal on the selected channel in the MUX or DEMUX direction and will affect service on the selected channel.

This command sets up an automated transmission test for a low-speed DS1 port. The test signal is a repetitive pattern which the system checks for bit errors. Only one channel is tested each time; multiple channels may not be tested simultaneously. Before this command is executed, the signal must be appropriately looped back. DDM-2000 checks for the presence of a loopback before beginning the test. If no loopback exists, the system will return a warning message before performing the test.

This command is used for installation of new equipment and for maintenance.

The input parameters are:

Address	Address of the DS1 port. Valid Addresses: {a, b, c} - {1-7} - {1-4}				
dirn	Direction of the transmission test. This parameter has the following values: <table> <tr> <td>mux</td><td>The test signal is inserted in the MUX direction (towards the optical fiber) as shown in Figure 11-16. This is the default for this parameter.</td></tr> <tr> <td>demux</td><td>The test signal is inserted in the DEMUX direction (towards the DSX) as shown in Figure 11-17.</td></tr> </table>	mux	The test signal is inserted in the MUX direction (towards the optical fiber) as shown in Figure 11-16. This is the default for this parameter.	demux	The test signal is inserted in the DEMUX direction (towards the DSX) as shown in Figure 11-17.
mux	The test signal is inserted in the MUX direction (towards the optical fiber) as shown in Figure 11-16. This is the default for this parameter.				
demux	The test signal is inserted in the DEMUX direction (towards the DSX) as shown in Figure 11-17.				
dur	Duration of the test in minutes. This value has a range of 1 through 120 with a default value of 1.				

This command can be aborted by pressing the "CANcel" or "DELeTe" key while the command is in progress.

⇒ NOTE:

Loopbacks on the fiber when testing in the MUX direction will cause an "inconsistent DCC switches" alarm condition. The alarm should be ignored during the loopback testing. To avoid this alarm, the user may disable the DCC prior to performing this test.

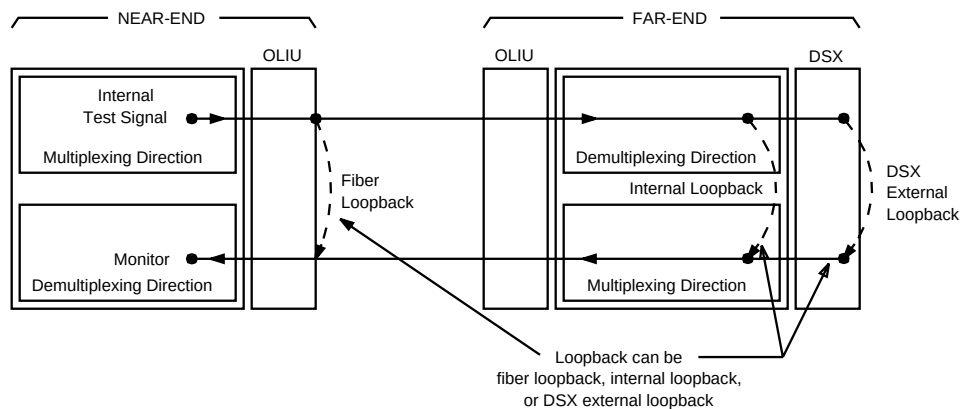


Figure 11-16. Automated Transmission Test of DS1 Signal in MUX Direction

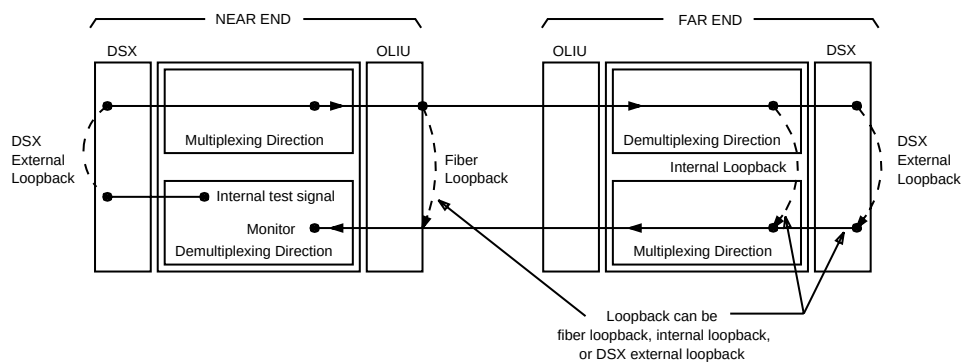


Figure 11-17. Automated Transmission Test of DS1 Signal in DEMUX Direction

This command displays the following output report:

```

/* DS1 Transmission Test Report
=====
DS1 Port = addr, Direction = dirn, Duration = dur minutes
=====
Elapsed      Errored
Time(sec)    Seconds
=====
  nnn        nnn
  .
  .
  .
  nnn        nnn
  */

```

The output parameters are:

DS1 Port	The address of the DS1 port
Direction	The direction of the transmission test
Duration	The duration of the test in minutes
Elapsed Time	Elapsed time of the test in seconds
Errored Seconds	Total number of errored seconds.

A question mark (?) as the rightmost character in the Errored Seconds indicates uncertain data because of a protection switch during the test.

If an equipment failure is detected during test, the following message is displayed:

```

/* Hardware failed - Test Aborted */

```

The system checks for presence of a loopback at the beginning of the test. If a loopback does not exist, the test continues and the following message appears before and after the report:

```

/* Preliminary hardware test indicates no loopback. */

```

If the test is interrupted or aborted, the following message is displayed:

```
/* Test Manually Aborted */
```

The following denial message will be displayed if the test cannot be performed due to other activity in the system:

```
SSRB  
/* Status, System Resources Busy */
```

When this command is entered, the following confirmation message is displayed:

```
/* Establish appropriate loopbacks (manual or electronic)  
prior to test execution, if appropriate. */  
  
/* Caution! Execution of this test may interrupt service.  
You have selected the test-trmsn-t1 command with these parameters:  
  
Address = x  
Direction = dirn  
Duration = dur */  
  
Execute? (y/n or CANCEL/DElete to quit) =
```

RELATED COMMANDS

opr-lpbk-t1

rls-lpbk-t1

NAME

test-trmsn-t3: Test Transmission T3

INPUT FORMAT

test-trmsn-t3:Address:[dirn=Direction][,dur=Duration];

DESCRIPTION**CAUTION:**

Execution of this command will affect service. This command causes the insertion of a test signal on the selected channel in the MUX or DEMUX direction and will affect service on the selected channel.

**NOTE:**

For the TMUX (BBG20) circuit pack in DDM-2000 OC-3 Release 11.1, only the DEMUX direction of this command will be applicable.

This command sets up an automated transmission test for a low-speed DS3 port. The direction of the test can be towards either the MUX (towards the optical fiber) or the DEMUX (towards the DSX) transmission directions. The test signal is a framed DS-3 signal which DDM-2000 checks for P-bit parity errors. Only one channel is tested each time; multiple channels may not be tested simultaneously. Before this command is executed, the signal must be appropriately looped back.

This command is used for installation of new equipment and for maintenance. In either case, the signal must be appropriately looped back.

If the test is run in the MUX direction and an external loopback is established at the far end, then the far end must be provisioned for clear channel (CC) mode with no AIS in order to test the entire transmission path. If an external loopback is used and the far end is provisioned for VMR Mode, only errors in the receive direction will be monitored.

If the test is run using a DS3 internal loopback, DDM-2000 automatically puts the path in clear channel mode while the loopback is active. When the loopback is released, the mode returns to its previous state.

DDM-2000 checks for the presence of a loopback before beginning the test. If no loopback exists, the system will return a warning message before performing the test.

For TMUX circuit packs in OC-3 R11.1 and later, a DS3 AIS signal will be transmitted in the DEMUX direction (towards DSX-3), and the received signal will be checked for P-bit parity errors.

⇒ NOTE 1:

Loopbacks on the fiber when testing in the MUX direction will cause an "inconsistent DCC switches" alarm condition. The alarm should be ignored during the loopback testing. To avoid this alarm, the user may disable the DCC prior to performing this test.

⇒ NOTE 2:

When the addressed port is on a BBG19 DS3 circuit pack, the cross-connection between the port and the OC-N ring is a 0x1 DS3 connection. This means that for a test in the MUX direction, the test signal is transmitted only on the outgoing fiber connected to one of the main OLIUs. Only the signal received via the same OLIU is monitored for errors. It is the user's responsibility to ensure that the far-end loopback causes the signal to return on the proper fiber interface.

The input parameters are:

Address Address of the DS3 port.

Valid DS3 Port Addresses (BBG4, BBG4B, BBG20 TMUX):
{a, b, c}

Valid DS3 Port Addresses (BBG19): **{a, b, c} - {1-2}**

dirn Direction of the transmission test. This parameter has the following values:

mux The test signal is inserted in the MUX direction and the received signal is monitored from the MUX direction (default) as shown in Figure 11-18.

demux The test signal is inserted in the DEMUX direction and the received signal is monitored from the DEMUX direction as shown in Figure 11-19. Additionally, Figure 11-20 shows a TMUX signal inserted in the DEMUX direction.

dur Duration of the test in minutes. This value has a range of 1 through 120 with a default value of 1.

This command can be aborted by pressing the "CANcel" or "DELeTe" key while the command is in progress.

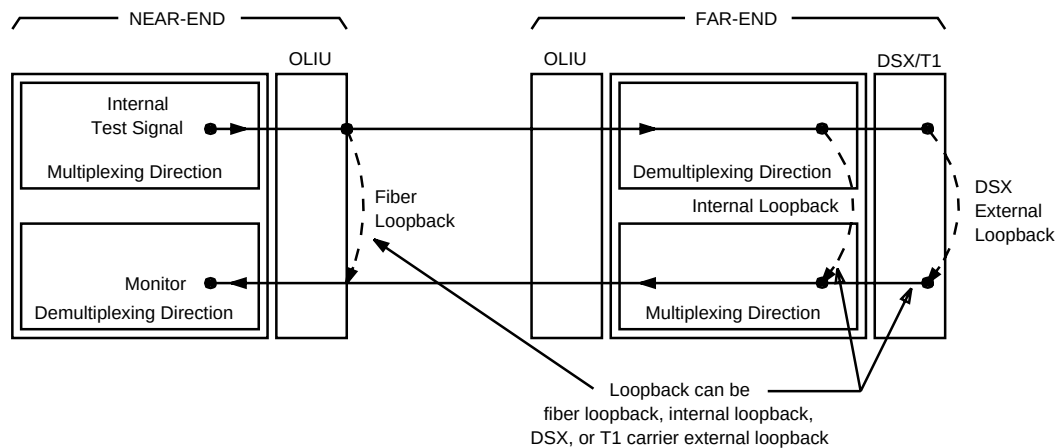


Figure 11-18. Automated Transmission Test of DS3 Signal in MUX Direction

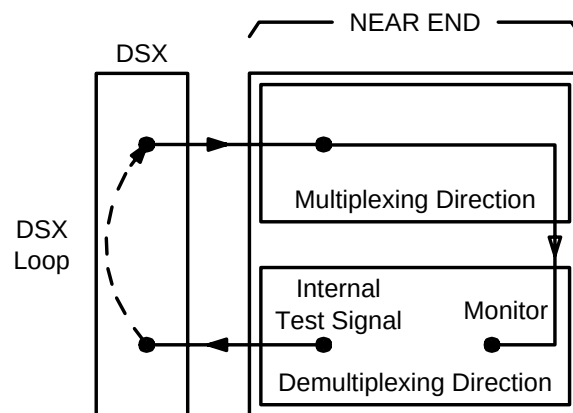


Figure 11-19. Automated Transmission Test of DS3 Signal in DEMUX Direction

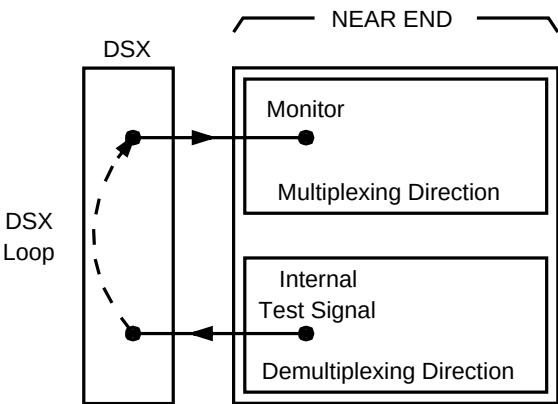


Figure 11-20. Automated Transmission Test of TMUX Signal in DEMUX Direction

This command displays the following output report:

```
/* DS3 Transmission Test Report
=====
DS3 Port = addr, Direction = dirn, Duration = dur minutes
=====
Elapsed      Errored
Time(sec)    Seconds
=====
  n          n    Out Of Frame
  .
  .
  .
  */
```

The output parameters are:

DS3 Port	The address of the DS3 port
Direction	The direction of the transmission test
Duration	The duration of the test in minutes
Elapsed Time	Elapsed time of the test in seconds
Errored Seconds	Total number of errored seconds.

A question mark (?) as the rightmost character in the Errored Seconds column indicates uncertain data because of a protection switch during the test.

The message "Out Of Frame" appears in the report if an out-of-frame condition is detected during the test.

If an equipment failure is detected during the test, the following message is displayed:

```
/* Hardware Failed - Test Aborted */
```

The system checks for the presence of a loopback at the beginning of the test. If a loopback does not exist, the test continues and the following message appears before and after the report:

```
/* Preliminary hardware test indicates no loopback. */
```

If the test is interrupted or aborted, the following message is displayed:

```
/* Test Manually Aborted */
```


The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

When this command is entered, the following confirmation message is displayed:

```
/* Establish appropriate loopbacks (manual or electronic)
prior to test execution, if appropriate. */

/* Caution! Execution of this test may interrupt service.
You have selected the test-trmsn-t3 command with these parameters:

Address = x
Direction = dirn
Duration = dur */
Execute? (y/n or CANCEL/DElete to quit) =
```

RELATED COMMANDS

opr-lpbk-t3

rls-lpbk-t3

rtrv-pm-t3

NAME

toggle: Toggle Between Local and Remote Sessions

INPUT FORMAT

^t (Press "t" while holding the **CTRL** key)

DESCRIPTION

This command toggles the user between the local and remote sessions. It provides a quick and easy way to switch from the local session to the remote session, while not terminating either one. The user must have established two valid sessions with network elements (NEs) in the local NE's subnetwork before this command executes successfully.

This command may be entered *only* between command executions; that is, *only* at the system prompt. If entered as a response to a parameter prompt, an error message will be displayed.

This command does not display a typical completion message. When entered, the TID for the NE switched to is displayed, followed by the date and time. This line is followed by a prompt from that system.

The following denial message will be output if the toggle cannot be performed.

```
SNVS
/* Status, Not in Valid State */
/* No remote login is active */
```

If the toggle request fails due to a far-end communication failure (after trying for 45 seconds or more), the following denial message will be displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Far end Communication failure */
```

RELATED COMMANDS

logout

rlgn

NAME

upd: Update Equipment List

INPUT FORMAT

upd;

DESCRIPTION**CAUTION:**

Execution of this command may affect service.

This command updates the system data base (as recorded in the nonvolatile memory) to reflect the existing hardware configuration and incoming signals.

This command can be executed either by pushing the Update/Initialize button, located on the SYSCTL circuit pack or by entering the command from the CIT. When the Update/Initialize button is pushed, a dot (.) will appear on the 7-segment display.

**NOTE 1:**

An **upd** may be performed at any time *except* before or during the 10-second window after powering up the System Controller (SYSCTL) while the critical (CR) LED is flashing.

**NOTE 2:**

The user should note that the critical LED light on the SYSCTL circuit pack will continue to flash after pressing the Update/Initialize button for a system reset. Do *not* reenter this command. The LED light will stop flashing after 10 seconds.

This command should be executed after the following:

- Removing a circuit pack — Activating the **upd** command following circuit pack removal deletes the circuit pack from the equipment list and clears the associated alarm. This command also changes the slot state to *auto*. Failure to update after removing a circuit pack will continue the "CP removed" alarm, which will become an "unexpected CP type", or similar alarm when a new and different type of circuit pack is placed in the slot. Performing the update at this later time will clear this alarm and provide default provisioning for the new circuit pack, provided the circuit pack is acceptable.
- Removing a signal input — When an incoming DS1, DS1, or EC1 signal is removed, the system data base must be updated to reflect the change and clear the associated alarm.

- Removing an STS1 or VT1.5 AIS alarm for incoming channels.
- Changing a switch setting on a circuit pack — The **upd** command should be activated following switch setting changes on the BBF1/BBF1B DS1, BBF3 DS1PM, BBG6 STS1E, 21G OLIU, or BBF2/BBF2B TGS circuit packs. This command enters the new settings into the system. Failure to update will cause an "unexpected CP switches" or "unexpected CP type" alarm, since the new switch settings do not agree with the switch settings already recorded in the system. Activating the update function will clear this alarm and make the new switch settings effective.
- Replacing Circuit Pack types — The user can "upgrade" from one type of circuit pack to another type in the following cases.

Automatic Upgrades — no alarms occur and there is no need to update:

1. For low-speed slots — from any BBF1/BBF1B to any other BBF1B/BBF1 type DS1 pack
2. For 1+1 slot pairs — from older 26-type to enhanced 26-type OLIU packs.
3. For low-speed slots — from any BBG4/BBG4B to any other BBG4B/BBG4 type DS3 pack
4. For 1+1 slot pairs — from any 21-type OLIU to any other 21-type OLIU pack
5. For 1+1 slot pairs — from older 22-type to enhanced 22-type OLIU packs.
6. For 1+1 slot pairs — from older 27-type to enhanced 27-type OLIU packs.
7. For timing slots — from BBF2 to BBF2B type TGS packs.

Manual Upgrades — "unexpected CP type" alarm will occur, and an update must be done:

1. For low-speed slots — from BBF1/BBF1B to BBF3 type DS1 packs
2. For low-speed slots — from BBF3 to BBF1/BBF1B type DS1 packs
3. For 1+1 slot pairs — from 21-type to 22-type OLIU packs.
4. For 1+1 slot pairs — from 22-type to 21-type OLIU packs.
5. For 1+1 slot pairs — from 22-type to 24-type OLIU packs.
6. For 1x1 slot pairs — from BBG2 MXRVO to BBG6 STS1E (high speed) packs.
7. For low-speed slots (b & c) — from BBG6 STS1E to 22-type OLIU packs for ring applications.

Manual Upgrades — "unexpected CP switches" alarm will occur and an update must be done:

1. For timing slots — between BBF2B and BBF2 TGS packs.

Following the documented upgrade procedures (slot 1 of 1x1 or 1+1 pairs), the old type circuit pack is removed and replaced with the new type circuit pack. Activating the update function will clear the alarm for new pack type and make the new circuit pack settings active.

Note: Upgrading from a 1x1 STS1E to an OC-3/IS-3 will force the application to 1+1.

ALARM RESTRICTIONS

Pressing the UPD button or issuing the **update** command will *not* change provisioning if the following alarms exist. The user will have to correct the alarmed condition before executing this command. These alarms are:

- illegal CP type
- CP not allowed *-(reason)*
- 2nd CP required for BBF3
- invalid CP switches.

SYSTEM RESTRICTIONS AND CORRECTIVE ACTIONS

Pressing the UPD button or issuing the **update** command will not retire a "CP removed", "unexpected CP type", or "unexpected CP switches" alarm or allow the system to accept the new provisioning request if certain system conditions exist. The user will have to correct the condition before updating the system.

If a restriction is detected, the following message will be displayed:

```
/* Address not equipped properly -- provisioning unchanged. */
```

The system restriction and corrective actions needed are:

■ **Port status in NMON or IN SERVICE**

If a low-speed circuit pack is removed before the incoming signal is removed or while the associated port or ports are in the *nmon* state, the system will not recognize that the service is no longer being carried on the port and will not remove the circuit pack from the equipment list. Note that this restriction does not apply to OLIU circuit packs in systems that support OC-N line states.

Corrective Action: If the port is in the *nmon* state, it must be moved to the *auto* state, using the **set-state-t1**, **set-state-t3**, or **set-state-ec1**, command, before the circuit pack can be removed and the system can be updated. If an incoming signal is present, it must first be removed, then the circuit pack can be removed, and the system can be updated.

■ **Manual cross-connection exists**

A manual cross-connection is entered into the system when an arrangement other than the default is desired and to support various applications.

Corrective Action: The system will not recognize a circuit pack removal until the manual cross-connection to the addressed circuit pack is deleted. (See the **dlt-crs-sts1**, **dlt-crs-vt1**, **rtrv-crs-vt1**, and **rtrv-crs-sts1** commands for more information on manual cross-connections.)

For 1+1 or 1x1 slot pairs, one circuit pack of the pair can be removed as long as the other remains to support the cross-connection. For rings systems, the Main circuit packs are special and all cross-connections in the system must be deleted before the addressed circuit pack can be removed.

For function units to which a 0x1 path is connected, one circuit pack of the pair can be removed as long as the other remains to support the cross-connection.

For 27-type OLIU function units to which a locked path is connected, the pack of the pair to which the connection is addressed cannot be removed until the manual cross-connection to the addressed pack is deleted.

- **Low-speed protection circuit pack in service**
The low-speed protection slot is currently supporting service.
Corrective Action: Before the protection pack can be removed and the protection slot moved to the *auto* state, the service must be moved back to the service pack.
- **Upgrades from Slot 2**
Upgrades from Slot 2 of a 1x1 or 1+1 pair are not permitted when Slot 1 is equipped.
Corrective Action: The documented upgrade procedures to change one type of circuit pack for another require that the change first be made in slot 1 of a slot pair when slot 1 is equipped.
- **TGS switches do not support timing source selected**
The shelf is currently provisioned to be line-timed and the new TGS pack type or switch settings do not support the existing condition.
Corrective Action: Reset the switches on the TGS circuit pack, or replace the circuit pack with one that supports timing from FN-C; or change Linetiming source to Main. Prior to Release 9.1, the system may be line-timed only from an 21- or 22-type OLIU in the Main or FN-C slots; the 27-type OLIU does not support line timing. Starting with Release 9.1, line-timing from 27-type OLIUs is available.
- **Timing Source removed**
When the sync timing source is provisioned to be LineTimed and the addressed circuit pack is selected for timing, the slot state will not change to *auto*.
Corrective Action: Insert an OLIU circuit pack that supports the timing selected or change the timing source.
- **Sync Autoreconfiguration Selected**
When the sync timing is provisioned for Autoreconfiguration and the addressed circuit pack is one of the sources for timing, the slot state will not change to *auto*.
Corrective Action: Insert an OLIU circuit pack that supports the timing selected or change the timing provisioning.
- **Change Time setting from Line to External**
If a system's sync timing source switch from Line to External timing is attempted by changing the switches on the TGS pack to an External timing setting while leaving the sync timing in Autoreconfiguration mode *enabled*, the attempt to switch from Line to External Timing will fail.
Corrective Action: In order to switch from Line to External timing, the user MUST ensure that in addition to setting the switches on the TGS pack to External timing, the Sync Autoreconfiguration parameter is set to *disabled*.

If a protection switch request of **forced**, **inhibit**, or **lockout** is specified to a slot that is now empty, entering the **upd** command may cause the protection switch to occur possibly affecting service. When this occurs, the following confirmation message will be displayed:

```
/* Caution! Execution of the update command may interrupt
service because of an active protection switch request on
an empty slot. It also updates the equipment list and
initializes ALL parameters associated with empty slots. */
```

```
Execute? (y/n or CANCEL/DELeTe to quit) =
```

RELATED COMMANDS

dlt-crs-sts1

dlt-crs-vt1

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-state-eqpt

rtrv-state-path

set-state-t1

set-state-t3

set-state-ec1

set-state-oc1

Detailed Alarm and History Reports

This section provides details of the Retrieve Alarm and Retrieve History commands with explanations of specific output messages.

Each command includes an **INPUT FORMAT** part, providing the syntax for the command, and a **DESCRIPTION** part, providing the details of the command input and output parameters. Following the **DESCRIPTION** part is a table listing the output messages associated with each command and a description of each message.

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

rtrv-alm[:alm=AlarmLevel];

DESCRIPTION

This command displays a report of active alarm and status conditions of the local network element. The report includes the source address of the alarm, as well as the date and time of the alarm, whether or not the condition is service affecting, and a short description of the condition.

The input parameter is:

alm AlarmLevel for which a report is desired. This parameter may have one of the following values:

all

cr

mj

mn

pmn

other

Alarms are listed from greatest to least severity. Within a severity level, newer alarms are listed first.

Example Alarm Report:

```
/* Active Alarms and Status Report
=====
Alarm      Source   Date   Time   Srv   Description
Level      Address   Detected
=====
Condition  address  MM-DD HH:MM:SS  srv  description
.
.
.
Condition  address  MM-DD HH:MM:SS  srv  description
*/
```

The output parameters are:

Alarm Level Alarm level is the alarm or status condition being reported. A status condition is named status if there is no user panel LED illuminated for that condition. An alarm condition is the name of the topmost LED on the user panel that is illuminated and may be one of the following conditions:

CRITICAL

MAJOR

MINOR

PWR MINOR

abnormal (status LED)

ne-acty (status LED)

status (no LED)

Source Address Source address is the address of the event. An event source may be a slot, channel, or port interface or an operations interface. See Table 11-1 at the beginning of this chapter for the address of slots, ports, channels, and operations interfaces, respectively.

Date Detected	Month (MM) and day (DD) of the event.
Time Detected	Time (Hours, Minute, Seconds) of event occurrence.
Srv	Srv indicates whether the condition is service affecting or not, and may have the following values:
	SA Service affecting
	NSA Not service affecting
	- Not applicable for this condition (not service affecting).
Description	Table 11-3 lists the meanings and likely causes of the conditions reported in the alarm and status report. For conditions with more than one possible cause, the most likely causes are listed first.

RELATED COMMANDS

rtrv-hsty

Table 11-3. RTRV-ALM Descriptions

Description	Meaning
2nd CP required for BBF3	The BBF3 (DS1PM) circuit pack requires both function unit slots in the group to be equipped. A second circuit pack of the same type should be inserted in the empty function unit slot.
2nd CP reqd for ls eqpt	The BBF6 (T1EXT) circuit pack requires both function unit slots in the group to be equipped. A second circuit pack of the same type should be inserted in the empty function unit slot.
-48V power/fuse failed	A -48 volt power feeder or a fuse on the user panel has failed.
-48V power/fuse FA FB failed	A -48 volt power feeder or a fuse on the user panel has failed. (FA or FB identifies failure if BBG8 controller used.)
AC power failed	The AC power supply to a remote terminal cabinet has failed.
ACO active	The parallel telemetry outputs and audible office alarms normally active due to the alarm conditions in the system are being suppressed. See the opr -aco command.
AGNE communication failure	A network element cannot establish communication with the alarm gateway network element (AGNE), or the AGNE cannot establish communication with a network element in the same alarm group. Use the rtrv-map-network command to determine if both network elements are in the same alarm group.
APS - automatic lock	The service associated with a DS1 CP has been automatically switched and locked onto the protection DS1 CP. The automatic protection switching (APS) lock will remain active until midnight. Cause: Four automatic switches of a single DS1 CP in 10 minutes, probably because of an intermittent failure of the DS1 CP.
APS channel failed	The SONET automatic protection switching (APS) channel on the protection OC-3 line has failed. Likely causes: Failure of the OLIU CP on the protection line at the far end; failure of the OLIU CP on the protection line at the near end.
auto turnup test IP	An automatic turnup test is in progress.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
BBF5 required in LS-4	A BBF5 circuit pack is missing from a group 3 (or earlier) shelf with two 27G2-U OLIU circuit packs in a function unit. The BBF5 is required to cross-couple transmission between the 27G2-U OLIUs. The alarm will clear when a BBF5 circuit pack is installed in slot 4 of the low-speed unit.
BBF5 required in LS-8	A BBF5 circuit pack is missing from a group 3 (or earlier) shelf with two 27-type OLIU circuit packs in a function unit. The BBF5 is required to allow proper DCC operation of the associated 27-type OLIUs with the DDM-2000 FiberReach shelves. The alarm will clear when a BBF5 circuit pack is installed in slot 8 of the low-speed unit.
communication failure	The system is not communicating with another shelf in the subnetwork. The rtrv-map-network command will report the name of the system(s) with which this system is not communicating. Likely cause: An unprotected OC-n line failure in the subnetwork; a controller failure, reset, or initialization on another shelf; section DCC channel failure on this or another shelf; failure of the OHCTL CP.
controln	The specified environmental control point (miscellaneous discrete output) is active. Note: The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the rtrv-attr-cont and set-attr-cont commands. Cause: The system was instructed to close the environmental control point by either a TBOS control point or by the closing of the corresponding environmental control input at the far end.
CP not allowed-(crs)	The circuit pack does not support the manual cross-connection(s) currently provisioned for this slot. The user should change the circuit pack type or change the cross-connection(s) to the slot.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
CP not allowed-(eqpt)	A DS1, DS1PM, or T1EXT CP is installed in a low-speed slot associated with a function unit currently provisioned for DS3, STS1E_L, or OLIU service. The DS1 or DS1PM or T1EXT CP should be removed from the shelf, or the function unit CP should be replaced with a MXRVO or STS1E_H CP. A second reason for getting this message is that a DS1 or DS1PM CP is installed in a low-speed slot and has caused a protection mismatch between a service slot and a protection slot.
CP not allowed-(timing)	When associated with a TG slot, the current circuit pack switch settings do not support the synchronization timing provisioned. The user should change the circuit pack switches or change the settable synchronization parameters. When associated with function unit slot C, the circuit pack type does not support the current provisioned synchronization parameters. The circuit pack type or the timing options should be changed.
CP removed	A CP previously installed in this system is removed. The CP should be replaced, or an "update" should be done to remove it from the system equipment list.
DS1 CP failed	Internal equipment failure of the specified DS1 CP.
DS1 loopback	A loopback (toward the optical fiber) is active on the specified T1 port. See the opr-lpbk-t1 and rls-lpbk-t1 commands.
DS1 loopback (to fiber)	A loopback (toward the optical fiber) is active on the specified T1 port. See the opr-lpbk-t1 and rls-lpbk-t1 commands.
DS1 loopback (to DSX)	A loopback (toward the DSX) is active on the specified T1 port. See the opr-lpbk-t1 and rls-lpbk-t1 commands.
DS1 trmsn test IP	A transmission test using the internal test signal generator and monitor is in progress on the specified T1 port. See the test-trmsn-t1 command.
DS1PM CP failed	Internal equipment failure of the specified DS1PM CP.
DS3 CP failed	Internal equipment failure of the specified DS3 CP.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
DS3 loopback	A loopback (toward the optical fiber) is active on the specified T3 port. See the opr-lpbk-t3 and rls-lpbk-t3 commands.
DS3 loopback (to Fiber)	A loopback (toward the optical fiber) is active on the specified T3 port. See the opr-lpbk-t3 and rls-lpbk-t3 commands.
DS3 loopback (to DSX)	A loopback (toward the DSX) is active on the specified T3 port. See the opr-lpbk-t3 and rls-lpbk-t3 commands.
DS3 trmsn test IP	A transmission test using the internal test signal generator and monitor is in progress on the specified T3 port. See the test-trmsn-t3 command.
DSNE not reachable	This alarm condition can be caused by the following cases: 1. When a non-DSNE starts up and it does not identify or get registered by a DSNE within a time interval, it will raise this alarm condition. 2. Any node (NE) registered with the DSNE will raise this alarm condition if it can no longer reach the DSNE because of a change in provisioning by the set-ne command to dsne=no. See the set-ne and rtrv-ne commands for DSNE provisioning information. 3. Any network element registered with the DSNE will raise this alarm condition if it can no longer reach the DSNE because of a DCC failure between local Network Element and the DSNE. Other likely causes: OC-N line failure in the subnetwork, a controller failure, reset, or initialization of the DSNE.
duplicate DSNE	A network element has been provisioned as a directory services network element (DSNE) in a subnetwork that already has a DSNE. Only one NE in the subnetwork may be provisioned as the DSNE to ensure proper DCC communication between nodes. See the set-ne and rtrv-ne commands for DSNE provisioning information.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
duplicate site/ne address	Two or more shelves in the alarm group have the same site address and the same network element address.
duplicate TBOS display	Two or more shelves in the alarm group have the same TBOS display number.
duplicate TID	Two or more shelves in the network have the same system name or "TID" set by the set -ne command.
EC1 loopback	A loopback (toward the optical fiber) is active on the specified EC1 port. See the opr - lpbk-ec1 and rls - lpbk-ec1 commands for more information.
EC1 loopback (to Fiber)	A loopback (toward the optical fiber) is active on the specified EC1 port. See the opr - lpbk-ec1 and rls - lpbk-ec1 commands for more information.
EC1 loopback (to DSX)	A loopback (toward the DSX) is active on the specified EC1 port. See the opr - lpbk-ec1 and rls - lpbk-ec1 commands for more information.
environmentn	The specified environmental alarm point (miscellaneous discrete input) is active. The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the rtrv-attr-env and set-attr-env commands.
excessive holdover	The system has been in holdover mode for more than 4 hours. This may cause degraded performance (high error rates) on the transmitted and/or received signals. Whenever this condition exists, the condition "holdover mode active" also exists. Likely Causes: See "holdover mode active."
externalMinor	The external minor alarm input (environmental alarm input 15) is active. Typically, this input will be connected to the power shelf and will indicate that the DC power or the cooling fan in a remote terminal cabinet has failed. The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the rtrv-attr-env and set-attr-env commands.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
fan control relay failed	The thermostat on the SYSCTL indicates that the cooling fan should be turned on, and the fan control relay on the SYSCTL CP failed to operate or the fan control relay output (backplane connector P62) does not connect to a fan. The system will continue to operate but might overheat if the SYSCTL controls a fan, leading to degraded or interrupted transmission and/or circuit pack failures. Likely causes: Telemetry output common pin on P62 is not grounded; SYSCTL CP failure.
fan shelf failed	The system has detected a failure of the DDM-2000 fan shelf. The system will continue to operate but it may overheat. The fan must be replaced within <i>4 hours</i> of the failure; otherwise service might be interrupted and/or circuit packs might fail. Likely causes: Filter needs replacing, a fan pack failed, fan shelf has lost one or both power feeders, or the fan shelf control board has failed.
forced switch	When associated with a line, this message means that the identified line is not selected as the active receiving line, and an automatic or manual protection switch to make this the active receiving line will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. Note that switching is unidirectional (one-way). Because of this, the specified line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. See the switch-line command. When associated with a function unit slot or a low-speed service slot, this message means that the identified equipment is not active, and an automatic or manual switch to make it active will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. See the switch-fn and switch-ls commands.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
holdover mode active	The system is in holdover synchronization mode. Likely causes: - The system was manually switched to holdover mode (with the switch-sync command, or, in a central office system, with a TBOS control point) and the switch has not been reset - The system automatically switched to holdover mode due to failure of the timing references, as follows: - The reference failures have not cleared. - The system is provisioned for nonrevertive synchronization mode switching. - The system is provisioned for External timing and no external timing references are available. - The system is provisioned for line-timed operation and the optical line or OLIU circuit pack has failed, or a message indicating an upstream clock problem has been received on the sync message bits of the optical line. (See the rtrv-sync command.) - The system is provisioned for sync message signaling, but the upstream system from which it line-times has not been provisioned for sync message signaling. The condition can be cleared by provisioning both systems the same. (See the set-sync and rtrv-sync commands.) The condition can be cleared by repairing at least one of the timing references (if both are failed) and resetting synchronization mode protection switch with the command switch-sync:s=mode,pri=reset. In a central office system, the synchronization mode can also be reset with a TBOS control point.
illegal CP type	An illegal or unknown circuit pack type has been inserted into the shelf. The circuit pack should be removed from the shelf.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. (from DSX) DS1 LOS	At least 128 consecutive zeros are received in the DS1 signal incoming from the DSX-1, or the energy at the DS1 input is below a preset threshold. Likely causes: Hard failure of upstream equipment or facility (towards the DSX-1). The DS1 input is disconnected at the backplane or the DSX-1; equipment is failed or removed at DSX-1.
inc. (from DSX) DS1 sig fail	The bit error ratio (BER) in the DS1 signal incoming from the DSX-1 exceeds the provisioned failure threshold, 10^{-3} , 10^{-6} , 10^{-7} , or 10^{-8} . Likely causes: Mismatch of line code (AMI/B8ZS); failure of upstream equipment or facility (towards the DSX-1); cross talk in office wiring; failure of the DS1 CP.
inc. DS1 sync. ref. AIS	DS1 alarm indication signal (AIS) is being received from the DS1 synchronization reference signal. Likely causes: Failure of upstream equipment or facility (towards the DSX-1).
inc. DS1 sync. ref. BER	The bit error ratio (BER) in the DS1 synchronization reference signal exceeds 10^{-3} . Likely causes: Failure of upstream equipment or facility (towards the DSX-1).
inc. DS1 sync. ref. E00F	Excessive out-of-frame (OOF) events were detected in the DS1 synchronization reference signal. Excessive OOF is defined as more than 512 out-of-frame events in one day. Likely cause: Failure of the incoming DS1 synchronization reference signal.
inc. DS1 sync. ref. LOF	The system is unable to frame on the DS1 synchronization reference signal. Likely causes: Upstream failure in the clock providing the reference signal; high bit error ratio on the received signal, caused by failure of the office timing supply that provides the DS1 timing reference; the system is provisioned for SF format on the specified DS1 synchronization reference signal and the received DS1 signal is in ESF format.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. DS1 sync. ref. LOS	At least 128 consecutive zeros were received in the DS1 synchronization reference signal, or the energy at the DS1 input is below a preset threshold. Likely causes: Failure of the office timing supply that provides the DS1 timing reference or failure of the connection to the timing supply.
inc. DS1 sync. ref. OOL	The incoming DS1 synchronization reference signal is out of lock (OOL). The frequency of the clock providing the DS1 reference signal is out of specification. Likely causes: Failure of the office timing supply that provides the DS1 timing reference.
inc. (from fiber) DS3 AIS	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. Likely causes: The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end.
inc. (from DSX) DS3 AIS	The system has detected DS3 alarm indication signal (AIS) in the MUX direction (that is, coming from the DSX-3) for the specified DS3 signal. Likely cause: The incoming DS3 signal at the far end is failed.
inc DS3 LOS	At least 128 consecutive zeros were detected in the DS3 signal received from the DSX-3. Likely causes: Equipment failed or removed at DSX-3; DS3 input disconnected at the DSX-3 or at the DDM-2000 backplane.
inc. (from fiber) DS3 OOF	The system has detected a DS3 out-of-frame (OOF) condition in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. This condition is reported only if the DS3 interface is provisioned in VM or VMR mode. See the set-t3 and rtrv-t3 commands. Likely causes: An out-of-frame DS3 signal incoming to the DSX-3 at the far end; failure of the DS3 CP at the far end or near end; the DS3 signal is looped at both ends.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. (from DSX) DS3 OOF	The system has detected a DS3 out-of-frame (OOF) condition in the MUX direction (that is, coming from the DSX-3) for the specified DS3 signal. Likely cause: An out-of-frame DS3 signal incoming to the DSX-3 at the far end.
inc. (from DSX) DS3 sig. fail	The bit error ratio (BER) in the incoming DS3 signal exceeds the provisioned failure threshold, 10^{-3} or 10^{-6} . Likely causes: Failure of the upstream equipment or facility (towards the DSX-3); cross talk in office wiring; unprotected failure of DS3 CP.
inc. EC1 FERF	The system has detected the EC-1 far-end receive failure (FERF) signal in the incoming EC-1 signal. Likely causes: The far end has detected an incoming signal failure on the specified EC-1 line. This may be caused by failure of the STS1E or 3STS1E CP at the near end, the STS1E or 3STS1E CP at the far end, or the transmit cable on the specified line.
inc. EC1 LOF	The system has detected a loss-of-frame (LOF) condition in an incoming EC-1 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the STS1E or 3STS1E or equivalent CP at the far end, failure of the STS1E or 3STS1E or equivalent CP at the near end, failure of the incoming cable, or a cable disconnect at the STSX-1 or shelf connector.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. EC1 LOS	The system has detected a loss-of-signal (LOS) condition on the EC-1 line. Likely causes: Failure of the incoming signal or cable from the STSX-1, failure of the STS1E or 3STS1E CP at the near end, or a cable disconnect at the STSX-1 or shelf connector.
inc. EC1 line AIS	The system has detected an EC-1 line alarm indication signal (AIS) on an incoming EC-1 line. Likely cause: Failure of an STS1E or 3STS1E CP at the far end.
inc. EC1 sig. degrade (BER)	The bit error ratio (BER) in the received EC-1 signal exceeds the provisioned threshold (10^{-5} to 10^{-9}). Likely causes: Failure of the STS1E or 3STS1E CP at the near end, failure of the incoming cable, cross talk in office wiring, or failure of the incoming signal from the STSX-1.
inc. EC1 sig. fail (BER)	The bit error ratio (BER) in the received EC-1 signal exceeds the fixed threshold of (10^{-3}). Likely causes: Failure of the STS1E CP at the near end, failure of the incoming cable, cross talk in office wiring, or failure of the incoming signal from the STSX-1.
inc. OC3 BER	The bit error ratio (BER) in the received OC-3 signal exceeds 10^{-3} . Likely causes: Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.
inc. OC3 FERF	The system has detected the OC-3 far end receive failure (FERF) signal in the incoming OC-3 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-3 line. This may be caused by failure of the OLIU CP at the near end, the OLIU CP at the far end, or the transmit fiber on the specified line.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. OC3 LOF	The system has detected a loss-of-frame (LOF) condition in an incoming OC-3 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.
inc. OC3 LOP STS1 x	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of a MXRVO or DS3 CP at the far end. If this condition occurs only on one OC-3 line, the likely cause is failure of the OLIU CP at the near end or far end.
inc. OC3 LOS	The system has detected loss-of-signal (LOS) condition on the OC-3 line. Likely causes: Failure of the OLIU CP at near end, failure of the OLIU CP at far end, or failure of the receive fiber.
inc. OC3 line AIS	The system has detected OC-3 line alarm indication signal (AIS) on an incoming OC-3 line. Likely cause: Failure of an OLIU CP at the far end.
inc. OC3 sig. degrade (BER)	The bit error ratio (BER) in the specified OC-3 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3} . Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, failure of the receive fiber, or incorrect setting of the optical power switch on the OLIU CP.
inc. OC3 sig. failed (BER)	The bit error ratio (BER) in the received OC-3 signal exceeds 10^{-3} . Likely causes: Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. OC1 FERF	The system has detected the OC-1 far end receive failure (FERF) signal in the incoming OC-1 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-1 line. This may be caused by failure of the OLIU CP at the near end, the OLIU CP at the far end, or the transmit fiber on the specified line.
inc. OC1 LOF	The system has detected a loss-of-frame (LOF) condition in an incoming OC-1 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.
inc. OC1 LOS	The system has detected loss-of-signal (LOS) condition on the OC-1 line. Likely causes: Failure of the OLIU CP at near end, failure of the OLIU CP at far end, or failure of the receive fiber.
inc. OC1 line AIS	The system has detected OC-1 line alarm indication signal (AIS) on an incoming OC-1 line. Likely cause: Failure of an OLIU CP at the far end.
inc. OC1 sig. degrade (BER)	The bit error ratio (BER) in the specified OC-1 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3} . Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.
inc. OC1 sig. failed (BER)	The bit error ratio (BER) in the received OC-1 signal exceeds 10^{-3} . Likely causes: Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. STS1 AIS	The system has detected an incoming STS-1 alarm indication signal (AIS) in the active OC-3 or OC-1 line. The system responds by transmitting DS1 or DS3 AIS toward the DSX and transmitting STS-1 yellow back toward the fiber from which the AIS is being received. Likely causes: Incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or failure of a DS3, MXRVO, STS1E, or OLIU CP at the far end; unprotected optical line failure.
inc. STS1 LOP EC1 x	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: Failure of the far end or near end STS1E or 3STS1E circuit pack.
inc. STS1 LOP OC1 x	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-1 lines, the likely cause is an unprotected failure of an MXRVO or an OLIU CP at the far end. If this condition occurs on only one OC-1 line, the likely cause is failure of the OLIU CP at the near end or far end.
inc. STS1 LOP OC3 x	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of an MXRVO or a DS3 CP at the far end. If this condition occurs on only one OC-3 line, the likely cause is failure of the OLIU CP at the near end or far end.
inc. STS1 sig. degrade (BER)	For STS-1 path switched ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold. Likely causes: Failure at a fiber or failure of an OLIU circuit pack at some point in the STS-1 path.
inc. STS1 unequipped	The system has detected the unequipped code (SONET path overhead signal code label byte=0) on an in-service STS-1 channel. Likely cause: An upstream STS-1 cross-connect has been deleted.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. STS1 sig. failed (BER)	For ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the signal fail threshold (10^{-6}). For VT1.5 path-switched rings, the system responds by inserting VT Path AIS in each pass-through VT contained in the STS-1. Locally, the system will select the VTs from the STS-1 on the other ring, as appropriate. Likely causes: Failure of the near end OLIU CP reporting the STS-1 failure, failure of the far end OLIU, or failure of the receive fiber if the OC-n is also reporting a failure.
inc. STS1 yellow	The system has detected an incoming STS-1 yellow signal inserted by the far-end path terminating equipment. Likely causes: Unprotected unidirectional failure of an OLIU CP or fiber at some point in the end-to-end path.
inc. VT AIS	The system has detected a VT path alarm indication signal (AIS) incoming from the active OC-n line. The system responds by transmitting DS1 AIS toward the DSX-1 or DSX-3 and VT yellow back toward the fiber from which the AIS is being received. Likely causes: Incomplete or incorrect cross-connect provisioning in end-to-end network; unprotected removal or failure of a DS1 or TMUX (BBG20) CP at the far end. In ring applications, a non-service affecting VT AIS alarm message may result from an upstream OLIU or fiber failure affecting only one ring direction. A VT yellow alarm message is not returned for a non-service affecting VT AIS.
inc. VT LOP	The system has detected a VT loss-of-pointer (LOP) condition. Likely causes: Unprotected failure of a DS1 CP at the near end; unprotected failure of a DS1 or TMUX (BBG20) CP at the far end; unprotected failure of an MXRVO CP at the near or far end; unprotected failure of an OC1 CP at the far end.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. VT sig. degrade (BER)	In a VT path switched ring, the system has detected a VT error rate that exceeds the provisioned threshold of 10^{-5} to 10^{-8} . The system selects a good VT signal from the other ring path. Likely causes: An OLIU circuit pack failure or a fiber failure at some point on the failed ring.
inc. VT unequipped	The system has detected the unequipped code (SONET path overhead VT signal code label byte=0) on an in-service VT1.5 channel. Likely cause: An upstream VT1.5 cross-connect has been deleted.
inc. VT yellow	The far end is detecting VT AIS or VT LOP and inserting VT yellow in its transmit signal. Likely causes: Unprotected unidirectional failure of a circuit pack or fiber at some point in the end-to-end path.
inconsistent DCC values	The "User/Network" parameter values are set the same at both ends of the DCC.
inhibit switch	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be done. No further protection switching of specified line will be done until the protection switch is reset. Note: Line switching is unidirectional. Because of this, the specified line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. See the switch-line command. When associated with a function unit slot, timing slot, or timing reference, this message means that the identified equipment or reference is not active, and protection switches to the identified equipment or reference will not be done until the protection switch is reset. See the switch-fn and switch-sync commands.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inhibit auto. OS messages	This message occurs when TL1 autonomous alarm reporting is inhibited by the TL1 inh-msg command. This message is cleared by enabling autonomous message reporting with the TL1 alw-msg command.
Intersubsystem link failure	In a <i>MegaStar</i> 2000 system, the SONET subsystem session is active but is unable to communicate with the RADIO subsystem.
invalid CP switches	When associated with a TG slot, this message means that the timing mode switch settings on the TGS _lockout of protection!T{ When associated with an OC-3 line, this message means that the identified protection line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be allowed. Note: Line switching is unidirectional. Because of this, the specified line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. The lockout will remain in effect until the protection switch is reset or until a protection switch "inhibit" request is entered. See the switch-line command. When associated with a low-speed protection slot, this message means that no service slot in the entire low-speed group will be allowed to switch to protection. The lockout will remain in effect until the protection switch is reset. See the switch-ls command.
lockout of service	When associated with a low-speed service slot, this message means that the specified low-speed service slot is active and will not be switched to protection. The lockout will remain in effect until the protection switch is reset. See the switch-ls command.
ls prot mode not chgd-(crs)	An attempt to change the low-speed protection mode has failed because all cross-connections terminating on low-speed ports were not removed. The user should remove all such cross-connections and execute the reset function.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
manual switch	The specified DS1 CP is manually switched to protection. The manual switch will remain in effect until the protection switch is reset or until a failure occurs and an automatic switch preempts the manual switch. See the switch-ls command.
manual sync. mode switch	The synchronization mode has been manually switched to holdover or free-running and will remain in that mode until the switch request is reset. See the switch-sync command.
MXRVO CP failed	Internal equipment failure of the specified MXRVO CP.
OC12 connector failed	The faceplate connector which carries the pass through channels between the OC12 interfaces on the 24-type OLIUs has been removed or has failed.
OHCTL CP failed	Internal equipment failure of the OHCTL CP.
OHCTL standby boot fail	Internal equipment failure of the OHCTL circuit pack during a local or remote software download. Likely cause: OHCTL circuit pack hardware failure.
OLIU CP failed	Internal equipment failure of the specified OLIU CP.
program installation IP	This system is being used to install software into another system. If this procedure is interrupted prior to completion, the remote systems' control circuit packs will likely become inoperable until another install program attempt is successful. For OC-3 Release 11.0 and later, this condition will appear if the network element determines that it is time to install a new software generic (originally, the action that caused this event to take place should have been the initiating of the apply command).
section DCC channel failed	The system cannot communicate with the far-end system through the SONET section data communications channel (DCC) Likely causes: SYSCTL or OHCTL CP failure, reset, or initialization at the far end; failed program installation at far end; program installation in progress at the far end; SYSCTL or OHCTL CP failure at the near end.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
STS1E_H CP failed	Internal equipment failure of the specified high-speed STS1E CP.
STS1E_L CP failed	Internal equipment failure of the specified low-speed STS1E CP.
SYSCTL CP failed	Internal equipment failure of the SYSCTL CP. The system has determined that some part of the SYSCTL CP has failed. Note that some types of failures cannot be reported since the SYSCTL CP cannot function under these conditions.
SYSCTL standby boot fail	Internal equipment failure of the SYSCTL circuit pack during a local or remote software download. Likely cause: SYSCTL circuit pack hardware failure.
TID address map full	The size of the directory services network element (DSNE) database has been exceeded. Likely cause: Network elements have been removed from the network but not from the DSNE database. See the dlt-tadrmap command.
TGS CP failed	Internal equipment failure of the specified TGS CP, or the systems at both ends of the span are line-timed from each other.
unexpected CP present	A DS1 circuit pack has been installed in a low-speed slot associated with a function unit currently provisioned for DS3 service. The DS1 CP should be removed from the shelf, or the DS3 CP should be replaced with an MXRVO CP.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
unexpected CP switches	When associated with the SYSCTL or OHCTL slot, this message means that an invalid switch setting has been selected on the CP, or that some of the unused switches are not in the prescribed position. For OLIU slots, it indicates that the optical power switch on the OLIU CP was different from what it was before the OLIU CP was replaced. For DS3 or DS1 slots, this message means that a change in a circuit pack switch setting was made. When associated with a TG slot, this message means: 1. The timing mode switch settings on the TGS CP are: a. different from those on the companion TGS CP, or b. different from what they were before the TGS CP was replaced, or 2. The DS1 format or line coding switches on the TGS CP are not the same as they were before the TGS CP was replaced.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
unexpected CP type	When associated with a function unit (FN) slot, this message means that a different but supported circuit pack is inserted in a slot already provisioned. When associated with a low-speed slot, this message means that a different but supported circuit pack type (for example, BBF3) is inserted in a slot already provisioned. For the STS1E circuit pack, this message means that the CP type switch (located on the circuit pack) is different from that already provisioned for the slot. This message is issued as a status condition if a 24-type OLIU is inserted in a main slot provisioned for a 22-type OLIU. This will occur during an upgrade of an OC3 ring interface to an OC12 ring interface on an OC3 shelf.
unsupported DCC connection	This message is issued when the DCC is enabled on an OC-1 connection between the main slots in two OC-3 shelves. The alarm is cleared by disabling the DCC on the OC-1 interface using the set - fecom command. The DDM-2000 OC-3 system does not support a DCC link over an OC-1 line terminating on the main slots between two OC-3 shelves.

NAME

rtrv-hsty:Retrieve History

INPUT FORMAT**rtrv-hsty;****DESCRIPTION**

This command displays an event-history report. This report contains a list of the most recent system events. This report contains up to 500 events. The events are listed in last-in, first-out order and are date- and time-stamped.

The output report appears as follows:

```

/* Maintenance History Report
=====
Date      Time      Sys.Alm.      Source      Event
          Level
=====
MM-DD HH:MM:SS  alarm      address      description
          .
          .
MM-DD HH:MM:SS  alarm      address      description
*/

```

The output parameters are:

Date	Month (MM) and day (DD) of the event.
Time	Time (hours, minute, seconds) of event occurrence. Time stamps reflect the time the entry is made. Entries are added to the history report BEFORE any applicable holdoff delays and AFTER any applicable clear delays.
System Alarm Level	Alarm level corresponds to the system alarm level at the time immediately after the event occurred. Alarm level is the level of the highest active or pending alarm/status condition. The alarm level is reported as if the holdoff delay was zero. Additionally, the alarm level column may show CR, MJ, MN, or PMN alarms for troubles that never really became alarms, since holdoff delays may prevent the troubles from reaching an alarm condition.

The alarm level may be one of the following:

CRITICAL	Critical Alarm
MAJOR	Major Alarm
MINOR	Minor Alarm
PWR MINOR	Power Minor Alarm
abnormal	Abnormal condition
ne-acty	Near-End Activity
status	Status condition
—	No active alarm or status condition in the system.

Source The source of the event. An event source may be the entire system or a slot, a channel, or an operations interface. If security is enabled, it may also be a CIT or a login name. Refer to "Commands" and Table 11-1 at the beginning of this section for the addresses of lines, slots, ports, channels, and operations interfaces.

Event Description Table 11-4 lists the meaning and likely cause of each of the messages that appear in the maintenance history report.

In addition to the messages listed here, any of the messages that appear in the alarm and status report can appear in the history report to record the onset of alarm and status conditions.

Also, all CIT and TL1 commands that affect the state of the system (provisioning commands; protection switching commands; loopbacks; transmission, alarm, and telemetry tests) will appear in the report.

⇒ NOTE:

Any messages that appear in the RTRV-ALM report may also appear in the history report.

Table 11-4. RTRV-HSTY Descriptions

Description	Meaning
2nd CP required clrd	A second circuit pack has been inserted into the empty function unit slot. The BBF3 (DS1PM) or BBF6 (T1EXT) circuit pack requires both function unit slots in the group to be equipped.
-48V power/fuse good	A failed -48 volt power feeder or a failed fuse on the user panel has been repaired.
CP removed	A circuit pack has been removed from the specified slot.
AC power failed-FE clrd	The AC power supply to a remote terminal cabinet has been restored.
AC power good	The AC power supply to the shelf has been restored.
AGNE communication good	An AGNE communication failure has been cleared.
APS - CP failed	An automatic protection switch was done because the system detected a circuit pack failure.
APS - automatic lock reset	The automatic protection switch lock for a DS1 circuit pack has been released.
APS channel good	A failure of the SONET automatic protection switching channel has cleared.
APS - sig. degraded	An automatic protection switch was done because the system detected a degraded signal on the OC-N line or path.
APS - sig. failed	An automatic protection switch was done because the system detected a failure of the OC-N line or path (incoming AIS, loss of signal, or bit error rate higher than 10^{-3}).
auto switch	An automatic protection switch of a DS1 circuit pack is active. When the failure that caused the switch to be done clears, the switch will be reset automatically. Likely causes: Protected failure or removal of a DS1 CP.
auto sync. mode switch	An automatic protection switch of the synchronization mode is active. When the failure that caused the switch to be done clears, the switch will be reset automatically if automatic mode switching is enabled. (See the set-sync and rtrv-sync commands.)

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
BBF5 required in LS-4 clrd	A BBF5 jumper pack has been inserted into low-speed slot 4 of a function group that has a pair of 27G2-U OLIUs installed in the corresponding function unit slots. The BBF5 is required for transmission cross-coupling between the 27G2-U OLIUs in group 3 (and earlier) shelves.
BBF5 required in LS-8 clrd	A BBF5 jumper pack has been inserted into low-speed slot 8 of a function group that has a pair of 27-type OLIUs installed in the corresponding function unit slots. The BBF5 is required for correct DCC operation for the 27-type OLIUs in group 3 (and earlier) shelves.
CIT timeout	A craft interface terminal (CIT) session was automatically terminated because there was no activity on the CIT for the provisioned time. (See the set -secu command.)
communication good	A communication failure has cleared. The system can now communicate, via the SONET section DCC, with another system with which it had previously lost communication.
controln rlcd	The system has released the specified miscellaneous discrete environmental control because it has been requested to do so through the serial telemetry or discrete telemetry interface. This message will appear only in a remote terminal. Any name may be provisioned in place of the controln part of this message.
cpy-prog compl.	The software copy procedure has been completed. This message will show at the source NE.
disconnect	The craft interface terminal has been disconnected.
DS1 CP good	The failure of the specified circuit pack has cleared.
DS1 CP inserted	A circuit pack was inserted into the shelf.
DS1 port in service	A DS1 port was put in the in-service state. This happens automatically when an incoming signal is detected (coming from the DSX) unless the port has been provisioned to the not monitored state.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
DS1 sync. ref. port in service	A DS1 External timing reference was automatically put in the in-service state because an incoming DS1 signal was detected.
DS1PM CP good	The failure of the DS1PM circuit pack has cleared.
DS1PM CP inserted	A DS1PM circuit pack was inserted into the shelf.
DS3 CP good	The failure of the DS3 CP has been cleared.
DS3 CP inserted	A DS3 circuit pack was inserted into the shelf.
DS3 port in service	A DS3 port was put in the in-service state. This happens automatically when an incoming signal is detected (coming from the DSX) unless the port has been provisioned to the not monitored state.
DSNE not reachable clrd	Communication has been restored between the DSNE and other network elements in the subnetwork, or other NE(s) can now reach the DSNE.
duplicate DSNE clrd	One of the duplicate DSNE shelves has been reprovisioned to no longer be a DSNE.
duplicate site/ne address clrd	A shelf has been reprovisioned and no longer has the same site or NE address as any other shelf in the network.
duplicate TID clrd	A shelf has been renamed and no longer has the same TID as any other shelf in the network.
duplicate TBOS display clrd	A shelf has been reprovisioned and no longer has the same TBOS display number as any other shelf in the network.
EC1 port in service	An EC1 port has been placed in the in-service state.
enable auto OS messages	Autonomous OS message reporting has been enabled with the TL1 command alw-msg .
environment n rlcd	The specified miscellaneous discrete environment alarm input point has been released, indicating that an environmental alarm or status condition has cleared. This message will appear only in a remote terminal. Any name may be provisioned in place of the environment n part of this message.
externalMinor clrd	The external minor alarm condition has cleared.
fan control relay good	The fan control relay on the SYSCTL CP was failed but is now operating properly to turn on the fans.
fan shelf good	A fault on the fan shelf has been cleared.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
frequency error clrd	The frequency offset failure has been cleared.
holdover mode clrd	The system is no longer in holdover timing mode. It has switched from holdover mode to the provisioned timing mode (either LoopTimed or phase locked to an External DS1 timing reference).
inc. DS1 good	A failure of the DS1 signal coming from the DSX is cleared.
inc. DS1 sync. ref. good	A failure of the External DS1 timing reference is cleared.
inc. (from fiber) DS3 AIS clrd	The system is no longer detecting DS3 AIS (alarm indication signal) in the DEMUX direction (that is, coming from the fiber).
inc. DS3 good	A failure of the DS3 signal coming from the DSX is cleared.
inc. (from fiber) DS3 OOF clrd	A DS3 out-of-frame (OOF) condition in the DEMUX direction (coming from the fiber) is cleared.
inc. EC1 FERF clrd	The system is no longer detecting an EC-1 far end receive signal failure (FERF) signal.
inc. EC1 good	A failure of the EC-1 signal has been cleared.
inc. (from DSX) DS3 AIS clrd	The system is no longer detecting DS3 AIS (alarm indication signal) in the MUX direction (that is, coming from the DSX-3). This is applicable to the TMUX (BBG20) circuit pack only.
inc. EC1 line AIS clrd	The EC-1 alarm indication signal (AIS) is no longer being received. A downstream failure has cleared.
inc. EC1 sig. degrade (BER) clrd	A failure of the specified EC-1 signal has cleared.
inc. OC3 FERF clrd	The system is no longer detecting the OC-3 far end receive failure (FERF) signal.
inc. OC3 good	A failure of the OC-3 line has been cleared.
inc. OC3 LOP STS1 #x clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. OC3 sig. degrade clrd	A failure of the specified OC-3 signal has cleared. OC-3 line AIS and/or OC-3 line FERF conditions may still be present on the specified OC-3 line. The OC-3 LOP condition may still be present for one or more of the STS-1 signals in the OC-3 line.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
inc. OC3 line AIS clrd	The system is no longer detecting the OC-3 alarm indication signal (AIS) on the specified OC-3 line.
inc. OC1 FERF clrd	The system is no longer detecting the OC-1 far end receive failure (FERF) signal.
inc. OC1 good	A failure of the OC-1 line has been cleared.
inc. OC1 sig. degrade clrd	A failure of the specified OC-1 signal has cleared. OC-1 line AIS and/or OC-1 line FERF conditions may still be present on the specified OC-1 line. The OC-1 LOP condition may still be present for the STS-1 signal in the OC-1 line.
inc. OC1 line AIS clrd	The system is no longer detecting the OC-1 alarm indication signal (AIS) on the specified OC-1 line.
inc. STS1 AIS clrd	The STS-1 alarm indication signal (AIS) is no longer being received. An upstream failure (in the MUX direction) has cleared.
inc. STS1 LOP EC1 clrd	A loss-of-pointer condition on the STS-1 signal of the EC-1 line has been cleared.
inc. STS1 LOP OC3 slot clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. STS1 LOP OC1 slot clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. STS1 sig. degrade clrd	A failure of the specified STS-1 signal has cleared.
inc. STS1 sig. failed clrd	A failure of the specified STS-1 signal has cleared.
inc. STS1 unequipped clrd	A failure of the specified STS-1 signal has cleared.
inc. STS1 yellow clrd	The STS-1 yellow signal is no longer being received.
inc. VT AIS clrd	The VT alarm indication signal (AIS) is no longer being received. A downstream failure (in the MUX direction) has cleared.
inc. VT LOP clrd	A loss-of-pointer condition on the VT1.5 signal has been cleared.
inc. VT sig. degrade clrd	Failure of the specified VT1.5 signal has cleared.
inc. VT unequipped clrd	A failure of the specified VT1.5 signal has cleared.
inc. VT yellow clrd	The VT yellow signal is no longer being received from the fiber (in the DEMUX direction).

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
ins-prog compl.	The software installation procedure has been completed. This message will show at the source NE.
Intersubsystem link clrd	In a <i>MegaStar</i> 2000 system, the active SONET subsystem can communicate with the RADIO subsystem.
login: <i>login_id</i>	A login session with a user's login identification has been started on the specified CIT port.
login: <i>login_id</i> DENY	A login session was attempted but denied because of an invalid login and password pair, or the system was in Lockout state.
logout: <i>login_id</i>	A login session with a user's login identification has ended on the specified CIT port.
logout: <i>login_id</i> DISCONNECT	A login session with a user's login identification has ended by a disconnect on the specified CIT port.
main-{1,2} protection switch	Equipment switching in a ring application has occurred due to equipment failure.
MXRVO CP good	The failure of the specified circuit pack has cleared.
MXRVO CP inserted	A circuit pack was inserted into the shelf.
OHCTL CP good	The internal equipment failure of the OHCTL circuit pack has cleared.
OLIUI CP good	The failure of the specified circuit pack has cleared.
OLIUI CP inserted	A circuit pack was inserted into the shelf.
remote session logout	A remote CIT session (set up by the <i>r lgn</i> command) has been terminated. This may have been caused by normally logging out of the remotely accessed far end session, or once in the far end session, the user toggled back and logged out of the local session.
remote session terminated	A remote CIT session (set up by the <i>r lgn</i> command) has been abnormally terminated. This may have been caused by a failure of the controller, circuit pack failure, timeout, or any other abnormal termination at the far end NE.
reset	The system software program has been reset.
<i>r lgn: login_id</i> DENY	A remote login session was attempted but denied because of an invalid login and password pair, or the DCC connecting the remote system was in Lockout state.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
section DCC channel good	The failure of the SONET section data communications channel has cleared.
STS1 channel in service	An STS1 channel was put in the in-service state. This happens automatically when a "good" signal is detected on the channel (neither AIS, unequipped signal, nor "loss of pointer" condition is present), unless the channel has been provisioned to the "not monitored" state.
STS1E CP good	The failure of the specified STS1E circuit pack has cleared.
STS1E CP inserted	An STS1E circuit pack was inserted into the shelf.
switch reset	— An automatic protection switch of a DS1 circuit pack been automatically reset. — The system has switched from holdover synchronization mode to the provisioned synchronization mode (LoopTimed or phase locked to an External DS1 timing reference). - or — A manually initiated protection switch has been reset (by the switch-sync, switch-line, switch-fn, or switch-ls command), or by removing a CP from the shelf.
sysctl crs map recovered	A read failure of the cross-connection data base occurred during restart, but the backup copy was recovered and is being used.
sysctl crs map initialized	A read failure of the cross-connection data base occurred during restart, and recovery using backup copies also failed. The cross-connection map was initialized.
sysctl channel states initialized	A read failure of the channel state data base occurred during restart, and recovery using backup copies also failed. The channel state data on SYSCTL was used.
sysctl port states initialized	A read failure of the port state data base occurred during restart, and recovery using backup copies also failed. The port state data on SYSCTL was used.
TID address map clrd	Exceeding the size of the DSNE database has been cleared.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
TGS CP good	The failure of the specified circuit pack has cleared.
TGS CP inserted	A circuit pack was inserted into the shelf.
VT channel in service	A VT channel was put in the in-service state. This happens automatically when a "good" signal is detected on the channel (neither AIS, unequipped signal, nor "loss of pointer" condition are present), unless the channel has been provisioned to the "not monitored" state.

A SONET Overview

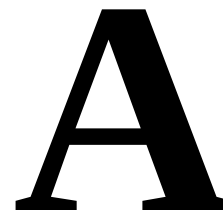
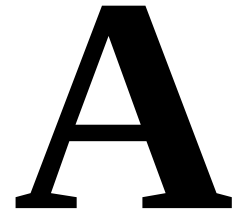


Table of Contents

Overview	A-1
History	A-1
Basic Purpose	A-2
Technical Overview	A-2
■ SONET Signal Hierarchy	A-2
■ SONET Layers	A-4
■ SONET Frame Structure	A-6
■ Section Overhead	A-6
■ Line Overhead	A-7
■ Path Overhead	A-8
STS-1 Path Overhead	A-8
VT Path Overhead	A-9
■ SONET Multiplexing Procedure	A-10
■ SONET Demultiplexing Procedure	A-12
■ SONET Digital Multiplexing Schemes	A-14
Asynchronous Multiplexing	A-14
Synchronous Multiplexing	A-15
■ Virtual Tributary Signals	A-15
■ Concatenated Mode	A-16
SONET Interface	A-17
■ SONET Payloads	A-18
■ Higher Rate Transport	A-19
Conclusion	A-19

Table of Contents

A SONET Overview



Overview

This section briefly describes the Synchronous Optical Network (SONET).

History

In the early 1980's, the American National Standards Institute (ANSI) recognized the need for an optical signal standard for future broadband transmission. The ANSI T1X1 subcommittee began working on optical signal and interface standards in 1984. In 1985, Bellcore proposed a network approach to fiber system standardization to T1X1. The proposal suggested a hierarchical family of signals whose rates would be **integer multiples** of a basic modular signal. The proposal further suggested a synchronous multiplexing technique, leading to the coining of the term *Synchronous Optical NETWORK* (SONET).

The International Telephone and Telegraph Consultative Committee (CCITT) first showed interest in 1986. Conferences held through 1987 and 1988 resulted in coordinated specifications for both the American National Standard (SONET) and the CCITT-International Standard, Synchronous Digital Hierarchy (SDH). Approval of both sets of standards occurred in late 1988.

Basic Purpose

The basic purpose of SONET is to provide a standard synchronous optical hierarchy with sufficient flexibility to accommodate digital signals that currently exist in today's network as well as those planned for the future.

SONET currently defines standard rates and formats and optical interfaces. These and other related issues continue to evolve through the ANSI committees. SONET ultimately will permit an optical midspan meet in a multivendor environment.

The American National Standard defines the following:

- Optical parameters (*ANSI** T1.106-1988)
- Electrical parameters (*ANSI* T1.102-1993 Draft)
- Multiplexing schemes to map existing digital signals (for example, DS1, DS2, and DS3) into SONET payload signals (*ANSI* T1.105-1991)
- Criteria for optical line automatic protection switch (APS) (*ANSI* T1.105-1991)
- Overhead channels to support standard operation, administration, maintenance, and provisioning (OAM&P) functions (*ANSI* T1.105-1991).

*

Technical Overview

SONET Signal Hierarchy

The SONET signal hierarchy is based on a basic "building block" frame called the synchronous transport signal - level 1 (STS-1), as shown in Figure A-2 on the following page. The STS-1 frame has a reoccurring rate of 8000 frames per second. Each frame is 125 microseconds.

The STS-1 frame consists of:

- 90 columns (each column is an 8-bit byte)
- 9 rows.

* Registered trademark of America National Standards Institute

The STS-1 frame is transmitted serially starting from the left with row 1 column 1 on through column 90, then row 2 column 1 through 90, continuing on, row-by-row, until all 810 bytes (9 X 90) of the STS-1 frame have been transmitted.

Since each STS-1 frame consists of 810 bytes and each byte has 8 bits, the frame contains 6480 bits a frame. There are 8000 STS-1 frames per second, at the STS-1 signal rate of 51,840,000 (6480 X 8000) bits a second.

The first three columns in each of the nine rows carry the SECTION and LINE overhead bytes. Collectively, these 27 bytes are referred to as transport overhead.

The remainder of the frame, columns 4 through 90, is reserved for payload signals (for example, DS1, DS3, and path overhead) and is referred to as the STS-1 synchronous payload envelope (STS-1 SPE). The optical counterpart of the STS-1 is the optical carrier level 1 signal (OC-1), which is the result of a direct optical conversion. The electrical counterpart of the STS-1 is the electrical carrier level 1 signal (EC-1).

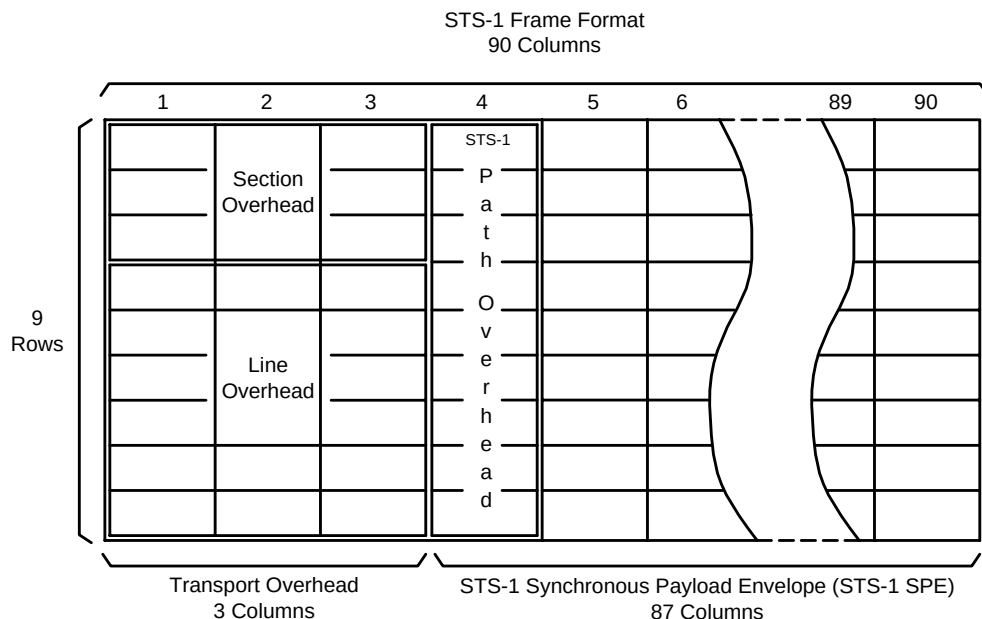


Figure A-2. SONET STS-1 Frame — Simplified Version

SONET Layers

SONET divides its processing functions into three layers. These three layers are associated with equipment that reflects the natural divisions in network spans.

Figure A-3 shows these defined layers in a signal path. They include:

- **SECTION and Section Terminating Equipment** - the transmission spans between lightwave terminating equipment and the regenerators. The spans between the regenerators are also considered sections. Section terminating equipment provides regenerator functions and terminates the section overhead to provide single-ended operations and section performance monitoring.
- **LINE and Line Terminating Equipment** - the transmission span between terminating equipment (STS-1 cross-connections) that provides line performance monitoring. If there are no intervening repeaters, the line terminating equipment also functions as section terminating equipment.
- **STS-1 and VT Path and Path Terminating Equipment** - the transmission span for an end-to-end tributary (DS1 or DS3) signal that provides functions including signal labeling and path performance monitoring for signals as they are transported through a SONET network. STS-1 path terminating equipment can also provide cross-connections for lower rate (that is, DS1) signals. A virtual tributary (VT) is a sub-DS3 payload and is described later in more detail.

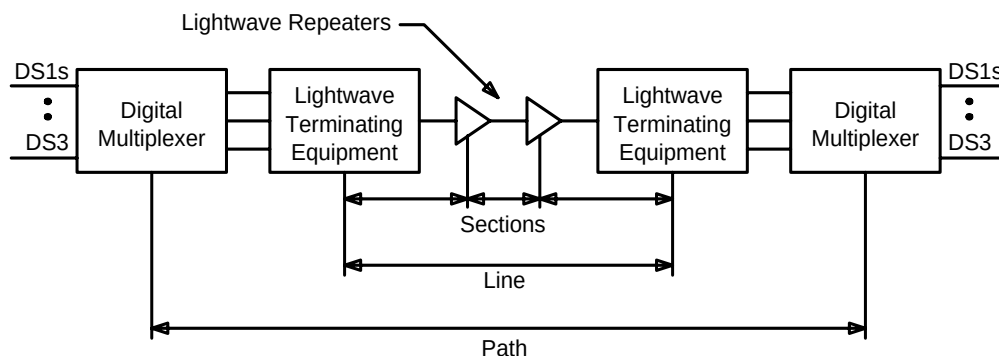


Figure A-3. Section, Line, and Path Definitions

Each SONET layer has a set of overhead bytes as shown in Figure A-4. These bytes carry information used by various network elements.

- **Section Overhead** contains information that is used by all SONET equipment including repeaters.
- **Line Overhead** is used by all SONET equipment except repeaters.
- **Path Overhead** is carried within the payload envelope.
 - **STS-1 path overhead** remains with the STS-1 SPE until its asynchronous signal is extracted (for example, DS-3) or until its individual VT1.5 signals are demultiplexed.
 - **VTN (N= 1.5, 2, 3, or 6) path overhead** remains with the VTN until its asynchronous signal is extracted.

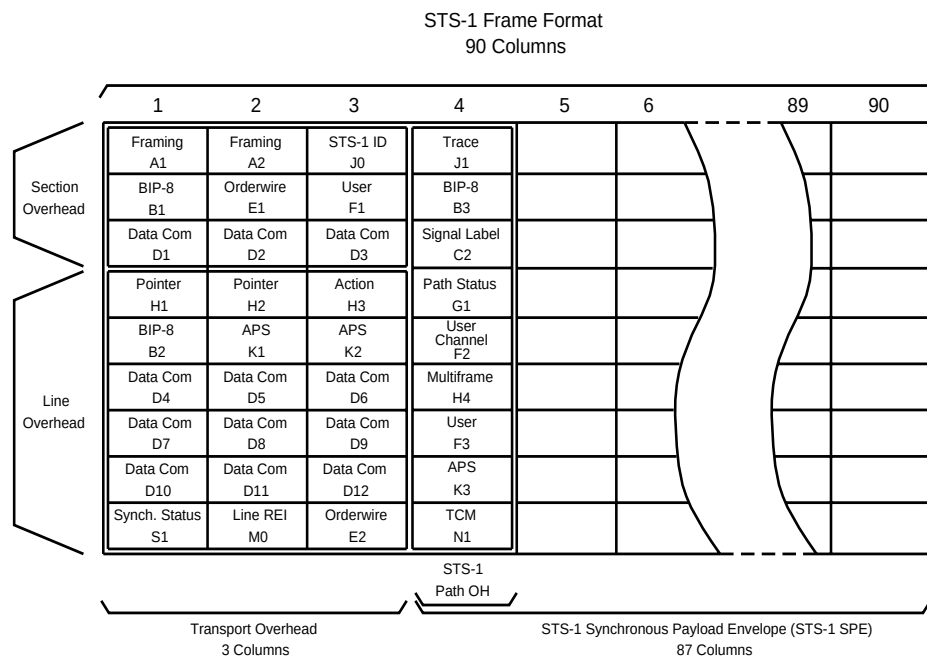


Figure A-4. SONET Frame Format

SONET Frame Structure

The following pages provide more detailed information on the function of various overhead bytes for each SONET layer.

Section Overhead

- Framing (A1, A2)
 - Provides framing for each STS-1.
- STS-1 ID (J0)
 - Provides the order of appearance in a byte-interleaved STS-*N* frame; for example, STS-1 #1, STS-1 #2.....STS-1 #48. In future applications, this byte will provide a section trace function. For information on STS-*N* signals, see the "Higher Rate Transport" part of this section.
- Section Bit-Interleaved Parity (BIP-8) (B1)
 - Provides SECTION performance monitoring and is calculated over all bits of the previous STS-*N* frame. Defined only for STS-1 #1 of an STS-*N* signal.
- Section Order Wire (E1)
 - Provides a local order wire for voice communication channel between section terminating network elements, such as repeaters. Defined only for STS-1 #1 of an STS-*N* signal.
- Section User Channel (F1)
 - Set aside for the user's purpose. Defined only for STS-1 #1 of an STS-*N* signal.
- Section Data Communications Channel (D1, D2, D3)
 - Is a 192 kb/s message-based channel. Used for alarms, maintenance, control, monitoring, and other communication needs between section terminating equipment. Defined only for STS-1 #1 of an STS-*N* signal.

Line Overhead

- Line Pointer (H1, H2)
 - Two bytes indicate the offset in bytes between the pointer action byte (H3) and the first byte (J1) of the STS-1 synchronous payload envelope (SPE).
- Pointer Action (H3)
 - One byte is allocated for frequency justification.
- Line Bit-Interleaved Parity (BIP-8) (B2)
 - This byte is for line performance monitoring. This byte is provided in all STS-1 signals within an STS-*N* signal.
- Line Automatic Protection Switching (APS) (K1, K2)
 - Two bytes used for APS signaling between line level entities. In addition, bits 6, 7, and 8 of K2 are used for line alarm indication signal (AIS) and line far-end receive failure (FERF). Defined only for STS-1 #1 of an STS-*N* signal.
- Line Data Communications Channel (D4 - D12)
 - Is a 576 kb/s message-based channel.
- Synch. Status (S1)
 - In STS-1 #1, the S1 byte is for synchronization status messages, and only bits 5 through 8 are used.
- Line REI (M0)
 - The M0 byte is for STS-1 line far-end block error (FEBE), and only bits 5 through 8 are used.
- Line Orderwire (E2). Defined only for STS-1 #1 of an STS-*N* signal.
 - One byte is allocated to be used as an express orderwire between line terminating equipment.

Path Overhead

There are two types of path overheads:

- STS-1 path overhead
- VT path overhead.

STS-1 Path Overhead

The STS-1 path overhead is assigned to and remains with the STS-1 SPE until the payload is extracted and is used for functions that are necessary to transport all synchronous payload envelopes.

- STS-1 Path Trace (J1)
 - Repetitively transmits a 64 byte, fixed length, string so that an STS-1 path receiving terminal can verify its continued connection to the intended transmitter.
- STS-1 Path Bit-Interleaved Parity (BIP-8) (B3)
 - Provides each STS-1 path performance monitoring. This byte is calculated over all bits of the previous STS-1 SPE before scrambling.
- STS-1 Path Signal Labels (C2)
 - Indicates the construction of the STS-1 SPE. A value of 00000000 indicates an unequipped STS-1 SPE. Values for various payload mappings are defined in TR-NWT-000253, Issue 2.
- STS-1 Path Status (G1)
 - Conveys the STS-1 path terminating status, far end block errors (FEBE), and yellow alarm signal conditions back to an originating STS-1 path terminating equipment.
- STS-1 Path User Channel (F2, F3)
 - User communication channel between Path elements.
- VT Multiframe Indicator (H4)
 - Provides a general multiframe indicator for VT-structured payloads.
- STS-1 Path Automatic Protection Switching (K3)
 - Path Automatic Protection Switching
- TCM - Tandem Connection Maintenance (N1)
 - Bits 1-4 used for incoming error monitoring. Bits 5-8 used as communications channel.

VT Path Overhead

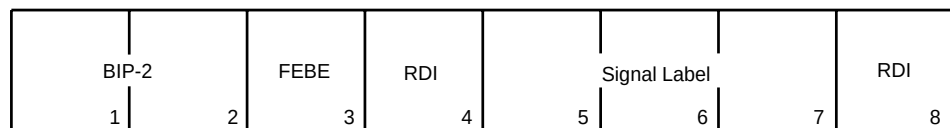
There is one byte of VT path overhead called V5. It occurs on every fourth frame; that is, 2000 times a second.

This byte provides for VT paths the same functions that B3, C2, and G1 provide for STS paths, namely:

- Error checking
- Signal label
- Path status.

The bit assignments of the VT path overhead are specified in the following list and are illustrated in Figure A-5:

- Bits 1 and 2 are used for error performance monitoring (BIP-2).
- Bit 3 is a VT path far-end-block-error (FEBE) indication that is sent back toward an originating VT PTE when errors are detected by the BIP-2.
- Bit 4 and Bit 8 are used for remote defect indication (RDI)
- Bits 5 through 7 provide a VT signal label.



VT Path Signal Label Coding:

0 0 0	Unequipped
0 0 1	Equipped-Nonspecific

Figure A-5. VT Path Overhead Byte

SONET Multiplexing Procedure

SONET has provisions for multiplexing asynchronous DS1s, synchronous DS1s, and asynchronous DS3s. Refer to Figure A-6 and Figure A-7.

The first stage in multiplexing is mapping the input DS1 or DS3 tributary. In the case of DS1 inputs, three time slots (DS0s) are added to the incoming signal thus becoming a VT1.5. An asynchronous DS1 that fully meets the specified rate is mapped into the VT1.5 SPE as clear channel input since no framing is needed.

- Each VT1.5 carries a single DS1 payload.
- Four VT1.5s are bundled into a VT group (VT-G).
- Seven VT-Gs are byte-interleaved into an STS-1 frame.

The VT-G to-STS-1 multiplex is a simple byte-interleaving process, so individual VT signals are easily observable within the STS-1. Thus, cross-connections and add/drop can be accomplished without the back-to-back multiplexing/multiplexing steps required by asynchronous signal formats. The structured VTs are now multiplexed into the STS-1 SPE, and the path, line, and section overhead are added. The final multiplexing, as shown in Figure A-6, provides the scrambled STS-*N* signal to the optical conversion stage.

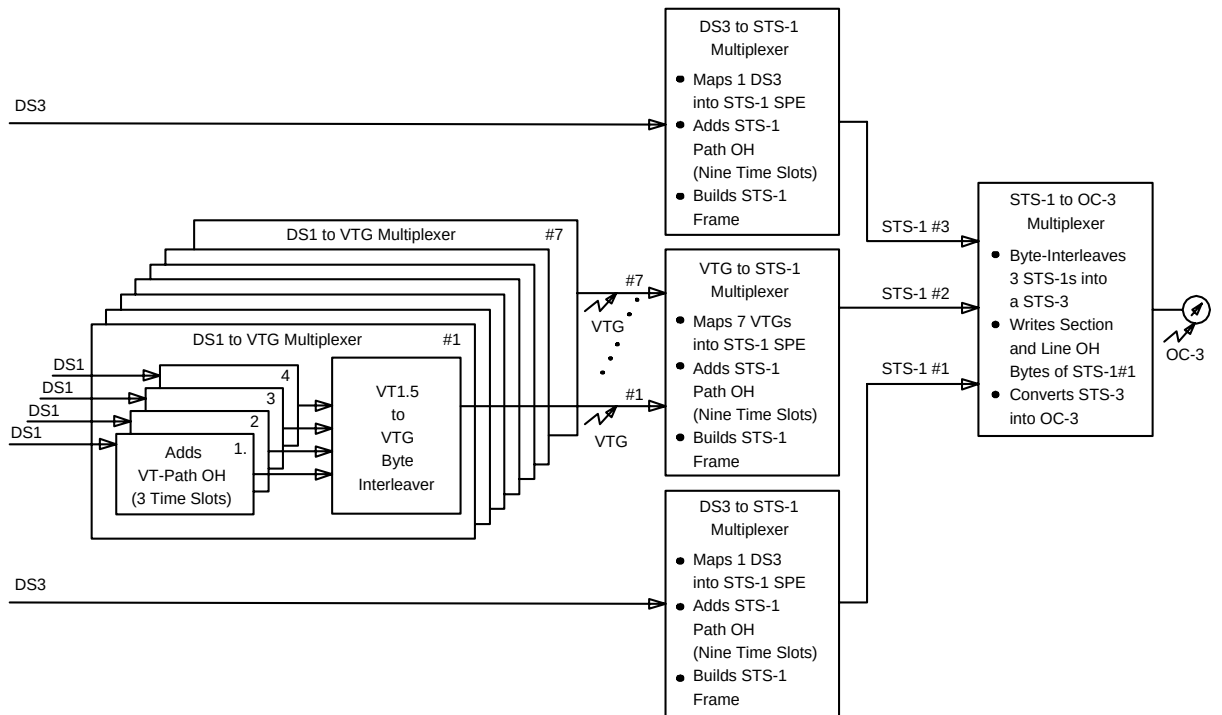


Figure A-6. SONET Multiplexing Procedure

SONET Demultiplexing Procedure

As shown in Figure A-7, demultiplexing is the inverse of multiplexing. The unscrambled STS-1 signal from the optical conversion stages is processed to extract the section and line overhead and accurately locate the SPE. The next stage processes the path overhead and demultiplexes the VTs. A standard DS3 signal will be provided to the asynchronous network after path overhead processing. For DS1 signals, the individual DS1 VTs are then processed to extract VT overhead and, via the VT pointer, accurately locate the DS1 SPE. Finally, desynchronization of the DS1 SPE provides a standard DS1 signal to the asynchronous network.

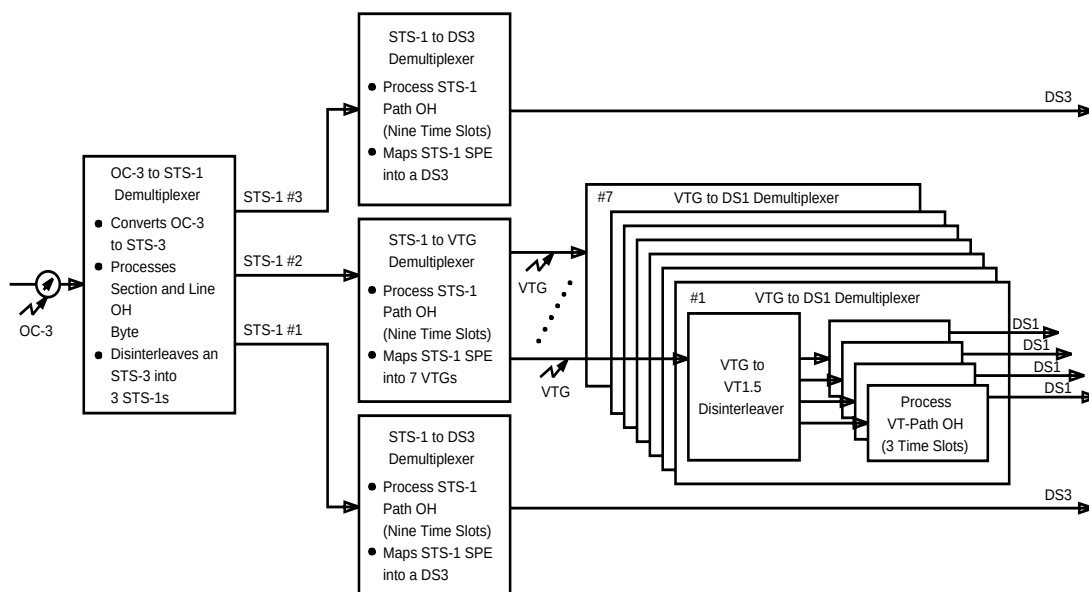


Figure A-7. SONET Demultiplexing Procedure

Two key points should be noted at this time. First, the SONET frame is a fixed time (125 μ s) and no bit-stuffing is used. Second, as shown in Figure A-8, the synchronous payload envelope can *float* within the frame using byte-stuffing. This is to permit compensation for small variations in frequency between the clocks of the two systems that may occur if the systems are independently timed (plesiochronous timing). The SPE can also drift across the 125- μ s frame boundary. SONET STS pointers are used to locate the SPE relative to the transport overhead.

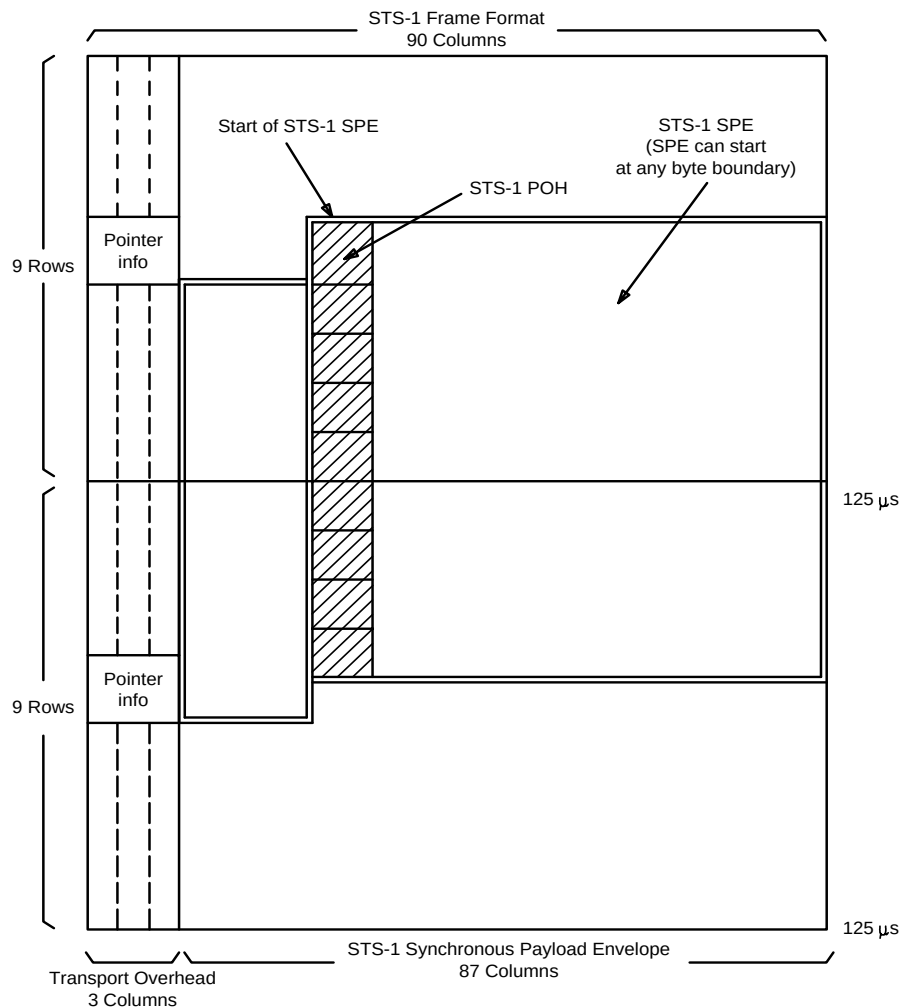


Figure A-8. STS-1 Synchronous Payload Envelope in Interior of STS-1 Frame

SONET Digital Multiplexing Schemes

Asynchronous Multiplexing

Currently, fiber optic facilities are primarily used to carry DS3 signals. The DS3 signal consists of a combination of the following payload signals:

- 28 DS1s
- 14 DS1Cs
- 7 DS2s.

Typically, 28 DS1 signals are multiplexed into a DS3 signal, using an M13 format. Refer to Figure A-9. M13 format is a process that includes bit-interleaving four DS1 into a DS2 signal and then bit-interleaving seven DS2 signals into a DS3. The DS3 rate is not a direct multiple of the DS1 or the DS2 rates due to the bit-stuffing synchronization technique used in asynchronous multiplexing.

Identification of DS0s contained in any DS-*N* signal, except DS1, is complex and DS0s cannot be directly extracted. Thus, an asynchronous DS3 signal must be demultiplexed down to the DS1 level to access and cross-connect DS0 and DS1 signals.

Another disadvantage of the M13 format is there is no end-to-end overhead channel for use by OAM&P groups.

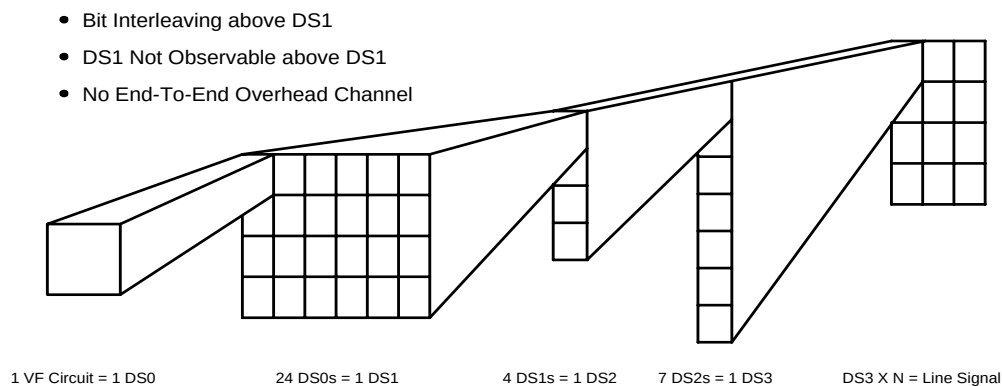


Figure A-9. Asynchronous Multiplexing

Synchronous Multiplexing

SONET's method of *byte-interleaving* DS1s to a higher signal rate permits economical extraction of a single DS1 without the need to demultiplex the entire STS-1 SPE. In addition, SONET provides overhead channels for use by OAM&P groups.

In SONET, a single asynchronous DS3 signal is mapped into an STS-1 SPE (Figure A-10).

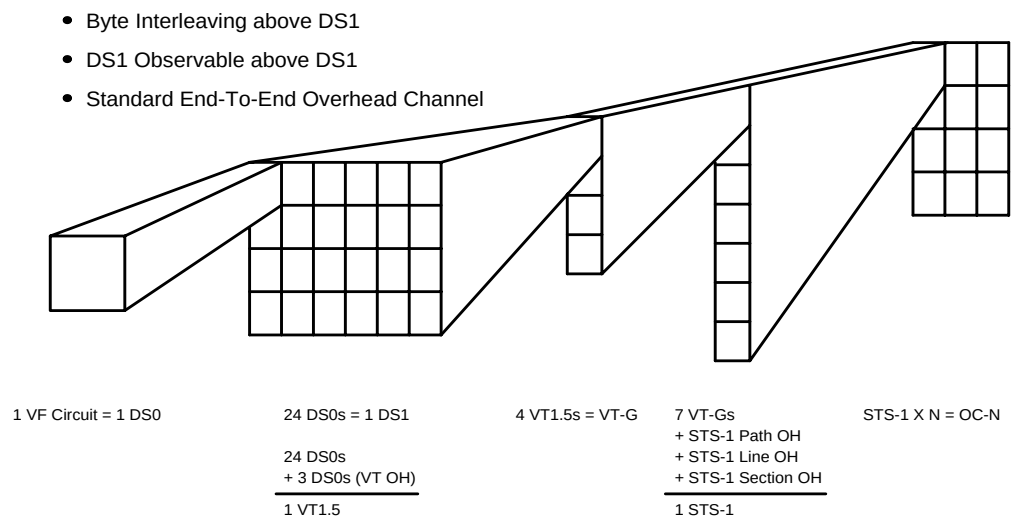


Figure A-10. Synchronous Multiplexing

Virtual Tributary Signals

Sub-DS3 asynchronous signals (DS1, DS1C, DS2 and E1) are *byte-interleaved* into a digital signal called a virtual tributary (VT). The VT is a structure designed for the transport and switching of sub-DS3 payloads. Like the STS-1 signal, the VT signal has a floating pointer that allows each VT SPE to move within the VT structure. There are four sizes of virtual tributaries (VT1.5, VT2, VT3, VT6). Higher rate payloads are transported as one or more concatenated STS-1 signals.

Concatenated Mode

For services requiring multiples of the STS-1 rate, STS-1 path payloads may be shared to create a single broadband payload called a concatenated STS-*N_c* (OC-*N_c*). STS-1 signals are mapped into an STS-*N_c* SPE and transported as a concatenated STS-*N_c* signal. This STS-*N_c* signal can be carried by an STS-*N* or OC-*N* (or higher level) line signal.

The STS-*N* signal is multiplexed, switched, and transported through the network as a single entity. A concatenation indicator, used to show that the STS-1s of the STS-*N_c* signal are linked together, is contained in the STS-1 payload pointer of all but the first STS-1. The line and section overhead is sent on the first STS-1 and the payload pointer for the first STS-1 is applied to all STS-1 signals in the concatenated signal.

Figure A-11 shows an example of an STS-3c SPE. It consists of 3 x 87 columns and 9 rows of bytes. The order of transmission is row by row, from left to right.

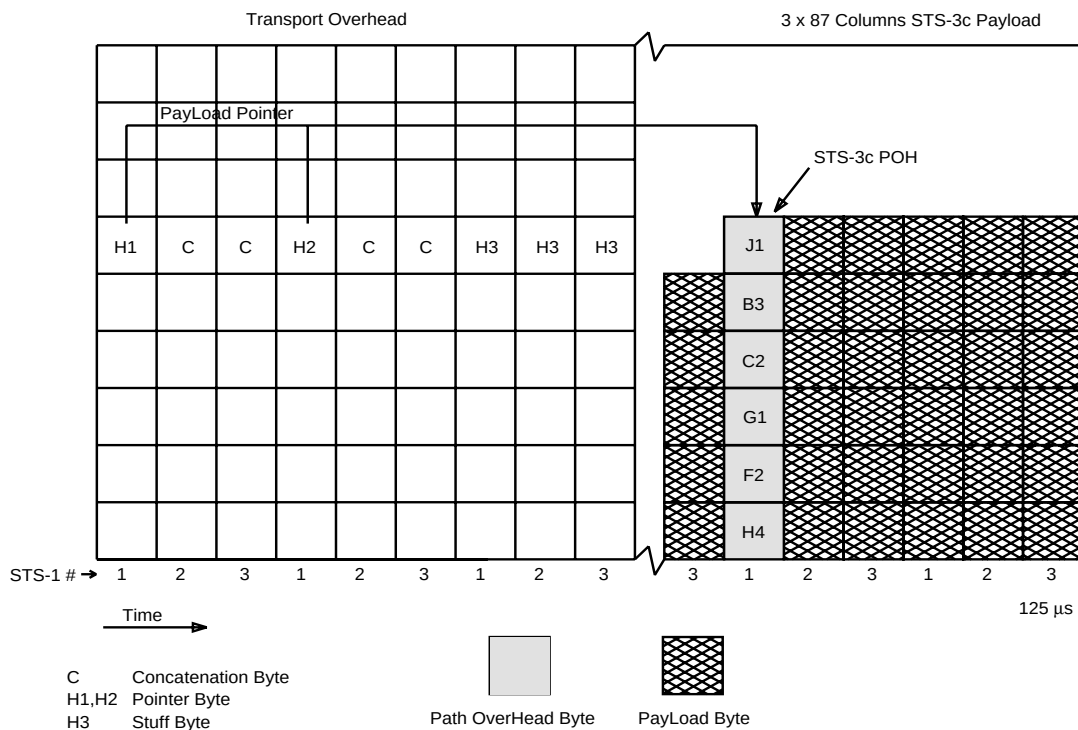


Figure A-11. STS-3c Concatenated Payload

SONET Interface

The SONET interface (Figure A-12) provides the optical midspan meet between SONET network elements. A SONET network element is the hardware and software that processes one or more layers of the SONET signal.

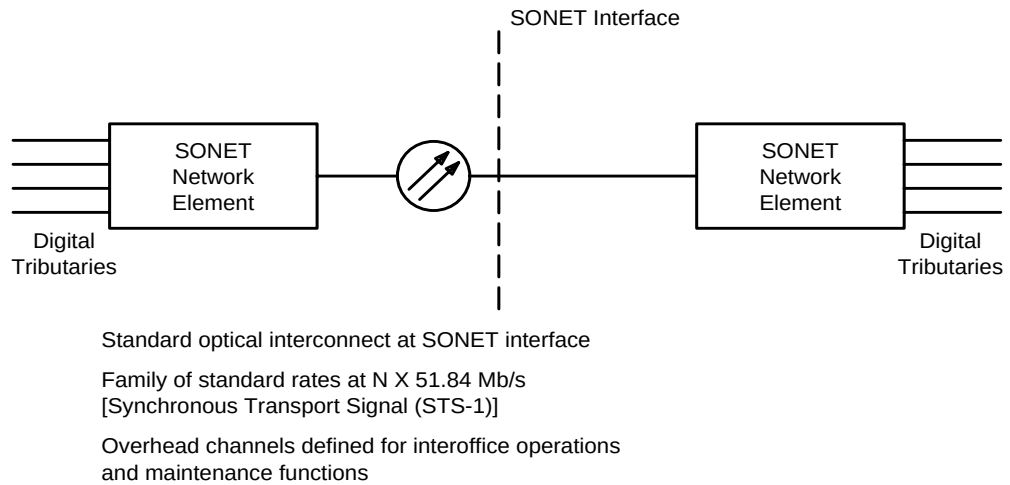


Figure A-12. SONET Interface

SONET Payloads

Table A-29 shows the digital signals that can be transported as SONET payloads.

Table A-29. SONET Payloads

Input Tributary	Equivalent Channels	Rate	SONET Signal	Rate
DS1	24 DS0s	1.544 Mb/s	VT1.5	1.728 Mb/s
E1 (CEPT)	32 DS0s	2.048 Mb/s	VT2	2.304 Mb/s
DS1C	48 DS0s	3.152 Mb/s	VT3	3.456 Mb/s
DS2	96 DS0s	6.312 Mb/s	VT6	6.912 Mb/s
DS3	672 DS0s	44.736 Mb/s	STS-1	51.840 Mb/s
DS4NA	2016 DS0s	139.624 Mb/s	STS-3c	150.336Mb/s
ATM		149.76 Mb/s	STS-3c	150.336Mb/s
FDDI		125.00 Mb/s	STS-3c	150.336Mb/s
Future payloads		up to 150 Mb/s		
Future broadband payloads		Greater than 150 Mb/s		

DS1 and DS3 signals are the most important of these signals in the current network. Broadband payloads, such as asynchronous transfer mode (ATM) and fiber distributed data interface (FDDI), with rates of 150 Mb/s and higher, are also important. Other payloads may be defined for specific applications.

Higher Rate Transport

Higher rate SONET signals are created by byte-interleaving N STS-1 to form an STS- N signal. The STS- N is then scrambled and converted to an optical carrier - level N (OC- N) signal. The OC- N has a line rate of exactly N times the OC-1 signal (see Table A-30).

Table A-30. SONET Transport Rates

OC Level	Line Rate (Mb/s)	Capacity
OC-1	51.84	28 DS1s or 1 DS3
OC-3	155.52	84 DS1s or 3 DS3s
OC-9	466.56	252 DS1s or 9 DS3s
OC-12	622.08	336 DS1s or 12 DS3s
OC-18	933.122	504 DS1s or 18 DS3s
OC-24	1244.16	672 DS1s or 24 DS3s
OC-36	1866.24	1008 DS1s or 36 DS3s
OC-48	2488.32	1344 DS1s or 48 DS3s

Conclusion

The intent of this section is to present a short overview of SONET. More detailed expositions can be found in various literature. An excellent description of SONET can be found in Reference 3.

REFERENCES

1. ANSI T1.106-1988 •American National Standard for Telecommunications - Digital Hierarchy Optical Interface Specifications, Single Mode,• and ANSI T1.105-1991 •American National Standard for Telecommunications - Digital Hierarchy Optical Rates and Formats Specification. •
2. CCITT Recommendations G.707, G.708, G.709.
3. R. Ballert and Y. C. Ching, •SONET: Now It's the Standard Optical Network,• *IEEE Communications Magazine*, Vol. 27, No. 3 (March 1989): 8-15.
4. ANSI T1.102-1993 Draft •American National Standard for Telecommunications - Digital Hierarchy Electrical Interface Specifications. •

Glossary

0x1

See Ring (0x1) Low Speed Interface.

1+1

The 1+1 protection switching architecture protects against failures of the optical transmit/receive equipment and their connecting fiber facility. One bidirectional interface (two fibers plus associated OLIUs on each end) is designated "service," and the other is designated "protection." In each direction, identical signals are transmitted on the service and protection lines ("dual-fed"). The receiving equipment monitors the incoming service and protection lines independently, and selects traffic from one line (the "active" line) based on performance criteria and technician/OS control. In 1+1 both service and protection lines could be active at the same time (service in one direction—protection in the other).

1xN, 1x1

1xN protection switching pertains to circuit pack protection that provides a redundant signal path through the DDM-2000 (it does not cover protection switching of an optical facility; see "1+1"). In 1xN switching, a group of N service circuit packs share a single spare protection circuit pack. 1x1 is a special case of 1xN, with N=1. In 1x1 only one is active at a time.

A

ABN

Abnormal (status condition)

ACO

Alarm Cutoff — A pushbutton switch available on the user panel that can be used to retire an audible office alarm.

ACO/TST

Alarm Cutoff and Test — The name of a pushbutton on the user panel.

Active

Active identifies a 1+1 protected OC-N line which is currently selected by the receiver at either end as the payload carrying signal or a 1x1 or 1xn protected circuit pack that is currently carrying service. (See Standby.)

ADM

Add/Drop Multiplexer.

AGNE

Alarm Gateway Network Element — A defined NE in an alarm group through which members of the alarm group exchange information.

AIS

Alarm Indication Signal — A code transmitted downstream in a digital network that shows that an upstream failure has been detected and alarmed.

AMI

Alternate Mark Inversion — A line code that employs a ternary signal to convey binary digits, in which successive binary ones are represented by signal elements that are normally of alternating, positive and negative polarity but equal in amplitude, and in which binary zeros are represented by signal elements that have zero amplitude.

ANSI

American National Standards Institute

APS

Automatic Protection Switch

ARM

Access Resource Manager

AS&C

Alarm, Status, and Control

ASCII

American Standard Code for Information Interchange — A standard 8-bit code used for exchanging information among data processing systems and associated equipment.

ASN.1

Abstract Syntax Notation 1

ASNE

Alarm Server Network Element.

ATM

Asynchronous Transfer Mode

Auto

Automatic — One possible state of a DS1 or DS3 port. In this state, the port will automatically be put "in service" if a good signal is detected coming from the DSX panel.

Automatic Protection Switc

A protection switch that occurs automatically in response to an automatically detected fault condition.

Automatic Synchronization Reconfiguratio

A feature that allows another synchronization source to be automatically selected and the synchronization source provisioning to be automatically reconfigured in the event of a synchronization source failure or network synchronization change, for example, a fiber cut.

AUXCTL

Auxiliary Control — The name of the slot to the left of the SYSCTL slot on the DDM-2000 OC-3 and FiberReach wideband shelves and to the right of the SYSCTL slot on the DDM-2000 OC-12 shelf.

Available Time

In performance monitoring, the 1-second intervals.

B

B3ZS

Bipolar 3-Zero Substitution — A line coding method that replaces a string of three zeros with a sequence of symbols having some special characteristic.

B8ZS

Bipolar 8-Zero Substitution — A line coding method that replaces a string of eight zeros with a sequence of symbols having some special characteristic.

Backbone Ring

A host ring.

BDFB

Battery Distribution and Fuse Bay.

BER

Bit Error Ratio — The ratio of bits received in error to the total bits sent.

BIP

Bit Interleaved Parity — A method of error monitoring over a specified number of bits, that is, BIP-3 or BIP-8.

BITS

Building Integrated Timing Supply — A single clock that provides all the DS1 and DS0 synchronization references required by clocks in a building.

BRI

Basic Rate Interface

Broadband

Any communications channel with greater bandwidth than a voice channel; sometimes used synonymously with wideband.

C

CC

Clear Channel — A provisionable mode for the DS3 output that causes parity violations not to be monitored or corrected before the DS3 signal is encoded.

CCITT

International Telephone and Telegraph Consultative Committee — An international advisory committee under United Nations' sponsorship that has composed and recommended for adoption worldwide standards for international communications. Recently changed to the International Telecommunications Union Telecommunications Standards Sector (ITU-TSS).

CEV

Controlled Environment Vault

CD-ROM

Compact Disk, Read Only Memory

CDTU

Channel and Drop Test Unit

Channel

A logical signal within a port. For example, for an EC-1 port, there is one STS-1 channel and sometimes 28 VT1.5 channels. See Port.

Channel State Provisioning

A feature that allows a user to suppress reporting of alarms and events during provisioning by supporting multiple states (automatic, in-service and not monitored) for VT1.5 and STS-1 channels. See Port State Provisioning.

CIT

Craft Interface Terminal

CLF

Carrier Line Failure Status

CLK

Clock

CMISE

Common Management Information Service Element

CMOS

Complementary Metal Oxide Semiconductor

CO

Central Office

COACH

A system of on-line support tools aimed at providing product news and bulletins, diagnostic services, compatibility information, and on-line documents.

CP

Circuit Pack

CPE

Customer Premises Equipment

CR

Critical (alarm status)

CSA

Carrier Serving Area

CSU

Channel Service Unit

CS&O

Customer Support and Operations

CV

Coding Violation (a performance-monitoring parameter)

CVFE

Coding Violation Far-End — An indication returned to the transmitting terminal that an errored block has been detected at the receiving terminal.

D**DACS III-2000**

Digital Access and Cross-Connect System that provides clear channel switching at either the DS3 or the STS-1 rates, eliminating the need for manual DSXs.

DACS IV-2000

Digital Access and Cross-Connect System that provides electronic DS3/STS-1 or DS1/VT1.5 cross-connect capability, eliminating the need for manual DSXs.

DCC

Data Communications Channel — The embedded overhead communications channel in the SONET line. It is used for end-to-end communications and maintenance. It carries alarm, control, and status information between network elements in a SONET network.

DCE

Data Communications Equipment — In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

DDM-1000

Lucent's Dual DS3 Multiplexer — A digital multiplexer that multiplexes DS1, DS1C, or DS2 signals into a DS3 signal or a 90 Mb/s or 180 Mb/s optical signal.

DDM-Plus

Lucent's optical and electrical DS1 transport system. DDM-Plus transports up to four DS1s per pair of optical fiber and can provide T1 extension over existing copper wires.

DDM-2000

Lucent's next generation network multiplexers that multiplex DS1, DS3, or EC-1 inputs into EC-1, OC-1, OC-3, or OC-12 outputs.

Default Provisioning

The parameter values that are preprogrammed as shipped from the factory.

Demultiplexing

A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DEMUX

Demultiplexer - "the DEMUX direction" is from the fiber toward the DSX.

Digital Multiplexer

Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

DLC

Digital Loop Carrier

DPLL

Digital Phase-Locked Loop

DRI

Dual Ring Interworking. Two ring networks interconnected at two common nodes.

Drop and Continue

A technique that allows redundant signal appearances at two central offices in a DRI network, allowing protection against central office failures.

DS1

Digital Signal Level 1 (1.544 M/bs)

DS1 Circuit Pack

The DS1 interface circuit pack interfaces to the DSX-1 panel.

DS3

Digital Signal Level 3 (44.736 M/bs)

DS3 Circuit Pack

The DS3 circuit pack interfaces to the DSX-3 panel.

DSn

Digital Signal Rate n — One of the possible digital signal rates at DDM-2000 OC-3 and OC-12 interfaces: DS1 (1.544 Mb/s) or DS3 (44.736 Mb/s).

DSNE

Directory Services Network Element — A designated network element that is responsible for administering a database that maps network element names (TIDs) to addresses [NSAPs (network service access points)] in an OSI subnetwork. There can be one DSNE per ring. Can also be a GNE.

DSX

Digital Cross-Connect Panel — A panel designed to interconnect equipment that operates at a designated rate. For example, a DSX-3 interconnects equipment operating at the DS3 rate.

DT

Distant Terminal

DTE

Data Terminating Equipment — That part of a data station that serves as a data source (originates data for transmission), a data sink (accepts transmitted data), or both.

Dual 0x1 Cross-Connection

In a single-homed application, the DDM-2000 OC-3/OC-12 Multiplexer uses a dual 0x1 cross-connection to map the VT1.5 channels between the DDM-2000 FiberReach OC-1 and the DDM-2000 OC-3/OC-12 rings. This dual 0x1 architecture means that the VT1.5 path switching is one in the DDM-2000 FiberReach and not in the host DDM-2000. Individual DS1 signals within an STS-1 can therefore be dropped to DDM-2000 OC-3 shelves at several nodes around the ring. See Single 0x1.

Dual Homing

In DDM-2000 FiberReach, a network topology in which two OC-3 shelves serve as DDM-2000 FiberReach Multiplexer hosts supporting up to twelve OC-1 rings. Each DDM-2000 FiberReach Multiplexer ring is interconnected between the two separate hosts. Two *SLC-2000* Access Systems serving as DDM-2000 FiberReach hosts can support up to four OC-1 rings. See Single Homing."

E

EC-1, EC-n

Electrical Carrier — The basic logical building block signal with a rate of 51.840 Mb/s for an EC-1 signal and a rate of n times 51.840 Mb/s for an EC-n signal. An EC-1 signal can be built in two ways: A DS1 can be mapped into a VT1.5 signal and 28 VT1.5 signals multiplexed into an EC-1 (VT1.5 based EC-1), or a DS3 can be mapped directly into an EC-1 (DS3 based EC-1).

ECI

Equipment Catalog Item — The bar code number on the faceplate of each circuit pack used by some inventory systems.

EEPROM

Electrically Erasable Programmable Read-Only Memory

EIA

Electronic Industries Association

EMC

Electromagnetic Compatibility

EMI

Electromagnetic Interference

EOOF

Excessive Out of Frame

EPROM

Erasable Programmable Read-Only Memory

EQ

Equipped (memory administrative state)

ES

Errored Seconds — A performance monitoring parameter. ES "type A" is a second with exactly one error; ES "type B" is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

ESD

Electrostatic Discharge

ESF

Extended Super Frame (format for DS1 signal)

EST

Environmental Stress Testing

F**FCC**

Federal Communications Commission

FDDI

Fiber Distribution Data Interface

FE

Far-End. Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

FE-ACTY

Far End Activity — An LED on the user panel.

FEBE

Far End Block Error — An indication returned to near-end transmitting node that an errored block has been detected at the far end.

FE ID

Far End Identification — The 7-segment display on the faceplate of the SYSCTL circuit pack.

FEPROM

Flash EPROM — A new technology that combines the nonvolatility of EPROM with the in-circuit reprogrammability of EEPROM (electrically-erasable PROM).

FERF

Far-End-Receive Failure — An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure.

FE SEL

Far End Select — An LED on the user panel.

FIT

Failures in 10^{-9} hours of operation.

Free Running

An operating condition of a clock in which its local oscillator is not locked to an internal synchronization reference and is using no storage techniques to sustain its accuracy.

FT-2000

AT&T's SONET OC-48 lightwave system.

Function Unit

Refers to any one of a number of different circuit packs that can reside in the A, B, or C function unit slots on the DDM-2000 OC-3 Multiplexer, or in the A, B, C, or D function unit slots of the DDM-2000 OC-12 Multiplexer.

G**GNE**

Gateway Network Element — A network element that has an active X.25 link. Can also be a DSNE.

GR

Bellcore General Requirement

Group

The eight slots that may be equipped.

GTP

General Telemetry Processor

GUI

Graphical User Interface

H**Hairpin Routing**

A cross-connection between function units (*inter*-function unit). For example, function unit C to function units A or B. Also, a cross-connection within the same function unit (*intra*-function unit). Cross-connections go through main, but no bandwidth or time slots are taken from the backbone ring. Eliminates need for another shelf.

HECI

Humans Equipment Catalog Item

Holdover

An operating condition of a network element in which its local oscillator is not locked to any synchronization reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

I**IC**

Internal Clock. Used in synchronization messaging.

ID

Identifier. See shelf ID and site ID.

IEC

International Electrotechnology Commission

IMF

Infant Mortality Factor

INC

Incoming Status

INCM

A parallel telemetry point used to indicate incoming low-speed failures.

I/O

Input/Output

IP

Internetwork Protocol

IR

Intermediate Reach. A term used to describe distances of from 15 to 40 km between optical transmitter and receiver without regeneration. See long reach.

IS

In Service — One possible state of a DS1, DS3, or EC-1 port. Other possible states are "auto" (automatic) and "nmon" (not monitored).

ISCI

Intershell Control Interface

ISI

Intershell Interface

ISDN

Integrated Services Digital Network

IS-3

An intraoffice short reach proprietary interface provided by the 21D/21D-U and 22D-U optical line interface units.

ISO

International Standards Organization. See OSI.

IVHS

Intelligent Vehicle Highway System

J

Jitter

Timing jitter is defined as short-term variations of the significant instants of a digital signal from their ideal positions in time.

L

LAN

Local Area Network

LAPD

Link Access Procedure "D"

LBO

Line Build Out — An equalizer network between the DDM-2000 OC-3 and OC-12 Multiplexers and the DSX panel. It guarantees the proper signal level and shape at the DSX panel.

LCN

Local Communications Network

LEC

Local Exchange Carrier

LED

Light Emitting Diode — Used on a circuit pack faceplate to show failure (red) or service state. It is also used to show the alarm and status condition of the system.

Line Timing

The capability to directly derive clock timing from an incoming OC-N signal while providing the user the capability to provision whether switching to an alternate OC-N from a different source (as opposed to entering holdover) will occur if the OC-N currently used as the timing reference for that NE becomes unsuitable as a reference. For example, intermediate nodes in a linear network are line timed. See Loop Timing.

Local

See Near-End.

Locked Cross-Connection

This is a variation of the ring cross-connection that allows the user to lock the path selector to a specified rotation of the ring. Any signal received from the other rotation of the ring is ignored.

LOF

Loss of Frame — A failure to synchronize to an incoming signal.

Loop Timing

Loop timing is a special case of line timing. It applies to NEs that have only one OC-N interface. For example, terminating nodes in a linear network are loop timed. See Line Timing.

LOP

Loss of Pointer — A failure to extract good data from an STS-1 payload.

LOS

Loss of Signal — The complete absence of an incoming signal.

LR

Long Reach. A term used to describe distances of 40 km or more between optical transmitter and receiver without regeneration. See intermediate reach.

LS

Low Speed

M

Main

Slots on the DDM-2000 shelf in which the OLIU circuit packs are installed.

Midspan Meet

The capability to interface between two lightwave terminals of different vendors. This applies to high-speed optical interfaces.

MD

Mediation Device

MJ

Major Alarm

MM

Multimode

MML

huMan-Machine Language defined by ITU-TSS, formerly CCITT.

MN

Minor Alarm

MPEG

Moving Picture Experts Group

MSDT

Multi-Services Distant Terminal

MTBF

Mean Time Between Failures

MTBMA

Mean Time Between Maintenance Activities

Multiplexing

The process of combining several distinct digital signals into a single composite digital signal.

Mult

Multiplying. The cascading of signals in a bay. In the MULT mode, the DS1 external reference can be cascaded to other shelves in a bay using Mult cables. Normally starting with the bottom shelf (Number 1) and working towards the top of the bay.

MUX

Multiplex

MXBIU

Multiplexer and Backplane Interface Unit

MXRVO Circuit Pack

The MXRVO circuit pack multiplexes seven VT-G signals from the DS1 circuit packs to an STS-1 signal for connection to the OLIU circuit packs.

N

NE

Near-End. The network element the user is at or working on. Also called local.

NE

Network Element — The basic building block of a telecommunications equipment within a telecommunication network that meets SONET standards. Typical internal attributes of a network element include: one or more high- and low-speed transmission ports, built-in intelligence, synchronization and timing capability, access interfaces for use by technicians and/or operation systems. In addition, a network element may also include a time slot interchanger.

NE-ACTY

Near End Activity — An LED on the user panel.

NEBS

Network Equipment-Building System

nm

Nanometer (10⁻⁹ meters)

NMA

Network Monitoring and Analysis — An operations system designed by Bellcore which is used to monitor network facilities.

NMON

Not Monitored — A provisioning state for equipment that is not monitored or alarmed.

Node

In SONET a node is a line terminating element.

Non-Revertive

A protection switching mode in which, after a protection switch occurs, the equipment remains in its current configuration after any failure conditions that caused a protection switch to occur clear or after any external switch commands are reset. (See Revertive.)

NRZ

Nonreturn to Zero

NSA

Not Service Affecting

NSAP

Network Services Access Point — An address that identifies a network element. Used for maintenance subnetwork communication using the OSI protocol.

NTF

No Trouble Found

O**OAM&P**

Operations, Administration, Maintenance, and Provisioning

OC, OC-n

Optical Carrier — The optical signal that results from an optical conversion of an STS signal; that is, OC-1 from STS-1 and OC-n from STS-n.

OC-1

Optical Carrier Level 1 Signal (51.84 Mb/s)

OC-3

Optical Carrier Level 3 Signal (155 Mb/s)

OC-3c (STS-3c)

Optical Carrier Level 3 Concatenated Signal — Low-speed broadband signal equivalent to three STS-1s linked together with a single path overhead.

OC-12

Optical Carrier Level 12 Signal (622 Mb/s)

OHCTL

The overhead controller circuit pack provides user access to the SONET overhead channels.

OLIU

Optical Line Interface Unit

OOF

Out of Frame

OOL

Out of Lock

Operations Interface

Any interface that provides information on the system performance or control. These include the equipment LEDs, user panel, CIT, office alarms, and all telemetry interfaces.

OPS/INE

Operations System/Intelligent Network Element

OS

Operations System — A central computer-based system used to provide operations, administration, and maintenance functions.

OS-GNE

Operations System - Gateway Network Element

OSI

Open Systems Interconnection — Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

OSGNE

Operations System Gateway Network Element — An OSGNE serves as a single interface to the OS for NEs in the same subnetwork using X.25 interfaces.

OSMINE

Operations Systems Modifications for the Integration of Network Elements.

OSP

Outside Plant

P**Pass Through**

Paths that are cross-connected directly across an intermediate node in a ring network.

P-bit

Performance Bit

PC

Personal Computer

PCU

Power Conversion Unit

PID

Program Identification

PINFET

Positive Intrinsic Negative Field Effect Transistor

PJC

Pointer Justification Count

Plesiochronous Network

A network that contains multiple maintenance subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly different at any particular instant. For example in SONET networks, each timing traceable to their own Stratum 1 clock are considered plesiochronous with respect to each other.

PLL

Phased-Locked Loop

PM

Performance Monitoring — Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

PMN

Power Minor Alarm

POH

Path Overhead

POP

Points of Presence

Port

The physical, electrical, or optical interface on a system. For example, DS1, DS3, EC-1, OC-3, and OC-12. See Channel.

Port State Provisioning

A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service and not monitored) for low speed ports. See Channel State Provisioning.

POTS

Plain Old Telephone Service

Proactive Maintenance

Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect (for example, performance monitoring).

Protection Line

As defined by the SONET standard, the protection line is the pair of fibers (one transmit and one receive) that carry the SONET APS channel (K1 and K2 bytes in the SONET line overhead). On a DDM-2000 OC-3 system, a *protection* line is a pair of fibers that terminate on an OLIU circuit pack in the main - 2, fn - a - 2, fn - b - 2, or fn - c - 2 slot. (See "Service Line.")

PRM

Performance Report Message

PROTN

Protection

Product Family 2000

Lucent's line of SONET standard network products providing total network solutions.

PRS

Primary Reference Source

PSU

Power Supply Unit

PVC

Permanent Virtual Circuit

PWR

Power

R**RAM**

Random Access Memory

Reactive Maintenance

Refers to detecting defects/failures and clearing them.

Remote

See Far-End.

REN

Ringer Equivalent Number

Revertive

A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the service equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur clear or after any external switch commands are reset. (See "Non-Revertive.")

RGU

Ringling Generator Unit

Ring

A configuration of nodes comprised of network elements connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over a protection line. Ring (0x1) Low Speed Interface

Formerly referred to as dual 0x1 or single 0x1. In ring applications, the DDM-2000 OC-3 and OC-12 Multiplexers use a 0x1 interface meaning both fibers carry service as opposed to a linear (1+1) low speed interface where one fiber is used for service and the other for protection. See 1+1.

RPP

Reliability Prediction Procedure — Described in Bellcore TR-NWT-00032.

RT

Remote Terminal — An unstaffed equipment enclosure that may have a controlled or uncontrolled environment.

RTAC

AT&T Regional Technical Assistance Center (1-800-225-RTAC)

RZ

Return to Zero

S**SA**

Service Affecting

SCADA

Supervisory Control and Data Acquisition

SD

Signal Degrade

SDH

Synchronous Digital Hierarchy

Self-Healing

Ring architecture in which two or more fibers are used to provide route diversity. Node failures only affect traffic dropped at the failed node.

SEFS

Severely Errored Frame Seconds

SEO

Single-Ended Operations — The maintenance capability that provides remote access to all DDM-2000 systems from a single location over the DCC.

Service Line

On a DDM-2000 system, a service (or "working") line is a pair of fibers (one transmit and one receive) that terminate on an OLIU circuit pack in the main-1, or fn-a-1, or fn-b-1, or fn-c-1 slot. As defined by the SONET standard, the SONET APS channel is not defined on a service (or "working") line. (See "Protection Line.")

SES

Severely Errored Seconds — This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occurs.

SF

Super Frame (format for DS1 signal)

Shelf ID

A switch settable parameter with values of from 1 to 8. Used to log into a selected shelf in a bay using the CIT.

SID

System Identification

Single 0x1 Cross-Connection

In a dual-homed application, the DDM-2000 OC-3/OC-12 Multiplexer uses a single 0x1 cross-connection to map the VT1.5 channels between the DDM-2000 FiberReach OC-1 and the DDM-2000 OC-3/OC-12 rings. This single 0x1 architecture maps low speed to high speed on a specified ring rotation. The high speed to low speed drop is made on the same specified ring with no path switching. Protection is provided at the VT1.5 end points. See Dual 0x1.

Single Homing

In DDM-2000 FiberReach, a network topology in which a single OC-3 shelf serves as a DDM-2000 FiberReach Multiplexer host supporting up to six OC-1 rings. A SLC-2000 Access System serving as a host can support up to two OC-1 rings. See Dual Homing.

Site ID

A switch settable parameter with values of from 1 to 8. Displayed on SYSCTL circuit pack to indicate to which site the user panel alarms and LEDs apply.

SLIM

Subscriber Loop Interface Module

SM

Single Mode

SONET

Synchronous Optical Network

SPE

Synchronous Payload Envelope

SPOTS

Super POTS

SQU

Sync Quality Unknown. Used in synchronization messaging.

SRD

Software Release Description

Standby

Standby identifies a 1+1 protected OC-N line which is not currently selected by the receiver at either end as the payload carrying signal, or a 1x1 or 1xn protected circuit pack that is not currently carrying service. (See Active.)

Star Topology

For DDM-2000 FiberReach, this refers to a configuration of multiple point-to-point OC-1 extensions from a single DDM-2000 OC-3/OC-12 Multiplexer.

Status

The indication of a short-term change in the system.

STS, STS-n

Synchronous Transport Signal — The basic logical building block signal with a rate of 51.840 Mb/s for an STS-1 signal and a rate of n times 51.840 Mb/s for an STS-n signal.

STS-1 SPE

STS-1 Synchronous Payload Envelope — A 125-microsecond frame structure composed of STS path overhead and the STS-1 payload.

STS-3c

Synchronous Transport Level 3 Concatenated Signal. See OC-3c.

Subnetwork

Group of SONET network elements that share a SONET data communications channel.

Synchronization Messaging

SONET synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

SYSCCTL

The system controller circuit pack that provides overall administrative control of the terminal.

T**T1EXT**

T1 Carrier Extension Circuit Pack

T1X1 and T1M1

The ANSI committees responsible for telecommunications standards.

TA

Bellcore Technical Advisory

TABS

Telemetry Asynchronous Byte Serial (Protocol)

TARP

TID Address Resolution Protocol

TBOS

Telemetry Byte-Oriented Serial (Protocol) — Defines one physical interface for direct connection between the telemetry remote and the monitored equipment. An RS-422 port is used to provide the operations system with sufficient alarm and status information to localize a problem to a given DDM-2000 and to determine the severity of the problem.

TCA

Threshold-Crossing Alert — A condition set when a performance-monitoring counter exceeds a user-selected threshold. A TCA does not generate an alarm but is available on demand through the CIT and is shown by TBOS and causes a message to be sent to NMA via the X.25/TL1 interface.

TCVCXO

Temperature-Compensated Voltage-Controlled Crystal Oscillator — A highly stable and accurate clock source used in the DDM-2000 TGS circuit pack.

TGS

The timing generator circuit pack generates clock signals for distribution to the transmit circuits. It operates in the free-running, loop-timing, phase-lock, and holdover modes.

TID

Target Identifier — The Bellcore name for the system name.

TL1

Transaction Language 1 — A Bellcore machine-to-machine communications language that is a subset of ITU-TSS, formerly CCITT's, human-machine language.

TLB

Timing Looped Back. Used in synchronization messaging.

TOP

Task Oriented Practice

TR

Bellcore Technical Requirement

TSA

Time Slot Assignment

TSI

Time Slot Interchange

TSO

Technical Support Organization — Supports RTAC and the customers.

U

UAS

Unavailable Seconds. In performance monitoring, the count of seconds in which a signal is declared failed or, in which, 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

Unidirectional

A protection switching mode in which the system at each end of an optical span monitors both service and protection lines and independently chooses the best signal (unless overridden by an equipment failure or by an external request, such as a forced switch or lockout). In a system that uses unidirectional line switching, both the *service* and *protection* lines may be *active* simultaneously, with one line carrying traffic in one direction and the other line carrying traffic in the other direction. The K1 and K2 bytes in the SONET line overhead are used to convey to the far end which line the near end receiver has chosen, so that an "active" indication may be made at the far end.

UOC

Universal Optical Connector — Receptacles on the faceplate of some OLIUs that accept *ST*[®], SC, or FC connectors.

UPD/INIT

A pushbutton on the user panel.

V

VF

Voice Frequency

VLSI

Very Large Scale Integration — Refers to very complex state of the art integrated circuits.

VM

Violation Monitor — A mode of the DS3 circuit pack in which it will monitor but not remove P-bit parity violations on the DS3 signal received from the fiber.

VMR

Violation, Monitor, and Removal — A mode of the DS3 circuit pack in which it will monitor and remove P-bit parity violations on the DS3 signal received from the fiber.

VONU

Virtual Optical Network Unit

VT

Virtual Tributary — A structure designed for transport and switching of a sub-DS3 payload.

VT1.5

A 1.728 Mb/s virtual tributary

VT-G

Virtual Tributary Group — A 9-row by 12-column SONET structure (108 bytes) that carries one or more VTs of the same size. Seven VT groups (756 bytes) are byte-interleaved within the VT-organized STS-1 synchronous payload envelope.

W

WAN

Wide Area Network

Z

Zero Code Suppression

A technique used to reduce the number of consecutive zeros in a line-codes signal (B3ZS for DS3 signals and B8ZS for DS1 signals).

Index

Numerics

0x1, 8-66
177A Retainer Card, 7-31, 7-38
Description, 7-43

A

ABN LED, 6-10
Access
Front, 9-35
ACO Indicator, 10-48
ACO LED, 6-10
ACO/TST Pushbutton, 6-11
ACTIVE Indicators, 6-13, 10-48
ACTIVE LED on Rings, 9-33
Administration
Controller Maintenance and Memory Administration, 8-4
Memory, 8-5
Security, 8-2
Software Upgrades, 8-4
Version Recognition, 8-1
AGNE, 8-24
AIS, 9-24
Alarm, 6-10
Delay, 6-14
Power Minor, 4-5
Alarm and Status Points
TBOS, 6-16
Alarm Gateway Network Element (AGNE), 8-24
Alarm Groups, 8-23
Alarm Indication Signal (AIS), 9-11
Alarms
Office, 6-14
Reports, 9-62
Status, 9-62
Applications
2000 Product Family Interworking, 2-59
Add/Drop, 2-56
Broadband Business Access, 2-70
DACS IV-2000 Cross-Connect System, 2-61
DS1 Performance Monitoring for Tariff Verification, 2-80
DS3 Transmultiplexer (TMUX) Application, 2-82
Dual Homing, 2-26
Dual Homing with Dual Ring Interworking, 2-36
Dual Ring Interworking, 2-28
Electrical Multiplexer, 2-58

Folded Ring, 2-18
FT-2000 OC-48 Lightwave System, 2-62
Gateway Between SONET and Asynchronous Interfaces,
2-74
Hairpin Cross-Connections on Rings, 2-40
High bit rate Digital Subscriber Line (HDSL) Application,
2-83
Hubbing, 2-51
Intelligent Vehicle Highway System, 2-78
Interoffice Transport, 2-69
LAN/WAN Data Networking/NMLI Services, 2-72
Loop Feeder, 2-69
MegaStar 2000 Radio, 2-67
Multivendor Applications, 2-68
OC-1 Path Switched Ring, 2-17
OC-1 Ring Transport on OC-3 Ring, 2-20, 2-26
OC-12 Path Switched Rings, 2-9
OC-12 STS-1/VT1.5 Path Switched Ring (0x1), 2-17
OC-3 Hubbing, 2-52
OC-3 Linear Optical Extensions from OC-3 and OC-12
Rings, 2-38
OC-3 Path Switched Ring, 2-6
OC-3 Point-to-Point, 2-45
OC-3 Repeater, 2-50
OC-3 Ring Transport on OC-12 Point-to-Point, 2-25
OC-3c Transport on OC-12, 2-54
Operations Interworking, 2-62
Path Switched Rings, 2-3
Point-to-Point Topologies, 2-45
Teleprotection and SCADA Applications, 2-76
Attenuators
Universal Buildout, 10-37
Universal Optical Connector, 10-37
Automatic Synchronization Reconfiguration, 9-34

B

Backup and Restoral, 8-6
Brownout Protection, 7-6

C

Cable
Dangler, 3-31
Canadian Standards Association, 10-55
C-Bit, 9-42
Centralized Survivable OS Access (OSGNE), 8-21
Channel State Provisioning, 8-18
Circuit Breakers
Fan, 3-32
Circuit Packs
177A Retainer Card, 7-31, 7-38, 7-43

- 21D/21D-U OLIU, 7-95
- 21G/21G-U/21G2-U OLIU, 7-101
- 22D-U OLIU, 7-116
- 22F/22F-U/22F2-U OLIU, 7-109
- 22G-U/22G2-U/22G3-U OLIU, 7-123
- 24G-U OLIU, 7-131
- 26G2-U OLIU, 7-139
- 27G-U/27G2-U OLIU, 7-146
- Automatic Provisioning, 8-16
- BBF1/BBF1B DS1, 7-28
- BBF2B TGS, 7-19
- BBF3/BBF3B DS1PM, 7-35
- BBF5 Jumper Circuit Pack, 7-44
- BBF8 HDSL, 7-45
- BBG10 OHCTL, 7-14
- BBG19 DS3 Data Service, 7-76
- BBG2 MXRVO, 7-54
- BBG20 TMUX, 7-84
- BBG4/BBG4B DS3, 7-59
- BBG6 STS1E, 7-67
- BBG8/BBG8B SYSCCTL, 7-3
- BBG9 OHCTL, 7-10
- Control, 7-2
- Faceplate Indicators, 6-8
- Slots, Equipping, 3-12
- Universal Optical Connector, 7-91
- CIT
 - Interfaces, 6-4
 - Local Access, 6-4
 - Modem Access, 6-6
 - Modem Port, 6-2
 - PC as a CIT, 6-6
 - Remote Access Using DCC, 6-7
 - Terminals, 6-2
- Clear Delay, 6-14
- CLEI, 8-1
- CLF Status, 6-25
- Comments
 - Document, lxxxvi
- Configurations (*see also* Applications, Shelf)
- Connectors
 - Universal Optical, 3-1
- Control Points
 - TBOS, 6-17
- Courses
 - Training, lxxv
- CPro-2000 Graphical User Interface and Provisioning Tool,
 - 6-8, 10-47
- Craft Interface Terminals, 6-2
- Cross-Connect Tests, 9-36
- Cross-Connection Provisioning, 8-26
- Cross-Connections
 - Allowable, 8-32
 - Hairpin, 8-28
 - Linear Example, 8-50
 - Locked, 8-27
 - OC-3/OC-1 Ring Provisioning, 8-70
 - OC-3/OC-12 Ring Drop and Continue Cross-Connection

- Provisioning, 8-61
- Ring Provisioning, 8-56
- Cross-Connections, Manual
 - Procedure, 8-47
 - Restrictions, 8-48
- Customer Training & Information Products, lxxv

D

- Dangler Cable, 3-31
- DCC
 - Remote Access Using DCC, 6-7
- DCC Provisioning, 8-17
- DDM-2000 FiberReach, 1-3
- DDM-Plus, 1-3
- Default Mapping
 - DS1 to VT1.5, 8-10
- Delay
 - Alarm, 6-14
 - Transmission, 10-41
- Directory Services Network Element (DSNE), 8-23
- Discretes
 - Miscellaneous, 6-27
- Document Comments, lxxxvi
- Documentation
 - Electronic, lxxxvi
 - Ordering, lxxxiv
 - Related, lxviii
 - Support, lxxxiii
- Drawings
 - DDM-2000 OC-12, lxxii
 - DDM-2000 OC-3, lxxii
- DS1 Line Performance Monitoring
 - ES-L Errored Seconds, 9-52
- DS1 Outputs, 7-24
- DS1 Path Parameters Performance Monitoring
 - CV-P Coding Violations, 9-52
 - CV-PFE Coding Violations, 9-52
 - ES-P Errored Seconds, 9-51
 - SES-P Severely Errored Second, 9-52
 - UAS Unavailable Seconds, 9-52
- DS1 Timing Output, 7-21
- DS3 Line Performance Monitoring
 - CV-L Coding Violations, 9-56
 - ES-L Errored Seconds, 9-56
 - SES-L Severely Errored Seconds, 9-56
- DS3 Path Path Performance Monitoring
 - SESF Severely Errored Frame Seconds, 9-54
- DS3 Path Performance Monitoring
 - CV-P Coding Violations, 9-54
 - ES-P Errored Seconds, 9-54
 - SES-P Severely Errored Seconds, 9-54
 - UAS-P Unavailable Seconds, 9-54
- DS3 Performance Monitoring, 9-42
 - C-Bit, 9-42
 - F&M-Bit, 9-42

- P-Bit, 9-42
- DSNE, 8-23
- DSX Test, 9-36
- Dual Homing, 5-19
- Dual Ring Interworking
 - Path Protection Scheme, 9-31
 - Software Compatibility, 9-10

E

- Earthquake Requirements, 10-54
- Electrostatic Discharge, lxiii
- EMC Requirements, 10-54
- Environmental Alarms, 6-26, 6-27
- Environmental Controls, 6-26, 6-27
- Equipment Indicators, 6-13, 10-48
- Equipment Protection, 9-33
- ESD Considerations, lxiii

F

- F&M-Bit, 9-42
- Faceplate Indicators, 6-8
- Fan
 - Alarm, 10-54
 - Cooling, 10-54
 - Shelf, 10-54
- Fan Circuit Breakers, 3-32
- Fan Filters, 3-31
- Fan Shelf Switch Settings, 3-30
- Far End Status, 6-25
- Fault Detection, Isolation and Reporting, 9-23
- FAULT Indicators, 6-13, 10-48
- FAULT LEDs, 4-5
- FE, 6-25
- FE ACTY LED, 6-10
- FE SEL Pushbutton, 6-10
- Feature Package Provisioning, 8-17
- FERF, 9-24
- FERF Signals, 9-11
- FiberReach, 1-3
- Filters
 - Fan, 3-31
- Fire Resistance, 10-55
- Fuses, 4-2
 - Shelf, 10-56

G

- Gateway Network Elements (GNEs)
 - Multiple, 8-21
- Grounding Jacks, lxv

H

- Hairpin Cross-Connections, 2-40, 8-28
- Hardened
 - Uncontrolled Environments, 10-54
- Heat Baffles, 10-54
- Holdoff Delay, 6-14
- Holdover, 5-35
- Holdover Timing Mode, 9-34

I

- Identifiers
 - AGNE, 8-85
 - DSNE, 8-85
 - GNE, 8-85
 - Network Element ID, 8-85
 - NSAP, 8-85
 - Shelf ID, 8-85
 - Site ID, 8-85
 - Target ID, 8-85
- INC, 6-26
- Incoming Status, 6-26
- Indicators
 - ACTIVE, 6-13
 - Equipment, 6-13, 10-48
 - Faceplate, 6-8
 - FAULT, 6-13
 - User Panel, 10-48
- Infant Mortality, 10-60
- In-Service Upgrades, 9-6
- Installation Tests, 9-36
- Instructions
 - Safety, lx
- Interfaces
 - Craft Interface Terminal, 10-44
 - Office Alarms, 10-48
 - Operations, 10-44
 - Technician, 6-2
 - TL1/X.25, 10-51
- ITM SNC Interface, 6-15

J

Jumpers
 Lightguide, 10-12

L

Laser Classifications, lxi
 Class I, lxi
Lasers and Eye Damage, lxi
LEDs, 4-5
 CONTROL FAULT, 3-32
 FAN FAULT, 3-32
 FILTER REPLACE, 3-32
 POWER FAULT, 3-32
 POWER ON, 3-32
 User Panel, 6-10
Lightguide Jumpers, 10-12
Lightwave Safety Guidelines, lx
Lightwave Safety Precautions, lxii
Line Protection Switching, 9-24
Line Timing, 5-34
Local Tests, 9-36
Locked Cross-Connection, 8-27
Locked DS3 Cross-Connect, 9-30
Loopbacks, 9-35
 DS1 and DS3, 9-35
 Optical, 9-35
Lucent 2000 Product Family, 1-1

M

Maintenance
 Automatic Diagnostics, 9-23
 Fault Detection, Isolation and Reporting, 9-23
 History Reports, 9-62
 Loopbacks and Testing, 9-35
 Proactive, 9-38
 Signaling, 9-11
 Single-Ended Maintenance Philosophy, 9-4
 Subnetwork, 9-4
 Three-tiered Operations, 9-1
Maintenance Signals
 Rings, 9-18
Memory
 BBG8 SYSCTL Circuit Pack, 7-4
Memory Administration, 8-5
Messages
 TL1, 6-15

Miscellaneous Discretes
 User-Definable, 6-26, 6-27, 10-49
Mixing
 OC-3 Optical Interface, 10-33
Modem, 6-2
 Baud Rates, 6-6
Modem Access, 6-6
Modem Port
 CIT, 6-2
Modems
 Compatible, 6-7, 10-46
Multiplexing and Mapping, 8-8
 DS1 to EC-1, 8-15
 DS1 to OC-1/OC-3/OC-12, 8-9
 DS3 to EC-1, 8-15
 DS3 to OC-1/OC-3/OC-12, 8-12
 EC-1 to EC-1, 8-15
 EC-1 to OC-1/OC-3/OC-12, 8-12
 Electrical EC-1 Multiplexer Application, 8-46
 OC-1 to OC-1 Hairpin, 8-14
 OC-1/OC-3/OC-12 to OC-1/OC-3/OC-12, 8-13
 OC-3 to OC-1, 8-13
 OC-3/OC-12 Path Protected Ring Drop and Continue
 Application, 8-46
 OC-3/OC-12 Path Protected Ring Optical Extension Appli-
 cation, 8-46
 OC-3/OC-12/OC-1 Path Protected Ring Application, 8-46
 OC-3c to OC-3c, 8-15
 Optical Add/Drop Application, 8-45
 Optical Drop Application, 8-45
 Optical Hubbing Application, 8-45
 Optical Point-to-Point Application, 8-45
 STS-1 to STS-1 Hairpin, 8-14

N

NE, 6-25
NE ACTY LED, 6-10
Near End Status, 6-25
Network Map Report
 Gateway Network Element (GNE), 9-63
Network Monitoring and Analysis, 6-15
NMA, 6-15
NSAP, 8-19

O

OC-3 Section Parameters Performance Monitoring
 Severely Errored Frame Seconds (SEFS), 9-46
OC-3/EC-1 Line Parameters Performance Monitoring
 Errored Seconds, 9-47

- Line Coding Violations (B2 Parity), 9-47
- Line Protection Switch Counts, 9-48
- Severely Errored Seconds, 9-47
- Unavailable Seconds, 9-48
- OC-3/OC-1 VT1.5 Dual-Homed Path-Switched Ring, 8-77
- OC-3/OC-1 VT1.5 Single-Homed Path-Switched Ring, 8-74
- OC-3/OC-12 VT1.5 Path Switched Ring (0x1), 8-66
- Office Alarms, 6-14
- Office Alarms Interfaces, 10-48
- Open Systems Interconnection Provisioning, 8-19
- Operations Interfaces, 10-44
- Operations Interworking
 - Alarm Gateway Network Element, 8-24
 - Alarm Groups, 8-23
 - Directory Services Network Element (DSNE), 8-23
 - Guidelines, 8-25
 - Remote Login, 8-22
 - Remote Office Alarms and User Panel, 8-22
 - Remote Software Download and Copy, 8-22
 - Single-Ended Operations, 8-21, 9-4
- Operations System/Intelligent Network Element, 6-15
- OPS/INE, 6-15
- Optical Connector
 - Universal, 10-33
- Optical Interface
 - OC-3 Mixing, 10-33
- Optical Parameters Performance Monitoring
 - Laser Bias Current, 9-46
 - Optical Transmit Power, 9-46
- Optical Span Test, 9-36
- Order Wire, 6-30
- Order Wire Interface, 7-17

P

- Parallel Telemetry, 6-25, 10-49
- Parameters
 - CIT Selectable, 8-79
 - Hardware Switch Selectable, 8-79
- Path Protection Switching
 - Rings, 9-27
- P-Bit, 9-42
- PC as a CIT, 6-6
- Performance
 - Jitter, 10-38
 - Signal, 10-38
 - Transient, 10-40
 - Wander, 10-38
- Performance Monitoring, 9-38
 - Adjusted F&M Bit, 9-42
 - C-Bit, 9-43
 - C-Bit Option, 9-55
 - Data Storage and Reports, 9-60
 - DS1, 9-40

- DS1 Line Parameters, 9-52
- DS1 Path Parameters, 9-51
- DS1/DS3 Line and Path and DS3 Path, 9-39
- DS3, 9-42
- DS3 Line, 9-43, 9-56
- DS3 Parameters, 9-53
- DS3 Path, 9-54
- DS3 Performance Monitoring, 9-53
- During Failed Conditions, 9-60
- OC-1 Line Parameters, 9-56
- OC-1 Section Parameters, 9-56
- OC-12 Line Parameters, 9-58
- OC-3 Section Parameters, 9-46
- OC-3/EC-1 Line Parameters, 9-47
- Optical Parameters, 9-46
- Parameter Thresholds, 9-60
- Performance Status Report, 9-61
- Reports, 9-61
- STS-1 Path Parameters, 9-48
- TCA Summary Report, 9-61
- TCA Transmission to OS, 9-61
- Thresholds, 9-60, 10-41
- VT, 9-40
- VT1.5 Path Parameters, 9-50
- Personal Computer for Software Download
 - Specifications, 10-45
- Plug-Ins, OC-3, 3-4
- PMN LED, 4-5
- Port State Provisioning, 8-17
- Power
 - Description, 4-2
 - Distribution, 4-6
 - DS1/DS1PM Circuit Pack, 4-4
 - DS3/TMUX Circuit Pack, 4-3
 - HDSL Circuit Pack, 4-4
 - MXRVO Circuit Pack, 4-3
 - OHCTL Circuit Pack, 4-4
 - OLIU Circuit Packs, 4-3
 - Power Conversion, 4-2
 - Power Modules, 4-2
 - STS1E Circuit Pack, 4-3
 - SYSCTL Circuit Pack, 4-4
 - TGS Circuit Packs, 4-3
- Power Dissipation, 10-57
- Power Loss Restart, 10-40
- Power Minor Alarm, 4-5
- Primary Reference Source (PRS), 5-38
- Proactive Maintenance, 9-38
- Product Family, DDM-2000, 1-3
- Program Flash-EPROM, 7-4
- Protection Switching, 9-24
 - Equipment, 9-33
 - Line, 9-24
 - Linear Networks, 10-40
 - OC-3/OC-1 Path Switched Ring (0x1) Ring, 9-33
 - OC-3/OC-12 Path Switched Ring (0x1), 9-33

- Ring Networks, 10-40
- Synchronization Reference, 9-34
- Provisioning, 8-16
 - AIS or Unequipped Provisioning, 8-18
 - Automatic Provisioning on Circuit Pack Replacement, 8-16
 - Channel State, 8-18
 - Cross-Connection, 8-26
 - Cross-Connection Types, 8-27
 - DCC, 8-17
 - Default Provisioning, 8-16
 - Feature Package, 8-17
 - Line State Provisioning, 8-18
 - Linear Application Default Cross-Connection Mode, 8-30
 - Manual Cross-Connection Procedure, 8-47
 - Manual Cross-Connection Restrictions, 8-48
 - Manual Cross-Connections, 8-31
 - OC-3/OC-1 Ring Cross-Connection, 8-70
 - OC-3/OC-1 VT1.5 Single-Homed Path Switched Ring, 8-74
 - OC-3/OC-12 Ring Drop and Continue Cross-Connection Provisioning, 8-61
 - OC-3/OC-12 VT1.5 Path Switched Ring (0x1), 8-66
 - Operations Interworking Provisioning, 8-20
 - OSI, 8-19
 - Port State, 8-17
 - Remote Provisioning, 8-16
 - Reports, 9-62
 - Ring Cross-Connection, 8-56
- Provisioning Tool, CPro-2000, 6-8, 10-47
- Pushbutton
 - ACO/TST, 6-11
 - ALARM RESET, 3-32
 - ALARM TEST, 3-32
 - Combinations, 6-12
 - Fan, 3-32
 - FE SEL, 6-10
 - UPD/INIT, 6-11
- PWR ON Indicator, 10-48
- PWR ON LED, 4-5, 6-10

R

- Related Training, lxxv
- Releases
 - DDM-2000 OC-3 Multiplexer Releases, 1-6
- Reliability, 10-59
- Reliability Predictions, 10-61
- Reports
 - Alarm and Status, 9-62
 - Database Change Transmission to OS, 9-62
 - Equipment, 9-63
 - Maintenance History, 9-62
 - Network Map, 9-63

- Performance Monitoring, 9-61
- Performance Status Report, 9-61
- Provisioning, 9-62
- State Reports, 9-63
- TCA Summary Report, 9-61
- Requirements
 - Earthquake, 10-54
 - EMC, 10-54
 - Power, 10-56
- Restart
 - Power Loss, 10-40
- Retainer Card
 - 177A Retainer, 7-31, 7-38, 7-43
- RIDES, 6-15
- Ring Interfaces
 - DS3 Data Services on an OC-3 Ring, 5-22
 - OC-1 Ring Function Unit Pass-Through, 5-28
 - OC-1 Ring Hairpin Local Drop, 5-29
 - OC-1/OC-1 Function Unit Hairpin, 5-30, 5-31, 5-32, 5-33
 - OC-3/OC-1 Ring (0x1) Dual-Homing, 5-27
 - OC-3/OC-1 Ring (0x1) Single-Homing, 5-26
 - OC-3/OC-12 Linear (1+1) Optical Extension, 5-23
 - OC-3/OC-12 Ring (0x1), 5-19
 - OC-3/OC-12 Ring (0x1) Dual-Homing, 5-21
 - OC-3/OC-12 Ring (0x1) Single-Homing, 5-20
- Rings
 - ACTIVE LED on, 9-33
 - Cross-Connection Provisioning, 8-56
 - DRI Path Protection Scheme, 9-31
 - Dual Ring Interworking, 9-31
 - Maintenance Signals, 9-18
 - OC-3/OC-1 Cross-Connection Provisioning, 8-70
 - OC-3/OC-1 Ring (0x1), 5-25
 - OC-3/OC-1 VT1.5 Single-Homed Path Switched Ring, 8-74
 - OC-3/OC-12 Drop and Continue Cross-Connection Provisioning, 8-61
 - OC-3/OC-12 Ring (0x1), 5-19
 - OC-3/OC-12 VT1.5 Path Switched Ring (0x1), 8-66
 - Path Protection - Locked DS3 Cross-Connect, 9-30
 - Path Protection Scheme, 9-28
 - Path Protection Switching, 9-27

S

- Safety
 - Cautions, lx
 - Dangers, lx
 - Instructions, lx
 - Labels, lx
 - Lasers and Eye Damage, lxi
 - Lightwave Safety Guidelines, lx
 - Warnings, lx
- Safety Instructions, lxxi

- Safety Precautions for Enclosed Systems, Ixii
- Safety Precautions for Unenclosed Systems, Ixiii
- Security
 - Administration, 8-2
- Serial Telemetry, 10-48
- Serial Telemetry (TBOS), 6-16
- Service Affecting Actions, 8-7
- Shelf
 - Capacity, 3-7
 - Circuit Pack Keying, 3-5
 - Configurations, 3-8
 - DS3 Data Services, 3-21
 - EC-1 Electrical Multiplexer, 3-15
 - EMC Requirements, 3-5
 - Fan Shelf, 3-29
 - Fuses, 4-2, 10-56
 - OC-3 Circuit Pack Slots, 3-5
 - OC-3 DDM-2000 FiberReach Host, Dual Homing, 3-24
 - OC-3 DDM-2000 FiberReach Host, Single Homing, 3-22
 - OC-3 DS1 Add/Drop, 3-16
 - OC-3 Dual Ring Interworking, 3-18
 - OC-3 FiberReach Host Shelf, Enhanced Routing, 3-25
 - OC-3 FiberReach Host Shelf, Enhanced Routing with 26G2-U OLIU, 3-26
 - OC-3 Front Access, 3-1
 - OC-3 Front Panel, 3-5
 - OC-3 Hub, 3-13
 - OC-3 Multiplexer, 3-1
 - OC-3 Rear Access, 3-1
 - OC-3 Ring, 3-17
 - OC-3 Ring with Optical Extension, 3-19
 - OC-3 Terminating, 3-12
 - OC-3 VT Hairpin, 3-20
 - OC-3 with DS3 Transmultiplexer, 3-28
 - OC-3 with HDSL Interface, 3-27
 - STS-1 Drop, 3-14
- SID, 6-26
- Signaling
 - Maintenance, 9-11
- Signals
 - Alarm Indication Signal (AIS), 9-11
 - FERF, 9-11
 - Yellow, 9-11
- Single Homing, 5-17, 5-19
- Single-Ended Operations, 9-4
- Slots, Circuit Pack, OC-3, 3-5
- Software
 - Circuit Pack Compatibility Matrix, 3-9
 - Compatibility, 8-4, 9-8
- Software Compatibility
 - DRI, 9-10
 - Operations Interworking, 8-20
- SONET
 - Concatenated Mode, A-16
 - Frame Structure, A-6
 - History, A-1
- Interface, A-17
- Layers, A-4
- Multiplexing Procedures, A-14
- Overhead Bytes, 10-38
- Purpose, A-2
- Section Order Wire, A-6
- Section Overhead, A-6
- Specifications
 - 21D/21D-U and 22D-U OLIUs, 10-17
 - 21G/21G-U/21G2-U OLIU Circuit Pack, 10-13
 - 22F/22F-U/22F2-U OLIU, 10-14
 - 22G-U/22G2-U/22G3-U OLIU, 10-15
 - 24G-U OLIU, 10-16
 - 26G2-U/27G-U/27G2-U OLIU, 10-18
 - BBF2/BBF2B TGS, 10-39
 - Craft Interface Terminal, 10-44
 - DS1 Low-Speed (BBF1B), 10-3
 - DS1PM Low-Speed (BBF3), 10-4
 - DS3 Data Services Interface (BBG19), 10-9
 - DS3 Low-Speed (BBG4/4B), 10-6
 - DS3 Transmultiplexer (BBG20), 10-10
 - EC-1 High-Speed and Low-Speed (BBG6), 10-8
 - Electrical Interfaces, 10-2
 - Environmental, 10-54
 - External Transmission Interfaces, OC-3, 10-1
 - HDSL Interface (BBF8), 10-5
 - Long Reach OC-12 Interface (24G-U), 10-16
 - Optical Interfaces, 10-13
 - Order Wire, 10-50
 - Personal Computer for Software Download, 10-45
 - Physical, 10-53
 - Protection Switching, 10-40
 - Signal Performance, 10-38
 - Synchronization, 10-39
 - Synchronization Messaging, 10-39
 - Synchronous Timing Generator, 10-39
 - Timing Modes, 10-39
- Status
 - Carrier Line Failure, 6-25
 - Far End, 6-25
 - Incoming, 6-26
 - Near End, 6-25
 - System Identification, 6-26
- STS-1 Path Parameters Performance Monitoring
 - Errored Seconds, 9-49
 - Severely Errored Seconds, 9-50
 - STS-1 Path Coding Violations (B3 Parity), 9-49
 - Unavailable Seconds, 9-50
- Subnetwork, Maintenance, 9-4
- Support
 - COACH, Ixxix
 - Customer Support and Operations, Ixxxii
 - Document Comments, Ixxxvi
 - Documentation, Ixxxiii
 - Electronic Documentation, Ixxxvi
 - Engineering and Installation Services, Ixxxii

- Ordering Documents, lxxxiv
- Training, lxxv
- Transmission Systems Technical Support Services, lxxxiii
- Switch Settings
 - 21G/21G-U OLIU Circuit Pack, 7-106
 - BBG19 DS3 Circuit Pack, 7-81
 - BBG20 TMUX Circuit Pack, 7-89
 - BBG4B DS3 Circuit Pack, 7-64
 - BBG6 STS1E Circuit Pack, 7-73
 - DS1 Circuit Pack, 7-33
 - DS1PM Circuit Pack, 7-40
 - TGS Circuit Pack, 7-25
- Switching
 - Line Protection, 9-24
 - Linear Networks, 10-40
 - Protection, 9-24, 10-40
 - Ring Networks, 10-40
- Synchronization
 - Access Network Timing Distribution, 5-64
 - Automatic Synchronization Reconfiguration, 5-43
 - Circuit Pack, 7-21
 - DS1 Reference Cascading (MULT Mode), 5-35
 - Holdover, 5-35
 - Interfaces, 5-34
 - Interoffice Timing Distribution, 5-62
 - Network Timing Distribution, 5-62
 - OC-3 and FT-2000 OC-48 Lightwave System, 5-56
 - OC-3 and OC-1 External/Line Timing, 5-60
 - OC-3 and OC-12 Dual Homing DRI, 5-58
 - Reference Protection, 9-34
 - Synchronization Functions, 7-19
 - Synchronization Messaging, 5-40, 9-34, 10-39
 - Synchronization Reconfiguration Using an Externally Timed Access Ring, 5-49
- System Identification Status, 6-26

- Manual, 9-35
- Optical Span, 9-36
- Test Signal Generators, 9-35
- Transmission, 9-35
- Threshold Crossing Alert (TCA), 9-60
- Timing Modes
 - DS1 External, 5-35
 - DS1 Reference Cascading (MULT Mode), 5-35
 - DS1 Synchronization Output, 5-35
 - External Timing, 7-21
 - Free-Running, 7-21, 7-23
 - Holdover, 7-23, 9-34
 - Line (formerly loop) Timing, 7-21
 - Line Timing, 5-34
- Timing Output
 - DS1, 7-21
- TL1 Messages, 6-15
- TL1/X.25 Interface, 6-15
 - Specifications, 10-51
- Training
 - Courses, lxxv
 - Related, lxxv
- Transmission
 - Electrical Interface, 7-28
 - Optical Interface, 7-91
- Transmission Availability, 10-59
- Transmission Interfaces, Block Diagram
 - DS1/DS3/EC-1 Add/Drop, 5-9
 - FiberReach Host - Single Homing, 5-13
 - FiberReach Stand-Alone Host, 5-15
 - OC-3 Hubbing, 5-6
 - OC-3 Terminal, 5-3
 - OC-3 with OC-12 Optics, 5-11
 - OC-3/OC-3c Repeater, 5-18
 - SONET Electrical Multiplexer, 5-7
 - STS-1 Drop, 5-5
 - VT1.5/STS-1 Path-Switched Ring, 5-9

T

- TBOS
 - Alarm, 6-18
 - Control Points, 6-17, 6-21
 - Display Tables, 6-17
 - Serial Telemetry, 6-16
- Telemetry
 - Parallel, 6-25, 10-49
 - Serial, 10-48
- Tests
 - Auto Turnup, 9-36
 - Automated Installation, 9-35
 - Cross-Connect, 9-36
 - DSX, 9-36
 - Installation, 9-36
 - Local, 9-36
 - Loopbacks, 9-35

U

- Uncontrolled Environments
 - Hardened, 10-54
- Underwriters Laboratories, 10-55
- Universal Buildout Attenuators, 10-37
- Universal Optical Connector, 3-1, 7-91, 10-33
- Universal Optical Connector Attenuators, 10-37
- UPD/INIT Pushbutton, 6-11
- Upgrades
 - Applications, 9-7
 - In-service, 9-6
 - Software, 8-4, 9-6
- User Panel, 6-8
 - LEDs, 6-10
- User Panel and Faceplate Interfaces, 6-8
- User Panel Indicators, 10-48

User-Definable Miscellaneous Discretes, 10-49

V

Version Recognition

Administration, 8-1

VT1.5 Path Parameters Performance Monitoring

Errored Seconds, 9-50

Severely Errored Seconds, 9-51

Unavailable Seconds, 9-51

W

Wander/Jitter, 10-38

Wrist Strap, lxxv

X

X.25 Interface, 6-15

Specifications, 10-51

Y

Yellow Signals, 9-11

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DDM-2000 OC-3 Multiplexer Releases 8.0 through 11.1

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NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residence is likely to cause harmful interference in which case the user will be required to correct the interference at the users own expense.

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How Are We Doing?

Document Title: DDM-2000 OC-3 Multiplexer Releases 8.0 through 11.1 User/Service Manual
(TOP) - Volume II

Document No.: 363-206-280

Issue 4A

Date: September 1998

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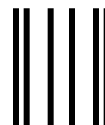
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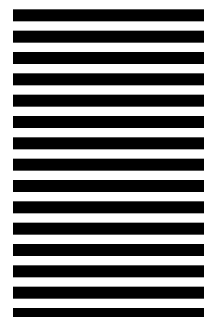
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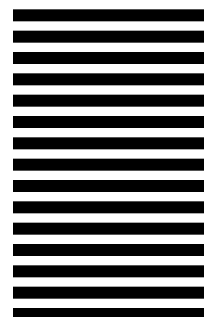
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Operation and Maintenance (TOP)

Contents

Overview	1
TOP Section Organization	1
How To Use This TOP Section	3
■ Screen Display and Panel Stamping Fonts	5
■ DDM-2000 OC-3 Installation	5
Safety Instructions	5
■ Product Safety Labels	5
Lightwave Safety Guidelines	6
■ General Laser Information	6
■ Lasers and Eye Damage	6
■ Classification of Lasers	7
■ Lightwave Safety Precautions	7
■ Safety Precautions for Enclosed Systems	8
■ Safety Precautions for Unenclosed Systems	9
Electrostatic Discharge (ESD) Considerations	10
General Safety Instructions	13
Installation Safety Instructions	14
Master Task Index	15
Numerical List of TOP Procedures	27
CPro-2000 Graphical User Interface and Provisioning Tool	33

Contents

Integrated Transport Management (ITM)	
SubNetwork Controller (SNC)	34
Acceptance Tab (Yellow)	
■ Task Index — Acceptance	
System Turnup/Circuit Order Tab (Orange)	
■ Task Index — System Turnup/Circuit Order	
Operation Tab (Green)	
■ Task Index — Operation	
Trouble Clearing Tab (Red)	
■ Task Index — Trouble Clearing	
Detailed Level Procedures Tab (Blue)	

Operation and Maintenance (TOP)

Overview

This section supports the turnup, operation, and maintenance of the DDM-2000 OC-3 Multiplexer. It includes the following five separate tabs:

- Acceptance — Yellow tab
- System Turnup/Circuit Order — Orange tab
- Operation — Green tab
- Trouble Clearing — Red tab
- Detailed Level Procedures — Blue tab.

TOP Section Organization

The **Acceptance** tab covers procedures to check the shelf or system after the shelf has been equipped or after the system has been established.

The **System Turnup/Circuit Order** tab includes procedures for the following:

- a. Equipping (turning up) a shelf in a looped back condition for the first time.
- b. Establishing an end-to-end system after all shelves have been equipped.
- c. Establishing initial end-to-end DS1, DS3, EC-1, OC-3c, HDSL, or DS3-to-DS1 (TMUX) service.
- d. Adding, converting, or discontinuing DS1, DS3, EC-1, OC-3c, or HDSL service to an in-service system.

- e. Adding new shelves or spans to existing configurations.
- f. Upgrading software to a new release.
- g. Converting or upgrading an OC-3 system to an OC-12 system.
- h. Upgrading an OC-3 point-to-point system to path switched ring.
- i. Establishing OC-3/IS-3 dual ring interworking (DRI) OC-3 to OC-12 or FT-2000 OC-48.
- j. Upgrading OC-3/FT-2000 OC-48 DRI from EC-1 to OC-3.
- k. Establishing single-homed or dual-homed FiberReach access via DDM-2000 OC-3 backbone ring.
- l. Establishing single-homed or dual-homed OC-3 access via DDM-2000 OC-12 or FT-2000 OC-48 backbone ring.
- m. Establishing stand-alone FiberReach access via DDM-2000 OC-3 host.
- n. Establishing OC-3 optical span extensions between FT-2000 OC-48, DDM-2000 OC-3, and DDM-2000 OC-12.
- o. Upgrading DDM-2000 OC-3/OC-12 DRI from EC-1 to OC-3/IS-3.
- p. Establishing FiberReach access via DDM-2000 OC-3 host shelf in OC-3 Release 8 linear configuration.
- q. Upgrading an OC-3 ring network to an OC-12 ring network using OC-3 shelves.
- r. Upgrading an OC-3 ring network to an OC-12 ring network using OC-3/OC-12 shelves.

The **Operation** tab covers procedures for operating the system such as connecting and using the craft interface terminal (CIT), displaying alarm and status conditions, installing a new generic program, etc.

The **Trouble Clearing** tab covers alarms and trouble reports.

The **Detailed Level Procedures** (DLP) tab contains all of the DLPs, beginning with DLP-500, used in this manual.

How To Use This TOP Section

Procedures in this TOP consist of the following:

- a. Task Index (**IXL**) - an index listing tasks that may need to be performed in establishing, operating, and maintaining the DDM-2000 OC-3 Multiplexer system. Each colored tab in this manual contains a separate index (**IXL-001**) and it is always first under each tab.
- b. Non-Trouble-Clearing Procedure (**NTP**) - a director level procedure that lists normal work items to perform other than trouble clearing.
- c. Trouble Analysis Procedure (**TAP**) - a director level procedure that contains step-by-step trouble-clearing instructions to locate and/or fix troubles.
- d. Detailed Level Procedures (**DLP**) - detailed step-by-step instructions.

All procedures in each section of this TOP are in numerical order, regardless of the type of procedure (see Table 1). Table 1, which lists all the procedures used in this TOP, is provided as a reference only. It should not be used alone in finding instructions for performing tasks.

To find the instructions for performing acceptance, system turnup/circuit order, operation, or trouble clearing tasks, proceed as follows:

1. Find your job in the Task Index (for example: **Acceptance IXL-001**) under the appropriate colored tab and go to the referenced procedure. Or you may use the Master Task Index (**IXL-001**) in this introduction.
2. Turn to the indicated director level, detail level, or trouble-clearing procedure listed under the "GO TO" column for the task being performed.
3. Perform all the items in the director level procedure in the indicated order unless it sends you to another director level procedure. When you complete a director level procedure, you have finished the task. Where more detailed information is required, you will be sent to a Detailed Level Procedure **DLP-()**. You may also be sent to a Detailed Level Procedure by another Detailed Level Procedure. All DLPs are in the Detailed Level Procedures tab section of this manual.
4. **IMPORTANT:** Unless otherwise directed, when you complete a Detailed Level Procedure, you **MUST** return to the procedure that sent you there.
5. **IMPORTANT:** Unless otherwise directed, if one director level procedure sends you to another director level procedure, you should not return to the first director level procedure after you complete the second.

6. Sometimes you will be asked to verify that things have occurred. This may take the form of a formal statement of the expected response. At other times, the instructions will merely state *verify that ...*

If the expected response is not observed and a specific trouble clearing reference is not made, you should reference the trouble analysis procedures under the Trouble Clearing tab to clear the trouble.

7. When performing tests or procedures using a CIT and system commands, you should refer to the "Commands and Reports" section of this manual for a description of the command, its parameters, and the output messages associated with the command.
8. If a procedure refers to software releases, for example Release 8 or later, it refers to all linear and ring releases with a numerical value of 8 or higher. If the procedure refers to software releases as Release 9 or later ring releases, it refers to all ring software releases with a numerical value of 9 or higher.
9. If you need assistance in clearing a trouble after completing all the applicable trouble-clearing procedures in this section, contact your local or regional maintenance assistance group. The telephone number for the Lucent Technologies Regional Technical Assistance Center (RTAC) is **1-800-225-RTAC**.

Circuit packs being returned for repair should be sent to the following address:

Lucent Technologies
Returned Goods Dept.
Dept. JC0221210
1600 Osgood Street
North Andover, Massachusetts 01845

Telephone: 1-508-960-5179
or
FAX to: 1-508-960-1705

Screen Display and Panel Stamping Fonts

The procedures in this manual use a monospace font to identify actual text on a screen or a response displayed from the system. A **bold** font identifies panel stamping such as alarm names or circuit pack names. Also, the **bold** font is used throughout this manual for emphasis.

DDM-2000 OC-3 Installation

363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual*, is available for customers planning to install the equipment themselves. To acquire this manual, refer to "How to Order Documents" in the About This Document tab.

Lucent Technologies recommends that **ONLY** designated Lucent Technologies cables be used with DDM-2000. Failure to use these cables will void the product warranty.

Safety Instructions

Product Safety Labels

These instructions involve lasers, lightwave optical cable and connectors, and precautions when handling circuit packs to prevent damage from electrostatic discharge. The appropriate user/service manual contains admonishments in the form of **DANGERS**, **WARNINGS**, and **CAUTIONS** that must be followed at all times.

These admonishments have the following definitions:

- **DANGER** indicates the presence of a hazard that **will** cause death or severe personal injury if the hazard is not avoided.
- **WARNING** indicates the presence of a hazard that **can** cause death or severe personal injury if the hazard is not avoided.
- **CAUTION** indicates the presence of a hazard that **will** or **can** cause minor personal injury or property damage if the hazard is not avoided. The caution is also used for property-damage-only accidents. This includes equipment damage, loss of software, or service interruption.

The alert symbol  appears throughout these products and the appropriate user/service manual to alert the user to the presence of important operating and maintenance (servicing) instructions for the DDM-2000 Multiplexers.

Lightwave Safety Guidelines

General Laser Information

Lightwave/lightguide systems, their associated test sets, and similar operating systems use semiconductor laser transmitters that emit light at wavelengths between approximately 800 nanometers and 1600 nanometers. The emitted light is above the red end of the visible spectrum, which is normally not visible to the human eye. Although radiant energy at near-infrared wavelengths is officially designated invisible, some people can see the shorter wavelength energy even at power levels several orders of magnitude below any that have been shown to cause injury to the eye.

Conventional lasers can produce an intense beam of monochromatic light. The term monochromaticity means a single wavelength output of pure color that may be visible or invisible to the eye. A conventional laser produces a small-size beam of light, and because the beam size is small the power density (also called irradiance) is very high. Consequently, lasers and laser products are subject to federal and applicable state regulations as well as international standards for their safe operation.

A conventional laser beam expands very little over distance or is said to be very well collimated. Thus, conventional laser irradiance remains relatively constant over distance. However, lasers used in lightwave systems have a large beam divergence, typically 10 to 20 degrees. Here, irradiance obeys the inverse square law (doubling the distance reduces the irradiance by a factor of 4) and rapidly decreases over distance.

Lasers and Eye Damage

Light energy emitted by laser and high-radiance LEDs in the 400-1400 nm range may cause eye damage if absorbed by the retina. When a beam of light enters the eye, the eye magnifies and focuses the energy, magnifying the irradiance. The irradiance of energy that reaches the retina is approximately 10^5 or 100,000 times that at the cornea; and if sufficiently intense, may cause a retinal burn.

The damage mechanism at the wavelengths used in telecommunications is thermal in origin (that is, damage caused by heating). Therefore, a specific amount of energy is required for a definite time to heat an area of retinal tissue. Damage is not instantaneous. It occurs only when one looks at the light sufficiently long enough that the product of the retinal irradiance and the viewing time exceeds the damage threshold. Light energies above 1400 nm would cause surface and skin burns and do not affect the retinal area.

Classification of Lasers

Manufacturers of lasers and laser products in the U.S. are regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) under 21 CFR 1040. These regulations require manufacturers to certify each laser or laser product as belonging to one of four major Classes — Class I, II, IIIa, IIIb, or IV. Lasers are classified according to the accessible emission limits and their potential for causing injury. Lightwave systems are generally classified as Class I, because, under normal operation conditions, all energized laser transmitting circuit packs are terminated on optical fibers which enclose the laser energy with fiber sheath, forming a protective housing. Also, covers are in place over the circuit pack shelves.

Lightwave Safety Precautions

In its normal operating mode, a lightwave system is totally enclosed and presents no risk of eye injury. It is a Class I system under the FDA/CDRH scheme.

The lightguide cables that interconnect various components of a lightwave system can disconnect or break, and may expose people to lightwave emission. Also, certain measures and maintenance procedures may expose the technician to emission from the semiconductor laser during installation and servicing. Unlike more familiar laser devices, such as solid-state and gas lasers, the emission pattern of a semiconductor laser results in a highly divergent beam. In a divergent beam, the irradiance (power intensity) decreases rapidly with distance. The greater the distance, the less energy will enter the eye, and the less potential risk for eye injury.

Inadvertently viewing an unterminated fiber or damaged fiber with the unaided eye at distances greater than 5 to 6 inches normally will not cause eye injury provided the power in the fiber is less than a few mW at the shorter wavelengths and higher at the longer wavelengths. However, damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe, is used to stare at the energized fiber end.



CAUTION:

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.

Safety Precautions for Enclosed Systems

Under normal operating conditions, lightwave transmission systems are completely enclosed; nonetheless, the following precautions should be observed:

1. Because of the potential for eye damage, technicians should neither disconnect any lightwave cable nor splice and stare into the optical connectors terminating the cables.
2. Under no circumstances shall lightwave/lightguide operations be performed by a technician before satisfactorily completing an approved training course.
3. Since viewing lightwave emission directly with an optical instrument, such as an eye loupe greatly increases the risk of eye damage, an appropriate label must appear in plain view on the front of the main frame or lightguide termination/interconnection equipment. The safety label (Figure 1) shall read as follows:

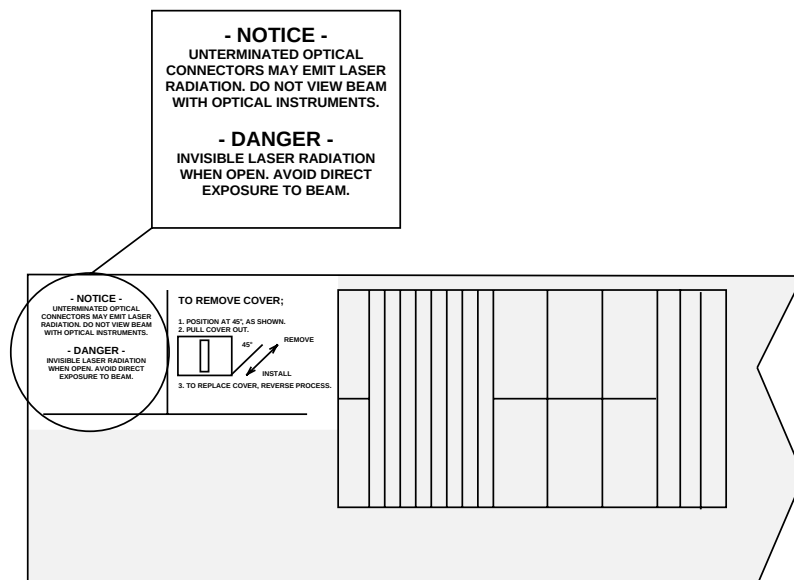


Figure 1. Safety Label on Inside of Front Shelf Cover

Safety Precautions for Unenclosed Systems

During service, maintenance, or restoration, a lightwave transmission system is considered unenclosed. Under these conditions, follow these practices:

1. Only authorized, trained personnel shall be permitted to do service, maintenance, and restoration. Avoid exposing the eye to emissions from unterminated, energized optical connectors at close distances. Connectors associated with lightwave regenerators are recessed, which limits exposure distance. However, technicians removing or replacing regenerators should not stare or look directly into the vacant regenerator slot with optical instruments or magnifying lenses. (Normal eyewear or indirect viewing instruments, such as a Find-R-Scope are not considered magnifying lenses or optical instruments.)
2. Only authorized, trained personnel shall use the lightwave test equipment during installation or servicing, since this equipment contains semiconductor lasers. (Some examples of lightguide test equipment are OTDR's, Hand-Held Loss Test Sets, and Feature Finders.)
3. Under no circumstances shall any personnel scan a fiber with an optical test set without verifying that all lightwave sources on the fiber are turned off.
4. All unauthorized personnel shall be excluded from the immediate area of lightwave transmission systems during installation and service.

Consult ANSI Z136.1 American National Standard for Safe Use of Lasers for guidance on the safe use of lasers in the workplace.

Electrostatic Discharge (ESD) Considerations



CAUTION:

Industry experience has shown that all integrated circuit packs can be damaged by static electricity that builds up on work surfaces and personnel. The static charges are produced by various charging effects of movement and contact with other objects. Dry air allows greater static charges to accumulate. Higher potentials are measured in areas with low relative humidity, but potentials high enough to cause damage can occur anywhere.

The following precautions should be observed when handling circuit packs in order to prevent damage by electrostatic discharge:

- Assume all circuit packs contain solid state electronic components that can be damaged by ESD. Use only Lucent Technologies manufactured UL recognized circuit packs specified in the appropriate user/service manual in this system.
- When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat. If a static-dissipating floor mat is used, be sure that it is clean.
- Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats. If a static-dissipating table mat is used, be sure that it is clean.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- Keep all static-generating materials such as food wrappers, plastics, and styrofoam* containers away from all circuit packs. Upon removal from the bay, immediately put circuit packs into static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.

*

Registered trademark of The Dow Chemical Company.

To reduce the possibility of ESD damage, shelves are equipped with grounding jacks to enable personnel to ground themselves using wrist straps (see Figure 2) while handling circuit packs or working on a shelf(s). The jacks for connection of wrist straps are located at the lower right-hand corner of each shelf and are labeled. When grounding jacks are not provided, an alligator clip adapter enables connection to bay frame ground.

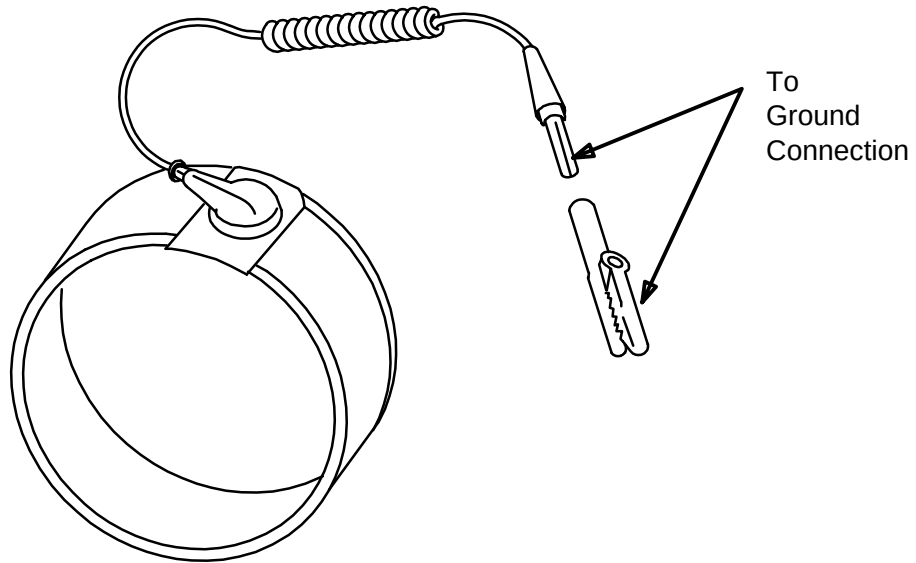


Figure 2. Static Control Wrist Strap

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General Safety Instructions

GENERAL SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
4. Slots and openings in this product's back or bottom are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided. For information on proper ventilation requirements, consult the "Equipment Installation Considerations" section of 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual*; or 363-206-208, *DDM-2000 OC-12 Multiplexer Installation Manual*; or 363-206-310, *DDM-2000 FiberReach Multiplexer Installation Manual*.
5. This product should be operated only from the type of power source indicated on the marking label. For information on proper electrical distribution and power requirements, refer to the "Power" and "Technical Specifications" sections of the appropriate user/service manual.
6. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the product.
7. To reduce the risk of electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit packs may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.
8.
 **CAUTION:**
Disconnect two (2) power connections when removing power from the system.
9. Use only Lucent Technologies' manufactured UL recognized circuit packs. Recognized circuit packs are listed in the appropriate user/service manual.

SAVE THESE INSTRUCTIONS.

Installation Safety Instructions

INSTALLATION SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Installation and maintenance procedures must be followed and performed by trained personnel only.
3. All DS1 and DS3 interfaces should not leave the building premises unless connected to telecommunication devices providing primary or secondary protection, as applicable.
4. For information on proper mounting instructions, consult 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual*; or 363-206-208, *DDM-2000 OC-12 Multiplexer Installation Manual*; or 363-206-310, *DDM-2000 FiberReach Multiplexer Installation Manual*.
5. Never install telecommunication wiring during a lightning storm.
6. Never install telecommunication connections in wet locations.
7. Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the DS1 or DS3 interface.
8. Use caution when installing or modifying telecommunication lines.

SAVE THESE INSTRUCTIONS.

Master Task Index Operation and Maintenance

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

ABN Indication — Clear Trouble Clearing: TAP-109

CIT — Activate Optional System Features . . . Detailed Level Procedure: DLP-512

CIT — Connect and Establish Session . . . Detailed Level Procedure: DLP-521

CIT — Enable or Disable System Security
and/or Edit, Delete, or Enter a User's Login . . . Detailed Level Procedure: DLP-541

DS1 Service — Add New
Group Already In Service Circuit Order: NTP-006

DS1 Service — Add New MXRVO Group —
System In Service Circuit Order: NTP-008

DS1 Service — Add New STS1E High Speed Group —
EC-1 Electrical Multiplexer
System In Service Circuit Order: NTP-032

DS1 Service — Convert to DS3 Group Service Circuit Order: NTP-009

DS1 Service — Discontinue Circuit Order: NTP-011

DS1 Service — Establish Initial End-to-End —
Group Equipped But Not In Service System Turnup: NTP-004

DS3 Service — Add New DS3 Group — In Service Circuit Order: NTP-007

DS3 Service — Convert to DS1 MXRVO Group Service . . . Circuit Order: NTP-010

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

DS3 Service — Discontinue	Circuit Order: NTP-012
DS3 Service — Establish Initial End-to-End — Group Equipped But Not In Service	System Turnup: NTP-005
DS3-to-DS1 Service — Establish Initial End-to-End — TMUX Group Equipped But Not In Service	System Turnup: NTP-053
DS3-to-DS1 Service — Add New TMUX Group — System In Service	Circuit Order: NTP-054
EC-1 Service — Add New STS1E Group — System In Service	Circuit Order: NTP-035
EC-1 Service — Establish Initial End-to-End — Group Equipped But Not In Service	System Turnup: NTP-034
EC-1 Service — Discontinue	Circuit Order: NTP-036
FAULT LED Indication (Flashing) — Clear	Trouble Clearing: TAP-110
FE SEL — Display Alarm/Status Condition	Detailed Level Procedure: DLP-530
LEDs — Test	Detailed Level Procedure: DLP-509
NE ACTY/FE ACTY Alarm Only — Clear	Trouble Clearing: TAP-117
SYSCTL — Install BBG8/BBG8B — New Shelf Only BBG9 OHCTL Installed	Detailed Level Procedure: DLP-549
SYSCTL — Replace — In Service	Detailed Level Procedure: DLP-501

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Accept DDM-2000 OC-3 Multiplexer Shelf
(Looped Back) Acceptance: NTP-003

Accept End-to-End System — OC-3 Point-to-Point Acceptance: NTP-004

Accept DDM-2000 OC-3 Multiplexer (Equipped) —
Overview Acceptance: NTP-002

Add DDM-2000 OC-3 Shelf —
Linear or Hub Configuration
Shelf Added in Middle of Optical Span Circuit Order: NTP-014

Add OC-3 Optical Span Linear Extension —
Extension Added Between FT-2000 and DDM-2000 OC-3 Circuit Order: NTP-049

Add DDM-2000 OC-3 Shelf and/or New Optical Span —
Shelf and/or Span Added as Extension to
DDM-2000 OC-3 Ring, Hub, Point-to-Point,
Linear Add/Drop Circuit Order: NTP-015

Add New DDM-2000 OC-3, OC-12, or FiberReach Node (Shelf)
To DDM-2000 OC-3/OC-12 Path Switched Ring Circuit Order: NTP-026

Add New DS1 Service —
Group Already In Service Circuit Order: NTP-006

Add New DS3 Group For DS3 Service —
System In Service Circuit Order: NTP-007

Add New HDSL Service —
Group Already In Service Circuit Order: NTP-028

Add New MXRVO Group For DS1 Service —
System In Service Circuit Order: NTP-008

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Add New TMUX Group for DS3 Service —
System In Service Circuit Order: NTP-054

Add New STS1E High Speed Group For DS1 Service —
EC-1 Electrical Multiplexer Shelf
System In Service Circuit Order: NTP-032

Add New STS1E Low Speed Group For EC-1 Service —
System In Service Circuit Order: NTP-035

Alarm — Critical (CR) — Clear Trouble Clearing: TAP-101

Alarm — Major (MJ) — Clear Trouble Clearing: TAP-102

Alarm — Minor (MN) — Clear Trouble Clearing: TAP-112

Alarm — NE ACTY/FE ACTY Only — Clear Trouble Clearing: TAP-117

Alarm — Power Minor (PMN) — Clear Trouble Clearing: TAP-104

Alarm Group — Establish New Detailed Level Procedure: DLP-564

Alarm/Status Condition —
Display Using FE SEL Detailed Level Procedure: DLP-530

Convert (Upgrade) DDM-2000 OC-3 Shelf
to DS1 Add/Drop OC-3 Shelf Circuit Order: NTP-020

Convert (Upgrade) DDM-2000 OC-3 System
to OC-12 System
Linear and Hub Configuration Circuit Order: NTP-021

Convert DS1 Group Service to DS3 Group Service Circuit Order: NTP-009

Convert DS1 Group Service to EC-1 Group Service Circuit Order: NTP-038

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Convert DS3 Group Service to DS1 MXRVO Group Service	Circuit Order: NTP-010
Copy Diskettes (Floppy Disks) and Make Backups	Detailed Level Procedure: DLP-534
Critical (CR) Alarm — Clear	Trouble Clearing: TAP-101
Discontinue DS1 Service	Circuit Order: NTP-011
Discontinue DS3 Service	Circuit Order: NTP-012
Discontinue OC-3 Optical Span Extension	Circuit Order: NTP-019
Discontinue DDM-2000 Node (Shelf) From DDM-2000 OC-3 Path Switched Ring	Circuit Order: NTP-027
Discontinue EC-1 Service	Circuit Order: NTP-036
Discontinue HDSL Service	Circuit Order: NTP-037
Discontinue STS1E High Speed Group — EC-1 Electrical Multiplexer Shelf	Circuit Order: NTP-033
Diskettes (Floppy Disks) — Copy and Make Backups	Detailed Level Procedure: DLP-534
Display Terminal Alarm/Status Condition — Using FE SEL	Detailed Level Procedure: DLP-530
Equip DDM-2000 EC-1 Electrical Multiplexer Shelf — Looped Back	System Turnup: NTP-031
Equip DDM-2000 OC-3 Shelf (Looped Back)	System Turnup: NTP-016
Establish DDM-2000 OC-3c (STS-3c) Service	System Turnup: NTP-002

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Establish Dual-Homed FiberReach Access
via DDM-2000 OC-3 Backbone Ring System Turnup: NTP-044

Establish Dual-Homed OC-3 Access
via FT-2000 OC-48 Backbone Ring System Turnup: NTP-048

Establish Dual-Homed OC-3 Access
via DDM-2000 OC-12 Backbone Ring System Turnup: NTP-050

Establish EC-1 Dual Ring Interworking —
DDM-2000 OC-3 to OC-12 or FT-2000
OC-3 Optical Fiber Spans Circuit Order: NTP-013

Establish End-to-End System —
OC-3 Point-to-Point System Turnup: NTP-003

Establish End-to-End DDM-2000 OC-3 System —
OC-3 Optical Fiber Spans
Linear or Hub Configuration System Turnup: NTP-017

Establish End-to-End DDM-2000 OC-3 System —
Optical Fiber Spans
Path Switched Ring Network System Turnup: NTP-022

Establish FiberReach Access
via DDM-2000 OC-3 Release 9 and Later Host Shelf
OC-3 Release 8 Linear Configuration System Turnup: NTP-052

Establish Initial Low Speed EC-1 Service —
Group Equipped But Not In Service System Turnup: NTP-034

Establish Initial End-to-End DS1 Service —
Group Equipped But Not In Service System Turnup: NTP-004

Establish Initial End-to-End DS3 Service —
Group Equipped But Not In Service System Turnup: NTP-005

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Establish Initial HDSL Service —
Group Equipped But Not In Service System Turnup: NTP-025

Establish OC-3/IS-3 Dual Ring Interworking —
DDM-2000 OC-3 to OC-12 or FT-2000 Ring Configurations
OC-3 Optical Fiber Spans System Turnup: NTP-041

Establish OC-3 Optical Span Extension —
Between DDM-2000 OC-12 Ring and DDM-2000 OC-3 . . . System Turnup: NTP-018

Establish Remote Login Detailed Level Procedure: DLP-522

Establish Single-Homed FiberReach Access
via DDM-2000 OC-3 Backbone Ring System Turnup: NTP-043

Establish Single-Homed OC-3 Access
via DDM-2000 OC-12 Backbone Ring System Turnup: NTP-040

Establish Single-Homed OC-3 Access
via FT-2000 OC-48 Backbone Ring System Turnup: NTP-047

Establish Stand Alone FiberReach Access
via DDM-2000 OC-3 Host Shelf System Turnup: NTP-045

Fan Shelf Alarm — Clear Trouble Clearing: TAP-118

Fan Shelf Assembly — Test Detailed Level Procedure: DLP-539

Fan Shelf Filter — Replace Detailed Level Procedure: DLP-540

Fuse — Remove –48V DC User Panel Detailed Level Procedure: DLP-555

Generic Software Version Identification —
Retrieve Detailed Level Procedure: DLP-531

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Install BBG8/BBG8B SYSCCTL — New Shelf Only BBG9 OHCTL Installed	Detailed Level Procedure: DLP-549
Install New Software Generic Program — In-Service System Local Shelf Download	Detailed Level Procedure: DLP-532
Install Software Generic Program — New Shelf Installation Only BBG8/BBG8B SYSCCTL and BBG9 OHCTL Installed	Detailed Level Procedure: DLP-561
Install New Software Generic Program — In-Service System Remote Shelf Download	Detailed Level Procedure: DLP-562
Login — Establish Remote	Detailed Level Procedure: DLP-522
Maintenance Philosophy	Trouble Clearing: TAD-100
Major (MJ) Alarm — Clear	Trouble Clearing: TAP-102
Minor (MN) Alarm — Clear	Trouble Clearing: TAP-112
Modem — Condition and Connect	Detailed Level Procedure: DLP-526
Obtain Equipment, Check Software, Prepare and Connect PC for Software Download	Detailed Level Procedure: DLP-566
Option Settings — Check (Set)	Detailed Level Procedure: DLP-513
Circuit Pack — Replace (Reference Only)	Detailed Level Procedure: DLP-523
Power Minor (PMN) Alarm — Clear	Trouble Clearing: TAP-104

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Remote Login — Establish	Detailed Level Procedure: DLP-522
Replace Circuit Pack (Reference Only)	Detailed Level Procedure: DLP-523
Service — Convert DS1 to DS3 Group Service	Circuit Order: NTP-009
Service — Convert DS1 to EC-1 Group Service	Circuit Order: NTP-038
Service — Convert DS3 to DS1 MXRVO Group Service	Circuit Order: NTP-010
Service — Discontinue DS1	Circuit Order: NTP-011
Service — Discontinue DS3	Circuit Order: NTP-012
Service — Discontinue EC-1	Circuit Order: NTP-036
Service — Establish Initial End-to-End EC-1 — Group Equipped But Not In Service	System Turnup: NTP-034
Service — Establish Initial End-to-End DS1 — Group Equipped But Not In Service	System Turnup: NTP-004
Service — Establish Initial End-to-End DS3 — Group Equipped But Not In Service	System Turnup: NTP-005
Shelf — Add DDM-2000 OC-3 — Linear or Hub Configuration Shelf Added in Middle of Optical Span	Circuit Order: NTP-014
Shelf — Add DDM-2000 OC-3 and/or New Optical Span— Shelf and/or Span Added as Extension to DDM-2000 OC-3 Ring Hub, Point-to-Point, Linear Add/Drop	Circuit Order: NTP-015

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Shelf — Equip DDM-2000 EC-1 Electrical Multiplexer —
Looped Back System Turnup: NTP-031

Shelf — Equip DDM-2000 OC-3 (Looped Back) System Turnup: NTP-016

Software Generic Program — Install —
In-Service System
Local Shelf Download Detailed Level Procedure: DLP-532

Software Generic Program — Install —
New Shelf Installation
Only BBG8/BBG8B SYSCCTL and
BBG9 OHCTL Installed Detailed Level Procedure: DLP-561

Software Generic Program — Install —
In-Service System
Remote Shelf Download Detailed Level Procedure: DLP-562

Software Version ID — Retrieve Detailed Level Procedure: DLP-531

Span — Add OC-3 Shelf and/or New Optical Span —
Hub, Point-to-Point, Linear Add/Drop Configuration Circuit Order: NTP-015

Span — OC-3 Optical — Discontinue Circuit Order: NTP-019

Sync Messaging —
Change Kbyte to Sbyte Detailed Level Procedure: DLP-565

System Backup and Restore — CPro-2000 Operation: NTP-002

System — Establish End-to-End DDM-2000 OC-3 —
OC-3 Point-to-Point System Turnup: NTP-003

System — Establish End-to-End DDM-2000 OC-3 —
OC-3 Optical Fiber Spans
Linear or Hub Configuration System Turnup: NTP-017

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

System — Establish End-to-End DDM-2000 OC-3 — Optical Fiber Spans Path Switched Ring Network	System Turnup: NTP-022
Telemetry — Upgrade TBOS/Parallel to TL1/X.25	Detailed Level Procedure: DLP-538
Test LEDs	Detailed Level Procedure: DLP-509
Test (Accept) DDM-2000 OC-3 Multiplexer (Looped Back)	Acceptance: NTP-003
Test (Accept) End-to-End System	Acceptance: NTP-004
Test (Accept) DDM-2000 OC-3 Multiplexer (Equipped) — Overview	Acceptance: NTP-002
Timing — Upgrade	Detailed Level Procedure: DLP-535
Trouble Report — Clear	Trouble Clearing: TAP-105
Upgrade Timing	Detailed Level Procedure: DLP-535
Upgrade TBOS/Parallel Telemetry to TL1/X.25	Detailed Level Procedure: DLP-538
Upgrade (Convert) DDM-2000 OC-3 Shelf to DS1 Add/Drop OC-3 Shelf	Circuit Order: NTP-020
Upgrade (Convert) DDM-2000 OC-3 System to OC-12 System Linear or Hub Configuration	Circuit Order: NTP-021

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Upgrade DDM-2000 OC-3 Point-to-Point
to Path Switched Ring
In Service Circuit Order: NTP-029

Upgrade DDM-2000 OC-3 Point-to-Point
to Path Switched Ring
Out of Service Circuit Order: NTP-030

Upgrade DDM-2000 OC-3 Add/Drop
Network to Path Switched Ring Circuit Order: NTP-039

Upgrade DDM-2000 OC-3/FT-2000 Dual Ring
Interworking Network from EC-1 to OC-3
In Service Circuit Order: NTP-042

Upgrade DDM-2000 OC-3/OC-12 Dual Ring
Interworking Network from EC-1 to OC-3/IS-3
In Service Circuit Order: NTP-051

Upgrade DDM-2000 OC-3 Ring Network to
OC-12 Ring Network Using OC-3 Shelves
In Service Circuit Order: NTP-023

Upgrade DDM-2000 OC-3 Ring Network to
OC-12 Ring Network Using OC-3/OC-12 Shelves
In Service Circuit Order: NTP-024

Upgrade DDM-2000 OC-3 Release 6 to Release 8 or
Release 7.1 or 7.2 to Release 9 or 11
System In Service Circuit Order: NTP-046

Upgrade DDM-2000 OC-12 Ring by Removing OC-12 Shelf
and Replacing with Existing Single-Homed OC-3 Shelf
In Service Circuit Order: NTP-055

Numerical List of TOP Procedures

Table 1. Numerical List of TOP Procedures (Note)

Acceptance Tab

IXL-001	Acceptance Task Index
NTP-002	Overview of Acceptance (Test) Procedures for DDM-2000 OC-3 Multiplexer (Equipped)
NTP-003	Test (Accept) DDM-2000 OC-3 Multiplexer Shelf (Looped-Back)
NTP-004	Test (Accept) End-to-End DDM-2000 OC-3 System (Network)

System Turnup/Circuit Order Tab

IXL-001	Task Index System Turnup/Circuit Order
NTP-002	Establish DDM-2000 OC-3c (STS-3c) Service
NTP-003	Establish End-to-End System DDM-2000 OC-3 Point-to-Point
NTP-004	Establish Initial End-to-End DS1 Service Group Equipped But Not In-Service
NTP-005	Establish Initial End-to-End DS3 Service Group Equipped But Not In Service
NTP-006	Add New DS1 Service Group Already In Service
NTP-007	Add New DS3 Group for DS3 Service System In Service
NTP-008	Add New MXRVO Group for DS1 Service System In Service
NTP-009	Convert DS1 Group Service to DS3 Group Service
NTP-010	Convert DS3 Group Service to DS1 MXRVO Group Service
NTP-011	Discontinue End-to-End DS1 Service
NTP-012	Discontinue End-to-End DS3 Service
NTP-013	Establish EC-1 Dual Ring Interworking DDM-2000 OC-3 to OC-12 or FT-2000 Ring Configurations OC-3 Optical Fiber Spans
NTP-014	Add DDM-2000 OC-3 Shelf Linear or Hub Configuration Shelf Added in Middle of Optical Span
NTP-015	Add DDM-2000 OC-3 Shelf and/or New Optical Span Shelf and/or Span Added as Extension to DDM-2000 OC-3 Ring, Hub, Point-to-Point, Linear Add/Drop Configuration
NTP-016	Equip DDM-2000 OC-3 Shelf (Looped-Back)
NTP-017	Establish End-to-End DDM-2000 OC-3 System OC-3 Optical Fiber Spans Linear or Hub Configuration

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

System Turnup/Circuit Order Tab (Contd)

NTP-018	Establish OC-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3
NTP-019	Discontinue OC-3 Optical Span Extension
NTP-020	Convert (Upgrade) DDM-2000 OC-3 Shelf to DS1 Add/Drop Shelf
NTP-021	Convert (Upgrade) DDM-2000 OC-3 System to OC-12 System Linear and Hub Configuration
NTP-022	Establish End-to-End DDM-2000 OC-3 System Optical Fiber Spans Path Switched Ring Network
NTP-023	Upgrade DDM-2000 OC-3 Ring Network to OC-12 Ring Network Using OC-3 Shelves In Service
NTP-024	Upgrade DDM-2000 OC-3 Ring Network to OC-12 Ring Network Using OC-3/OC-12 Shelves In Service
NTP-025	Establish Initial HDSL Service Group Equipped But Not In Service
NTP-026	Add New DDM-2000 OC-3, OC-12, or FiberReach Node (Shelf) To DDM-2000 OC-3/OC-12 Path Switched Ring
NTP-027	Discontinue DDM-2000 Node (Shelf) From DDM-2000 OC-3 Path Switched Ring Network
NTP-028	Add New HDSL Service Group Already In Service
NTP-029	Upgrade DDM-2000 OC-3 Point-to-Point Network to Path Switched Ring In Service
NTP-030	Upgrade DDM-2000 OC-3 Point-to-Point to Path Switched Ring Out of Service
NTP-031	Equip DDM-2000 EC-1 Electrical Multiplexer Shelf Looped Back
NTP-032	Add New STS1E High Speed Group for DS1 Service EC-1 Electrical Multiplexer Shelf System In Service
NTP-033	Discontinue STS1E High Speed Group EC-1 Electrical Multiplexer Shelf
NTP-034	Establish Initial Low Speed EC-1 Interface Group Equipped But Not In Service
NTP-035	Add New STS1E Low Speed Group for EC-1 Interface System In Service
NTP-036	Discontinue EC-1 Interface
NTP-037	Discontinue End-to-End HDSL Service

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

System Turnup/Circuit Order Tab (Contd)

NTP-038	Convert DS1 Group Service to EC-1 Group Service
NTP-039	Upgrade DDM-2000 OC-3 Add/Drop Network to Path Switched Ring
NTP-040	Establish Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring
NTP-041	Establish OC-3/IS-3 Dual Ring Interworking DDM-2000 OC-3 to OC-12 or FT-2000 Ring Configurations OC-3 Optical Fiber Spans
NTP-042	Upgrade DDM-2000 OC-3/FT-2000 Dual Ring Interworking Network from EC-1 to OC-3 In Service
NTP-043	Establish Single-Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring
NTP-044	Establish Dual-Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring
NTP-045	Establish Stand-Alone FiberReach Access via DDM-2000 OC-3 Host Shelf
NTP-046	Upgrade DDM-2000 OC-3 Release 6 to Release 8 or Release 7.1 or 7.2 to Release 9 or 11 System In Service
NTP-047	Establish Single-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring
NTP-048	Establish Dual-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring
NTP-049	Establish OC-3 Optical Span Linear Extension Extension Added Between FT-2000 and DDM-2000 OC-3
NTP-050	Establish Dual-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring
NTP-051	Upgrade DDM-2000 OC-3/OC-12 Dual Ring Interworking Network from EC-1 to OC-3/IS-3 In Service
NTP-052	Establish FiberReach Access via DDM-2000 OC-3 Release 9 and Later Host Shelf OC-3 Release 8 Linear Configuration
NTP-053	Establish Initial End-to-End DS3-to-DS1 Service TMUX Group Equipped But Not In Service
NTP-054	Add New TMUX Group for DS3 Service System In Service
NTP-055	Upgrade DDM-2000 OC-12 Ring by Removing OC-12 Shelf and Replacing with Existing Single-Homed OC-3 Shelf In Service

See note at end of table.

Operations Tab

IXL-001	Task Index Operations
NTP-002	CPro-2000 System Backup and Restore

Trouble Clearing Tab

IXL-001	Task Index Trouble Clearing
TAD-100	Maintenance Philosophy

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Trouble Clearing Tab (Contd)

TAP-101	Clear Critical (CR) Alarm
TAP-102	Clear Major (MJ) Alarm
TAP-103	Clear Multiple Failure
TAP-104	Clear Power Minor (PMN) Alarm
TAP-105	Clear Trouble Report
TAP-106	Isolate and Clear Failure
TAP-107	Clear Far End Alarm Using Craft Interface Terminal (CIT)
TAP-108	Clear Obscure Failure Condition
TAP-109	Clear Abnormal (ABN) Indication
TAP-110	Clear Flashing FAULT LED Indication
TAP-111	Clear OLIU or Fiber Trouble — Linear Extensions/Configurations
TAP-112	Clear Minor (MN) Alarm
TAP-113	Clear Obscure Minor (MN) Alarm
TAP-114	Clear External Minor Alarm at RT
TAP-115	Clear LED Test Trouble
TAP-116	Clear Trouble During Program Upgrade
TAP-117	Clear NE ACTY/FE ACTY Alarm Only
TAP-118	Clear Fan Shelf Alarm
TAP-119	Clear OLIU or Fiber Trouble — Path Protected Ring
TAP-120	Clear STS/VT AIS Alarm Conditions
TAP-121	Clear Brownout Condition — Flashing L in FE Display

Detailed Level Procedures (DLP) Tab

DLP-500	Install OHCTL Circuit Pack New Shelf
DLP-501	Replace SYSCTL In Service
DLP-502	Install STS1E Circuit Packs

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab (Contd)

DLP-503	Install TGS Circuit Packs
DLP-504	Install OLIU Circuit Packs
DLP-505	Connect Optical Loop
DLP-506	Install MXRVO Circuit Packs
DLP-507	Install DS3/TMUX Circuit Packs
DLP-508	Install DS1/DS1PM Circuit Packs
DLP-509	Perform LED Test
DLP-510	Perform DS1 Transmission Test
DLP-511	Perform DS3 Transmission Test
DLP-512	Activate Optional System Features Using CIT
DLP-513	Set Circuit Pack Options
DLP-514	Perform Optical Fiber Connections and Verification of Optical Facility
DLP-515	Perform End-to-End Optical Line Test
DLP-516	Check Local Office Alarms
DLP-517	Check Parallel Telemetry
DLP-518	Check Telemetry Byte-Oriented Serial (TBOS) Telemetry
DLP-519	Test Protection Switching Function
DLP-520	Condition DS1/DS1PM Circuit Pack/Port for New DS1 Service
DLP-521	Connect CIT and Establish Session
DLP-522	Establish Remote Login
DLP-523	Replace Circuit Pack
DLP-524	Check -48 V DC Office Battery
DLP-525	Perform Automatic End-to-End OC-3 Line Test
DLP-526	Condition and Connect Modems to Establish Communication From Remote CIT Location
DLP-527	Clean Optical Fibers, Connectors, and Lightguide Buildouts (LBOs)
DLP-528	Perform Automatic Local Transmission Test
DLP-529	Perform Automatic Cross-Connect Wiring Test
DLP-530	Operate FE SEL Pushbutton on SYSCTL
DLP-531	Retrieve Generic Software Version ID
DLP-532	Install New Software Generic Program In-Service System Local Shelf Download
DLP-533	Introduction to the Personal Computer (PC)
DLP-534	Copy Diskettes and Make Backups
DLP-535	Upgrade BBF2 TGS To BBF2B TGS
DLP-536	Perform Test of RT Batteries Using 197A BATTERY LOAD TEST SET
DLP-537	Check 197A BATTERY LOAD TEST SET

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab (Contd)

DLP-538	Upgrade Telemetry Byte-Oriented Serial (TBOS)/Parallel Telemetry to TL1/X.25
DLP-539	Test ED-8C733-30, G7 Fan Shelf
DLP-540	Replace ED-8C733-30, G4 Fan Filter
DLP-541	Enable or Disable System and/or Edit, Delete, or Enter a User's Login
DLP-542	Replace Existing OLIU With Different Type OLIU
DLP-543	Change Timing Mode on TGS Circuit Pack
DLP-544	Perform OC-3c (STS-3c) Transmission Test
DLP-545	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Linear or Add/Drop Configuration
DLP-546	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Single OC-3 Ring Configuration
DLP-547	DDM-2000 Receiver Sensitivity Test
DLP-548	Replace Defective Fan Pack
DLP-549	Install BBG8/BBG8B SYSCCTL New Shelf Only BBG9 OHCTL Installed
DLP-550	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration Release 9 and Later
DLP-551	Replace DDM-2000 OC-3 Shelf User Panel Out of Service
DLP-552	Install/Remove Lightguide Buildout
DLP-553	Perform DS3 Transmission Test Dual Ring Interconnection
DLP-554	Perform DS1 Transmission Test Dual Ring Interconnection
DLP-555	Remove -48 V DC User Panel Fuse
DLP-556	Perform End-to-End OC-1 Optical Line Test
DLP-557	Make VT1.5 (DS1) or STS1 Cross-Connections Using CIT Single/Dual Homing OC-3/OC-1 Ring Configuration
DLP-558	Make VT1.5 (DS1) or STS1 Cross-Connections Using CIT Stand Alone OC-3/OC-1 Ring Configuration
DLP-559	Make Cross-Connections Using CIT Single/Dual Homing and OC-3 Extensions OC-48/OC-3 Configurations
DLP-560	Make Cross-Connections Using CIT Single/Dual Homing OC-12/OC-3 Ring Configuration

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab (Contd)

DLP-561	Install Software Generic Program New Shelf Installation Only BBG8/BBG8B SYSCTL and BBG9 OHCTL Installed
DLP-562	Install Software Generic Program In-Service System Remote Shelf Download
DLP-563	Provision STS-1 Path Trace
DLP-564	Establish New Alarm Group System In-Service
DLP-565	Sync Messaging - Change Kbyte to Sbyte
DLP-566	Obtain Equipment, Check Software, Prepare and Connect Personal Computer (PC) for Software Download
DLP-567	Install BBF8 HDSL Circuit Packs

Note: Table 1 is provided as a reference only, and should not be used alone in finding instructions for performing tasks.

CPro-2000 Graphical User Interface and Provisioning Tool

The CPro-2000 Graphical User Interface and Provisioning Tool is a *Microsoft[†] Windows[†]* based user interface that can optionally be used with the DDM-2000 OC-3 Multiplexer. The tool simplifies and mechanizes administration, maintenance, and provisioning operations for ring networks. With the tool a user can:

- Display and control cross-connections at each network element (NE) in a subnetwork, and the entire subnetwork, including dual ring interworking (DRI) (for example, drop and continue paths at DRI nodes).
- Obtain and display graphical images of the subnetwork configuration, equipment, and cross-connections.
- Perform an analysis of the subnetwork to detect provisioning errors.
- Retrieve and store data about a selected NE.
- Backup and restore provisioning information including cross-connections, DS1 port options, DS3 port options, EC-1 port options, and OC-3 line options.

[†] Registered trademark of Microsoft Corporation.

In response to a user, the tool automatically complies and sends all the necessary commands to perform a task. If the user is provisioning cross-connections, for example, the tool automatically prevents provisioning errors by comparing the new provisioning information with the subnetwork inventory. For more information, see 190-523-1xx (release dependent), *CPro-2000 User Manual*.

Integrated Transport Management (ITM) SubNetwork Controller (SNC)

ITM SNC is an element management system that supports SONET NEs such as the Lucent Technologies' DDM-2000, FT-2000, SLC[®]-2000, and the Fujitsu[‡] Lightwave Multiplexer (FLM). ITM SNC provides fault, provisioning, configuration, and security management functions via a Graphical User Interface (GUI). Through these functions, ITM SNC is able to support communication multiplexing or concentration, to provide network security, and to record all database changes. ITM SNC also provides a cut-through capability, allowing the ITM SNC user to access an NE through its native command set.

ITM SNC operates as an enhanced graphical tool and as a general configuration management aid. It provides NE, port, cross-connection, and path provisioning, as well as flowthrough from provisioning operations systems (OSs) to NEs. ITM SNC also provides fault management through subnetwork alarm and event preprocessing prior to sending fault information to a network surveillance system such as the Network Monitoring and Analysis-Facility (NMA-F). For more information, see 107-564-2xx (release dependent), *Integrated Transport Management (ITM) SubNetwork Controller (SNC), User Guide* and 107-564-2xx (release dependent), *Integrated Transport Management SubNetwork Controller, System Administration Guide*.

[‡] Registered trademark of Fujitsu Limited.

Task Index Acceptance

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Acceptance Procedures (Shelf Equipped)

⇒ **NOTE:**

The following procedures are for use in testing the DDM-2000 OC-3 Multiplexer system after another organization has equipped it. The procedures test the DDM-2000 OC-3 system *after* all circuit packs have been installed and the shelf is looped back or after a system has been established end-to-end. They are not intended to be used for initial system turnup or in establishing an end-to-end system. System Turnup procedures are found in this manual under the System Turnup/Circuit Order tab.

Test (Accept) DDM-2000 OC-3 Multiplexer (Equipped) —

Overview Acceptance: NTP-002

Test (Accept) DDM-2000 OC-3 Multiplexer Shelf
(Looped Back)

Acceptance: NTP-003

Test (Accept) End-to-End DDM-2000 OC-3

System (Network) Acceptance: NTP-004

Acceptance Procedures (Shelf Unequipped)

⇒ **NOTE:**

Procedures for installing and testing DDM-2000 OC-3 system bays, shelves, and cables are found in 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual*.

Overview of Acceptance (Test) Procedures for DDM-2000 OC-3 Multiplexer (Equipped)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

- A.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

-  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **NOTE:**
This procedure is an overview of acceptance procedures that may be performed on the DDM-2000 OC-3 Multiplexer. It assumes that the DDM-2000 OC-3 shelf or system has been installed and equipped with circuit packs. It also assumes that the system is being tested (accepted) by an organization that *did not* install it. This procedure is for reference only. It contains a list of items that may be performed in doing acceptance of a shelf or system and is not intended to be done in sequence.

Verify that office battery has been applied to the shelf.
(PWR ON LED lighted on User Panel.)

DLP-524

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

B. Set (check) circuit pack option switch settings, if required. **DLP-513**

C. Test (accept) DDM-2000 OC-3 Multiplexer (looped back).
[Acceptance: NTP-003]

D. Test (accept) end-to-end DDM-2000 OC-3 System
[Acceptance: NTP-004]

E. If required, perform DS1 transmission tests on each DS1 port:

a. Linear or Single Ring Configuration	DLP-510
b. Dual Ring (DRI) Configuration	DLP-554
c. Single/Dual Homing Configuration	DLP-510
-

F. If required, perform DS3 transmission tests on each DS3 port:

a. Linear or Single Ring Configuration	DLP-511
b. Dual Ring (DRI) Configuration	DLP-553
c. Single/Dual Homing Configuration	DLP-511
-

G. If required, perform OC-3c transmission tests. **DLP-544**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

H. Verify/set option settings using **rtrv-ne/set-ne:**
commands.

I. Verify/set option settings using **rtrv-()/set-():** **DLP-512**
commands.

Test (Accept) DDM-2000 OC-3 Multiplexer Shelf (Looped-Back)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

-  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **NOTE 1:**
This test is to be performed if the DDM-2000 is being tested or accepted by an organization that did not install it.

-  **NOTE 2:**
It is assumed that the DDM-2000 is installed, powered, equipped, and free of alarms. If it was not left in that condition, notify the organization that installed the DDM-2000 that they have not completed the installation or use **Trouble Clearing: IXL-001**.

-  **NOTE 3:**
If the DDM-2000 fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-2000 or use **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 4:

The **rtrv-()** commands (**rtrv-ne**, **rtrv-oc3**, **rtrv-sync**, or **rtrv-t1**) may be used to retrieve switch settings except for LBO settings on **DS1** and **DS3** circuit packs.

Verify correct circuit packs have been installed and option switches have been set correctly, if not already performed.

DLP-513

2. CAUTION:

*Before looping a shelf, verify/set DSNE parameter of the **rtrv-ne:/set-ne:** command to **no**. This parameter will be set as required when the shelf is integrated into a network. Only one DSNE is allowed in a network.*

⇒ NOTE 1:

An "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. To clear the alarm during a fiber loopback, use the **set-fecom:address:com=disable** command to disable the DCC.

⇒ NOTE 2:

An "AGNE communication failure" alarm will also occur when the **OLIUs** are looped back. This alarm occurs because at least one shelf in the network must be set as an AGNE but the default for the shelf is AGNE=**no**. To clear the alarm during a fiber loopback, use the **set-ne:tid:agne=yes** command.

Install **OLIU** optical loops between their respective **IN** and **OUT** optical connectors.

DLP-505

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. **NOTE 1:**

If the **ACO** button is depressed longer than 2 seconds, the **SYSCTL** display will scroll through the software version code and all LEDs will remain lighted until the code is displayed.

 NOTE 2:

The proper release of software must be installed for this test to work. If software has not been installed, the letter "P" will be displayed in the seven-segment **FE ID** display. If the software in the **SYSCTL** is incompatible with the software in the **OHCTL** or with the shelf configuration, the letter "d" or "C" will be displayed in the 7-segment **FE ID** display. If the proper release of software has not been installed or if the **SYSCTL** and **OHCTL** have incompatible software, refer the problem to the organization that installed the shelf.

Depress and hold the **ACO** pushbutton on the User Panel. Verify that all User Panel and circuit pack LEDs and the **SYSCTL** display light. Verify proper version of software is installed.

DLP-509

-
4. Release the **ACO** pushbutton. Verify that all LEDs on the DDM-2000 go off.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5.  **CAUTION:**
*The **init-sys:all** command should **NOT** be used on an in-service system.*

 **NOTE 1:**
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000.

 **NOTE 2:**
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to their default values. STS1 and/or VT1.5 cross-connections may have been made which should be deleted before the system is placed in service. The **init-sys:all** command may be used to reset all provisionable parameters and cross-connections to default values.

 **NOTE 3:**
An "inconsistent DCC values" alarm will occur when the **init-sys:all** command is executed. To clear the alarm, use the **set-fecom:address:com=disable** command to disable the DCC.

 **NOTE 4:**
An "AGNE communication failure" alarm will also occur when the **init-sys:all** command is executed because the AGNE parameter of the **set-ne:** command is set to **no** again. To clear the alarm, use the **set-ne:tid:agne=yes** command.

If required, use the command **init-sys:all** to reset provisionable parameters to default values.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. ➤ **NOTE 1:**

Automatic turnup tests using the **test-auto** command are available for linear releases only. Automatic local and DSX turnup tests will **not** operate properly if a local DDM-2000 shelf is provisioned for line-timed mode. The timing mode must be set to external or free running (**DLP-513**) before executing the **test-auto:** command. The timing mode should be returned to the correct state after these tests have been run. For ring releases, perform the DS1 or DS3 transmission tests.

➤ **NOTE 2:**

These procedures assume that the DDM-2000 has been connected to the DSX-() cross-connect points, as required. DS1 and/or DS3 circuit packs must be inserted, as required, before performing these tests.

➤ **NOTE 3:**

The automatic turnup tests, using **test-auto** commands, expect the default internal STS-1 cross-connections to be in place. If the cross-connections are not in place or have been deleted, all **MXRVO** and **DS3** circuit packs will fail when the automatic test is run.

Perform transmission and cross-connect tests for each group, as required. Refer any failures to organization that installed the DDM-2000.

Ring Releases:

- A. DS1 Transmission/Cross-Connect Test
- B. DS3 Transmission/Cross-Connect Test

DLP-510
DLP-511

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

Linear Releases:

A. Automatic Local (looped back) Transmission Test	DLP-528
B. Automatic Cross-Connect Wiring Test	DLP-529
-

7. Test ED-8C733-30, G7 fan shelf, if installed.	DLP-539
-

8.  **NOTE:**
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000 OC-3 Multiplexer. Refer to the Commands and Reports section and use the **rtrv-()** commands to determine the existing options.

Activate optional features that you require at this time.	DLP-512

9. After each shelf in the network has been tested, the DDM-2000 will be ready for end-to-end testing.
[Acceptance: NTP-004]
-

Test (Accept) End-to-End DDM-2000 OC-3 System (Network)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

 -  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 -  **NOTE 1:**
This test is to be performed if the DDM-2000 is being tested or accepted by an organization that did not install it.

 -  **NOTE 2:**
It is assumed that the DDM-2000 is installed and running in an end-to-end network configuration and each shelf has previously been tested in a looped-back configuration.

 -  **NOTE 3:**
If the DDM-2000 fails to respond in the indicated manner, refer the trouble to the organization that installed the DDM-2000 or use **Trouble Clearing: IXL-001**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2.  **CAUTION:**
*The "**init-sys:all**" command should NOT be used on an in-service system.*

 **NOTE 1:**
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to default values. STS-1 and/or VT1.5 (DS1) cross-connections may have been made which should be deleted before the system is placed in service. The "**init-sys:all**" command will reset all provisionable parameters and cross-connections to default values. If parameters have already been set to their proper values and you are sure they are set correctly, you may not want to perform this step. Some parameters will have to be reset later before service is established.

 **NOTE 2:**
An "inconsistent DCC values" alarm will occur when the "**init-sys:all**" command is executed, if fecom has not been enabled at both ends of the system.

 **NOTE 3:**
A network requires that at least one shelf be designated as an AGNE. An "AGNE communication failure" alarm will occur when the "**init-sys:all**" command is executed because the AGNE parameter of the "**set-ne:**" command is set to **no** again. The alarm will clear when you use the "**set-ne:tid:agne=yes**" command to designate an AGNE.

If required, use the "**init-sys:all**" command to reset provisionable parameters to default values.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. **NOTE 1:**

If external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches may not be set correctly. The specified timing mode must be set on the **TGS** circuit packs.

 NOTE 2:

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

 NOTE 3:

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the "**rtrv-sync**" command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Use "**rtrv-sync**" command at each node to verify proper timing options. At least one node in the network should be set for *DS1 External* or *Free Running* unless timing is obtained from an optical interface (**FUNCTION UNITS C**) to another portion of the network. Verify **TGS** circuit pack options are set correctly [**DLP-513**].

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

The "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the "**rtrv-ne:**" and "**set-ne:**" commands to verify/set ONE shelf as the DSNE. Use the "**rtrv-ne:**" and "**set-ne:**" commands to verify/set the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5. Determine the optical loss of the optical facility from office records or by making the required measurements.

-
6.  **NOTE:**
Only **21G/21G-U OLIUs** have option switches. There are no option switches on other OC-3 **OLIUs**.

If **21G/21G-U OLIUs** are installed, ensure **HIGH/LOW POWER** option switches are set to agree with the loss of the optical facility.

DLP-513

-
7. Use "**rtrv-fecom:**" and "**set-fecom:com=enabled**" commands to verify/enable the DCC channel between all nodes, as required.

-
8.  **NOTE:**
The "**rtrv-map-network**" and "**rtrv-map-neighbor**" commands may be used to retrieve a map of the network, including the systems in the network and how they are connected.

Ensure all DDM-2000 OC-3 shelves (**OLIUs**) in the network have been properly connected to the optical facility. Verify the integrity of each optical span.

DLP-514

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9.  **NOTE 1:**
If Kbyte/Sbyte (sync messaging) is enabled for any node in a system, it **must** be enabled at all nodes of the system.
-  **NOTE 2:**
The "**rtrv-oc3:**" or "**rtrv-oc12:**" command retrieves the "OC-3 Line Provisioning Report" or "OC-12 Line Provisioning Report". This report displays the provisioned configuration of OC-3 or OC-12 lines. See the "Commands and Reports" section of this manual for a description of the "**rtrv-oc3:**" or "**rtrv-oc12:**" command format.

Use the "**rtrv-oc3:**" or "**rtrv-oc12:**" command to obtain the "OC-3 Line Provisioning Report" or "OC-12 Line Provisioning Report" and verify if Kbyte is enabled or disabled. Use the "**set-oc3:**" or "**set-oc12:**" command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. ➤ **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.
- **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed node in a linear system, it **must** be enabled at all line-timed nodes of a linear system.
- **NOTE 3:**
The "**rtrv-sync:**" command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the "**rtrv-sync:**" command format.
- Use the "**rtrv-sync:**" command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled. Use the "**set-sync:**" command to enable or disable the Sync Autoreconfiguration parameter, as required.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **NOTE 1:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line test to work. Default condition for the DCC channel is "enabled." If it has been disabled, use the "**set - fecom:**" command **at each shelf** to enable far-end communications.

 NOTE 2:

The "**r lgn**" command can be used to log in to each shelf at optical span being tested.

Perform end-to-end line test on all optical spans. Report any failures to the organization that installed the DDM-2000.

- A. Ring Releases
- B. Linear Releases

DLP-515
DLP-525

-
12. Perform end-to-end DS1 transmission test in the **Mux** direction for each **FUNCTION UNITS** group, if required.

- A. DS1 Single Ring Test in **Mux** Direction
- B. DS1 Dual Ring (DRI) Test in **Mux** Direction
- C. DS1 Single/Dual Homing Test in **Mux** Direction

DLP-510
DLP-554
DLP-510

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13.	Perform end-to-end DS3 transmission test in the Mux direction for each FUNCTION UNITS group, if required.	
	A. DS3 Single Ring Test in Mux Direction	DLP-511
	B. DS3 Dual Ring (DRI) Test in Mux Direction	DLP-553
	C. DS3 Single/Dual Homing Test in Mux Direction	DLP-511
14.	Perform end-to-end OC-3c (STS-3c) transmission test in the Mux direction, if required.	DLP-544
15.	Check local office alarm interface as required.	DLP-516
16.	Check office telemetry interface as required:	
	A. Parallel telemetry	DLP-517
	B. Serial telemetry	DLP-518
17.	Test protection switching function, if required.	DLP-519
18.	The system is ready for service to be established.	
19.	Activate remaining optional features, as required.	DLP-512

Task Index

System Turnup/Circuit Order

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Equipment Required for Shelf Turnup

1. IBM* compatible personal computer with *MS-DOS*[†] software Release 2.1 or later. Used for loading software.
2. Proper software release for system configuration you have.
3. **FS1E-E-02** lightguide jumpers for looping shelf **OLIUs**.

Initial Shelf Turnup and Establishing End-to-End System

⇒ NOTE:

These procedures are used to equip DDM-2000 OC-3 shelves, establish end-to-end OC-3 systems, and establish initial end-to-end DS1/DS3 service after all necessary bay, shelf, and cable installation has been done.

Shelf — Equipping (Looped Back)

Equip DDM-2000 OC-3 Shelf (Looped Back) —
as EC-1 Multiplexer System Turnup: NTP-031

Equip DDM-2000 OC-3 Shelf (Looped Back) System Turnup: NTP-016

Equip DDM-2000 OC-3 Shelf (Looped Back) —
For OC-3c Service System Turnup: NTP-002

* Registered trademark of International Business Machines Corporation.

† Registered trademark of Microsoft Corporation.

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

System — Establish End-to-End

⇒ NOTE:

Figures 1-31 show a variety of system configurations and may be used as a quick reference to most of the system end-to-end procedures listed here.

Establish FiberReach Access —
via DDM-2000 OC-3 Release 9 Host Shelf
OC-3 Release 8 Linear Configuration System Turnup: NTP-052

Establish Dual-Homed FiberReach Access —
via DDM-2000 OC-3 Backbone Ring System Turnup: NTP-044

Establish Dual-Homed OC-3 Access —
via DDM-2000 OC-12 Backbone Ring System Turnup: NTP-050

Establish Dual-Homed OC-3 Access —
via FT-2000 OC-48 Backbone Ring System Turnup: NTP-048

Establish EC-1 Dual Ring Interworking —
DDM-2000 OC-3 to OC-12 or FT-2000 Ring
OC-3 Optical Fiber Spans System Turnup: NTP-013

Establish Single-Homed OC-3 Access —
via DDM-2000 OC-12 Backbone Ring System Turnup: NTP-040

Establish Single-Homed OC-3 Access —
via FT-2000 OC-48 Backbone Ring System Turnup: NTP-047

Establish End-to-End DDM-2000 OC-3 System —
DDM-2000 OC-3 Optical Fiber Spans
Linear and Hub Configurations System Turnup: NTP-017

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Establish End-to-End DDM-2000 OC-3 System —
Optical Fiber Spans
OC-3 Path Switched Ring Network System Turnup: NTP-022

Establish OC-3/IS-3 Dual Ring Interworking —
DDM-2000 OC-3 to OC-12 or FT-2000 Ring
OC-3 Optical Fiber Spans System Turnup: NTP-041

Establish End-to-End DDM-2000 OC-3 System —
OC-3 Point-to-Point System Turnup: NTP-003

Establish Single-Homed FiberReach Access —
via DDM-2000 OC-3 Backbone Ring System Turnup: NTP-043

Establish Stand Alone FiberReach Access —
via DDM-2000 OC-3 Host Shelf System Turnup: NTP-045

Service — Establish Initial DS1

Establish Initial End-to-End DS1 Service —
(Group Equipped But Not In Service) System Turnup: NTP-004

Establish Initial Low Speed EC-1 Interface —
Group Equipped With STS1E Not In Service System Turnup: NTP-034

Service — Establish Initial DS3

Establish Initial End-to-End DS3 Service —
(Group Equipped But Not In Service) System Turnup: NTP-005

Establish Initial Low Speed EC-1 Interface —
Group Equipped With STS1E Not In Service System Turnup: NTP-034

Service — Establish Initial HDSL

Establish Initial HDSL Service —
(Group Equipped But Not In Service) System Turnup: NTP-025

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Service — Establish Initial TMUX

Establish Initial End-to-End DS3-to-DS1 Service —
(TMUX Group Equipped But Not In Service) System Turnup: NTP-053

Circuit Order/Work Order Procedures

⇒ NOTE:

Some of these procedures are used to add, convert, or discontinue DS1 and/or DS3 service after the system is running with initial service. Other procedures are used to add new shelves and optical spans and upgrade system configurations.

Alarm Group — Establish New

Establish New Alarm Group Detailed Level Procedure: DLP-564

Shelf/Span — Adding New

Add DDM-2000 OC-3 Shelf —
To Linear or Hub Configuration
Shelf Added in Middle of Optical Span Circuit Order: NTP-014

Add DDM-2000 OC-3 Node (Shelf) —
To DDM-2000 OC-3 or OC-12 Path Switched Ring Circuit Order: NTP-026

Add DDM-2000 OC-3 Shelf and/or Optical Span —
Shelf and/or Span Added as Extension
to DDM-2000 OC-3 Ring,
Hub, Point-to-Point, Linear Add/Drop Configuration Circuit Order: NTP-015

Add DDM-2000 OC-3 Shelf and Optical Span —
Shelf Added as Extension to DDM-2000 OC-12 Circuit Order: NTP-018

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Add OC-3 Optical Span Linear Extension —
Extension Added Between FT-2000 and DDM-2000 OC-3 System Turnup: NTP-049

Shelf/Span — Discontinue

Span — OC-3 Optical — Discontinue Circuit Order: NTP-019

Discontinue DDM-2000 OC-3 Node (Shelf) —
From DDM-2000 OC-3 Path Switched Ring Circuit Order: NTP-027

Service — Adding New DS1

Add New DS1 Service —
MXRVO/STS1E Group Already In Service Circuit Order: NTP-006

Add New MXRVO Group for DS1 Service —
In-Service Circuit Order: NTP-008

Service — Adding New DS3

Add New DS3 Group for DS3 Service —
System In-Service Circuit Order: NTP-007

EC-1 Interface — Adding

Add New STS1E Group for EC-1 Interface —
System In Service Circuit Order: NTP-035

Add New STS1E High Speed Group for DS1 Service —
EC-1 Electrical Multiplexer Shelf
System In Service Circuit Order: NTP-032

Service — Adding New HDSL

Add New HDSL Service —
(Group Already In Service) Circuit Order: NTP-028

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Service — Adding New TMUX

Add New TMUX Group for DS3 Service —
System In Service Circuit Order: NTP-054

Conversions

Change Kbyte Sync Messaging to

Sbyte Sync Messaging Detailed Level Procedures: DLP-565

Convert (Upgrade) DDM-2000 OC-3 Shelf —
to DS1 Add/Drop Shelf Circuit Order: NTP-020

Convert (Upgrade) DDM-2000 OC-3 System —
to OC-12 System (Linear) Circuit Order: NTP-021

Convert DS1 Group Service to EC-1 Group Service Circuit Order: NTP-038

Convert DS1 Group Service to DS3 Group Service Circuit Order: NTP-009

Convert DS3 Group Service to DS1 Group Service Circuit Order: NTP-010

Service — Discontinue DS1

Discontinue DS1 Service Circuit Order: NTP-011

Service — Discontinue DS3

Discontinue DS3 Service Circuit Order: NTP-012

Service — Discontinue EC-1 Interface

Discontinue EC-1 Service — Circuit Order: NTP-036

Discontinue STS1E High Speed Group —
EC-1 Electrical Multiplexer Shelf Circuit Order: NTP-033

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Service — Discontinue HDSL

Discontinue End-to-End HDSL Service Circuit Order: NTP-037

Shelf (Node) — Discontinue

Discontinue an OC-3 Shelf (Node) —
From Path Switched Ring Circuit Order: NTP-027

Span (Shelf) — Discontinue OC-3 Optical

Discontinue an OC-3 Optical Span —
From Linear and Hub Configurations Circuit Order: NTP-019

Upgrades

Upgrade DDM-2000 OC-3/FT-2000 Dual Ring
Interworking Network from EC-1 to OC-3
In Service System Turnup: NTP-042

Upgrade DDM-2000 OC-3/OC-12 Dual Ring
Interworking Network from EC-1 to OC-3/IS-3
In Service Circuit Order: NTP-051

Upgrade DDM-2000 OC-3 Ring Network to
OC-12 Ring Network Using OC-3 Shelves
In Service Circuit Order: NTP-023

Upgrade DDM-2000 OC-3 Ring Network to
OC-12 Ring Network Using OC-3/OC-12 Shelves
In Service Circuit Order: NTP-024

Upgrade DDM-2000 OC-3 System —
Linear Add/Drop to Path Switched Ring
In Service Circuit Order: NTP-039

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Upgrade DDM-2000 OC-3 System —
Point-to-Point to Path Switched Ring
In Service Circuit Order: NTP-029

Upgrade DDM-2000 OC-3 System —
Point-to-Point to Path Switched Ring
Out of Service Circuit Order: NTP-030

Upgrade DDM-2000 OC-12 Ring by Removing OC-12 Shelf
and Replacing with Existing Single-Homed OC-3 Shelf
In Service Circuit Order: NTP-055

Upgrade DDM-2000 OC-3 System —
Release 6 to Release 8 or
Release 7.1 or 7.2 to Release 9 or 11
System In Service System Turnup: NTP-046

Upgrade Software Program —
In-Service System
Local Shelf Download Detailed Level Procedure: DLP-532

Upgrade Software Program —
In-Service System
Remote Shelf Download Detailed Level Procedure: DLP-562

Upgrade Timing Detailed Level Procedures: DLP-535

Upgrade TBOS/Parallel Telemetry to
TL1/X.25 Detailed Level Procedures: DLP-538

Examples of System Configurations - Turnup Procedures

The following figures are for reference only and are not intended to suggest any working configuration. They are used to support this **IXL-001**.

The figures in this section show a variety of subnetwork configurations and associated flow diagrams. Figure 1 depicts a large network configuration consisting of FT-2000 OC-48, DDM-2000 OC-3, OC-12, and FiberReach. The remainder of the figures illustrate individual subnetworks necessary to establish the large network configuration. Some subnetwork configurations can be established as stand-alone subnetworks and added later to the overall large network configuration (For Example, the OC-3 ring subnetworks in Figures 6 and 7). Other subnetworks require you establish the host subnetwork first (For Example, the single-homed OC-3 access ring via the FT-2000 ring in Figures 2 and 3). The shaded areas in each figure show the configuration being established.

The following is a list of the configurations shown in this section:

- Figure 2 Single-Homed OC-3 Access via FT-2000 Ring
- Figure 4 Single-Homed FiberReach Access via DDM-2000 OC-3 Ring
- Figure 6 End-to-End DDM-2000 OC-3 Path Switched Ring System
- Figure 8 OC-3 Optical Extension Between FT-2000 and DDM-2000 OC-3
- Figure 10 OC-3 Shelf/Optical Span Extension Added to DDM-2000 OC-3
- Figure 12 Dual-Homed FiberReach Access via DDM-2000 OC-3 Ring
- Figure 14 End-to-End DDM-2000 OC-12 Path Switched Ring System
- Figure 16 OC-3 Optical Extension Between DDM-2000 OC-3 Ring and OC-12 ring
- Figure 18 OC-3 Optical Extension Between FT-2000 OC-48 Ring and DDM-2000 OC-12 ring
- Figure 20 OC-3 Dual Ring Interworking - FT-2000 OC-48 Ring to DDM-2000 OC-3 ring
- Figure 22 Single-Homed OC-12 Access via FT-2000 OC-48 Ring
- Figure 24 Single-Homed OC-3 Access via DDM-2000 OC-12 Ring
- Figure 26 Dual-Homed OC-3 Access via FT-2000 OC-48 Ring
- Figure 28 Dual-Homed OC-12 Access via FT-2000 OC-48 Ring
- Figure 30 Dual-Homed OC-3 Access via DDM-2000 OC-12 Ring

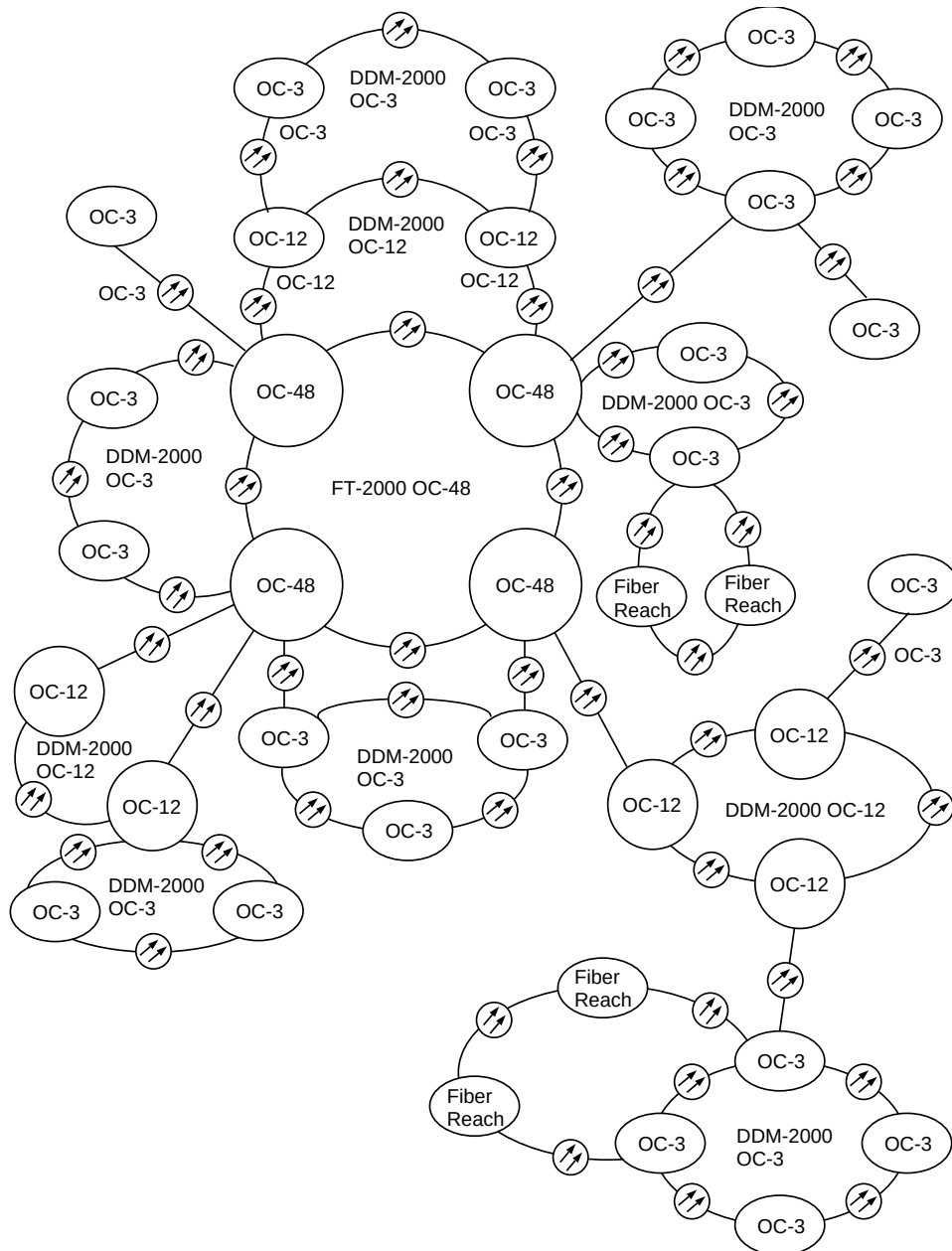


Figure 1. DDM-2000/FT-2000 Large Network Configurations

Establish Single-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring
See Figure 3

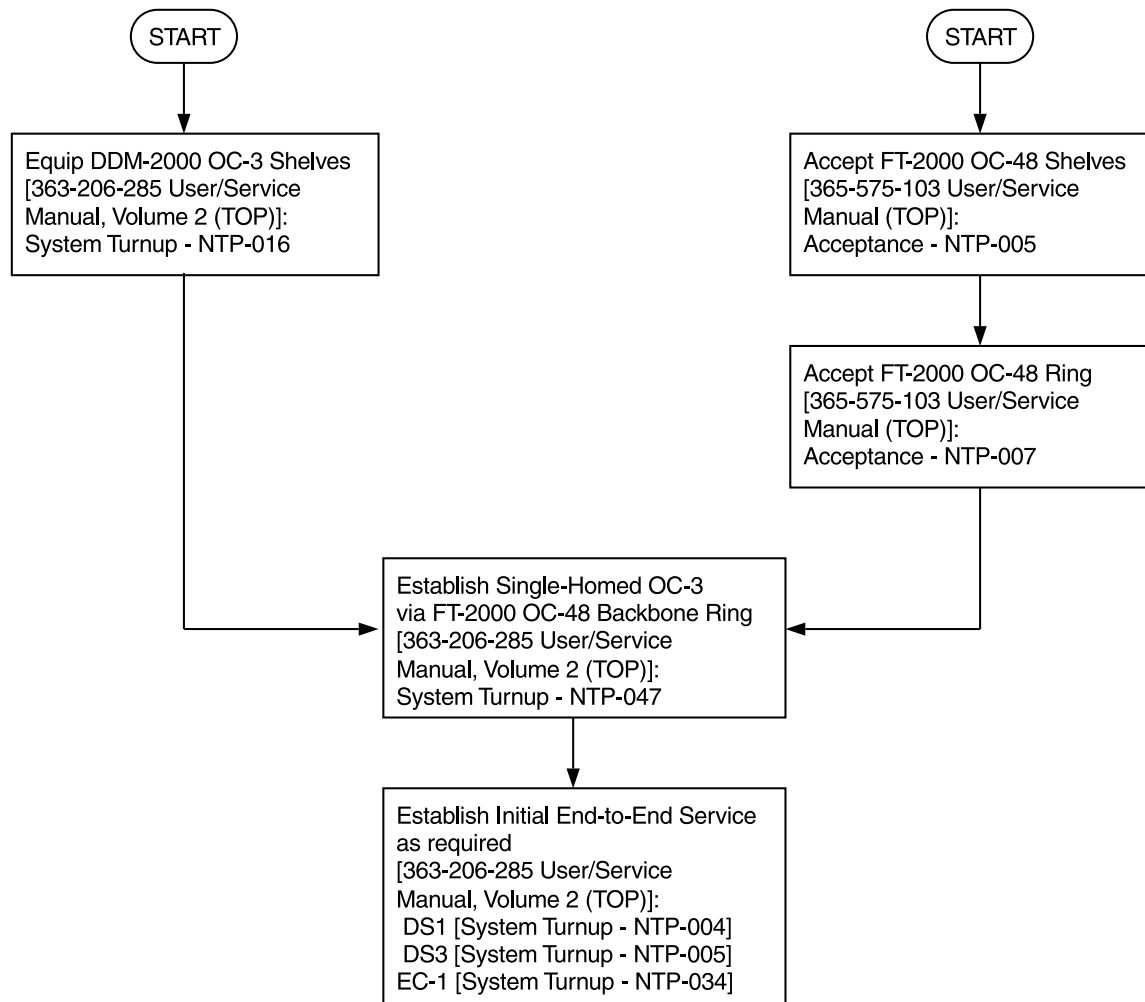


Figure 2. DDM-2000/FT-2000 Large Network Configurations — Single Homed OC-3 Access via FT-2000 Backbone Ring

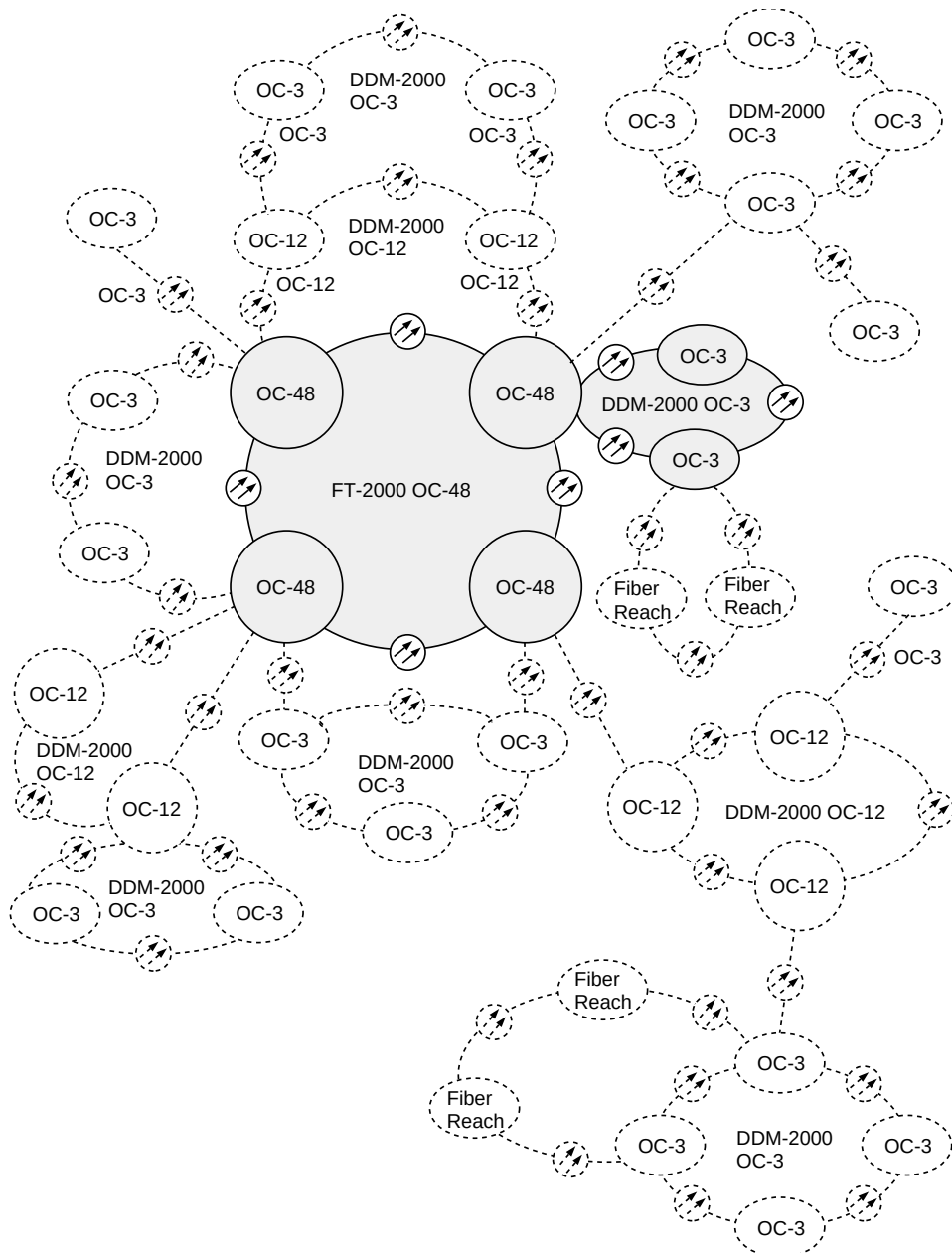


Figure 3. DDM-2000/FT-2000 Large Network Configurations — Single Homed OC-3 Access via FT-2000 Backbone Ring

Establish Single-Homed FiberReach Access
via DDM-2000 OC-3 Backbone Ring
See Figure 5

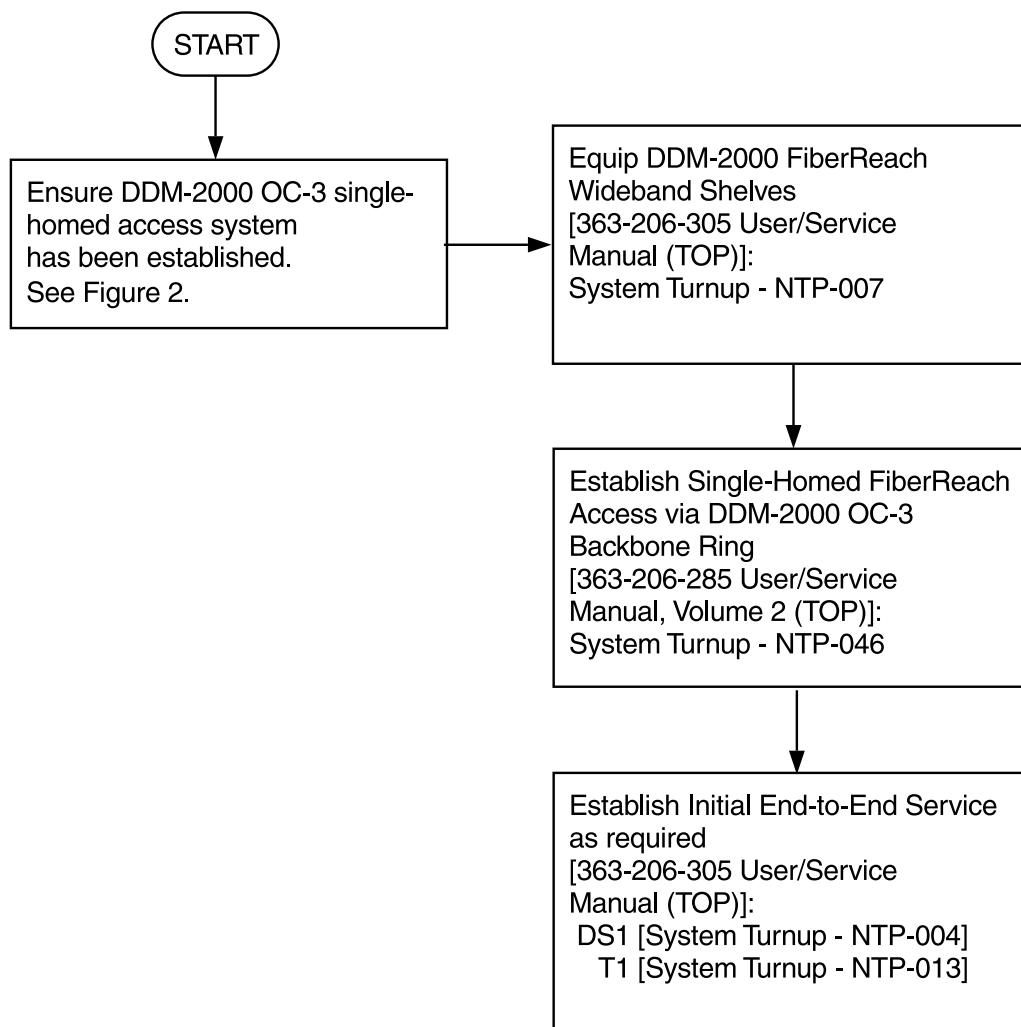


Figure 4. DDM-2000/FT-2000 Large Network Configurations — Single Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

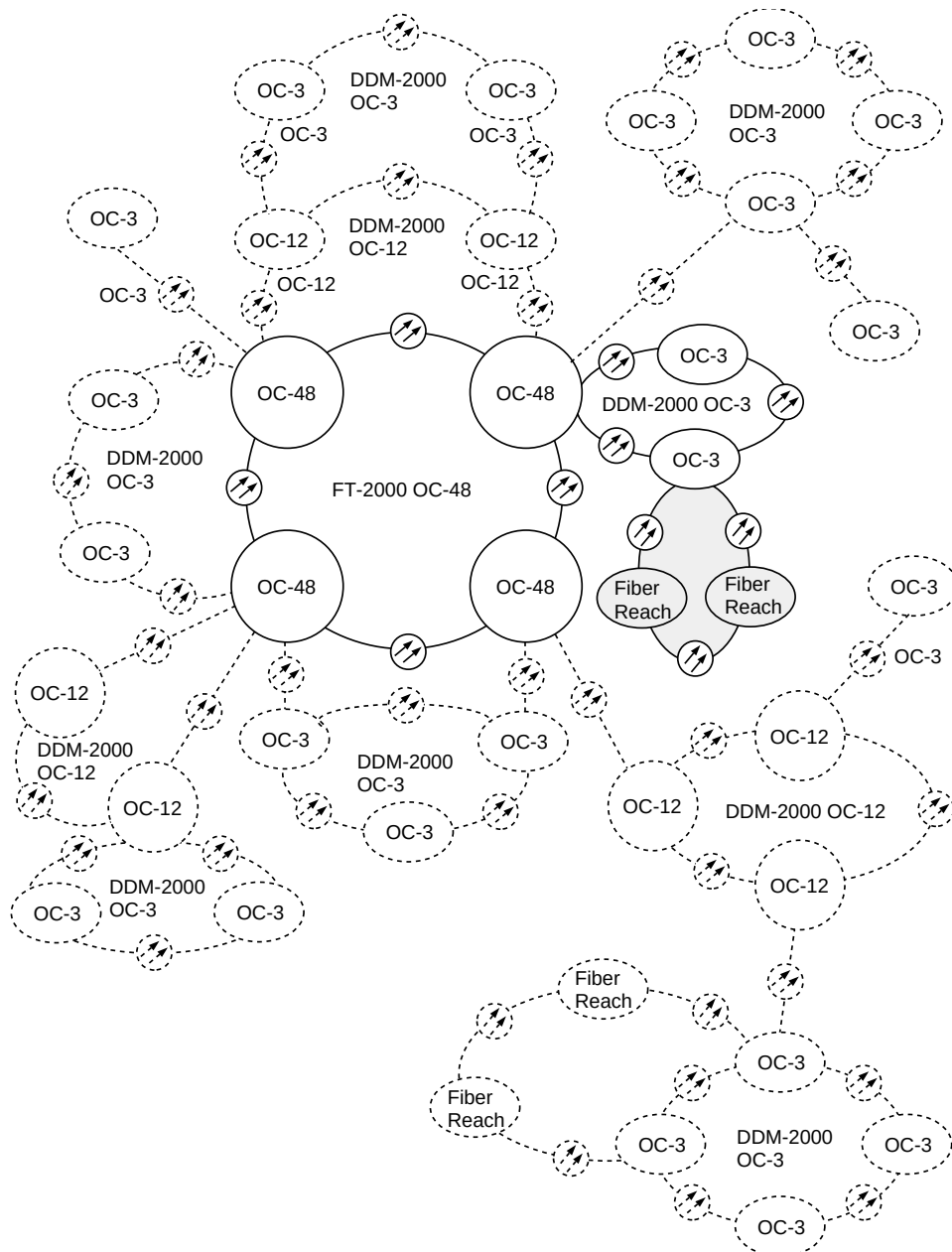


Figure 5. DDM-2000/FT-2000 Large Network Configurations — Single Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

Establish End-to-End DDM-2000 OC-3 System - Path Switched Ring
See Figure 7

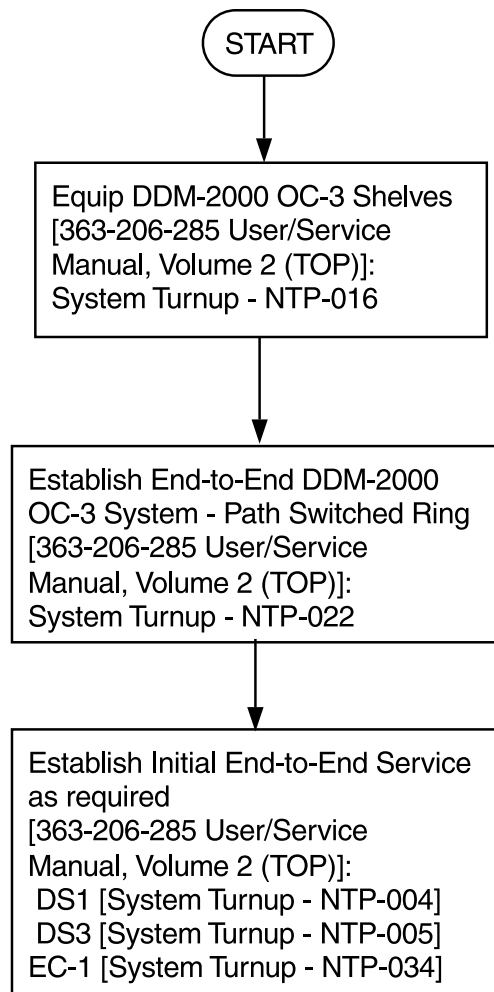


Figure 6. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-3 Path Switched Ring

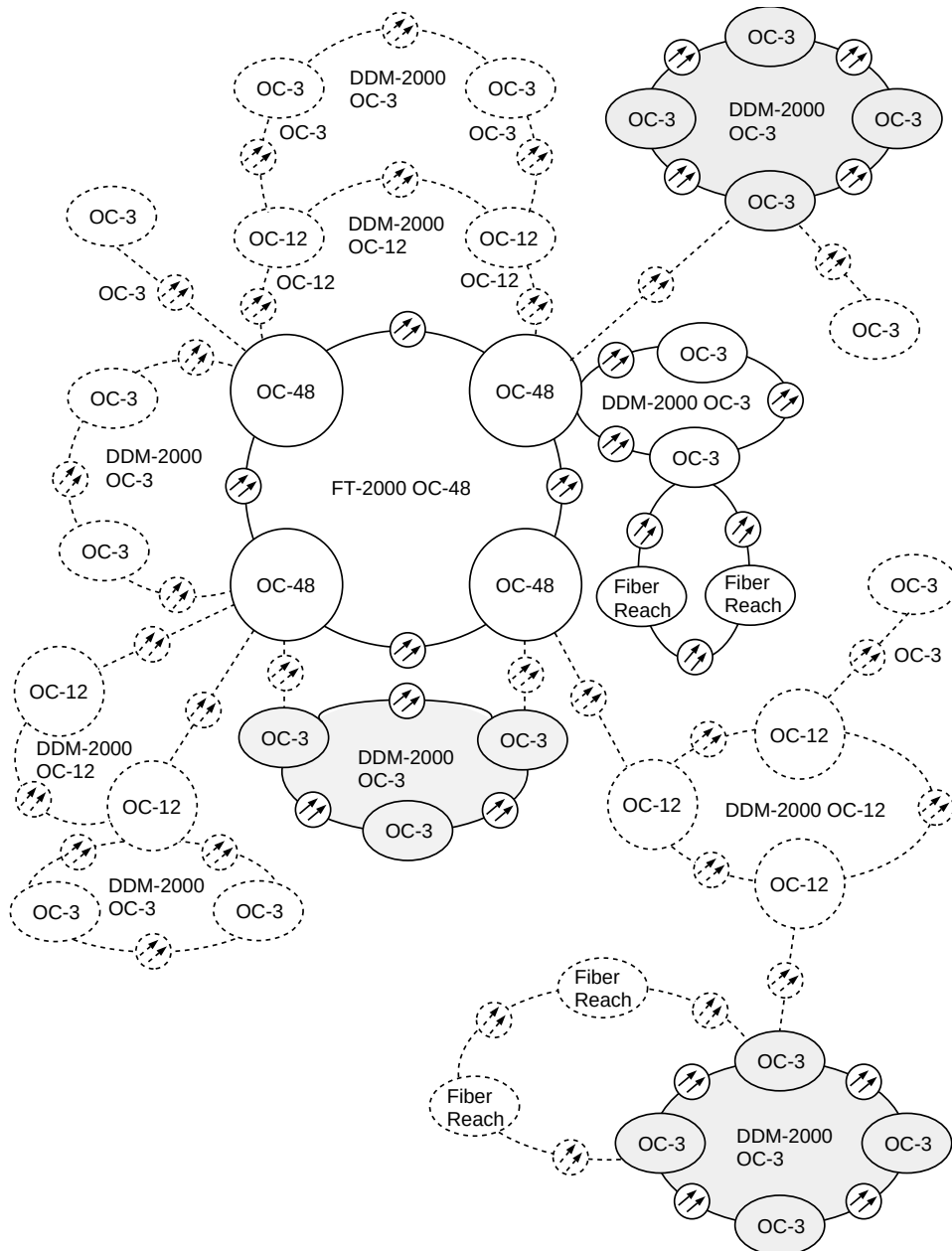


Figure 7. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-3 Path Switched Ring

Establish OC-3 Optical Span Linear Extension
Between FT-2000 and DDM-2000 OC-3
See Figure 9

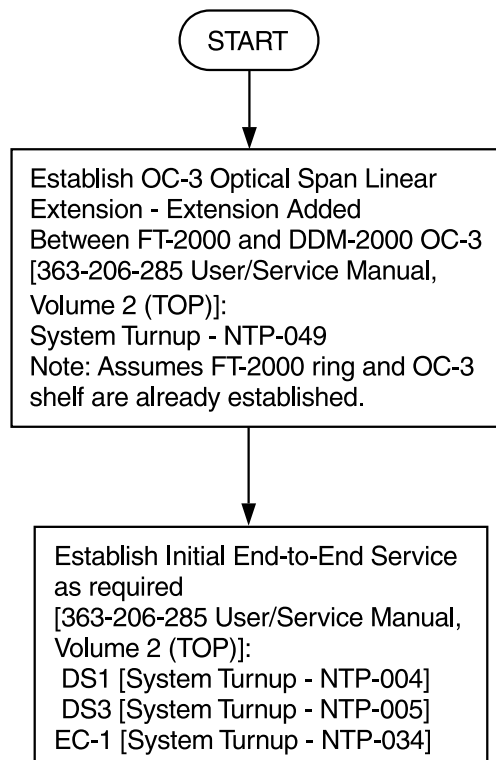


Figure 8. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Linear Extension Between FT-2000 and DDM-2000 OC-3

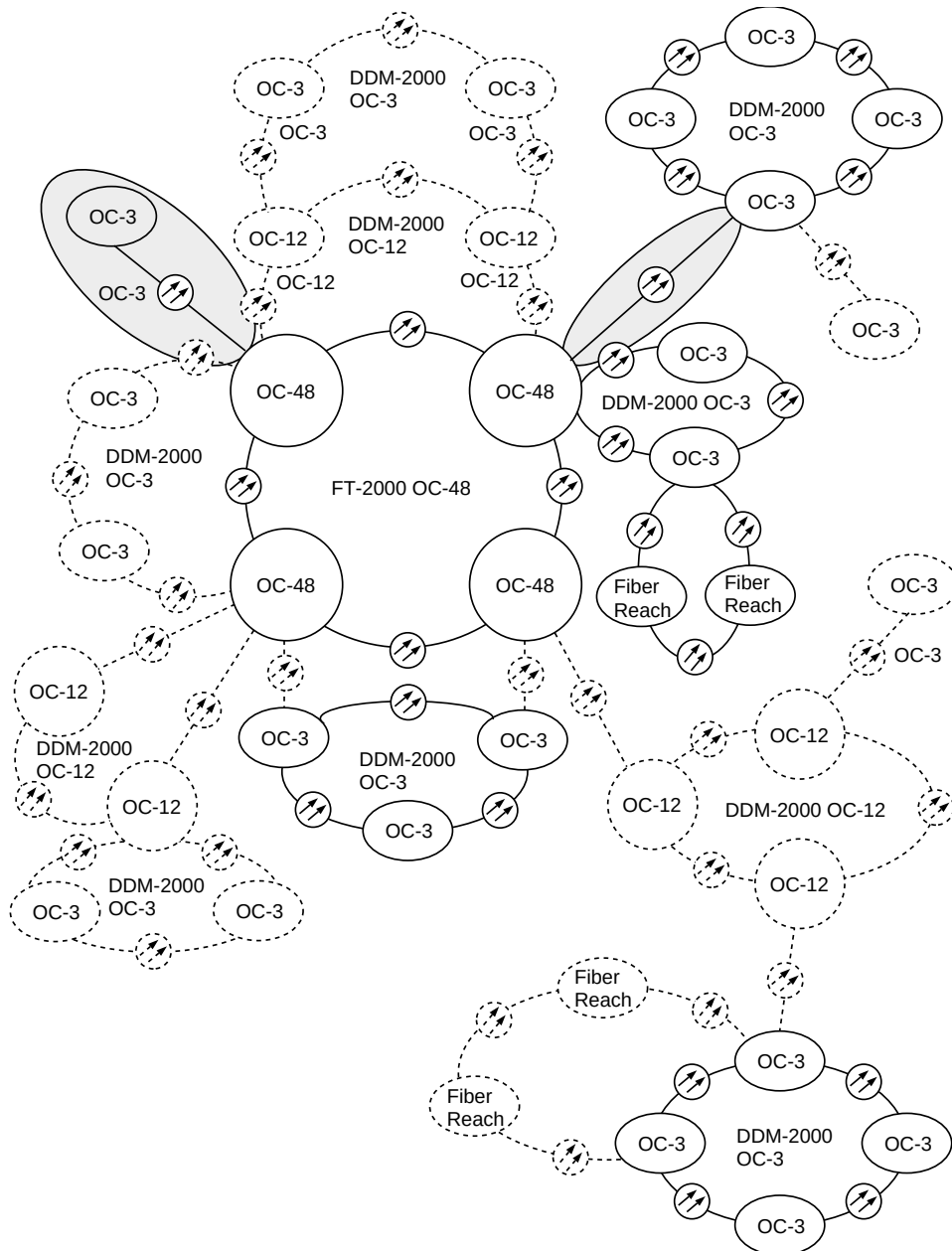


Figure 9. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Linear Extension Between FT-2000 and DDM-2000 OC-3

Add OC-3 Shelf and/or New Optical Span
Added as Extension to DDM-2000 OC-3 Ring
See Figure 11

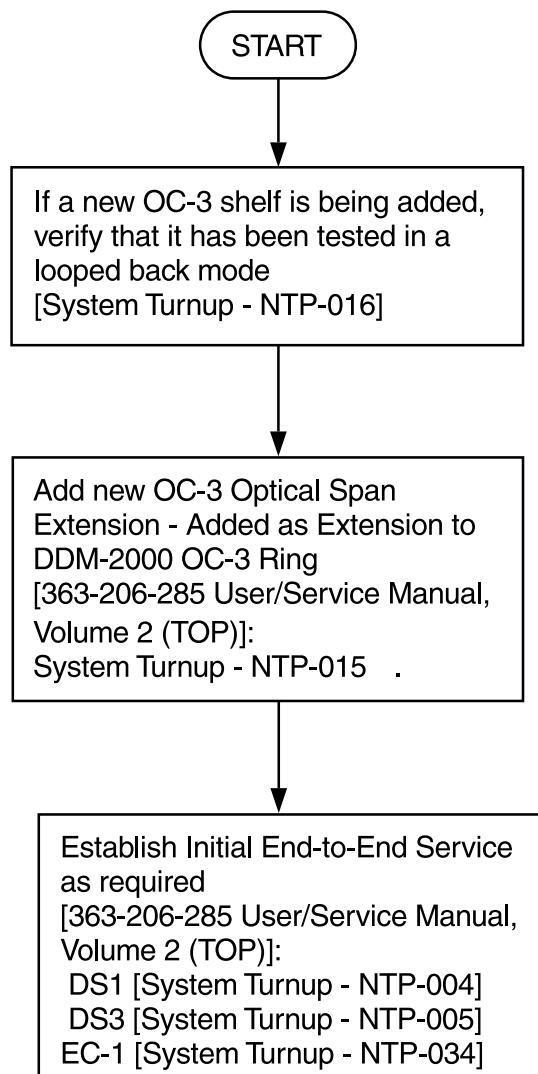


Figure 10. DDM-2000/FT-2000 Large Network Configurations — OC-3 Shelf and/or Optical Span Added as Extension to DDM-2000 OC-3 Ring

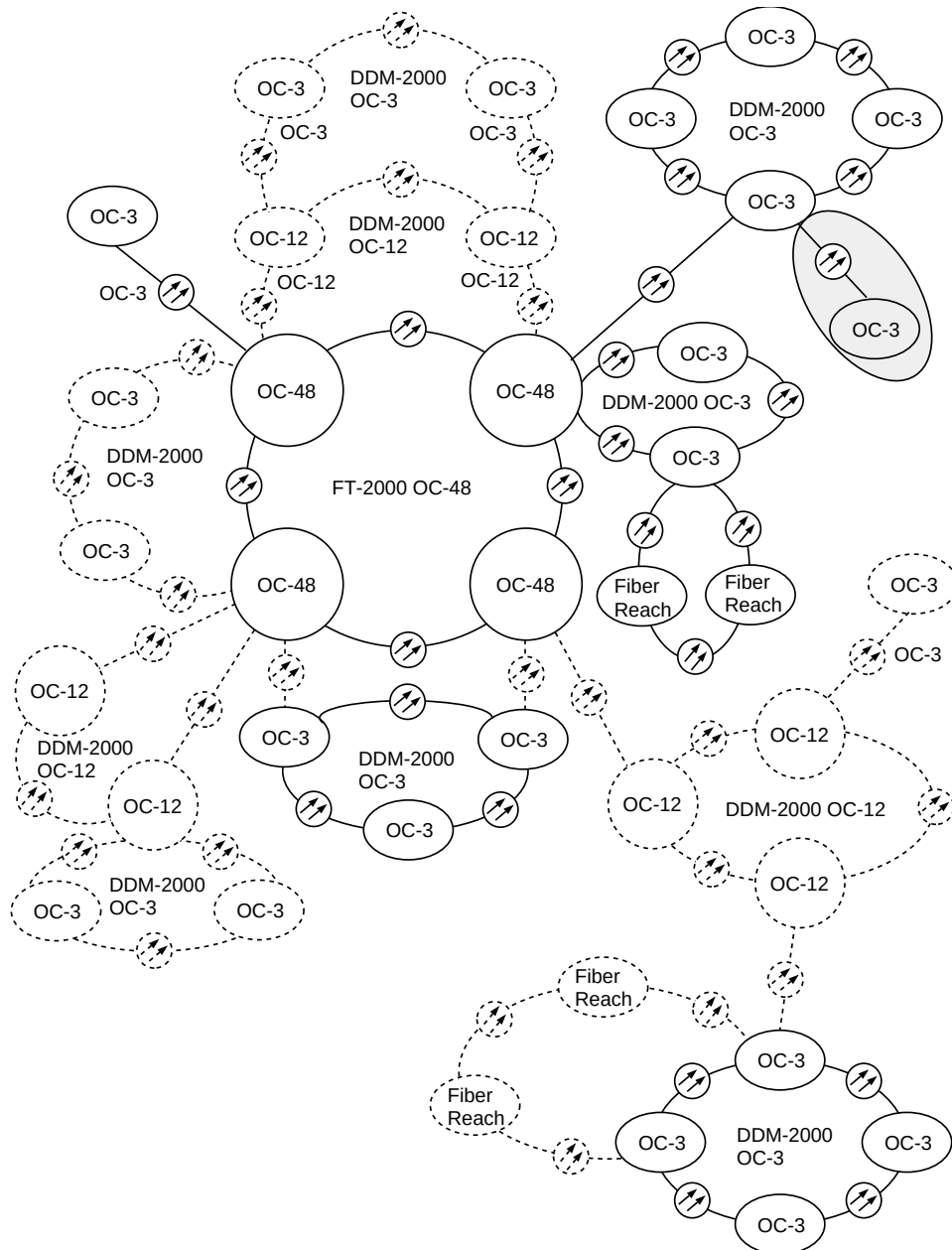


Figure 11. DDM-2000/FT-2000 Large Network Configurations — OC-3 Shelf and/or Optical Span Added as Extension to DDM-2000 OC-3 Ring

Establish Dual-Homed FiberReach Access
via DDM-2000 OC-3 Backbone Ring
See Figure 13

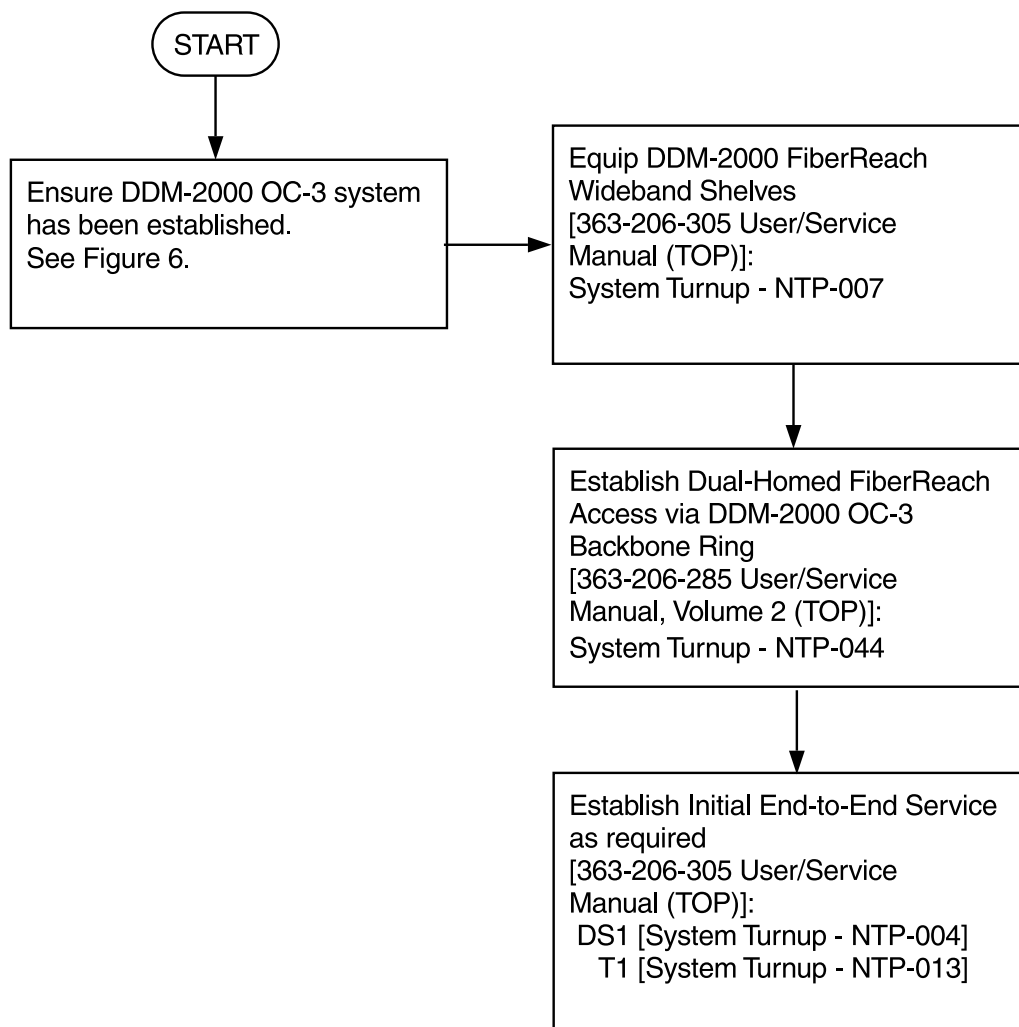


Figure 12. DDM-2000/FT-2000 Large Network Configurations — Dual Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

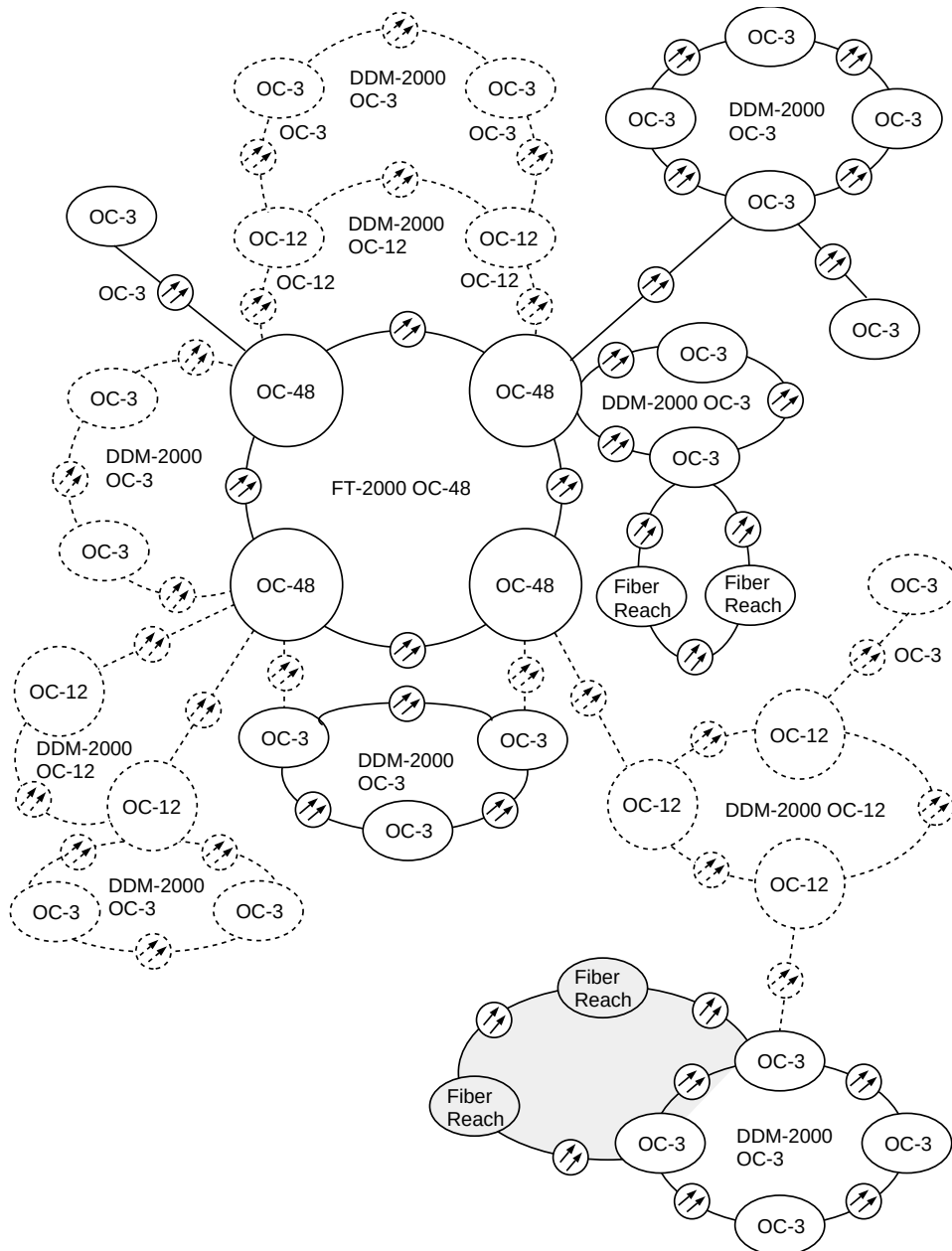


Figure 13. DDM-2000/FT-2000 Large Network Configurations — Dual Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

Establish End-to-End DDM-2000 OC-12 System - Path Switched Ring
See Figure 15

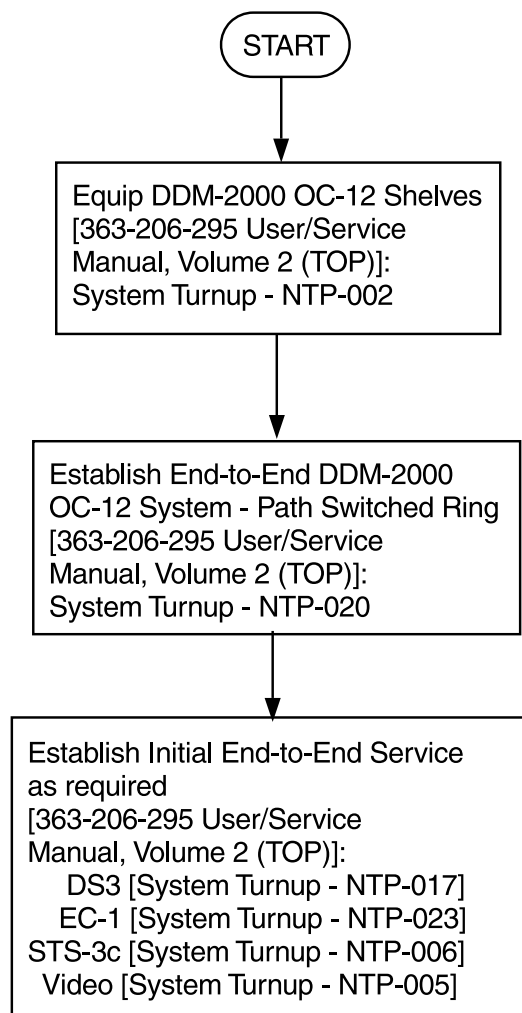


Figure 14. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-12 Path Switched Ring

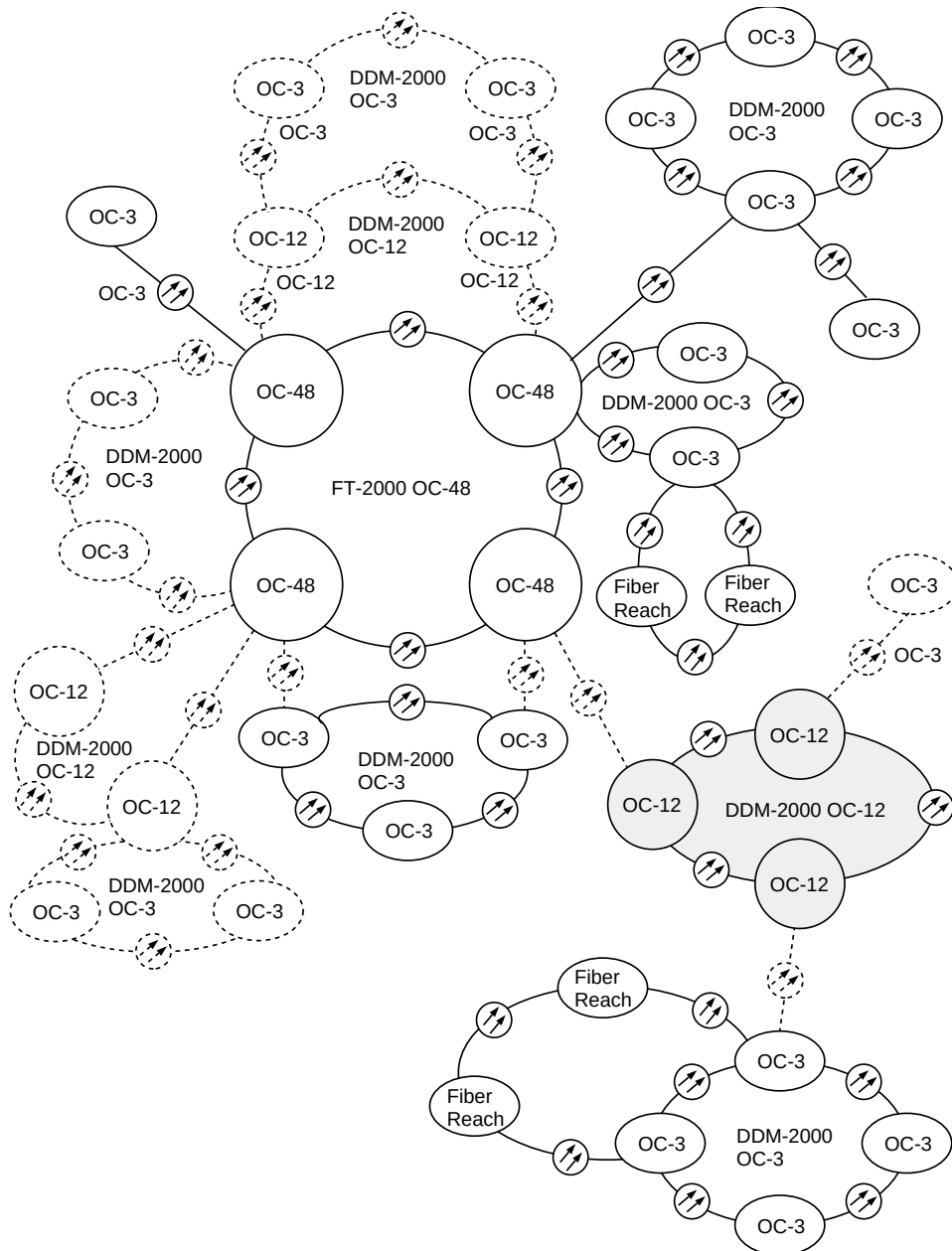


Figure 15. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-12 Path Switched Ring

Establish OC-3 Optical Span Extension
Between DDM-2000 OC-12 Ring and DDM-2000 OC-3
See Figure 17

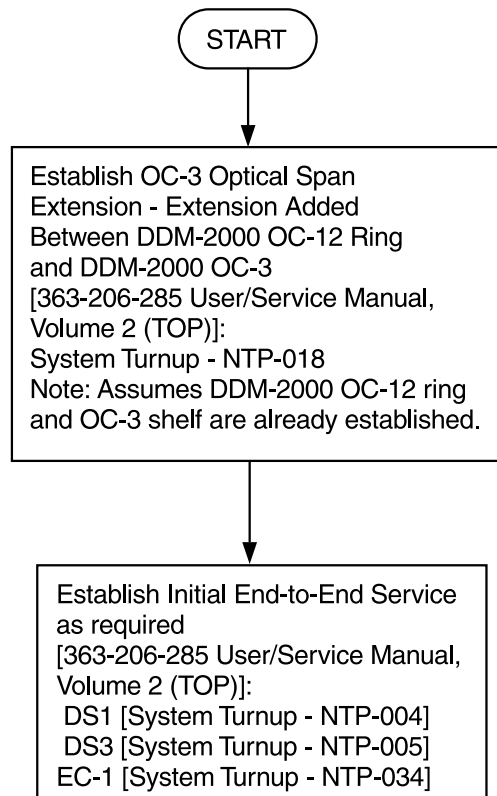


Figure 16. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3

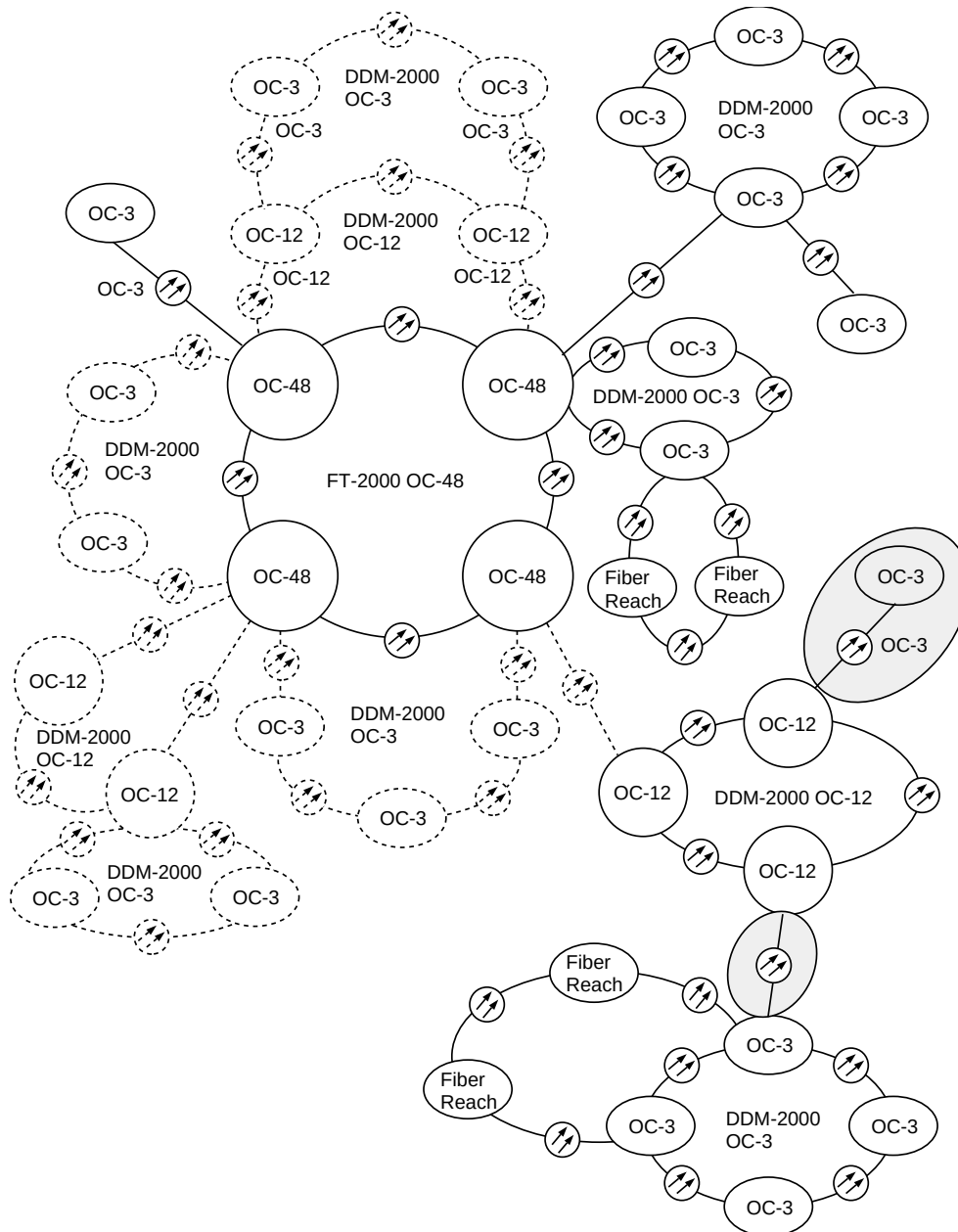


Figure 17. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3

Establish OC-3/IS-3 Optical Span Extension
Between FT-2000 and DDM-2000 OC-12 Ring
See Figure 19

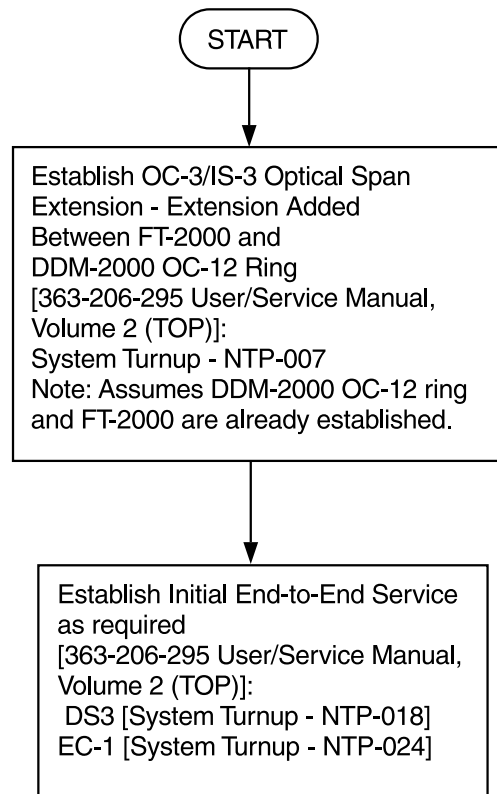


Figure 18. DDM-2000/FT-2000 Large Network Configurations — OC-3/IS-3 Optical Span Extension Between DDM-2000 OC-12 Ring and FT-2000 OC-48

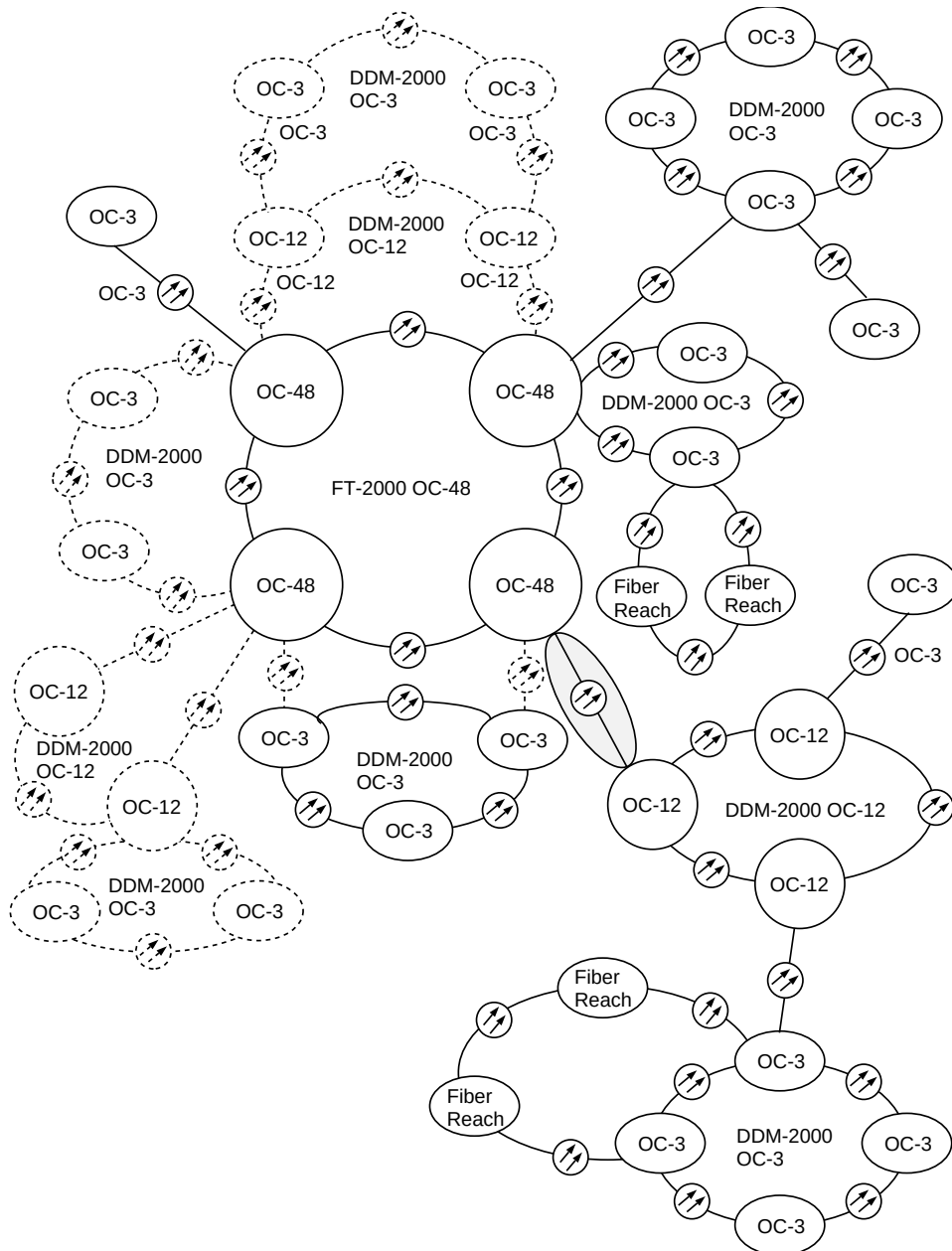


Figure 19. DDM-2000/FT-2000 Large Network Configurations — OC-3/IS-3 Optical Span Extension Between DDM-2000 OC-12 Ring and FT-2000 OC-48

Establish OC-3/IS-3 Dual Ring Interworking
DDM-2000 OC-3 to FT-2000 Ring
See Figure 21

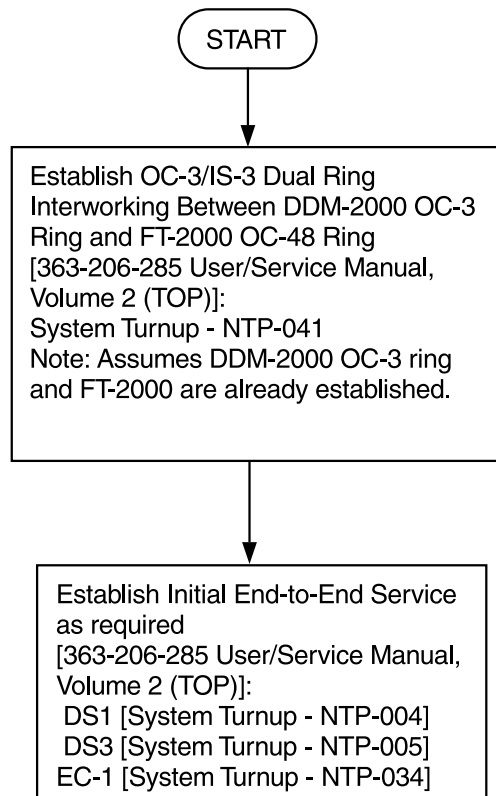
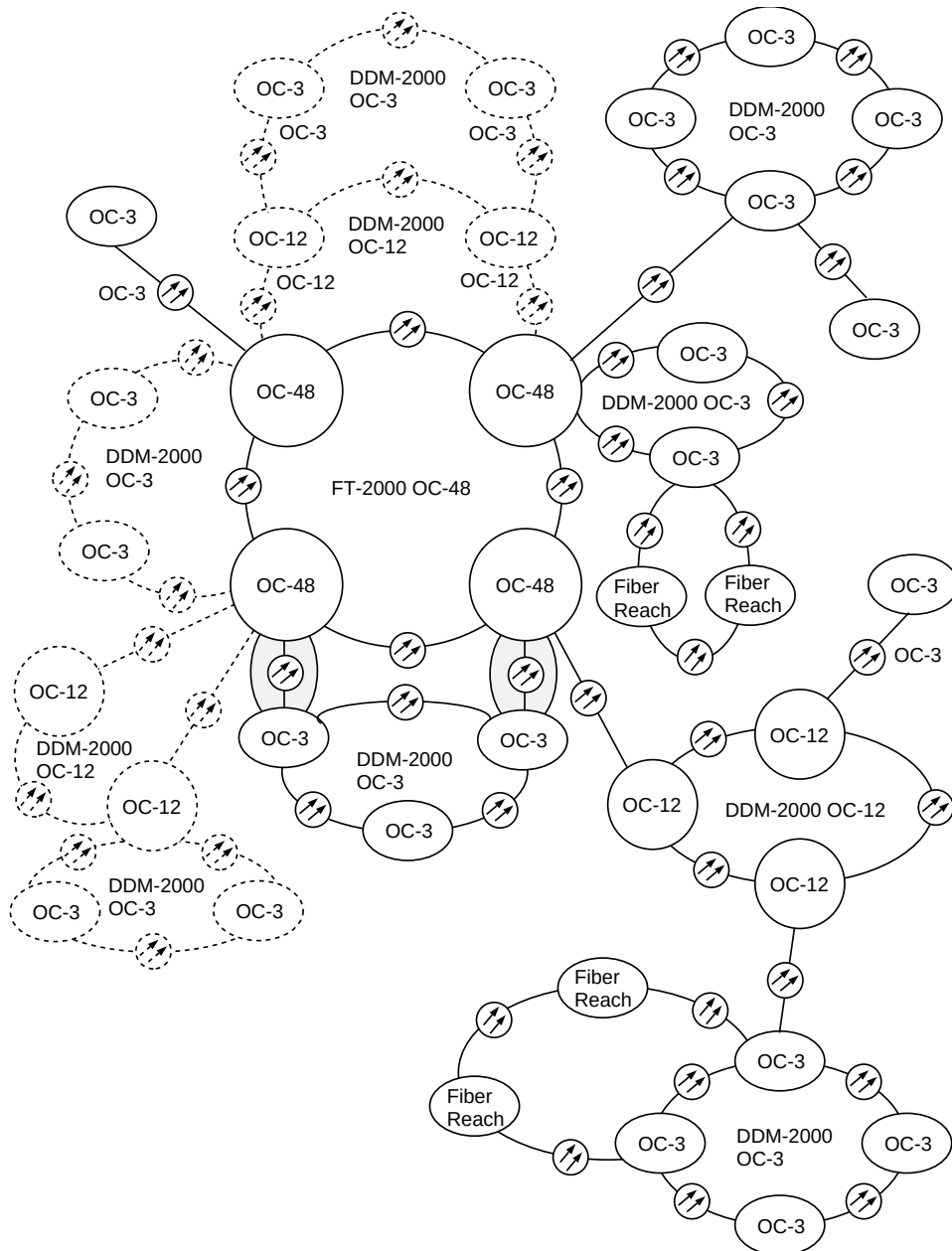


Figure 20. DDM-2000/FT-2000 Large Network Configurations — OC-3/IS-3 Dual Ring Interworking Between DDM-2000 OC-3 Ring and FT-2000 OC-48



Establish Single-Homed OC-12 Access
via FT-2000 OC-48 Backbone Ring
See Figure 23

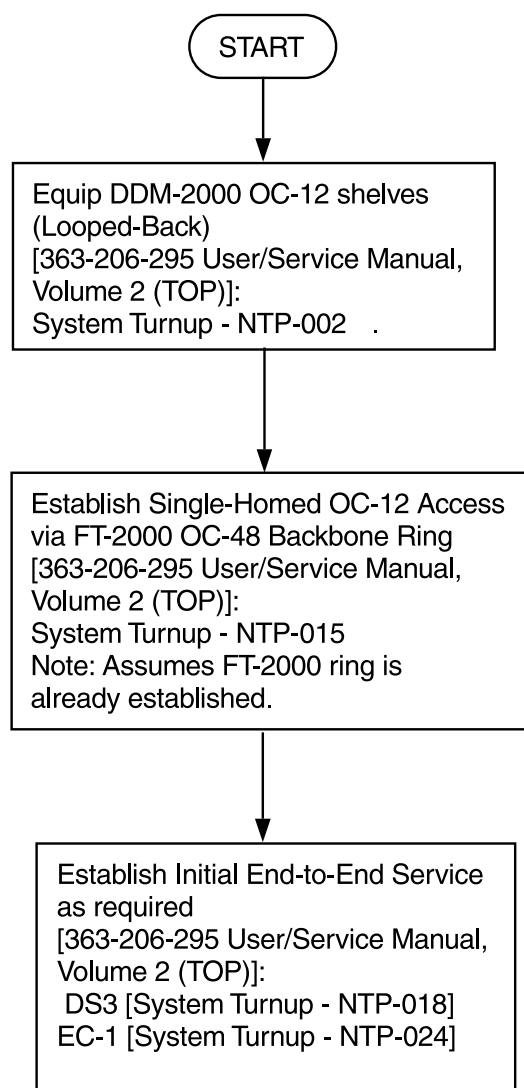


Figure 22. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

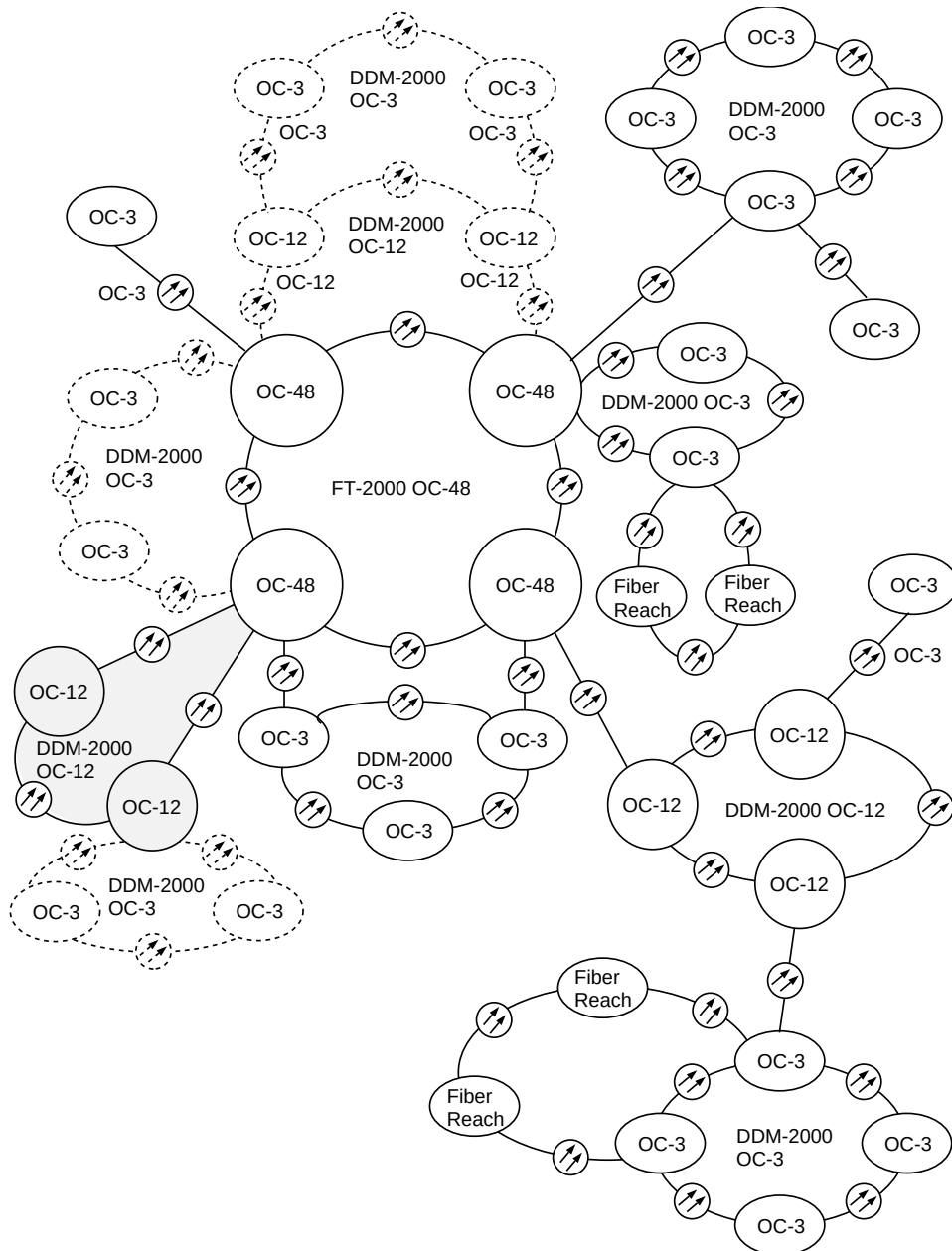


Figure 23. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

Establish Single-Homed OC-3 Access
via DDM-2000 OC-12 Backbone Ring
See Figure 25

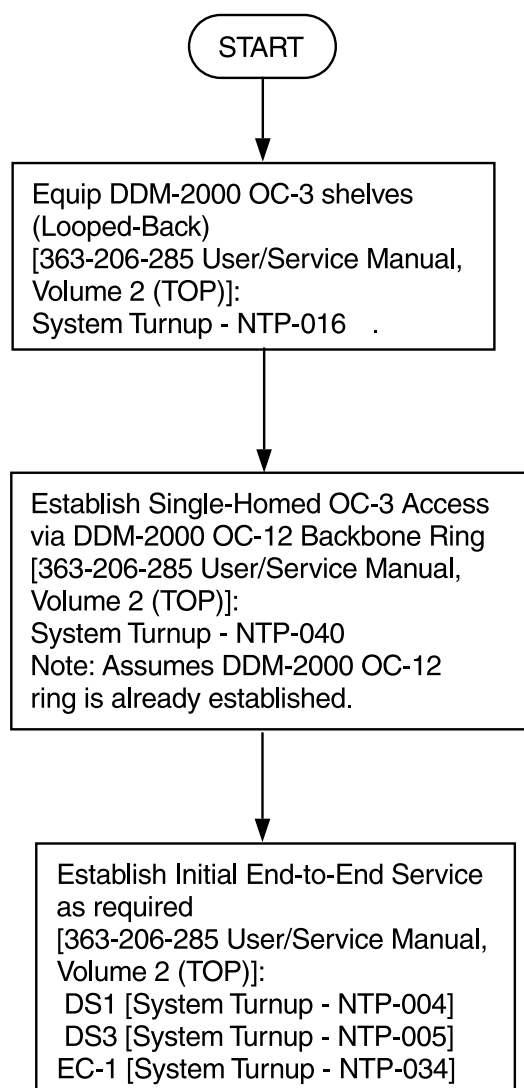


Figure 24. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

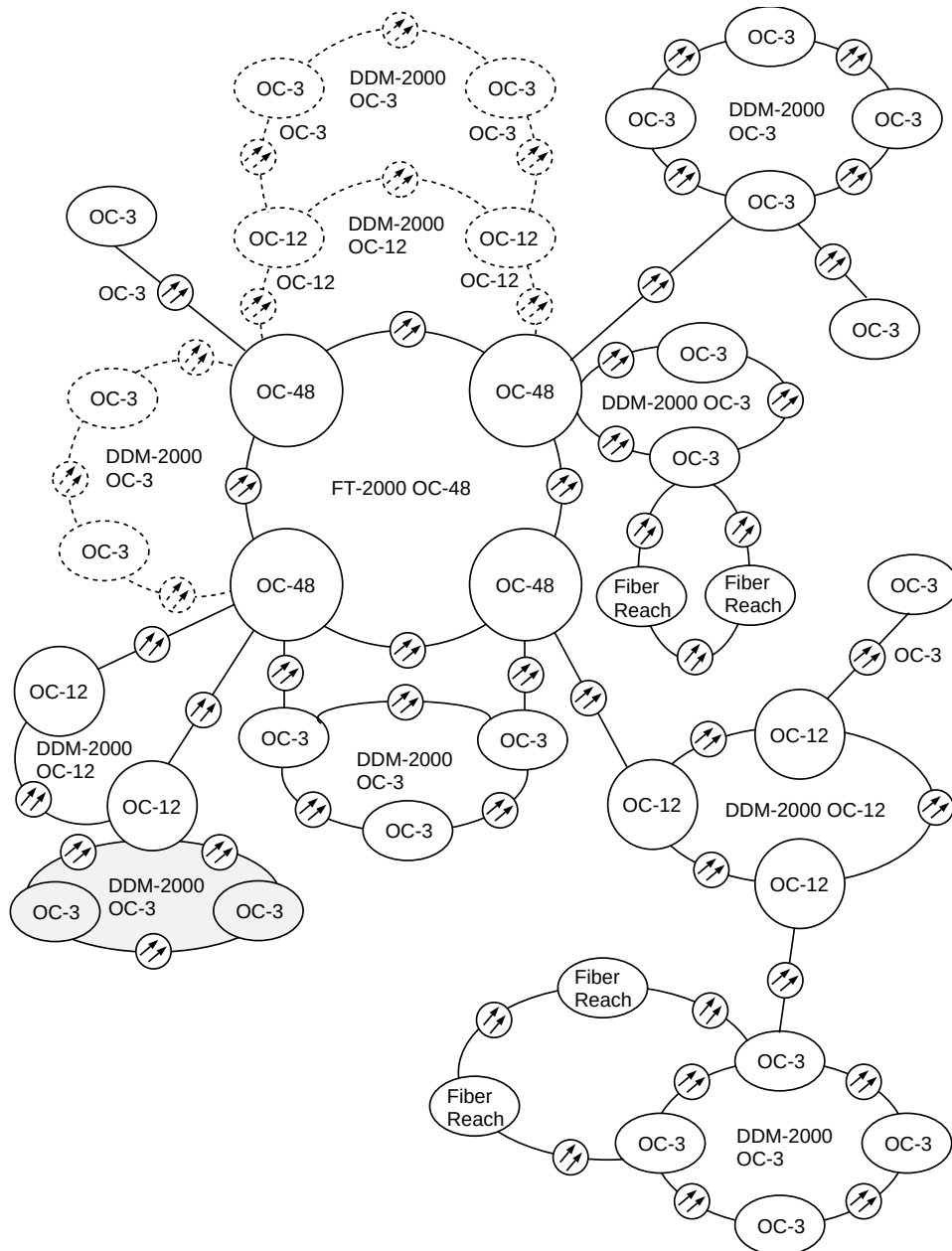


Figure 25. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

Establish Dual-Homed OC-3 Access
via FT-2000 OC-48 Backbone Ring
See Figure 27

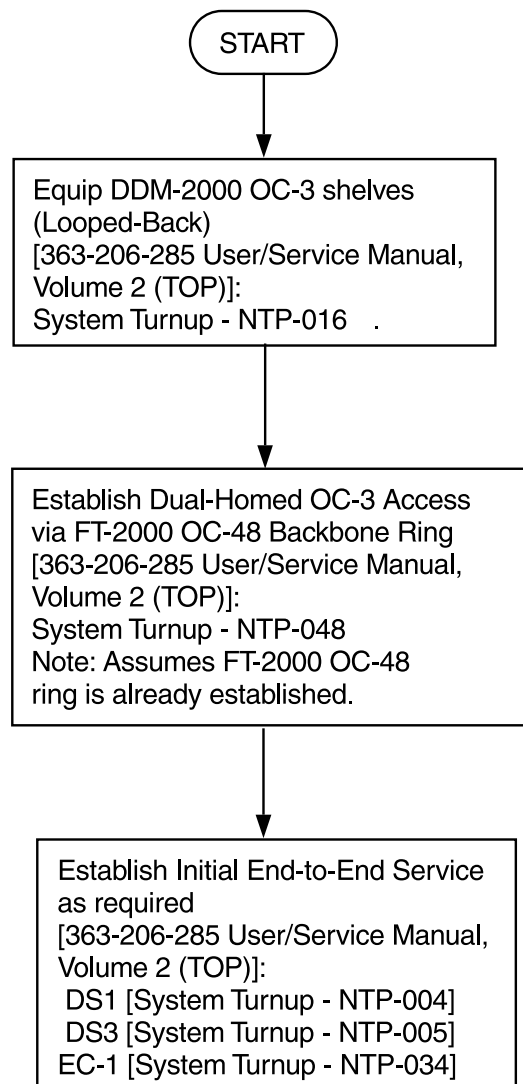


Figure 26. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring

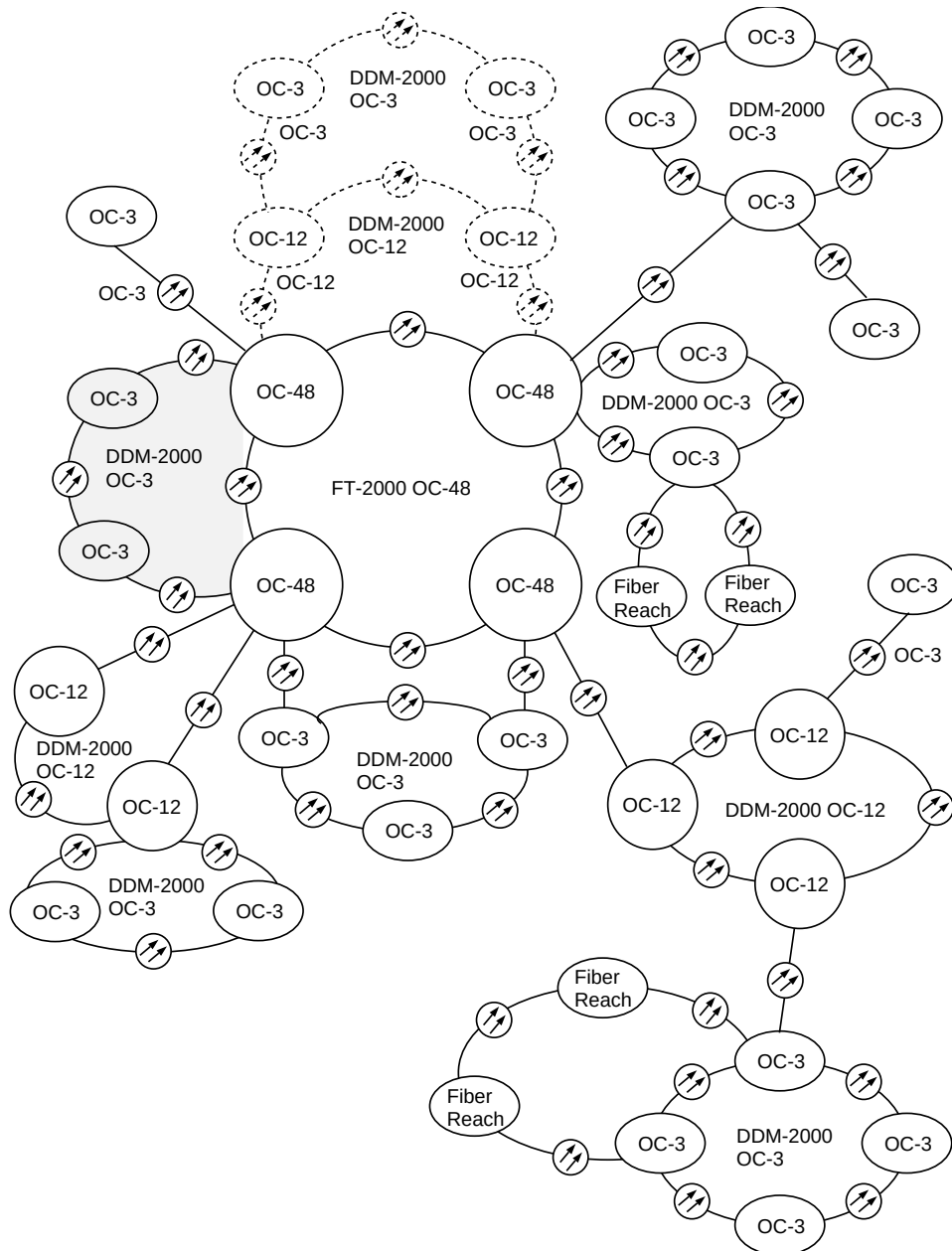


Figure 27. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring

Establish Dual-Homed OC-12 Access
via FT-2000 OC-48 Backbone Ring
See Figure 29

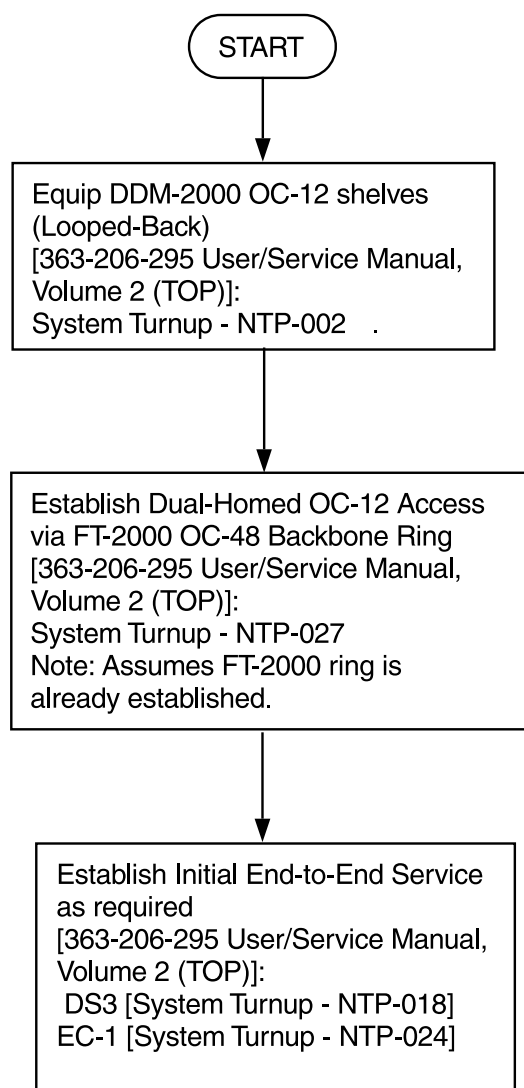


Figure 28. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

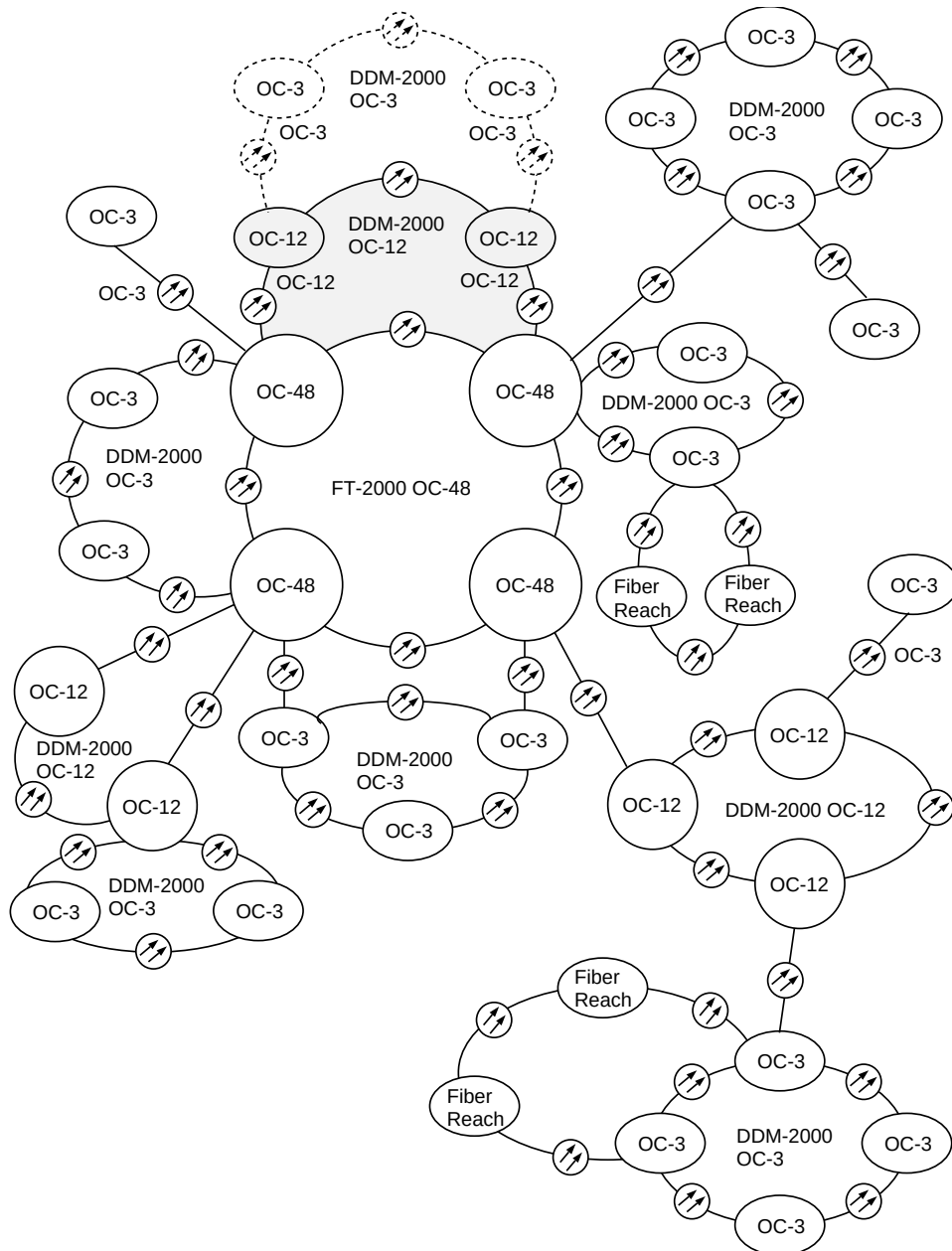


Figure 29. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

Establish Dual-Homed OC-3 Access
via DDM-2000 OC-12 Backbone Ring
See Figure 31

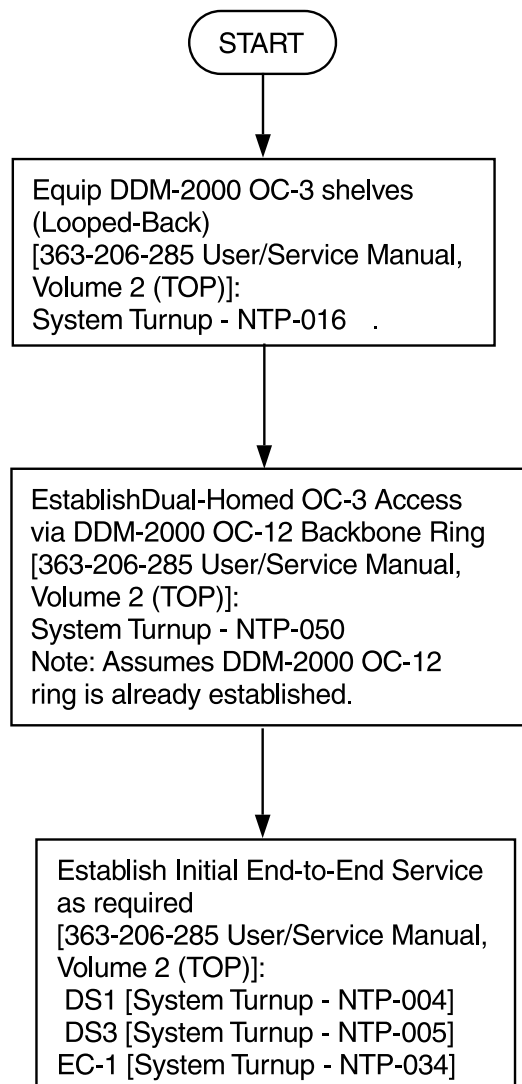


Figure 30. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

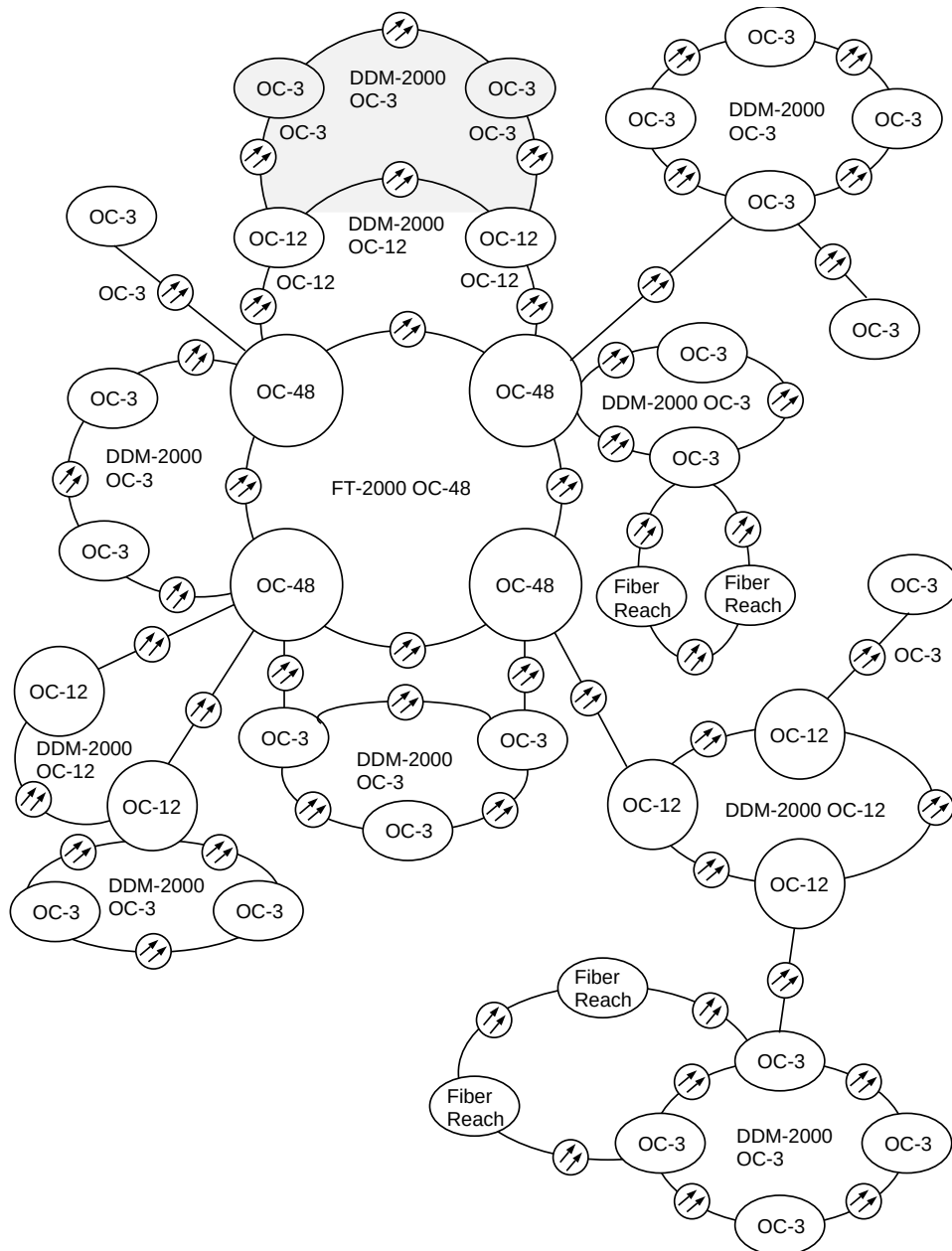


Figure 31. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

Establish DDM-2000 OC-3c (STS-3c) Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
It is assumed that the DDM-2000 has been properly equipped and has passed the looped transmission test(s) [**System Turnup: NTP-016**]. It is also assumed that the end-to-end OC-3 optical spans have been established.

 **NOTE 2:**
It is assumed that the DDM-2000 OC-3 shelf is colocated with the broadband terminal equipment which is connected to the **OLIUs** in the DDM-2000 OC-3 **FUNCTION UNITS C** slots.

 **NOTE 3:**
It is assumed that **21G/21G-U/21G2-U OLIUs** are installed in **MAIN** and **FUNCTION UNITS C** slots for OC-3c service and that the **OLIUs** in **FUNCTION UNITS C** slots are looped back at the terminating ends. **FUNCTION UNITS A** and **B** and **LOW SPEED** slots are not equipped when the DDM-2000 OC-3 shelf is equipped for OC-3c service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Verify **21G/21G-U/21G2-U OLIU** circuit packs are installed in **FUNCTION UNITS C** slots.

2. **NOTE 1:**

The "**set -ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the "**set -ne:**" command to:

- Designate ONE shelf in the subnetwork as the DSNE, if not already performed.
 - Designate the AGNE(s) and alarm group number, as required.
 - Set cross-connect mode to manual ("**crs>manual**").
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. Use the "**ent-crs-sts1:**" command at each shelf to make the following STS-1 cross-connections: m-1 to c-1, m-2 to c-2, and m-3 to c-3. For example, "**ent-crs-sts1:m-1,c-1**".

-
4. Use the "**set-feat:feat=sts3c,act=enable**" command to allow OC-3c service to be supported.

-
5. Use the "**set-oc3:**" command to set the OC-3 line for **concat** mode.

-
6. Determine the optical loss of the OC-3c span from the DDM-2000 to the terminating equipment.

-
7. Remove optical loops from **OLIUs** in **FUNCTION UNITS C** slots and the terminating equipment.

-
8.  **NOTE:**
There are no option switches on the **21G2-U OLIU**.

Set the option switches on the **21G/21G-U OLIUs** in the **FUNCTION UNITS C** slots to agree with the loss of the optical span to the terminating equipment.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9.  **NOTE:**
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is installed.

Reinstall **OLIUs** (if removed) and connect the optical cables from the DDM-2000 OC-3 to the terminating equipment. **DLP-514**

-
10. Perform an OC-3c transmission test using a SONET test set, if required. **DLP-544**
-

Establish End-to-End System DDM-2000 OC-3 Point to Point

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

 **NOTE 2:**
It is assumed that the DDM-2000s at both ends of the system have been equipped and passed the looped shelf transmission test(s) [**System Turnup: NTP-016**].

Determine the optical loss of the optical facility from office records or by making the required measurements.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. **NOTE 1:**

For a given optical span, the network elements that terminate on each side of the span must have their DCC Network Side/User Side (NS/US) parameters set to opposite values to avoid an "inconsistent DCC values" alarm. Figure 1 illustrates the parameter settings.

 NOTE 2:

Setting the DCC Network Side/User Side (NS/US) parameters with the **set - fecom** command will cause a controller reset. It may take 2 minutes or more for the controller to stabilize after the reset.

Use the **rtrv - fecom/set - fecom** command to verify/set the DCC Network Side/User Side (NS/US) parameter settings.

3. **NOTE 1:**

The **set - ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

⇒ **NOTE 3:**

Setting the DSNE parameters with the **set -ne** command will cause a controller reset. It may take 2 minutes or more for the controller to stabilize after the reset.

Use the **set -ne:** command to designate ONE shelf as the DSNE.

Use the **set -ne:** to designate the AGNE(s) and alarm group number, as required.

4. ⇒ **NOTE:**

Two or more shelves in the same network with the same TBOS display number will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID will cause a "duplicate TID" alarm.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to change settings.

5. Remove **OLIU** optical loops (if installed).
-

6.  **NOTE:**
The section data communication channel (DCC), used for far-end communications, must be enabled at each network element (shelf) for the end-to-end line test to work. Default condition for the DCC channel is "enabled." If it has been disabled, use the **set-fecom:** command **at each shelf** to enable far-end communications (fecom).

At each shelf, use the **set-fecom:address:com=enabled** command to ensure far end communications (fecom) is enabled.

7. If **21G/21G-U OLIUs** are installed, set the option switch on the **21G/21G-U OLIUs** to agree with the loss of the optical facility.
-

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. ➤ **NOTE:**
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is installed.

Reinstall **OLIUs**, if removed, and perform optical fiber connections and verification of the optical facility. **DLP-514**

9. ➤ **NOTE 1:**
If line timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.

➤ **NOTE 2:**
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

➤ **NOTE 3:**
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is **Holdover** instead of **External**, check that the incoming timing references are connected.

Set timing mode on **TGS** to the timing mode specified in work order or office records. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

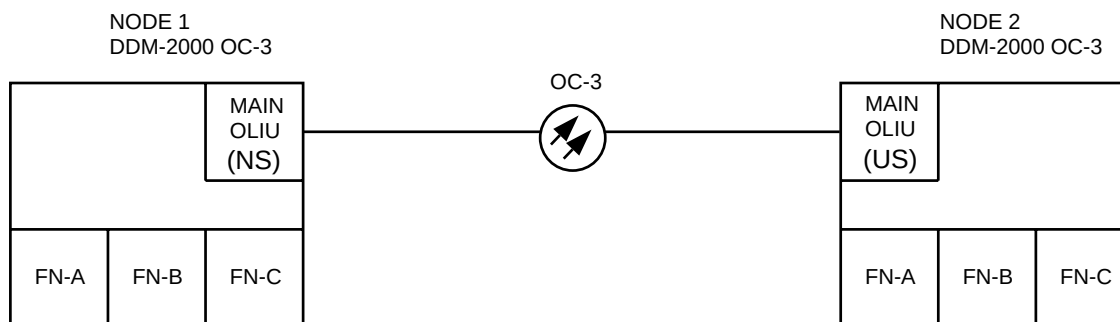
10. Perform end-to-end OC-3 line test. **DLP-525**

11. Perform end-to-end DS1 transmission test for each group, if required. **DLP-510**

12. Perform end-to-end DS3 transmission test for each group, if required. **DLP-511**

13. The system is now ready for initial DS1, DS3, or EC-1 service to be established.
[System Turnup: NTP-004] (DS1),
[System Turnup: NTP-005] (DS3),
[System Turnup: NTP-034] (EC-1).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO



DDM-2000 OC-3 Linear Applications DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)				
21-Type/ 22-Type OLIUs	MAIN dcc-m	FN-A dcc-a	FN-B dcc-b	FN-C dcc-c
	US	NS	NS	NS

Figure 1. Example of Linear System Network Side/User Side Settings

Establish Initial End-to-End DS1 Service Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
The OC-3 system must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves and establish the system.

 **NOTE 2:**
If the DS1 terminating end(s) are in a DDM-2000 OC-3, this procedure assumes that **MXRVO** circuit packs have already been installed during initial shelf turnup and either **MXRVO** or **STS1E** circuit packs have been installed during initial shelf turnup at the other DDM-2000 OC-3 terminating end(s) of the circuit. If the terminating end is in another system, it is assumed that the appropriate installation and connections have been made to that system. If the appropriate circuit packs have not been installed and the system is in-service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new group for DS1 service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

If the DDM-2000 fails to respond in the indicated manner, refer to
Trouble Clearing: IXL-001.

Verify that no LEDs or alarms are activated. If any LEDs
or alarms are activated, refer to **Trouble Clearing:**
IXL-001 and follow the appropriate trouble-clearing
procedure.

2. ⇒ **NOTE:**

The "**rtrv-eqpt:**" command retrieves the "Equipage and
Version Report". This report lists the circuit pack type and version
information for one or more slots. See the "Commands and Reports"
section of this manual for a description of the "**rtrv-eqpt:**"
command format.

At each DDM-2000 OC-3 terminating end, use the
"**rtrv-eqpt:**" command to obtain the "Equipage and
Version Report" and verify that the proper service
and protection (if required) **MXRVO (STS1E)** circuit
packs have been installed in (**FUNCTION UNITS**
group(s) **A**, **B**, or **C**) being put into service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. At the DS1 terminating node(s) of the circuit being established, determine which DS1 port(s) is to be put into service and what options are to be selected.

-
4.  **NOTE:**
The "**rtrv-t1:**" command retrieves the "T1 Port Provisioning Report". This report lists information about each DS1 port. This information includes attributes set by the "**set-t1:**" command. See the "Commands and Reports" section of this manual for a description of the "**rtrv-t1:**" command format.

At each DS1 terminating node, use the "**rtrv-t1:**" command to obtain the "T1 Port Provisioning Report" and verify the hardware and software option settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5. ➤ **NOTE 1:**

Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

➤ **NOTE 2:**

If DS1 protection is required and any service **DS1PM** circuit packs are installed, a **DS1PM** circuit pack must be installed in the protection **8(P)** slot.

➤ **NOTE 3:**

If the **LOW SPEED GROUP** is to be equipped with any **BBF3/BBF3B DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed in the corresponding **FUNCTION UNITS** group.

At each DS1 terminating node, set option switches and install **DS1/DS1PM** circuit pack(s), as required.

DLP-508

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6.  **CAUTION 1:**
*No service **LOW SPEED** DS1 slot locations should be left empty in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.*

-  **CAUTION 2:**
*When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A** Retainer Card in the same **LOW SPEED GROUP** will result in a loss of service to the protected **DS1/DS1PM** and the removed **DS1/DS1PM** circuit pack.*

-  **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 **LOW SPEED** slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Cards into all unused service **DS1** slots in **LOW SPEED GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.

-
7. At each DS1 terminating node, use the "**set-t1:**" command to set the characteristics of the DS1 port of the circuit being established.
-
8. At each DS1 terminating node, make the appropriate cable connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.
10. If one of the terminating nodes is equipped with **STS1E** circuit packs for an EC-1 interface to support DS1 services being established, establish initial EC-1 low-speed interface [**NTP-034**].
11.  **NOTE 1:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs>manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ **NOTE 2:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**cnvt-crs**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connections to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. Make necessary VT1.5/STS1 cross-connections at each node in the network.

A. Linear or Add/Drop Configuration	DLP-545
B. Single Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/FiberReach Configuration	DLP-557
E. Stand Alone OC-3/FiberReach Configuration	DLP-558
F. Single/Dual OC-3/OC-48 Configuration	DLP-559
G. Single/Dual OC-3/OC-12 Configuration	DLP-560

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13.  **NOTE:**

For a DS1 circuit in a path protected ring network, the "sw-path- () :address" command must be used at the terminating nodes (and dual ring interworking (DRI) nodes in a DRI ring network) to switch the active VT1.5 (DS1) path to repeat this test on the other path(s).

Perform DS1 end-to-end transmission test for each circuit being put into service, as required:

A. Linear or Ring Configuration	DLP-510
B. Dual Ring Interworking (DRI) Configuration	DLP-554
C. OC-3/FiberReach Configuration	DLP-510

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS1 port(s) of the circuit being established.

-
15.  **NOTE:**

If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t1:**" command to set the port state of the DS1 port(s) of the circuit being established.

-
16. If **BBF3/BBF3B DS1PM** circuit packs are installed and the optional **ds1pm** performance monitoring feature is to be used, use the "**set-feat:feat=ds1pm,act=enable**" command to enable the feature.
-

Establish Initial End-to-End DS3 Service Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
The OC-3 system must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves, and to establish a system.

 **NOTE 2:**
This procedure assumes that **DS3** circuit packs have already been installed during the initial shelf turnup at the DS3 terminating end(s) of the circuit and either **DS3** or **STS1E** circuit packs have been installed during initial shelf turnup at the other terminating end of the circuit. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new DS3 group for DS3 service.

 **NOTE 3:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

At the DS3 terminating node(s) of the circuit being established, determine which DS3 port is to be put into service and what options are to be selected.

2. **NOTE:**

The "**rtrv-eqpt:**" command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the "**rtrv-eqpt:**" command format.

Use the "**rtrv-eqpt:**" command to obtain the "Equipage and Version Report" and verify that the service and protection (if required) **DS3** circuit packs have been installed in proper group (**FUNCTION UNITS A, B, or C**) being put into service.

3. **NOTE:**

The "**rtrv-t3:**" command retrieves the "T3 Port Provisioning Report". This report lists information about each DS3 port. This information includes attributes set by the "**set-t3:**" command. See the "Commands and Reports" section of this manual for a description of the "**rtrv-t3:**" command format.

Use the "**rtrv-t3:**" command to obtain the "T3 Port Provisioning Report" and verify the software option settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4.  **NOTE:**
 DS1 circuit packs **cannot** be installed in a group that is equipped with
 DS3 circuit packs.

Verify the line build out (LBO) option jumpers are
installed as required and reinstall **DS3** circuit pack(s).

DLP-513

-
5. Make the appropriate cable connection(s) to the DS3
cross-connect point(s) or equivalent connection point(s)
for the circuit being added.

-
6. Verify that no LEDs or alarms are activated. If any LEDs
or alarms are activated, refer to **Trouble Clearing:**
IXL-001 and follow the appropriate trouble-clearing
procedure.

-
7. If one of the terminating nodes is equipped with **STS1E**
circuit packs for an EC-1 interface to support DS3
services being established, establish initial EC-1 low-
speed interface.

NTP-034

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs=manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

 NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted ("**cnvt-crs**") to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

The following commands may be used to delete, enter, and retrieve STS-1 cross-connections in a path protected ring network: "**dlt-crs-sts1**", "**ent-crs-sts1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands.

Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

-
9. Make necessary STS-1 cross-connections for each node in the network.

A. Linear or Add/Drop Configuration	DLP-545
B. Single Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/OC-48 Configuration	DLP-559
E. Single/Dual OC-3/OC-12 Configuration	DLP-560

10. ⇒ **NOTE:**

For a DS3 circuit in a path protected ring network, the "**sw-path-sts1:address**" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path(s).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Perform DS3 end-to-end transmission test for each circuit being put into service (optional).

A. Linear or Single Ring Configuration	DLP-511
B. Dual Ring Interworking (DRI) Configuration	DLP-553
C. Single/Dual Homing Ring Configuration	DLP-511
-

11. Use the "**set - t3:**" command to set the characteristics of the DS3 port of the circuit being established.
-

12. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS3 port of the circuit being established.
-

13.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t3:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t3:**" command to set the port state of the DS3 port of the circuit being established.

Add New DS1 Service Group Already In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a new DS1 port or **DS1/DS1PM** circuit pack is being added to a **LOW SPEED GROUP** that is already in service and the corresponding **FUNCTION UNITS** group is equipped with **MXRVO** circuit packs at the DS1 terminating end(s). It also assumes that **STS1E** circuit packs have been installed if the other end is an EC-1 interface. If proper circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new group (**MXRVO** or **STS1E**).

 **NOTE 2:**
If the **LOW SPEED GROUP** is to be equipped with any **BBF3/BBF3B DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed in the corresponding **FUNCTION UNITS** group. Also, if DS1 protection is required and service **DS1PM** circuit packs are to be installed, a **DS1PM** circuit pack must first be installed in the protection **8(P)** slot.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

⇒ **NOTE 4:**

If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Determine which DS1 ports/slots are to be put into service and what options are to be selected.

-
2. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3.  **CAUTION 1:**
*To minimize "hits" on in-service ports on **DS1/DS1PM** circuit packs having a port added, it is recommended that a CIT be used to manually switch (using the "**switch-ls**" command) the DS1 to protection if the **DS1/DS1PM** circuit pack is removed or to set channel options without removing the circuit pack.*

 **CAUTION 2:**
*If the protection **DS1/DS1PM** circuit pack is not available for a protection switch, removing a service **DS1/DS1PM** circuit pack will interrupt service on all ports on that circuit pack. If a CIT is available, use the "**rtrv-state-eqpt**" command to check the status of the protection switch.*

 **CAUTION 3:**
*When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A** Retainer Card in the same **LOW SPEED GROUP** will result in a loss of service to the protection **DS1/DS1PM** circuit pack and the removed **DS1/DS1PM** circuit pack.*

 **CAUTION 4:**
*No service **LOW SPEED** DS1 slot locations should be left empty in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.*

Condition **DS1/DS1PM** circuit pack or port for new DS1 service being added.

DLP-520

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. At each DS1 terminating node, use the "**set-t1:**" command to set the characteristics of the DS1 port being established, if not already performed.

-
5. At each DS1 terminating node, make the appropriate cable connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.

-
6. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

-
7.  **NOTE 1:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs>manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ **NOTE 2:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted ("**cnvt-crs**") to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. Make necessary VT1.5/STS1 cross-connections for each node in the network.

A. Linear or Add/Drop Configuration	DLP-545
B. Single Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/FiberReach Configuration	DLP-557
E. Stand Alone OC-3/FiberReach Configuration	DLP-558
F. Single/Dual OC-3/OC-48 Configuration	DLP-559
G. Single/Dual OC-3/OC-12 Configuration	DLP-560

-
9.  **NOTE:**

For a DS1 circuit in a path protected ring network, the "**sw-path-vt1: address**" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active VT1.5 (DS1) path to repeat this test on the other path.

Perform DS1 end-to-end transmission test for each circuit being put into service.

A. Linear or Single Ring Configuration	DLP-510
B. Dual Ring Interworking (DRI) Configuration	DLP-554
C. OC-3/FiberReach Configuration	DLP-510

-
10. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS1 port(s) of the circuit being established.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the "**set-state-t1:**" command to set the port state of the DS1 port(s) of the circuit being established.

-
12. If **BBF3/BBF3B DS1PM** circuit packs are installed and the optional **ds1pm** performance monitoring feature is to be used, use the "**set-feat:feat=ds1pm,act=enable**" command to enable the feature.
-

Add New DS3 Group for DS3 Service System In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a new group is being equipped with **DS3/DS3PM** circuit packs for DS3 service. It also assumes that **STS1E** circuit packs have been installed if the other end is an EC-1 interface. If it has not been installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new **STS1E** group.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

-
3. Verify no **DS1/DS1PM** circuit packs are installed in **LOW SPEED** slots associated with new DS3 **FUNCTION UNITS** group being added.

-
4. Set line build out (LBO) option jumpers and install **DS3/DS3PM** circuit packs into proper slots of **FUNCTION UNITS** group (**A, B, or C**) being equipped.

DLP-507

-
5. Make the appropriate connection(s) to the DS3 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.

-
6. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE 1:**

Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs=manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

 NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve STS-1 cross-connections: "**dlt-crs-sts1**", "**ent-crs-sts1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

-
8. Make necessary STS-1 cross-connections for each node in the network.

A. Linear or Add/Drop Configuration	DLP-545
B. Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/OC-48 Configuration	DLP-559
E. Single/Dual OC-3/OC-12 Configuration	DLP-560

9. ⇒ **NOTE:**

For a DS3 circuit in a path protected ring network, the "**sw-path-sts1:address**" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

Perform DS3 end-to-end transmission test for each circuit being put into service (optional).

A. Linear or Single Ring Configuration	DLP-511
B. Dual Ring Interworking (DRI) Configuration	DLP-553
C. Single/Dual Homing Configuration	DLP-511
-

10. Use the "**set-t3:**" command to set the characteristics of the DS3 port.
-

11. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS3 port(s) of the circuit being established.
-

12.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t3:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t3:**" command to set the port state of the DS3 port(s) of the circuit being established.

Add New MXRVO Group for DS1 Service System In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a new **FUNCTION UNITS** group(s) is being added with **MXRVO** circuit packs for DS1 service. If the group is already equipped with **MXRVO** circuit packs, refer to **Circuit Order: NTP-006**. This procedure also assumes that **STS1E** circuit packs have been installed if the other end is an EC-1 interface. If proper circuit packs have not been installed at the EC-1 interface, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add new **STS1E** group.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

-
3.  **NOTE:**
If the **LOW SPEED GROUP** is to be equipped with any **BBF3/BBF3B DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed in the corresponding **FUNCTION UNITS** group.

At DS1 terminating end, install **MXRVO** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, or **C**) being equipped.

DLP-506

-
4.  **NOTE:**
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Option and install required service **DS1/DS1PM** circuit packs. **DLP-508**

5.  **NOTE:**
If DS1 protection is required and service **DS1PM** circuit packs are installed, a **DS1PM** circuit pack must be installed in the protection **8(P)** slot.

Install protection **DS1/DS1PM** circuit pack into slot **8(P)** of **LOW SPEED GROUP** being put into service, if required. **DLP-508**

6. At the DS1 terminating end(s) use the "**set - t1**" command to set the characteristics of the DS1 ports.
-

7.  **CAUTION:**
*No service **LOW SPEED** DS1 slot locations should be left empty in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.*

-  **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 **LOW SPEED** slot locations from the DDM-2000's internal protection bus.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Install **177A** Retainer Cards into all unequipped service DS1 slots in **LOW SPEED GROUPS** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.

8. Make the appropriate connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.
-

9. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.
-

10.  **NOTE 1:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs>manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. Make necessary VT1.5/STS1 cross-connections for each node in the network.

A. Linear or Add/Drop Configuration	DLP-545
B. Single Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/FiberReach Configuration	DLP-557
E. Stand Alone OC-3/FiberReach Configuration	DLP-558
F. Single/Dual OC-3/OC-48 Configuration	DLP-559
G. Single/Dual OC-3/OC-12 Configuration	DLP-560

-
12.  **NOTE:**

For a DS1 circuit in a path protected ring network, the "**sw-path-vt1: address**" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active VT1.5 (DS1) path to repeat this test on the other path(s).

Perform DS1 end-to-end transmission test for each circuit being put into service.

A. Linear or Single Ring Configuration	DLP-510
B. Dual Ring Interworking (DRI) Configuration	DLP-554
C. OC-3/FiberReach Configuration	DLP-510

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS1 port(s) of the circuit being established.

-
14.  **NOTE:**

If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t1:**" command to set the port state of the DS1 port(s) of the circuit being established.

-
15. If **BBF3/BBF3B DS1PM** circuit packs are installed and the optional **ds1pm** performance monitoring feature is to be used, use the "**set-feat:feat=ds1pm,act=enable**" command to enable the feature.
-

Convert DS1 Group Service to DS3 Group Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a DS1 **LOW SPEED GROUP** is being changed to a DS3 **FUNCTION UNITS** group for DS3 service.

 **NOTE 2:**
If, at any point in this procedure, the DDM-2000 fails to respond in the indicated manner, you should refer to **Trouble Clearing: IXL-001**.

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being converted.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

-
3. At the DSX-1, remove the DS1 signals associated with the DS1 group being converted. (**FAULT** LED flashes on **DS1/DS1PM** circuit packs with signals removed.)

-
4.  **NOTE:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen, to operate it.

On the **SYSCTL**, momentarily depress the **UPD/INIT** button. (**FAULT** LEDs go off.)

-
5.  **NOTE 1:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs>manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ **NOTE 2:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Use the "**dlt-crs-sts1:**" or "**dlt-crs-vt1:**" command to delete cross-connections associated with all **DS1/DS1PM** circuit packs being removed.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. Remove the **DS1/DS1PM** circuit packs from **LOW SPEED GROUP** being converted to DS3.

-
7. Remove the **MXRVO** circuit packs from **FUNCTION UNITS** group being converted to DS3.

-
8. Momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.

-
9. Verify that all alarms are off.

-
10.  **NOTE:**
DS1/DS1PM circuit packs **cannot** be installed in a group that is equipped with **DS3/DS3PM** circuit packs.

Set line build out (LBO) option jumpers and install **DS3/DS3PM** circuit packs into **FUNCTION UNITS** group (**A, B, or C**) being put into service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. Make appropriate connections(s) to the DS3 cross-connect point(s) or equivalent connection point(s) for the channel(s) being added.

-
12. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

-
13. Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

-
14. As required, at each shelf in the end-to-end network, use the "**ent-crs-sts1:**" command at each shelf to make required STS-1 cross-connections for DS3 channel being established.

A. Linear or Add/Drop Configuration	DLP-545
B. Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/OC-48 Configuration	DLP-559
E. Single/Dual OC-3/OC-12 Configuration	DLP-560

-
15. Perform an end-to-end DS3 low-speed transmission test for each DS3 group being put into service (optional).

A. Linear or Single Ring Configuration	DLP-511
B. Dual Ring Interworking (DRI) Configuration	DLP-553
C. Single/Dual Homing Configuration	DLP-511

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16. Use the "**set-t3:**" command to set the characteristics of the DS3 port.

-
17. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS3 port(s) of the circuit being established.
-

18.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t3:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t3:**" command to set the port state of the DS3 port(s) of the circuit being established.

Convert DS3 Group Service to DS1 MXRVO Group Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

Determine which DS3 group is to be converted.

-
2.  **NOTE:**
The following operation will activate the office major (critical) alarm.
The audible alarm may be suppressed by depressing the **ACO** button.

Remove service (signal) from the DS3 group being discontinued. (**FAULT** LED flashes on **DS3/DS3PM** circuit packs with signal removed.)

-
3. Momentarily depress **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs=manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

 NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

The following commands may be used to delete, enter, and retrieve STS1 cross-connections: "**dlt-crs-sts1**", "**ent-crs-sts1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

From the work order or "**rtrv-crs-sts1**" command, determine the cross-connections for circuit being discontinued. Use the "**rtrv-crs-sts1**" command at each node to obtain the "STS-1 Cross Connect Report".

-
5.  **CAUTION:**
Removal of the wrong cross-connect may interrupt service.

⇒ **NOTE:**

DS3 slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In ring configurations, remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the non-terminating nodes, if required. A Critical alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Use the "**dlt-crs-sts1:**" command to delete the STS-1 cross-connections associated with **DS3/DS3PM** circuit pack being removed.

6. Remove **DS3/DS3PM** circuit packs associated with **FUNCTION UNITS** DS3 group(s) being discontinued, if required.
-

7. Momentarily depress **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.
-

8. Verify that all alarms go off.
-

9.  **NOTE 1:**

Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

If the **LOW SPEED GROUP** is to be equipped with any **BBF3/BBF3B DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed.

Install **MXRVO** circuit packs into proper slots of **FUNCTION UNITS** group (**A, B, or C**) being converted to DS1 service.

DLP-506

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10. Option and install required service **DS1/DS1PM** circuit packs.

DLP-508

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11. ⇒ **NOTE:**

If DS1 protection is required and service **DS1PM** circuit packs are installed, a **DS1PM** circuit pack must be installed in the **LOW SPEED** protection **8(P)** slot.

Install protection **DS1/DS1PM** circuit pack into slot **8(P)** of **LOW SPEED GROUP** being put into service, if required.

DLP-508

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. Use the "**set - t1:**" command to set the characteristics of the DS1 port.

-
13.  **CAUTION:**
*No service DS1 **LOW SPEED** slots should be left empty in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.*

 **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 **LOW SPEED** slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Cards into all unequipped service DS1 **LOW SPEED** slots in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.

-
14. Make appropriate cable connection(s) to DSX-1 cross-connect point(s) or equivalent connection point(s) for DS1 ports(s) being added.

-
15. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

16. **NOTE 1:**

Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs=manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

 NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 3:

The following commands may be used to delete, enter, and retrieve cross-connections: "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross connections for each node from the work order or circuit order.

-
17. If required, use the "**ent-crs-()**:" command(s) at each shelf to make necessary STS-1 and/or DS1 (VT1.5) cross-connections.

A. Linear or Add/Drop Configuration	DLP-545
B. Single Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/FiberReach Configuration	DLP-557
E. Stand Alone OC-3/FiberReach Configuration	DLP-558
F. Single/Dual OC-3/OC-48 Configuration	DLP-559
G. Single/Dual OC-3/OC-12 Configuration	DLP-560

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

18. Perform an end-to-end DS1 transmission test for each DS1 port being put into service (optional).

A. Linear or Single Ring Configuration	DLP-510
B. Dual Ring Interworking (DRI) Configuration	DLP-554
C. OC-3/FiberReach Configuration	DLP-510

19. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS1 port(s) of the circuit being established.
-

20.  **NOTE:**

If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t1:**" command to set the port state of the DS1 port(s) of the circuit being established.

21. If **BBF3/BBF3B DS1PM** circuit packs are installed and the optional **ds1pm** performance monitoring feature is to be used, use the "**set-feat:feat=ds1pm,act=enable**" command to enable the feature.
-

Discontinue End-to-End DS1 Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION 1:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **CAUTION 2:**
*When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A** Retainer Card in the same **LOW SPEED GROUP** will result in a loss of service to the protection **DS1/DS1PM** circuit pack and the removed **DS1/DS1PM** circuit pack.*

-  **NOTE:**
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine which DS1 ports are to be discontinued and verify no alarms exist on the system.

2.  **NOTE 1:**
The following operation may activate the office major, minor, or no alarm. The audible alarm may be suppressed by depressing the **ACO** button.

-  **NOTE 2:**
One of the terminating nodes for the DS1 service may be equipped with **STS1E** circuit packs to provide an EC-1 interface for the DS1 service.

At the DSX-1 at the DS1 terminating nodes, remove the DS1 signals associated with the port(s) being discontinued. (**FAULT** LEDs begin flashing on **DS1/DS1PM** circuit pack with signals removed.)

3.  **NOTE:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

Momentarily depress the **UPD/INIT** button on the **SYSCTL** at the DS1 terminating nodes or use the "**upd**" command to update the equipment list. (Flashing **FAULT** LEDs go off.)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. If a craft interface terminal (CIT) is available, use the "**rtrv-state-eqpt**" command to verify that the right port has been changed from *in-service* (i) to *auto* (a) state.

-
5.  **CAUTION:**
*Removing the wrong cross-connection may cause service interruption. Use the "**rtrv-crs- ()**" command to determine the proper cross-connections.*

From work order or "**rtrv-crs- ()**" command, determine the cross-connections for circuit being discontinued.

-
6.  **NOTE 1:**
DS1 **LOW SPEED** slots cannot be unequipped without an alarm until all port cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In a ring configuration, remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the intermediate nodes. A Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ NOTE 2:

In ring configurations, the following rules are used in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ NOTE 3:

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-vt1**", "**dlt-crs-sts1**", "**ent-crs-vt1**", "**ent-crs-sts1**", "**rtrv-crs-vt1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 4:**

If the cross-connection to a group with a DS1 being discontinued is an STS1 cross-connection, removal of the STS1 cross-connection may cause service interruption to other **DS1** circuit packs. In order to remove an individual **DS1**, the "**cnvt -crs**" may have to be used to convert the STS1 cross-connection to 28 individual VT1.5 cross-connections. If the entire group is being discontinued, the STS1 cross-connection may be removed, if required.

Use the "**dlt -crs -vt1:**" command to delete the terminating (drop) node cross-connections for all DS1 service being removed, if required.

-
7. Use the "**dlt -crs -vt1:**" command to delete the pass-through cross-connections at each nonterminating node for all DS1 service being removed, if required.
-
8. If all four DS1 ports on the **DS1/DS1PM** circuit pack are being discontinued, you may remove the **DS1/DS1PM** circuit pack, if required.
-
9. If *all* **DS1/DS1PM** circuit packs in a **LOW SPEED GROUP** are removed, you may remove the **FUNCTION UNITS** group (**MXRVO** or **STS1E**) circuit packs and the protection **DS1/DS1PM** circuit pack, if required.
-
10. If group **MXRVO/STS1E** circuit packs are removed, proceed to Step 12. Otherwise, continue with Step 11.
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

11.  **CAUTION:**
*No service DS1 **LOW SPEED** slots should be left empty in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** or **STS1E** (high speed mode) circuit packs.*

 **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 **LOW SPEED** slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Card(s), as required, into the DS1 **LOW SPEED** slot(s) for the **DS1/DS1PM** circuit pack(s) removed.

-
12.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

If circuit packs have been removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the "**upd**" command to update the DDM-2000 internal equipment list.

If circuit packs have *not* been removed, use the "**set-state-t1:**" command to set the port state of the DS1 port(s) to *auto* or *nmon*, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. Verify all alarms are off.

Discontinue End-to-End DS3 Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

Determine which DS3 group is to be discontinued and verify no alarms exist on the system.

2.  **NOTE 1:**
The following operation may activate the office critical, major, or minor alarm. The audible alarm may be suppressed by depressing the **ACO** button (**opr - aco** command).

-  **NOTE 2:**
One of the terminating (drop) nodes for the DS3 service may be equipped with **STS1E** circuit packs to provide an EC-1 interface for the DS3 service.

At the DSX-3/STSX cable cross-connect point at the terminating (drop) nodes, remove the DS3/EC-1 service (signal) from the DS3 group being discontinued. (**FAULT** LED flashes on **DS3/DS3PM/STS1E** circuit packs with signal removed.)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. **NOTE:**

The **UPD/INIT** pushbutton on the **SYCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

At the terminating (drop) nodes, momentarily depress the **UPD/INIT** button on the **SYCTL** circuit pack or use the **upd** command to update the equipment list. (Flashing **FAULT** LEDs go off.)

4. If a craft interface terminal (CIT) is available, use the **rtrv-state-eqpt** command to verify that the right port has been changed from *in-service* (i) to *auto* (a) state at the terminating nodes.
-

5. From the work order or **rtrv-crs-sts1** command, determine the cross-connections for circuit being discontinued. Use the **rtrv-crs-sts1** command at each node in the ring network to obtain the "STS-1 Cross Connect Report".
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6.  **CAUTION:**
Removal of the wrong cross-connect may interrupt service.

 **NOTE 1:**
DS3 slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In ring configurations, remove the cross-connections from the terminating (drop) nodes first, then remove the pass-through cross-connections at the non-terminating nodes, if required. A Critical alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

 **NOTE 2:**
In ring configurations, the following rules are used in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**cnvt -crs**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connections to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 3:

The following commands may be used to delete, enter, and retrieve STS-1 cross-connections: **dlt-crs-sts1**, **ent-crs-sts1**, and **rtrv-crs-sts1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

At the terminating (drop) nodes, use the **dlt-crs-sts1** command to delete the STS-1 cross-connections for the DS3 service being discontinued, if required.

-
7. Use the **dlt-crs-sts1** command to delete the pass-through STS-1 cross-connections at each non-terminating node for the DS3 service being removed, if required.

-
8. Remove the **DS3/DS3PM/STS1E** circuit packs associated with the group(s) being discontinued, if required.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **NOTE:**

If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t3:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If circuit pack(s) was removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.

If circuit pack(s) was *not* removed, use **set-state-t3** command to set state of **DS3/DS3PM/STS1E** circuit pack to "not monitored" (*nmon*).

10. Verify that all alarms go off.

Establish EC-1 Dual Ring Interworking DDM-2000 OC-3 to OC-12 or FT-2000 OC-3 Optical Fiber Spans

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE:**
This procedure treats the EC-1 Dual Ring Interworking (DRI) configuration as separate components which use the cross-connections to integrate the components into the DRI configuration. The EC-1 DRI configuration is established by first equipping the proper nodes with the EC-1 interfaces and then establishing DS1/DS3 service through the network. The procedures for establishing service reference the proper cross-connection procedure (DLP-550) for making the necessary cross-connections.

Establish Initial Low Speed EC-1 Interface	NTP-034

-
2. Establish Initial End-to-End DS1 Service, if required.	NTP-004

-
3. Establish Initial End-to-End DS3 Service, if required.	NTP-005
-

Add DDM-2000 OC-3 Shelf Linear or Hub Configuration Shelf Added in Middle of Optical Span

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and a new RT site (shelf) is being added in the middle of an optical span. (See Figures 1-4.)

 **NOTE 2:**
It is assumed that the optical loops are installed on the new shelf and that the new shelf has been tested in a looped-back configuration. **[System Turnup: NTP-016]** It is also assumed that options have been set using the **set-ne:** and **set-fecom:** commands.

 **NOTE 3:**
All shelves in the same network must have the same or compatible software releases.

 **NOTE 4:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Use the **rtrv-alm** command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

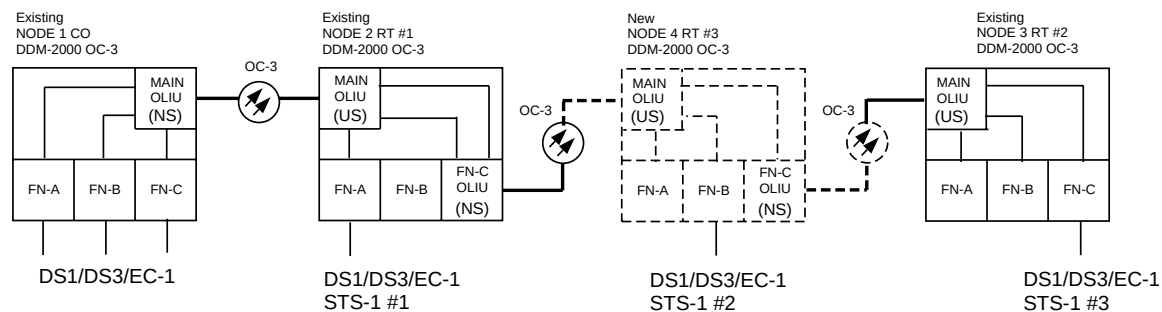


Figure 1. Adding an RT in Middle of an Add/Drop Optical Span

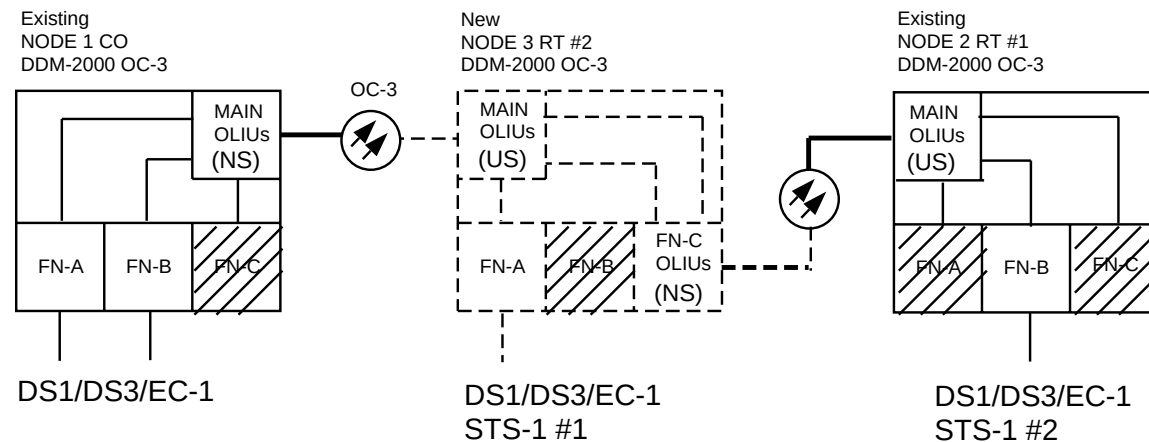


Figure 2. Adding an RT in Middle of a Point-to-Point Optical Span

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

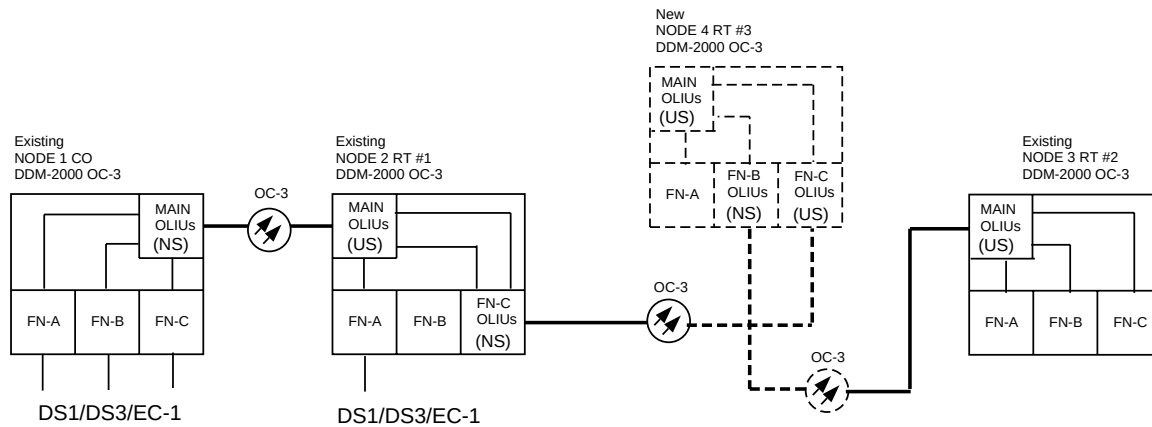


Figure 3. Adding a Release 9 RT in Middle of an Add/Drop Optical Span

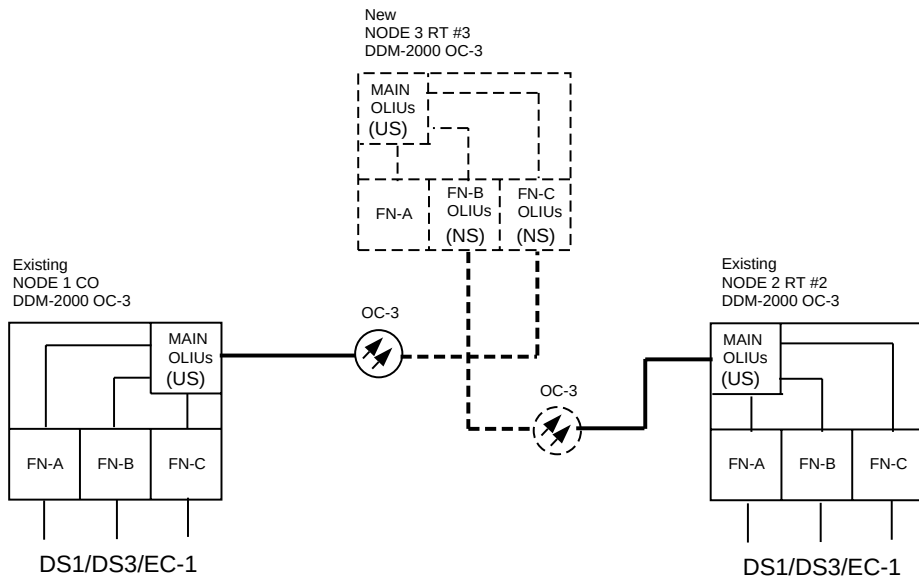


Figure 4. Adding a Release 9 RT in Middle of a Point-to-Point Optical Span

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. At **both** shelves on each side of the RT being added (for example, in Figure 1, RT #1 and RT #2), use the **switch-line:address:pri>manual** command to switch to the protection line [slot **2(P)**], if not already on protection.

4. **NOTE:**

The data communication channel (DCC) (far-end communication [fecom]) must be turned off at each shelf before the new shelf is spliced in. For example, if the configuration is as shown in Figure 1, the DCC must be disabled on both **MAIN** and **FUNCTION UNITS C** DCCs at the new shelf using these commands:
set-fecom:dcc-m:com=disabled and
set-fecom:dcc-c:com=disabled.
Also, the DCC must be disabled on **FUNCTION UNITS C** DCCs at RT #1 and on **MAIN** DCC at RT #2. The **set-fecom:** command must be performed individually at each site through a physical CIT connection or through a modem connection. This command cannot be done from within a remote login.

Use **set-fecom:address:com=disabled** command at each shelf to disable the appropriate DCC section communication link.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5.  **NOTE:**
Using the **rtrv-crs-vt1/sts1:** command at existing nodes displays the existing cross-connections. For example, in Figure 1, if the new RT is being added between existing RT #1 and existing RT #2, use the **rtrv-crs-vt1/sts1:** command at RT #1 to display the existing DS1 (VT1.5)/STS-1 cross-connections to RT #2.

Use **rtrv-crs-vt1/sts1:** command at existing RTs to retrieve existing cross-connections.

6.  **NOTE:**
If all 28 VT1.5s (DS1s) in an STS-1 are being passed through a linear release node equipped with **22-Type OLIUs** with the cross-connect mode set to manual (**set-ne:tid,crs>manual**), then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connections to drop DS1s at a later time. Pass-through cross connections between function units in ring releases nodes (for example, Release 9) in a linear configuration (for example, Figures 3 and 4) must be provisioned as VT1.5 cross connections.

At new RT, use **ent-crs-sts1:address,address** or **ent-crs-vt1:address,address** command to cross-connect all in-service STS-1/VT1.5 signals from incoming optical interface to outgoing optical interface. (For example, in Figure 1, use **ent-crs-sts1:m-1,c-1**; **ent-crs-sts1:m-2,c-2**; and **ent-crs-sts1:m-3,c-3**; commands to cross-connect all STS-1 signals from **MAIN** to **FUNCTION UNITS C OLIUs**.)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

-  **CAUTION:**
*Use the **rtrv-state-eqpt:** command to ensure system is operating on the protection fiber lines. Cutting the wrong fiber lines will cause a service interruption.*

Use local procedures to cut the **service** (slot 1) fiber line connecting existing shelves and condition the fiber for connection to the new RT shelf.

-
8. At new RT, remove **OLIU** optical loops.
-
9. Determine the optical loss of the optical facility from office records or by making the required measurements.
-
10. If **21G/21G-U OLIUs** are used, set option switch on **OLIUs** to agree with the loss of the optical facility, if required. **DLP-513**
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11.  **NOTE:**
The network elements that terminate on each end of the optical span must have their "Network Side"/"User Side" parameters set to opposite values to avoid an "inconsistent DCC values" alarm. Network Side/User Side parameters [(**set-fecom** command)] must be properly set at each end of OC-3 optical spans. One end is provisioned as "NS" (Network Side) and the other end is provisioned as "US" (User Side).

Use the **rtrv-fecom/set-fecom** commands at existing and new DDM-2000 ends of optical spans to verify/set "Network Side/User Side" parameters to proper values.

-
12.  **NOTE:**
DCC failures will exist on the new RT after the service fibers are connected to the new RT (**MJ** alarm lighted and **FAULT** LED flashing on the **OHCTL**).

Connect **service** line optical fibers to new RT optical interfaces. For example, in Figure 1, **MAIN** and **FUNCTION UNITS C OLIUs**.

DLP-514

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at new shelf turnup, the new shelf **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.

 NOTE 2:

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

 NOTE 3:

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected.

Set timing mode on new shelf **TGS** to the timing mode specified in work order or office records.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14.  **NOTE:**
Line timing from **FUNCTION UNITS C** slot requires **BBF2B TGS** circuit packs in the shelf.

If new RT is line timed, use **rtrv-sync/set-sync** commands to verify/set sync source to proper value (*main* or *fn-c*).

-
15.  **NOTE:**
The OC-3 optical line tests have to be performed at each physical shelf location associated with the optical spans being tested.

Perform end-to-end OC-3 optical line test locally on service line at **each** shelf in the network associated with new optical spans.

- A. Linear software
B. Ring software

DLP-525
DLP-515

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16.  **CAUTION:**
*The **switch-line:** command in the following step must be performed in the order given.*

 **NOTE:**
This step will force selection of the service line and place the new RT in the active path and in service.

Use **switch-line:address:pri=lockout** command at the following four locations to force selection of the service line at new and existing shelves (For example, see Figures 5 and 6):

1. New shelf (RT) upstream (toward CO) optical interface. [For example,
Figure 5: **MAIN**, (*address=main*).
Figure 6: **FUNCTION UNITS C**, (*address=fn-c*)].
 2. New shelf (RT) downstream (away from CO) optical interface. [For example,
Figure 5: **FUNCTION UNITS C**, (*address=fn-c*).
Figure 6: **FUNCTION UNITS B**, (*address=fn-b*)].
 3. Existing downstream shelf (RT away from CO) optical interface. (Forces service to downstream line.) [For example,
Figures 5 and 6: **MAIN**, (*address=main*).]
 4. Existing upstream shelf (CO, or RT toward the CO) optical interface. (Forces service to upstream line.) [For example,
Figures 5 and 6: **MAIN**, (*address=main*).]
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

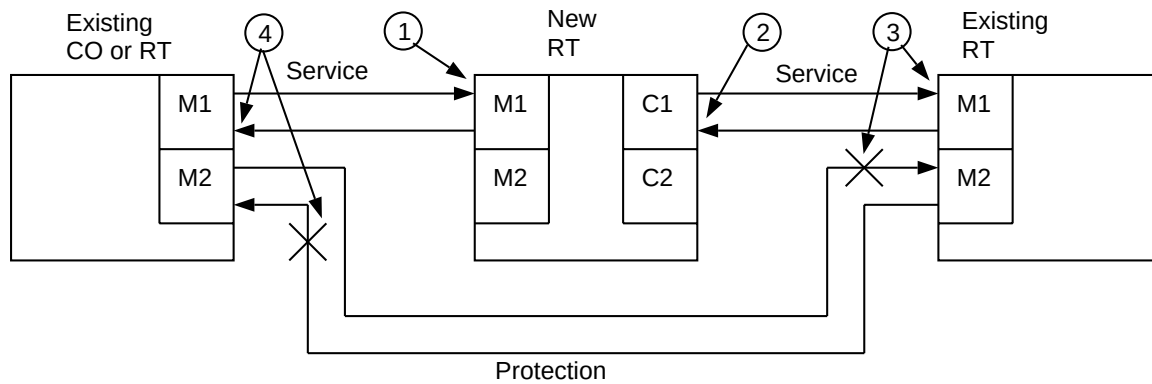


Figure 5. Example of Use of switch-line Command

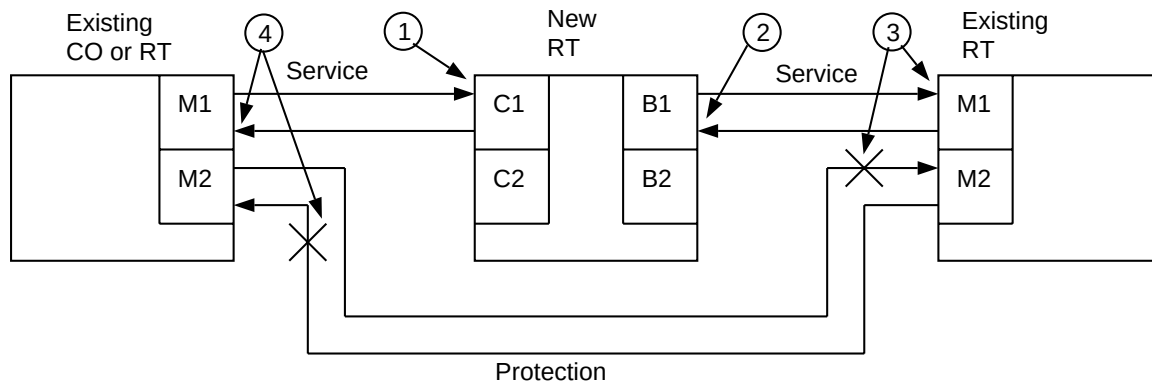


Figure 6. Example of Use of switch-line Command

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17.  **CAUTION:**
*Use the **rtrv-state-eqpt:** command to ensure system is operating on the service fiber lines. Cutting the wrong fiber lines will cause a service interruption.*

Use local procedures to cut the **protection** fiber line connecting existing shelves and condition the fiber for connection to the new RT shelf.

-
18. Connect **protection** line optical fibers to new RT optical interfaces. For example, in Figure 1, **MAIN** and **FUNCTION UNITS C OLIUs**. **DLP-514**
-

19. Perform end-to-end OC-3 optical line test locally on protection line at **each** shelf in the network.

- A. Linear software **DLP-525**
B. Ring software **DLP-515**
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. At the following locations, use **switch-line:address:pri=reset** command in the following order to return system to normal state with no external switch requests (For example, see Figures 7 and 8):
1. Existing upstream shelf (CO, or RT toward CO) optical interface. [For example, Figures 7 and 8: **MAIN**, (*address*=main).]
 2. New shelf (RT) downstream (away from CO) optical interface. [For example, Figure 7: **FUNCTION UNITS C**, (*address*=fn-c). Figure 8: **FUNCTION UNITS B**, (*address*=fn-b).]
 3. New shelf (RT) upstream (toward CO) optical interface. [For example, Figure 7: **MAIN**, (*address*=main). Figure 8: **FUNCTION UNITS C**, (*address*=fn-c).]
 4. Existing downstream shelf (RT away from CO) optical interface. [For example, Figures 7 and 8: **MAIN**, (*address*=main).]
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

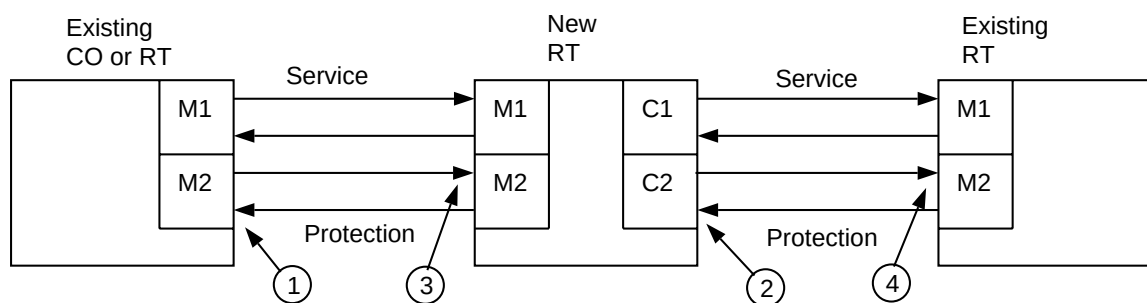


Figure 7. Use of switch-line Command to Return System to Normal

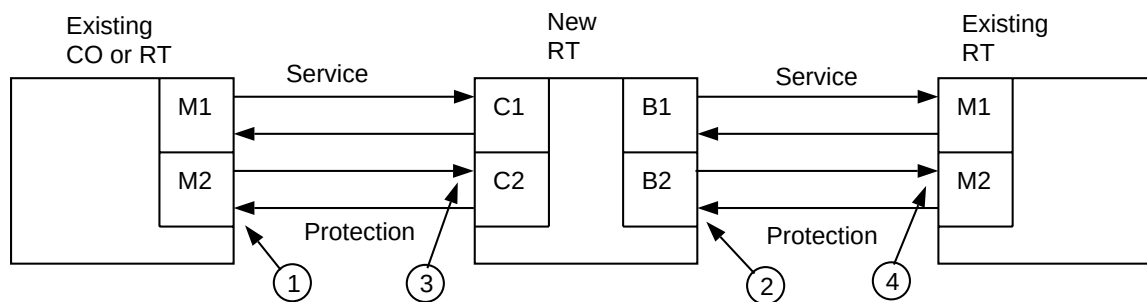


Figure 8. Use of switch-line Command to Return System to Normal

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

21. Use **set-fecom:address:com=enabled** command at each shelf to enable the DCC section communication link for each optical interface. Allow two or three minutes for alarms to stabilize.

-
22. Perform end-to-end DS1 transmission test for DS1s being added, as required. **DLP-510**
-

23. The system is ready for service to be established.
-

Add DDM-2000 OC-3 Shelf and/or New Optical Span Shelf and/or Span Added as Extension to DDM-2000 OC-3 Ring, Hub, Point-to-Point, Linear Add/Drop Configuration

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and a new DDM-2000 OC-3 shelf and/or new optical span are being added. See Figures 1, 2, 3, and 4.

 **NOTE 2:**
If a new shelf is being added, it is assumed that it has been tested in a looped-back mode [**System Turnup: NTP-016**] and configured for the type of shelf required, STS1 drop (default) or DS1 add/drop [**System Turnup: NTP-020**].

 **NOTE 3:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

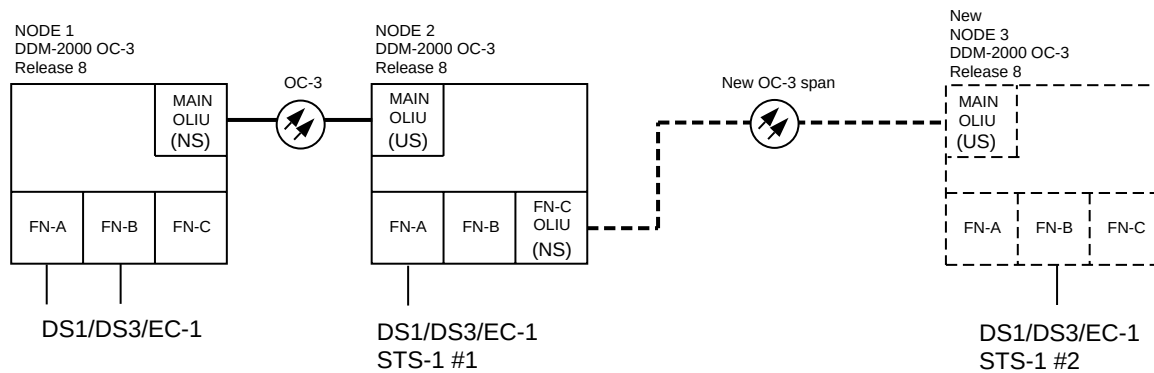


Figure 1. Adding RT and Optical Span to Point-to-Point Configuration

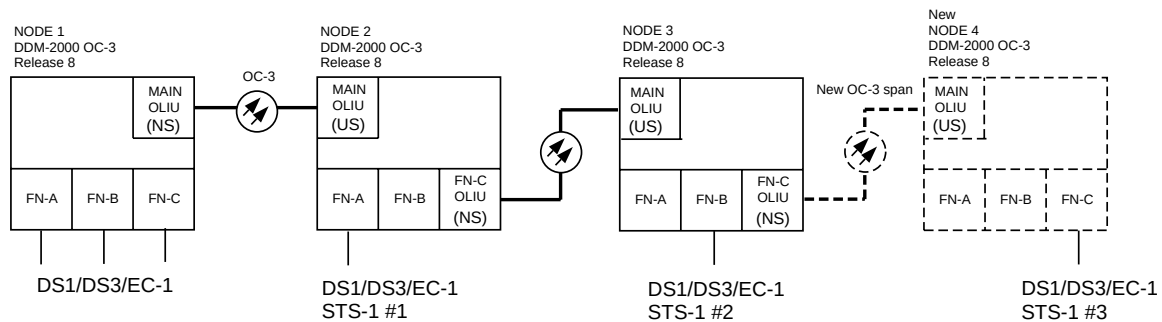


Figure 2. Adding RT and Optical Span to End of STS-1 Drop Configuration

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

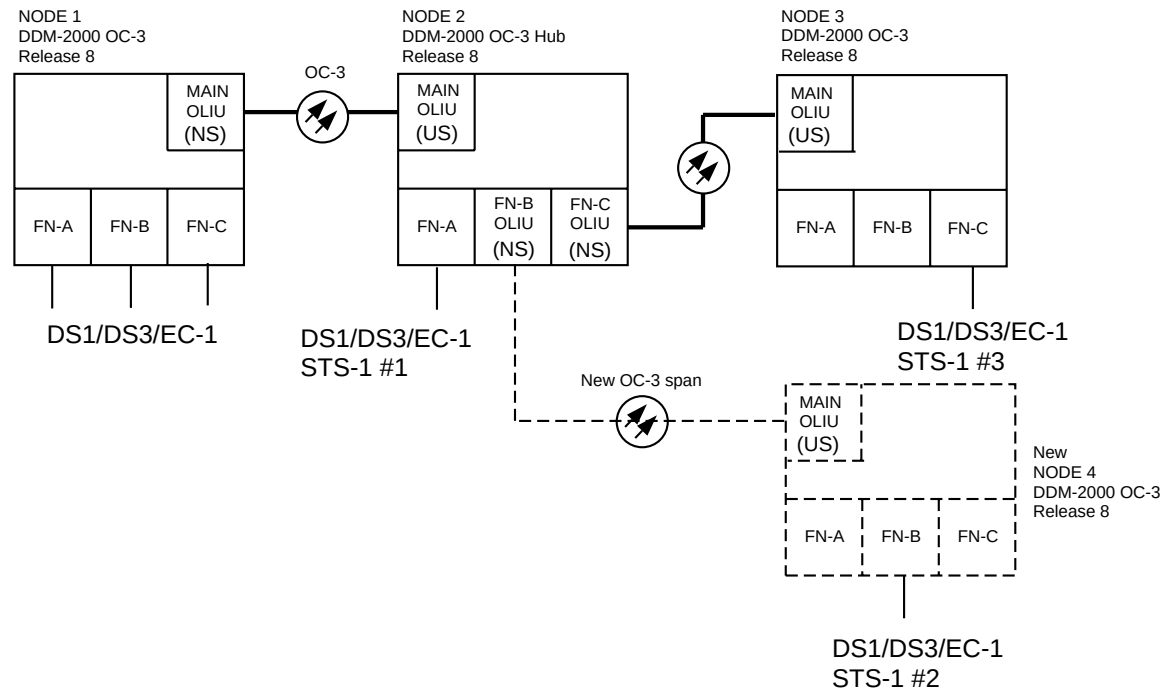


Figure 3. Adding RT and Optical Span to Hub Location

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

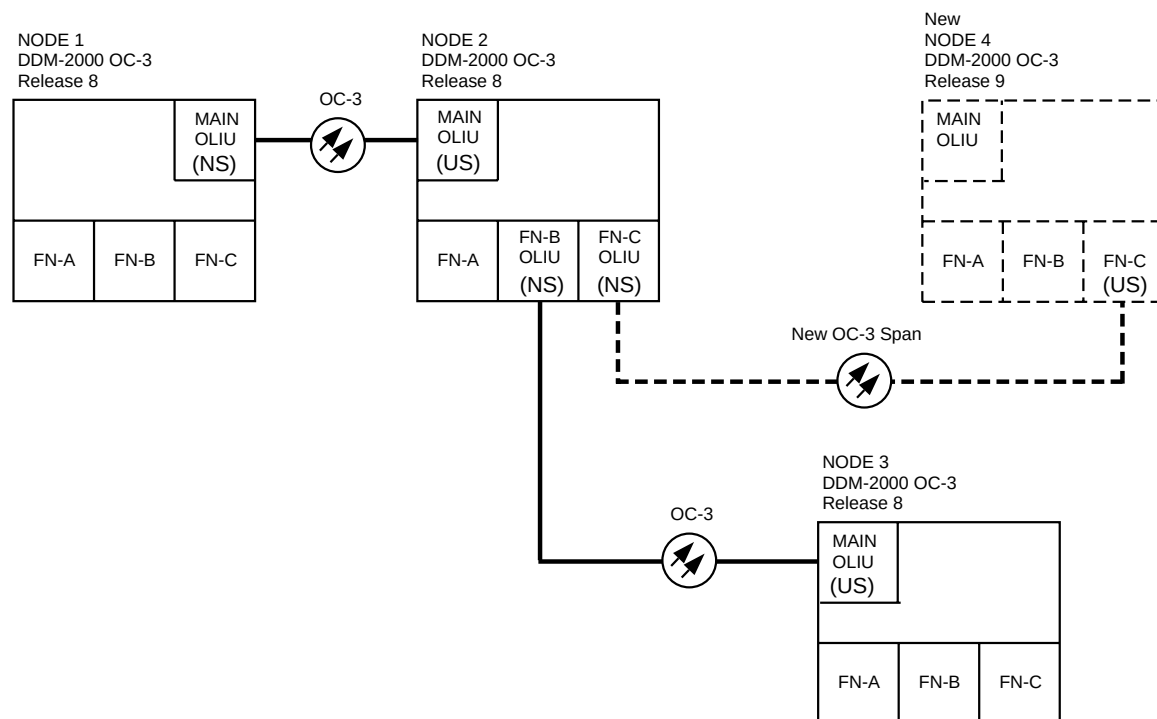


Figure 4. Adding Release 9 RT and Optical Span to Hub Location

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

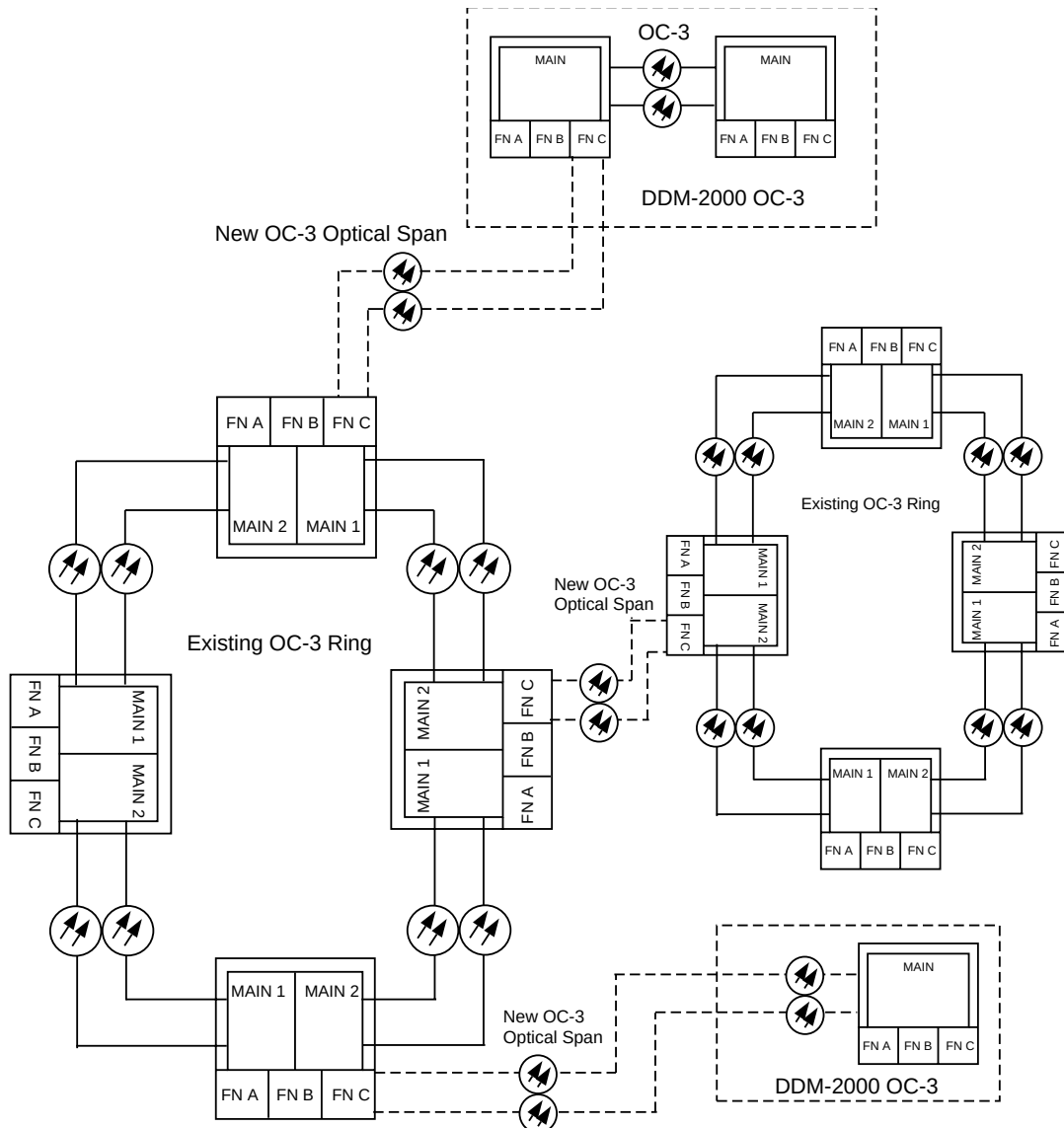


Figure 5. Adding New Shelf and/or Optical Span to OC-3 Ring

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

-
3. If this is a linear system and the existing RT is going to be a DS1 add/drop shelf and is not yet converted, convert it using the procedures of **NTP-020**, then return to this procedure.
-

4.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

At existing RT, install **OLIU** circuit packs in slots being used for the new extension, if not already performed.

DLP-504

-
5.  **NOTE:**
If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops. **22G-U OLIUs** require a 10 dB LBO. **21G2-U** and **22G2-U/22G3-U OLIUs** require **no** attenuation when looped on themselves.

At existing RT, connect optical loops to the new **OLIUs**.

DLP-505

-
6. After new **OLIU** alarm LEDs go off, remove **OLIU** optical loops at both existing and new RTs.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. Determine the optical loss of the optical facility from office records or by making the required measurements.

-
8.  **NOTE:**
The Network Side/User Side parameters of the "**set - fecom:**" command must be set opposite at each end of the optical spans.

Use the "**rtrv - fecom/set - fecom**" command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

-
9. If **21G/21G-U OLIUs** are used, set option switch on each **21G/21G-U OLIU** to agree with the loss of the optical facility. **DLP-513**

-
10.  **NOTE:**
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the "**set - fecom:**" command **at each shelf** to enable far end communications.

At each shelf, use the "**set - fecom: address: com=enabled**" command to ensure far end communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **⇒ NOTE:**
If option switch setting is changed, an update must be performed by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is reinstalled.

Reinstall **OLIUs** (if removed) and connect each **OLIU** to the new optical facility. **DLP-514**

12. **⇒ NOTE 1:**
If line timing mode is specified or external timing mode is specified but the timing reference was not available at new shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the "**rtrv-sync**" command to check the operational mode of the system. If the mode is **Holdover** instead of **External**, check that the incoming timing references are connected.

Set timing mode on **TGS** to the timing mode specified in work order or office records. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **NOTE 1:**

The "**set -ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the "**set -ne:**" command to designate ONE shelf as the DSNE, if not already done. Use the "**set -ne:**" to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. Perform automatic end-to-end OC-3 line test at new or existing RT.
- | | |
|---|----------------|
| A. Linear configuration with linear extension | DLP-525 |
| B. Ring configuration with linear extension | DLP-515 |
-

15. Use "**rtrv-crs-sts1**" or "**rtrv-crs-vt1**" commands at existing RT to see if required cross-connections have been made to new RT. If required, use "**ent-crs- ()**" commands at existing RT to make required cross-connections.
-

16. Perform end-to-end DS1 transmission test for added low speed group, as required. **DLP-510**
-

17. Perform end-to-end DS3 transmission test for added low speed group, as required. **DLP-511**
-

18. The system is ready for service to be established.
-

Equip DDM-2000 OC-3 Shelf (Looped-Back)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure is **not** used to equip a shelf as an EC-1 electrical multiplexer or for OC-3c service. See **System Turnup: IXL-001** for proper procedures.

 **NOTE 2:**
This procedure assumes that all hardwired installation and testing of the unequipped DDM-2000 shelf has been done. It also assumes that power is applied to the shelf (**PWR ON** LED(s) lighted on User Panel).

 **NOTE 3:**
Some of the circuit packs have option switches which must be set before they are installed.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

Check –48 V DC office battery, if required.

DLP-524

-
2. Install **BBG9 OHCTL** circuit pack.

DLP-500

-
3.  **NOTE:**

If system software has not been previously installed in the **OHCTL** and **SYCTL**, it must be installed [**DLP-561**] after the **SYCTL** is installed.
If the DDM-2000 OC-3 Multiplexer is being used as a DDM-2000 FiberReach host shelf, Release 9 or later ring software **must** be installed.

Install **BBG8/BBG8B SYCTL** circuit pack.

DLP-549

-
4.  **NOTE 1:**

As additional circuit packs are installed, office alarms may be activated, accompanied by flashing **FAULT** LEDs on some of the circuit packs. This is a normal condition at this stage of the procedure. You can momentarily depress the **ACO/TST** pushbutton to retire office alarms.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

To avoid timing alarms before the end-to-end OC-3 system has been established, the **TGS** option switches must be *temporarily* set to *free running* if either of the following is true:

- DS1 external timing is specified but the DS1 timing reference is not yet available.
- Line timing mode is specified but the **OLIUs** will be optically looped back at the shelf.

When the DS1 external timing references become available or when the end-to-end system is established, the timing mode must be changed to the specified timing mode. If external timing is the specified timing mode and external timing is available to the shelf, the timing mode may be set for external timing.

Install **TGS** timing circuit packs.

DLP-503

5. ⇒ **NOTE:**

The **BBF5 JMPR** jumper circuit pack connects signals between slots of a **FUNCTION UNITS** group equipped with **27G-U/27G2-U OLIUs**. In Group 1 or Group 3 shelves, **BBF5 JMPR** circuit packs must be installed in slot **8(P)** of **LOW SPEED GROUPs** associated with **FUNCTION UNITS** groups that have both slots equipped with **27G-U OLIUs**. In Group 1 or Group 3 shelves, **BBF5 JMPR** circuit packs must be installed in slots **4** and **8(P)** of **LOW SPEED GROUPs** associated with **FUNCTION UNITS** groups that have both slots equipped with **27G2-U OLIUs**. The **BBF5 JMPR** circuit pack is not needed in Group 4 shelves in any application.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Install **BBF5 JMPR** jumper circuit pack.

6.  **NOTE 1:**
OC-3 add/drop and ring configurations require **22-Type OLIUs**. DDM-2000 FiberReach host OC-1 applications require **26G2-U** or **27G-U/27G2-U OLIUs**. OC-3 shelves configured for OC-12 ring configurations require **24G-U OLIUs**. For other configurations, if **21G/21G-U OLIUs** are used, the **HIGH/LOW POWER** switch is set to **LOW** for shelf loopback.

-  **NOTE 2:**
OC-12 ring applications require **24G-U OLIUs** in the **MAIN** slots. When the second **24G-U OLIU** is seated in the **MAIN 2(P)** slot, an "OC12 connector failed" alarm will occur. Normally, the alarm occurs because the OC-12 connector (ribbon cable) is not yet installed. To clear the alarm, install the OC-12 connector on the **24G-U OLIUs** seated in the **MAIN 1** and **MAIN 2(P)** slots.

Install **OLIU** circuit packs.

DLP-504

7.  **CAUTION:**
*Before looping a shelf, verify/set DSNE parameter of the "rtrv-ne:/set-ne:" command to **no**. This parameter will be set as required when the shelf is integrated into a network. Only one DSNE is allowed in a network.*

-  **NOTE 1:**
The **22G-U**, **24G-U**, **26G2-U** and **27G-U/27G2-U OLIUs** require a 10 dB LBO for loopback testing. The **22G2-U** and **22G3-U OLIUs** do **not** require an LBO for loopback testing.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**
Unused optical connectors on the **27G-U/27G2-U OLIUs** should remain looped back or use the "**set-state-oc1**" command to set the state of the unused OC-1 ports to **nmon**.

⇒ **NOTE 3:**
If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the "Network side/User side" parameters at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the "**set-fecom:address:com=disable**" command to disable the DCC.

⇒ **NOTE 4:**
An "AGNE communication failure" alarm will also occur when the **OLIUs** are looped back. This alarm occurs because at least one shelf in the network must be set as an AGNE but the default for the shelf is AGNE=**no**. To clear the alarm during a fiber loopback, use the "**set-ne:tid:agne=yes**" command.

Install **OLIU** optical loops.

DLP-505

-
8. ⇒ **NOTE:**
BBG2 MXRVO circuit packs must be installed in both **FUNCTION UNITS** group slots **1** and **2(P)** if **BBF3/BBF3B DS1PM** circuit packs are going to be installed.

Install **BBG2 MXRVO** circuit packs (if required).

DLP-506

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. Install **BBG4/BBG4B/BBG19 DS3** circuit packs (if required). **DLP-507**

10. Install **BBG20 TMUX** circuit packs (if required). **DLP-507**

11. Install **BBG6 STS1E** (optioned for LOW SPEED) circuit packs (if required). **DLP-502**

12. **⇒ NOTE 1:**
Do not install **BBF1/BBF1B DS1** or **BBF3/BBF3B DS1PM** interface circuit packs in a **LOW SPEED GROUP** corresponding to a **FUNCTION UNITS** group that is not going to be equipped with **MXRVO** circuit packs.

⇒ NOTE 2:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 3:

177A Retainer Cards must be installed in all empty **DS1/DS1PM** circuit pack slots in **LOW SPEED GROUPS** corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs. This is generally performed when initial service is established. [**System Turnup: NTP-004**] All **DS1/DS1PM** slots must be empty in **LOW SPEED GROUPS** that are unequipped or corresponding to **FUNCTION UNITS** groups that are not equipped with **MXRVO** circuit packs.

⇒ NOTE 4:

If **BBF3/BBF3B DS1PM** circuit packs are installed in service slots, then a **BBF3/BBF3B DS1PM** circuit pack must be installed in the protection slot, if protection is required.

Install service and protection **BBF1/BBF1B DS1** or **BBF3/BBF3B DS1PM** circuit packs (if required).

DLP-508

13. ⇒ NOTE:

A maximum of three **BBF8 HDSL** circuit packs, including a protection circuit pack, can be installed in any one **FUNCTION UNITS** group. Both service and protection **MXRVO** circuit packs must also be installed.

Install **BBF8 HDSL** circuit packs (if required).

DLP-567

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14.  **CAUTION:**
*The command "**init-sys:all**" may affect service. It should never be used on an in-service system. It should be used only after a shelf has been equipped to reset all provisionable parameters and cross-connections to their default values.*

 **NOTE 1:**
An "inconsistent DCC values" alarm will occur when the "**init-sys:all**" command is executed because "fecom" becomes enabled again. To clear the alarm, use the "**set-fecom:address:com=disable**" to disable the DCC.

 **NOTE 2:**
An "AGNE communication failure" alarm will also occur when the "**init-sys:all**" command is executed because the AGNE parameter of the "**set-ne:**" command is set to **no** again. To clear the alarm, use the "**set-ne:tid:agne=yes**" command.

Use the "**init-sys:all**" command to initialize all provisionable parameters to their original default values. It may take approximately 2 minutes after "**init-sys:all**" command for alarms to stabilize.

-
15. Perform an LED test.

DLP-509

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16. **⇒ NOTE:**

This procedure assumes that the DDM-2000 high speed signals are looped back [manual optical (OLIU) loopback]. Automatic local tests (looped back) using the "**test-auto**" command are not available for Rings.

Perform automatic local (looped back) transmission test.

A. DS1/EC-1 Transmission Test (Rings)	DLP-510
B. DS3/EC-1 Transmission Test (Rings)	DLP-511
C. Automatic Local Transmission Test (Linear)	DLP-528

17. **⇒ NOTE:**

This procedure assumes that the DDM-2000 has been connected to the low-speed DSX cross-connection as required. Automatic cross-connect tests (looped back) using the "**test-auto**" command are not available for Rings.

Perform automatic local cross-connect wiring test (looped back).

A. DS1/EC-1 Transmission Test (Rings)	DLP-510
B. DS3/EC-1 Transmission Test (Rings)	DLP-511
C. Automatic Cross-Connect Wiring Test (Linear)	DLP-529

-
18. Perform DDM-2000 OC-3 receiver sensitivity test (if required). Optional test.	DLP-547
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

19. Check office alarm interface as required. **DLP-516**

20. Check telemetry interface as required.

- A. Parallel telemetry
- B. Serial telemetry

DLP-517
DLP-518

21. Test protection switching function, if required. **DLP-519**

22.  **CAUTION:**
*The command "**init-sys:all**" may affect service. It should never be used on an in-service system. It should be used only after a shelf has been equipped to reset all provisionable parameters and cross-connections to their default values.*

 **NOTE 1:**
An "inconsistent DCC values" alarm will occur when the "**init-sys:all**" command is executed because "fecom" becomes enabled again. To clear the alarm, use the "**set-fecom:address:com=disable**" to disable the DCC.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

An "AGNE communication failure" alarm will also occur when the "**init-sys:all**" command is executed because the AGNE parameter of the "**set-ne:**" command is set to **no** again. To clear the alarm, use the "**set-ne:tid:agne=yes**" command.

Use the "**init-sys:all**" command to initialize all provisionable parameters to their original default values.

23. ⇒ **NOTE 1:**

A craft interface terminal (CIT) is required to access optional features of the DDM-2000 OC-3 Multiplexer, such as system name (tid); site, ne, and shelf number; DSNE, alarm groups and AGNE; security and logins; date and time; far end communications (fecom); etc.

⇒ **NOTE 2:**

Alarm activity will result when optical fiber loops are removed for end-to-end system testing.

Activate optional features as required from work order or office records.

DLP-512

24. ⇒ **NOTE:**

The procedures referenced in this step are used to establish basic configurations. For other configurations requiring connections with other systems (FT-2000, OC-12, etc.) or networks, refer to the **System Turnup/Circuit Order: IXL-001** for procedures on how to connect OC-3/IS-3/EC-1 spans (for example, establishing dual ring interworking, adding new spans or shelves, etc.).

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

After all shelves in the network have been tested, you can establish the end-to-end DDM-2000 OC-3 subnetwork.

A. DDM-2000 OC-3 Point-to-Point	NTP-003
B. DDM-2000 OC-3 Linear or Hub	NTP-017
C. DDM-2000 Path Switched Rings	NTP-022
D. OC-3/IS-3 Dual Ring Interworking — DDM-2000 OC-3 to OC-12 or FT-2000 Ring	NTP-041
E. EC-1 Dual Ring Interworking — DDM-2000 OC-3 to OC-12 or FT-2000 Ring	NTP-013
F. DDM-2000 OC-3 Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring	NTP-040
G. DDM-2000 OC-3 Dual Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring	NTP-050
H. FiberReach Access via DDM-2000 OC-3 Ring Release 9 or 11 Host Shelf in OC-3 Release 8 Linear Configuration	NTP-052
I. Single-Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring	NTP-043
J. Dual-Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring	NTP-044
K. Stand-Alone FiberReach OC-1 Ring/Hub Network	NTP-045
L. Single-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring	NTP-047
M. Dual-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring	NTP-048
-

Establish End-to-End DDM-2000 OC-3 System OC-3 Optical Fiber Spans Linear or Hub Configuration

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.***

-  **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

-  **NOTE 2:**
It is assumed that all DDM-2000s in the system have passed the looped transmission test(s). [**System Turnup: NTP-016**]

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

From work order or circuit order, determine the **MAIN** and **FUNCTION UNITS** slots being used to establish the final system configurations. Note that the connections are different, depending on the configuration. For example, see Figures 1, 2, and 3. Nodes being used for FiberReach hosts must be loaded with Release 9 or later software and connected to the timing source either externally or line timed through the **FUNCTION UNITS C** slot. (See **set-sync:src={main,fn-c}**; command in the Commands and Reports section of Volume 1 of this manual.)

-
2. Determine the optical loss of each optical span from office records or by making the required measurements.
-

3.  **NOTE:**
The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans.

Use the **rtrv-fecom/set-fecom:nsus=ns/us** command to verify/set "Network Side (ns)/User Side (us)" parameters at each end of optical span being established. For example, see Figures 1, 2, and 3.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.

 NOTE 2:

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

 NOTE 3:

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5.  **NOTE 1:**
If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for any optical interfaces at any node, it is recommended that it be enabled at all nodes of the system.

-  **NOTE 2:**
The **rtrv-oc3:** command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte/Sbyte parameter, as required.

-
6.  **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

-  **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed nodes.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 3:

The **rtrv-sync:** command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed node. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

7. ⇒ NOTE:

Two or more shelves in the same network with the same TBOS display number (set by the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate ONE shelf as the DSNE.

Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

9. **NOTE:**

It is suggested this procedure establish the OC-3 optical spans starting from the DSNE node and continuing to an adjacent node, then to the next node, etc.

Remove optical loops from **OLIUs** in the OC-3 optical span being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set - fecom:** command **at each shelf** to enable far end communications.

At each shelf, use the
set - fecom: address:com=enabled command to
ensure far end communications (fecom) is enabled.

-
11. If **21G/21G-U OLIUs** are used, set the option switches on the **21G/21G-U OLIUs** to agree with the loss of the optical facility. **DLP-513**
-

12. **NOTE:**

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is installed.

Reinstall **OLIUs** (if removed) and connect the optical span being established to the **OLIUs** at each end. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. Perform automatic end-to-end OC-3 line test on OC-3 optical span established. **DLP-525**

14. (Optional test). Perform end-to-end DS1 transmission test for DS1 group being dropped at end of span being established, if required. **DLP-510**

15. (Optional test). Perform end-to-end DS3 transmission test for DS3 group being dropped at end of span being established, if required. **DLP-511**

16. Repeat this procedure from Step 3 for each OC-3 optical span being established in the DDM-2000 OC-3 network.

17. The system is now ready for initial DS1, DS3, or EC-1 service to be established.
[System Turnup: NTP-004] (DS1)
[System Turnup: NTP-005] (DS3)
[System Turnup: NTP-034] (EC-1)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

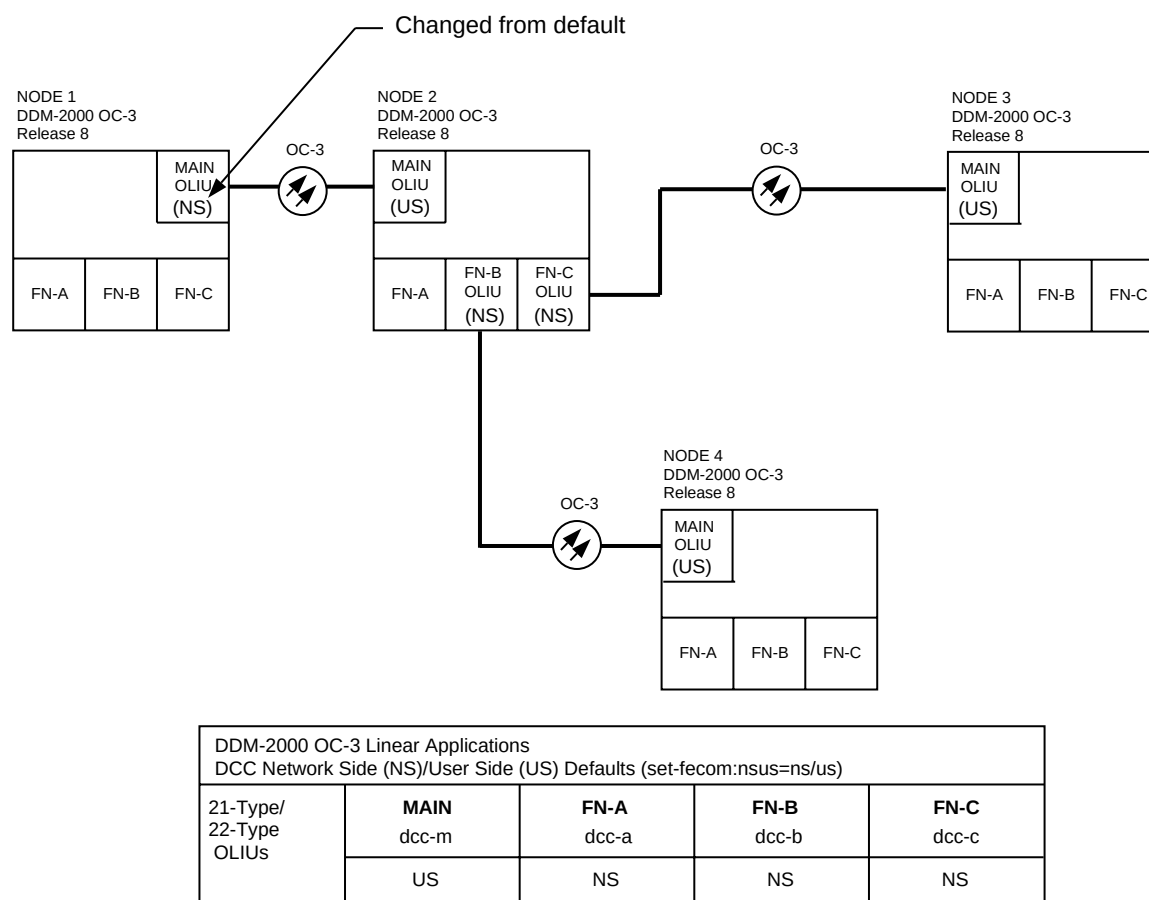
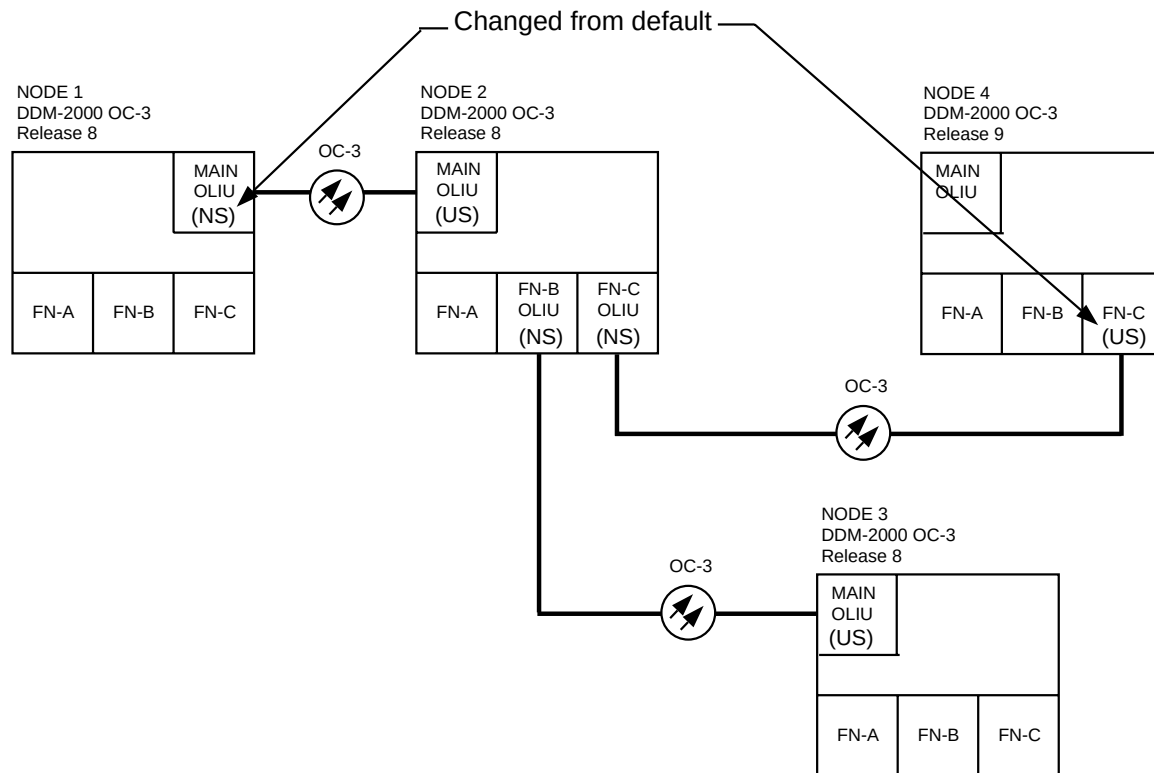


Figure 1. Example of Release 8 Linear/Hub Configuration

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO



DDM-2000 OC-3 Linear Applications DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)				
21-Type/ 22-Type OLIUs	MAIN dcc-m	FN-A dcc-a	FN-B dcc-b	FN-C dcc-c
	US	NS	NS	NS

Figure 2. Example of Release 8 Linear/Hub Configuration with Release 9 FiberReach Host

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

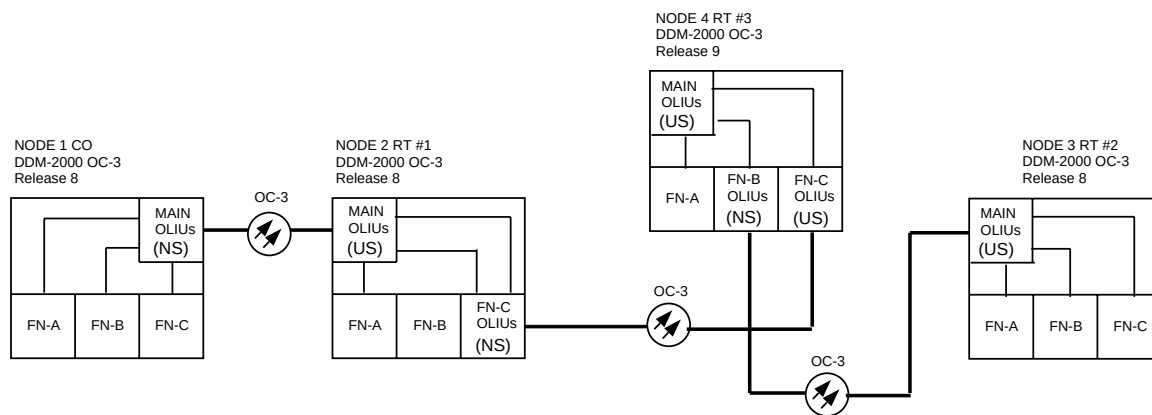


Figure 3. Example of Release 8 Linear Configuration with Release 9 FiberReach Host

Establish OC-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 OC-12 ring is in service and an OC-3 1+1 optical span is being added between this OC-12 ring and an OC-3 system. See Figures 1 through 3.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

3.  **NOTE 1:**

The "**rtrv-eqpt**:" command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the "**rtrv-eqpt**:" command format.

 **NOTE 2:**

If work order or office records do not specify **OLI** types, refer to 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers, Applications, Planning, and Ordering Guide* and/or 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of **OLI** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

At OC-12 node, verify/install **OLI** circuit packs in (**FUNCTION UNITS A, B, C, or D**) slots being used for the new OC-3 extension. (OC-12 Reference: 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II, DLP-503*)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops.

 NOTE 2:

If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the "**set-fecom:address:com=disable**" command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIUs** just installed.

5. **NOTE:**

The "**rtrv-oc3:**" command retrieves the "OC-3 Line Provisioning Report". This report lists information about each OC-3 line. This information includes attributes set by the OC-12 "**set-oc3:**" command. The applications (*app*) parameter of the "**set-oc3**" command must be set to *1+1* for the **FUNCTION UNITS** slots being used for the OC-3 extension in the OC-12 shelf. See the "Commands and Reports" section of 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I*, for a description of the "**rtrv-oc3:**" command format.

Use the "**rtrv-oc3/set-oc3:**" command at the OC-12 shelf to verify/set the applications parameter to *1+1*.

(For example,

" **set-oc3:fn-{a,b,c,d,all},app=1+1**")

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. **NOTE:**

DDM-2000 OC-3 shelves must be connected through the **MAIN** or **FUNCTION UNITS C** slots if the shelf or network is deriving timing from the OC-3 optical links to the OC-12 network. See description of the **src** parameter in "**set -sync:**" command in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*.

Ensure the DDM-2000 OC-3 subnetwork and/or shelf has been properly equipped with **OLIUs** to accept the new OC-3 optical extension. Use **System Turnup: NTP-016** to equip a new DDM-2000 OC-3 shelf. If the new extension to be established is an OC-3c extension use **System Turnup: NTP-002** or procedure in 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II, System Turnup: NTP-006* to establish OC-3c (STS-3c) service.

-
7. Determine the optical loss of the optical facility from office records or by making the required measurements.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE:**

The Network Side (NS)/User Side (US) parameters of the "**set - fecom:**" command must be set opposite at each end of the optical spans.

Use the "**rtrv - fecom/set - fecom**" command to verify/set "Network Side/User Side" parameters at each end of optical span being established. See Figure 4.

-
9. If **21G/21G-U OLIUs** are used, set option switch on each **21G/21G-U OLIU** to agree with the loss of the optical facility.

DLP-513

10. **NOTE:**

If option switch setting is changed, an update must be performed by momentarily depressing the **UPD/INIT** button on the **SYCTL** after the **OLIU** is reinstalled.

Reinstall **OLIUs** (if removed) and momentarily depress the **UPD/INIT** button on the **SYCTL** or use the **UPD** command.

-
11. Use "**set - fecom:address:com=enabled**" command to enable DCC communications on the new OC-3 optical extension.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. Perform OC-3 optical fiber connections and verification of the optical facility. **DLP-514**
-

13.  **NOTE 1:**
If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the OC-3 optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring and in the **FUNCTION UNITS** slots of the host OC-12 shelf.

 **NOTE 2:**
The "**rtrv-oc3:**" command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I* and 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I*, for a description of the "**rtrv-oc3:**" command format.

Use the "**rtrv-oc3:**" command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use "**set-oc3:fn-{a,b,c, or d}:kbyte=enabled**" or "**set-oc3:fn-{a,b,c, or d}:syncmsg=Kbyte/Sbyte**" command at the OC-12 shelf to enable Kbyte/Sbyte sync messaging for the **FUNCTION UNITS** group used for the new OC-3 optical extension.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. **NOTE 1:**

If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

 NOTE 2:

If Sync Autoreconfiguration is enabled at any line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed nodes.

 NOTE 3:

The "**rtrv-sync:**" command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I* and 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I*, for a description of the "**rtrv-sync:**" command format.

Use the "**rtrv-sync:**" command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed node. Use the "**set-sync:**" command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15. **NOTE 1:**

The "**set -ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur and one of the DSNEs must be disabled. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

It may take 5 minutes or more for the network to stabilize after one of the DSNEs is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Use the "**set -ne:TID=tid:dsne=no**" command to discontinue one of DSNEs, if not already done. Use the "**reset**" command at the remaining DSNE to reset the node.

16. **NOTE:**

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the "**set -ne:**" command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the "**set -ne**" command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the "**set -ne**" command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The "**rtrv-ne:**" command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the "**set -ne**" command to make new settings.

18. Perform automatic end-to-end OC-3 line test on new OC-3 optical extension.	DLP-515

19. Perform end-to-end DS1 transmission test for each low speed group, if required.	DLP-510

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. Perform end-to-end DS3 transmission test for each low speed group, if required. **DLP-511**

21. The network is ready for service to be established. Use procedures from both 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual (TOP)—Volume II* and 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*, to establish the type of service required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

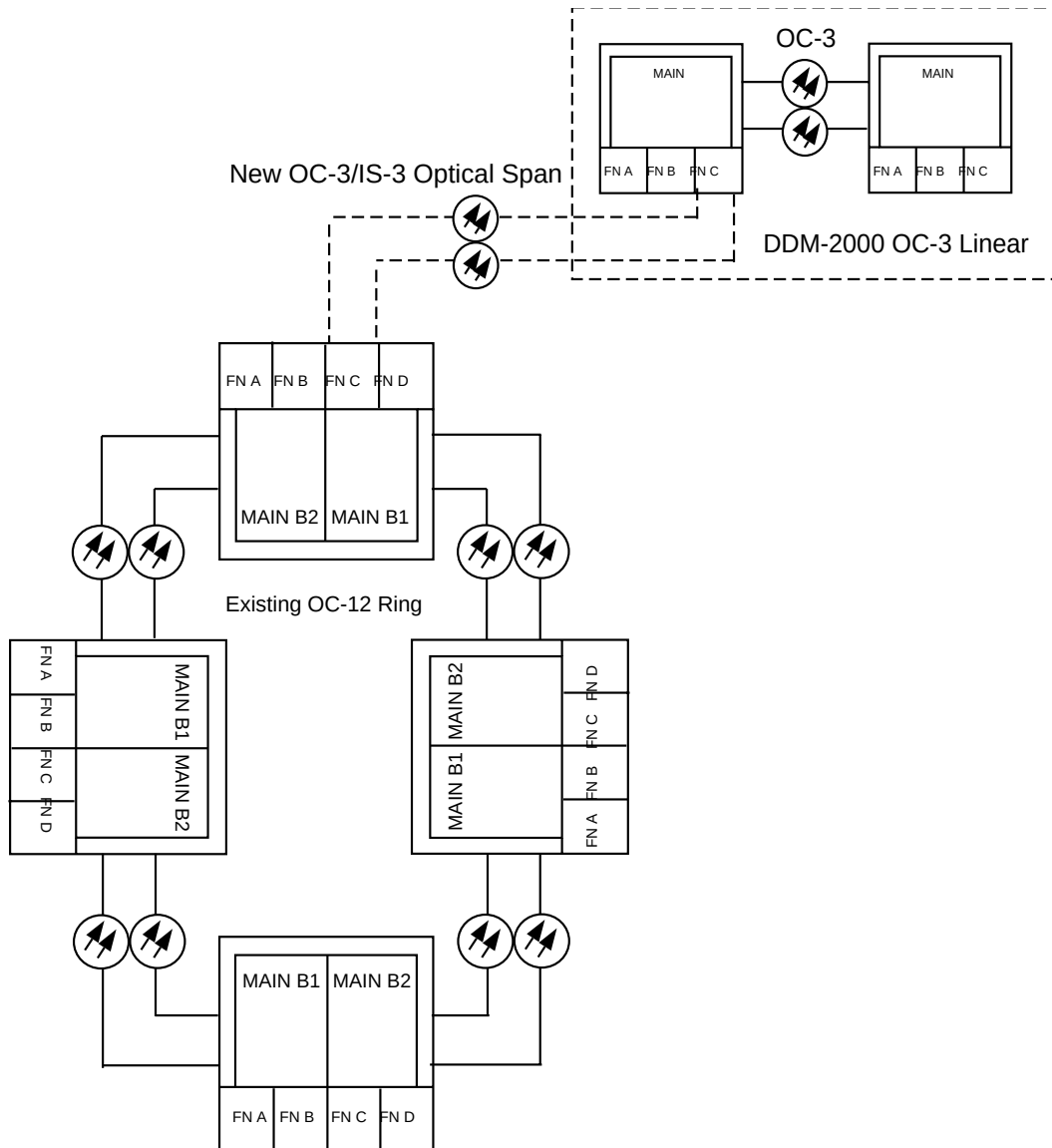


Figure 1. Adding New OC-3 Optical Span Extension — Linear OC-3 Network to OC-12 Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

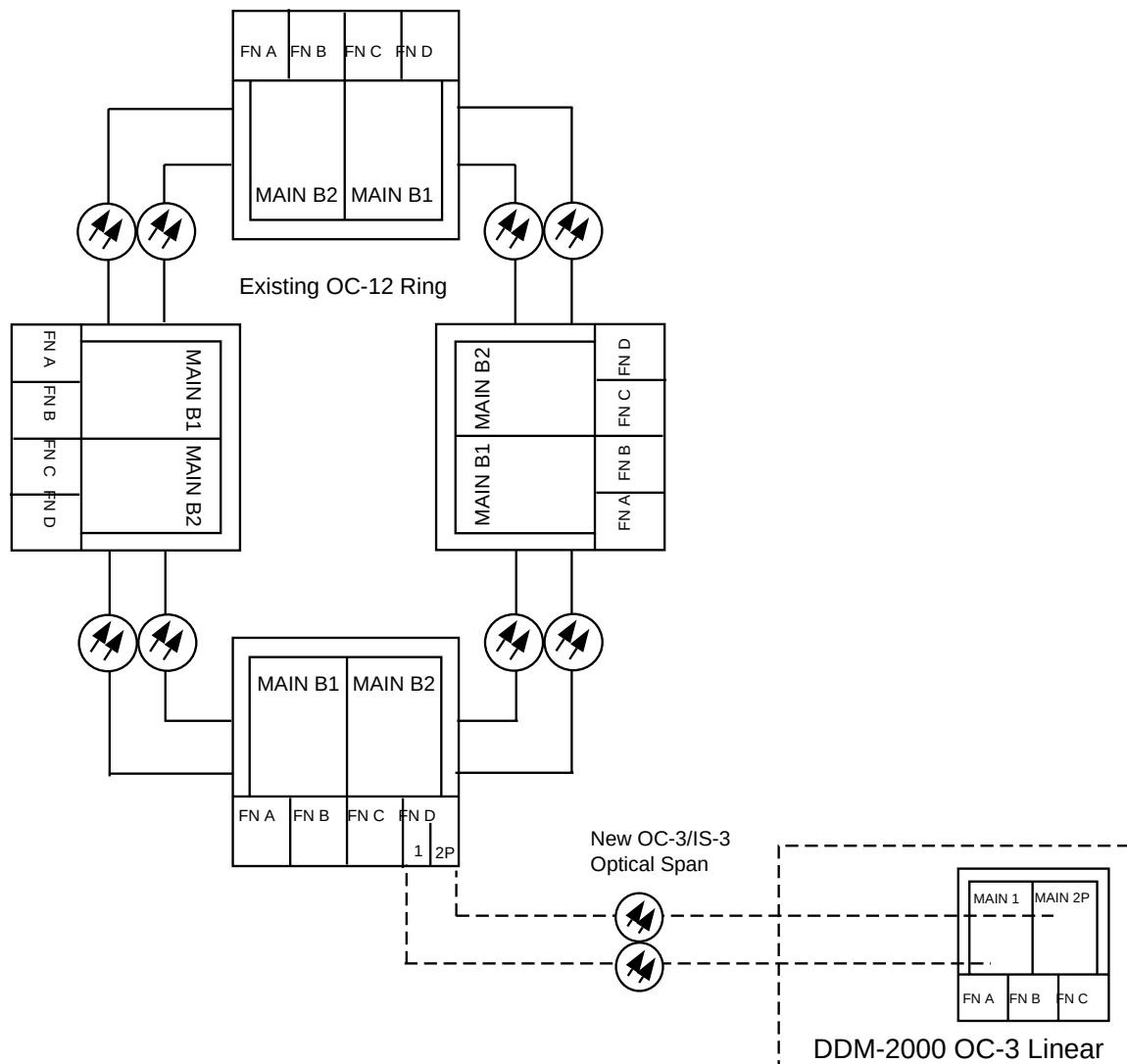


Figure 2. Adding New OC-3 Optical Span Extension — Linear OC-3 Shelf to OC-12 Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

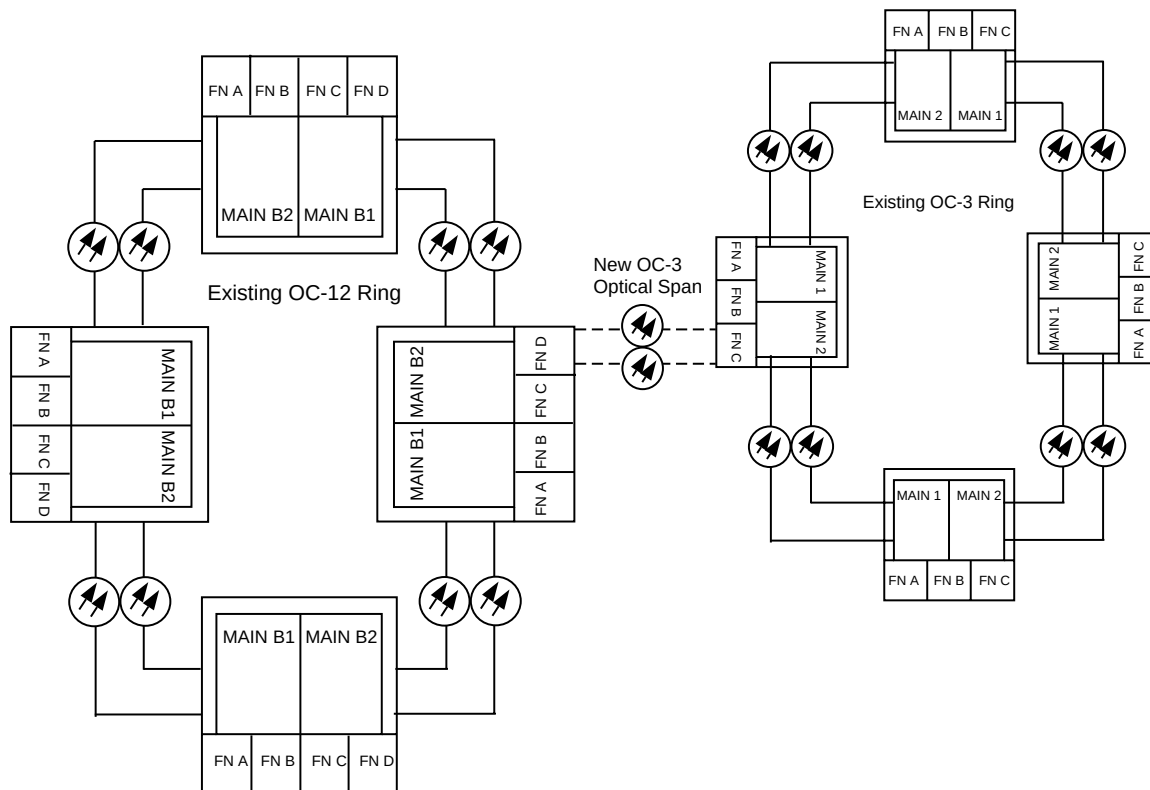


Figure 3. Adding New OC-3 Optical Span Extension — OC-3 Ring to OC-12 Ring

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

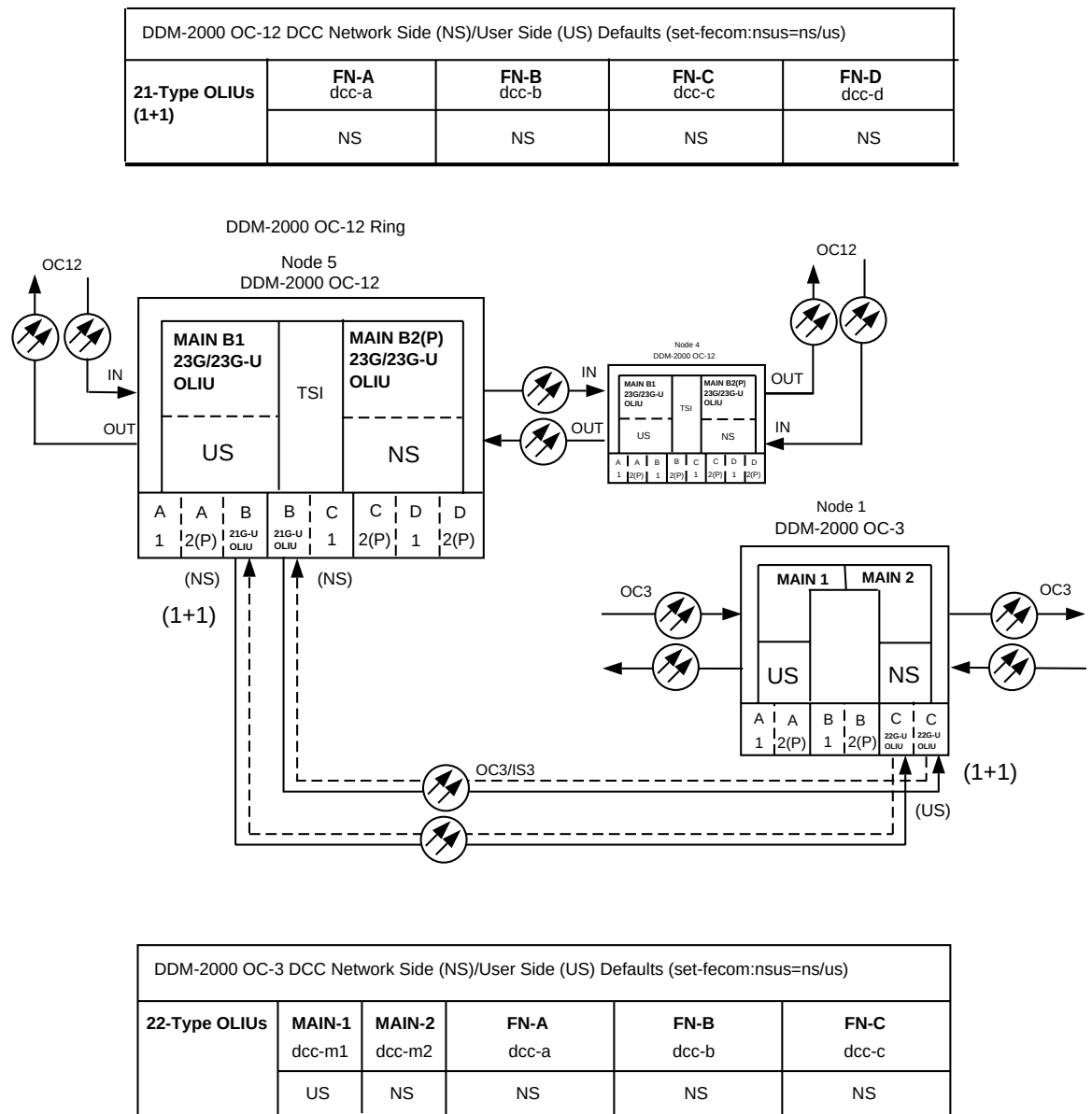


Figure 4. Adding New OC-3 Optical Span Extension to OC-12 Ring

Discontinue OC-3 Optical Span Extension

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE:**
The craft interface terminal (CIT) **rtrv-map-network:** command may be used to retrieve a map of the SONET network, including a list of the systems in the network and how they are connected. The **rtrv-crs- ():** command may be used to retrieve STS-1/VT1.5 cross-connections within the DDM-2000 OC-3 system.

Determine which optical span(s) is being discontinued.

-
2. Ensure service (signals) has been removed from the DS1/DS3/EC-1 groups in the span(s) being discontinued [**NTP-011** (DS1), **NTP-012** (DS3), and/or **NTP-036** (EC-1)].
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. **NOTE 1:**

The **set-ne:** command also designates a shelf as an alarm gateway network element (AGNE). Shelves may be assigned an alarm group number (default alarm group number is 255). At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

 NOTE 2:

It may take several minutes for the network to stabilize after the AGNE has been changed.

If a shelf being discontinued is an AGNE, use the **set-ne:TID=tid:agne=yes** command to establish the AGNE on another shelf, if required. Use the **set-ne:TID=tid:agne=no** command to disable the AGNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur and one of the DSNEs must be disabled.

 NOTE 2:

It is recommended that a DDM-2000 OC-3 shelf be assigned as the DSNE.

 NOTE 3:

It may take 6 minutes or more for the network to stabilize after the DSNE has been discontinued.

If the DSNE is being discontinued and another DDM-2000 OC-3 shelf is going to be designated as the DSNE, use the **set-ne:TID=tid:dsne=yes** command to establish the DSNE on another DDM-2000 OC-3 shelf. Use the **set-ne:TID=tid:dsne=no** command to disable the DSNE at the shelf being removed.

If the DSNE is being discontinued and a FT-2000 node is going to be designated as the DSNE, use the **SECURITY-Set-Network Element-DSNE:yes** command at the FT-2000 to designate the DSNE. Use the **set-ne:TID=tid:dsne=no** command to disable the DSNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

5.  **CAUTION:**
*Removal of wrong fiber connections will result in a service interruption.
Ensure you remove only the fiber connections for the optical span
being discontinued.*

 **NOTE:**
The following operations will activate office alarms. The audible alarm
may be suppressed by depressing the **ACO** button.

Remove optical fiber connections from all **OLIUs**
associated with optical span(s) being discontinued.

-
6. Remove **OLIU(s)** associated with optical span being
discontinued, if required.

-
7.  **NOTE:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its
accidental operation. You will need a small pointed object, such as a
ball-point pen to operate it.

If **OLIU** circuit pack(s) was removed, momentarily
depress the **UPD/INIT** button on the **SYSCTL** or use the
upd command to update the DDM-2000 internal
equipment list.

If **OLIU** circuit pack(s) was *not* removed, connect optical
fiber loops to **OLIU(s)**.

DLP-505

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

When a shelf is removed from a DDM-2000 network and one of the other DDM-2000 nodes is designated as a DSNE, the **dlt-tadrmmap:tid=tid** command must be used to delete the TID of the removed shelf from the directory services data base. This prevents that TID from appearing in **rtrv-map-network** or **rtrv-map-neighbor** reports and will retire the "communication failure" alarms at all shelves in the network.

 NOTE 2:

The **dlt-tadrmmap:tid=tid** command is valid only at a DDM-2000 DSNE. The **rtrv-map-network** command may be used to determine which shelf is the DSNE.

 NOTE 3:

If the DSNE is other than a DDM-2000/SLC-2000 shelf, the DSNE will automatically delete the node(s) from its inventory. Wait at least 6 minutes for alarms to settle.

If the DSNE is a DDM-2000 node, wait at least one minute then use the **dlt-tadrmmap:tid=tid** command at the DSNE to delete the TID of the removed shelf from the directory services data base.

9. Verify that all alarms go off.

Convert (Upgrade) DDM-2000 OC-3 Shelf to DS1 Add/Drop Shelf

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure is used to convert/upgrade a DDM-2000 OC-3 shelf to a DS1 Add/Drop shelf. It requires replacing all **OLI** circuit packs in a shelf with **22-Type OLI** circuit packs which require Release 3 or later software. If Release 3 or later software is not installed, a software upgrade must be done before the **OLI**s are installed. After the software and **OLI**s are installed, the **set-ne:TID:crs>manual** command sets the shelf cross-connect mode to manual to allow cross-connections to be entered manually. The shelf is now an STS-1 add/drop shelf. In order to convert it to a DS1 add/drop shelf, the **cnvt-crs:** command is used to convert an existing STS-1 cross-connection to up to 28 individual VT1.5 (DS1) cross-connections.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use **rtrv-alm** command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

-
3. Install generic program Release 3 or later, if not already installed. **DLP-532**
-

4. Replace existing **OLIUs** with **22-Type OLIUs**, if not already performed. **DLP-542**
-

5.  **NOTE:**
The "Commands and Reports" section of this manual gives a description of commands.

Use the **set -ne:TID:crs>manual** command to set shelf cross-connect mode to manual.

6.  **CAUTION:**
*Execution of the **cnvt-crs** command for existing STS-1 cross-connections that are supporting DS3 or other non-DS1 services will interrupt those services. This command should only be executed when existing STS-1 cross-connections are supporting either no service or DS1 service.*

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE:**

No inverse capability is available with this command to convert from 28 DS1 cross-connections back to a single STS-1 cross-connection. In order to do this, you must delete each of the 28 DS1 cross-connections using the **dlt-crs-vt1** command and then enter the STS-1 cross-connection using the **ent-crs-sts1** command.

Use the **cnvt-crs:address1, address2** command to convert the required STS-1 cross-connections to DS1 cross-connections.

7. ⇒ **NOTE:**

The shelf is now a DS1 add/drop shelf. Individual DS1 cross-connections may now be made using the **ent-crs-vt1** command. The command description in the "Commands and Reports" section of this manual lists the valid cross-connections. See *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

See **System Turnup/Circuit Order: IXL-001** for procedures to add DS1 service.

Convert (Upgrade) DDM-2000 OC-3 System to OC-12 System Linear or Hub Configuration

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure is used to upgrade/convert from an in-service DDM-2000 OC-3 point-to-point system to a DDM-2000 OC-12 point-to-point system. It assumes that timing arrangements and cabling have been engineered and installed to satisfy the timing requirements of the new network arrangement.

Basically, this procedure first establishes an end-to-end DDM-2000 OC-12 system with **FUNCTION UNITS** slots equipped with proper **OLIU** circuit packs. Then, the optical fibers from the OC-3 **MAIN** slots are removed and connected to the OC-12 **MAIN-B** slots if the OC-12 system is going to use the removed fibers. If extra fiber pairs exist, the OC-12 system may be established and end-to-end tests performed before the upgrade begins. Protection circuit packs must be available in the OC-3 **MAIN 2(P)** slots to allow service to switch to the protection **OLIU** when the optical fibers are removed. After the OC-12 system is established, new optical fiber connections are made between the OC-3 **MAIN** slots and the OC-12 **FUNCTION UNITS** slots.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

This procedure requires craft to be at both ends of the OC-3/OC-12 optical span.

⇒ **NOTE 2:**

It is assumed that the OC-12 shelves have been established and have passed local tests.

⇒ **NOTE 3:**

Any **FUNCTION UNITS** slot of the OC-12 system may be used to connect the OC-3 shelf to the OC-12 shelf. **21D/21D-U** or **21G/21G-U/21G2-U** OLIUs may be used in the OC-12 system. **21D/21D-U**, **21G/21G-U/21G2-U**, **22G-U/22G2-U/22G3-U**, **22D-U**, or **22F/22F2-U** OLIUs may be used in the OC-3 system. **21G/21G-U/21G2-U** and **22F/22F2-U** OLIUs use single-mode or multimode fiber connections in the both directions. **21D/21D-U** OLIUs use multimode fiber connections in both directions.

⇒ **NOTE 4:**

All shelves in the same network must have compatible software releases. A network is defined as all shelves tied together through optical fiber connections with communication among all shelves.

⇒ **NOTE 5:**

This procedure assumes that the optical fibers from **MAIN 1** at one end of the OC-3 system connect to **MAIN 1** at the other end of the OC-3 system. This upgrade requires technicians at both ends of the system to remove and make fiber connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 6:**

Different system configurations may require different timing arrangements. Before performing this upgrade, work orders and/or office records must be available to determine the new timing arrangements. Depending on the timing mode used and the availability of external timing, timing cables may have to be installed or moved and/or different timing modes set for the OC-3 and/or OC-12 shelves.

⇒ **NOTE 7:**

If timing upgrades are required, perform the timing upgrades before performing this procedure.

⇒ **NOTE 8:**

If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Verify that the shelf timing cabling and timing modes are provided as required. If external timing is being used, verify that the external timing inputs are good.

A. OC-3 Shelf

DLP-513

B. OC-12 Shelf [363-206-290]

DLP-510

-
2. Ensure that OC-3 software is compatible with the OC-12 system to be turned up.
-

DLP-532

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. Establish an end-to-end OC-12 system. [363-206-290, NTP-003]

-
4. Use the "**rtrv-alm**" and "**rtrv-state**" commands to verify that no alarms, locks, loops, or switches are present.
-

5. Notify maintenance center that alarms will be generated.
-

6.  **NOTE:**
Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYSCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the "**set-ne**" command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The "**rtrv-ne:**" command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches or use the "**set-ne**" command to make new settings.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE 1:**

For OC-3 Release 6 or later, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection (OSI) protocol. Switches **S2-1** through **S2-4** must be set to control the identification of the DCC for OSI interworking. **S2:3** or later **OHCTLs** are factory-programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

 NOTE 2:

The **FAULT** LED on the **OHCTL** will flash, and the **MJ** LED will be lighted until the other end is upgraded.

If required, set switches on **OHCTL**.

DLP-513

8. **NOTE:**

In OC-3 Release 6 or later software, the "**set -ne : TID : gne=yes**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DS-NE). **One**, and only one, shelf in the network **must** be provisioned as a GNE. If there is no GNE (DS-NE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DS-NE), a "duplicate GNE" alarm will occur. In Release 6 or later software, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

If Release 6 or later software is installed and the GNE is to be in the OC-3 system, use the "set-ne:TI D:gne=yes" command to designate ONE OC-3 shelf as the GNE.

9. Ensure that OC-3 shelves are equipped with both **MAIN 1** and **MAIN 2(P) OLIUs** so that service can be switched from service slot **MAIN 1** to protection slot **MAIN 2(P)**.
-

10. At each OC-12 shelf, use "set-fecom:address:com=disable" command to disable DCC communications for the **FUNCTION UNITS** slot being used in the OC-12 system.

For example, if **FUNCTION UNITS** slot **A** in the OC-12 is being used to connect the OC-3 system, the command "set-fecom:dcc-a:com=disable" disables communication for **FUNCTION UNITS** slot **A**.

11. At each OC-3 shelf, use "set-fecom:dcc-m:com=disable" to disable DCC communications for OC-3 **MAIN** slots.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12.  **NOTE:**
Service must be switched to the protection slot [**MAIN 2(P)**] at both ends of the OC-3 system being upgraded. If only the service **MAIN OLIUs** have **ACTIVE** LEDs lighted, the "**switch-line:main:pri>manual**" command must be performed at both ends of the system. If both service and protection **MAIN OLIUs** have the **ACTIVE** LEDs lighted, use the "**rtrv-state:main-all**" command to determine the switch state of the main **OLIUs**. The "**switch-line:main:pri>manual**" command must be performed at the end of system that shows active-rx for **MAIN 1**.

At **both** ends of the OC-3 system, use the "**switch-line:main:pri>manual**" command to switch to the protection line, if required.

Response: Only **OLIUs** in the protection slot have **ACTIVE** LEDs lighted.

-
13.  **CAUTION:**
*Disconnecting the wrong fiber will cause service interruption. After the **MAIN 1** fiber is disconnected, the OC-3 system will continue service unprotected on **MAIN 2(P)**.*

At each end of the OC-3 system, disconnect the optical fiber from **MAIN 1 OLIU**.

Response: Incoming OC-3 loss of signal alarm for **MAIN 1** fiber.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. If the optical fiber just removed from OC-3 **MAIN 1** is to be used for the OC-12 system, connect the fiber to the **OLIU** in **MAIN-B-1** at each end of the OC-12 system [363-206-290, NTP-003].
-

15.  **NOTE:**
When a circuit pack is removed, a "CP removed" alarm is activated. When a different circuit pack is installed or one is reinstalled with different switches, an "unexpected CP type/switches" alarm is activated.

At both ends of the OC-3 system, if **21G/21G-U/21G2-U OLIUs** are used, remove **OLIUs** from **MAIN 1** slots, set optical power switches to proper position, then reinstall **OLIUs**.

DLP-513

If a different type of **OLIU** is to be used in the OC-3 **MAIN** slots, remove existing **OLIUs** from **MAIN 1** slots, and install new **OLIUs**.

16. One at a time, at both ends of the OC-12 system, connect new optical fiber from the OC-12 **OLIU** in **FUNCTION UNITS** service slot **1** to OC-3 **OLIU** in **MAIN 1** slot [363-206-290, DLP-551].
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17. One at a time, at both ends of the OC-3 system, momentarily depress the **UPD/INIT** button on the **SYSCTL**. Verify that **FAULT** LEDs go off on all **OLIUs**.

-
18. At **both** ends of the OC-3 system, use the "**switch-line:main:pri>manual**" command to switch to the **MAIN 1** service line, if not already switched (**ACTIVE** LED lighted on only the **OLIU** in **MAIN 1** slot).

-
19. At both ends of the OC-3 system, disconnect the optical fiber from **OLIU** in **MAIN 2(P)** slot.

Response: Incoming OC-3 loss of signal
alarm for **MAIN 2(P)** fiber.

-
20. If the optical fiber just removed from OC-3 **MAIN 2(P)** is to be used for the OC-12 system, connect the fiber at each end of the OC-12 system to the **OLIU** in **MAIN-B-2(P)** [363-206-290, DLP-511].

-
21. At both ends of the OC-3 system, remove OC-3 **OLIU** from **MAIN 2(P)** and momentarily depress **UPD/INIT** button on the **SYSCTL**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

22. At both ends of the OC-3 system, install in **MAIN 2(P)** the same type **OLIU** with same switch settings as used in **MAIN 1**.

23. One at a time, at both ends of the OC-12 system, connect new optical fiber from OC-12 **OLIU** in **FUNCTION UNITS** protection slot **2(P)** to OC-3 **OLIU** in **MAIN 2** slot. Verify that **FAULT** LEDs go off on all **OLIUs** [363-206-290, DLP-551].

24. At each OC-3 shelf, use "**set - fecom:dcc-m:com=enable**" to enable DCC communications for OC-3 **MAIN** slots.

25. At each OC-12 shelf, use "**set - fecom:address:com=enable**" to enable DCC communications for the **FUNCTION UNITS** slot being used in the OC-12 system.

For example, if **FUNCTION UNITS** slot **A** in the OC-12 system is being used to connect the OC-3 system, the command "**set - fecom:dcc-a:com=enable**" enables communication for **FUNCTION UNITS** slot **A**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

26. The upgrade is now complete. Maintenance operations may need to be moved from the OC-3 shelf to the OC-12 shelf. This may include setting **SYSCTL** switches to enable TBOS on the OC-12 and disable it on the OC-3 **[DLP-513]**. It may also include using the "**set -ne:**" command to indicate which system is a gateway network element (GNE).
-

Establish End-to-End DDM-2000 OC-3 System Optical Fiber Spans Path Switched Ring Network

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

 **NOTE 2:**
It is assumed that all DDM-2000s in the system have been equipped and passed the looped transmission test(s) [**System Turnup: NTP-016**].

Determine the optical loss of each optical span from office records or by making the required measurements.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. ➤ **NOTE:**

The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

3. ➤ **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.

➤ **NOTE 2:**

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

➤ **NOTE 3:**

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. **DLP-513**

4. **⇒ NOTE 1:**
If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

⇒ NOTE 2:
The **rtrv-oc3:** or **rtrv-oc12:** command retrieves the or "OC-12 Line Provisioning Report". This report displays the provisioned configuration of OC-3 or OC-12 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** or **rtrv-oc12:** command format.

Use the **rtrv-oc3:** or **rtrv-oc12:** command to obtain the "OC-3 Line Provisioning Report" or "OC-12 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:** or **set-oc12:** command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5. **NOTE 1:**

If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

 NOTE 2:

If Sync Autoreconfiguration is enabled at any line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed nodes.

 NOTE 3:

The **rtrv-sync:** command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed node. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter and to set sync source, as required.

6. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set by the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

7. **NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate ONE shelf as the DSNE. Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE:**

A ring configuration requires that the **MAIN 1 OLIU** at one shelf (node) connect to the **MAIN 2(P) OLIU** at an adjacent OC-3 shelf (node). See Figure 1. It is suggested that this procedure establish the ring configuration starting from the DSNE node (near end) and continuing to an adjacent node, then to the next node until the final connection is made from the last node back to the first node.

At the near end, remove the optical loop from ONE **OLIU** (for example, **MAIN 2(P)**) associated with the optical span being established. At the other end, remove the optical loop from the associated **OLIU** (for example, **MAIN 1**) in the optical span being established.

9. **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set - fecom:** command **at each shelf** to enable far end communications.

At each shelf, use the **set - fecom: address: com=enabled** command to ensure far end communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **NOTE:**

One ring node must be designated as the DSNE for proper DCC communications and in order to verify that the proper nodes have been interconnected using the **rtrv-map-network** command. You should start ring node interconnections at the node designated as the DSNE.

Perform optical fiber connections and verification of the integrity of the optical span being established.

DLP-514

11. **NOTE:**

The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-3 or OC-12 lines terminated on the system.

Perform end-to-end line test.

DLP-515

-
12. Repeat this procedure from Item 2 for each optical span being established in the DDM-2000 OC-3 network.

-
13. The system is now ready for initial service to be established.

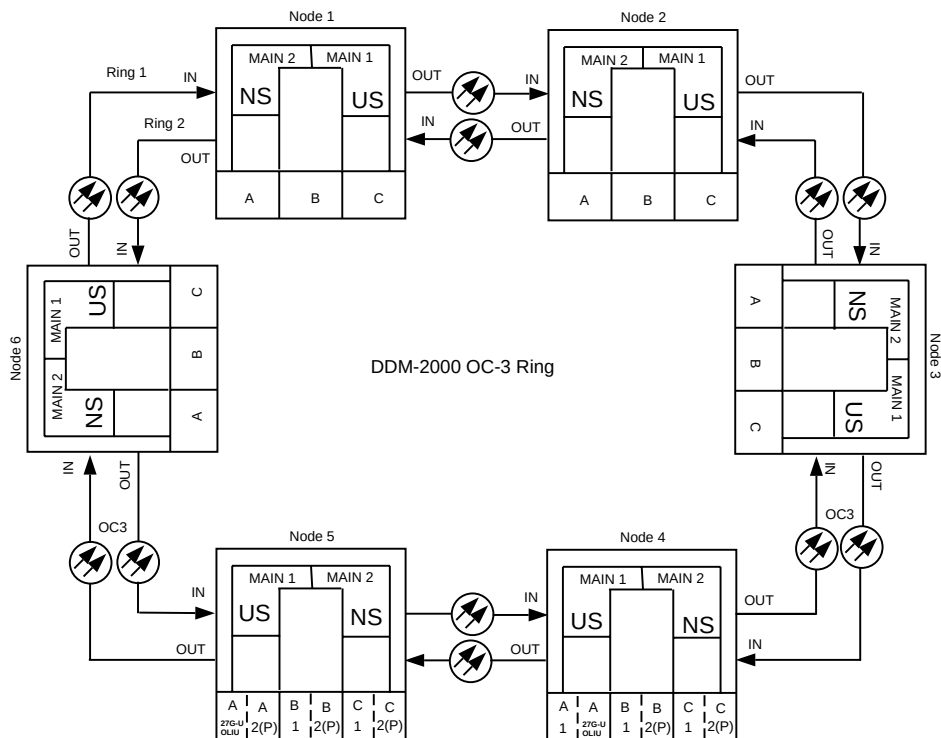
Initial DS1 Service [System Turnup: NTP-004]

Initial DS3 Service [System Turnup: NTP-005]

Initial EC-1 Interface [System Turnup: NTP-034]

Initial HDSL Interface [System Turnup: NTP-025]

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
22-Type OLIUs	MAIN-1	MAIN-2	FN-A		FN-B		FN-C	
	dcc-m1	dcc-m2	dcc-a		dcc-b		dcc-c	
	US	NS	NS		NS		NS	
27-Type OLIUs	MAIN-1	MAIN-2	FN-A-1	FN-A-2	FN-B-1	FN-B-2	FN-C-1	FN-C-2
	dcc-m1-1	dcc-m2-1	dcc-a1-1	dcc-a2-1	dcc-b1-1	dcc-b2-1	dcc-c1-1	dcc-c2-1
	dcc-m1-2	dcc-m2-2	dcc-a1-2	dcc-a2-2	dcc-b1-2	dcc-b2-2	dcc-c1-2	dcc-c2-2
	US	NS	NS	US	NS	US	NS	US

Figure 1. Example Ring Configuration Connections

Upgrade DDM-2000 OC-3 Ring Network to OC-12 Ring Network Using OC-3 Shelves In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1. **⇒ NOTE 1:**
This procedure is used to convert an OC-3 VT1.5 path protected ring network to an OC-12 path protected ring network using **24G-U OLIUs** in DDM-2000 OC-3 shelves only. If an OC-12 shelf is being added to the ring fibers to support single-homing the original OC-3 shelf at the CO, use the procedures of **NTP-024** instead of this procedure. It is assumed that the fiber being used in the current OC-3 ring network will be used to build the new OC-12 ring.

- ⇒ NOTE 2:**
This procedure uses a 4-node OC-3 ring as an example for the OC-3 optics to OC-12 optics ring upgrade (Figure 1). This upgrade starts at Node 1 and proceeds clockwise. Local procedures will have to be written, using the concepts of this procedure, to upgrade the particular configuration that you have.

- ⇒ NOTE 3:**
OC-3 Release 11 software must be installed in the OC-3 shelves.

- ⇒ NOTE 4:**
You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the **rtrv-alm:** command at the OC-3 ring to verify that no alarms, locks, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

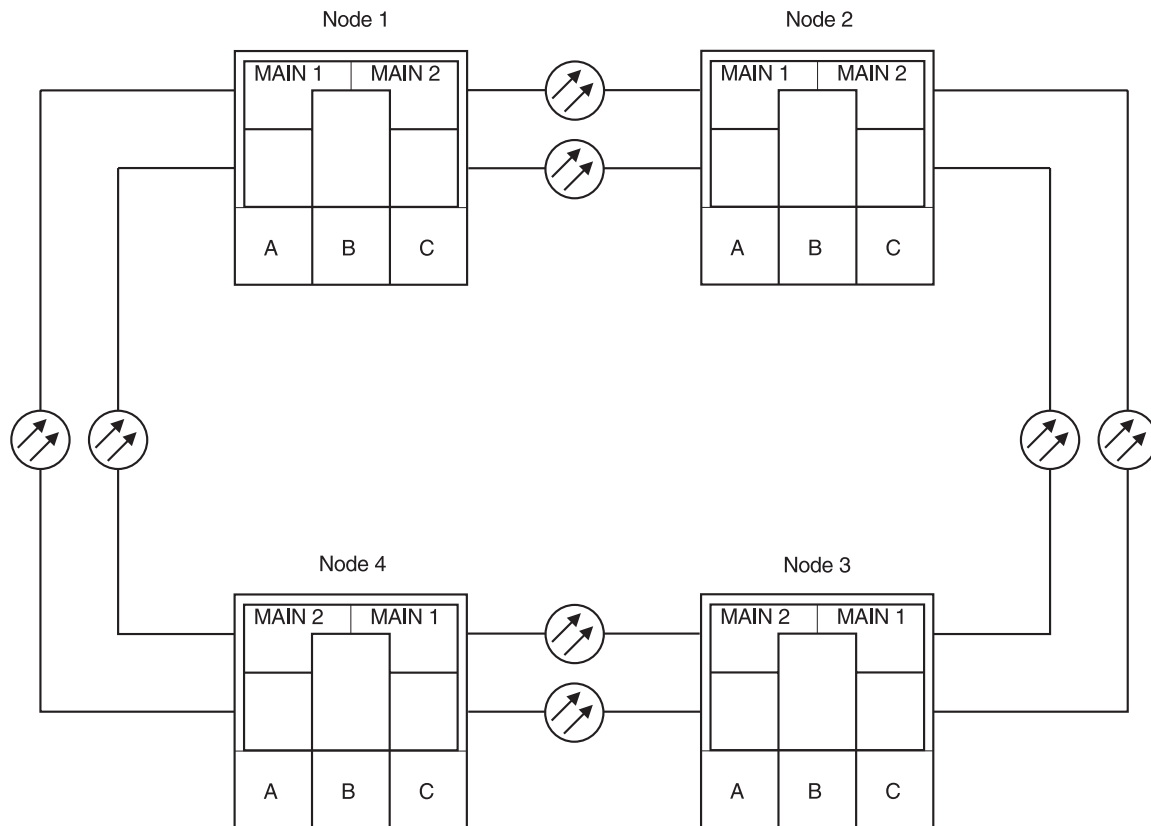


Figure 1. Example of OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

3. Use **rtrv-map-network:** and **rtrv-map-neighbor:** commands to determine the configuration of the OC-3 ring being upgraded and how the individual nodes are connected.

4. Before beginning this procedure, verify ring integrity and path protection switching function. At the start node, remove the receive (**IN**) fiber from ONE of the **MAIN OLIUs**. Verify no critical (**CR**) alarms are present. Reconnect the fiber and wait until alarms clear. Repeat this step on the other **MAIN OLIU**.

5. Upgrade all nodes to OC-3 Release 11 or later software.

- A. In-Service Local Software Download
- B. In-Service Remote Software Download

DLP-532
DLP-562

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6.  **CAUTION:**
Sync autoconfiguration must be enabled at each line-timed node in the network.

At each line-timed node in the network, use
set-oc3:syncmsg=Kbyte/Sbyte command to set
Kbyte or Sbyte sync messages. Use
set-sync:auto=enabled command to enable Sync
auto-reconfiguration.

7.  **NOTE:**
A "CP removed" alarm will occur when the **OLIU** is removed. An
"inc. OC-3 LOS" (blinking **FAULT** LED on **OLIU**) alarm will occur at
the other node connected to the removed fibers. Other nodes will
receive "inc. VT and STS AIS" alarms.

At the starting Node (in this example, Node 1), remove
optical fibers from **MAIN 2(P) OLIU**, then remove **MAIN
2(P) OLIU**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE:**

When the **24G-U OLIU** is installed in this step, an "unexpected CP type" status and "inc. OC-12 LOS" alarm will occur. At the connecting node, an "inc. OC-3 LOS" alarm will occur. When fibers are reconnected, the "unexpected CP type" status is still present at this Node and an "inc. OC-12 LOF" alarm will occur. An "inc. OC-3 LOF" alarm will occur at the connecting Node.

At the starting Node, install a **24G-U OLIU** into **MAIN 2(P) OLIU** slot and reconnect optical fibers.

9. **NOTE:**

A "CP removed" alarm will occur in this step when the **MAIN 1 OLIU** is removed. A "inc. OC12 LOS" alarm will occur at the connecting Node with the **24G-U OLIU** installed.

At the other end of the OC12 optical span being established, remove optical fibers from **MAIN 1 OLIU**, then remove **MAIN 1 OLIU**.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

10. **⇒ NOTE:**

When the **24G-U OLIU** is installed, an "unexpected CP type" status alarm will occur. The "inc. OC-12 LOS" alarm clears at both ends of the span. The "inc. VT and STS AIS" alarms clear downstream.

Install a **24G-U OLIU** into **MAIN 1 OLIU** slot and reconnect optical fibers. **Wait until the blinking FAULT LED goes off before continuing.**

11. **⇒ NOTE:**

A "CP removed" alarm will occur and an "inc. OC-3 LOS" alarm will occur at the connecting Node when the **MAIN 2(P) OLIU** is removed from this Node. Other nodes will receive "inc. VT and STS AIS" alarms.

Remove optical fibers from **MAIN 2(P) OLIU** for next span being established, then remove **MAIN 2(P) OLIU**.

12. **⇒ NOTE:**

When the **24G-U OLIU** is installed an "unexpected CP type" status and "OC12 connector failed" alarm will occur. An "inc. OC-12 LOF" alarm will occur at the Node connected to this **OLIU**.

Install a **24G-U OLIU** into **MAIN 2(P) OLIU** slot and reconnect optical fibers.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. Connect the OC12 faceplate connector between **MAIN 1** and **MAIN 2(P) 24G-U OLIUs**. Wait until "OC12 connector failed" alarm clears.

-
14.  **CAUTION:**
The update (UPD) command must be executed at the Node with both 24G-U OLIUs installed.

 **NOTE:**
After the update at this node, the "inc. OC-12 LOF" alarm remains until the **24G-U OLIU** is installed at the connecting Node.

Momentarily depress the **UPD** button on the **SYSCTL** or execute the update (**UPD**) command at the Node with both **24G-U OLIUs** installed.

-
15. Repeat Steps 9 through 14 for all Nodes until you arrive back at the starting Node.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Last Span Optical Upgrade

16.  **NOTE:**
A "CP removed" alarm will occur when the **MAIN 1 OLIU** is removed from the starting Node.

At the starting Node, remove optical fibers from **MAIN 1 OLIU**, then remove **MAIN 1 OLIU**.

17.  **NOTE:**
When the **24G-U OLIU** is installed, an "unexpected CP type" status and "OC12 connector failed" alarm will occur. The "inc. OC-12 LOS" alarm should clear at both ends of the span. The "inc. VT and STS AIS" alarms clear downstream.

Install a **24G-U OLIU** into **MAIN 1 OLIU** slot and reconnect optical fibers.

18. At the starting Node, connect the OC-12 faceplate connector between **MAIN 1** and **MAIN 2(P) 24G-U OLIUs**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

19. Momentarily depress the **UPD** button on the **SYSCTL** or execute the update (**UPD**) command at the starting Node.

-
20. If an OC-12 shelf is to be added to this new ring configuration, Use the procedures of **NTP-021** in 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*.
-

Upgrade DDM-2000 OC-3 Ring Network to OC-12 Ring Network Using OC-3/OC-12 Shelves In Service

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

1. **⇒ NOTE 1:**

This procedure is used to convert an OC-3 VT1.5 path protected ring network to an OC-12 path protected ring network using **24G-U OLIUs** in DDM-2000 OC-3 shelves. It is assumed that the fiber being used in the current OC-3 ring network will be used to build the new OC-12 ring.

⇒ NOTE 2:

This procedure uses a 4-node OC-3 ring as an example for the OC-3 optics to OC-12 optics ring upgrade (Figure 1). This procedure also adds an OC-12 shelf at the CO and single-homes the existing OC-3 shelf to the OC-12 shelf. If only the OC-3 optics are being upgraded to OC-12 optics, use the procedures of **NTP-023**. This upgrade starts at the Node adjacent to the CO connected to **MAIN 2(P)** of the existing CO OC-3 shelf and proceeds clockwise. Local procedures will have to be written, using the concepts of this procedure, to upgrade the particular configuration that you have.

⇒ NOTE 3:

You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the "**rtrv-alm:**" command at the OC-3 ring to verify that no alarms, locks, or switches are present.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Before beginning this procedure, verify ring integrity and path protection switching function. At the start node (Node 1), remove the receive (**IN**) fiber from ONE of the **MAIN OLIUs**. Verify no critical (**CR**) alarms are present. Reconnect the fiber and wait until alarms clear. Repeat this step on the other **MAIN OLIU**.

-
3. Notify maintenance center that alarms will be generated.
-

4. Use "**rtrv-map-network:**" and "**rtrv-map-neighbor:**" commands to determine the configuration of the OC-3 ring being upgraded and how the individual nodes are connected.
-

5. Upgrade all OC-3 nodes to OC-3 Release 11 or later software.

- A. In-Service Local Software Download
- B. In-Service Remote Software Download

DLP-532
DLP-562

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. Install and equip the OC-12 shelf at the CO using procedures of NTP-002 in 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*. Install OLIUs in OC-12 **FUNCTION UNITS ()** slots that are going to be used for connecting the existing CO OC-3 shelf.

7.  **CAUTION:**
*Sync Autoreconfiguration must be enabled at each **line-timed** node in the network. Not available for external timed or free-running nodes.*

At each line-timed node in the network, use
"**set-oc3:syncmsg=Kbyte/Sbyte**" command to set
Kbyte or Sbyte sync messages. Use
"**set-sync:auto=enabled**" command to enable Sync
Autoreconfiguration at each line-timed node.

8.  **NOTE:**
A "CP removed" alarm will occur when the **OLIU** is removed. An
"inc. OC-3 LOS" (blinking **FAULT** LED on **OLIU**) alarm will occur at
the other node connected to the removed fibers. Other nodes will
receive "inc. VT and STS AIS" alarms.

At the starting Node (in this example, Node 1), remove
optical fibers from **MAIN 2(P) OLIU**, then remove **MAIN
2(P) OLIU**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **⇒ NOTE:**

When the **24G-U OLIU** is installed in this step, an "unexpected CP type" status and "inc. OC-12 LOS" alarm will occur. At the connecting node, an "inc. OC-3 LOS" alarm will occur. When fibers are reconnected, the "unexpected CP type" status is still present at this Node and an "inc. OC-12 LOF" alarm will occur. An "inc. OC-3 LOF" alarm will occur at the connecting Node.

At the starting Node, install a **24G-U OLIU** into **MAIN 2(P) OLIU** slot and reconnect optical fibers.

10. **⇒ NOTE:**

A "CP removed" alarm will occur in this step when the **MAIN 1 OLIU** is removed. A "inc. OC12 LOS" alarm will occur at the connecting Node with the **24G-U OLIU** installed.

At the other end of the OC-12 optical span being established, remove optical fibers from **MAIN 1 OLIU**, then remove **MAIN 1 OLIU**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11.  **NOTE:**
When the **24G-U OLIU** is installed, an "unexpected CP type" status alarm will occur. The "inc. OC-12 LOS" alarm clears at both ends of the span. The "inc. VT and STS AIS" alarms clear downstream.

Install a **24G-U OLIU** into **MAIN 1 OLIU** slot and reconnect optical fibers. **Wait until the blinking FAULT LED goes off before continuing.**

12.  **NOTE:**
A "CP removed" alarm will occur and an "inc. OC-3 LOS" alarm will occur at the connecting Node when the **MAIN 2(P) OLIU** is removed from this Node. Other nodes will receive "inc. VT and STS AIS" alarms.

Remove optical fibers from **MAIN 2(P) OLIU** for next span being established, then remove **MAIN 2(P) OLIU**.

13.  **NOTE:**
When the **24G-U OLIU** is installed an "unexpected CP type" status and "OC12 connector failed" alarm will occur. An "inc. OC-12 LOF" alarm will occur at the Node connected to this **OLIU**.

Install a **24G-U OLIU** into **MAIN 2(P) OLIU** slot and reconnect optical fibers.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. Connect the OC-12 faceplate connector between **MAIN 1** and **MAIN 2(P) 24G-U OLIUs**. Wait until "OC12 connector failed" alarm clears.
-

15.  **CAUTION:**
The update (UPD) command must be executed at the Node with both 24G-U OLIUs installed.

 **NOTE:**
After the update at this node, the "inc. OC-12 LOF" alarm remains until the **24G-U OLIU** is installed at the connecting Node.

Momentarily depress the **UPD** button on the **SYSCTL** or execute the update (**UPD**) command at the Node with both **24G-U OLIUs** installed.

16. Repeat Steps 9 through 15 for all Nodes until you have equipped all nodes outside the CO with **24G-U OLIUs**, except for **MAIN 1** at starting Node 1 (it will be done at the end of this procedure).
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17.  **NOTE:**
The "**rtrv-eqpt:**" command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the "**rtrv-eqpt:**" command format.

At OC-12 node, verify/install **DLP-503**
21G/21G-U/21G2-U/21D/21D-U OLIU circuit packs in
FUNCTION UNITS (A, B, C, or D) slots being used for
the new OC-3/IS-3 extension.

-
18.  **NOTE 1:**
If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops.

 **NOTE 2:**
If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the "**set - fecom: address: com=disable**" command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIUs** just **DLP-504**
installed in the OC-12 shelf, if not already connected.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

19.  **NOTE:**
The Network Side (NS)/User Side (US) parameters of the
"set-fecom:" command must be set opposite at each end of the
optical spans.

Use the "rtrv-fecom/set-fecom" command to
verify/set "Network Side/User Side" parameters at each
end of optical span being established.

-
20. Use the "rtrv-oc3/set-oc3" command at the OC-12
shelf to verify/set application (*app*) parameter for the
OC-12 **FUNCTION UNITS** slots being used for this
single-homed configuration. For example,
"set-oc3:fn-a,app=0X1".
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

21.  **NOTE 1:**
If Kbyte/Sbyte (sync messaging) is enabled for the OC-3 **MAIN 1** and **MAIN 2(P)** optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring and in the **FUNCTION UNITS** slots of the host OC-12 shelf.

-  **NOTE 2:**
The "**rtrv-oc3:**" command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* and 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the "**rtrv-oc3:**" command format.

Use the "**rtrv-oc3:**" command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the "**set-oc3:**" command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

22.  **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.
-  **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed OC-3 node in a ring (not available for external timed or free-running nodes), it **must** be enabled at all line-timed OC-3 nodes of a ring.
-  **NOTE 3:**
The "**rtrv-sync:**" command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* and 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the "**rtrv-sync:**" command format.

Use the "**rtrv-sync:**" command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed node. Use the "**set-sync:**" command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

23.  **NOTE:**
Two or more shelves in the same network with the same TBOS display number (determined by **SYCTL** switch settings) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the "**set -ne**" command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, and/or TID settings exist. The "**rtrv-ne:**" command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the "**set -ne**" command to make new settings.

-
24. From office records or by using the "**rtrv-crs-sts1:all**" command at any site, determine **ALL** existing cross-connections.
-

25.  **CAUTION:**
Critical or Major alarms will be generated if cross-connections are not made on the new OC-12 shelf before splicing it into the network.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 1:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 2:**

Up to 12 DS3/EC-1s, 4 OC-3s, or 8 STS-3cs may be terminated in an OC-12 ring network. Once a DS3/EC-1/OC-3/STS-3c is terminated, that timeslot must be reserved in both directions around the ring to the far end. Therefore, if a DS3/EC-1/OC-3/STS-3c is terminated (cross-connected) to a **FUNCTION UNITS** group on a near-end and far-end terminating shelf, it must also be pass-through cross-connected in every shelf in the network. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross connections.

Use the or "**ent-crs-sts1:**" command at the new OC-12 shelf to make all required cross-connections, including pass-through cross-connections and cross-connections for the CO OC-3 shelf to be added to this OC-12 shelf (for example, "**ent-crs-sts1:m-1,m-1**"). Pass-through cross-connections must be made at the new OC-12 shelf to correspond to each terminating cross-connection present on every shelf in the OC-12 ring network. Terminating cross-connections must be made at the new OC-12 shelf to correspond to each terminating cross-connection present on the existing CO OC-3 shelf.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

26.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

 **CAUTION:**
An automatic protection switch service hit may occur when the correct optical fibers are cut. Cutting the wrong fiber lines will cause a service interruption.

At the point where the new DDM-2000 OC-12 shelf will be added, use local procedures to cut the two fiber lines connecting the existing OC-3 shelf at the CO with the adjacent OC-3 shelf equipped with both **24G-U OLIUs**. Condition the fiber for connection to the new shelf.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

27. ➤ **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-3 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

➤ **NOTE 2:**

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

➤ **NOTE 3:**

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the "**rtrv-sync**" command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. (OC-3 Reference: 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual (TOP)*—Volume II, **DLP-513**).

DLP-510

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

28. At new OC-12 shelf, remove **OLIU** optical loops from
MAIN-B-1 slot.

29. Determine the optical loss of the optical facility from
office records or by making the required measurements.

30. Connect optical fibers from adjacent OC-3 shelf **MAIN
2(P) 24G-U OLIU** to new OC-12 shelf **MAIN-B-1 OLIU**.

31.  **NOTE:**
If the report in this step indicates wrong fiber connections or no
connection, verify that *fecom* is ON ("**rtrv-fecom:**") and check fiber
integrity.

Use "**rtrv-map-neighbor:**" command to verify proper
fiber connections have been made to the adjacent node.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

32.  **NOTE:**
This single-homed ring configuration requires that the **FUNCTION UNITS-()-1 OLIU** on the OC-12 shelf connect to the **MAIN 1 OLIU** at the first OC-3 shelf from the OC-12 shelf. **MAIN 2(P) OLIU** at the OC-3 shelf connects to **FUNCTION UNITS-()-2(P) OLIU** on the host OC-12 shelf.

At the near end, remove the optical loop from the OC-12 shelf **OLIU** in **FUNCTION UNITS-()-1** slot being used.

-
33. At CO OC-3 shelf, connect optical fibers from CO OC-3 shelf **MAIN 1** slots to OC-12 **FUNCTION UNITS-()-1** slot being used for CO OC-3 extension. Ensure that the fibers are connected to the correct **OLIU**.

-
34.  **NOTE:**
If the report in this step indicates wrong fiber connections or no connection, verify that *fecom* is ON ("**rtrv-fecom:**") and check fiber integrity.

Use "**rtrv-map-neighbor:**" command to verify proper fiber connections have been made to the adjacent node.

-
35. Perform end-to-end OC-12 optical line test on optical spans being established. **DLP-515**
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

36. Remove optical fibers from CO OC-3 shelf **MAIN 2(P) OLIU** and connect to OC-12 **MAIN-B-2(P) OLIU**.

37. Connect optical fibers from CO OC-3 shelf **MAIN 2(P) OLIU** to OC-12 **FUNCTION UNITS-()-2(P) OLIU** being used for OC-3 extension.

38. At the starting node (Node 1), Remove optical fibers from OC-3 shelf **MAIN 1 OLIU**

39. At starting OC-3 node, install a **24G-U OLIU** into **MAIN 1 OLIU** slot and reconnect optical fibers.

40. At the starting node, connect the OC-12 faceplate connector between **MAIN 1** and **MAIN 2(P) 24G-U OLIUs**. Wait until "OC12 connector failed" alarm clears.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

41.  **CAUTION:**
*The update ("upd") command must be executed at the Node with both
24G-U OLIUs installed.*

 **NOTE:**
After the update at this node, the "inc . 0C-12 LOF" alarm remains
until the **24G-U OLIU** is installed at the connecting Node.

Momentarily depress the **UPD/INIT** button on the
SYSCTL or execute the update ("upd") command at the
Node with both **24G-U OLIUs** installed.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

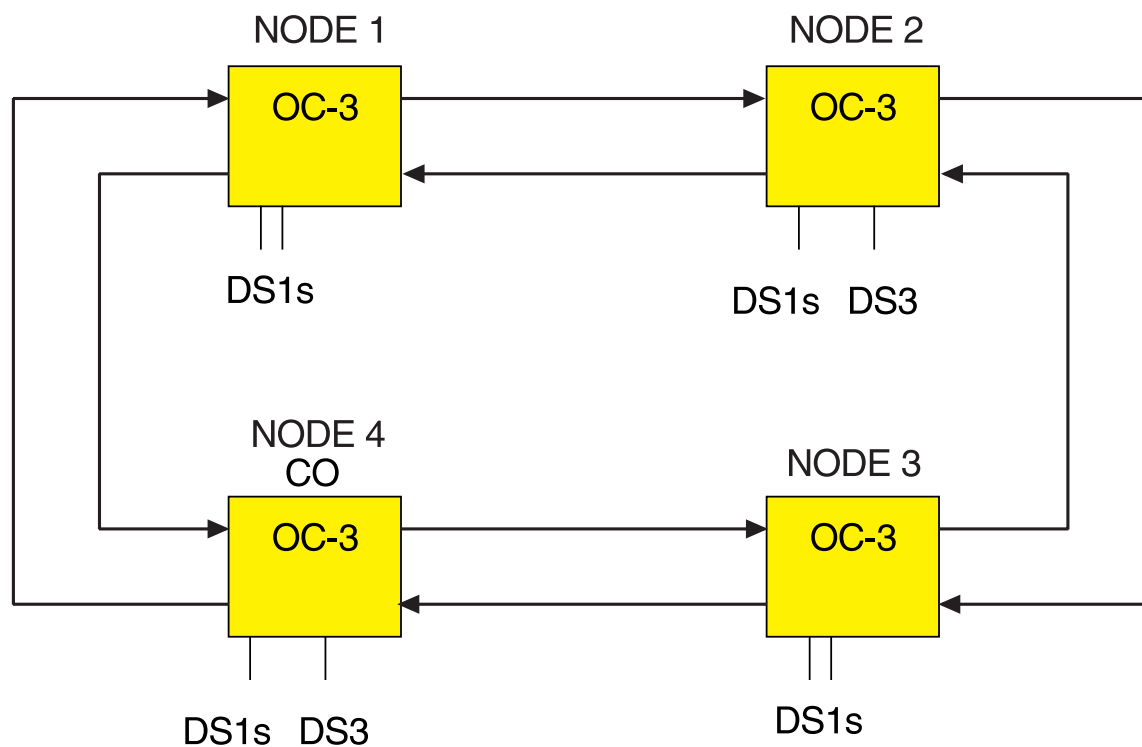


Figure 1. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

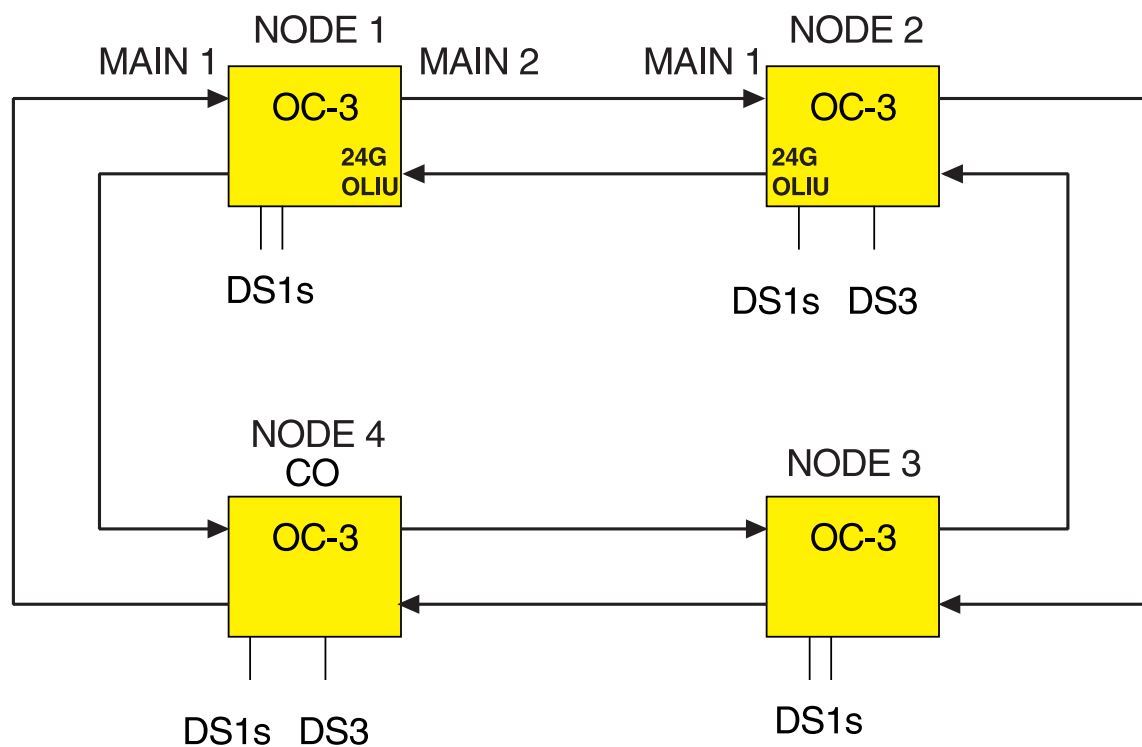


Figure 2. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

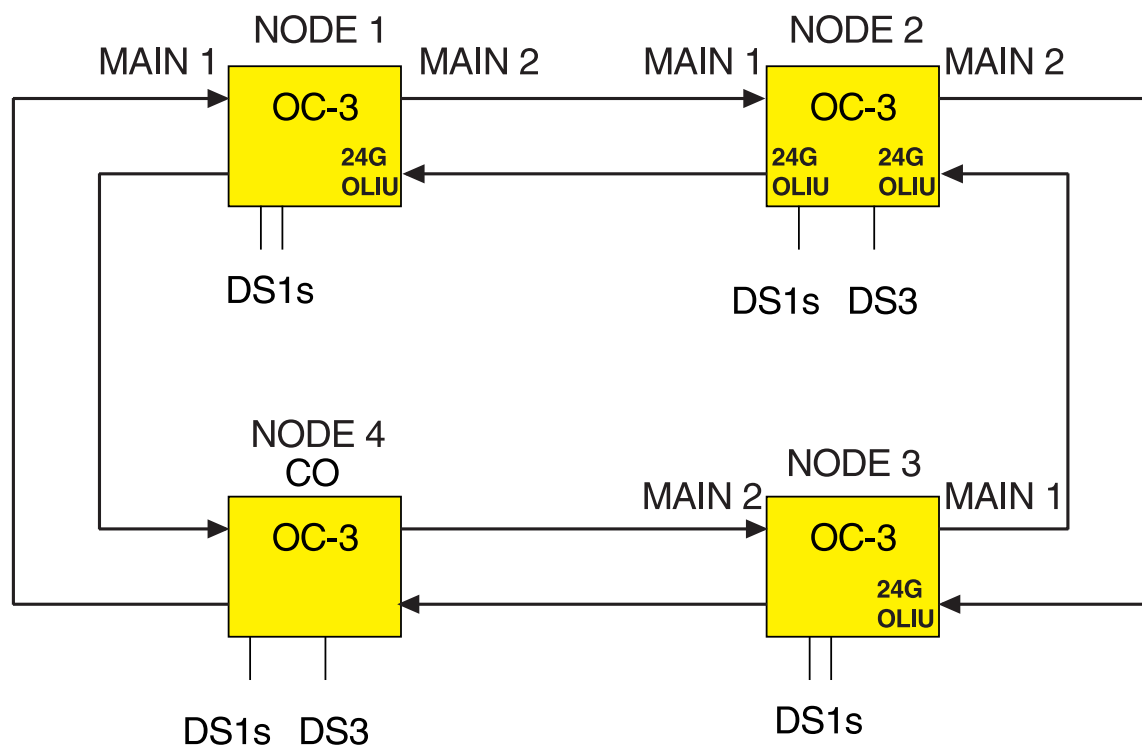


Figure 3. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

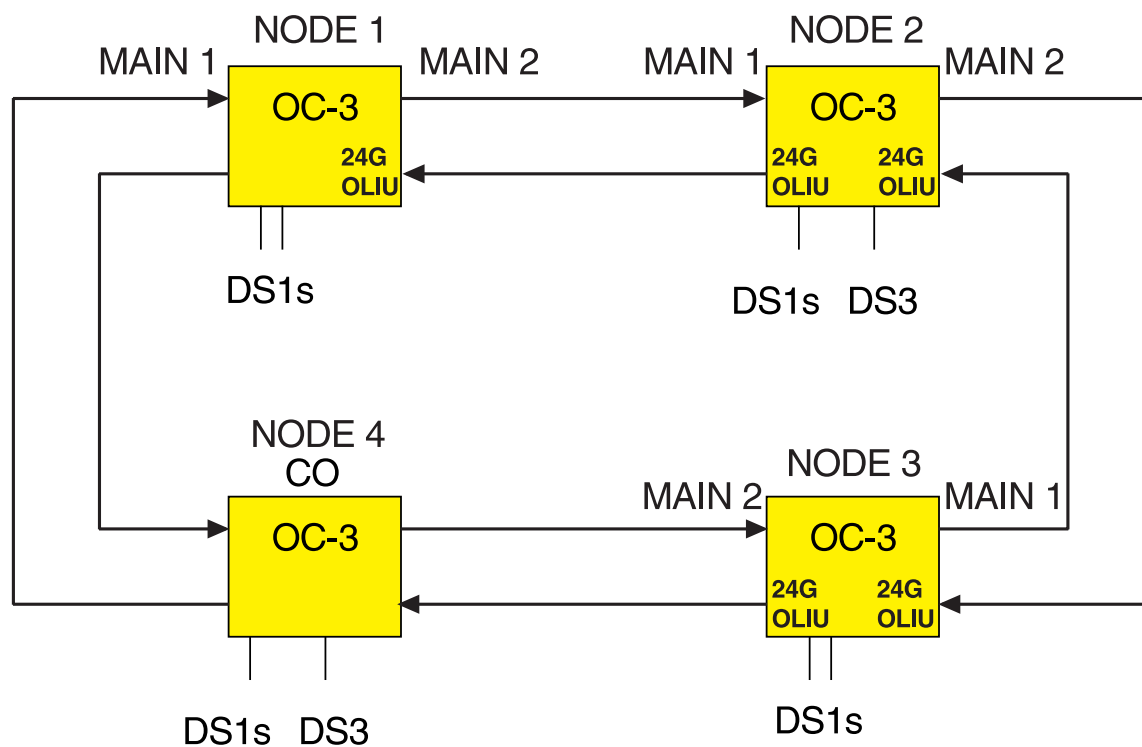


Figure 4. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

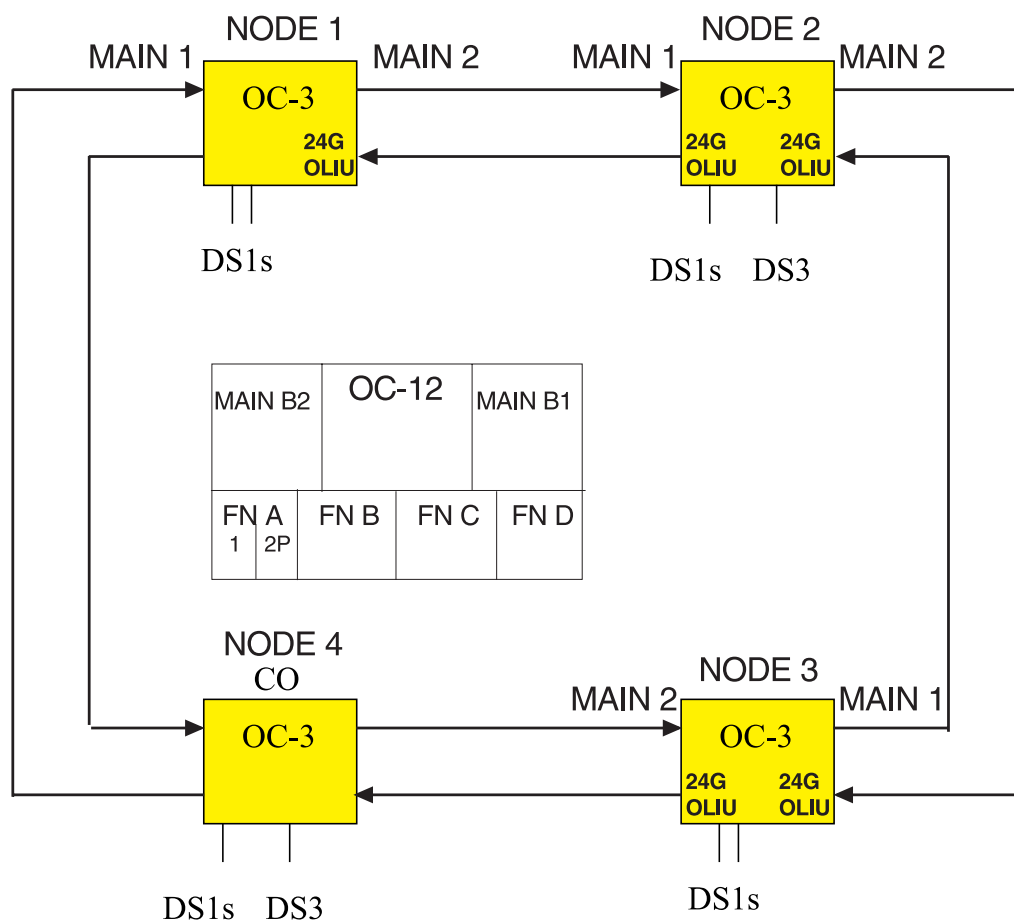


Figure 5. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

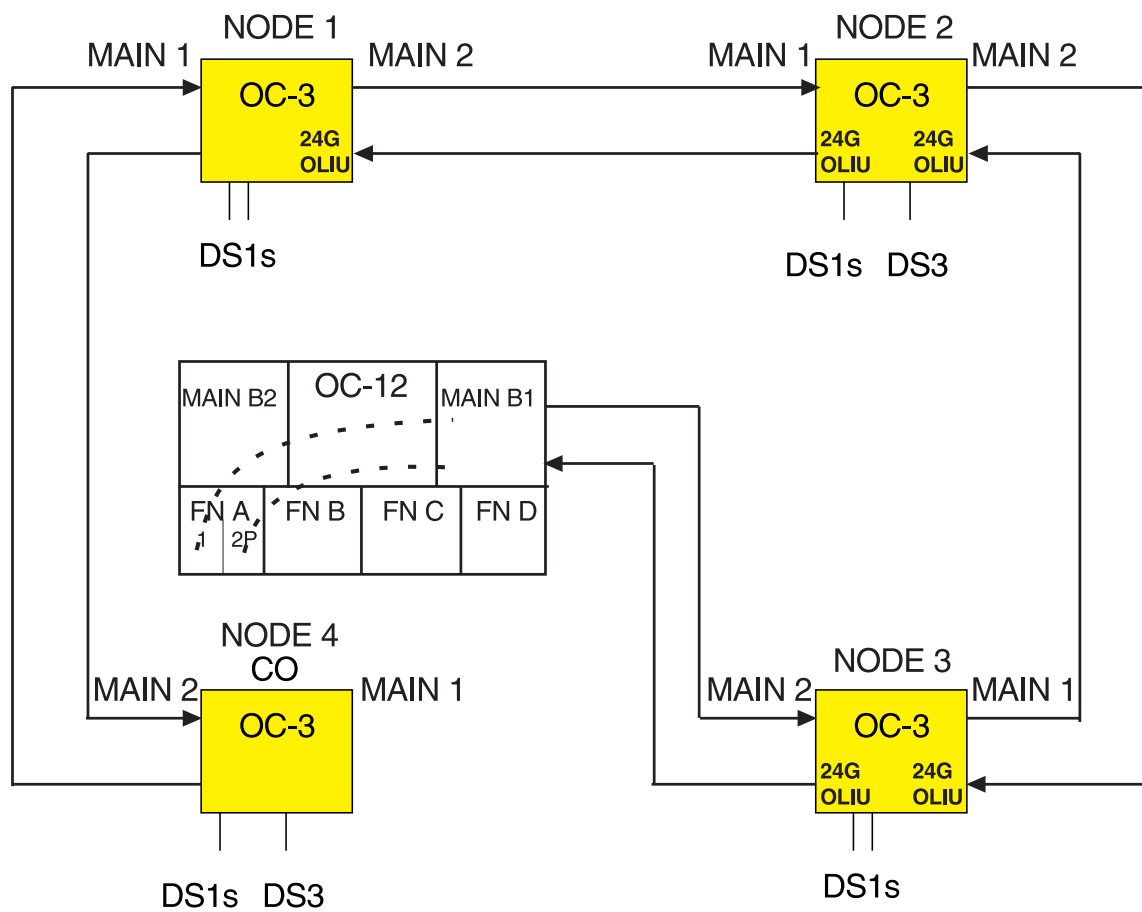


Figure 6. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

Figure 7. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

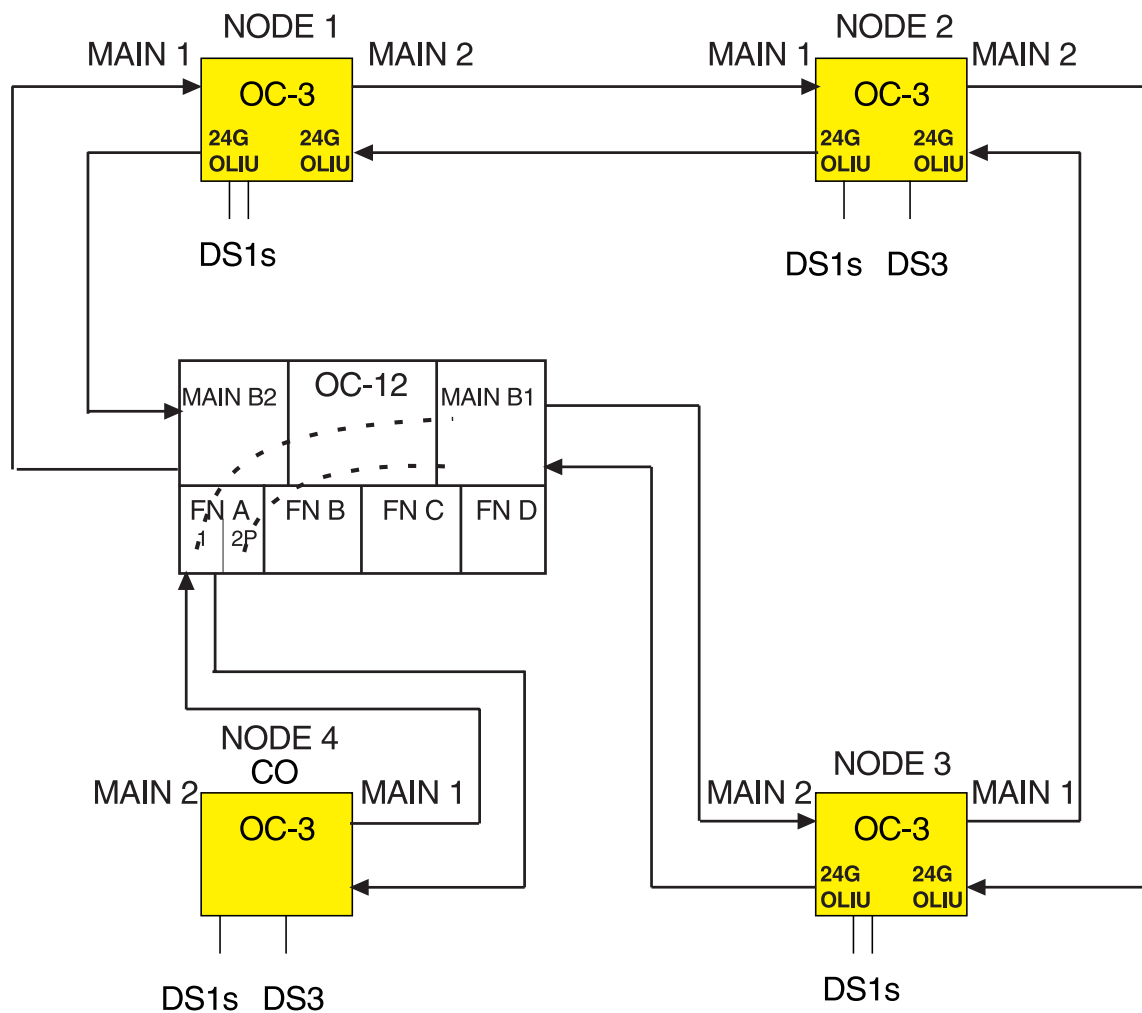


Figure 8. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

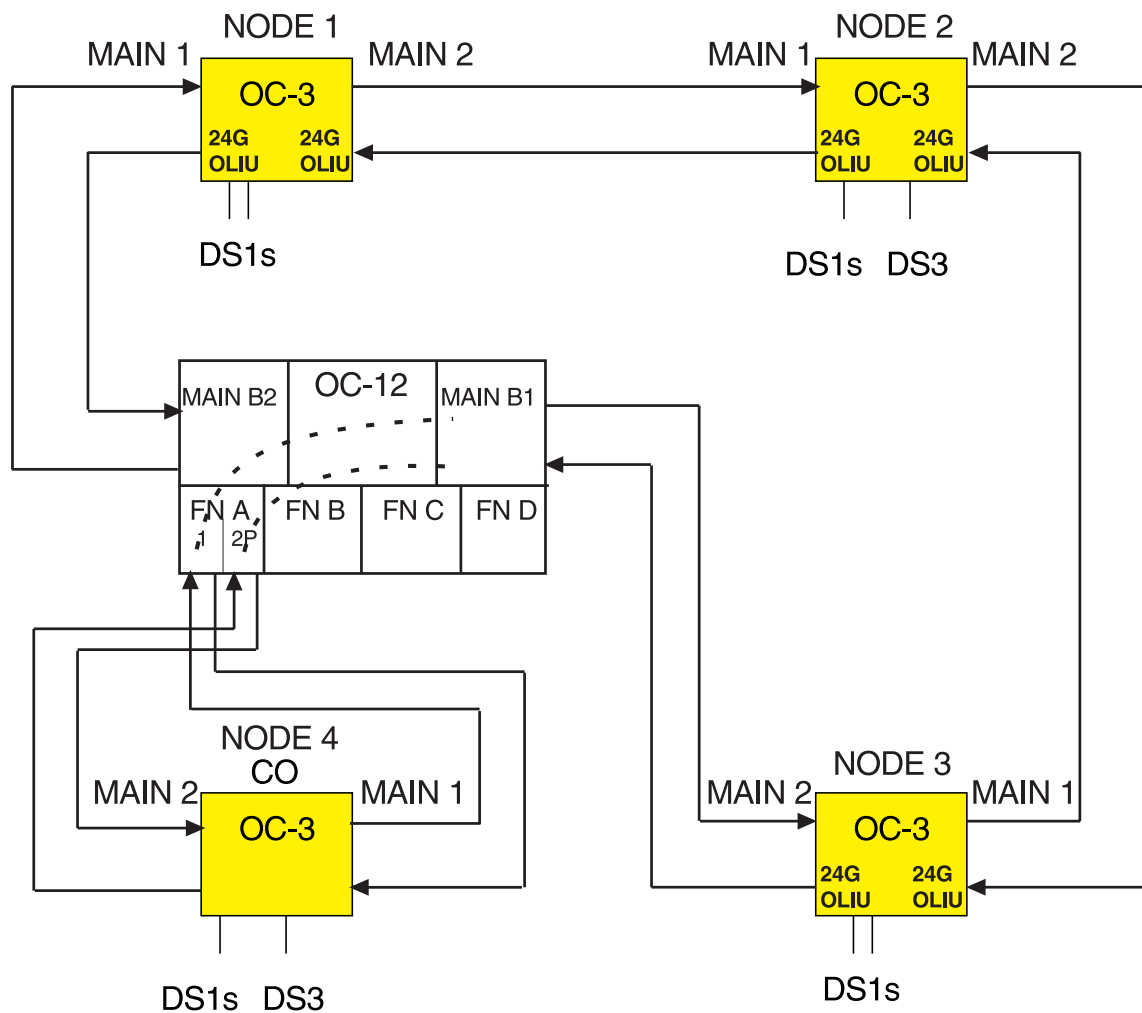


Figure 9. Basic 4-Node OC-3 Ring for OC-3 to OC-12 Ring Upgrade

Establish Initial HDSL Service Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION 1:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **CAUTION 2:**
In addition to primary lightning protection, an external Lightning and Surge Secondary Protection Assembly (ED-8C783-30 or equivalent) is required for HDSL circuits used in outside plant applications.

-  **NOTE 1:**
The OC-3 system must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves and establish the system.

-  **NOTE 2:**
If the DS1 terminating end(s) are in a DDM-2000 OC-3, this procedure assumes that **MXRVO** circuit packs have already been installed during initial shelf turnup and either **MXRVO** or **STS1E** circuit packs have been installed during initial shelf turnup at the other DDM-2000 OC-3 terminating end(s) of the circuit. If the terminating end is in another system, it is assumed that the appropriate installation and connections have been made to that system. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **DLP-506** for procedures to install new **MXRVO** circuit packs and **DLP-567** for procedures to install new **HDSL** circuit packs.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

A maximum of three **BBF8 HDSL** circuit packs, including a protection circuit pack, can be installed in any one **LOW SPEED GROUP**. Both service and protection **MXRVO** circuit packs must also be installed in the corresponding **FUNCTION UNITS** group.

⇒ **NOTE 4:**

If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

2. ⇒ **NOTE:**

The "**rtrv-eqpt:**" command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the "**rtrv-eqpt:**" command format.

At each DDM-2000 OC-3 terminating end, use the "**rtrv-eqpt:**" command to obtain the "Equipage and Version Report" and verify that the proper service and protection (if required) **MXRVO (STS1E)** circuit packs have been installed in **FUNCTION UNITS** group(s) (**A**, **B**, or **C**) being put into service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. At the HDSL terminating node(s) of the circuit being established, determine which HDSL port(s) is to be put into service and what options are to be selected.

-
4.  **NOTE:**
Both service and protection **MXRVO** circuit packs must be installed in the **FUNCTION UNITS** group corresponding to the **LOW SPEED GROUP** equipped with **HDSL** circuit packs.

At each HDSL terminating node, set option switches and install **HDSL** circuit pack(s), as required.

DLP-567

-
5.  **CAUTION 1:**
*No service **LOW SPEED DS1** slot locations should be left empty in **GROUPs** equipped with protection **HDSL** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.*

-  **CAUTION 2:**
*When a **HDSL** circuit pack is switched to protection, removal of any other **HDSL** circuit pack or **177A** Retainer Card in the same **LOW SPEED GROUP** will result in a loss of service to the protected **HDSL** and the removed **HDSL** circuit pack.*

-  **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Install **177A** Retainer Cards into all unused service **DS1** slots in **LOW SPEED GROUPS** equipped with protection **HDSL** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.

6. Use the "**set - t1:**" command to set the characteristics of the DS1 port of the circuit being established.
 7. At each HDSL terminating node, make the appropriate cable connection(s) to the HDSL cross-connect point(s) or equivalent connection point(s) for the circuit being added.
 8. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.
 9. If one of the terminating nodes is equipped with **STS1E** circuit packs for an EC-1 interface to support services being established, establish initial EC-1 low speed interface [**NTP-034**].
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **NOTE 1:**

Ring releases support only manual VT1.5 and STS-1 cross-connections. Manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

 NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command ("**cnvt -crs**") for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

-
11. Make necessary VT1.5/STS1 cross-connections at each node in the network.

A. Single Ring Configuration	DLP-546
B. Dual Ring Interworking (DRI) Configuration	DLP-550
C. Single/Dual OC-3/FiberReach Configuration	DLP-557
D. Stand Alone OC-3/FiberReach Configuration	DLP-558
E. Single/Dual OC-3/OC-48 Configuration	DLP-559
F. Single/Dual OC-3/OC-12 Configuration	DLP-560

12. ⇒ **NOTE:**

For a DS1 circuit in a path protected ring network, the "**sw-path- () :address**" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active VT1.5 (DS1) path to repeat this test on the other path(s).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Perform DS1 end-to-end transmission test for each circuit being put into service, as required.

A. Ring Configuration	DLP-510
B. Dual Ring Interworking (DRI) Configuration	DLP-554
C. OC-3/FiberReach Configuration	DLP-510
-

13. Use the "**rtrv-state-eqpt:**" command to determine the port state of the DS1 port(s) of the circuit being established.
-

14.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t1:**" command to set the port state of the DS1 port(s) of the circuit being established.

15. Use PairGain* Technologies procedures to access the faceplate RS-232 interface and set HDSL link management features for each port being provisioned.
-

* Trademark pending.

Add New DDM-2000 OC-3, OC-12, or FiberReach Node (Shelf) To DDM-2000 OC-3/OC-12 Path Switched Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and a new RT node (shelf) is being added to the Path Switched OC-3 or OC-12 Ring configuration. (See Figure 1.)

 **NOTE 2:**
It is assumed that optical loops are installed on the new shelf, that the new shelf has been properly equipped and tested in a looped-back configuration, and that the proper release of software has been loaded. (DDM-2000 OC-3 **System Turnup: NTP-016** or 363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual* or 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II.*)

 **NOTE 3:**
All shelves in the same network must have the same or compatible software releases.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

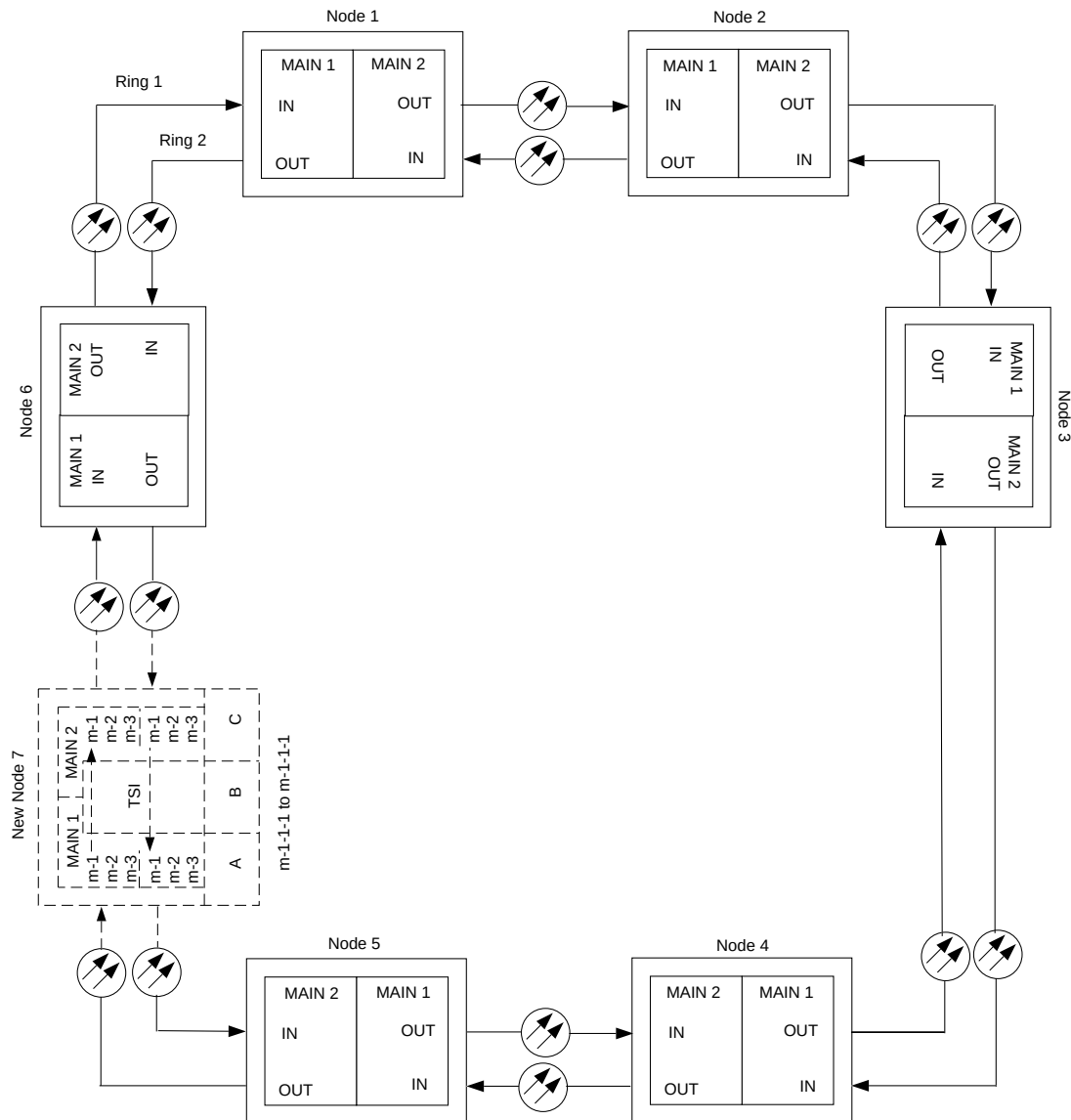


Figure 1. Adding an RT (Node) to an Existing Ring Network

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 4:**

This procedure requires information from other sites in the network, either through remote modem connection or by having a technician at the neighboring site.

⇒ **NOTE 5:**

If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

-
2. Notify maintenance center that alarms will be generated.
-

3. ⇒ **NOTE:**

It may be helpful to make a sketch of the network to visualize the cross-connections required.

Use "**rtrv-map-network:**" and "**rtrv-map-neighbor:**" commands to determine systems (sites) in the network and how they are connected to each other.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

The "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

 NOTE 3:

Two or more shelves in the same network with the same TBOS display number will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID will cause a "duplicate TID" alarm.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Use the "**rtrv-ne**" command at each site to verify no duplicate DSNE, TBOS, site/ne, or TID settings exist. If duplicates exist, determine new settings and use "**set-ne**" command to make new settings.

Use the "**set-ne:**" command to set the alarm group number for this shelf, if required. (Default alarm group number is 255.) If the shelf is an AGNE, use the "**set-ne:**" command to designate the shelf as an AGNE. One primary AGNE and one backup per alarm group is recommended.

-
5. From office records or by using the "**rtrv-crs-vt1:all**" or "**rtrv-crs-sts1:all**" command at any site, determine the existing cross-connections.

-
6.  **CAUTION:**
Critical or Major alarms will be generated if pass-through cross-connections are not made on the new shelf before splicing it into the network.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 1:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 2:**

Up to 84 DS1s may be terminated in a ring network. Once a DS1 is terminated, that timeslot must be reserved in both directions around the ring to the far end. Therefore, if a DS1 is terminated (cross-connected) to a **FUNCTION UNITS** group on a near-end and far-end terminating shelf, it must also be pass-through cross-connected in every shelf in the network. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Use the "**ent-crs-vt1:**" or "**ent-crs-sts1:**" command at the new shelf to make all required *pass-through* cross-connections (for example, "**ent-crs-vt1:m-1-1-1,m-1-1-1**" or "**ent-crs-sts1:m-1,m-1**"). Pass-through cross-connections must be made at the new shelf to correspond to each terminating cross-connection present on every shelf in the ring network. (See Figure 1.)

7.  **NOTE 1:**
If Kbyte or Sbyte (sync messaging) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

 **NOTE 2:**
The "**rtrv-oc3:**" or "**rtrv-oc12:**" command retrieves the "OC-3 Line Provisioning Report" or "OC-12 Line Provisioning Report". This report displays the provisioned configuration of OC-3 or OC-12 lines. See the "Commands and Reports" section of this manual for a description of the "**rtrv-oc3:**" or "**rtrv-oc12:**" command format.

Use the "**rtrv-oc3:**" or "**rtrv-oc12:**" command to obtain the "OC-3 Line Provisioning Report" or "OC-12 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the "**set-oc3:**" or "**set-oc12:**" command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

 NOTE 2:

If Sync Autoreconfiguration is enabled at any line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed nodes.

 NOTE 3:

The "**rtrv-sync:**" command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the "**rtrv-sync:**" command format.

Use the "**rtrv-sync:**" command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed node. Use the "**set-sync:**" command to enable or disable the Sync Autoreconfiguration parameter, as required.

9. **WARNING:**

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO



CAUTION:

An automatic protection switch service hit may occur when the correct optical fibers are cut. Cutting the wrong fiber lines will cause a service interruption.

At the point where the new DDM-2000 shelf will be added, use local procedures to cut the two fiber lines connecting existing shelves and condition the fiber for connection to the new shelf.

10. **NOTE:**

Cutting the main sync source will cause the line-timed node to go into *holdover*.

Verify that only "minor nsa OC-3 LOS" or "minor nsa OC-12 LOS" and "nsa inc. VT/STS1 AIS" alarms are present at each end of the fiber cut.

11. **NOTE 1:**

For DDM-2000 OC-3 or OC-12 shelves, if line timing mode is specified, or external timing mode is specified but the timing reference was not available at new shelf turnup, the new shelf **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack. This step is not applicable to the DDM-2000 FiberReach shelf.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ **NOTE 3:**

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the "**rtrv-sync**" command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected.

Set timing mode on new shelf **TGS** to the timing mode specified in work order or office records.

DLP-513

12. ⇒ **NOTE:**

The Network Side/User Side parameters of the "**set - fecom:**" command must be set opposite at each end of the optical spans.

Use the "**rtrv-fecom/set-fecom**" command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. At new shelf, remove **OLIU** optical loops.

14. Determine the optical loss of the optical facility from office records or by making the required measurements.

15. Connect one pair of optical fibers from an adjacent shelf to new shelf **MAIN 1 OLIU**. Ensure that you connect the fibers correctly [From adjacent OC-3 shelf **MAIN 2(P) OLIU**, OC-12 shelf **MAIN B 2(P) OLIU**, or FiberReach shelf **MAIN-2 OLIU** to new OC-3 shelf **MAIN 1 OLIU**, OC-12 shelf **MAIN B 1 OLIU**, or FiberReach **MAIN-1 OLIU**]. **DLP-514**

16.  **NOTE:**
If the report in this step indicates wrong fiber connections or no connection, verify that *fecom* is ON ("**rtrv-fecom:**") and check fiber integrity.

Use "**rtrv-map-neighbor:**" command to verify proper fiber connections have been made to the adjacent node.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

17. Connect one pair of optical fibers from an adjacent shelf to new shelf **MAIN 2(P) OLIU**. Ensure that you connect the fibers correctly [From adjacent OC-3 shelf **MAIN 1 OLIU**, OC-12 shelf **MAIN B 1 OLIU**, or FiberReach **MAIN-1 OLIU**. to new OC-3 shelf **MAIN 2(P) OLIU**, OC-12 shelf **MAIN B 2(P) OLIU**, or FiberReach shelf **MAIN-2 OLIU**]. **DLP-514**
-

18.  **NOTE:**
If the report in this step indicates wrong fiber connections or no connection, verify that *fecom* is ON ("**rtrv-fecom:**") and check fiber integrity.

Use "**rtrv-map-neighbor:**" command to verify proper fiber connections have been made to the adjacent node.

19. Verify that all alarm and status conditions clear. If "nsa inc. VT AIS" alarm is present and no "inc. OC-3 LOS" or "inc. OC-12 LOS" alarm, check that all pass-through cross-connections have been properly made using the "**rtrv-crs-vt1:**" command. If "nsa inc. STS AIS" alarm is present and no "inc. OC-3 LOS" or "inc. OC-12 LOS" alarm, check that all pass-through cross-connections have been properly made using the "**rtrv-crs-sts1:**" command.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. Perform end-to-end OC-3 or OC-12 optical line test on optical spans being established. **DLP-515**
-

21.  **NOTE:**
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS1/DS3/EC-1 port being tested. After one path (ring1 or ring2) has been tested, use the "sw-path-():" command at both ends to test the other ring path.

Perform appropriate end-to-end transmission test for the circuits being added, as required.

A. Single Ring DS1 Test	DLP-510
B. Dual Ring Interworking (DRI) DS1 Test	DLP-554
C. Single Ring DS3 Test	DLP-511
D. Dual Ring Interworking (DRI) DS3 Test	DLP-553
-

22. The system is ready for service to be established.
Initial DS1 Service [**System Turnup: NTP-004**]
Initial DS3 Service [**System Turnup: NTP-005**]
Initial EC-1 Service [**System Turnup: NTP-034**]
Initial HDSL Service [**System Turnup: NTP-025**]
-

Discontinue DDM-2000 Node (Shelf) From DDM-2000 OC-3 Path Switched Ring Network

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE:**
The craft interface terminal (CIT) "**rtrv-map-network:**" and "**rtrv-map-neighbor:**" commands may be used to retrieve a map of the SONET network, including a list of the systems in the network and how they are connected. The "**rtrv-crs-vt1:**" command may be used to retrieve VT1.5 (DS1) cross-connections within the DDM-2000 OC-3 system. The "**rtrv-crs-sts1:**" command may be used to retrieve STS-1 cross-connections within the DDM-2000 OC-3 system.

Use "**rtrv-alm**" command to verify no alarms, locks, loops, or switches are present.

-
2. Determine which DDM-2000 node (shelf) is being discontinued.
-
3. Verify that optical line loss budget will not be exceeded by removing this node.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. At the shelf being discontinued and all associated terminating shelves and extensions, ensure service (signals) has been removed from the **FUNCTION UNITS** groups being discontinued.
Discontinue DS1 Service [**System Turnup: NTP-011**]
Discontinue DS3 Service [**System Turnup: NTP-012**]
Discontinue EC-1 Interface [**System Turnup: NTP-036**]
Discontinue HDSL Interface [**System Turnup: NTP-037**]
-

5. **NOTE 1:**

The "**set-ne:**" command designates a shelf as an alarm gateway network element (AGNE). Shelves may be assigned an alarm group number (default alarm group number is 255). At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

 NOTE 2:

It may take several minutes for the network to stabilize after the AGNE has been changed.

If a shelf being discontinued is an AGNE, use the "**set-ne:TID=tid:agne=yes**" command to establish the AGNE on another shelf, if required. Use the "**set-ne:TID=tid:agne=no**" command to disable the AGNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. **NOTE 1:**

The "**set-ne:**" command also designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur and one of the DSNEs must be disabled.

 NOTE 2:

It is recommended that a DDM-2000 OC-3 shelf be assigned as the DSNE.

 NOTE 3:

It may take 6 minutes or more for the network to stabilize after the DSNE has been discontinued.

If the DSNE is being discontinued and another DDM-2000 OC-3 shelf is going to be designated as the DSNE, use the "**set-ne:TID=tid:dsne=yes**" command to establish the DSNE on another DDM-2000 OC-3 shelf. Use the "**set-ne:TID=tid:dsne=no**" command to disable the DSNE at the shelf being removed.

If the DSNE is being discontinued and a FT-2000 node is going to be designated as the DSNE, use the "**SECURITY-Set-Network Element-DSNE:yes**" command at the FT-2000 to designate the DSNE, Use the "**set-ne:TID=tid:dsne=no**" command to disable the DSNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7.  **CAUTION:**
Removal of wrong fiber connections will result in a service interruption. Ensure you remove only the fiber connections for the optical span being discontinued.

 **NOTE:**
The following operations will activate office alarms. The audible alarm may be suppressed by depressing the **ACO** button.

Remove optical fiber connections from **MAIN OLIUs** in node (shelf) being discontinued.

-
8. Reconnect the optical fibers, bypassing the node just removed. Ensure all alarms in the ring configuration are off. If alarms are present, verify fiber connections and integrity.

-
9. If the removed shelf is not to be left powered, power down the shelf per local procedures then continue with Step 12. Otherwise, continue with Step 10.

-
10. If **OLIU** circuit packs are *not* removed, connect optical fiber loops to **OLIUs**.
-

DLP-505

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **NOTE:**

The **UPD/INIT** pushbutton on the **SYSCCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen to operate it.

If any circuit packs were removed, momentarily depress the **UPD/INIT** button on the **SYSCCTL** or use the "**upd**" command to update the DDM-2000 internal equipment list.

12. **NOTE 1:**

When a shelf is removed from a DDM-2000 network and one of the DDM-2000 nodes is designated as a DSNE, the "**dlt-tadmap:tid=tid**" command must be used to delete the TID of the removed shelf from the directory services data base used for routing messages over the DCC. This prevents that TID from appearing in "**rtrv-map-network**" and "**rtrv-map-neighbor**" reports and will retire the "communication failure" alarms at all shelves in the network.

 NOTE 2:

The "**dlt-tadmap:tid=tid**" command is valid only at the DDM-2000 DSNE. The "**rtrv-map-network**" command may be used to determine which shelf is the DSNE.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

If the DSNE is other than a DDM-2000 shelf, the DSNE will automatically delete the node(s) from its inventory. Wait at least 6 minutes for alarms to settle.

Wait at least one minute, then at the DDM-2000 DSNE, use the "**dlt-tadrmap:tid=tid**" command to delete the TID of the removed shelf from the directory services data base, if required.

13. Verify that all alarms go off.

Add New HDSL Service Group Already In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a new HDSL port or **HDSL** circuit pack is being added to a **LOW SPEED GROUP** that is already in service and corresponding to a **FUNCTION UNITS** group that is equipped with **MXRVO** circuit packs at the DS1 terminating end(s). It also assumes that **STS1E** circuit packs have been installed if the other terminating end is an EC-1 interface. If proper circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new group (**MXRVO** or **STS1E**).

 **NOTE 2:**
A maximum of three **BBF8 HDSL** circuit packs, including a protection circuit pack, can be installed in any one **LOW SPEED GROUP**. Both service and protection **MXRVO** circuit packs must also be installed in the corresponding **FUNCTION UNITS** group.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

If the DDM-2000 fails to respond in the indicated manner, refer to
Trouble Clearing: IXL-001.

Determine which HDSL ports/slots are to be put into
service and what options are to be selected.

-
2. Verify that no LEDs or alarms are activated. If any LEDs
or alarms are activated, refer to **Trouble Clearing:**
IXL-001 and follow the appropriate trouble-clearing
procedure.

-
3.  **CAUTION:**
*No service **LOW SPEED DS1** slot locations should be left empty in
GROUPs equipped with protection **HDSL** circuit packs and
corresponding to **FUNCTION UNITS** groups equipped with **MXRVO**
circuit packs.*

If a new **HDSL** circuit pack is being installed, remove
177A Retainer Card from DS1 slot being equipped, then
set option switches and install new **HDSL** circuit pack.

DLP-567

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. At each HDSL terminating node, use the "**set -t1:**" command to set the characteristics of the DS1 port being established, if not already performed.

-
5. At each HDSL terminating node, make the appropriate cable connection(s) to the cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.

-
6. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

-
7.  **NOTE 1:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted ("**cnvt -crs**") to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt -crs**", "**dlt -crs-sts1**", "**dlt -crs-vt1**", "**ent -crs-sts1**", "**ent -crs-vt1**", "**rtrv -crs-sts1**", and "**rtrv -crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. Make necessary VT1.5/STS1 cross-connections for each node in the network.

A. Single Ring Configuration	DLP-546
B. Dual Ring Interworking (DRI) Configuration	DLP-550
C. Single/Dual OC-3/FiberReach Configuration	DLP-557
D. Stand Alone OC-3/FiberReach Configuration	DLP-558
E. Single/Dual OC-3/OC-48 Configuration	DLP-559
F. Single/Dual OC-3/OC-12 Configuration	DLP-560

9.  **NOTE:**

For a DS1 circuit in a path protected ring network, the "**sw-path-vt1: address**" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active VT1.5 (DS1) path to repeat this test on the other path.

Perform DS1 end-to-end transmission test for each circuit being put into service.

A. Single Ring Configuration	DLP-510
B. Dual Ring Interworking (DRI) Configuration	DLP-554
C. OC-3/FiberReach Configuration	DLP-510

10. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS1 port(s) of the circuit being established.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t1:**" command to set the port state of the DS1 port(s) of the circuit being established.

12. Use PairGain^{*} Technologies procedures to access the faceplate RS-232 interface and set HDSL link management features for each port being provisioned.
-

* Trademark pending.

Upgrade DDM-2000 OC-3 Point-to-Point Network to Path Switched Ring In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION 1:**
*This procedure requires **22-Type OLIU** circuit packs in all shelves. If existing **OLIUs** will be replaced in this procedure [DLP-542], you must determine if the **22-Type OLIUs** will support the existing span length. For example, **22F/22F-U/22F2-U OLIU** circuit packs will not support span lengths as long as **21G/21G-U/21G2-U OLIU** circuit packs will support. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.*

-  **CAUTION 2:**
This procedure requires an optical splitter and fiber couplers to connect the splitter to the optical line. This procedure has been tested using a Gould fiber splitter which introduces 3 dB of loss into the fiber span. The amount of loss may differ for the type of splitter used and must be considered when doing an upgrade. If there is not enough excess loss budget in the optical spans between the CO and first RT to allow the use of a splitter and fiber couplers, the upgrade may be performed out of service. Optical fiber switches which introduce no loss may also be used, but require extra steps in the upgrade procedure which are not documented. Fiber splitters and/or switches are available from manufacturers such as Gould, Fibercell, Corning, DiCon, ADC, and others.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

 **CAUTION 3:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and the optical line connections are going to be changed to a ring configuration. It also assumes that Release 8 is initially installed in each shelf to support **22-Type OLIUs**. Release 9 or later software is required for the final ring configuration.

 **NOTE 2:**
All shelves in the same network must have the same or compatible software releases.

 **NOTE 3:**
You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the **rtrv-alm:** command to verify that no alarms, locks, loops, or switches are present.

-
2. Notify maintenance center that alarms will be generated.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3.  **NOTE:**
The Network Side/User Side parameters of the **set-fecom:**
command must be set opposite at each end of the optical spans.

Use the **rtrv-fecom/set-fecom** command to
verify/set "Network Side/User Side" parameters at each
end of optical span being established.

-
4. Verify software in each DDM-2000 shelf is Release 8 or
later which supports **22-Type OLIUs**.

-
5.  **NOTE:**
Mixing of **21-Type OLIUs** and **22-Type OLIUs** in one shelf is not
allowed in ring software.

Replace **OLIUs** in each shelf with proper **22-Type
OLIUs**, if not already done. (Protection **OLIUs** are
required.)

DLP-542

-
6. **All** shelves in the network being upgraded must have the
cross-connect mode set to manual. Use the
rtrv-ne/set-ne command to verify/set the cross-
connect mode (**set-ne:tid=tid:crs>manual**).
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE 1:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

 NOTE 2:

If STS-1 cross-connections exist presently and VT1.5 cross-connections will be required, conversion of STS-1 cross-connections to VT1.5 cross-connections must be performed before ring software is loaded into the system.

If required, at all shelves in the network, use the **cnvt -crs: address1, address2** command to convert all low-speed DS1 STS-1 cross-connections to corresponding VT1.5 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. Use **rtrv-sync:** command to check timing mode and parameters for proper provisioning. If necessary, use **set-sync:** command to change timing provisioning to that specified on the work order.

-
9.  **CAUTION:**
***TIMING** slot 2 should always be equipped with a **TGS** circuit pack and be active prior to software download. To clear a "C" condition from the **SYSCTL FE ID** display, procedures will require removal of the **TGS** circuit pack from **TIMING** slot 1 to force the system to run the new software. See Table A.*

Before performing this procedure, ensure that both **TGS** circuit packs are installed in the shelf, then use the **switch-sync:s=circuitpack,pri>manual** command to switch to the protection **TGS** circuit pack in **TIMING** slot 2 if not already **ACTIVE**. Use **rtrv-sync:** command to verify that the **TGS** circuit pack in **TIMING** slot 2 is **ACTIVE**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. At Node 1 and Node 2, use the **switch-line:main:pri=manual** command to switch to the protection line. Use the **rtrv-state-eqpt:main-all** command to check switch state (main-2 OLIU active). (See Figure 1.)
 11. Use **set-fecom:dcc-m:com=disabled** command to disable far-end communications (fecom) at Node 1.
-

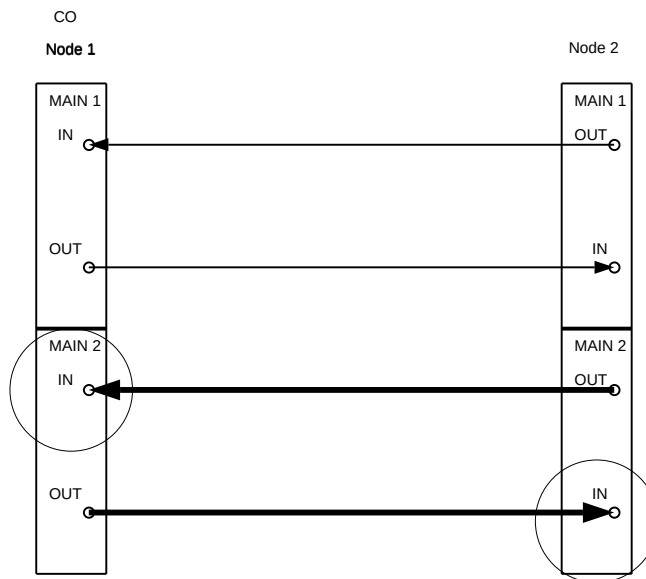


Figure 1. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. At Node 1, install optical splitter in optical line between Node 1 **MAIN 1 OUT** and Node 2 **MAIN 1 IN** as shown in Figure 2.
-

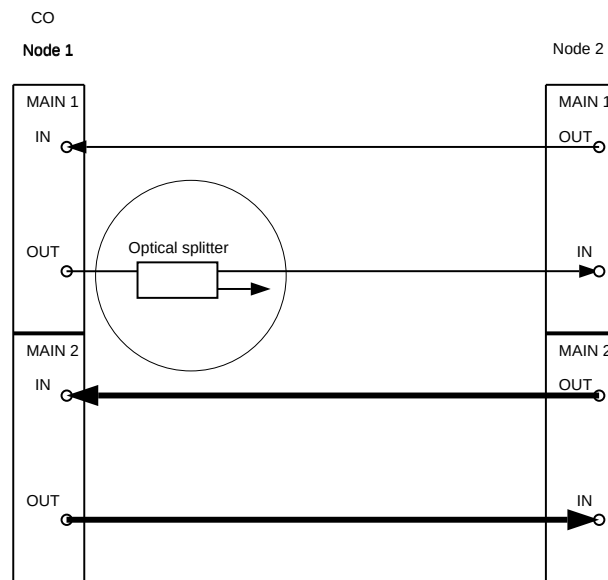


Figure 2. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the
switch-line:main:pri=manual command to switch
to the service (MAIN 1) line (main-1 OLIU active-
rx). (See Figure 3.)

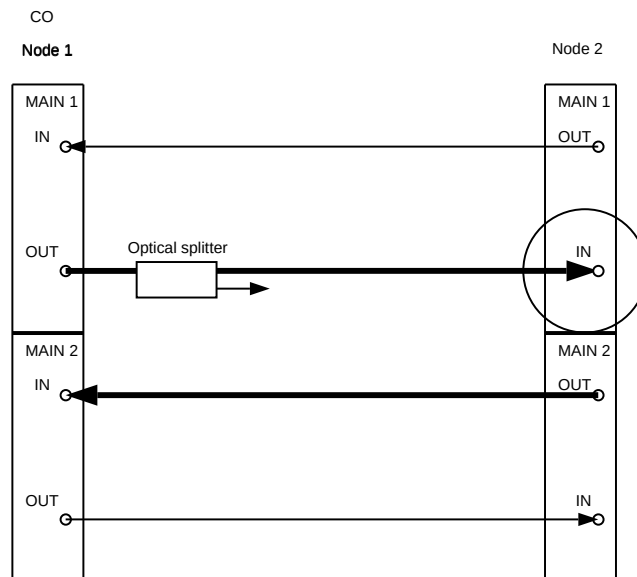


Figure 3. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. At Node 1, remove optical fiber from **OLIU MAIN 2(P)**
OUT and connect it to the other output of the optical
splitter. (See Figure 4.)
-

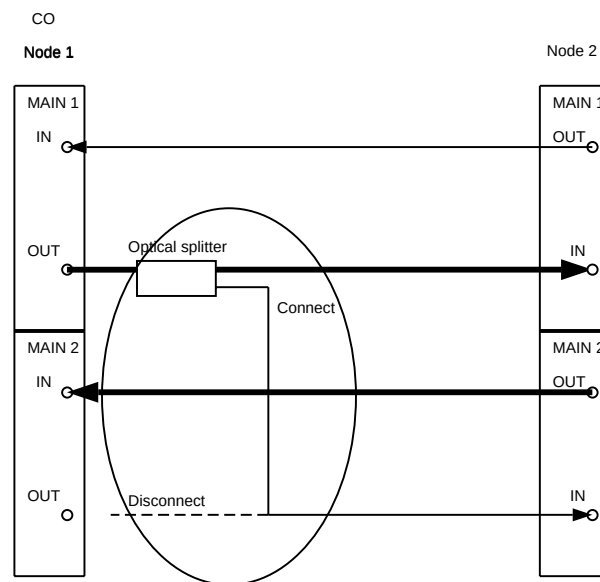


Figure 4. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the
switch-line:main:pri=manual command to switch
service to the protection line (main-2 OLIU active-
rx at Node 2). (See Figure 5.)

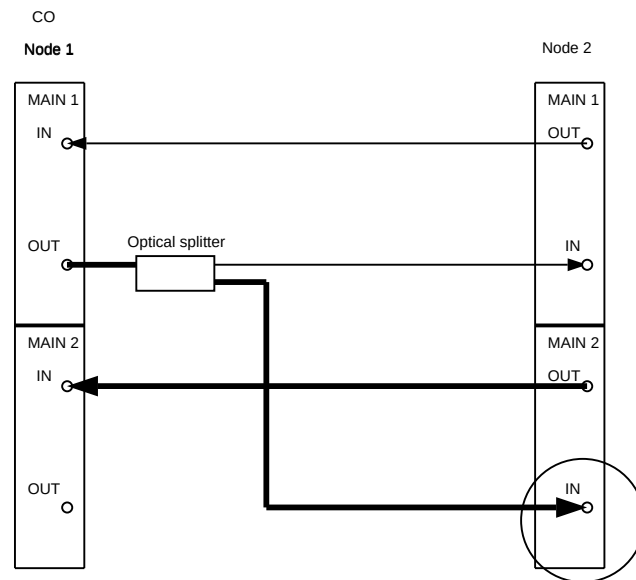


Figure 5. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16. Disconnect the fiber from the optical splitter output going to Node 2 **MAIN 1 IN**. Connect the fiber from Node 2 **MAIN 1 IN** to Node 1 **MAIN 2(P) OUT**. (See Figure 6.)
-

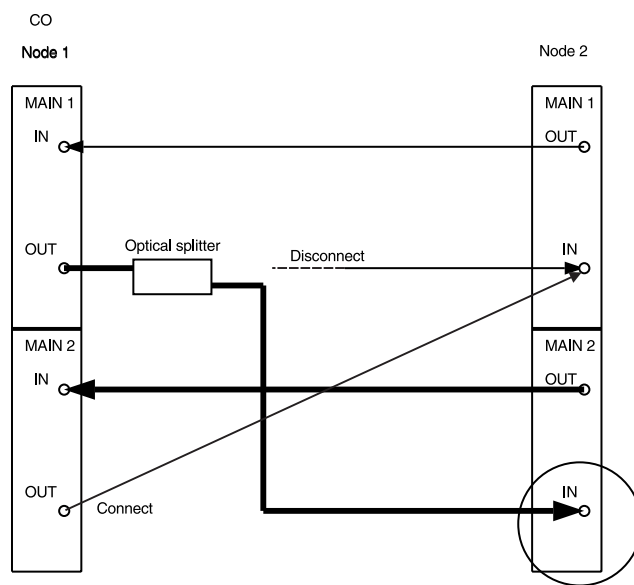


Figure 6. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the
switch-line:main:pri>manual command to switch
service to the service line (main-1 OLIU active-rx
at Node 2). (See Figure 7.)

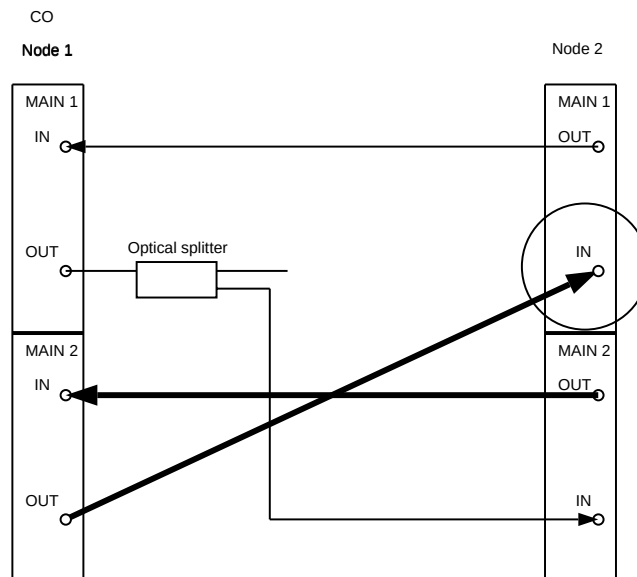


Figure 7. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

18. Remove optical splitter from Node 1 **MAIN 1 OUT** and Node 2 **MAIN 2(P) IN**. Connect optical fiber from Node 1 **MAIN 1 OUT** to Node 2 **MAIN 2(P) IN**. (See Figure 8.)
-

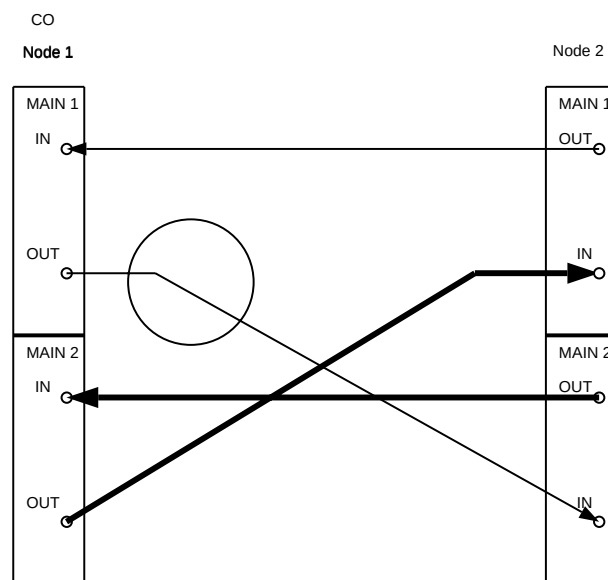


Figure 8. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

19. At Node 1, install optical splitter in optical line between Node 1 **MAIN 1 IN** and Node 2 **MAIN 1 OUT** as shown in Figure 9.
-

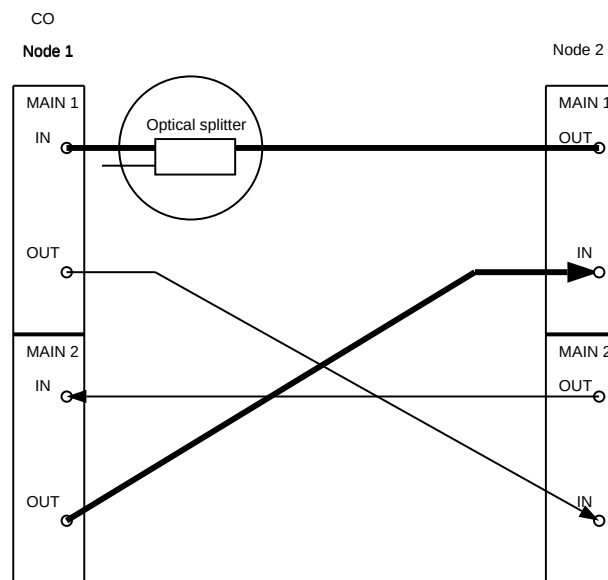


Figure 9. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20.  **NOTE:**
Wait until **FAULT LED** on **MAIN OLIU** extinguishes before attempting switch.

At Node 1 only, use the
switch-line:main:pri=manual command to switch
service to the service line (main-1 OLIU active-rx
at Node 1). (See Figure 10.)

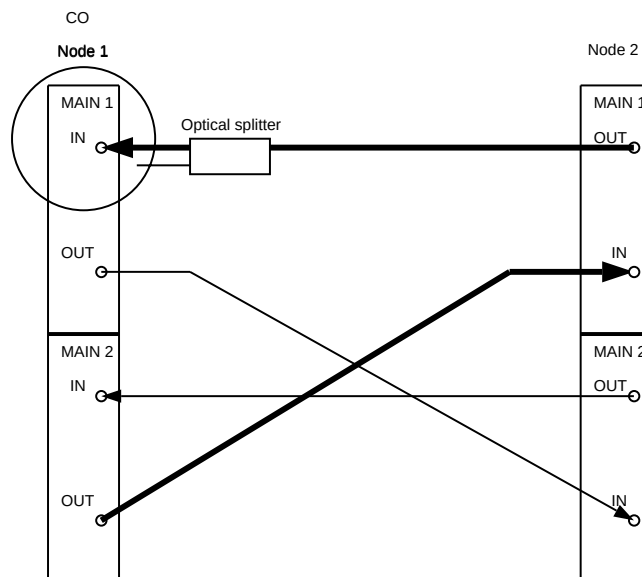


Figure 10. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

21. Disconnect optical fiber from Node 1 **MAIN 2(P) IN** and connect remaining optical splitter output to **MAIN 2(P) IN**.
(See Figure 11.)
-

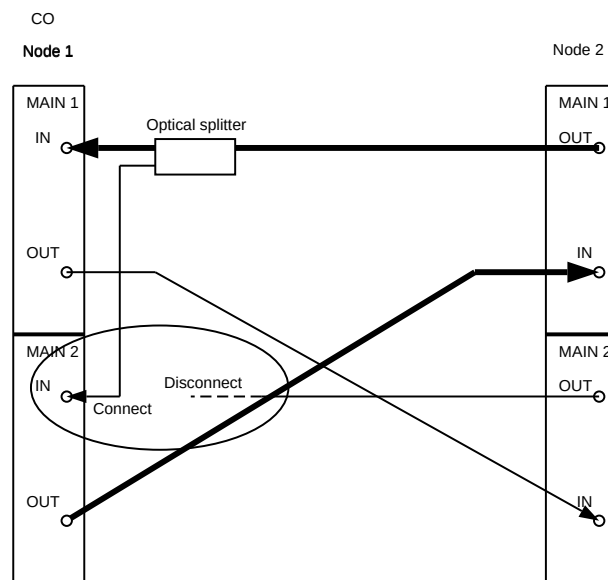


Figure 11. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

22.  **NOTE:**
Wait until **FAULT LED** on **MAIN OLIU** extinguishes before attempting switch.

At Node 1, use the **switch-line:main:pri=manual** command to switch service to the protection line (main-2 OLIU active-rx at Node 1). (See Figure 12.)

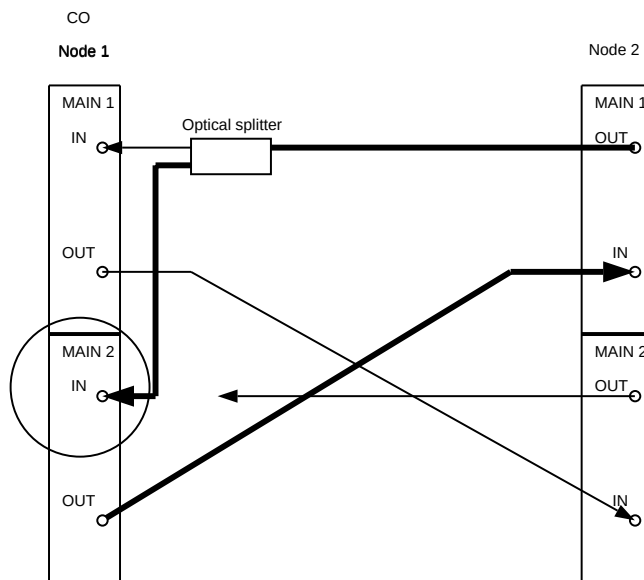


Figure 12. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

23. At Node 1, remove optical splitter output from **MAIN 1 IN** and connect optical fiber from Node 2 **MAIN 2(P) OUT** to Node 1 **MAIN 1 IN**. (See Figure 13.)
-

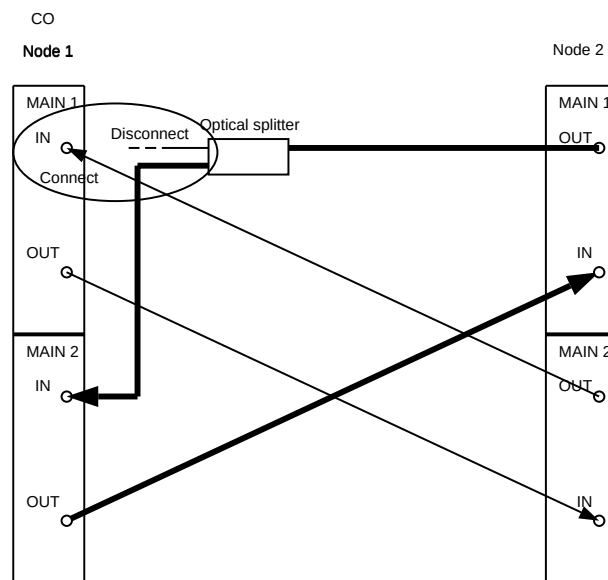


Figure 13. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

24.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 1, use the **switch-line:main:pri=manual** command to switch service to the service line (main-1 OLIU active-rx) at Node 1. (See Figure 14.)

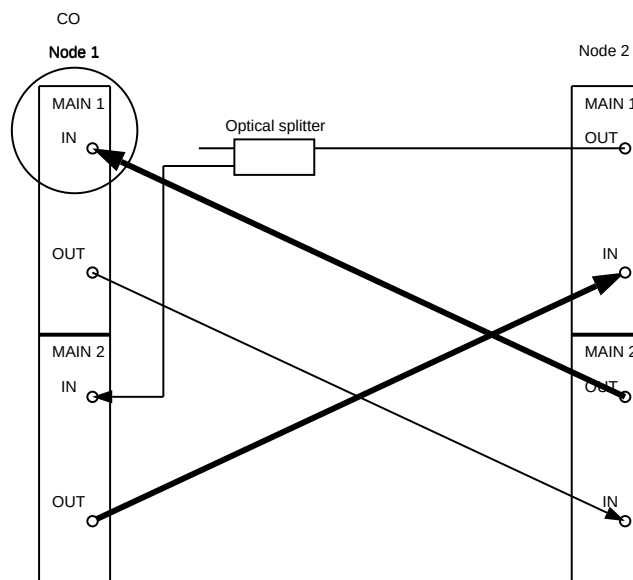


Figure 14. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

25. Remove optical splitter from Node 1 **MAIN 2(P) IN** and Node 2 **MAIN 1 OUT**. Connect optical fiber from Node 2 **MAIN 1 OUT** to Node 1 **MAIN 2(P) IN**. (See Figure 15.)
-

26. ➡ **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2, use the **switch-line:main:pri>manual** command to switch service to the protection line (main-2 OLIU active) at Node 2. (See Figure 15.)

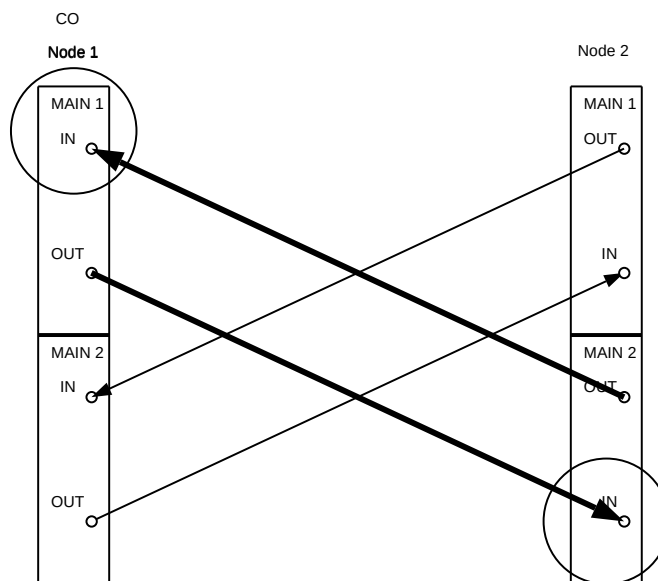


Figure 15. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

27. Upgrade both nodes (shelves) with Release 9 or later software. (Software upgrades must be made locally at each shelf.) **DLP-532**

28. Reinstall **TGS** circuit pack into **TIMING** slot **1**.

29. Use **set-fecom:dcc-all:com=enabled** command at both ends to enable far-end communications (fecom).

30.  **NOTE 1:**
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ **NOTE 2:**

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate ONE shelf as the DSNE. Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

31. ⇒ **NOTE 1:**

If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

⇒ **NOTE 2:**

The **rtrv-oc3:** command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

32.  **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.
-  **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed nodes.
-  **NOTE 3:**
The **rtrv-sync:** command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled any any line-timed node. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

-
33. The ring configuration is now complete and new nodes may be added as required [**NTP-026**].
-

Upgrade DDM-2000 OC-3 Point-to-Point to Path Switched Ring Out of Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION 1:**
*This procedure requires **22-Type OLIU** circuit packs in all shelves. If existing **OLIUs** will be replaced in this procedure, you must determine if the **22-Type OLIUs** will support the existing span length. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.*

 **CAUTION 2:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure requires that the system be taken out of service long enough to change **OLIU** optical fiber connections to the ring configuration. It is assumed that Release 8 software is initially installed in each shelf to support **22-Type OLIUs**. It is assumed that Release 9 or later software is required for the final ring configuration.

 **NOTE 2:**
All shelves in the same network must have the same software release.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

You may also contact Lucent Technologies to provide an in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the **rtrv-alm:** command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.
-

3. ⇒ **NOTE:**

The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4.	Verify software in each DDM-2000 shelf is Release 8 that supports 22-Type OLIUs , if not already performed.	DLP-532
-

5.	Replace OLIUs in each shelf with 22-Type OLIUs , if not already done. (Protection OLIUs are required.)	DLP-542
-

6.	At each shelf, use set-ne:tid=tid:crs>manual command to set cross-connect mode to manual.	
-

7. **NOTE 1:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 2:

If STS-1 cross-connections exist presently and VT1.5 cross-connections will be required, conversion of STS-1 cross-connections to VT1.5 cross-connections must be performed before ring software is loaded into the system.

If required, at all shelves in the network, use the **cnvt -crs: address1, address2** command to convert all low-speed DS1 STS-1 cross-connections to corresponding VT1.5 cross-connections.

-
8. Use **rtrv-sync:** command to check timing mode and parameters for proper provisioning. If necessary, use **set-sync:** command to change timing provisioning.

-
9. Use **set-fecom:dcc-m:com=disabled** command to disable far-end communications (fecom) at the near end shelf.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10.  **CAUTION:**
*Transmission configuration information for in service systems is stored on the **TGS** circuit pack in **TIMING** slot **1**. In some instances (for example, during system tests or while performing this upgrade), if the version of software being installed is not compatible with the current transmission configuration, it will be necessary to remove the **TGS** circuit pack in **TIMING** slot **1** in order to force the system to run the software you are trying to download. If both **TGS** circuit packs are not installed, removal of the only **TGS** circuit pack will cause service interruption.*

Ensure both **TGS** circuit packs are installed. Then, use the **switch-sync:s=circuitpack,pri>manual** command to switch to the protection **TGS** circuit pack, if not already **ACTIVE**. Use **rtrv-sync:** command to verify that the **TGS** circuit pack in **TIMING** slot **2** is **ACTIVE**. Unplug the **TGS** circuit pack in **TIMING** slot **1**.

-
11.  **CAUTION:**
This step will interrupt service until the optical lines have been properly reconnected. Notify maintenance center and other required personnel that service will be interrupted.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE:**
In the ring configuration, optical fibers from **MAIN 1** at one node connect to **MAIN 2(P)** at the adjacent node.

At Node 1, remove and reconnect the optical fibers as shown in Figure 1.

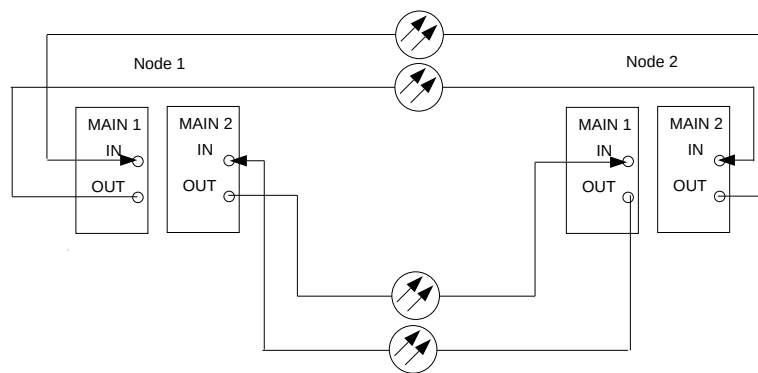


Figure 1. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

12. Upgrade both nodes (shelves) with Release 9 or later software. (Software upgrades must be made locally at each shelf.)

DLP-532

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate ONE shelf as the DSNE, if required. Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. Use **set-fecom:dcc-all:com=enabled** command at both ends to enable far-end communications (fecom).
-

15. ➤ **NOTE 1:**
If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

- **NOTE 2:**
The **rtrv-oc3:** command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16.  **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.
-  **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed nodes.
-  **NOTE 3:**
The **rtrv-sync:** command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed node. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

-
17. The ring configuration is now complete and new nodes may be added as required [**NTP-026**].
-

Equip DDM-2000 EC-1 Electrical Multiplexer Shelf Looped-Back

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that all hardwired installation and testing of the unequipped DDM-2000 shelf has been done. It also assumes that power is applied to the shelf (**PWR ON** LED lighted on User Panel).

 **NOTE 2:**
Many of the circuit packs have numerous option switches which must be set before they are installed.

Check -48 V DC office battery, if required. **DLP-524**

-
2. Install **BBG9 OHCTL** circuit pack. **DLP-500**

-
3. Install **BBG8/BBG8B SYSCTL** circuit pack. **DLP-549**
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

As additional circuit packs are installed, office alarms may be activated, accompanied by flashing **FAULT** LEDs on some of the circuit packs. This is a normal condition at this stage of the procedure. You can momentarily depress the **ACO/TST** button to retire office alarms.

 NOTE 2:

To avoid timing alarms before the end-to-end system has been established, the **TGS** option switches must be *temporarily* set to *free running* if DS1 external timing is specified but the DS1 timing reference is not yet available. When the DS1 external timing references become available or when the end-to-end system is established, the timing mode must be changed to the specified timing mode. If external timing is the specified timing mode and external timing is available to the shelf, the timing mode may be set for external timing.

Install **TGS** timing circuit packs.

DLP-503

-
5. Install **BBG6 STS1E** circuit packs (as required) with option switches set for high speed.

DLP-502

-
6. At the cross-connect point or backplane connectors [**J38-J39** (Group A), **J40-J41** (Group B), **J42-J43** (Group C)], loop back the EC-1 signal associated with **FUNCTION UNITS** slots equipped with **STS1E** circuit packs.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. Use "**set-ec1**" command to set the characteristics of the EC-1 port(s).

8. **NOTE 1:**

Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

 NOTE 2:

177A Retainer Cards must be installed in all empty **LOW SPEED** DS1 slots in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **STS1E** circuit packs.

Install service and protection **DS1/DS1PM** circuit packs, as required.

DLP-508

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9.  **CAUTION:**
*The command "**init-sys:all**" may affect service. It should never be used on an in-service system. It should only be used after a shelf has been equipped to reset all provisionable parameters and cross-connections to their default values.*

If a CIT is available, use the "**init-sys:all**" command to initialize all provisionable parameters to their original default values.

-
10. Perform an LED test. **DLP-509**
-

11.  **NOTE:**
This procedure assumes that the DDM-2000 high speed signals are looped back (as required) at the backplane coaxial connectors (**J38-J39, J40-J41, J42-J43**) or at a cross-connect point.

Perform automatic local (looped back) transmission test. **DLP-528**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. **NOTE:**

This procedure assumes that the DDM-2000 has been connected to the low-speed DSX-1 cross-connection as required.

Perform automatic local wiring cross-connect test (looped back).

DLP-529

13. Check office alarm interface as required.

DLP-516

14. Check telemetry interface as required.

- A. Parallel telemetry
- B. Serial telemetry

DLP-517

DLP-518

15. Test protection switching function, if required.

DLP-519

16. **NOTE:**

A craft interface terminal (CIT) is required to access the optional features of the DDM-2000, such as security, date and time, logins, etc.

Activate optional features as required.

DLP-512

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17. This shelf is now equipped to provide DS1 service through an EC-1 high speed electrical interface.

18. When the EC-1 electrical interface is required, remove the required EC-1 loopback, make appropriate cable connections to the coaxial connectors, and set the required **TGS** timing options [**DLP-513**].

Add New STS1E High Speed Group for DS1 Service EC-1 Electrical Multiplexer Shelf System In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.***

 **NOTE 1:**
This procedure assumes that the DDM-2000 is equipped as a DDM-2000 EC-1 electrical multiplexer shelf. It is also assumed that the shelf is in service and that a new **FUNCTION UNITS** group is being equipped with **STS1E** circuit packs for DS1 service. If the group is already equipped with **STS1E** circuit packs, refer to **Circuit Order: NTP-006.**

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

-
3.  **NOTE:**
If the **LOW SPEED GROUP** is to be equipped with any **BBF3/BBF3B DS1PM** circuit packs, both service and protection **STS1E** circuit packs must be installed.

Install **STS1E** circuit packs (high speed mode) into proper slots of **FUNCTION UNITS** group (**A, B, or C**) being equipped.

DLP-502

-
4. Use the "**set-ec1**" command to set the characteristics of the EC-1 port.

-
5.  **NOTE:**
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Option and install required service **DS1/DS1PM** circuit packs. **DLP-508**

6.  **NOTE:**
If **BBF3/BBF3B DS1PM** circuit packs are installed and DS1 protection is required, a **BBF3/BBF3B DS1PM** circuit pack must be installed in the protection slot.

Install protection **DS1/DS1PM** circuit pack into slot **8(P)** of the **LOW SPEED GROUP** being put into service, if required. **DLP-508**

7. Use the "**set - t1**" command to set the characteristics of the DS1 ports.
-

8.  **CAUTION:**
*No service DS1 **LOW SPEED** slots should be left empty in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **STS1E** circuit packs.*

-  **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Install **177A** Retainer Cards into all unequipped service DS1 slots in **LOW SPEED GROUPS** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **STS1E** circuit packs.

9. Make the appropriate connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.
 10. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.
 11. Make EC-1 coaxial connections to proper backplane connectors [**J38-J39** (Group A), **J40-J41** (Group B), **J42-J43** (Group C)].
 12. If **BBF3/BBF3B DS1PM** circuit packs are installed and the optional *ds1pm* performance monitoring feature is used, use the "**set-feat:feat=ds1pm,act=enable**" command to enable the feature.
 13. After terminating end is established, perform an end-to-end DS1 transmission test for each DS1 circuit being put into service (optional).
-

DLP-510

Discontinue STS1E High Speed Group EC-1 Electrical Multiplexer Shelf

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION 1:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **CAUTION 2:**
*When a **DS1** is switched to protection, removal of any other **DS1** circuit pack or **177A** Retainer Card in the same group will result in a loss of service to the protected **DS1** and the removed **DS1** circuit pack.*

-  **NOTE:**
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the **set-t1:address:ais=no** command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine which DS1 group is to be discontinued and verify no alarms exist on the system.

2.  **NOTE:**
The following operation may activate the office major or minor alarm.
The audible alarm may be suppressed by depressing the **ACO** button.

At the DSX-1, remove the DS1 signals associated with the group(s) being discontinued. (**FAULT** LEDs begin flashing on **DS1** circuit pack with signals removed.)

3.  **NOTE:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen to operate it.

On the **SYSCTL**, momentarily depress the **UPD/INIT** button to update the equipment list. (**FAULT** LEDs go off.)

4. Remove **DS1/DS1PM** circuit packs, if required.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5. Remove the group **STS1E** circuit packs, if required.

6. If circuit packs are removed, momentarily depress the
UPD/INIT button on the **SYSCTL** to update the
DDM-2000 internal equipment list.

7. Verify all alarms are off.

Establish Initial Low Speed EC-1 Interface Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
The end-to-end network must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves, and to establish the end-to-end network.

 **NOTE 2:**
This procedure assumes that **STS1E** circuit packs, optioned for low speed, have been installed during the initial shelf turnup at the EC-1 terminating end(s) of the circuit. The other terminating end(s) may be equipped with **DS3**, **STS1E**, or **MXRVO** and **DS1/DS1PM** circuit packs. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the new groups.

 **NOTE 3:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

At the EC-1 terminating (drop) node(s), determine which **STS1E** circuit pack is to be put into service and what options are to be selected.

2. **NOTE:**

The "**rtrv-eqpt:**" command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the "**rtrv-eqpt:**" command format.

Use the "**rtrv-eqpt:**" command to obtain the "Equipage and Version Report" and verify that the service and protection (if required) **STS1E** circuit packs have been installed in proper **FUNCTION UNITS** group (**A**, **B**, or **C**) being put into service.

3. **NOTE:**

The "**rtrv-ec1:**" command retrieves the "EC1 Port Provisioning Report". This report lists information about each EC-1 port. This information includes attributes set by the "**set-ec1:**" command and parameters set by switches on the circuit pack. See the "Commands and Reports" section of this manual for a description of the "**rtrv-ec1:**" command format.

Use the "**rtrv-ec1:**" command to obtain the "EC1 Port Provisioning Report" and verify the hardware and software option settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4.  **NOTE:**
DS1/DS1PM circuit packs *cannot* be installed in a shelf **LOW SPEED GROUP** corresponding to a **FUNCTION UNITS** group equipped with **STS1E** circuit packs optioned for LOW SPEED mode.

Verify/set line build out (LBO) option jumpers on **STS1E** **DLP-513**
circuit pack(s), as required.

5.  **NOTE:**
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** circuit pack after the **STS1E** circuit pack is reinstalled.

If necessary, set the **STS1E** circuit pack option switch to **DLP-513**
LOW SPEED and reinstall the **STS1E** circuit pack(s).

6. Use the "**set -ec1:**" command to set the characteristics of the EC-1 port at the EC-1 terminating node(s) of the circuit being established.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. Make the appropriate backplane cable connection(s) [J38-J39 (FUNCTION UNITS A), J40-J41 (FUNCTION UNITS B), or J42-J43 (FUNCTION UNITS C)] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.
-

8. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.
-

9. If both terminating nodes are equipped with **STS1E** circuit packs to terminate the EC-1, continue with Step 10. Otherwise, refer to **System Turnup/Circuit Order: IXL-001** for procedures to establish initial end-to-end DS1/DS3 service.
-

10.  **NOTE 1:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs>manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ **NOTE 2:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ **NOTE 3:**

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**" and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or office records.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

11. Make necessary VT1.5/STS-1 cross-connections for each node.
- | | |
|---|----------------|
| A. Linear or Add/Drop Configuration | DLP-545 |
| B. Single Ring Configuration | DLP-546 |
| C. Dual Ring Interworking (DRI) Configuration | DLP-550 |
| D. Single/Dual OC-3/FiberReach Configuration | DLP-557 |
| E. Stand Alone OC-3/FiberReach Configuration | DLP-558 |
| F. Single/Dual OC-3/OC-48 Configuration | DLP-559 |
| G. Single/Dual OC-3/OC-12 Configuration | DLP-560 |
-
12. Perform the appropriate end-to-end transmission test for circuit(s) being put into service. For a circuit in a path-protected single OC-3 ring network, use the "**sw-path- () :address**" command at both terminating nodes to switch the active path and repeat this test on the other path.
- | | |
|-----------------------------|----------------|
| A. DS1 Single Ring Test | DLP-510 |
| B. DS1 Dual Ring (DRI) Test | DLP-554 |
| C. DS3 Single Ring Test | DLP-511 |
| D. DS3 Dual Ring (DRI) Test | DLP-553 |
-
13. Use the "**rtrv-state-eqpt**" command to determine the port state of the EC-1 port of the circuit being established.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. **NOTE:**

If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-ec1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-ec1:**" command to set the port state of the EC-1 port of the circuit being established.

Add New STS1E Low Speed Group for EC-1 Interface System In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a new group is being equipped with **STS1E** circuit packs for an EC-1 interface.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

At the EC-1 terminating end(s), determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

2. Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. Verify no **DS1/DS1PM** circuit packs are installed in **LOW SPEED GROUP** slots associated with new **STS1E FUNCTION UNITS** group being added.

-
4. Set line build out (LBO) option jumpers and LOW SPEED mode, then install **STS1E** circuit packs into proper slots of **FUNCTION UNITS** group (**A, B, or C**) being equipped. **DLP-502**
-

5. Use the "**set -ec1:**" command to set the characteristics of the EC-1 port.

-
6. Make the appropriate backplane cable connection(s) [**J38-J39 (FUNCTION UNITS A)**, **J40-J41 (FUNCTION UNITS B)**, or **J42-J43 (FUNCTION UNITS C)**] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.
-

7. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.

-
8. If both terminating nodes are equipped with **STS1E** circuit packs to terminate the EC-1, continue with Step 9. Otherwise, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add DS1/DS3 service.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **NOTE 1:**

Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs=manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

 NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ NOTE 3:

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or office records.

-
10. Make necessary VT1.5/STS1 cross-connections for each node.

A. Linear or Add/Drop Configuration	DLP-545
B. Single Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/FiberReach Configuration	DLP-557
E. Stand Alone OC-3/FiberReach Configuration	DLP-558
F. Single/Dual OC-3/OC-48 Configuration	DLP-559
G. Single/Dual OC-3/OC-12 Configuration	DLP-560

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. Perform the appropriate end-to-end transmission test for circuit being put into service. For a circuit in a path protected ring network, use the "**sw-path- () : address**" command at both terminating nodes to switch the active path and repeat this test on the other path.

A. DS1 Single Ring Test	DLP-510
B. DS1 Dual Ring (DRI) Test	DLP-554
C. DS3 Single Ring Test	DLP-511
D. DS3 Dual Ring (DRI) Test	DLP-553
E. DS1 Single/Dual Homing Test	DLP-510
F. DS3 Single/Dual Homing Test	DLP-511

-
12. Use the "**rtrv-state-ecpt**" command to determine the port state of the EC-1 port(s) of the circuit being established.

-
13.  **NOTE:**
If a port is in the *nmon (n)* state, the signal is not monitored or alarmed. The port will not automatically go to the *in service (i)* state when a signal is detected as it will in the *auto (a)* state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-ec1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-ec1:**" command to set the port state of the EC-1 port(s) of the circuit being established.

Discontinue EC-1 Interface

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE:**
This procedure assumes that **STS1E** circuit packs are installed at one terminating node in the circuit and either **STS1E**, **DS3**, or **MXRVO** circuit packs are installed at the other terminating node(s) of the circuit. It further assumes that the EC-1 interface is being discontinued, not just an individual DS1. If DS1/DS3 service is being discontinued, see **System Turnup/Circuit Order: IXL-001** for procedures to discontinue DS1/DS3 service.

At the EC-1 terminating node, determine which EC-1 port is to be discontinued, verify service has been removed, and verify no alarms exist on the system.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. **NOTE:**

The following operation may activate the office major or minor alarm.
The audible alarm may be suppressed by depressing the **ACO** button.

At the EC-1 cable cross-connect panel at the terminating nodes, remove the EC-1 signal(s) associated with the port(s) being discontinued. (**FAULT** LEDs begin flashing on **STS1E** circuit pack with signals removed.)

3. **NOTE:**

The **UPD/INIT** pushbutton on the **SYSC TL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

At the terminating nodes, momentarily depress the **UPD/INIT** button on the **SYSC TL** circuit pack or use the "**upd**" command to update the equipment list. (Flashing **FAULT** LEDs go off.)

-
4. If a craft interface terminal (CIT) is available, use the "**rtrv-state-eqpt**" command to verify that the right port has been changed from *in-service* (i) to *auto* (a) state at the terminating nodes.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5. **NOTE:**

If the other terminating node for the EC-1 interface is equipped with **DS3** circuit packs, then STS1 cross-connections will be present. If the other terminating node(s) for the EC-1 interface is equipped with **DS1** circuit packs, then either STS1 or VT1.5 cross-connections will be present. The "**rtrv-crs-sts1:**" command retrieves the "STS-1 Cross Connect Report". The "**rtrv-crs-vt1:**" command retrieves the "VT1 Cross Connect Report".

From the work order or "**rtrv-crs-()**" command, determine the cross-connections for circuit being discontinued. Use the "**rtrv-crs-()**" command at each node in the network to obtain the "STS-1 or VT1 Cross Connect Report".

6. **CAUTION:**

Deleting wrong cross-connections may interrupt service.

 NOTE 1:

STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. Remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the non-terminating nodes. A Critical or Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 2:

The following commands may be used to delete, enter, and retrieve VT1.5 cross-connections: "**dlt-crs-vt1**", "**ent-crs-vt1**", and "**rtrv-crs-vt1**". The following commands may be used to delete, enter, and retrieve STS-1 cross-connections: "**dlt-crs-sts1**", "**ent-crs-sts1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connections.

Use the "**dlt-crs-vt1:**" or "**dlt-crs-sts1:**" command to delete the terminating node cross-connections for all service being removed, if required.

-
7. Use the "**dlt-crs-vt1:**" or "**dlt-crs-sts1:**" command to delete the pass-through cross-connections at each non-terminating node for all service being discontinued, if required.

-
8. If **STS1E** circuit packs are at the other terminating node, remove the service and protection **STS1E** circuit packs, if required.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. Use the "**rtrv-state-eqpt**" command to determine the port state of the EC-1 port(s) of the circuit being established.

-
10.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-ec1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-ec1:**" command to set the port state of the EC-1 port(s) of the circuit being established.

-
11. If the other terminating node(s) is equipped with **DS1/DS1PM** or **DS3** circuit packs, discontinue the DS1/DS3 service at those nodes as required.

- A. Discontinue DS1 Service.
B. Discontinue DS3 Service.

NTP-011
NTP-012

-
12. Verify all alarms are off.
-

Discontinue End-to-End HDSL Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.***

Determine which HDSL ports are to be discontinued and verify no alarms exist on the system.

-
2.  **NOTE:**
The following operation may activate the office major, minor, or no alarm. The audible alarm may be suppressed by depressing the **ACO** button.

At the cross-connect point for the HDSL terminating nodes, remove the HDSL signals associated with the port(s) being discontinued. (**FAULT** LEDs begin flashing on **HDSL** circuit pack with signals removed.)

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. **NOTE:**

The **UPD/INIT** pushbutton on the **SYCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

Momentarily depress the **UPD/INIT** button on the **SYCTL** at the HDSL terminating nodes or use the "**upd**" command to update the equipment list. (Flashing **FAULT** LEDs go off.)

-
4. Use the "**rtrv-state-eqpt**" command to verify that the right port has been changed from *in-service* (i) to *auto* (a) state.
-

5. **CAUTION:**

*Removing the wrong cross-connection may cause service interruption. Use the "**rtrv-crs- ()**" command to determine the proper cross-connections.*

From work order or "**rtrv-crs- ()**" command, determine the DS1 (VT1.5) cross-connections for circuit being discontinued.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. ➤ **NOTE 1:**

DS1 **LOW SPEED** slots cannot be unequipped without an alarm until all port cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In a ring configuration, remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the intermediate nodes. A Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

➤ **NOTE 2:**

In ring configurations, the following rules are used in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 3:

The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-vt1**", "**dlt-crs-sts1**", "**ent-crs-vt1**", "**ent-crs-sts1**", "**rtrv-crs-vt1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connections.

Use the "**dlt-crs-vt1**:" command to delete the terminating (drop) node cross-connections for all HDSL service being removed, if required.

-
7. Use the "**dlt-crs-vt1**:" command to delete the pass-through cross-connections at each nonterminating node for all DS1/HDSL service being removed, if required.

-
8. If both HDSL ports on the **HDSL** circuit pack are being discontinued, you may remove the **HDSL** circuit pack, if required.

-
9. If *all* **HDSL** circuit packs in a **LOW SPEED GROUP** are removed, you may remove the **FUNCTION UNITS** group **MXRVO** circuit packs and the protection **HDSL** circuit pack, if required.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. If group **MXRVO/STS1E** circuit packs are removed, proceed to Step 12. Otherwise, continue with Step 11.

-
11.  **CAUTION:**
*No service DS1 **LOW SPEED** slots should be left empty in **GROUPs** equipped with protection **HDSL** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** or **STS1E** (high speed mode) circuit packs.*

-  **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Card(s), as required, into the DS1 slot(s) for the **HDSL** circuit pack(s) removed.

-
12.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

If circuit packs have been removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the "**upd**" command to update the DDM-2000 internal equipment list.

If circuit packs have *not* been removed, use the "**set-state-t1:**" command to set the port state of the DS1 port(s) to *auto* or *nmon*, as required.

13. Verify all alarms are off.

Convert DS1 Group Service to EC-1 Group Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a DS1 group is being changed to an EC-1 group to provide an EC-1 interface.

 **NOTE 2:**
If, at any point in this procedure, the DDM-2000 fails to respond in the indicated manner, you should refer to **Trouble Clearing: IXL-001**.

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being converted.

-
2. Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. At the DSX-1, remove the DS1 signals associated with the DS1 **LOW SPEED GROUP** being converted. (**FAULT** LED flashes on **DS1/DS1PM** circuit packs with signals removed.)

-
4.  **NOTE:**
The **UPD/INIT** pushbutton on the **SYSCCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen, to operate it.

On the **SYSCCTL**, momentarily depress the **UPD/INIT** button. (**FAULT** LEDs go off.)

-
5.  **NOTE:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs>manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

From work order or "**rtrv-crs-()**" command, determine the cross-connections for circuit being discontinued.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6.  **CAUTION:**
*Removing the wrong cross-connection may cause service interruption.
Use the "rtrv-crs-()" command to determine the proper
cross-connections.*

 **NOTE 1:**
DS1 **LOW SPEED** slots cannot be unequipped without an alarm until all port cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In a ring configuration, remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the intermediate nodes. A Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

 **NOTE 2:**
The following commands may be used to convert, delete, enter, and retrieve cross-connections: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Use the "**dlt-crs-sts1:**" or "**dlt-crs-vt1:**"
command to delete cross-connections associated with all
DS1/DS1PM circuit packs being removed.

7. Remove the **DS1/DS1PM** circuit packs from **LOW SPEED GROUP** being converted to EC-1 service.
-

8. Remove the **MXRVO** circuit packs from **FUNCTION UNITS** group being converted to EC-1 service.
-

9. Momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.
-

10. Verify that all alarms are off.
-

11. Set the **S1** switch on the **STS1E** circuit pack to LOW-SPEED operating mode ("**I or III**" position). **DLP-513**
-

12.  **NOTE:**
DS1/DS1PM circuit packs **cannot** be installed in a **LOW SPEED GROUP** corresponding to a **FUNCTION UNITS** group that is equipped with **STS1E** circuit packs.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Set line build out (LBO) option jumpers and install **STS1E** **DLP-513**
circuit packs into **FUNCTION UNITS** group (**A**, **B**, or **C**)
being put into service.

13. Use the "**set -ec1:**" command to set the characteristics
of the EC-1 port.
-

14. Make appropriate backplane cable connections(s)
[**J38-J39 (FUNCTION UNITS A)**, **J40-J41 (FUNCTION**
UNITS B), or **J42-J43 (FUNCTION UNITS C)**] to the
EC-1 cross-connect point or equivalent connection point
for the channel being added.
-

15. Verify that no LEDs or alarms are activated. If any LEDs
or alarms are activated, refer to **Trouble Clearing:**
IXL-001 and follow the appropriate trouble-clearing
procedure.
-

16. If both terminating nodes are equipped with **STS1E**
circuit packs to terminate the EC-1, continue with Step
17. Otherwise, refer to **System Turnup/Circuit Order:**
IXL-001 for procedures to add DS1/DS3 service.
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

17. Determine the necessary cross-connections for each node from the work order or office records.

-
18. Make necessary VT1.5/STS1 cross-connections for each node.

A. Linear or Add/Drop Configuration	DLP-545
B. Single Ring Configuration	DLP-546
C. Dual Ring Interworking (DRI) Configuration	DLP-550
D. Single/Dual OC-3/FiberReach Configuration	DLP-557
E. Stand Alone OC-3/FiberReach Configuration	DLP-558
F. Single/Dual OC-3/OC-48 Configuration	DLP-559
G. Single/Dual OC-3/OC-12 Configuration	DLP-560

-
19. Perform the appropriate end-to-end transmission test for circuit being put into service. For a circuit in a path protected ring network, use the "sw-path- () : address" command at both terminating nodes to switch the active path and repeat this test on the other path.

A. DS1 Single Ring Test	DLP-510
B. DS1 Dual Ring (DRI) Test	DLP-554
C. DS3 Single Ring Test	DLP-511
D. DS3 Dual Ring (DRI) Test	DLP-553

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. Use the "**rtrv-state-ecpt**" command to determine the port state of the EC-1 port(s) of the circuit being established.

-
21.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-ec1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-ec1:**" command to set the port state of the EC-1 port(s) of the circuit being established.

Upgrade DDM-2000 OC-3 Add/Drop Network to Path Switched Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION 1:**
*Three STS-1 channels or 84 VT1.5 channels is the maximum capacity for an OC-3 ring. Before this upgrade is performed, you should verify that there is enough capacity in the ring to carry **ALL CO sourced** channels plus **ALL added** channels coming into the network at any RT.*

-  **CAUTION 2:**
*Ring configurations support 84 timeslots within the ring. A timeslot used for one signal (VT1.5/STS-1) cannot be reused at another location. Before upgrading from a linear system to a ring system, verify that no duplicate timeslot assignments exist. For example in Figure 1, page 7, if timeslot **m-1-1-1** is dropped at Node 2, verify that the same timeslot is not dropped at another node. If duplicates exist, [for example, if timeslot **m-1-1-1** is dropped at Node 2; **m-1-1-2** is cross-connected to **c-1-1-1** (instead of **c-1-1-2**) at Node 2; and then **m-1-1-1** is dropped at Node 3, then you have duplicate (**m-1-1-1**) timeslot assignments] you must rearrange your timeslot assignments to accommodate the new ring configuration.*

-  **CAUTION 3:**
*This procedure requires **22-Type OLIU** circuit packs in all shelves. If existing **OLIUs** will be replaced in this procedure [**DLP-542**], you must determine if the **22-Type OLIUs** will support the existing span length. For example, **22F/22F-U/22F2-U OLIU** circuit packs will not support span lengths as long as **21G/21G-U/21G2-U OLIU** circuit packs will support. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.*

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO



CAUTION 4:

This procedure has been tested using a Gould fiber splitter which introduces 3 dB of loss into the fiber span. The amount of loss may differ for the type of splitter used and must be considered when doing an upgrade. If there is not enough excess loss budget in the optical spans between the CO and first RT to allow the use of a splitter, the upgrade may be performed out of service. Optical fiber switches which introduce no loss may also be used, but require extra steps in the upgrade procedure which are not documented. Fiber splitters and/or switches are available from manufacturers such as Gould, Fibercell, Corning, DiCon, ADC, and others.



CAUTION 5:

Plans, patch facilities, and loss budget calculations must be available for the fiber line to be connected between the CO and the "last" RT to form the ring network.



CAUTION 6:

*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*



NOTE 1:

This procedure assumes that the DDM-2000 is in service and the optical line connections are going to be changed to a ring configuration. It is also assumed that Release 8 linear software is initially installed in each shelf. Release 9 or later ring software is required for the final ring configuration.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

⇒ **NOTE 2:**

All shelves in the same network must have the same or compatible software releases.

⇒ **NOTE 3:**

You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

⇒ **NOTE 4:**

This procedure is completed in a series of node upgrades beginning at the near end (Node 1 CO), then going to the last RT Node (RTn) and sequentially upgrading each DDM-2000 to a ring until you get back to the near end Node 1. The first steps of this procedure performed between Node 1 (CO) and Node 2 (the first RT) use an optical splitter to convert the two nodes into a ring configuration. This part of the procedure is similar to a point-to-point to ring upgrade.

Use the "**rtrv-alm:**" command to verify that no alarms, locks, loops, or switches are present.

-
2. Notify maintenance center that alarms will be generated.
-

3. ⇒ **NOTE:**

The Network Side/User Side parameters of the "**set-fecom:**" command must be set opposite at each end of the optical spans.

Use the "**rtrv-fecom/set-fecom**" command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. Verify software in each DDM-2000 shelf is Release 8 or earlier linear software that supports **22-Type OLIUs**

-
5.  **NOTE:**
Mixing of **21-Type OLIUs** and **22-Type OLIUs** in one shelf is not allowed in ring software.

Replace **OLIUs** in each shelf with proper **22-Type OLIUs**, if not already done. (Protection **OLIUs** are required.)

DLP-542

-
6. At **all** shelves in the network being upgraded, use "**set-ne:tid=tid:crs>manual**" command to set cross-connect mode to manual.

-
7.  **NOTE:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Linear releases support default cross-connections and manual cross-connections if the shelf is set to manual using the "**set-ne:crs>manual**" command. In ring releases or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

If required, at all shelves in the network, use the "cnvt-crs:address1,address2" command to convert all low-speed DS1 STS-1 cross-connections to corresponding VT1.5 cross-connections.

8. Use "rtrv-sync:" command to check timing mode and parameters for proper provisioning. If necessary, use "set-sync:" command to change timing provisioning to that specified on the work order.
-

9.  **CAUTION:**
*Transmission configuration information for in service systems is stored on the **TGS** circuit pack in **TIMING** slot 1. In some instances (for example, during system tests or while performing this upgrade), if the version of software being installed is not compatible with the current transmission configuration, it will be necessary to remove the **TGS** circuit pack in **TIMING** slot 1 in order to force the system to run the software you are trying to download. If both **TGS** circuit packs are not installed, removal of the only **TGS** circuit pack will cause service interruption.*

Ensure both **TGS** circuit packs are installed. Then, use the "switch-sync:s=circuitpack,pri>manual" command to switch to the protection **TGS** circuit pack, if not already **ACTIVE**. Use "rtrv-sync:" command to verify that the **TGS** circuit pack in **TIMING** slot 2 is **ACTIVE**. Unplug **TGS** circuit pack in **TIMING** slot 1.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **⇒ NOTE:**

This procedure uses an example configuration as shown in Figure 1. Your configuration may differ, but the procedures are the same for any drop or add/drop configuration. "Add" traffic is defined in relation to a "head-end" node. A head-end node is determined for the network and should be the node that terminates the most traffic. In this procedure, the head-end node is Node 1 (CO) and other nodes are designated as Node 4 [last RT, (RT_n)], Node 3 [next-to-last RT, (RT_n-1)], and Node 2 (RT_n-2). All traffic that does not terminate at the CO is referred to as "Add" traffic. "Drop" traffic is defined as traffic that terminates at the CO. See Figure 1.

This procedure will convert the first two nodes (Node 1 and Node 2) to a ring, then the last (Node 4) and first (Node 1) nodes, and then continue to work back through the network from last node to first.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

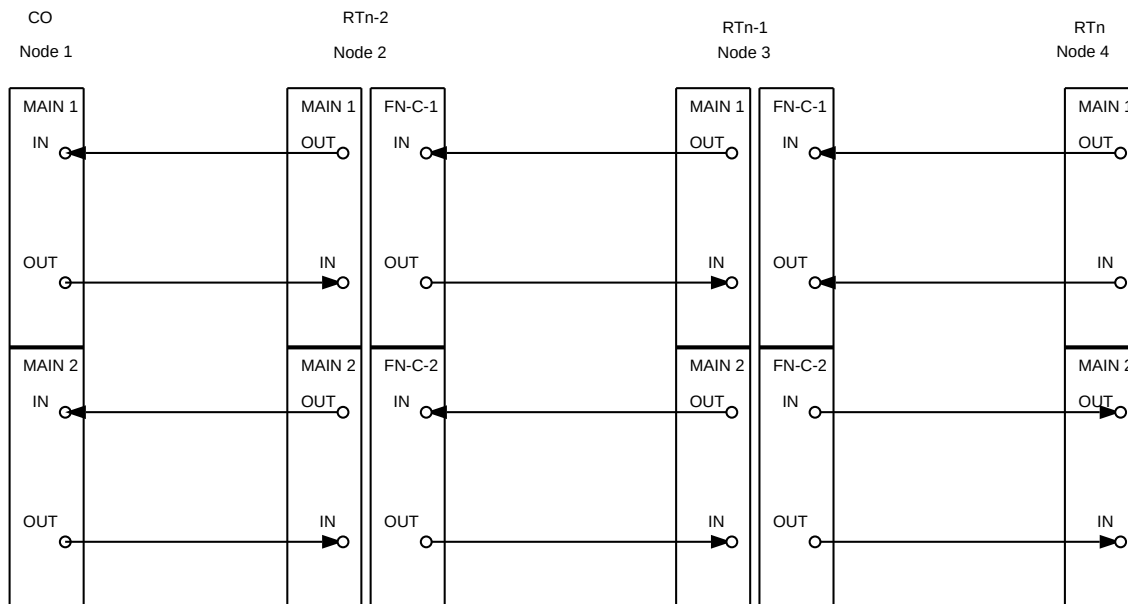
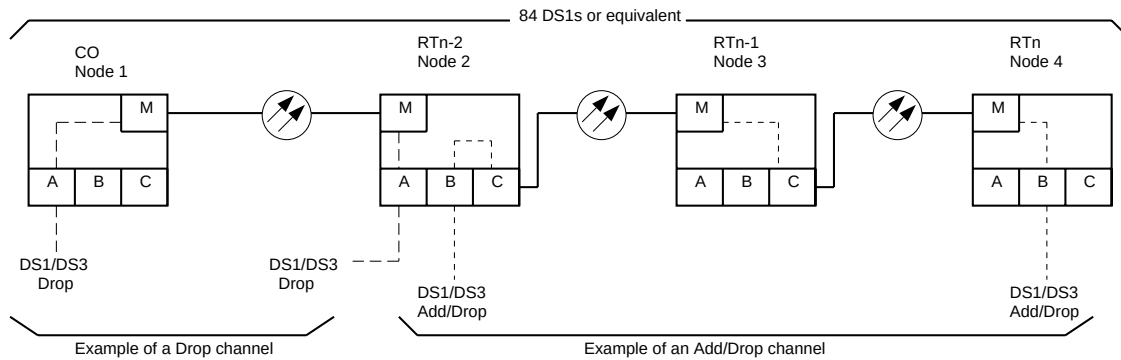


Figure 1. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **⇒ NOTE:**
Steps 11 through 26 are performed between the CO (Node 1) and the first RT (Node 2). An optical splitter is used to convert the optical span to a ring configuration.

At Node 1 and Node 2, use the
"switch-line:main:pri>manual" command to switch to the protection line. Use the
"rtrv-state-eqpt:main-all" command to check switch state (main-2 OLIU active). (See Figure 2.)

12. Use **"set-fecom:dcc-m:com=disabled"** command to disable far-end communications (fecom) at Node 1.
-

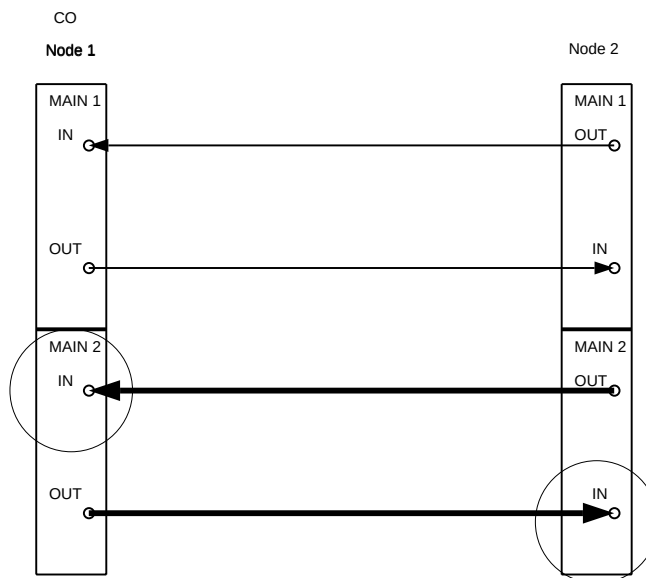


Figure 2. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. At Node 1, install optical splitter in **MAIN 1 OUT** optical line as shown in Figure 3.
-

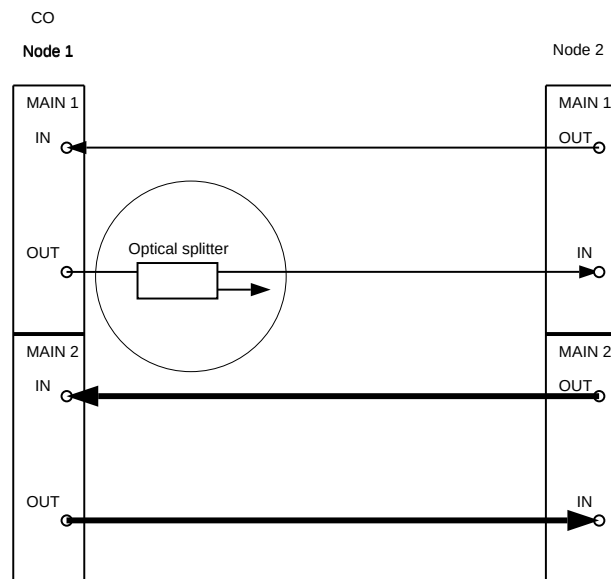


Figure 3. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the
"switch-line:main:pri>manual" command to
switch to the service (**MAIN 1**) line (main-1 OLIU
active). (See Figure 4.)

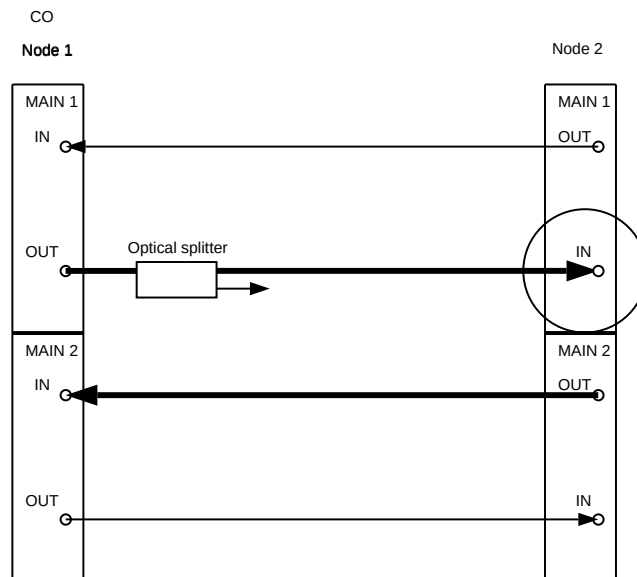


Figure 4. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15. At Node 1, remove optical fiber from **OLIU MAIN 2(P)**
OUT and connect it to the other output of the optical
splitter. (See Figure 5.)
-

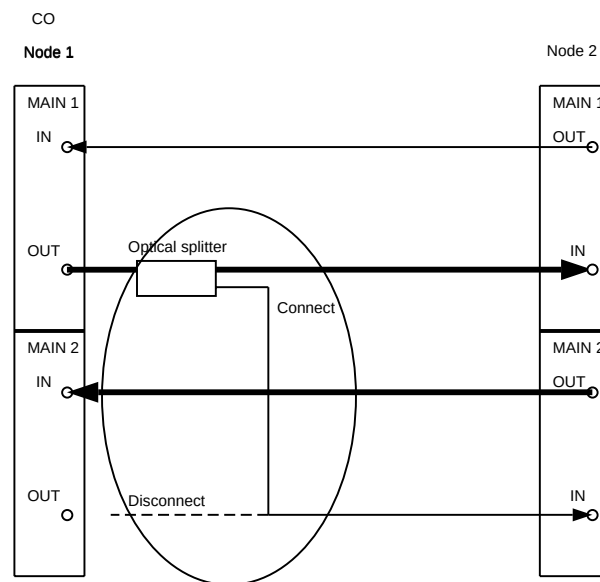


Figure 5. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the
"switch-line:main:pri>manual" command to
switch service to the protection line (main-2 OLIU
active at Node 2). (See Figure 6.)

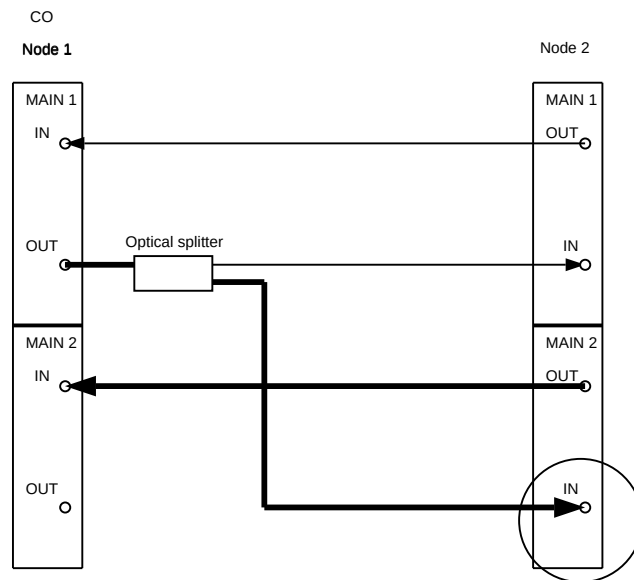


Figure 6. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17. Disconnect the optical splitter output from the fiber going to Node 2 **MAIN 1 IN** and connect the fiber to Node 1 **MAIN 2(P) OUT**. (See Figure 7.)
-

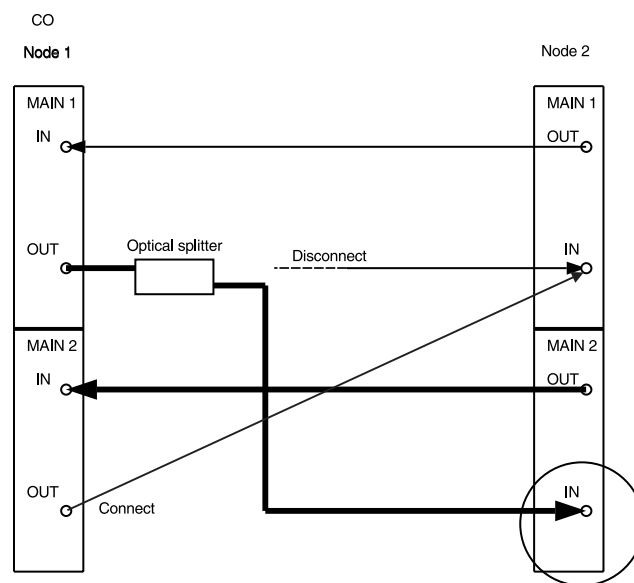


Figure 7. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

18.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the
"switch-line:main:pri>manual" command to
switch service to the service line (main-1 OLIU
active at Node 2). (See Figure 8.)

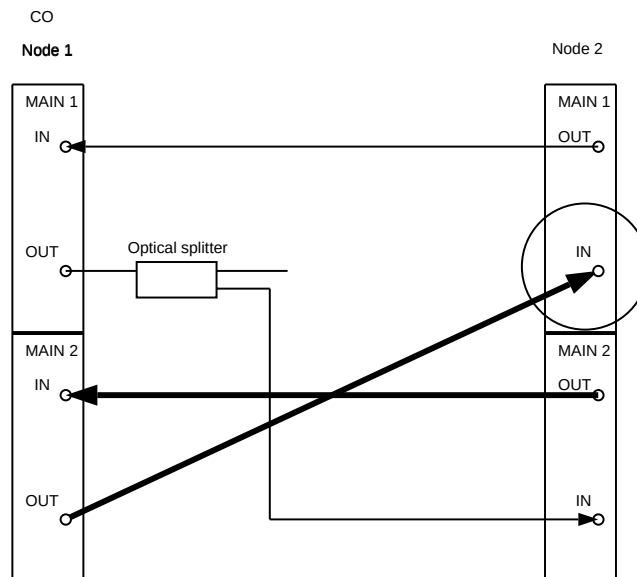


Figure 8. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

19. At Node 1, remove optical splitter from **MAIN 1 OUT**.
Connect optical fiber from Node 1 **MAIN 1 OUT** to Node
2 **MAIN 2(P) IN**. (See Figure 9.)
-

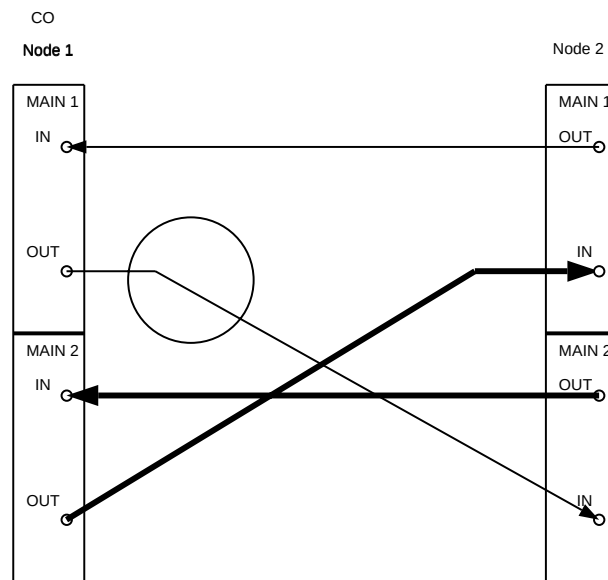


Figure 9. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. Disconnect optical fiber from **MAIN 1 IN** at Node 1 and install optical splitter in **MAIN 1 IN** optical line as shown in Figure 10.
-

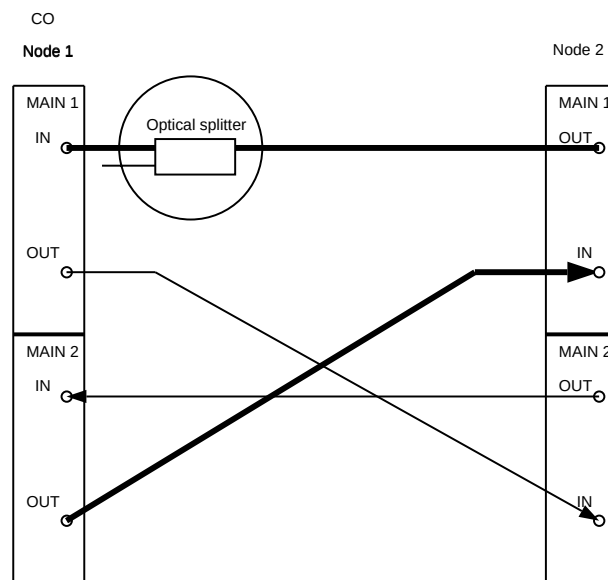


Figure 10. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

21.  **NOTE:**
Wait until **FAULT LED** on **MAIN OLIU** extinguishes before attempting switch.

At Node 1 only, use the
"switch-line:main:pri>manual" command to
switch service to the service line (main-1 OLIU
active at Node 1). (See Figure 11.)

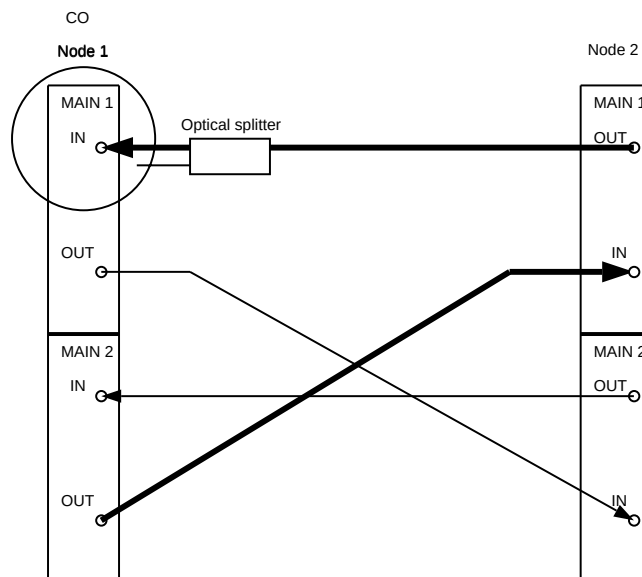


Figure 11. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

22. Disconnect optical fiber from Node 1 **MAIN 2(P) IN** and connect remaining optical splitter output to **MAIN 2(P) IN**.
(See Figure 12.)
-

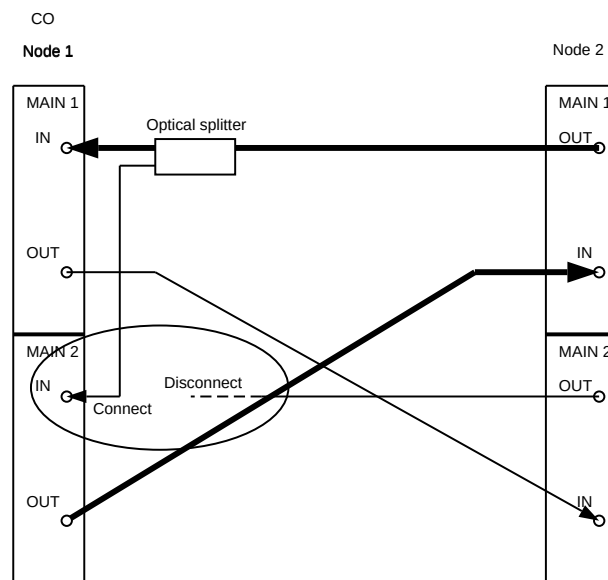


Figure 12. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

23.  **NOTE:**
Wait until **FAULT LED** on **MAIN OLIU** extinguishes before attempting switch.

At Node 1, use the
"switch-line:main:pri>manual" command to
switch service to the protection line (main-2 OLIU
active at Node 1). (See Figure 13.)

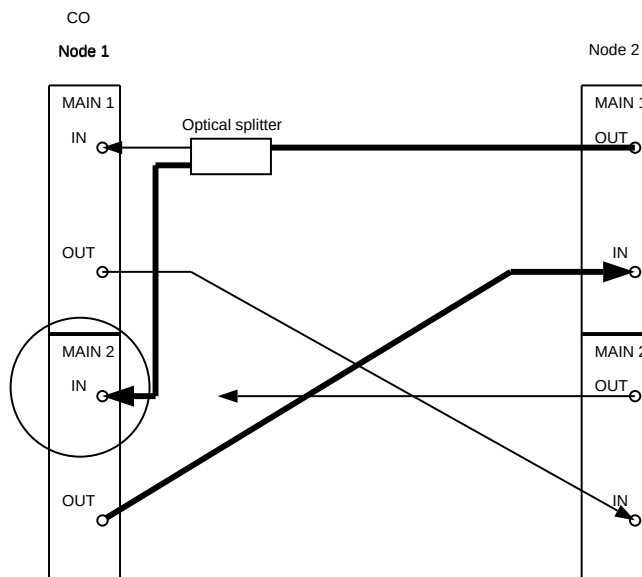


Figure 13. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

24. At Node 1, remove optical splitter output from **MAIN 1 IN** and connect optical fiber from Node 2 **MAIN 2(P) OUT** to Node 1 **MAIN 1 IN**. (See Figure 14.)
-

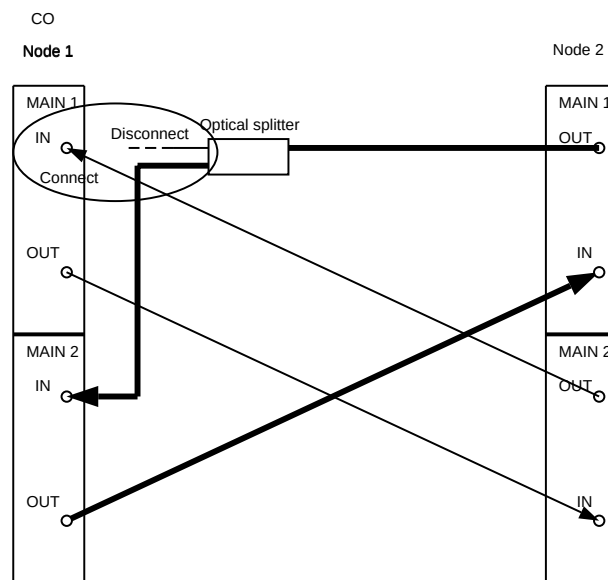


Figure 14. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

25.  **NOTE:**
Wait until **FAULT LED** on **MAIN OLIU** extinguishes
before attempting switch.

At Node 1, use the "**switch-
line:main:pri>manual**" command to switch service
to the service line (main-1 OLIU active) at Node 1.
(See Figure 15.)

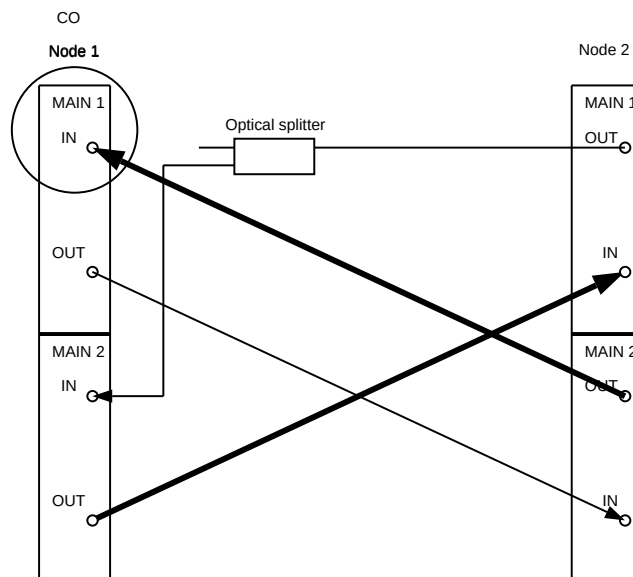


Figure 15. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

26. At Node 1, remove optical splitter from **MAIN 2(P) IN**.
Connect optical fiber from Node 2 **MAIN 1 OUT** to Node
1 **MAIN 2(P) IN**. (See Figure 16.)
-

27.  **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting
switch.

At Node 2, use the "**switch-
line:main:pri>manual**" command to switch service
to the protection line (main-2 OLIU active) at Node
2. (See Figure 16.)

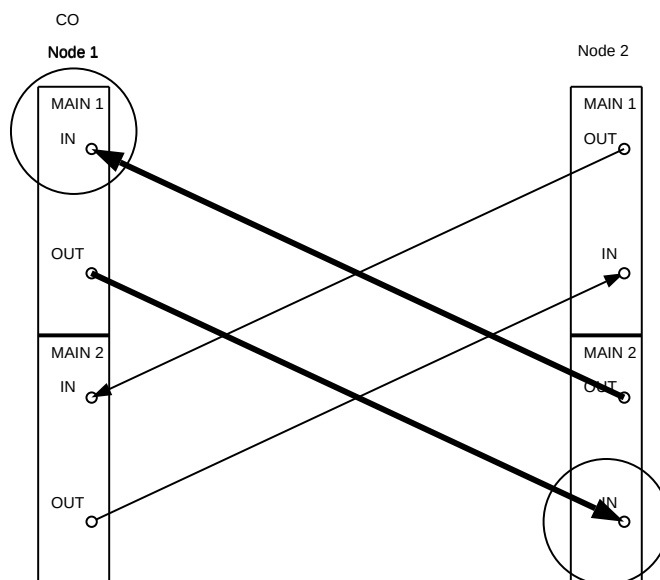


Figure 16. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

28. The example 4-node configuration now looks like that shown in Figure 17. Steps completed between the last RT and next to last RT are repeated as each span is converted to a ring configuration.
-

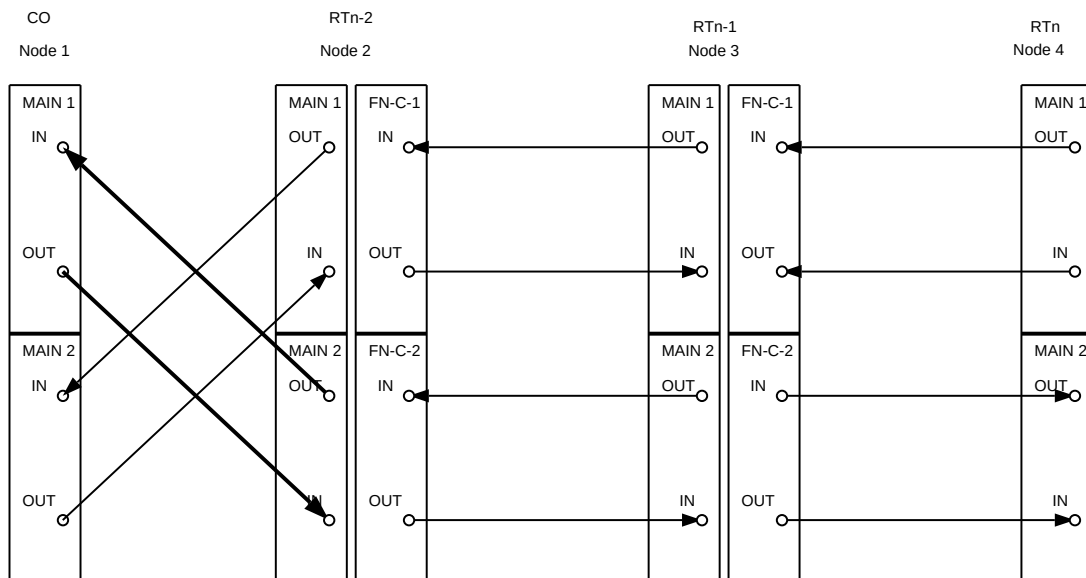


Figure 17. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

29. At Node 1 (CO) and Node 2, disconnect fiber from **MAIN 2(P) OUT** at the CO and **MAIN 1 IN** at Node 2. Disconnect fiber from **MAIN 2(P) IN** at the CO and **MAIN 1 OUT** at Node 2. (See Figure 18.)
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

30. At the next-to-last Node (Node 3), use the **"switch-line:fn-c:pri>manual"** command to switch service to the protection line (fn-c-2 OLIU active at Node 3). At the last Node (Node 4), use the **"switch-line:main:pri>manual"** command to switch service to the protection line (main-2 OLIU active at Node 4). (See Figure 18.)
-
31. At the last Node (Node 4) and next-to-last Node (Node 3), disconnect optical fiber from **MAIN 1 OUT** at Node 4 and **FUNCTION UNITS C 1 IN** at Node 3. Disconnect fiber from **MAIN 1 IN** at the Node 4 and **FUNCTION UNITS C 1 OUT** at Node 3. (See Figure 18.)
-

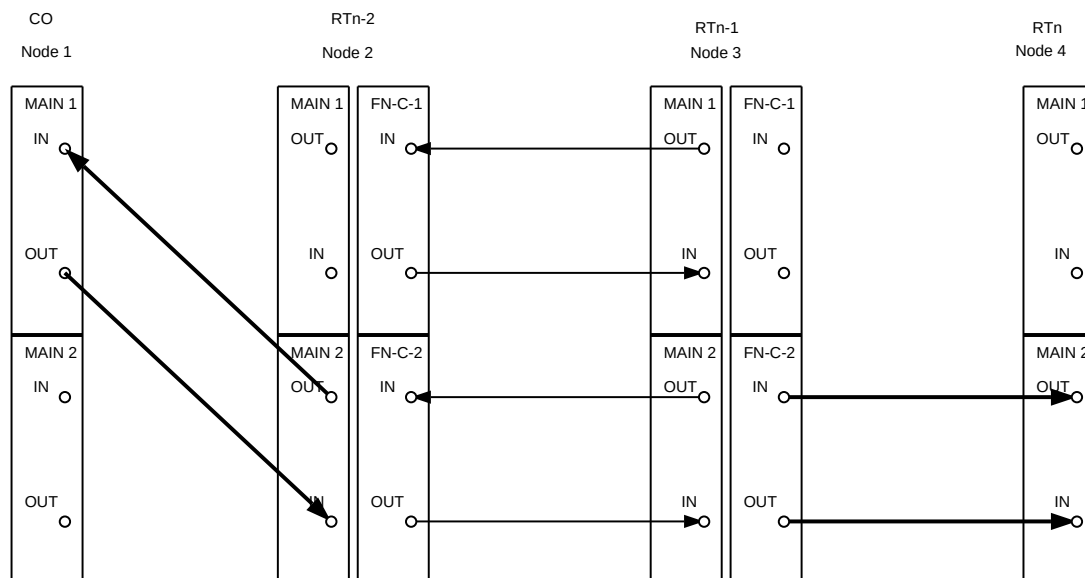


Figure 18. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

32. At Node 1 (CO), locally download Release 9 or later software. Then use "**set-fecom:dcc=m2:com=disabled**" command to disable DCC at Node 1. **DLP-532**
-

33.  **CAUTION:**
Service interruption will occur if the following step is not performed for all timeslots that terminate at other nodes in the ring network.

 **NOTE:**
"Drop" traffic is defined as traffic that terminates at the CO. All traffic that does not terminate at the CO is referred to as "Add" traffic.

At Node 1 (CO), use the "**ent-crs-vt1**" command or "**ent-crs-sts1**" command to set up main-to-main pass-through cross-connections associated with all STS/VT timeslots that are terminated on other nodes of the ring but are not terminated at the CO.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

34.  **CAUTION:**
Plans, patch facilities, and loss budget calculations must be available for the fiber line to be connected between the CO and the "last" RT to form the ring network.

Connect optical fiber from Node 1 (CO) **MAIN 2(P) OUT** to last Node 4 (RTn) **MAIN 1 IN**. Connect optical fiber from Node 1 (CO) **MAIN 2(P) IN** to last Node 4 (RTn) **MAIN 1 OUT**. (See Figure 19.)

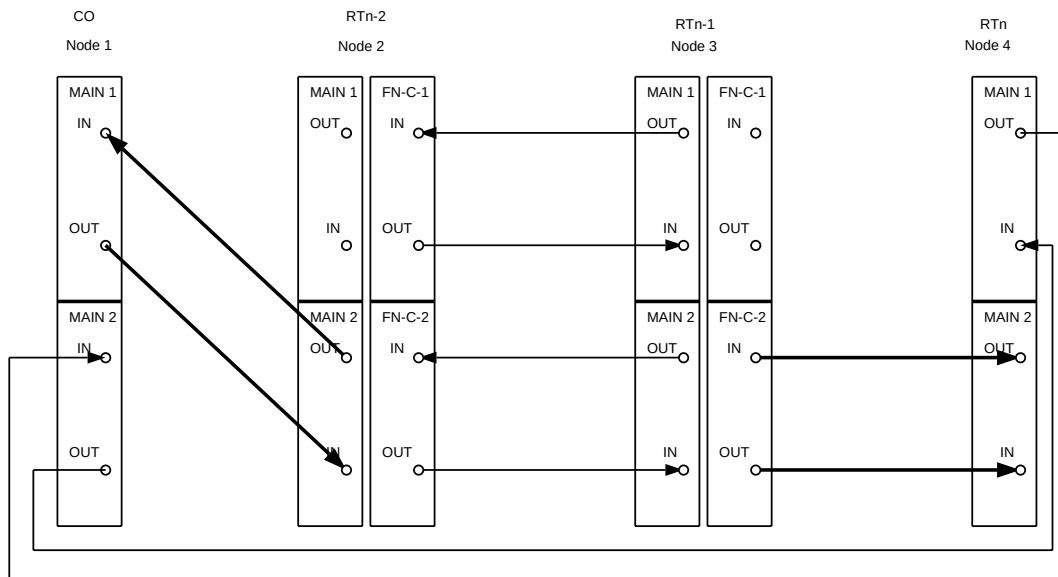


Figure 19. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

35. At last Node 4 (RTn), locally download Release 9 or later software. **DLP-532**
-

36.  **CAUTION:**
Service interruption will occur if the following step is not performed for all timeslots that terminate at other nodes in the ring network.

At last Node 4 (RTn) use the "**ent-crs-vt1**" command or "**ent-crs-sts1**" command to set up all main-to-main pass-through cross-connections associated with all remaining STS/VT timeslots that are terminated on other nodes of the ring.

37.  **NOTE:**
Traffic is now passing from Node 1 (CO) to Node 4 (RTn) and is accessible to all of the RTs from this direction. The following steps will work back from Node 4 to Node 2, reconfiguring the fibers and upgrading the software at each node.

If this is an add/drop network (with traffic terminating at other nodes but not at the CO), continue with Step 38. If this is a drop network (with traffic terminating only between the CO and another node), continue with Step 41.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

38.  **CAUTION:**
If this is an add/drop network instead of a drop network and channels are "added" at the node being converted, service interruption will occur when cross-connections are deleted. The following must be performed prior to disconnecting the fibers from this node to the downstream node to minimize out-of-service time. For example, if channels are added and dropped between Node 3 and Node 4, pass-through cross-connections must be established in all remaining nodes to minimize service interruption.

For all added channels, use the "**ent-crs-()**" command(s) to set up pass through cross-connections from fn-c to main at all nodes leading back to Node 1 (CO).

-
39. Ensure main-to-main pass-through cross-connections are made at the CO as specified in Step 33.
-

40. At the node being converted, use the "**dlt-crs-()**" command to delete the cross-connections from **FUNCTION UNITS** group **A** or **B** (fn-a, fn-b) to **FUNCTION UNITS** group **C** (fn-c). Immediately after each cross-connection is deleted, use the "**ent-crs-()**" command to reroute the channel from fn-a or fn-b to main. This routes the added traffic channel back to the CO and over the installed ring nodes to the intended drop points.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

41. At Node 3, use the "**dlt-crs-vt1**" or "**dlt-crs-sts1**" command to delete all "main" to "fn-c" cross-connections.
 42. At Node 3, disconnect the fibers from **FUNCTION UNITS C 2(P) OLIUs**. Remove the **OLIUs** from **FUNCTION UNITS C** slots. Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**. (See Figure 20.)
-

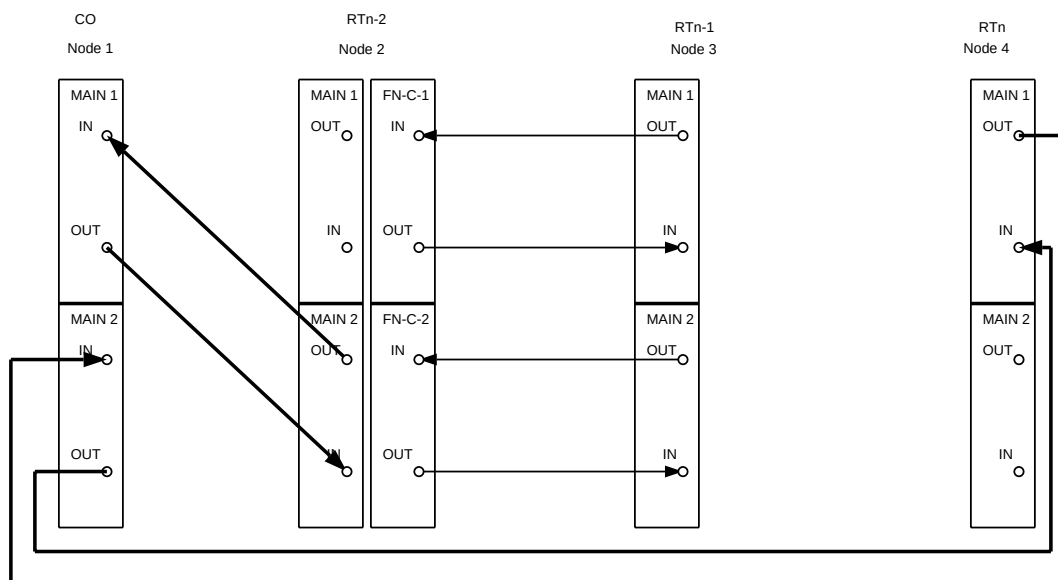


Figure 20. DDM-2000 OC-3 Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

43. At Node 2 (RTn-2) and Node 3 (RTn-1), use the **"switch-line:main:pri>manual"** command to switch service to the protection line (main-2 OLIU active). (See Figure 21.)
-
44. At Node 3 (RTn-1), disconnect the optical fibers from **MAIN 1 OLIUs**. At Node 2 (RTn-2), disconnect the optical fibers from **FUNCTION UNITS C 1 OLIUs**. (See Figure 21.)
-
45. Connect optical fiber from Node 3 (RTn-1) **MAIN 1 OUT** to Node 4 (RTn) **MAIN 2(P) IN**. Connect optical fiber from Node 3 (RTn-1) **MAIN 1 IN** to Node 4 (RTn) **MAIN 2(P) OUT**. (See Figure 21.)
-

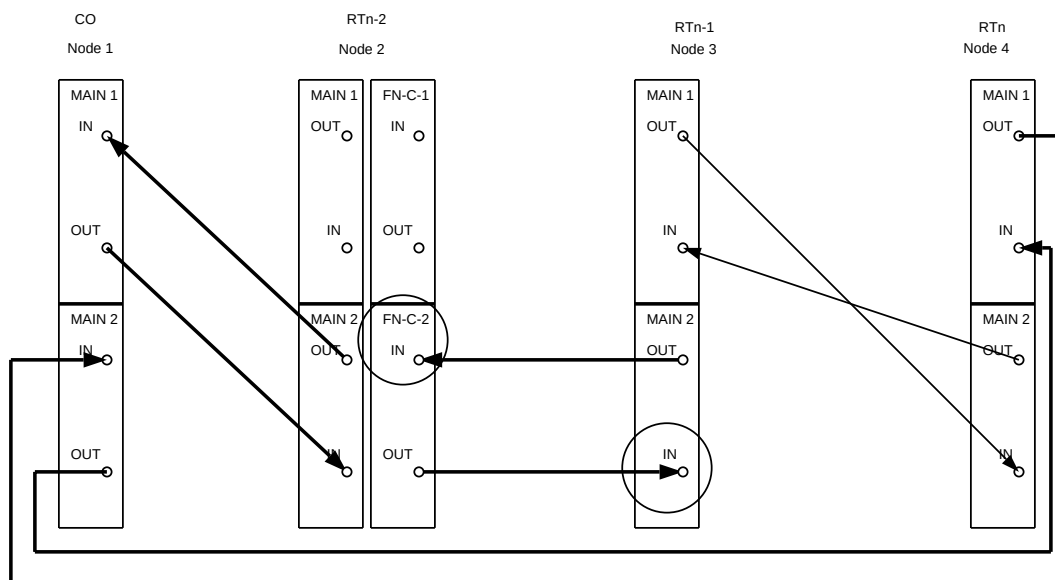


Figure 21. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

46. At Node 3 (RTn-1), locally download Release 9 or later software. **DLP-532**

47. Reinstall **TGS** circuit pack into **TIMING** slot **1**. Use the "**switch-sync:s=circuitpack,pri=reset**" command to reset the manual protection switch.

48. At Node 3 (RTn-1), use the "**ent-crs-vt1**" command or "**ent-crs-sts1**" command to set up all main-to-main pass-through cross-connections associated with all remaining STS/VT timeslots that are terminated on other nodes of the ring.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

49. Repeat this procedure from Step 37 for all remaining nodes to be converted. Figure 22 shows the completed ring configuration.
-

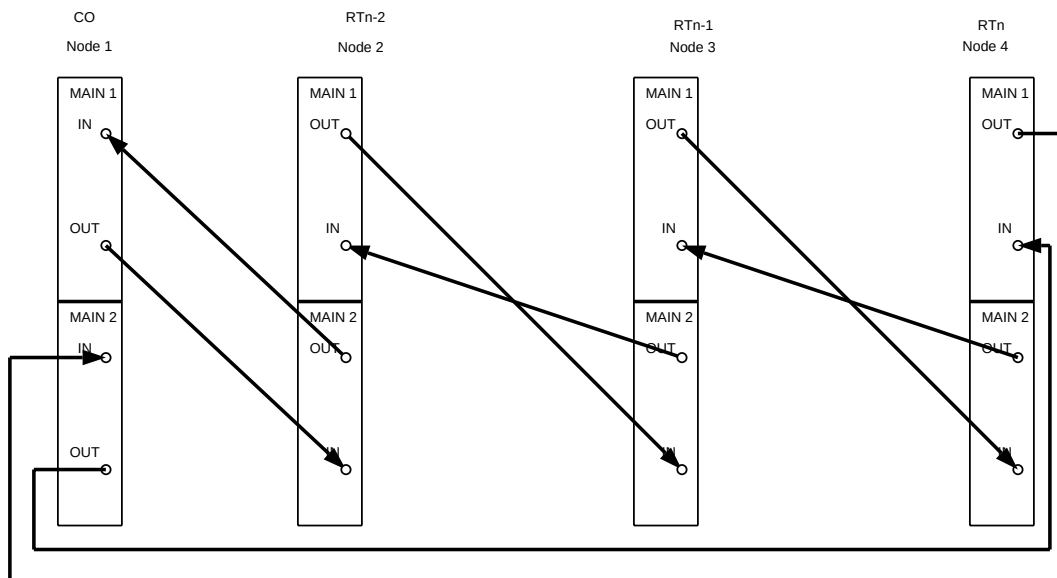


Figure 22. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

50. **NOTE 1:**

The "**set -ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the "**set -ne:**" command to designate ONE shelf as the DSNE, if required. Use the "**set -ne:**" to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

51. Use "**set-fecom:dcc-all:com=enabled**" command at all nodes to enable far-end communications (fecom).

52. Reinstall all **TGS** circuit packs in **TIMING** slots **1**, if still removed.

53. ➤ **NOTE 1:**
If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

➤ **NOTE 2:**
The "**rtrv-oc3:**" command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the "**rtrv-oc3:**" command format.

Use the "**rtrv-oc3:**" command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the "**set-oc3:**" command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

54.  **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.
-  **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed nodes.
-  **NOTE 3:**
The "**rtrv-sync:**" command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the "**rtrv-sync:**" command format.

Use the "**rtrv-sync:**" command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed node. Use the "**set-sync:**" command to enable or disable the Sync Autoreconfiguration parameter, as required.

-
55. The ring configuration is now complete and new nodes may be added as required [**NTP-026**].
-

Establish Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

-  **NOTE 2:**
It is assumed that all DDM-2000 OC-12 shelves in the system have passed the looped transmission test(s) (363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*, **System Turnup: NTP-002**) and the DDM-2000 OC-12 ring has been established (363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*, **System Turnup: NTP-020**). It is also assumed the DDM-2000 OC-3 shelves have been equipped and tested, **System Turnup: NTP-016**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine the network configuration (for example, see Figure 1.)

2. Verify that the host DDM-2000 OC-12 shelf is equipped with Release 5 or later ring software. If not equipped with Release 5 or later software, upgrade the DDM-2000 OC-12 host shelf with proper software. Verify that the DDM-2000 OC-3 shelf is equipped with Release 9 or later ring software. **DLP-531**
-

3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

4. **⇒ NOTE 1:**
The **rtrv-eqpt:** command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

- ⇒ NOTE 2:**
If work order or office records do not specify **OLI** types, refer to 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers, Applications, Planning, and Ordering Guide* and/or 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of **OLI** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

At the host OC-12 node, verify/install **OLI** circuit packs in **FUNCTION UNITS (A, B, C, or D)** slots being used for OC-3 access.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5.  **NOTE:**
If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **set-fecom:address:com=disable** command to disable the DCC.

At OC-12 shelf, connect optical loops for **FUNCTION UNITS OLIUs** just installed.

-
6.  **NOTE:**
The Network Side (NS)/User Side (US) parameters of the **set-fecom:** command must be set opposite at each end of the optical spans. For example, see Figure 2.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

-
7. Use the **rtrv-oc3/set-oc3** command at the OC-12 shelf to verify/set application (*app*) parameter for the OC-12 **FUNCTION UNITS** slots being used for this single-homed configuration. For example, **set-oc3:fn-a, app=0X1**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. ➤ **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-3 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

➤ **NOTE 2:**

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

➤ **NOTE 3:**

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. (OC-12 Reference: 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)*—Volume II, **DLP-510**).

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **⇒ NOTE 1:**

If Kbyte or Sbyte (sync messaging) is enabled for the OC-3 **MAIN 1** and **MAIN 2(P)** optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring and in the **FUNCTION UNITS** slots of the host OC-12 shelf.

⇒ NOTE 2:

The **rtrv-oc3:** command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* and 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **NOTE 1:**

If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

 NOTE 2:

If Sync Autoreconfiguration is enabled at any OC-3 line-timed node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed OC-3 nodes.

 NOTE 3:

The **rtrv-sync:** command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* and 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed OC-3 node. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. ➡ NOTE 1:

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

➡ NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

Use the **set-ne:** command to designate ONE shelf in the network as the DSNE, if not already done.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **NOTE:**

This single-homed ring configuration requires that the **FUNCTION UNITS () 1 OLIU** on the OC-12 shelf connect to the **MAIN 1 OLIU** at the first OC-3 shelf from the OC-12 shelf. **MAIN 2(P) OLIU** at the OC-3 shelf (node) connects to the **MAIN 1 OLIU** at an adjacent OC-3 shelf (node). The **MAIN 2(P) OLIU** at the last OC-3 shelf on the OC-3 ring connects to **FUNCTION UNITS () 2(P) OLIU** on the host OC-12 shelf. See Figure 1. This procedure will establish the ring configuration starting from the OC-12 host node (near end) to the first OC-3 node, then continuing to the next node until the final connection is made from the last OC-3 node back to the host OC-12 node.

At the near end, remove the optical loop from the **OLIU** (for example in Figure 1, Node 5 OC-12 shelf **FUNCTION UNITS A 1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated **OLIU** (for example, in Figure 1, Node 7 OC-3 shelf **MAIN 1 OLIU**).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14.  **NOTE:**
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set - fecom:** command **at each shelf** to enable far end communications.

At each shelf, use the
set - fecom: address:com=enabled command to
ensure far end communications (fecom) is enabled.

-
15. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**
-

16.  **NOTE:**
The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-3 lines terminated on the system.

Perform end-to-end OC-3 line test. **DLP-515**

17. Repeat this procedure from Step 13 for all OC-3 optical spans back to the host OC-12 shelf.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

18. **NOTE:**

Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The single-homed DDM-2000 OC-3 access network is now ready for initial service to be established. For DS3, EC-1, STS-3c, and video terminations on a DDM-2000 OC-12 shelf, use the procedures in 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*, to establish those services. For DS1, DS3, and/or EC-1 terminations on a DDM-2000 OC-3 shelf, use the procedures in this 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual (TOP)—Volume II*, to establish those services.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

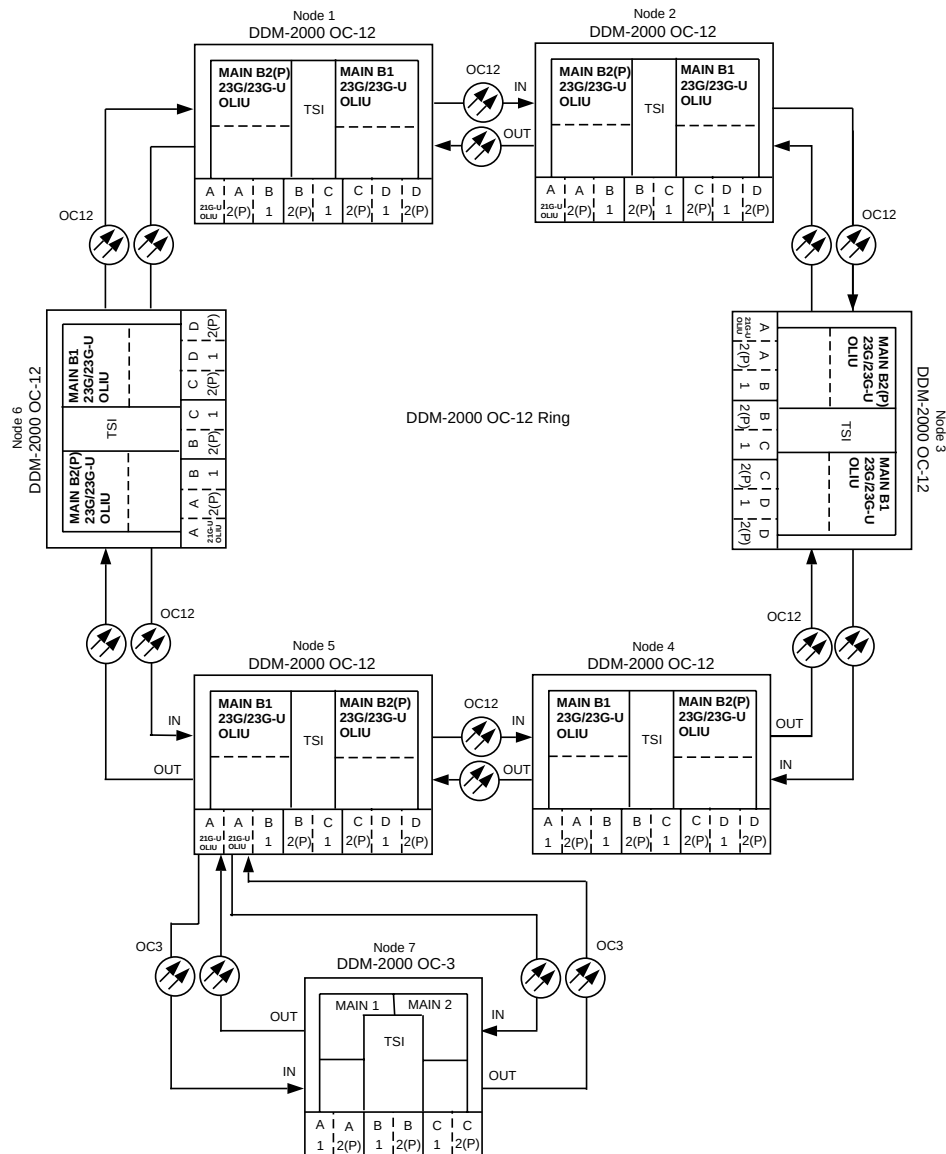
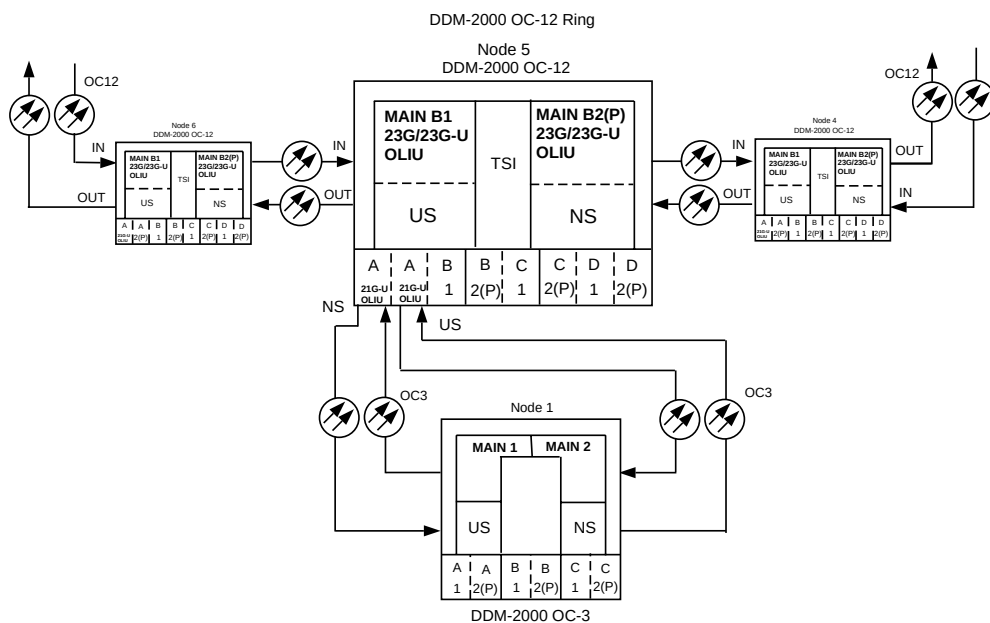


Figure 1. Example Single-Home Ring Configuration Connections

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
21-Type OLIUs (0X1 or video)	FN-A-1 dcc-a1	FN-A-2 dcc-a2	FN-B-1 dcc-b1	FN-B-2 dcc-b2	FN-C-1 dcc-c1	FN-C-2 dcc-c2	FN-D-1 dcc-d1	FN-D-2 dcc-d2
	NS	US	NS	US	NS	US	NS	US
23-Type OLIUs	MAIN-B-1 dcc-mb1		MAIN-B-2 dcc-mb2					
	US		NS					



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
22-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2	FN-A dcc-a	FN-B dcc-b	FN-C dcc-c			
	US	NS	NS	NS	NS			
27-Type OLIUs	MAIN-1	MAIN-2	FN-A-1	FN-A-2	FN-B-1	FN-B-2	FN-C-1	FN-C-2
	dcc-m1-1	dcc-m2-1	dcc-a1-1	dcc-a2-1	dcc-b1-1	dcc-b2-1	dcc-c1-1	dcc-c2-1
	dcc-m1-2	dcc-m2-2	dcc-a1-2	dcc-a2-2	dcc-b1-2	dcc-b2-2	dcc-c1-2	dcc-c2-2
	US	NS	NS	US	NS	US	NS	US

Figure 2. Example of User Side/Network Side Value Settings

Establish OC-3/IS-3 Dual Ring Interworking DDM-2000 OC-3 to OC-12 or FT-2000 Ring Configurations OC-3 Optical Fiber Spans

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.***

-  **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001** in the appropriate DDM-2000/FT-2000 documentation.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

It is assumed that the DDM-2000 or FT-2000 systems have been established in required individual ring configurations. Ring Release 7.2 or later software is required in each DDM-2000 OC-3 shelf. Ring Release 5 or later software is required in each DDM-2000 OC-12 shelf. Ring Release 6 or later software is required in each FT-2000 shelf. If **OLIUS** have already been installed in the **FUNCTION UNITS** slots and the systems established in a DRI configuration using OC-3/IS-3 connections, go to Step 13 to establish new service. Otherwise, continue with this procedure to establish the initial DRI configuration.

⇒ **NOTE 3:**

If the OC-3 ring is to be line timed (no external timing available) from another system or ring, **BBF2B TGS** timing circuit packs must be installed in the node connected to the other system and the **FUNCTION UNITS C** slot must be equipped first to provide a source of synchronization. See the "**set-sync**:" command in the Commands and Reports section of this manual.

Consult office records or work/circuit orders to determine the **OLIUS FUNCTION UNITS** slots in each DRI node that will be used to connect the two systems together in a DRI configuration. See Figure 1.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. **NOTE:**

If work order or office records do not specify **OLI** types, refer to 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers, Applications, Planning, and Ordering Guide*, and/or 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume 1*, for a description of **OLI** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

At the DDM-2000 OC-3 dual ring interworking nodes,
install **OLI** circuit packs in selected **FUNCTION UNITS**
slots.

DLP-504

-
3. If FT-2000 shelves are the dual ring interworking nodes, use FT-2000 procedures in 365-575-102, *FT-2000 OC-48 Lightwave System User/Service Manual*, to **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**. If DDM-2000 OC-12 shelves are the dual ring interworking nodes, use procedures in 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual(TOP)—Volume II*, to **Install FUNCTION UNITS OLI Circuit Packs, DLP-503**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4.  **NOTE 1:**
22G-U OLIUs require a 10 dB LBO when optically looped. **21G/21G-U OLIUs**, with **POWER** switch set to **HIGH**, require a 10 dB LBO when optically looped. **21G/21G-U OLIUs**, with **POWER** switch set to **LOW**, and **21G2-U** and **22G2-U/22G3-U OLIUs** do not require an LBO.

-  **NOTE 2:**
If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the "**set - fecom:address:com=disable**" command to disable the DCC.

At DDM-2000 nodes, install **OLIU** optical loops.

- A. DDM-2000 OC-3
B. DDM-2000 OC-12 User/Service Manual

DLP-505
DLP-504

-
5. Determine the optical loss of each OC-3 optical span from office records or by making the required measurements.

-
6. Remove optical loops from **OLIUs** in the OC-3 optical span being established.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE 1:**

The network elements that terminate on each end of the optical span must have their "Network Side"/"User Side" parameters set to opposite values to avoid an "inconsistent DCC values" alarm. Network Side/User Side parameters [**set - fecom** command] must be properly set at each end of OC-3 optical spans. One end is provisioned as "Network" and the other end is provisioned as "User". Both ends of the OC-3 line cannot be the same and it makes no difference which end is "Network".

 NOTE 2:

The section data communication channel (DCC), used for far-end communications, must be enabled at each network element (shelf) for communication and to allow the end-to-end line tests to work when the optical span is established. Default condition in DDM-2000 is "enabled" for the DCC channel. If it has been disabled, use the **"set - fecom:"** command **at the DDM-2000 shelf** to enable far-end communications.

At the DDM-2000 shelf, use the
"set - fecom: address:com=enabled, nsus=ns/us"
command to enable far-end communications (fecom) and
set Network Side (ns)/User Side (us) parameters.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. At each DDM-2000 OC-3/OC-12 node, use the
"set-oc3/oc12:address:kbyte=enabled" or
"set-oc3/oc12:address:syncmsg=Kbyte/Sbyte"
command to enable sync messaging between the DDM-
2000 **FUNCTION UNITS OLIUs** connecting to the other
ring DRI nodes.
 9. At each DDM-2000 OC-3/OC-12 DRI node, use the
"set-oc3/oc12:address:kbyte=disabled" or
"set-oc3/oc12:address:syncmsg=disabled"
command to disable sync messaging between the
DDM-2000 **MAIN OLIUs** connecting the adjacent DRI
nodes of the DDM-2000 OC-3/OC-12 ring. For example
in the top DDM-2000 OC-3 ring in Figure 1, disable sync
messaging between CO 2 **MAIN 1** and CO 4 **MAIN 2(P)**.
 10. At FT-2000 DRI nodes, if only one **OLIU** is used for the
DRI connection, use "**CONFIGURATION-Set-OC3**"
command to set the protection mode to **0 X 1** for the
OC-3 slot used for DRI connections. If two **OLIUs** are
used for the DRI connection, use "**CONFIGURATION-
Set-OC3**" command to set the protection mode to **1 + 1**
for the OC-3 slot used for DRI connections.
 11. At FT-2000 DRI nodes, use "**CONFIGURATION-Enter-
Assignment-DCC**" command to assign a DCC channel
to slot(s) used for DRI connections.
 12. Perform optical fiber connections and verification of the
optical facility.
-

DLP-514

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **⇒ NOTE 1:**

The "**set -ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In mixed DDM-2000 and FT-2000 networks, it is recommended that the DSNE be provisioned in a DDM-2000. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

⇒ NOTE 3:

It may take 5 minutes or more for the network to stabilize after a DSNE is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Discontinue one of the duplicate DSNEs, if present (DDM-2000, "**set -ne:dsne=no**"). Use the "**reset**" command at the remaining DSNE to reset the DSNE node. Use the "**set -ne:**" command to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. Perform end-to-end OC-3 line test at DRI nodes. **DLP-515**

15. The network is now ready for initial DS1, DS3, or EC-1 service to be established.
[System Turnup: NTP-004] (DS1)
[System Turnup: NTP-005] (DS3)
[System Turnup: NTP-034] (EC-1)
[System Turnup: NTP-025] (HDSL)

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

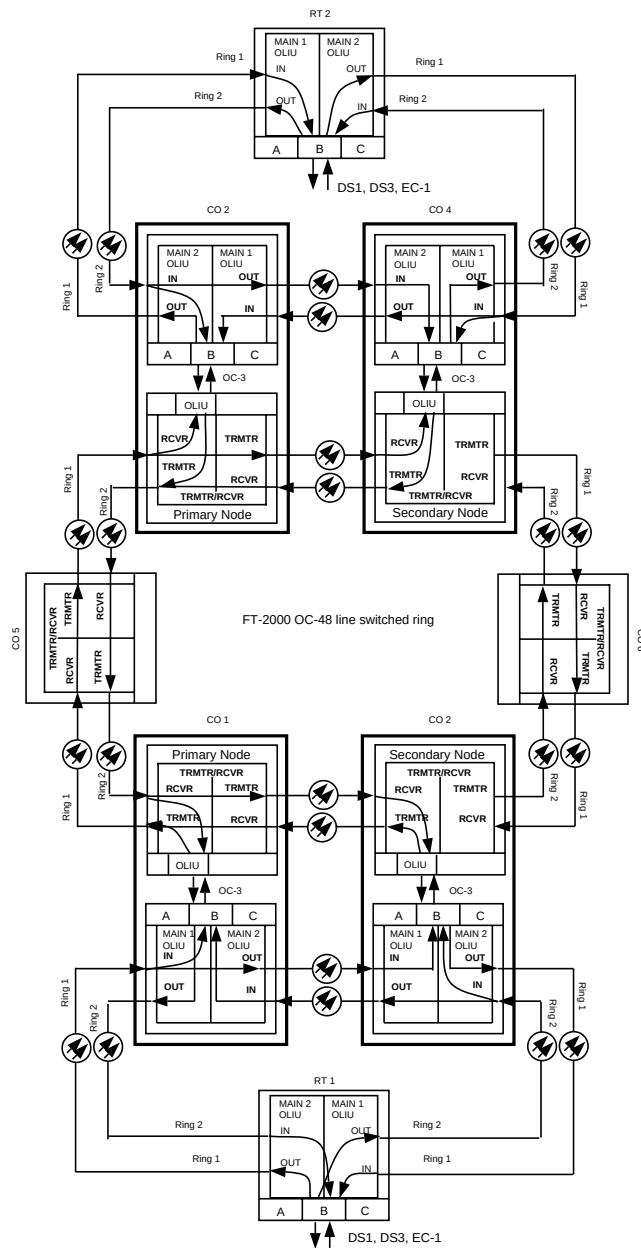


Figure 1. Example of DDM-2000 OC-3/FT-2000 OC-48 Dual Ring Interworking Network

Upgrade DDM-2000 OC-3/FT-2000 Dual Ring Interworking Network from EC-1 to OC-3 In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
Existing **BBG6 STS1E** circuit packs will be replaced in this procedure with **OLIU** circuit packs to support OC-3/IS-3 applications. If work order or office records do not specify **OLIU** types, refer to 363-206-200, DDM-2000 OC-3 and OC-12 Multiplexers, Applications, Planning, and Ordering Guide and/or 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/service Manual(emVolume 1*, for a description of **OLIU** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

 **NOTE 2:**
This procedure assumes that the DDM-2000 and FT-2000 systems are in service and ring Release 9 or later software is used in each DDM-2000 OC-3 shelf. Ring Release 6 or later software is required in each FT-2000 shelf.

 **NOTE 3:**
All shelves in the same network must have the same or compatible software releases.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 4:

You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the "**rtrv-alm:**" command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. Upgrade software in each FT-2000 OC-48 and DDM-2000 OC-3 shelf with a release that supports OC-3 interfaces (Ring Release 6 or later (OC-48), Ring Release 9 or later (OC-3), if not already performed.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4.  **CAUTION 1:**
*Ensure traffic is being carried through the FT-2000 **primary** node to prevent unnecessary service hits (for example, node B in Figure 1).*
(FT-2000 command
"**CONFIGURATION-Retrieve-Crossconnection-STS3**")

 **CAUTION 2:**
Removal of the wrong cross-connections may cause service interruption.

 **NOTE 1:**
When signals or circuit packs are removed, alarms will be generated until update procedures are performed.

 **NOTE 2:**
STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs.

 **NOTE 3:**
If the OC-3 circuit pack is going to be using the same cross-connects as the EC-1 circuit pack that is to be removed, then the only cross-connects that need to be deleted are those at the node where the circuit pack is being replaced. The pass-through cross-connections can remain.

Discontinue the EC-1 interface cross-connections at the OC-3 node associated with the FT-2000 **secondary** node. **Note that only cross-connections at the DRI node are being discontinued when using the procedures of NTP-036.**

NTP-036

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5. At the OC-3 node associated with the FT-2000 **secondary** dual ring interworking node, remove **BBG6 STS1E** circuit pack(s) from **FUNCTION UNITS** slot(s) being upgraded to **OLIUs** (for example, node D in Figure 1).
 6. Momentarily depress **UPD/INIT** button on **SYSCTL** or use the "**upd**" command from the CIT.
 7. At the FT-2000 **secondary** dual ring interworking node (for example, node A in Figure 1), use FT-2000 procedures in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Delete DS3 and/or EC1 Low Speed Port(s), NTP-003**.
 8. At the FT-2000 **secondary** dual ring interworking node, use FT-2000 procedures in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**.
 9. Install required **OLIU(s)** in the OC-3 node associated with the FT-2000 secondary node (for example, node D in Figure 1). **DLP-504**
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **NOTE 1:**

The network elements that terminate on each end of the optical span must have their "Network Side"/"User Side" parameters set to opposite values to avoid an "inconsistent DCC values" alarm. Network Side/User Side parameters [**set - fecom** command] must be properly set at each end of OC-3 optical spans. One end is provisioned as "Network" and the other end is provisioned as "User". Both ends of the OC-3 line cannot be the same and it makes no difference which end is "Network".

 NOTE 2:

The section data communication channel (DCC), used for far-end communications, must be enabled at each network element (shelf) for communication and to allow the end-to-end line tests to work when the optical span is established. Default condition in DDM-2000 is "enabled" for the DCC channel. If it has been disabled, use the **"set - fecom:"** command **at the DDM-2000 shelf** to enable far-end communications.

At the DDM-2000 shelf, use the
"set - fecom: address: com=enabled, nsus=ns/us"
command to enable far-end communications (fecom) and
set Network Side (ns)/User Side (us) parameters.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. At the FT-2000 shelf, use "**CONFIGURATION-Set -OC3**" command to set the protection mode to **0 X 1** for the OC-3 slot used for DRI connections, if only one **OLI**U is used for the DRI connection. If two **OLI**Us are used for the DRI connection, use "**CONFIGURATION-Set -OC3**" command to set the protection mode to **1 + 1** for the OC-3 slot used for DRI connections.

12. At the FT-2000 shelf, use "**CONFIGURATION-Enter - Assignment -DCC**" command to assign a DCC channel to slot(s) used for DRI connections, if required.

13. Perform optical fiber connections and verification of the optical facility.

DLP-514

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. **NOTE 1:**

The "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In mixed DDM-2000 and FT-2000 networks, it is recommended that the DSNE be provisioned in a DDM-2000. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

 NOTE 3:

It may take 5 minutes or more for the network to stabilize after the DSNE is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Discontinue one of the duplicate DSNEs, if required. Use the "**reset**" command at the remaining DSNE to reset the DSNE node. Use the "**set-ne:**" to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15. Perform end-to-end OC-3/IS-3 line test at DRI nodes associated with the FT-2000 secondary node (for example, between nodes A and D in Figure 1). **DLP-515**

16. At the OC-3 DRI node, use the "**ent-crs-sts1**" or "**ent-crs-vt1**" commands to make proper "drop and continue" cross-connections. **DLP-550**

17. At the FT-2000 **primary** node, use the "**FAULT-Switch-Path-STS3**" command to switch the designated tributary from primary node to secondary node. (Switch traffic to secondary node.) See Figure 2.

18.  **NOTE:**
If the OC-3 circuit pack is going to be using the same cross-connects as the EC-1 circuit pack that is to be removed, then the only cross-connects that need to be deleted are those at the node where the circuit pack is being replaced. The pass-through cross-connections can remain.

Discontinue the EC-1 interface cross-connections at the OC-3 node associated with the FT-2000 **primary** node. **NTP-036**
Note that only cross-connections at the DRI node are being discontinued when using the procedures of NTP-036.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

19. At the OC-3 node associated with the FT-2000 **primary** dual ring interworking node, remove both **BBG6 STS1E** circuit packs from **FUNCTION UNITS** slots being upgraded to **OLIUs** (for example, node C in Figure 2).
 20. Momentarily depress **UPD/INIT** button on **SYSCTL** or use the "**upd**" command from the CIT.
 21. At the FT-2000 **primary** dual ring interworking node (for example, node B in Figure 2), use FT-2000 procedures in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Delete DS3 and/or EC-1 Low Speed Port(s), NTP-003**.
 22. At the FT-2000 **primary** dual ring interworking node, use FT-2000 procedures in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

23. Install required **OLI**U(s) in the OC-3 node associated with the FT-2000 primary node (for example, node C in Figure 1). **DLP-504**

24. At the DDM-2000 end of optical span between the FT-2000 primary node and DDM-2000, use the **"set - fecom: address: com=enabled, nsus=ns/us"** command to enable far-end communications (fecom) and set Network Side (ns)/User Side (us) parameters.

25. At the FT-2000 shelf, use **"CONFIGURATION-Set - OC3"** command to set the protection mode to **0 X 1** for the OC-3 slot used for DRI connections, if only one **OLI**U is used for the DRI connection. If two **OLI**Us are used for the DRI connection, use **"CONFIGURATION-Set - OC3"** command to set the protection mode to **1 + 1** for the OC-3 slot used for DRI connections.

26. At the FT-2000 shelf, use **"CONFIGURATION-Enter - Assignment - DCC"** command to assign a DCC channel to slot(s) used for DRI connections.

27. Perform optical fiber connections and verification of the optical facility. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

28. Perform end-to-end OC-3/IS-3 line test at DRI nodes associated with the FT-2000 primary node (for example, nodes B and C in Figure 2). **DLP-515**

29. At the OC-3 DRI node, use the "**ent-crs-sts1**" or "**ent-crs-vt1**" commands to make proper "drop and continue" cross-connections. **DLP-550**

30. At FT-2000 primary node, use the "**FAULT-Switch-Path-STs3**" command to switch the designated tributary from secondary node to primary node. (Switch traffic to primary node.)

31. Remove all EC-1/DS3 connections between the nodes with **BBG6 STS1E/LAA4 STS1E** circuit packs removed, if required.

32. The upgrade is now complete.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

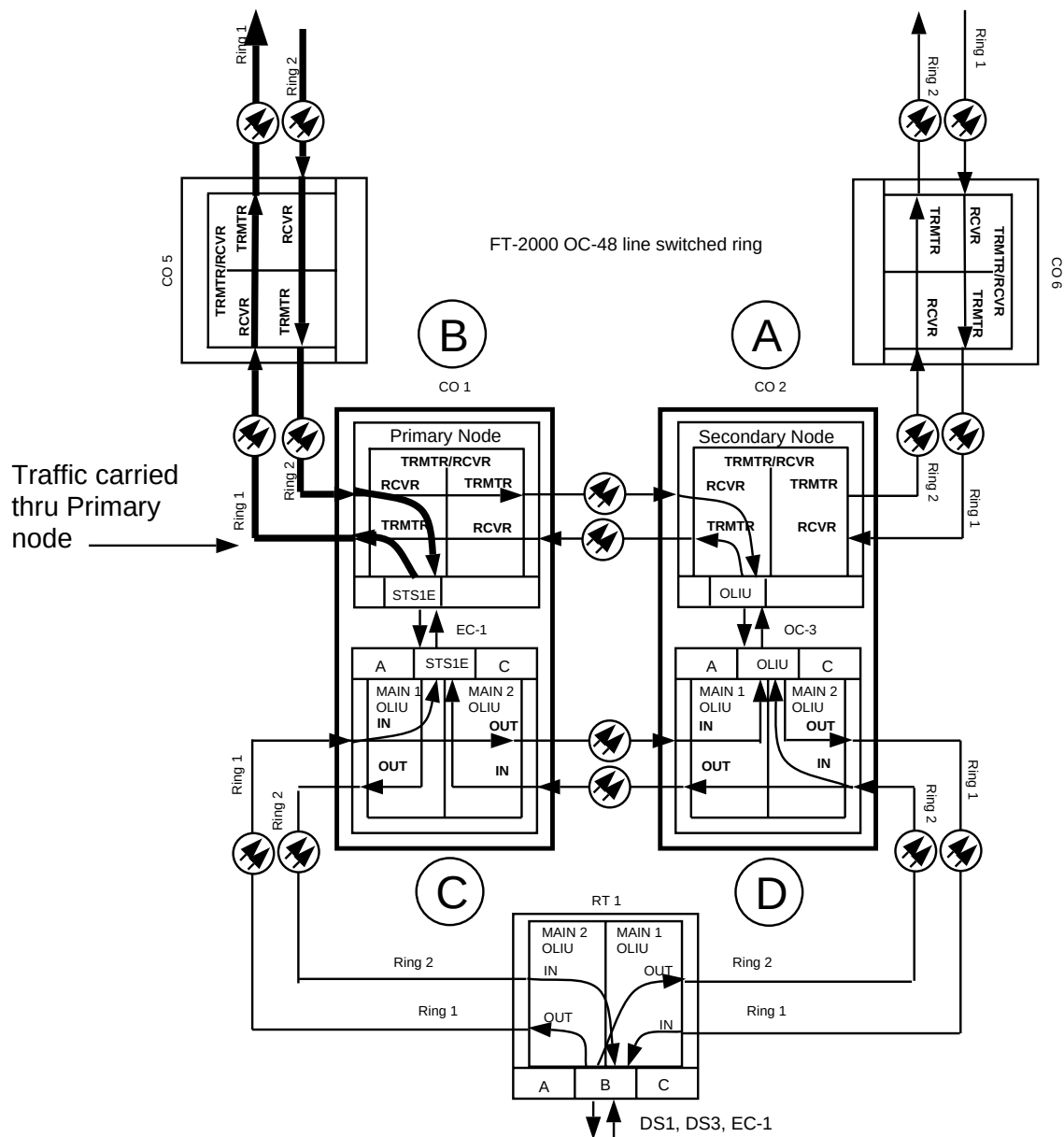


Figure 1. OC-3/OC-48 DRI Interworking

The diagram illustrates the FT-2000 OC-48 line switched ring architecture, showing four nodes (A, B, C, D) and their connections to external rings (Ring 1, Ring 2) and internal components.

Nodes and Components:

- Node A (Secondary Node):** Contains a Primary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI) and a Secondary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI). It is connected to Ring 1 and Ring 2.
- Node B (Primary Node):** Contains a Primary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI) and a Secondary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI). It is connected to Ring 1 and Ring 2.
- Node C (Primary Node):** Contains a Primary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI) and a Secondary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI). It is connected to Ring 1 and Ring 2.
- Node D (Secondary Node):** Contains a Primary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI) and a Secondary Node (TRMTR/RCVR, RCVR, TRMTR, OLUI). It is connected to Ring 1 and Ring 2.

Connections and Traffic Flow:

- Ring 1 and Ring 2:** These rings connect the nodes to external networks. Traffic is carried through the Secondary Node.
- OC-3:** Optical Channel 3 connections between the Primary and Secondary Nodes.
- OLUI:** Optical Line Interface Unit connections between the Primary and Secondary Nodes.
- MAIN 1 OLUI IN/OUT:** Main 1 Optical Line Interface Unit connections between the Primary and Secondary Nodes.
- MAIN 2 OLUI IN/OUT:** Main 2 Optical Line Interface Unit connections between the Primary and Secondary Nodes.

Legend:

- Ring 1:** Ring 1
- Ring 2:** Ring 2
- TRMTR/RCVR:** Transmitter/Receiver
- RCVR:** Receiver
- TRMTR:** Transmitter
- OLUI:** Optical Line Interface Unit
- OC-3:** Optical Channel 3
- MAIN 1 OLUI IN/OUT:** Main 1 Optical Line Interface Unit connections
- MAIN 2 OLUI IN/OUT:** Main 2 Optical Line Interface Unit connections

Figure 2. OC-3/OC-48 DRI Interworking

Establish Single-Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

 **NOTE 2:**
It is assumed that all DDM-2000 OC-3 shelves in the system have passed the looped transmission test(s) (**System Turnup: NTP-016**) and the DDM-2000 OC-3 ring has been established (**System Turnup: NTP-022**) It is also assumed the DDM-2000 FiberReach shelves have been equipped and tested (363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*, **System Turnup: NTP-016**).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine the network configuration (for example, see Figure 1.)

2. Verify that the host DDM-2000 OC-3 shelf is equipped with Release 9 or later ring software. If not equipped with Release 9 or later software, upgrade the DDM-2000 OC-3 host shelf with proper software NTP-046
-

3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

4.  **NOTE 1:**
The **rtrv-eqpt:** command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

-  **NOTE 2:**
If work order or office records do not specify **OLI** types, refer to 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers, Applications, Planning, and Ordering Guide* and/or 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of **OLI** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

At the host OC-3 node, verify/install **26G2-U** or **27G-U/27G2-U OLIU** circuit packs in **FUNCTION UNITS (A, B, or C)** slots being used for FiberReach access. **DLP-504**

5. **NOTE:**

If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **set - fecom: address: com=disable** command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIUs** just installed. **DLP-505**

6. **NOTE:**

The Network Side/User Side parameters of the **set - fecom:** command must be set opposite at each end of the optical spans. For example, see Figure 2.

Use the **rtrv - fecom/set - fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

The **set -ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "dupLiCate DSNE" alarm will occur. The DSNE must not be a FiberReach shelf. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set -ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

Use the **set -ne:** command to designate ONE shelf in the network as the DSNE, if not already done.

Use the **set -ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **NOTE 1:**

This single-homed ring configuration requires that the **FUNCTION UNITS () 1 OLIU** on the OC-3 shelf connect to the **MAIN-1 OLIU** at the first FiberReach shelf from the OC-3 shelf. **MAIN-2 OLIU** at the FiberReach shelf (node) connects to the **MAIN-1 OLIU** at an adjacent FiberReach shelf (node). The **MAIN-2 OLIU** at the last FiberReach shelf on the OC-1 ring connects to **FUNCTION UNITS () 2(P) OLIU** on the host OC-3 shelf. See Figure 1. This procedure will establish the ring configuration starting from the OC-3 host node (near end) to the first FiberReach node, then continuing to the next node until the final connection is made from the last FiberReach node back to the host OC-3 node.

 NOTE 2:

All unused ports on the **27G-U/27G2-U OLIU** must be set to **nmon** with the **set-state-oc1** command.

At the near end, remove the optical loop from the **26G2-U** or **27G-U/27G2-U OLIU** OC-1 line (**1** or **2**) (for example in Figure 1, OC-3 shelf **FUNCTION UNITS A 1**, OC-1 line **1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated **OLIU** (for example, in Figure 1, FiberReach **MAIN-1 OLIU**).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set - fecom:** command **at each shelf** to enable far end communications.

At each shelf, use the
set - fecom: address: com=enabled command to
ensure far end communications (fecom) is enabled.

-
11. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**
-

12. **NOTE:**

The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-1 lines terminated on the system.

Perform end-to-end OC-1 line test. **DLP-556**

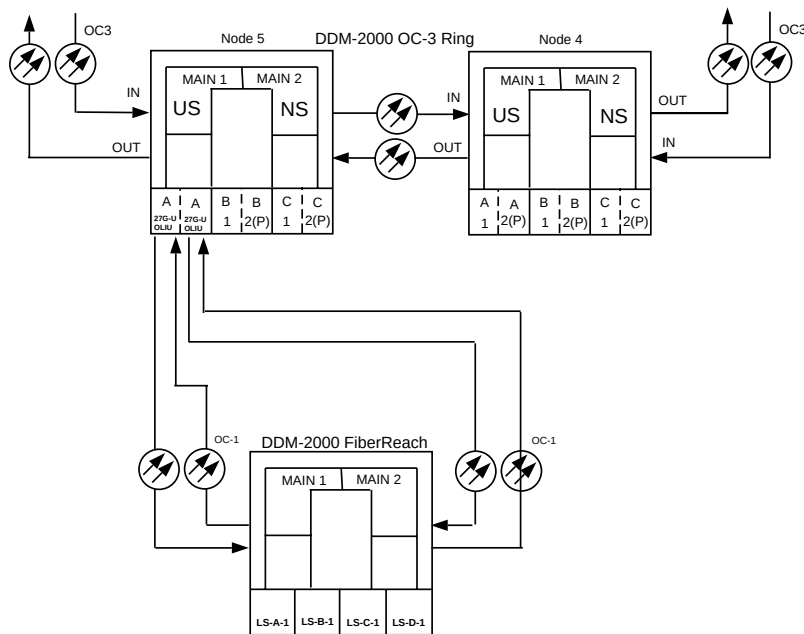
13. Repeat this procedure from Step 11 for all OC-1 optical spans back to the host OC-3 shelf.
-

14. The system is now ready for initial service to be established.
Initial DS1 Service **[System Turnup: NTP-004]**
-



DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
22-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2	FN-A dcc-a		FN-B dcc-b		FN-C dcc-c	
	US	NS	NS		NS		NS	
27-Type OLIUs	MAIN-1 dcc-m1-1	MAIN-2 dcc-m2-1	FN-A-1 dcc-a1-1	FN-A-2 dcc-a2-1	FN-B-1 dcc-b1-1	FN-B-2 dcc-b2-1	FN-C-1 dcc-c1-1	FN-C-2 dcc-c2-1
	dcc-m1-2	dcc-m2-2	dcc-a1-2	dcc-a2-2	dcc-b1-2	dcc-b2-2	dcc-c1-2	dcc-c2-2
	US	NS	NS	US	NS	US	NS	US



DDM-2000 FiberReach DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)		
26-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2
	US	NS

Figure 2. Example of User Side/Network Side Value Settings

Establish Dual-Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

-  **NOTE 2:**
It is assumed that all DDM-2000 OC-3 shelves in the system have passed the looped transmission test(s). [**System Turnup: NTP-016**] and the host DDM-2000 OC-3 ring has been established [**System Turnup: NTP-022**] with software to support DDM-2000 FiberReach applications. It is also assumed the DDM-2000 FiberReach shelf(ves) has been equipped and tested using DDM-2000 FiberReach documentation (363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*, **System Turnup: NTP-007**).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine the network configuration (for example, see Figures 1 and 2.)

2. Verify the host DDM-2000 OC-3 shelves (for example, Figures 1 and 2, nodes 4 and 5) are equipped with Release 9 or later ring software. If not equipped with Release 9 or later software, upgrade the DDM-2000 OC-3 host shelves with proper software.
-

3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

4.  **NOTE 1:**

The **rtrv-eqpt:** command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

-  **NOTE 2:**

If work order or office records do not specify **OLI** types, refer to 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers, Applications, Planning, and Ordering Guide* and/or 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of **OLI** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

At the host OC-3 nodes, verify/install **26G2-U** or **27G-U/27G2-U OLIU** circuit packs in **FUNCTION UNITS** (A, B, or C) slots being used for FiberReach access.

DLP-504

5. **NOTE:**

If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **set-fecom:address:com=disable** command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIUs** just installed.

DLP-505

6. **NOTE:**

The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans. For example, see Figure 3.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of OC-1 optical span being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm. Two or more shelves in the same network designated as a DSNE (set by the **set-ne** command) will cause a "duplicate DSNE" alarm.

Verify no duplicate TBOS, site/ne, TID or DSNE settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "dupLiCate DSNE" alarm will occur. The DSNE must not be a FiberReach shelf. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

Use the **set-ne:** command to designate ONE shelf as the DSNE.

Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **NOTE 1:**

In dual homing configurations, **OLIU** circuit packs must be installed in the correct slots in the host OC-3 nodes to support the direction of traffic required. For example, see Figures 1 and 2. In Figure 1, if a **26G2-U** or **27G-U/27G2-U OLIU** is installed in Node 5, **FUNCTION UNITS A**, slot **1**, traffic will be routed toward Node 6 when cross-connections are made. The other end of the associated OC-1 ring must be connected to a **26G2-U** or **27G-U/27G2-U OLIU** installed in slot **2(P)** of the **FUNCTION UNITS** group () being used to terminate the OC-1 line (for example, Node 4 in Figure 1). Traffic from Node 4 will then be directed toward Node 3 when cross-connections are made. In Figure 2, note that all traffic from the FiberReach shelf will be directed to Node 7 because of the slot positions that terminate the OC-1 line.

 NOTE 2:

A dual-homed ring configuration requires that the first FiberReach **MAIN-1 OLIU** connect to **FUNCTION UNITS () 1 OLIU** on one host OC-3 shelf. The last FiberReach **MAIN-2 OLIU** connects to the **FUNCTION UNITS () 2(P) OLIU** on the other host OC-3 shelf. Intermediate FiberReach shelves on the same OC-1 ring connect from **MAIN-2 OLIU** at one FiberReach shelf to the **MAIN-1 OLIU** at an adjacent FiberReach shelf (node). For example, see Figure 4. This procedure will establish the ring configuration starting from one OC-3 host node (near end) and continuing to an adjacent FiberReach node, then to the next FiberReach node until the final connection is made from the last FiberReach node to the remaining OC-3 host node.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

All unused ports on the **27G-U/27G2-U OLIU** must be set to **nmon** with the **set-state-oc1** command.

At the near end OC-3 host node, remove the optical loop from the **26G2-U** or **27G-U/27G2-U OLIU** OC-1 line (**1** or **2**) being used for the OC-1 ring configuration (for example, in Figure 4, OC-3 shelf Node 5, slot **FUNCTION UNITS A 1**, OC-1 line **1**.) At the other end of the optical span being established, remove the optical loop from the associated **OLIU**. (for example, in Figure 4, FiberReach **MAIN-1 OLIU**.)

10. ⇒ **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set-fecom:** command **at each shelf** to enable far end communications.

At each shelf, use the **set-fecom:address:com=enabled** command to ensure far end communications (fecom) is enabled.

-
11. Perform optical fiber connections and verification of the integrity of the optical span being established.
-

DLP-514

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. **⇒ NOTE:**

The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-1 lines terminated on the system.

Perform end-to-end OC-1 line test.

DLP-556

-
13. Repeat this procedure from Item 11 for all OC-1 optical spans being established in the DDM-2000 OC-3/OC-1 network. Ensure that the last optical span connected to the OC-3 host shelf is connected to an **OLI** in the opposite slot as the one in the first host OC-3 (for example, slot **2(P)** at one node and slot **1** at the other node).

-
14. The dual-homed FiberReach access network is now ready for initial service to be established.
Initial DS1 Service [**System Turnup: NTP-004**]
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

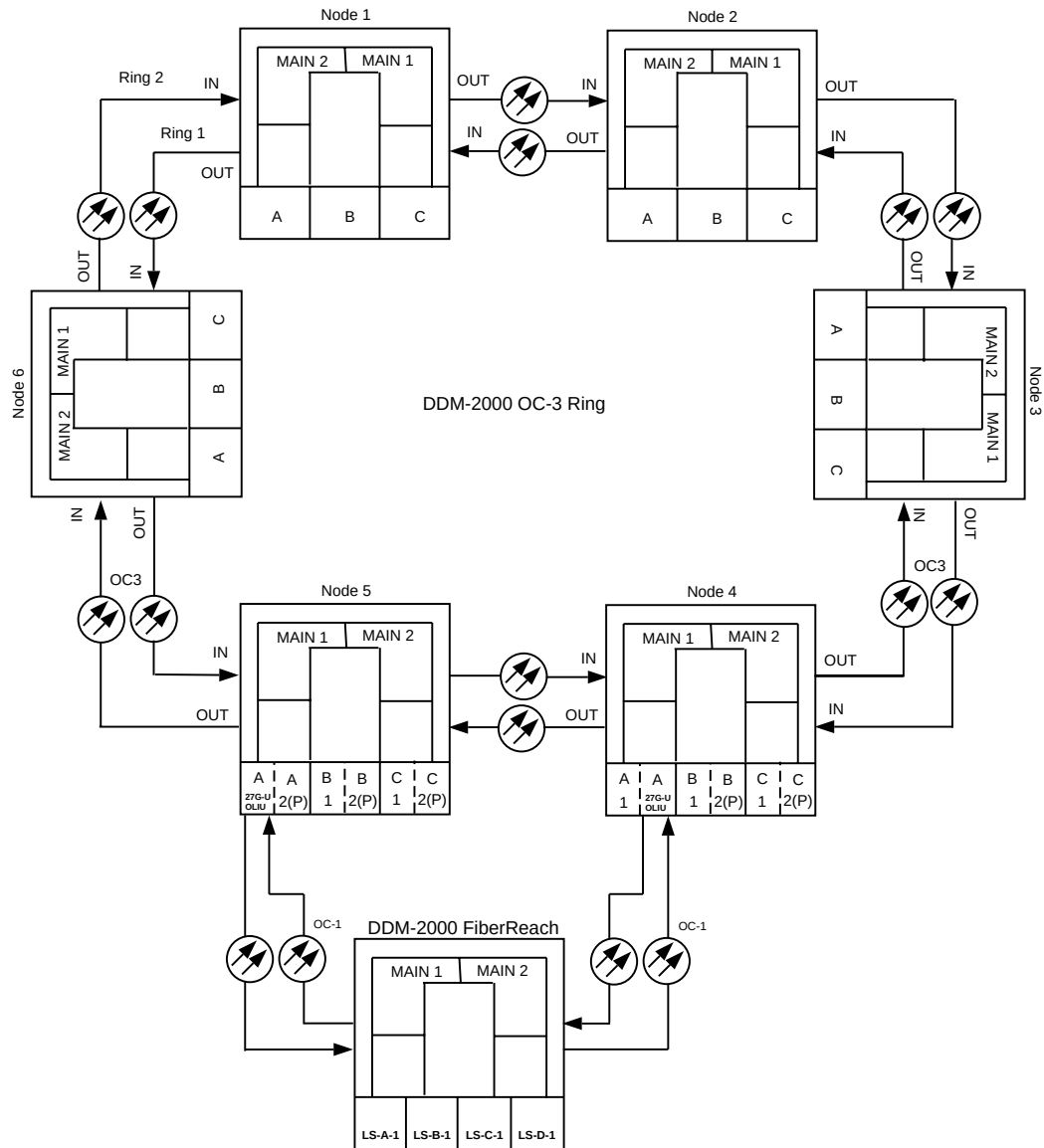


Figure 1. Example Dual-Homed OC-1/OC-3 Ring Configuration

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

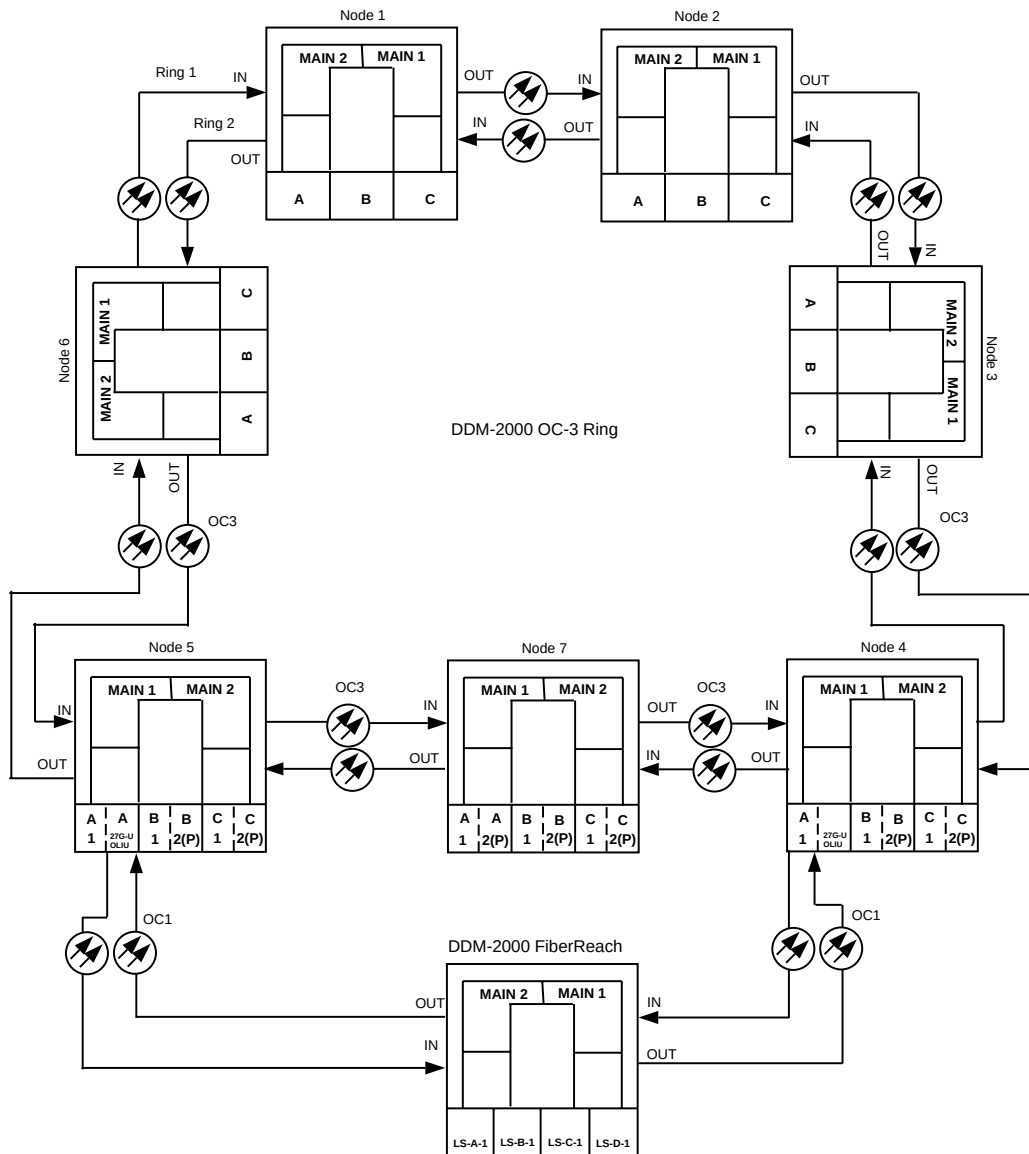
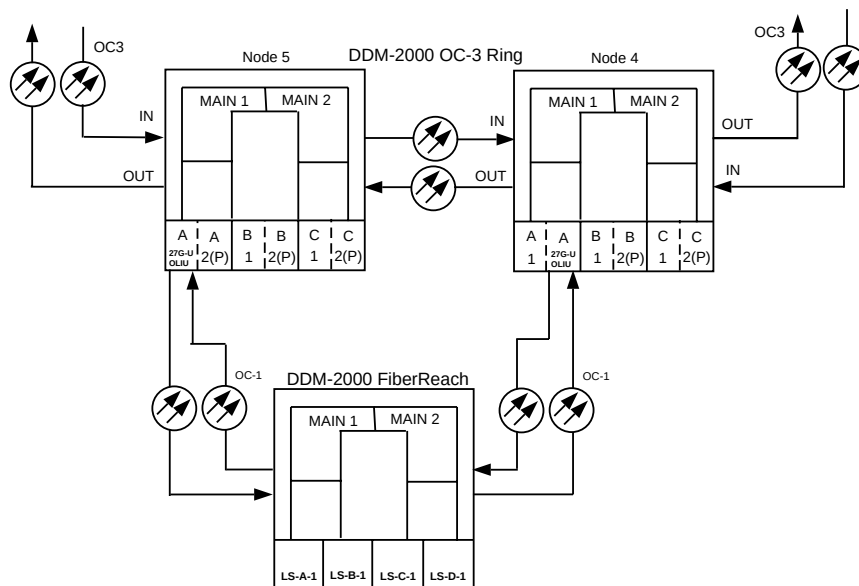


Figure 2. Example Dual-Homed OC-1/OC-3 Ring Configuration

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
22-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2	FN-A dcc-a		FN-B dcc-b		FN-C dcc-c	
	US	NS	NS		NS		NS	
27-Type OLIUs	MAIN-1 dcc-m1-1 dcc-m1-2	MAIN-2 dcc-m2-1 dcc-m2-2	FN-A-1 dcc-a1-1 dcc-a1-2	FN-A-2 dcc-a2-1 dcc-a2-2	FN-B-1 dcc-b1-1 dcc-b1-2	FN-B-2 dcc-b2-1 dcc-b2-2	FN-C-1 dcc-c1-1 dcc-c1-2	FN-C-2 dcc-c2-1 dcc-c2-2
	US	NS	NS	US	NS	US	NS	US



DDM-2000 FiberReach DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)		
26-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2
	US	NS

Figure 3. Example of User Side/Network Side Value Settings

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

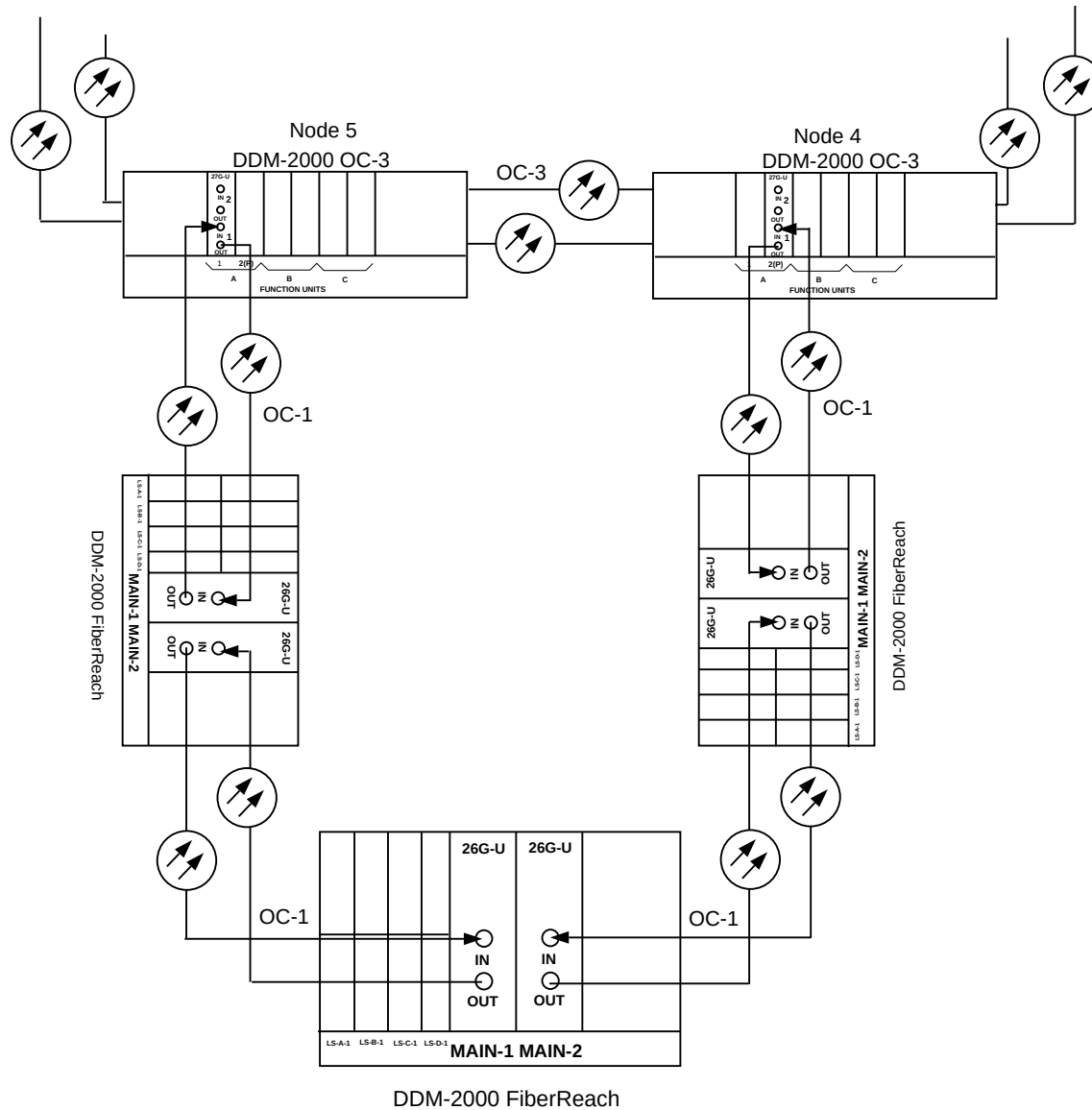


Figure 4. Example of Dual-Homed OC-1/OC-3 Ring Configuration Connections

Establish Stand-Alone FiberReach Access via DDM-2000 OC-3 Host Shelf

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

 **NOTE 2:**
It is assumed that the DDM-2000 OC-3 shelf in the system has passed the looped transmission test(s) (**System Turnup: NTP-016**). It is also assumed the DDM-2000 FiberReach shelves have been equipped and tested (363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*, **System Turnup: NTP-007**).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine the network configuration (for example, see Figure 1.)

2. Verify that the host DDM-2000 OC-3 shelf is equipped with Release 9 or later ring software. If not equipped with Release 9 or later software, upgrade the DDM-2000 OC-3 host shelf with proper software
-

3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

4.  **NOTE:**
The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans. For example, see Figure 2.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5.  **CAUTION:**
*Stand-alone OC-3 shelves can be timed from an external source, set as free-running, or line timed from **FUNCTION UNITS C** OC-3 slot. Stand-alone OC-3 shelves cannot be line timed from the **MAIN** slots. Therefore, if the OC-3 shelf is to be line timed, the **set-sync:src=fn-c** must be used to derive timing from the **FUNCTION UNITS C** slot, if equipped.*

 **NOTE 1:**
At the OC-3 shelf, if line timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.

 **NOTE 2:**
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

 **NOTE 3:**
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. Use the **set-sync:** command to set the OC-3 synchronization source, if required.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "dupLiCate DSNE" alarm will occur. The DSNE must not be a FiberReach shelf. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

Use the **set-ne:** command to designate ONE shelf in the network as the DSNE, if not already done.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

This standalone ring configuration requires that the **MAIN 1 OLIU** on the OC-3 shelf connect to the **MAIN-2 OLIU** at the first FiberReach shelf from the OC-3 shelf. **MAIN-1 OLIU** at the FiberReach shelf (node) connects to the **MAIN-2 OLIU** at an adjacent FiberReach shelf (node). The **MAIN-1 OLIU** at the last FiberReach shelf on the OC-1 ring connects to **MAIN 2(P) OLIU** on the host OC-3 shelf. See Figure 1. This procedure will establish the ring configuration starting from the OC-3 host node (near end) to the first FiberReach node, then continuing to the next node until the final connection is made from the last FiberReach node back to the host OC-3 node.

 NOTE 2:

All unused ports on the **27G-U/27G2-U OLIU** must be set to **nmon** with the **set-state-oc1** command.

At the near end, remove the optical loop from the **26G2-U** or **27G-U/27G2-U OLIU** OC-1 line (**1** or **2**) (for example in Figure 1, OC-3 shelf **MAIN 1**, OC-1 line **1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated **OLIU** (for example, in Figure 1, FiberReach **MAIN-2 OLIU**).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set - fecom:** command **at each shelf** to enable far end communications.

At each shelf, use the
set - fecom: address:com=enabled command to
ensure far end communications (fecom) is enabled.

-
10. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**
-

11. **NOTE:**

The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-1 lines terminated on the system.

Perform end-to-end OC-1 line test. **DLP-556**

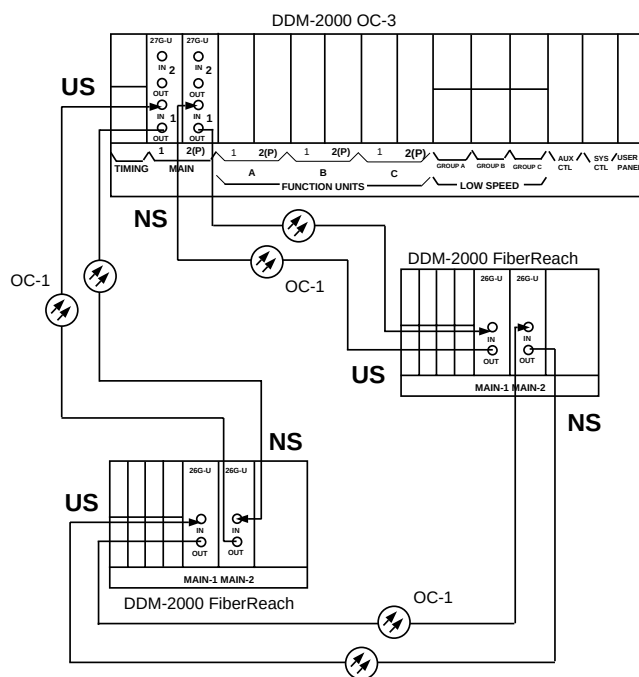
12. Repeat this procedure for all OC-1 optical spans back to the host OC-3 shelf.
-

13. The system is now ready for initial service to be established.
Initial DS1 Service **[System Turnup: NTP-004]**
-

Figure 1. Example Stand-Alone OC3/OC1 Configuration Connections

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
22-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2	FN-A dcc-a		FN-B dcc-b		FN-C dcc-c	
	US	NS	NS		NS		NS	
27-Type OLIUs	MAIN-1 dcc-m1-1	MAIN-2 dcc-m2-1	FN-A-1 dcc-a1-1	FN-A-2 dcc-a2-1	FN-B-1 dcc-b1-1	FN-B-2 dcc-b2-1	FN-C-1 dcc-c1-1	FN-C-2 dcc-c2-1
	dcc-m1-2	dcc-m2-2	dcc-a1-2	dcc-a2-2	dcc-b1-2	dcc-b2-2	dcc-c1-2	dcc-c2-2
	US	NS	NS	US	NS	US	NS	US



DDM-2000 FiberReach DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)		
26-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2
	US	NS

Figure 2. Example of User Side/Network Side Value Settings

Upgrade DDM-2000 OC-3 Release 6 to Release 8 or Release 7.1 or 7.2 to Release 9 or 11 System In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and is being upgraded from Release 6 software to Release 8 or Release 7.1 or 7.2 software to Release 9 or 11. Releases 8 and 9 or later software require that a new **BBG8/BBG8B SYSCTL** and a **BBG9 OHCTL** be installed in the shelf. This procedure must be performed locally at all shelves in the same control network.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use the **rtrv-alm** command to verify that no alarms, locks, loops, or switches are present.

-
2. Notify maintenance center that alarms will be generated.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3.  **CAUTION:**
*Both **TGS** circuit packs must be installed before performing this procedure. During this procedure, downloading Release 8.x, 9.x, or 11.x software to a shelf running OC-3 Releases 6.x or 7.x requires you to remove the **TGS** circuit pack in **TIMING** slot 1 in order to "force" the system to run the new software. If both **TGS** circuit packs are not installed, removal of the only **TGS** circuit pack will cause service interruption.*

 **NOTE 1:**
If upgrading from a Release 6 system to a Release 8 system or a Release 7.1 system to a Release 9 or 11 system, after the first shelf is upgraded, single ended operations will not be available and major alarms (section DCC channel failed) will exist until all shelves are upgraded.

 **NOTE 2:**
This procedure will not affect transmission when properly performed.

Before performing this procedure on an in-service system, ensure that both **TGS** circuit packs are installed in the shelf and use the
switch-sync:s=circuitpack,pri>manual
command to switch to the protection **TGS** circuit pack in **TIMING** slot 2, if not already **ACTIVE**. Use
rtrv-sync: command to verify that the **TGS** circuit pack in **TIMING** slot 2 is **ACTIVE**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. From system records, work orders, or the retrieve [RTRV-()] commands, retrieve all parameters that might have been set using the SET commands [DLP-512]. See the "Commands and Reports" section of this manual for a description of the **rtrv-()** commands. Note all the parameters that are set using the **set-ne** and **set-fecom** commands. These parameters may have to be reset when the controllers are replaced and the new software is installed.

-
5. If upgrading from Release 6 to Release 8 or Release 7.1 to Release 9 or 11, use the **set-ne:gne=no** command to discontinue the GNE shelf in the R6 linear or R7.1 ring.
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

6.  **CAUTION:**
*Removing the **BBG5 SYSCTL** without performing a 10-second countdown sequence on the **FE ID** display (see **Note**) may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

 **NOTE:**
Before removing the **SYSCTL**, you must momentarily depress the **ACO** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

Remove **BBG5 SYSCTL** circuit pack.

-
7. Remove **BBG7 OHCTL** circuit pack.

-
8. Install **BBG9 OHCTL**. **DLP-500**
-

9.  **NOTE 1:**
If upgrading from Release 6 to Release 8 or Release 7.1 to Release 9 or 11 (all shelves), after the software download is successfully completed, the **FAULT** LED on the **OHCTL** will flash and the **MJ** LED will be lighted until the other end is upgraded.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

Users who receive software upgrades or new **SYSCTL** circuit packs from the factory may find that a new default login (LUC01, LUC02, or LUC03) is needed to allow access into the system. If none of the new default logins permits access to the system, the user should try one of the old default logins (ATT01, ATT02, ATT03). The default password is DDM-2000.

Install new **BBG8/BBG8B SYSCTL**.

DLP-501

10. **CAUTION:**

*Do not designate any shelf as the DSNE (Step 12) until all shelves in the network have been upgraded to the new software. Designating the DSNE first will prevent the other nodes from completing the **set -ne** command.*

⇒ **NOTE:**

Parameters that were previously set by switches on the **BBG7 OHCTL** and **BBG5 SYSCTL** are set by software commands on the new **BBG9 OHCTL** and **BBG8/BBG8B SYSCTL** controllers: **TID, Site, NE, Shelf, PMN, TBOS, CO/RT, Network Side/User Side (NS/US)** parameters.

Use the **set -ne** and **set -fecom** commands to set these parameters on the new controllers: **TID, Site, NE, Shelf, PMN, TBOS, CO/RT, Network Side/User Side (NS/US)**. If other parameters have to be reset from default during this upgrade, use the Commands and Reports section of this manual for a description of the **set -** commands.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. Repeat this procedure from Step 2 for all shelves being upgraded, if not already performed.
-
12. After all shelves have been upgraded to new software, use the **set-ne:agne=yes** command to designate one shelf as the AGNE.
-
13. After all shelves have been upgraded to new software, use the **set-ne:dsne=yes** command to designate one shelf as the DSNE.
-

Establish Single-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

 **NOTE 2:**
It is assumed that the FT-2000 in the system have passed local tests and the FT-2000 ring has been established. It is also assumed the DDM-2000 OC-3 shelves have been equipped and tested (363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual (TOP)—Volume II, System Turnup: NTP-016*).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 3:

This procedure is used to establish a single-homed DDM-2000 OC-3 ring connection to an FT-2000 ring (See Figure 1). Other configurations may have to be established to obtain your final configuration. See **NTP-048** for dual-homed configurations and **NTP-049** for single OC-3 optical extensions from the FT-2000 low speed interface (**LS INTFC**) ports.

Determine the network configuration (for example, see Figure 1.)

-
2. Verify that the host FT-2000 OC-48 shelf is equipped with Release 6 or later ring software. If not equipped with Release 6 or later software, upgrade the FT-2000 OC-48 host shelf with proper software. Verify that the DDM-2000 OC-3 shelves are equipped with Release 7.2, 9.0 or later ring software.

-
3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

4. **NOTE:**

FAULT LEDs will not go off until fibers are connected to the DDM.

Verify/Add OC-3/IS-3 Low Speed Slots at the host FT-2000 shelves. (365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**).

5. At the FT-2000, verify/provision the FT-2000 low speed OC-3 slots Protection Mode (from OC-3) Parameter to *0X1* (See **CONFIGURATION-Set -OC3** command in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Provision Low Speed Slot and Port Parameters, DLP-517**.)
-

6. At the FT-2000, verify/assign DCC channels to FT-2000 low speed OC-3 slots. (See **CONFIGURATION-Enter -Assignment -DCC** command in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Provision Low Speed Slot and Port Parameters, DLP-517**.)
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **⇒ NOTE 1:**

This procedure will establish the OC-3 ring configuration starting from the FT-2000 host node (far end) to the first OC-3 node (near end), then continuing to the next OC-3 node until the final connection is made from the last OC-3 node back to the host FT-2000 node.

⇒ NOTE 2:

The Network Side (NS)/User Side (US) parameters of the OC-3 **set-fecom:** command and the FT-2000 DCC orientation must be set opposite at each end of the optical spans. For example, see Figure 2.

Use the **rtrv-fecom/set-fecom** command at the DDM-2000 or the **CONFIGURATION-Enter-Assignment-DCC** command at the FT-2000 to verify/set "Network Side/User Side" parameters at each end of all optical spans being established.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-3 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

 NOTE 2:

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

 NOTE 3:

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on DDM-2000 **TGS** circuit packs to the timing mode specified in work order or office records.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. ➤ **NOTE 1:**
If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the OC-3 **main-1** and **main-2** optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring.

- **NOTE 2:**
The **rtrv-oc3:** command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual and the OC-3 manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the "OC-3 Line Provisioning Report". Use the **set-oc3:** command to enable the Kbyte/Sbyte parameter, if required.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

10. ➤ **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.
- **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed OC-3 node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed OC-3 nodes.
- **NOTE 3:**
The **rtrv-sync:** command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual and the OC-3 manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed OC-3 node. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. **⇒ NOTE 1:**

The DDM-2000 **set-ne:** command designates a DDM-2000 shelf as the directory service network element (DSNE). **One**, and only one, shelf in the DDM-2000/FT-2000 network **must** be provisioned as a DSNE. It is recommended that a DDM-2000 shelf be provisioned as the DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

⇒ NOTE 3:

It is recommended that the DSNE be changed from an FT-2000 node to a DDM-2000 node, discontinue the FT-2000 DSNE and use the **reset** command to reset the DDM-2000 DSNE node.

Use the **set-ne:** command to designate ONE shelf in the DDM-2000 network as the DSNE, if the DSNE is going to be a DDM-2000 shelf.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **NOTE:**

If auto reconfiguration is enabled, the DDM-2000 shelf that will connect to the FT-2000 via the **MAIN 1** should be the first of the DDM-2000 ring to connect to the FT-2000. If the DDM-2000 shelf connecting to FT-2000 via **MAIN 2(P)** is connected first, the DDM-2000 shelf will remain in holdover as will all other subsequent DDM-2000 shelves in the ring until the shelf connecting to the FT-2000 via **MAIN 1** is connected.

At the near end, remove the optical loop from the **MAIN OLIU** (for example in Figure 2, OC-3 node 2 **MAIN 1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated FT-2000 **OLIU** (for example, in Figure 2, FT-2000 **LS INTFC 1A** slot).

14. **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set - fecom:** command **at each shelf** to enable far end communications.

At each DDM-2000 shelf, use the **set - fecom: address:com=enabled** command to ensure far end DCC communications (fecom) is enabled.

At each FT-2000 shelf, use the **SECURITY-Set -Far End Communications:** command to ensure far end DCC communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**
-

16.  **NOTE:**
The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-3 lines terminated on the system.

Perform end-to-end OC-3 line test. **DLP-515**

17. Repeat this procedure from Item 15 for all OC-3 optical spans until the OC-3 ring is complete back to the host FT-2000 shelf.
-

18.  **NOTE:**
Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The single-homed DDM-2000 OC-3 access network is now ready for initial service to be established. For service terminations on a FT-2000 shelf, use the procedures in the FT-2000 User/Service Manual to establish those services. For DS1, DS3, and/or EC-1 terminations on a DDM-2000 OC-3 shelf, use the procedures in this User/Service manual to establish those services.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

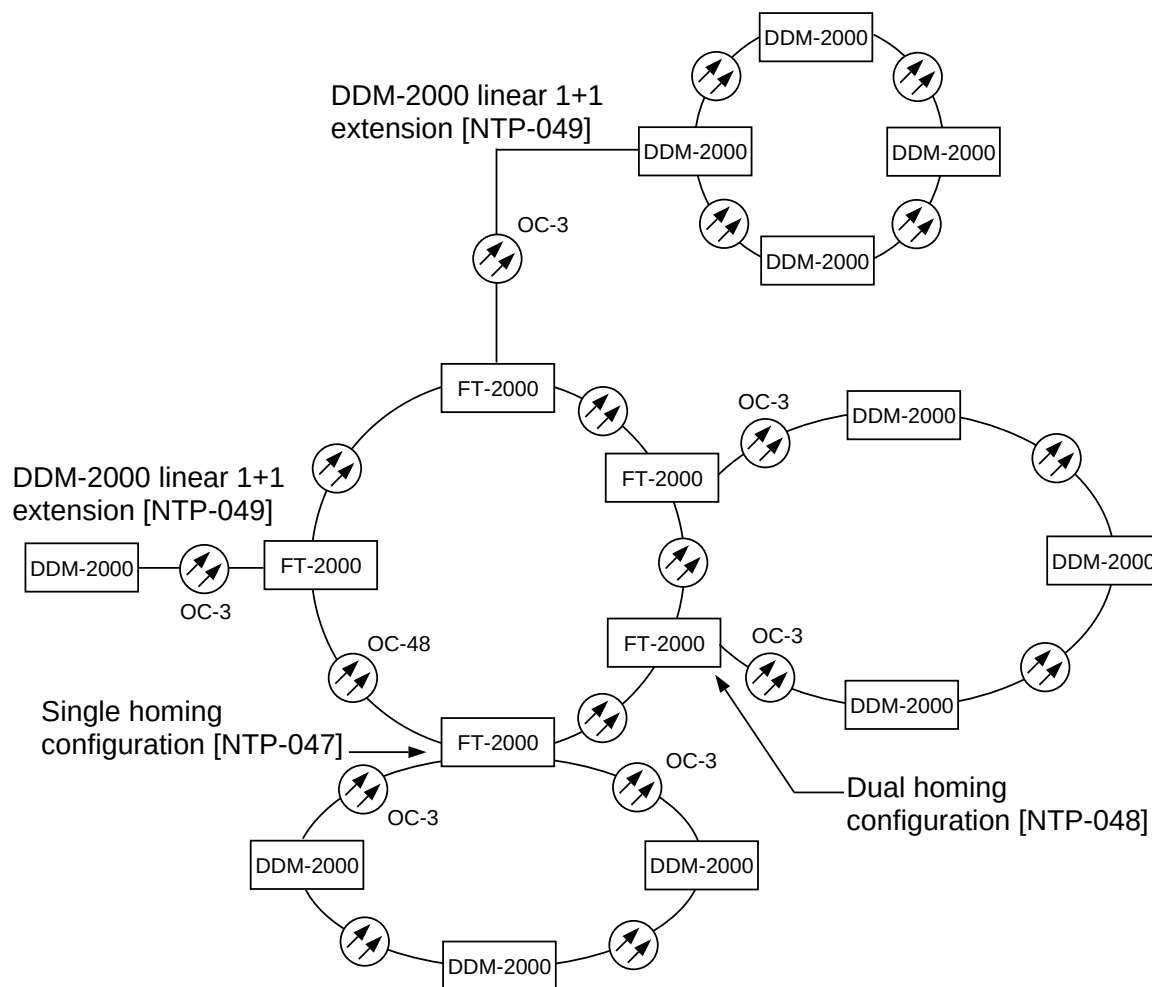
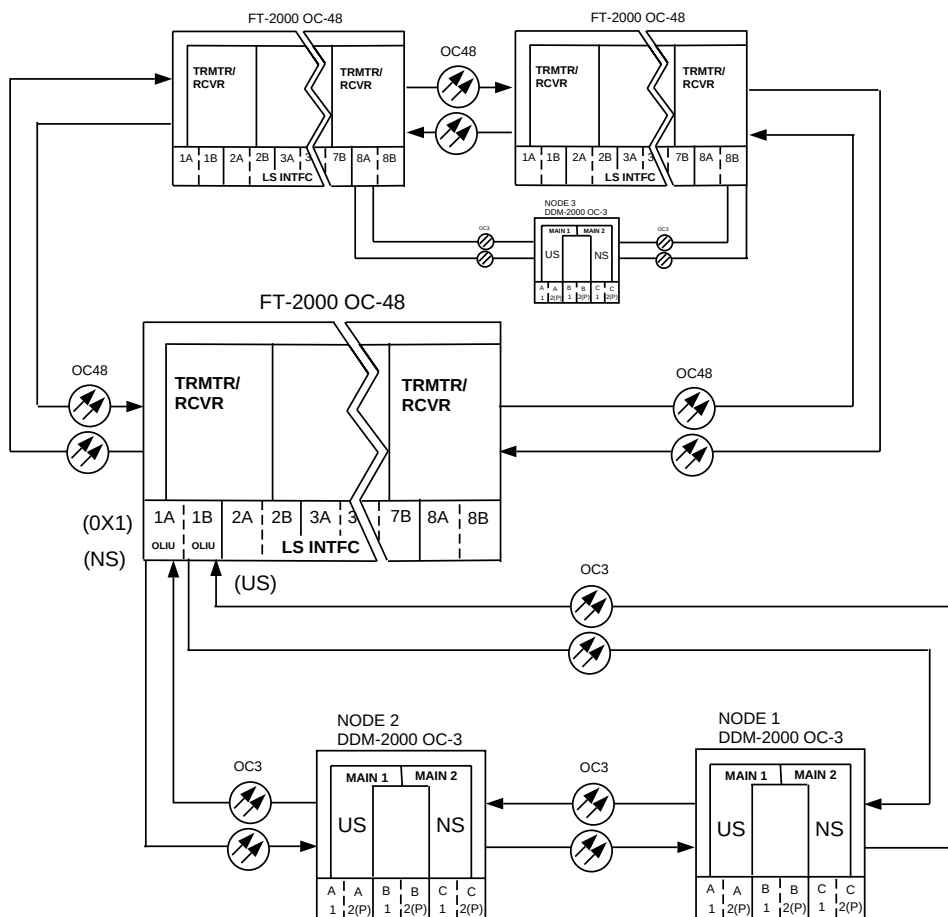


Figure 1. Example FT-2000 OC-48/DDM-2000 OC-3 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)					
22-Type OLIUs (0X1 Rings application)	MAIN 1 dcc-m1	MAIN 2 dcc-m2	FN-A dcc-a	FN-B dcc-b	FN-C dcc-c
	US	NS	NS	NS	NS

Figure 2. Example of Single Homed User Side/Network Side Value Settings

Establish Dual-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

 **NOTE 2:**
It is assumed that the FT-2000 in the system have passed local tests and the FT-2000 ring has been established. It is also assumed the DDM-2000 OC-3 shelves have been equipped and tested (363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual (TOP)—Volume II, System Turnup: NTP-016*).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 3:

This procedure is used to establish a dual-homed DDM-2000 OC-3 ring connection to an FT-2000 ring (See Figure 1). Other configurations may have to be established to obtain your final configuration. See **NTP-047** for single-homed configurations and **NTP-049** for single OC-3 optical extensions from the FT-2000 low speed interface (**LS INTFC**) ports.

Determine the network configuration (for example, see Figure 1.)

-
2. Verify that the host FT-2000 OC-48 shelves are equipped with Release 6 or later ring software. If not equipped with Release 6 or later software, upgrade the FT-2000 OC-48 host shelves with proper software. Verify that the DDM-2000 OC-3 shelves are equipped with Release 7.2, 9.0 or later ring software.
-
3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4.  **NOTE:**
FAULT LEDs will not go off until fibers are connected to the DDM.

Verify/Add OC-3/IS-3 Low Speed Slots at the host FT-2000 shelves. (See 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual, Add OC-3/IS-3 Low Speed Slot(s), NTP-010*).

-
5. At the FT-2000, verify/provision the FT-2000 low-speed OC-3 slots Protection Mode (from OC-3) Parameter to "0X1". (See **CONFIGURATION-Set-OC3** command in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual, Provision Low Speed Slot and Port Parameters, DLP-517*.)

-
6. At the FT-2000, verify/assign DCC channels to FT-2000 low-speed OC-3 slots. (See **CONFIGURATION-Enter-Assignment-DCC** command in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual, Provision Low Speed Slot and Port Parameters, DLP-517*.)
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **⇒ NOTE 1:**

This procedure will establish the OC-3 ring configuration starting from one FT-2000 host node (far end) to the first OC-3 node (near end), then continuing to the next OC-3 node until the final connection is made from the last OC-3 node to the other host FT-2000 node.

⇒ NOTE 2:

The Network Side (NS)/User Side (US) parameters of the DDM-2000 OC-3 **set-fecom:** command and the FT-2000 DCC orientation must be set opposite at each end of the optical spans. For example, see Figure 2.

Use the **rtrv-fecom** command at the DDM-2000 to retrieve DCC parameters. Use **set-fecom:nsus=NS/US** command at the DDM-2000 to set "Network Side (NS)/User Side (US)" parameters at each end of all optical spans being established. Use the **CONFIGURATION-Enter-Assignment-DCC** command at the FT-2000 to assign DCC channels.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-3 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

 NOTE 2:

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

 NOTE 3:

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on DDM-2000 **TGS** circuit packs to the timing mode specified in work order or office records.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9.  **NOTE 1:**
If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the OC-3 **main-1** and **main-2** optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring.

-  **NOTE 2:**
The **rtrv-oc3:** command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual and the OC-3 manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the "OC-3 Line Provisioning Report". Use the **set-oc3:** command to enable the Kbyte/Sbyte parameter, if required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10.  **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

-  **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed OC-3 node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed OC-3 nodes.

-  **NOTE 3:**
The **rtrv-sync:** command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual and the OC-3 manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed OC-3 node. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. **⇒ NOTE 1:**

The DDM-2000 **set-ne:** command designates a DDM-2000 shelf as the directory service network element (DSNE). **One**, and only one, shelf in the DDM-2000/FT-2000 network **must** be provisioned as a DSNE. It is recommended that a DDM-2000 shelf be provisioned as the DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

⇒ NOTE 3:

It is recommended that the DSNE be changed from an FT-2000 node to a DDM-2000 node, discontinue the FT-2000 DSNE and use the reset command to reset the DDM-2000 DSNE node.

Use the **set-ne:** command to designate ONE shelf in the DDM-2000 network as the DSNE, if the DSNE is going to be a DDM-2000 shelf.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **NOTE 1:**

If auto reconfiguration is enabled, the DDM-2000 shelf that will connect to the FT-2000 via the **MAIN 1** should be the first of the DDM-2000 ring to connect to the FT-2000. If the DDM-2000 shelf connecting to FT-2000 via **MAIN 2(P)** is connected first, the DDM-2000 shelf will remain in holdover as will all othe subsequent DDM-2000 shelves in the ring until the shelf connecting to the FT-2000 via **MAIN 1** is connected.

At the near end, remove the optical loop from the **MAIN OLIU** (for example in Figure 1, OC-3 node 1 **MAIN 1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated FT-2000 **OLIU** (for example, in Figure 2, FT-2000 **LS INTFC 1A** slot).

14. **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set - fecom:** command **at each shelf** to enable far end communications.

At each DDM-2000 shelf, use the **set - fecom: address:com=enabled** command to ensure far end DCC communications (fecom) is enabled.

At each FT-2000 shelf, use the **SECURITY-Set -Far End Communications:** command to ensure far end DCC communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**
-

16.  **NOTE:**
The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-3 lines terminated on the system.

Perform end-to-end OC-3 line test. **DLP-515**

17. Repeat this procedure from Item 15 for all OC-3 optical spans until the OC-3 ring is complete to the other host FT-2000 shelf.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

18. **NOTE:**

Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The dual-homed DDM-2000 OC-3 access network is now ready for initial service to be established. For service terminations on a FT-2000 shelf, use the procedures in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual* to establish those services. For DS1, DS3, and/or EC-1 terminations on a DDM-2000 OC-3 shelf, use the procedures in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual (TOP)—Volume II*, to establish those services.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

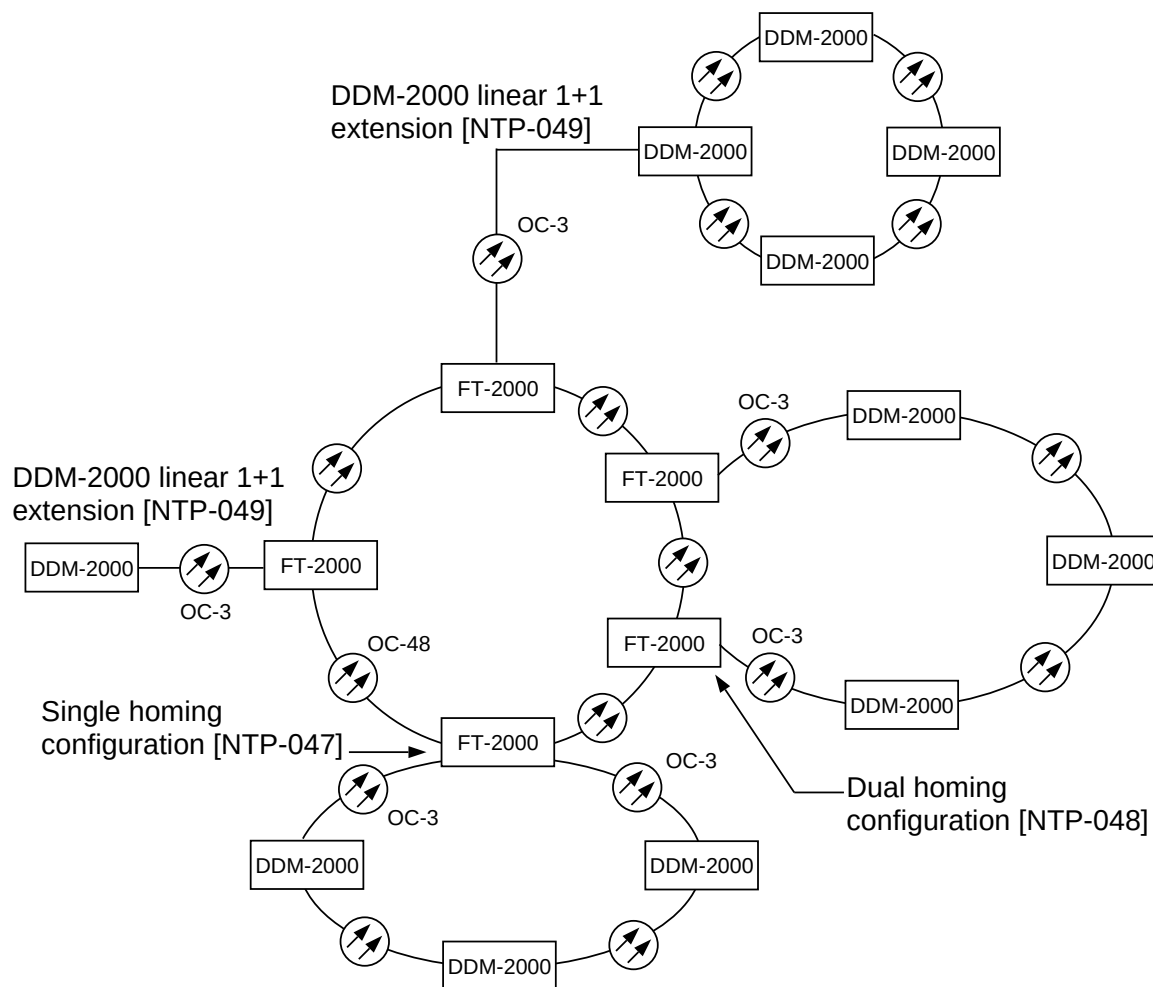


Figure 1. Example FT-2000 OC-48/DDM-2000 OC-3 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

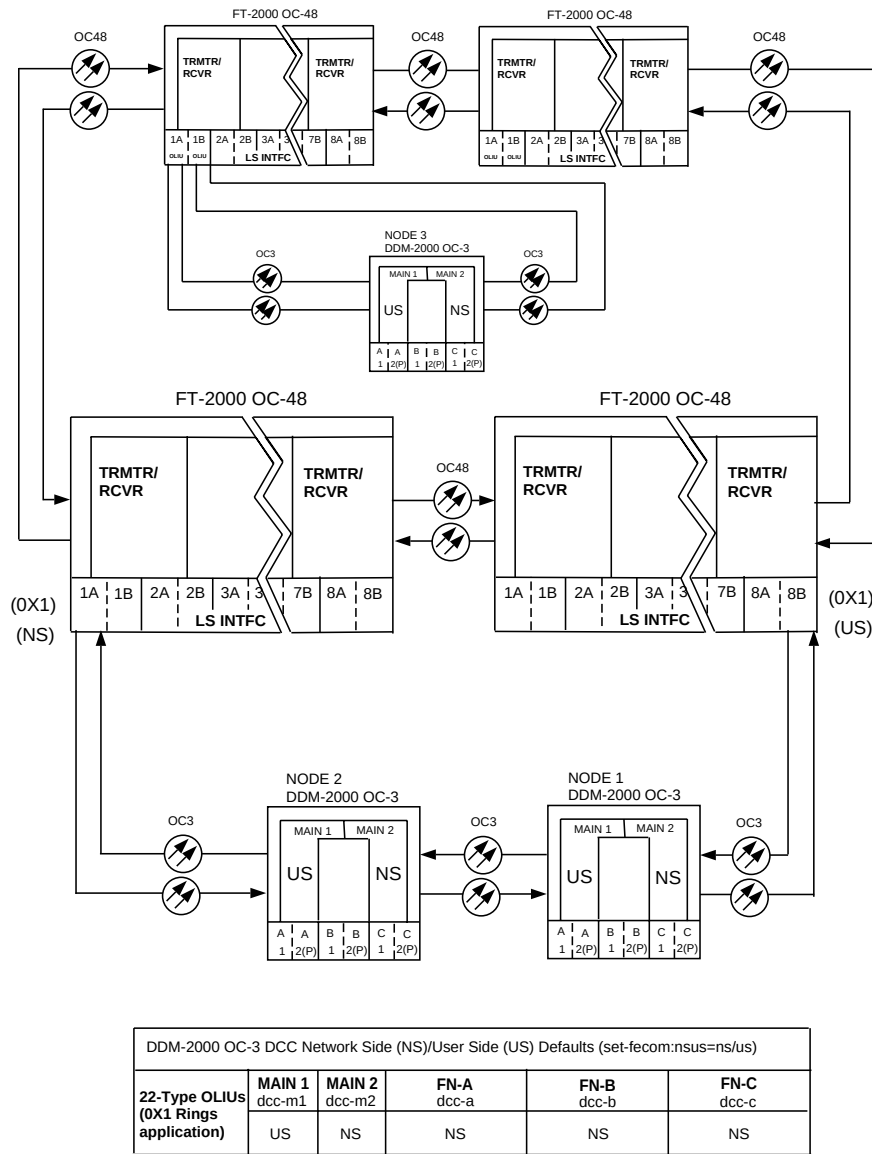


Figure 2. Example of Dual Homed User Side/Network Side Value Settings

Establish OC-3 Optical Span Linear Extension Extension Added Between FT-2000 and DDM-2000 OC-3

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the FT-2000 OC-48 ring is in service and a new OC-3 optical span is being added between the OC-48 ring and DDM-2000. See Figure 1.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use **rtrv-alm** command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

-
3.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

 **NOTE 1:**
The **rtrv-eqpt:** command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

 **NOTE 2:**
DDM-2000 OC-3 shelves must be connected through the **FUNCTION UNITS C** slots if the shelf or network is deriving timing from the OC-3 optical links to the OC-48 network. See description of the **src** parameter in **set-sync:** command in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*.

At OC-3 node, verify/install **OLIU** circuit packs in **FUNCTION UNITS** slots being used for the new OC-3 extension.

DLP-504

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4. **NOTE 1:**

If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops. The **22G-U OLIU(s)** requires a 10 dB LBO when it is looped on itself. **21G2-U** and **22G2-U/22G3-U OLIUs** require **no** attenuation when looped on themselves.

 NOTE 2:

If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **set - fecom: address: com=disable** command to disable the DCC.

Connect optical loops for **OLIUs** just installed.

DLP-505

-
5. Determine the optical loss of the optical facility from office records or by making the required measurements.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. **⇒ NOTE:**

The Network Side/User Side parameters of the OC-3 **set-fecom:** command and the FT-2000 DCC orientation must be set opposite at each end of the OC-3 optical spans. For example, see Figures 2 and 3.

Use the **rtrv-fecom/set-fecom** command at the DDM-2000 or the **CONFIGURATION-Enter-Assignment-DCC** command at the FT-2000 to verify/set "Network Side/User Side" parameters at each end of optical span being established.

-
7. If **21G/21G-U OLIUs** are used, set option switch on each **21G/21G-U OLIU** to agree with the loss of the optical facility.
-

DLP-513

8. **⇒ NOTE:**

If option switch setting is changed, an update must be performed by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is reinstalled.

Reinstall **OLIUs** (if removed) and momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **UPD** command.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. Use procedures in the FT-2000 User/Service Manual to Verify/Add OC-3 Low Speed Slots at the host FT-2000 shelf. (365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**).

(Verify/Provision the FT-2000 low speed OC-3 slots Protection Mode (from OC-3) Parameter to *1+1* if both slots are used for the extension or to *0X1* if only one slot is used.)

-
10. At DDM-2000 shelf, use the **set-fecom:address:com=enabled** command to ensure far end DCC communications (fecom) is enabled on the new OC-3 optical extension.

At FT-2000 shelf, use the **SECURITY-Set-Far End Communications:** command to ensure far end DCC communications (fecom) is enabled on the new OC-3 optical extension.

-
11. Perform OC-3 optical fiber connections and verification of the optical facility. **DLP-514**
-

12. Use **set-oc3:fn-{a,b,c, or d}:kbyte=enabled**
or
set-oc3:fn-{a,b,c, or d}:syncmsg=Kbyte/Sbyte
command to enable sync messaging for the **FUNCTION UNITS** group used for the new OC-3 optical extension.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **⇒ NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur and one of the DSNEs must be disabled. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:

It may take 6 minutes or more for the network to stabilize after one of the DSNEs is discontinued. The remaining or new DSNE must record and map all the new network elements in the network.

⇒ NOTE 3:

It is recommended that a DDM-2000 OC-3 shelf be assigned as the DSNE.

Discontinue the DSNE on the FT-2000 OC-48 ring. Use the **reset** command at DDM-2000 OC-3 DSNE to reset the node, if a DSNE was established on the DDM-2000 OC-3 ring. Use the **set-ne:TID=tid:dsne=yes** command to establish the DSNE on the DDM-2000 OC-3 ring, if no DSNE was established on the DDM-2000 OC-3 ring.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

14. **NOTE:**

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set -ne:** command to designate the AGNE(s) and alarm group numbers, as required.

15. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the **set -ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set -ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set -ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16. Perform automatic end-to-end OC-3 line test on new OC-3 optical extension. **DLP-515**
-

17.  **NOTE:**
Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The network is ready for service to be established. For service terminations on a FT-2000 shelf, use the procedures in the FT-2000 User/Service Manual to establish those services. For DS1, DS3, and/or EC-1 terminations on a DDM-2000 OC-3 shelf, use the procedures in this User/Service manual to establish those services.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

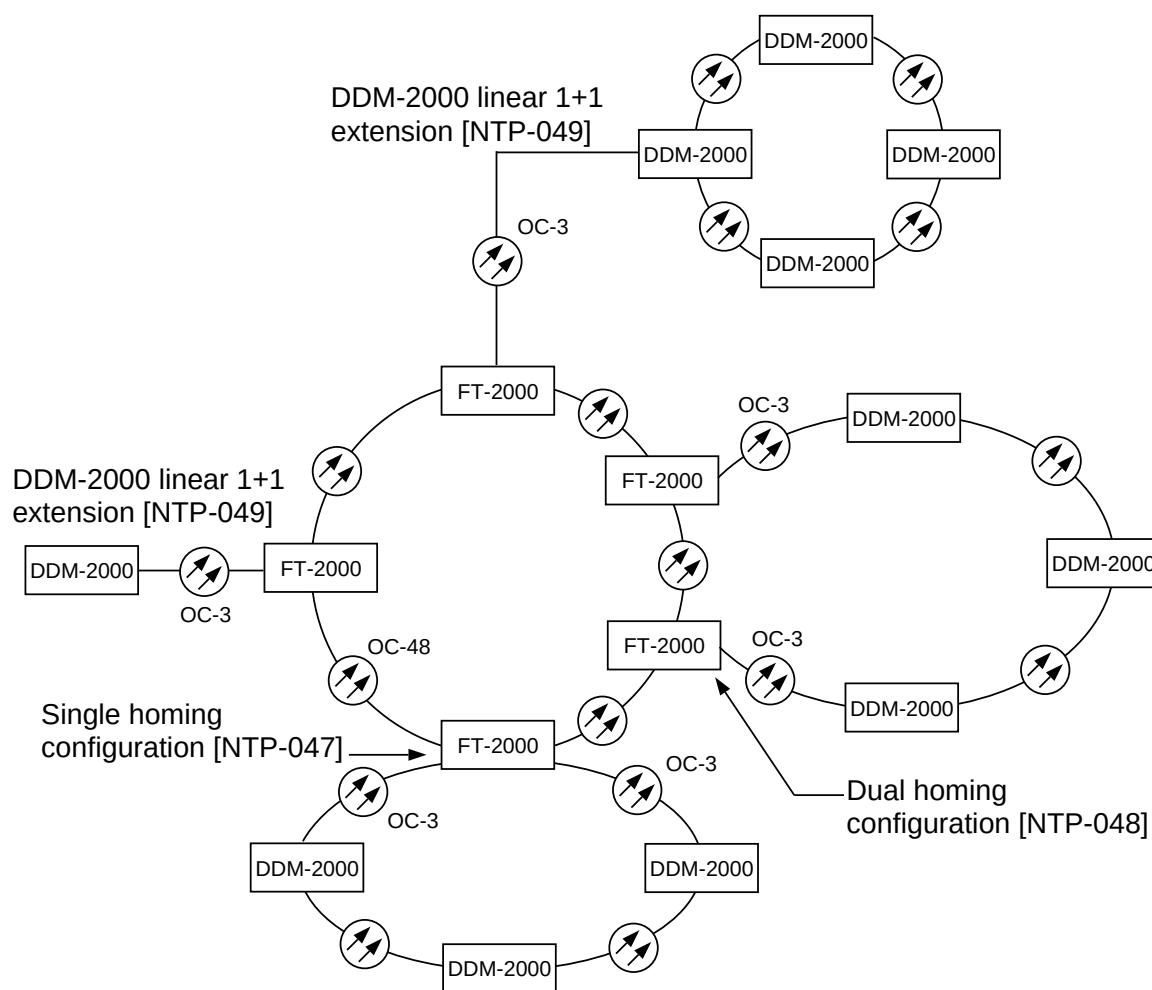
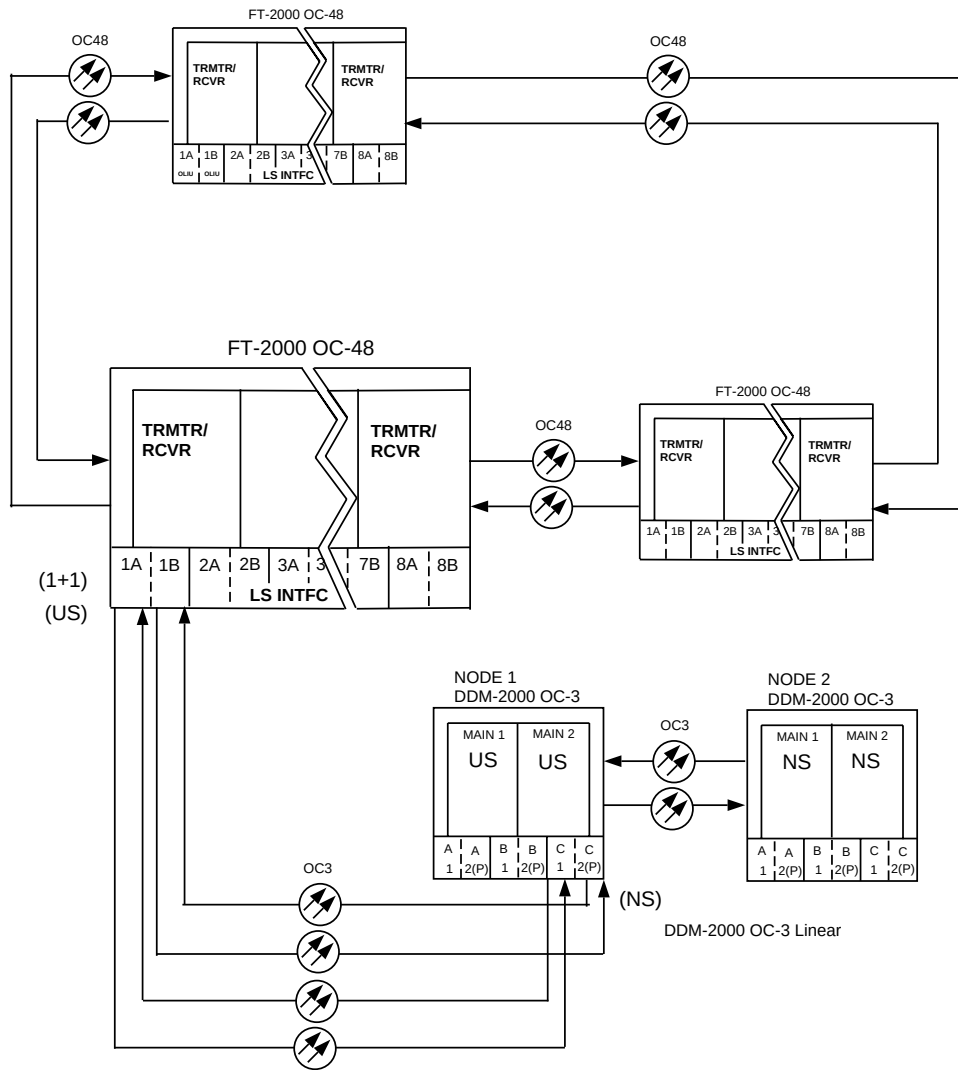


Figure 1. Example FT-2000 OC-48/DDM-2000 OC-3 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)				
22-Type/ 21-Type OLIUs (1+1 Linear application)	MAIN dcc-m	FN-A dcc-a	FN-B dcc-b	FN-C dcc-c
	US	NS	NS	NS

Figure 2. Adding New OC-3 Optical Span Extension — FT-2000/OC-3 Linear

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

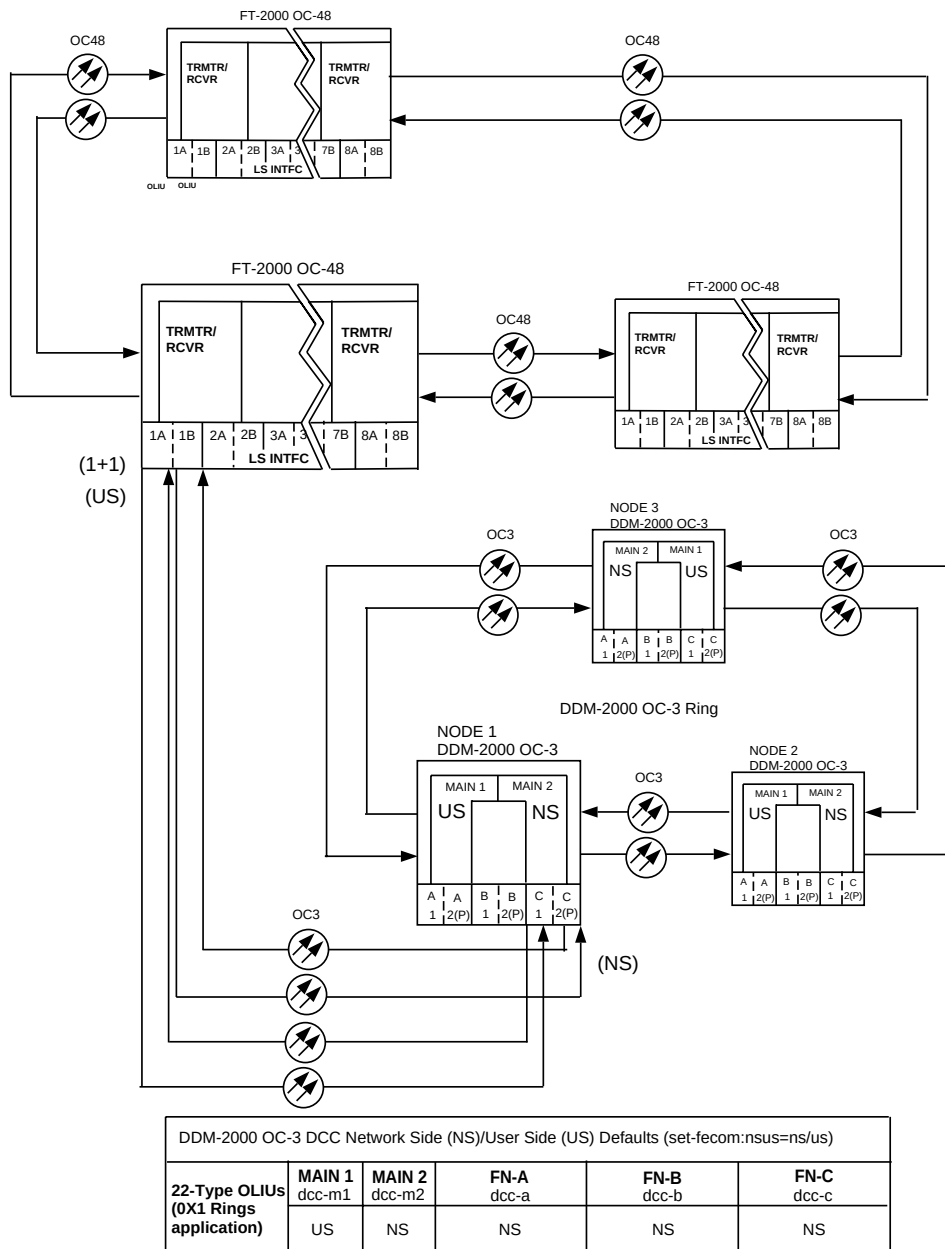


Figure 3. Adding New OC-3 Optical Span Extension — FT-2000/OC-3 Ring

Establish Dual-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

 **NOTE 2:**
It is assumed that all DDM-2000 OC-12 shelves in the system have passed the looped transmission test(s) (363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*, **System Turnup: NTP-002**) and the host DDM-2000 OC-12 ring has been established (363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*, **System Turnup: NTP-020**) with software to support DDM-2000 OC-3 optical line access. It is also assumed the DDM-2000 OC-3 shelves have been equipped and tested, **System Turnup: NTP-016**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine the network configuration (for example, see Figures 1 and 2.)

2. Verify the host DDM-2000 OC-12 shelves (for example, Figures 1 and 2, Nodes 4 and 5) are equipped with Release 5 or later ring software. If not equipped with Release 5 or later software, upgrade the DDM-2000 OC-12 host shelves with proper software. Verify that the DDM-2000 OC-3 shelf is equipped with Release 9 or later software. **DLP-531**
-

3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

4.  **NOTE 1:**
The "**rtrv-eqpt**:" command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the "**rtrv-eqpt**:" command format.

-  **NOTE 2:**
If work order or office records do not specify **OLI** types, refer to 363-206-200, *DDM-2000 OC-3 and OC-12 Multiplexers, Applications, Planning, and Ordering Guide* and/or 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of **OLI** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

At the host OC-12 nodes, verify/install **OLIU** circuit packs in **FUNCTION UNITS (A, B, C, or D)** slots being used for OC-3 access.

5. **NOTE:**

If fecom is enabled, an "inconsistent DCC values" alarm will occur when the **OLIUs** are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTLs** at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the "**set - fecom: address: com=disable**" command to disable the DCC.

At OC-12 shelves, connect optical loops for **FUNCTION UNITS OLIUs** just installed.

6. **NOTE:**

The Network Side (NS)/User Side (US) parameters of the "**set - fecom:**" command must be set opposite at each end of the optical spans. For example, see Figures 3 and 4.

Use the "**rtrv - fecom/set - fecom**" command to verify/set "Network Side/User Side" parameters at each end of OC-3 optical span being established.

7. Use the "**rtrv - oc3/set - oc3**" command at the OC-12 shelf to verify/set application (*app*) parameter for the OC-12 **FUNCTION UNITS** slots being used for this single homed configuration. For example, "**set - oc3: fn-a, app=0X1**".
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

8. ➤ **NOTE 1:**

If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-3 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

➤ **NOTE 2:**

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

➤ **NOTE 3:**

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the "**rtrv-sync**" command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. (OC-12 Reference: 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)*—Volume II, **DLP-510**)

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **NOTE 1:**

If Kbyte (Release 9.0 and earlier) or Sbyte (Releases 8.1, 9.1, and later) (sync messaging) is enabled for the OC-3 **MAIN 1** and **MAIN 2(P)** optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring and in the **FUNCTION UNITS** slots of the host OC-12 shelf.

 NOTE 2:

The "**rtrv-oc3:**" command retrieves the "OC-3 Line Provisioning Report". This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* and 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the "**rtrv-oc3:**" command format.

Use the "**rtrv-oc3:**" command to obtain the "OC-3 Line Provisioning Report" and verify if Kbyte/Sbyte is enabled or disabled. Use the "**set-oc3:**" command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. ➤ **NOTE 1:**
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.
- **NOTE 2:**
If Sync Autoreconfiguration is enabled at any line-timed OC-3 node (not available for external timed or free-running nodes), it **must** be enabled at all line-timed OC-3 nodes.
- **NOTE 3:**
The "**rtrv-sync:**" command retrieves the "Synchronization Report". This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* and 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the "**rtrv-sync:**" command format.

Use the "**rtrv-sync:**" command to obtain the "Synchronization Report" and verify if Sync Autoreconfiguration is enabled or disabled at any line-timed OC-3 node. Use the "**set-sync:**" command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set by the "**set -ne**" command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address (set by the "**set -ne**" command) will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the "**set -ne**" command) will cause a "duplicate TID" alarm. Two or more shelves in the same network designated as a DSNE (set by the "**set -ne**" command) will cause a "duplicate DSNE" alarm.

Verify no duplicate TBOS, site/ne, TID or DSNE settings exist. The "**rtrv-ne:**" command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the "**set -ne**" command to make new settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. **NOTE 1:**

The "**set -ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "duplicate DSNE" alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the "**set -ne:**" command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

Use the "**set -ne:**" command to designate ONE shelf as the DSNE.

Use the "**set -ne:**" command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. **NOTE 1:**

In dual homing configurations, **OLIU** circuit packs must be installed in the correct **FUNCTION UNITS** slots in the host OC-12 nodes to support the direction of traffic required. For example, see Figures 1 and 2. In Figure 1, if an **OLIU** is installed in Node 5, **FUNCTION UNITS** group **A**, slot **1**, traffic will be routed toward Node 6 when cross connections are made. The other end of the associated OC-3 ring must be connected to an **OLIU** installed in slot **2(P)** of the **FUNCTION UNITS** group **()** being used to terminate the OC-3 line (for example, Node 4 in Figure 1). Traffic from Node 4 will then be directed toward Node 3 when cross-connections are made. In Figure 2, note that all traffic from the OC-3 shelf will be directed to Node 8 because of the slot positions that terminate the OC-3 line.

 NOTE 2:

A dual-homed ring configuration requires that the first OC-3 **MAIN 1 OLIU** connect to **FUNCTION UNITS () 1 OLIU** on one host OC-12 shelf. The last OC-3 **MAIN 2(P) OLIU** connects to the **FUNCTION UNITS () 2(P) OLIU** on the other host OC-12 shelf. Intermediate OC-3 shelves on the same OC-3 ring connect from **MAIN 2(P) OLIU** at one OC-3 shelf to the **MAIN 1 OLIU** at an adjacent OC-3 shelf (node). For example, see Figure 3. This procedure will establish the ring configuration starting from one OC-12 host node (near end) and continuing to an adjacent OC-3 node, then to the next OC-3 node until the final connection is made from the last OC-3 node to the remaining OC-12 host node.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

Unused optical connectors on **OLIUs** should remain looped until optical line connections are made.

At the near end OC-12 host node, remove the optical loop from the **FUNCTION UNITS OC-3 OLIU** being used for the OC-3 ring configuration (for example, in Figure 3, OC-12 shelf Node 5, slot **FUNCTION UNITS A 1**) At the other end of the optical span being established, remove the optical loop from the associated **OLIU** (for example, in Figure 3, OC-3 shelf Node 7 **MAIN 1 OLIU**).

14. ⇒ **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the "**set - fecom:**" command **at each shelf** to enable far end communications.

At each shelf, use the "**set - fecom: address: com=enabled**" command to ensure far end communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**
-

16.  **NOTE:**
The "**rtrv-pm-line**" command in the following procedure displays performance monitoring data associated with the OC-3 lines terminated on the system.

Perform end-to-end OC-3 line test. **DLP-515**

17. Repeat this procedure from Item 13 for all OC-3 optical spans being established in the DDM-2000 OC-12/OC-3 network. Ensure that the last optical span connected to the OC-12 host shelf is connected to an **OLI**U in the opposite slot as the one in the first host OC-12 (for example in Figure 3, slot **1** at one host node and slot **2(P)** at the other host node).
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

18. **NOTE:**

Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The dual-homed DDM-2000 OC-3 access network is now ready for initial service to be established. For DS3, EC-1, STS-3c, and video terminations on a DDM-2000 OC-12 shelf, use the procedures in 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II*, to establish those services. For DS1, DS3, and/or EC-1 terminations on a DDM-2000 OC-3 shelf, use the procedures in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual (TOP)—Volume II* to establish those services.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

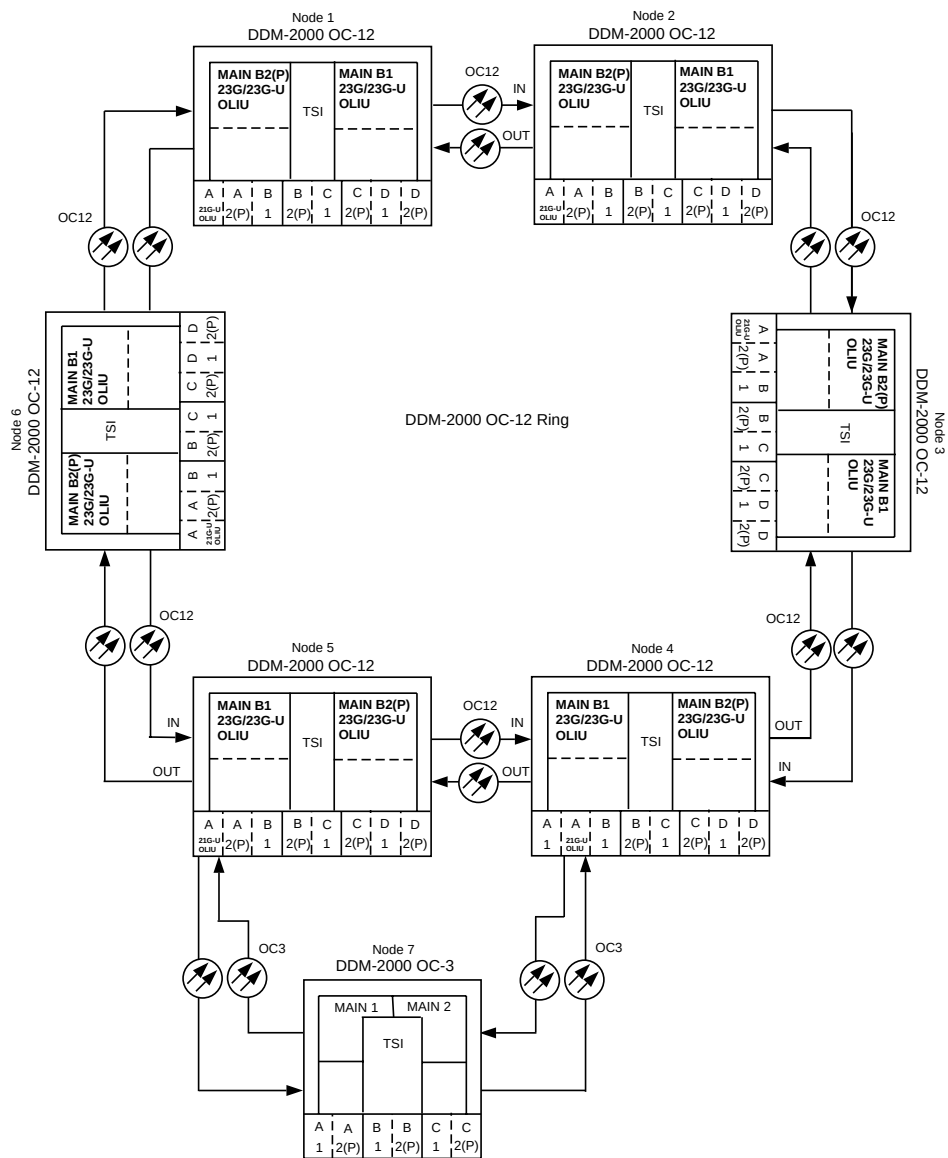


Figure 1. Example Dual-Homed OC-3/OC-12 Ring Configuration

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

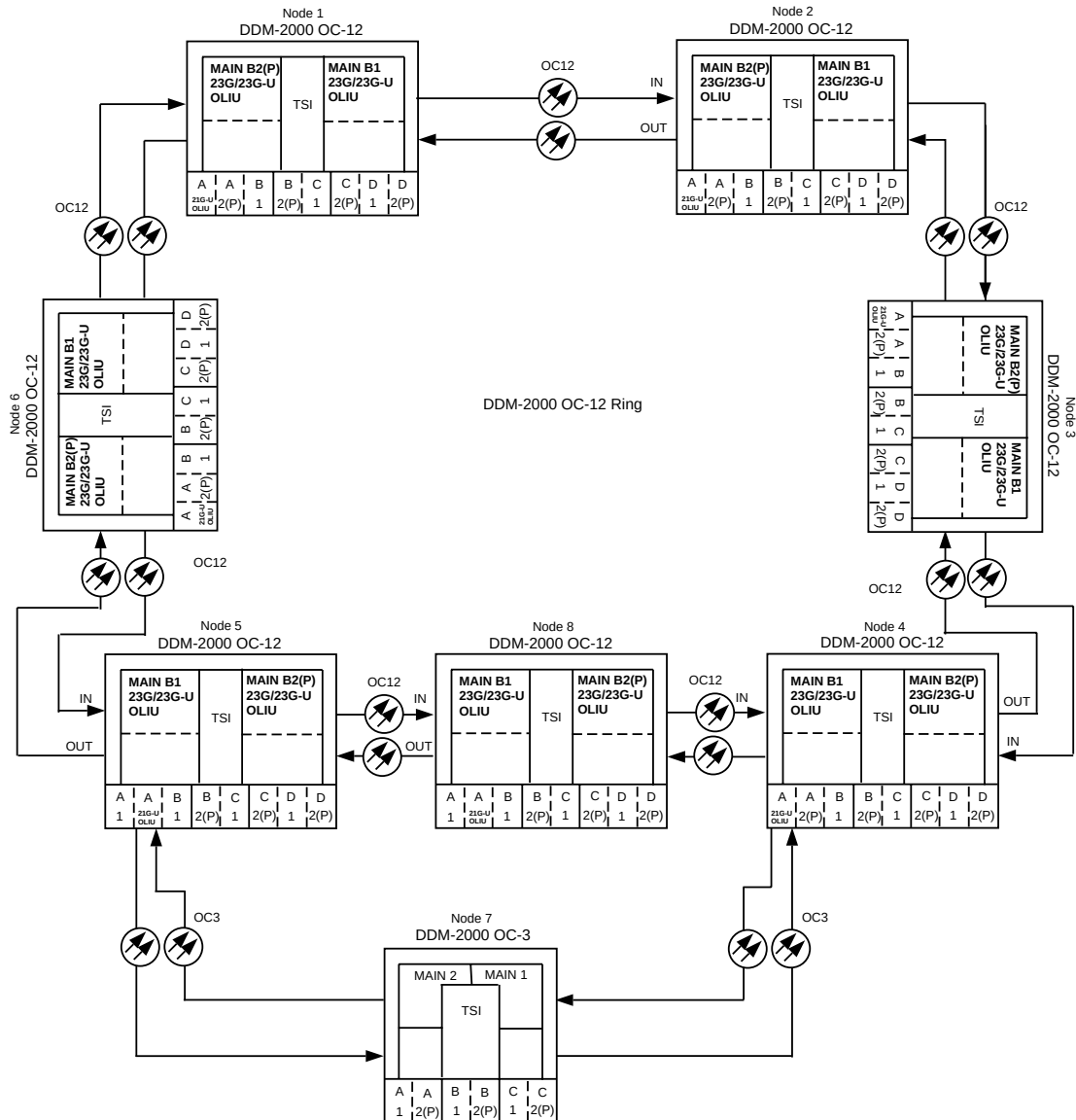
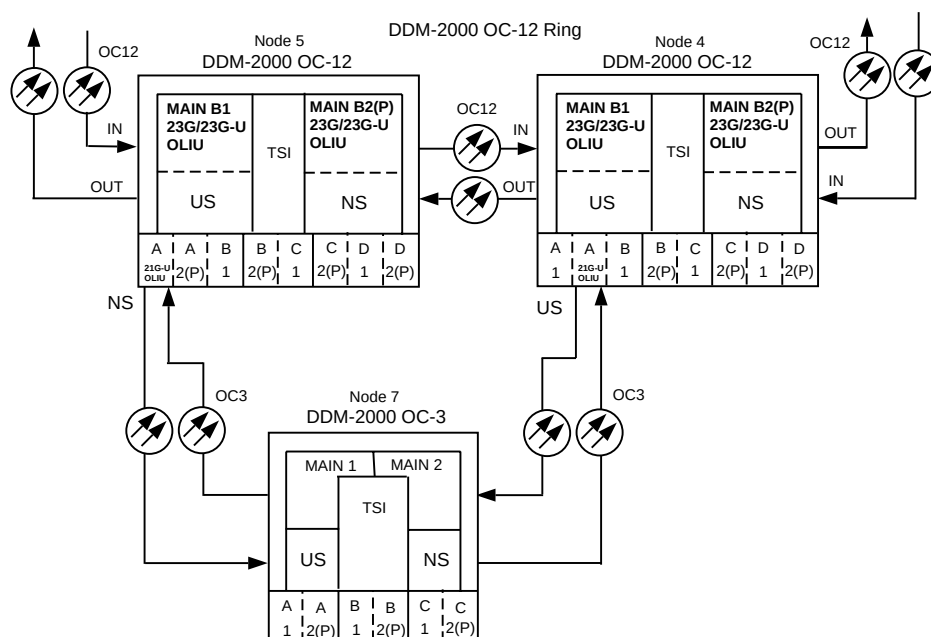


Figure 2. Example Dual-Homed OC-3/OC-12 Ring Configuration

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
21-Type OLIUs (0X1 or video)	FN-A-1 dcc-a1	FN-A-2 dcc-a2	FN-B-1 dcc-b1	FN-B-2 dcc-b2	FN-C-1 dcc-c1	FN-C-2 dcc-c2	FN-D-1 dcc-d1	FN-D-2 dcc-d2
	NS	US	NS	US	NS	US	NS	US
23-Type OLIUs	MAIN-B-1 dcc-mb1		MAIN-B-2 dcc-mb2					
	US		NS					



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)					
22-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2	FN-A dcc-a	FN-B dcc-b	FN-C dcc-c
	US	NS	NS	NS	NS

Figure 3. Example of User Side/Network Side Value Settings

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

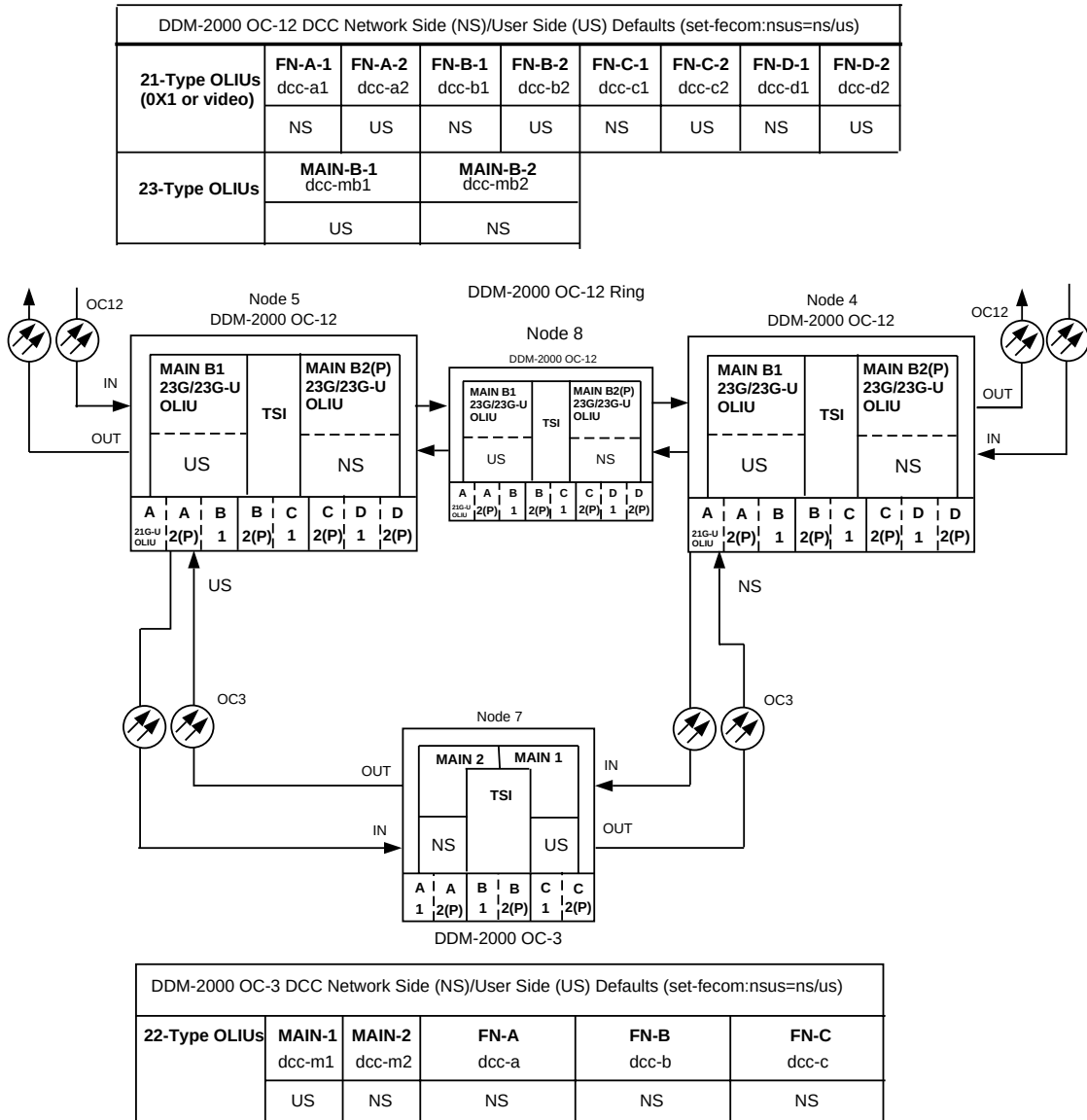


Figure 4. Example of User Side/Network Side Value Settings

Upgrade DDM-2000 OC-3/OC-12 Dual Ring Interworking Network from EC-1 to OC-3/IS-3 In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure requires **21G/21G-U/21G2-U OLIUs** (OC-3) or **21D/21D-U OLIUs** (IS-3) circuit packs in all DDM-2000 OC-12 shelves and **22G-U/22G2-U/22G3-U OLIUs** (OC-3) or **22D-U OLIUs** (IS-3) circuit packs in all DDM-2000 OC-3 shelves. Existing **3STS1E** and **STS1E** circuit packs will be replaced in this procedure with **OLIU** circuit packs to support OC-3/IS-3 applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

 **NOTE 2:**
This procedure assumes that the DDM-2000 systems are in service. Ring Release 5 or later software is required in each DDM-2000 OC-12 shelf. Ring Release 7.2 or later software is required in each DDM-2000 OC-3 shelf.

 **NOTE 3:**
All shelves in the same network must have the same or compatible software releases.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE 4:

You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the "**rtrv-alm:**" command to verify that no alarms, locks, loops, or switches are present.

-
2. Notify maintenance center that alarms will be generated.

-
3. Upgrade software in each DDM-2000 OC-3/OC-12 shelf with a release that supports OC-3/IS-3 interfaces (Ring Release 5 (OC-12), Ring Release 7.2 or later (OC-3), if not already performed.

DLP-532

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

4.  **CAUTION:**
Removal of the wrong cross-connections may cause service interruption.

 **NOTE 1:**
When signals or circuit packs are removed, alarms will be generated until update procedures are performed.

 **NOTE 2:**
STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs.

 **NOTE 3:**
If the OC-3 circuit pack is going to be using the same cross-connects as the EC-1 circuit pack that is to be removed, then the only cross-connects that need to be deleted are those at the node where the circuit pack is being replaced. The pass throughs can remain.

At the first set of dual ring interworking nodes having circuit packs replaced, discontinue the EC-1 interface cross-connections at the OC-3 node [NTP-036]/OC-12 node [NTP-025]. **Note that only cross-connections at the DRI node are being discontinued using NTP-036 or NTP-025.**

NTP-036

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

5. At the first set of dual ring interworking nodes having circuit packs replaced, remove both **3STS1E** circuit packs from the OC-12 node and both **STS1E** circuit packs from the OC-3 node. (For example, see Figure 1. Remove the **3STS1E** circuit packs from the OC-12 at node D and the **STS1E** circuit packs from the OC-3 at node G.)

-
6. At both OC-12 and OC-3 nodes, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** or use the "upd" command to update the DDM-2000 internal equipment list.

-
7. Remove all EC-1/DS3 connections between the OC-3 and OC-12 nodes with **3STS1E/STS1E** circuit packs removed.

-
8. If **21G/21G-U OLIUs** are installed in OC-12 node, set the option switch on the **21G/21G-U OLIUs** to agree with the loss of the optical facility.

DLP-513

-
9. Install both **21G/21G-U/21G2-U OLIUs** (OC-3) or **21D/21D-U OLIUs** (IS-3) in the OC-12 node and both **22G-U/22G2-U/22G3-U OLIUs** (OC-3) or **22D-U OLIUs** (IS-3) in the OC-3 node.

DLP-504

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. **NOTE 1:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line tests to work when the optical span is being established. Default condition for the DCC channel is "enabled". If it has been disabled, use the "**set - fecom:**" command **at each DDM-2000 shelf** to enable far end communications.

 NOTE 2:

The network elements that terminate on each end of the optical span must have their "Network Side/User Side" parameters set to opposite values to avoid an "inconsistent DCC values" alarm. One end is provisioned as "Network Side" and the other end is provisioned as "User Side". Both ends of the OC-3 line cannot be the same and it makes no difference which end is "Network Side".

At each DDM-2000 shelf, use the
"**set - fecom: address: com=enabled, nsus=ns/us**"
command to enable far-end communications (fecom) and
set Network Side (ns)/User Side (us) parameters.

-
11. Perform optical fiber connections and verification of the
optical facility.
-

DLP-514

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. **NOTE 1:**

The "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur and one of the DSNEs must be disabled. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

 NOTE 2:

It may take 5 minutes or more for the network to stabilize after one of the DSNEs is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Use the "**set-ne:TID=tid:dsne=no**" command to discontinue one of DSNEs, if not already done. Use the "**reset**" command at the remaining DSNE to reset the DSNE node.

13.	Perform end-to-end OC-3/IS-3 line test at DRI nodes (For example, between nodes D and G in Figure 1).	DLP-515

14.	At the upgraded DRI nodes, use the " ent-crs-sts1 " or " ent-crs-vt1 " commands to make proper "drop and continue" cross-connections.	DLP-550

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

15. At the next set of dual ring interworking nodes having circuit packs replaced, discontinue the EC-1 interface cross-connections at the OC-3 node [**NTP-036**]/OC-12 node [**NTP-025**]. **Note that only cross-connections at the DRI node are being discontinued using NTP-036 or NTP-025.** **NTP-036**

16. At the dual ring interworking nodes having circuit packs replaced, remove both **3STS1E** circuit packs from the OC-12 node and both **STS1E** circuit packs from the OC-3 node. (For example, see Figure 1. Remove the **3STS1E** circuit packs from the OC-12 at node C and the **STS1E** circuit packs from the OC-3 at node H.)

17. At both OC-12 and OC-3 nodes, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** or use the "upd" command to update the DDM-2000 internal equipment list.

18. Remove all EC-1/DS3 connections between the OC-3 and OC-12 nodes with **3STS1E/STS1E** circuit packs removed.

19. If **21G/21G-U OLIUs** are installed in OC-12 node, set the option switch on the **21G/21G-U OLIUs** to agree with the loss of the optical facility. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. Install both **21G/21G-U/21G2-U OLIUs** (OC-3) or **DLP-504**
21D/21D-U OLIUs (IS-3) in the OC-12 node and both
22G-U/22G2-U/22G3-U OLIUs (OC-3) or **22D-U OLIUs**
(IS-3) in the OC-3 node.

21. At each DDM-2000 shelf, use the
"set - fecom: address: com=enabled, nsus=ns/us"
command to enable far-end communications (fecom) and
set Network Side (ns)/User Side (us) parameters.

22. Perform optical fiber connections and verification of the **DLP-514**
optical facility.

23. Perform end-to-end OC-3/IS-3 line test at DRI nodes **DLP-515**
(For example, between nodes C and H in Figure 1).

24. At the upgraded DRI nodes, use the **"ent - crs - sts1"** or **DLP-550**
"ent - crs - vt1" commands to make proper "drop and
continue" cross-connections.

25. The upgrade is now complete.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

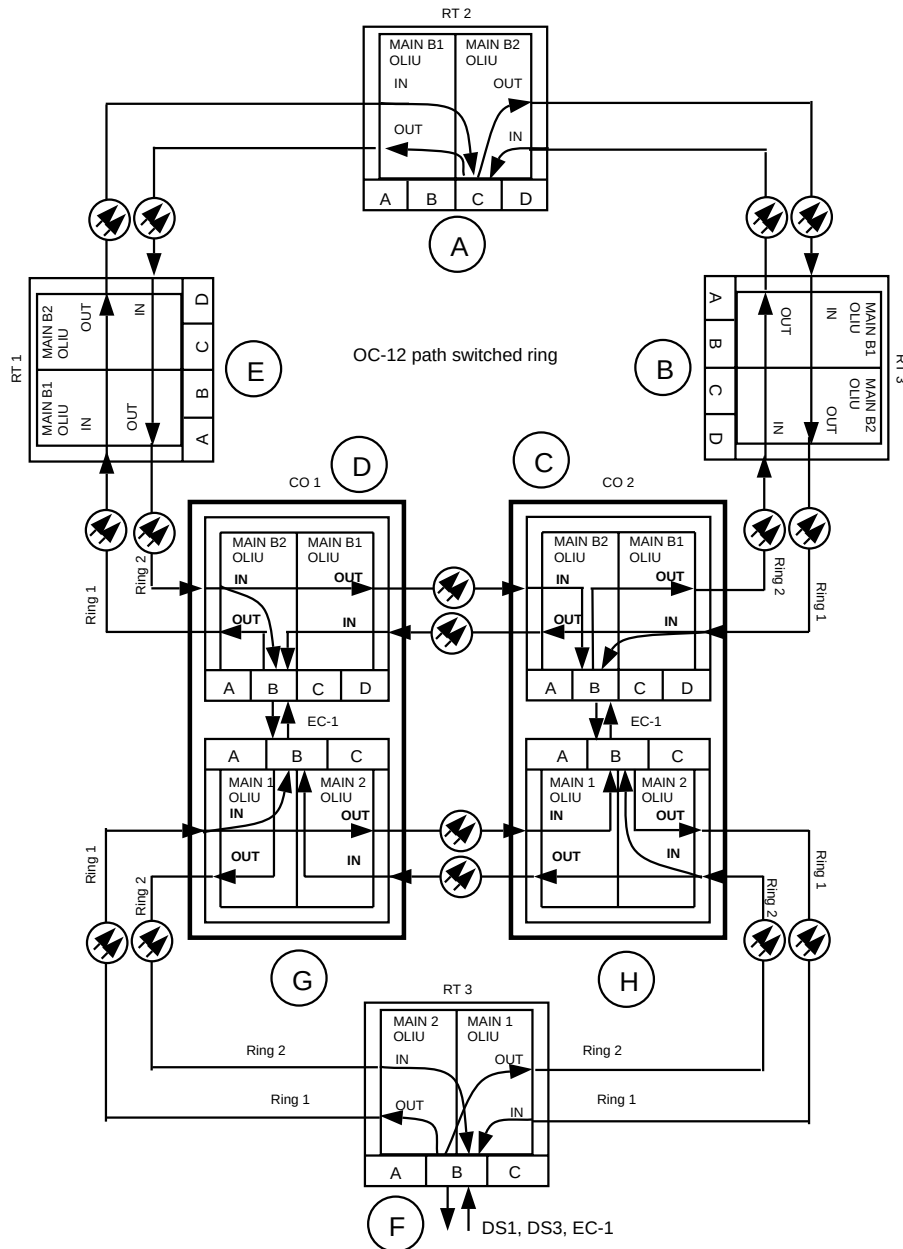


Figure 1. OC-3/OC-12 DRI Interworking

Establish FiberReach Access via DDM-2000 OC-3 Release 9 and Later Host Shelf OC-3 Release 8 Linear Configuration

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **NOTE 1:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

-  **NOTE 2:**
It is assumed that the DDM-2000 OC-3 shelves in the system have passed the looped transmission test(s) (**System Turnup: NTP-016**) and the final configuration has been established with the DDM-2000 OC-3 Release 9 host shelf in the linear network. It is also assumed the DDM-2000 FiberReach shelves have been equipped and tested (363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*, **System Turnup: NTP-016**).

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Determine the network configuration (for example, see Figures 1 and 2.)

2. Verify that the host DDM-2000 OC-3 shelf is equipped with Release 9 or later ring software.
-

3. Determine the optical loss of each optical span from office records or by making the required measurements.
-

4.  **NOTE:**
The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans. For example, see Figure 3.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

5.  **CAUTION:**
*The host OC-3 shelf can be timed from an external source or line timed from **FUNCTION UNITS C** slot. The host OC-3 shelf cannot be line timed from the **MAIN** slots. Therefore, if the OC-3 shelf is to be line timed, the **set-sync:src=fn-c** must be used to derive timing from the **FUNCTION UNITS C** slot.*

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 1:**

At the OC-3 shelf, if line timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ **NOTE 2:**

If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ **NOTE 3:**

If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is Holdover instead of External, check that the incoming timing references are connected. Also check Mode Switching (revertive or nonrevertive) and the external DS1 Line Code/Format switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. Use the **set-sync:** command to set the OC-3 synchronization source, if required.

DLP-513

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. **NOTE:**

Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a "duplicate TBOS display" alarm. Two or more shelves in the same network with the same site/ne address will cause a "duplicate site/ne address" alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a "duplicate TID" alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

7. **NOTE 1:**

The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a "duplicate DSNE" alarm will occur. The DSNE must be an OC-3 shelf with Release 9 or later software, unless an FT-2000 is part of the network, then the DSNE will always be an FT-2000 node. The DSNE must not be a FiberReach shelf. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an "AGNE communication failure" alarm.

Use the **rtrv-ne/set-ne:** command to verify/designate ONE shelf in the network as the DSNE, if not already done.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

8. ⇒ **NOTE 1:**

This configuration requires that the **MAIN 1 OLIU** on the host OC-3 shelf (node) connect to the **MAIN-2 OLIU** at the first FiberReach shelf from the OC-3 shelf. See Figure 3. **MAIN-1 OLIU** at the FiberReach shelf connects to the **MAIN-2 OLIU** at an adjacent FiberReach shelf (node). The **MAIN-1 OLIU** at the last FiberReach shelf on the OC-1 ring connects to **MAIN 2(P) OLIU** on the host OC-3 shelf. This procedure will establish the FiberReach ring configuration starting from the OC-3 host node (near end) to the first FiberReach node, then continuing to the next node until the final connection is made from the last FiberReach node back to the host OC-3 node.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 2:**

All unused ports on the **27G-U/27G2-U OLIU** must be set to **nmon** with the **set-state-oc1** command.

At the near end, remove the optical loop from the **26G2-U** or **27G-U/27G2-U OLIU** OC-1 line (**1** or **2**) (for example in Figure 3, OC-3 shelf **MAIN 1**, OC-1 line **1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated **OLIU** (for example, in Figure 3, FiberReach **MAIN-2 OLIU**).

9. ⇒ **NOTE:**

The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **set-fecom: command at each shelf** to enable far end communications.

At each shelf, use the
set-fecom: address:com=enabled command to
ensure far end communications (fecom) is enabled.

-
10. Perform optical fiber connections and verification of the integrity of the optical span being established.
-

DLP-514

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

11. **NOTE:**

The **rtrv-pm-line** command in the following procedure displays performance monitoring data associated with the OC-1 lines terminated on the system.

Perform end-to-end OC-1 line test.

DLP-556

-
12. Repeat this procedure for all OC-1 optical spans back to the host OC-3 shelf.
-

13. The system is now ready for initial service to be established.
Initial DS1 Service [**System Turnup: NTP-004**]
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

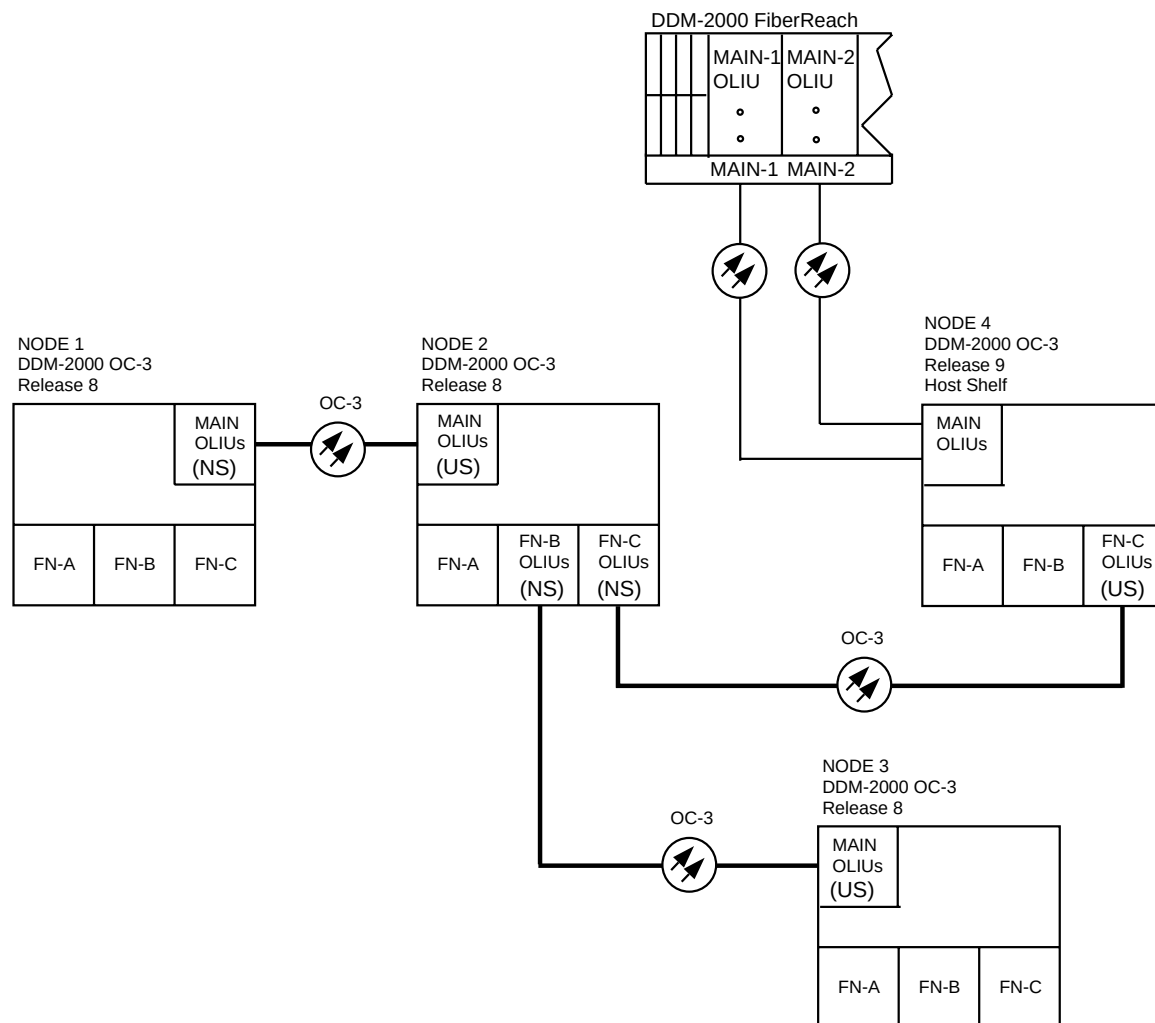


Figure 1. Example of Single-Homed FiberReach Ring to OC-3 Linear Terminating Node

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

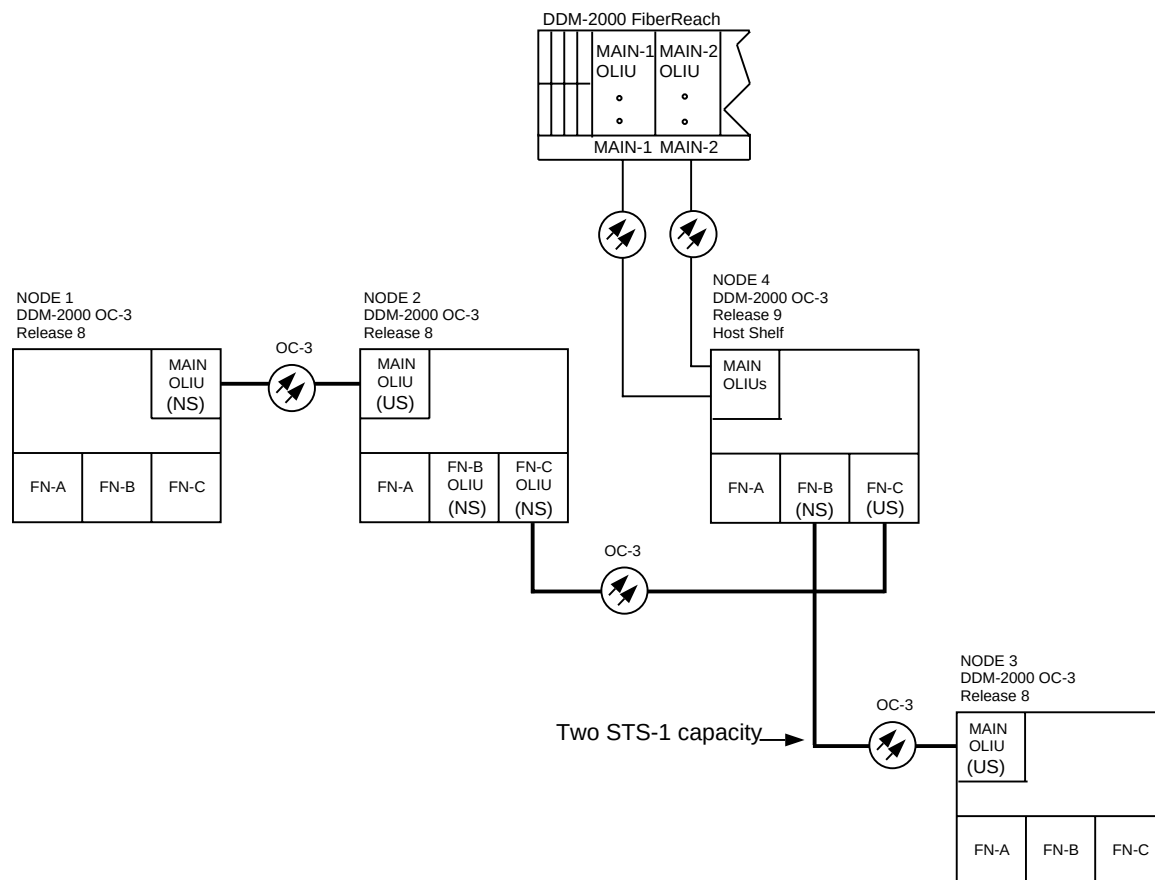
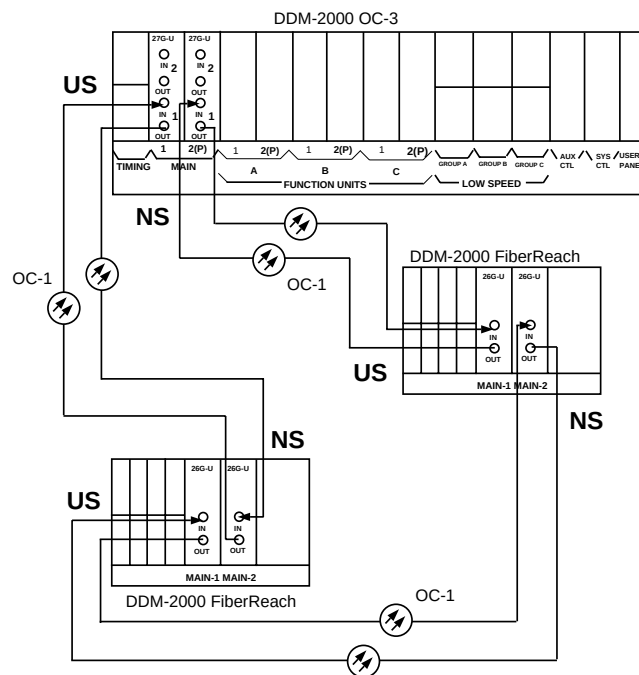


Figure 2. Example of Single-Homed FiberReach Ring to OC-3 Linear Intermediate Node

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
22-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2	FN-A dcc-a		FN-B dcc-b		FN-C dcc-c	
	US	NS	NS		NS		NS	
27-Type OLIUs	MAIN-1 dcc-m1-1	MAIN-2 dcc-m2-1	FN-A-1 dcc-a1-1	FN-A-2 dcc-a2-1	FN-B-1 dcc-b1-1	FN-B-2 dcc-b2-1	FN-C-1 dcc-c1-1	FN-C-2 dcc-c2-1
	dcc-m1-2	dcc-m2-2	dcc-a1-2	dcc-a2-2	dcc-b1-2	dcc-b2-2	dcc-c1-2	dcc-c2-2
	US	NS	NS	US	NS	US	NS	US



DDM-2000 FiberReach DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)		
26-Type OLIUs	MAIN-1 dcc-m1	MAIN-2 dcc-m2
	US	NS

Figure 3. Example of User Side/Network Side Value Settings

Establish Initial End-to-End DS3-to-DS1 Service TMUX Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
The OC-3 system must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves, and to establish a system.

 **NOTE 2:**
This procedure assumes that **TMUX** circuit packs have already been installed during the initial shelf turnup at the DS3 terminating end(s) of the circuit and either **DS1** or **STS1E** circuit packs have been installed during initial shelf turnup at the other terminating end of the circuit. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new DS3 group for DS3-to-DS1 service.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ **NOTE 3:**

If the DS1 terminating end(s) are in a DDM-2000 OC-3, this procedure assumes that **MXRVO** circuit packs have already been installed during initial shelf turnup and **TMUX** circuit packs have been installed during initial shelf turnup at the other DDM-2000 OC-3 terminating end(s) of the circuit. If the terminating end is in another system, it is assumed that the appropriate installation and connections have been made to that system. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new group for DS1 service.

⇒ **NOTE 4:**

If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

-
2. At the DS3 terminating node(s) of the circuit being established, determine which DS3 port is to be put into service and what options are to be selected.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

3. **NOTE:**

The "**rtrv-eqpt:**" command retrieves the "Equipage and Version Report". This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the "**rtrv-eqpt:**" command format.

Use the "**rtrv-eqpt:**" command to obtain the "Equipage and Version Report" and verify that the service and protection (if required) **TMUX** circuit packs have been installed in proper **FUNCTION UNITS** group (**A**, **B**, or **C**) being put into service.

At the DS1 terminating end, use the "**rtrv-eqpt:**" command to obtain the "Equipage and Version Report" and verify that the proper service and protection (if required) **MXRVO (STS1E)** circuit packs have been installed in **FUNCTION UNITS** group(s) (**A**, **B**, or **C**) being put into service.

4. **NOTE:**

The "**rtrv-t3:**" command retrieves the "T3 Port Provisioning Report". This report lists information about each DS3 port. This information includes attributes set by the "**set-t3:**" command. See the "Commands and Reports" section of this manual for a description of the "**rtrv-t3:**" command format.

Use the "**rtrv-t3:**" command to obtain the "T3 Port Provisioning Report" and verify the software option settings.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

5.  **NOTE:**
 DS1 circuit packs *cannot* be installed in a **LOW SPEED GROUP**
 corresponding to a **FUNCTION UNITS** group that is equipped with
 TMUX circuit packs.

Verify the line build out (LBO) option jumpers are
installed as required and reinstall **TMUX** circuit pack(s).

DLP-513

-
6. Make the appropriate cable connection(s) to the DS3
cross-connect point(s) or equivalent connection point(s)
for the circuit being added.
-
7. At the DS1 terminating node(s) of the circuit being
established, determine which DS1 port(s) is to be put into
service and what options are to be selected.
-

8.  **NOTE:**
 The "**rtrv-t1:**" command retrieves the "T1 Port Provisioning
 Report". This report lists information about each DS1 port. This
 information includes attributes set by the "**set-t1:**" command. See
 the "Commands and Reports" section of this manual for a description
 of the "**rtrv-t1:**" command format.

At each DS1 terminating node, use the "**rtrv-t1:**"
command to obtain the "T1 Port Provisioning
Report" and verify the hardware and software option
settings.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. ➤ **NOTE 1:**

Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the "**set-t1:address:ais=no**" command) on any DS1 circuit that is not in service.

➤ **NOTE 2:**

If DS1 protection is required and any service **DS1PM** circuit packs are installed, a **DS1PM** circuit pack must be installed in the protection **8(P)** slot.

➤ **NOTE 3:**

If the **LOW SPEED GROUP** is to be equipped with any **BBF3/BBF3B DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed in the corresponding **FUNCTION UNITS** group.

At each DS1 terminating node, set option switches and install **DS1/DS1PM** circuit pack(s), as required.

DLP-508

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

10.  **CAUTION 1:**
*No service DS1 **LOW SPEED** slots should be left empty in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.*

 **CAUTION 2:**
*When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A Retainer Card** in the same **LOW SPEED GROUP** will result in a loss of service to the protected **DS1/DS1PM** and the removed **DS1/DS1PM** circuit pack.*

 **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

Install **177A Retainer Cards** into all unused service **DS1 LOW SPEED** slots in **GROUPs** equipped with protection **DS1/DS1PM** circuit packs and corresponding to **FUNCTION UNITS** groups equipped with **MXRVO** circuit packs.

-
11. At each DS1 terminating node, use the "**set-t1:**" command to set the characteristics of the DS1 port of the circuit being established.
-
12. At each DS1 terminating node, make the appropriate cable connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

13. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

-
14. If one of the terminating nodes is equipped with **STS1E** circuit packs for an EC-1 interface to support DS3 services being established, establish initial EC-1 low speed interface. **NTP-034**
-

15. **⇒ NOTE 1:**
Ring releases support only manual VT1.5 and STS-1 cross-connections. Manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

- ⇒ NOTE 2:**
The following commands may be used to delete, enter, and retrieve cross-connections in a path protected ring network: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", and "**rtrv-crs-vt1**". See the "Commands and Reports" section of this manual for a description of commands.

Determine the necessary VT1.5/STS-1 cross-connections for each node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

16. Make necessary VT1.5/STS-1 cross-connections for each node in the network.

-
17.  **NOTE:**
For a DS3 circuit in a path protected ring network, the "**sw-path-sts1:address**" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path(s).

Perform DS3-to-DS1 transmission test for each circuit being put into service (optional).

-
18. Use the "**set-t3:**" command to set the characteristics of the DS3 port of the circuit being established.
-
19. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS3 port of the circuit being established.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. **NOTE:**

If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t3:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t3:**" command to set the port state of the DS3 port of the circuit being established.

21. Use the "**set-t1:**" command to set the characteristics of the DS1 port(s) of the circuit being established.
-

22. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS1 port(s) of the circuit being established.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

23.  **NOTE:**
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t1:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t1:**" command to set the port state of the DS1 port(s) of the circuit being established.

24. If **BBF3/BBF3B DS1PM** circuit packs are installed and the optional **ds1pm** performance monitoring feature is to be used, use the "**set-feat:feat=ds1pm,act=enable**" command to enable the feature.
-

Add New TMUX Group for DS3 Service System In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

 **NOTE 1:**
This procedure assumes that the DDM-2000 is in service and that a new **FUNCTION UNITS** group is being equipped with **TMUX** circuit packs for DS3-to-DS1 service. It also assumes that **DS1** or **STS1E** circuit packs have been installed if the other end is an DS1 or EC-1 interface. If it has not been installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new **DS1** or **STS1E** group.

 **NOTE 2:**
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

2. Use the "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

-
3. Verify no **DS1/DS1PM** circuit packs are installed in **LOW SPEED** slots associated with new **TMUX FUNCTION UNITS** group being added.

-
4. Set line build out (LBO) option jumpers and install **TMUX** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, or **C**) being equipped. **DLP-507**

-
5. Make the appropriate connection(s) to the DS3 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.

-
6. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

7. **NOTE 1:**

Ring releases support only manual VT1.5 and STS-1 cross-connections. Manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS3/DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

 NOTE 2:

The following commands may be used to convert, delete, enter, and retrieve STS-1 cross-connections: "**dlt-crs-sts1**", "**ent-crs-sts1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

-
8. Make necessary STS-1 cross-connections for each node in the network.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. **NOTE:**

For a DS3 circuit in a path protected ring network, the "sw-path-sts1:address" command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path.

Perform DS3-to-DS1 transmission test for each circuit being put into service (optional).

-
10. Use the "**set-t3:**" command to set the characteristics of the DS3 port.
-

11. Use the "**rtrv-state-eqpt**" command to determine the port state of the DS3 port(s) of the circuit being established.
-

12. **NOTE:**

If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the "**set-state-t3:**" command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the "**upd**" command.

Use the "**set-state-t3:**" command to set the port state of the DS3 port(s) of the circuit being established.

Upgrade DDM-2000 OC-12 Ring by Removing OC-12 Shelf and Replacing with Existing Single-Homed OC-3 Shelf In Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1. **⇒ NOTE 1:**

This procedure is used to remove an OC-12 shelf from an OC-12 ring network that has an in-service OC-3 shelf single-homed on it. The existing OC-3 shelf is equipped with **24G-U OLIUs** and cut into the OC-12 ring. It is assumed that the fiber being used in the current OC-12 ring network will be used in the new configuration.

⇒ NOTE 2:

This procedure assumes an OC-12 Release 5, or later, ring configuration with one OC-3 Release 11, or later, shelf single-homed (OX1) on the OC-12 shelf being removed. This procedure uses a 3-node OC-12 ring as an example for the upgrade (See Figure 1). This procedure will eliminate the NODE 1 OC-12 shelf and replace it with the NODE 5 OC-3 shelf after equipping the OC-3 shelf with **24G-U OLIUs**.

⇒ NOTE 3:

A spare OC-3 shelf is required to preprovision the **SYSCTL** and **24G-U OLIUs** with the proper software, cross connections, synchronization requirements, and SITE, NE, and TID settings.

⇒ NOTE 4:

You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

Contact maintenance center or use the "**rtrv-alm:**" command to verify that no alarms, locks, or switches are present.

2. Before beginning this procedure, determine which OC-12 shelf is being removed. If the shelf being removed is externally timed, the timing transfer can be done with a mult-out cable to the associated OC-3; or if holdover mode is acceptable, the timing cable can be switched later in this procedure.
-

3. Notify maintenance center that alarms will be generated.
-

4. Before beginning this procedure, verify ring integrity and path protection switching function. At the start nodes (NODE 1 OC-12 and NODE 5 OC-3), remove the receive (**IN**) fiber from ONE of the **MAIN OLIUs**. Verify no critical (**CR**) alarms are present. Reconnect the fiber and wait until alarms clear. Label each fiber and repeat this step on the other **MAIN OLIU**.
-

5. Use "**rtrv-map-network:**" and "**rtrv-map-neighbor:**" commands to determine the configuration of the OC-3 ring being upgraded and how the individual nodes are connected.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. Upgrade all OC-3 nodes to OC-3 Release 11 or later software, if required.

- A. In-Service Local Software Download
B. In-Service Remote Software Download

DLP-532
DLP-562

7.  **CAUTION:**
This step is very important. You should review the association among cross connections from the "Administration and Provisioning" section and the "Commands and Reports" section of Volume 1 of this manual. Improper cross connections will result in a loss of service.

Using office records or the "**rtrv-crs-()**:" commands, determine the drop and pass-through cross connects at the nodes being converted.

8. Equip the spare OC-3 shelf with new **SYSCTL**, **OHCTL**, **TGS**, and new **24G-U OLIU**s circuit packs using procedures of **NTP-016**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

9. Provision the **SYSCTL** and **24G-U OLIUs** using the **DLP-512**
"set-ne", "set-sync", and "set-fecom" commands to
parameters for the existing NODE 1 OC-12 shelf. Use
the "ent-crs-()" commands to preprovision the
proper cross connections for the new **24G-U OLIUs**.
(This procedure uses the cross connections shown in
Figures 1-3 as an example for this upgrade. Note the
preprovisioned cross connections for the **24G-U OLIUs** in
Figure 2 and how they relate to the original cross
connections in Figure 1.)
-

10.  **NOTE:**
A "CP removed" alarm will occur when the **OLIU** is removed. An
"inc. OC-3 LOS" (blinking **FAULT LED** on **OLIU**) alarm will occur at
the other node connected to the removed fibers. Other nodes will
receive "inc. VT and STS AIS" alarms.

At the starting OC-3 NODE, (in this example, NODE 5
OC-3), remove optical fibers from **MAIN 1 OLIU**, then
remove **MAIN 1 OLIU**. See Figure 2.

11. At the starting OC-12 NODE, (in this example, NODE 1
OC-12), remove optical fibers from **MAIN B-1 OLIU** and
label fibers. See Figure 2.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12.  **CAUTION:**
*Exercise care in the following step. Do not unseat (unplug) the **OLIU**.
The faceplate latch must be only slightly lifted until the **FAULT LED**
lights. Do not put any pressure on the latch.*

At the starting OC-3 NODE (NODE 5 OC-3), slightly lift
the faceplate latch on the **MAIN 2(P) OLIU** until the
FAULT LED lights.

-
13. At the starting OC-3 NODE (NODE 5 OC-3), remove
SYSCTL.

-
14. At the starting OC-3 NODE (NODE 5 OC-3), insert
preprovisioned **24G-U OLIU** into **MAIN 1 OLIU** slot.

-
15. At the starting OC-3 NODE (NODE 5 OC-3), connect
labeled fibers disconnected from NODE 1 OC-12 **MAIN
B-1** slot to **24G-U OLIUs** in **MAIN 1 OLIU** slots. Wait
until the **FAULT LED** at the adjacent OC-12 Node
(NODE 3, OC-12) goes off. The **FAULT LED** on the
OC-3 **24G-U OLIU** will remain lighted.

-
16. At the starting OC-3 NODE (NODE 5 OC-3), install
preprovisioned **SYSCTL**. Wait until system initializations
is complete, then verify new cross connections, TID, Site
and NE, and other preprovisioned settings.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17. If timing changes are necessary, make new cable connections or **TGS** settings.
 18. At the starting OC-3 NODE (NODE 5 OC-3), disconnect optical fibers from **MAIN 2(P) OLIUs** and remove existing **OLIUs**.
 19. At the starting OC-3 NODE (NODE 5 OC-3), install new **24G-U OLIU** into **MAIN 2(P) OLIU** slot.
 20. At the starting OC-12 NODE (NODE 1 OC-12), disconnect optical fibers from **MAIN B-2(P) OLIUs** and label.
 21. At the starting OC-3 NODE (NODE 5 OC-3), connect optical fibers from adjacent OC-12 node **MAIN B-1 OLIUs** to **MAIN 2(P) 24G-U OLIU**. Wait until the **FAULT** LED at the adjacent OC-12 Node (NODE 2, OC-12) goes off. The **FAULT** LED on the OC-3 **24G-U OLIU** will remain lighted.
 22. At the starting OC-3 NODE (NODE 5 OC-3), connect the OC-12 faceplate connector between **MAIN 1** and **MAIN 2(P) 24G-U OLIUs**.
-

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

23. At the starting OC-3 NODE (NODE 5 OC-3), momentarily depress the **UPD/INIT** button on the **SYSCTL** or execute the update ("**upd**") command.

24. At the DSNE, use the "**dlt-tadrmmap**" command to delete the discontinued OC-12 shelf (NODE 1, OC-12).

25. Use "**rtrv-network-map**" command to verify DCC connectivity throughout the ring. Verify system is free of alarms.

26. At the starting OC-3 NODE (NODE 5, OC-3), test protection switching and optical fiber integrity by disconnecting and reconnecting, one at a time, the **MAIN 1** and **MAIN 2(P) OLIU** fiber connections. Wait until alarms clear between disconnecting the fibers.

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

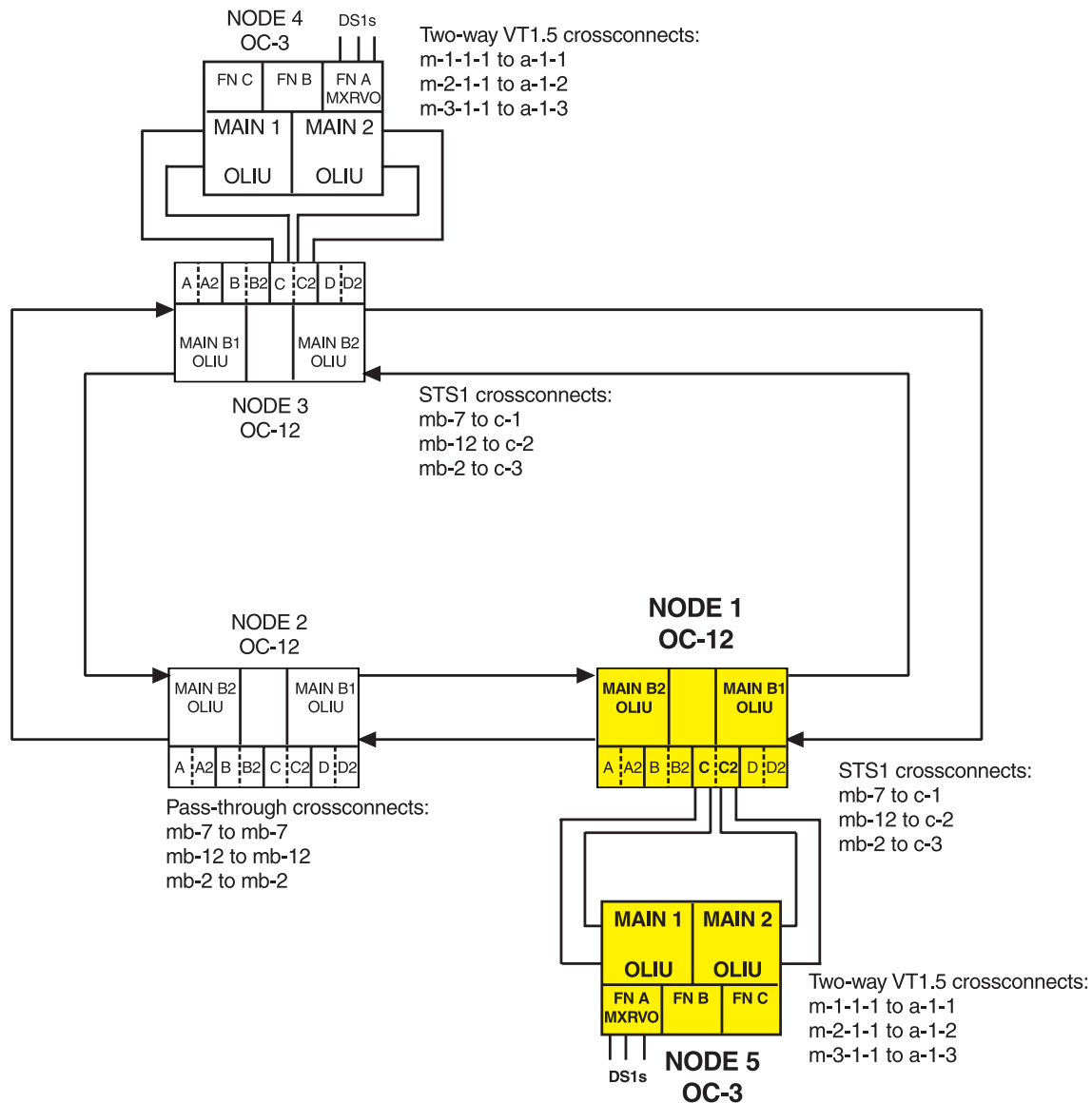


Figure 1. Basic 3-Node OC-12 Ring for Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

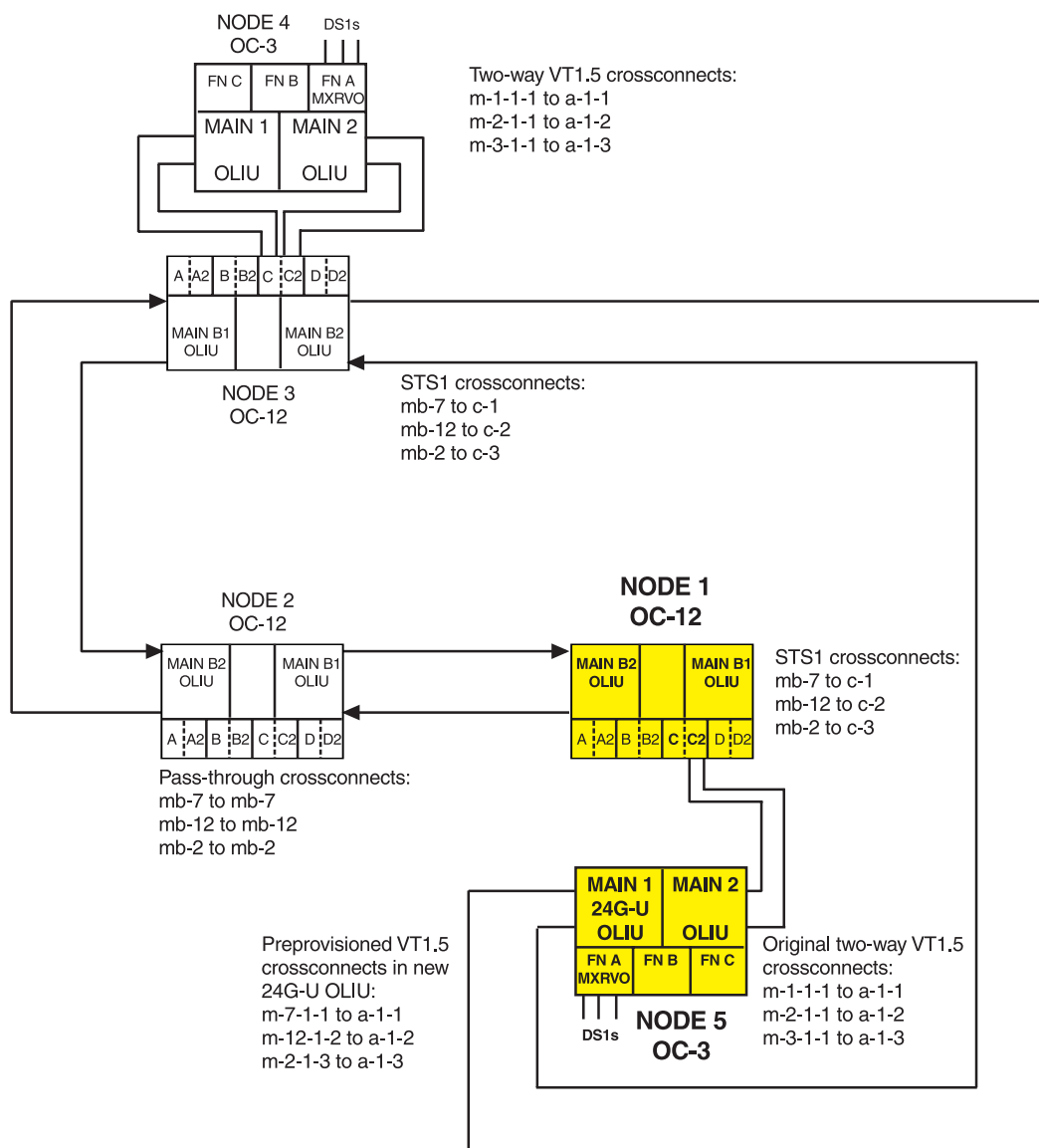


Figure 2. Basic 3-Node OC-12 Ring for Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . FOR DETAILS, GO TO

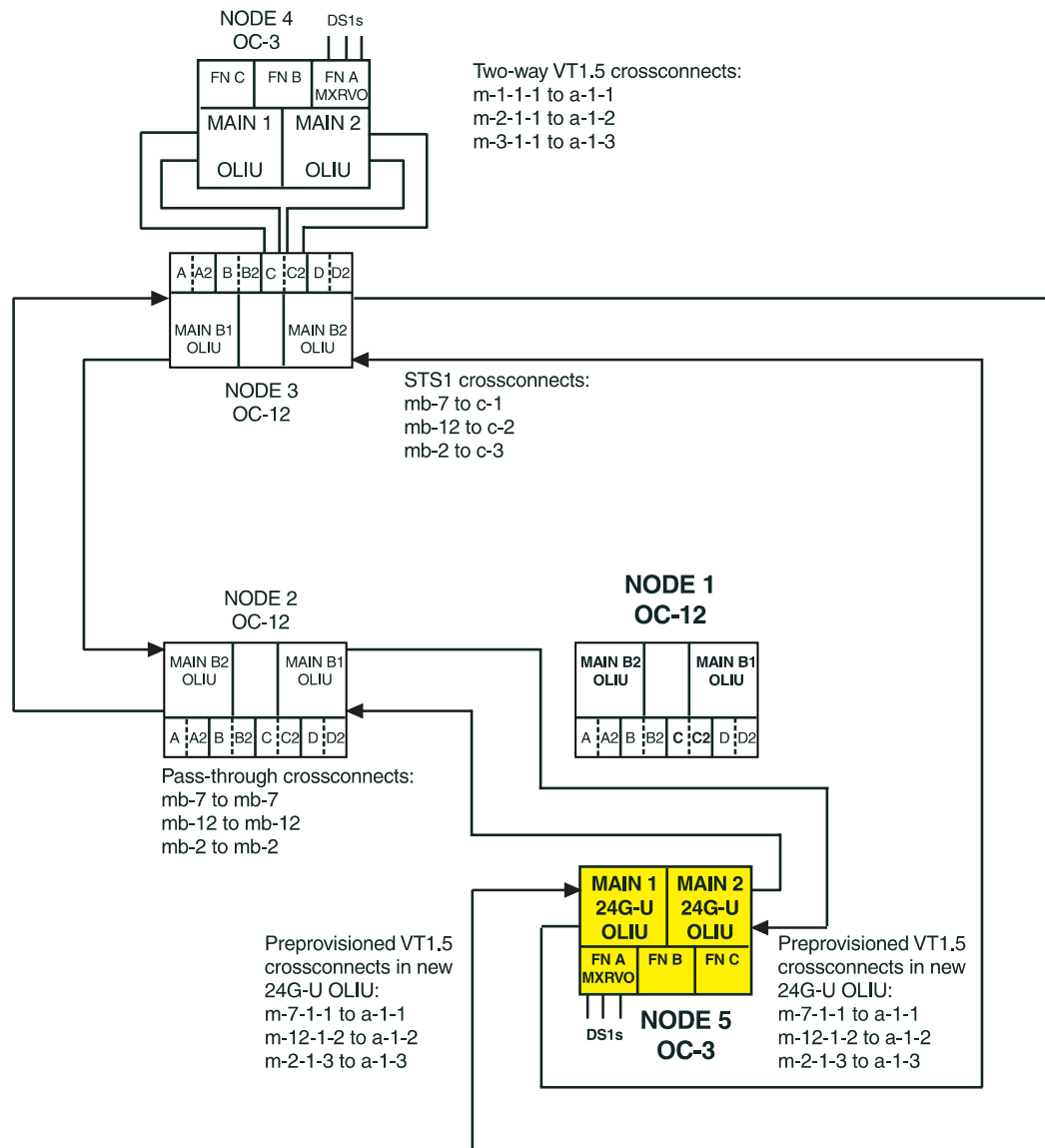


Figure 3. Basic 3-Node OC-12 Ring for Ring Upgrade

Task Index Operation

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Operation Procedures

CPro-2000 System Backup and Restore Operation: NTP-002

CIT — Connect and Establish Session Detailed Level Procedure: DLP-521

CIT — Activate Optional System Features . . . Detailed Level Procedure: DLP-512

CIT — Enable or Disable System Security
and/or Edit, Delete, or Enter a User's Login . . . Detailed Level Procedure: DLP-541

Copy Diskettes (Floppy Disks)
and Make Backups Detailed Level Procedure: DLP-534

Display Terminal Alarm/Status Condition —
Using Far End Select (FE SEL) Detailed Level Procedure: DLP-530

Establish Remote Login Detailed Level Procedure: DLP-522

Fan Filter — Replace Detailed Level Procedure: DLP-540

Fan Shelf — Test Detailed Level Procedure: DLP-539

FE SEL (Far End Select) —
Display Terminal Alarm/Status Condition . . . Detailed Level Procedure: DLP-530

Fuse — Remove -48V DC User Panel Detailed Level Procedure: DLP-555

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Generic Software Version Identification —

Retrieve Detailed Level Procedure: DLP-531

Install or Replace SYSCTL Detailed Level Procedure: DLP-501

Install New Generic Program

Local or Remote Detailed Level Procedure: DLP-532

Introduction to the PC Detailed Level Procedure: DLP-533

Modems — Condition and Connect Detailed Level Procedure: DLP-526

OLIU Receiver Sensitivity — Test Detailed Level Procedure: DLP-547

Sync Messaging —

Change Kbyte to Sbyte Detailed Level Procedure: DLP-565

Test LEDs Detailed Level Procedure: DLP-509

Upgrade DDM-2000 OC-3 Release 6 to Release 8
or Release 7.1 or 7.2 to Release 9 or 11 —

System In Service Non-Trouble Clearing Procedure: NTP-046

Upgrade Software Program Detailed Level Procedure: DLP-532

Upgrade TBOS/Parallel Telemetry to TL1/X.25 Detailed Level Procedure: DLP-538

Upgrade Timing Detailed Level Procedure: DLP-535

Reference Only Procedures

Option Settings — Check (Set) Detailed Level Procedure: DLP-513

Replace Circuit Pack (Reference Only) Detailed Level Procedure: DLP-523

CPro-2000 System Backup and Restore

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

⇒ NOTE:

The CPro-2000 Graphical User Interface and Provisioning Tool includes backup and restore features to protect provisioning information in ring applications. These features save a copy of a node's provisionable parameters so they can be restored at a later date, if necessary.

These features provide backup and restore for:

- Cross-connections
- DS1 port options
- DS3 port options
- EC-1 port options
- OC-3 line options.

See the CPro-2000 Graphical User Interface and Provisioning Tool on-line user's guide for more information on these features.

Task Index Trouble Clearing

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

Trouble Analysis Procedures

Maintenance Philosophy	TAD-100
ABN Indication - Clear	TAP-109
FAULT Indication (Flashing) - Clear	TAP-110
Alarm - Critical (CR) - Clear	TAP-101
Alarm - Major (MJ) - Clear	TAP-102
Alarm - Minor (MN) - Clear	TAP-112
Alarm - NE ACTY/FE ACTY Only - Clear	TAP-117
Alarm - Power Minor (PMN) - Clear	TAP-104
ED-8C733-30, G7 Fan Shelf Alarm - Clear	TAP-118
Trouble Report - Clear	TAP-105
Trouble During Program Upgrade - Clear	TAP-116

Maintenance Philosophy

Overview

The maintenance philosophy is built on gathering system information at two levels. The first is through an Operation System or Graphical User Interface [TL1 (X.25), ITM-SNC, CPro-2000, etc.]. Trouble indications obtained from these interfaces are analyzed at the operations center and trouble reports issued. For more information on TL1 interfaces, see 824-102-151 *Operations System Engineering Guide (OSEG)*. For ITM-SNC, see 107-564-288, *ITM-SNC System Administration Guide*, and 107-564-270, *ITM-SNC User Guide*. For CPro-2000, see 190-523-xxx (release dependent), *Cpro-2000 User Manual*.

Operations center personnel can use the OSEG and the **rtrv-alm** Report Descriptions in the "Commands and Reports" section of Volume 1 of this User/Service manual to assess the severity and meaning of alarm messages received at the operations interface. After analyzing the reports, center personnel may dispatch someone to the site indicating a local alarm condition. The trouble clearing procedures in this manual assume that troubles have been isolated to a particular node and are being used by technicians that have been dispatched to the site.

The second level of maintenance is a local visual inspection of the user panel and circuit pack LEDs, then using a CIT interface to retrieve detailed alarm reports.

Trouble Analysis Procedures

The trouble analysis procedures in this document involve replacing faulty circuit packs and obtaining performance reports and/or alarm and status reports for analysis to determine proper system operation and/or trouble. After determining the alarm level (Critical, Major, Minor, etc.) or trouble indication, the technician accesses the proper trouble analysis procedure (TAP) from **Trouble Clearing: IXL-001**. If the trouble cannot be corrected or identified using these procedures, the procedures direct the technician to obtain assistance because no more step-action procedural data is known for the specific trouble.

Regional Technical Assistance Center (RTAC)

The technician must make the decision regarding trouble analysis, corrective action, and obtaining assistance. The technician or local technical support staff may choose to continue trouble analysis based on their knowledge or experience on the DDM-2000 system, or may elect to obtain assistance by calling the Regional Technical Assistance Center **1-800-225-RTAC**.

COACH Assistance

Various customer computer-support tools are on-line and available via COACH. A login identification and password must be obtained to gain access to the COACH tools. Contact your regional DDM-2000 coordinator for information on obtaining a COACH login.

Diagnostic Dictionary	The Diagnostic Dictionary tool gives the user access to previously detected symptoms, problems, temporary fixes, cautions, and solutions. These may be usable in diagnosing, correcting, or avoiding a system problem.
Compatibility Data	The Compatibility Data tool gives the user access to hardware configuration data that is compatible to a user-specified software generic.
News and Bulletin	The News and Bulletin tool allows the user to process News and Bulletin information. News consists of messages which may be of general interest to the user. Bulletins contain information of a more urgent nature.

Circuit Pack Failures

Circuit pack failures are identified by LEDs and reported by system alarms and/or by manual or automatic diagnostic reports. When this occurs, a determination must be made as to why a circuit pack has failed. One recommendation as a first step for determining the cause of a failure is to unseat and then reseat the suspected circuit pack. For example, if a DS3 circuit pack is reported faulty, that circuit pack should be unseated and then resealed before being returned as defective. This will cause an automatic recovery and diagnostic operation to be performed on that DS3 circuit pack. If there is a contact problem such as dirt, oil, or lack of total contact connection, then this may be corrected by reseating and thus avoiding the return of a good unit for repair. Use caution when unseating circuit packs. For example, ensure protection switching is available for circuit pack being removed.

When circuit packs are replaced in some sequence to clear a trouble, they should be replaced one at a time by installing the original circuit packs if they were found to be operational.

Electrostatic Discharge (ESD) Considerations

Any integrated circuit on a circuit pack can be damaged by static electricity that builds up within a work area, particularly in areas with low relative humidity. This static buildup on work surfaces and on personnel and their clothing is produced by the various charging effects of even simple movements and by contact between various objects.

As a rule, the greatest potential for electrostatic damage occurs in areas with the lowest relative humidity. But, because such damage can occur anywhere, all personnel handling circuit packs should take the following precautions:

1. Since materials such as food wrappers, plastics, and *Styrofoam** containers tend to generate static electricity, keep them away from all circuit packs.
2. Be sure to read all warning labels on bags and cartons before opening any packaging.
3. If possible, open all circuit packs at a static-safe work position using properly grounded wrist straps and table mats that can dissipate static electricity.
4. Whenever possible, wait to remove circuit packs from their protective antistatic packaging until it is time to insert them into a bay.
5. Never touch a circuit pack's components, conductors, or connector pins. Handle all circuit packs only by the faceplate or latch or by the top and bottom outermost edges.
6. When opening and handling circuit packs or when working on backplanes, always wear a grounded wrist strap or wear a heel strap and stand on a grounded floor mat that can dissipate static electricity.
7. Always store and transport circuit packs in static-safe packages. (Shielding is not required unless specified.)
8. Whenever you remove circuit packs from a shelf, immediately put them into static-safe packages.
9. Try to keep relative humidity above 20 percent.

* Registered trademark of the Dow Chemical Corporation.

10. DDM-2000 shelves are equipped with grounding jacks for connecting static ground wrist straps. The jacks are located on the bottoms of the user panels.

Clear Critical (CR) Alarm

1.  **NOTE:**
Critical alarms are failures that cause loss of service to more than four DS1s (96 DS0 customer channels). Table A lists conditions which may cause critical alarms.

Is a CIT available?

If **NO**, then continue with **Step 2**.

If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3.  **NOTE:**
The **FE SEL** button on the **SYSC TL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

4. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?
If **NO**, then continue with **Step 5**.
If **YES**, then proceed to **Step 16**.
5. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).
6. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?
If **YES**, then continue with **Step 7**.
If **NO**, then do **TAP-108**.
7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display [**DLP-530**]).

8. Issue a trouble report of critical alarm condition at the far-end DDM-2000 site indicated in **FE ID** display.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
10. **⇒ NOTE:**
For all network configurations except point-to-point, there will be multiple far-end far end terminals. Using a Craft Interface Terminal (CIT) aids in troubleshooting multi-shelf DDM-2000 networks.

Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system, if not already performed.

Reference: **DLP-521**

11. **⇒ NOTE 1:**
The "**rtrv-alm**" command can be used to display a report of active DDM-2000 OC-3 alarm and status conditions. The "Commands and Reports" section of this manual gives a description of the command.
- ⇒ NOTE 2:**
The "Active Alarms and Status Report" is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line (for example, "CRITICAL ... inc. OC3 LOS" in the report below) in the "Active Alarms and Status Report".


```

/* Active Alarms and Status Report
=====
Alarm      Source      Date   Time      Srv  Description
Level      Address      Detected
=====
CRITICAL   main-2      MM-DD HH:MM:SS  SA    inc. OC3 LOS
-----
MAJOR      m2-2-1-1   MM-DD HH:MM:SS          inc. VT AIS
          .
          .
          .
MAJOR      dcc-m2     MM-DD HH:MM:SS          section DCC chan fail
MAJOR      dcc-m1     MM-DD HH:MM:SS          section DCC chan fail
-----
MINOR      main-1     MM-DD HH:MM:SS          inc. OC3 LOS
-----
ne-acty    -          holdover mode active
*/

```

Figure 1. Example of Active Alarms and Status Report

12.  **NOTE:**
Far-end alarm or status conditions are listed in this report with a Source Address of farend. Local alarm or status conditions have a Source Address of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, TL1 (X.25), TBOS, etc.) where the event occurred. (See *Addresses* in the "Commands and Reports" section of this manual.) Use the "**rtrv-alm**" command to get another report, if necessary.

Does the Source Address of any top entry in the alarm report indicate a **local** slot, channel, port or operations interface for the CRITICAL alarm?

If **NO**, then do **TAP-107**.

If **YES**, then continue with **Step 13**.

13. Use "**opr-aco**" command to silence active audible office alarms, if required.
14. Note the **local** trouble indication in the Description column of the "Active Alarms and Status Report", starting with the highest alarm level (Critical) listed in the Alarm Level column.
15. Find the trouble description in Table A for the highest alarm level and go to the indicated step or procedure.

Table A. Critical (CR) Alarm Conditions

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. CR LED lighted. FAULT LED flashing on OLI circuit pack(s).	inc. OC3 LOS inc. OC3 LOF inc. OC3 sig failed (BER) inc. OC3 sig degrade (BER)	Failure of OLI circuit pack at near or far end, or failure of receive fiber.	TAP-111 (linear, 1+1) or TAP-119 (ring, 0X1)
	inc. STS1 LOP OC3 <i>slotaid</i>	If failure on both OC-3 lines: unprotected removal or failure of MXRVO or DS3 circuit pack at far end.	Step 31
		If failure on only one OC-3 line: Failure of OLI circuit pack at near or far end.	TAP-111 (linear, 1+1) or TAP-119 (ring, 0X1)
	inc. OC12 LOS inc. OC12 LOF inc. OC12 sig failed (BER) inc. OC12 sig degrade (BER)	Failure of OLI circuit pack at near or far end, or failure of receive fiber.	TAP-119 (ring, 0X1)
	inc. STS1 LOP OC12 <i>slotaid</i> inc. STS3c LOP OC12 <i>slotaid</i>	If failure on both OC-12 lines: unprotected removal or failure of MXRVO or DS3 circuit pack at far end.	Step 31
		If failure on only one OC-12 line: Failure of OLI circuit pack at near or far end.	TAP-119 (ring, 0X1)
	inc. OC1 LOS inc. OC1 LOF inc. OC1 sig failed (BER) inc. OC1 sig degrade (BER)	Failure of OLI circuit pack at near or far end, or failure of receive fiber.	TAP-119 (ring, 0X1)
	inc. STS1 LOP OC1 <i>slotaid</i>	If failure on both OC-1 lines: unprotected removal or failure of MXRVO or OLI circuit pack at far end.	Step 31
		If failure on only one OC-1 line: Failure of OLI circuit pack at near or far end.	TAP-119 (ring, 0X1)
CRITICAL. CR LED lighted.	inc. OC3 line AIS* inc. OC12 line AIS* inc. OC1 line AIS	Failure of OLI circuit pack at the far end.	Step 37

See notes/footnotes at end of table.

Table A. Critical (CR) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. CR LED lighted. FAULT LED flashing on DS3/TMUX circuit pack.	inc. (from DSX) DS3 AIS* inc. (from DSX) DS3 LOS* inc. (from DSX) DS3 OOF* inc. (from DSX) DS3 sig fail*	Equipment failed or removed at DSX-3; DS3 input disconnected at the DSX-3 or at the DDM-2000 backplane; an out-of-frame DS3 signal incoming to the DSX-3 at the far end; unprotected failure of DS3 circuit pack at the far end or near end; DS3 signal looped at both ends for DS3 circuit packs.	Step 17
CRITICAL. CR LED lighted. FAULT LED flashing on STS1E circuit pack.	inc. EC1 LOS* inc. EC1 LOF* inc. EC1 sig failed (BER)* inc. EC1 sig degrade (BER)*	Failure of incoming EC-1 signal from STSX, failure of STS1E circuit pack at the near end, failure of incoming cable or cable disconnect at EC-1 STSX cross-connect point or shelf connector, cross talk in office wiring,	Step 17
	inc. EC1 line AIS*	Failure of the STS1E circuit pack or equivalent at other end of EC-1 line.	Step 35
	inc. STS1 LOP EC1*	Failure of the near-end or far-end STS1E circuit pack.	Step 35
CRITICAL. CR LED lighted.	inc. STS1 AIS*	Incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or obscure failure of a DS3 , STS1E , MXRVO , or OLIUI circuit pack at the far end; unprotected optical line failure.	TAP-120
	inc. VT AIS*	Incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or failure of a DS1 circuit pack at the far end.	TAP-120
	inc. STS1 sig failed (BER) inc. STS1 sig degrade (BER)	Failure of OLIUI circuit pack at near end or far end or failure of receive fiber.	TAP-111 (linear, 1+1) or TAP-119 (ring, 0X1)

See notes/footnotes at end of table.

Table A. Critical (CR) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. CR LED lighted.	inc. STS1 unequipped	STS-1 cross-connects have been deleted or an equipment slot(s) has been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring.	TAP-120
	invalid CP switches	When associated with TIMING slot, timing mode switch settings on TGS circuit pack are invalid.	Step 24
CRITICAL. CR LED lighted. FAULT LED may be lighted on failed circuit packs.	Both TGS CP fail Both MXRVO CP fail Both OLIU CP fail Both DS3 CP fail Both STS1E CP fail Both TMUX CP fail	Internal circuit pack failure. Replace circuit pack.	DLP-523
CRITICAL. CR LED lighted.	Both TGS CP removed Both MXRVO CP removed Both OLIU CP removed Both DS3 CP removed Both STS1E CP removed Both TMUX CP removed	Circuit packs removed without doing upd command to remove circuit packs from equipment list.	Step 28
	CP not allowed - (crs)	Circuit pack does not support the manual cross-connection(s) currently provisioned for this slot.	Change circuit pack or change cross-connections.
	CP not allowed - (timing)	When associated with TIMING slot, current circuit pack switch settings do not support the sync. timing provisioned.	Change TGS switches [DLP-513] or change sync. parameters (" set - sync ").
		When associated with FUNCTION UNITS group C , circuit pack type does not support the current provisioned sync. parameters (" set - sync ").	Change circuit pack type or change timing options
	environment ⁿ *	Default message, can be changed. An environmental alarm point (miscellaneous discrete input) is active.	Use " rtrv-attr-env " command at RT to determine cause.
	ExternalMinor [*]	External minor alarm (environmental alarm input 15) is active at RT. DC power or cooling fan in RT has failed.	Use " rtrv-attr-env " command at RT to determine cause. Clear trouble using local procedures.

See notes/footnotes at end of table.

Table A. Critical (CR) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. CR LED lighted. FAULT LED lighted on circuit pack.	unexpected CP switches unexpected CP type	Switch settings invalid, different from other circuit pack, or different than they were before circuit pack was removed or replaced. Circuit pack inserted into slot provisioned for different circuit pack.	Step 21
CRITICAL. CR LED lighted.	illegal CP type	An illegal or unknown circuit pack type has been inserted into the shelf.	Remove circuit pack and install correct circuit pack.
	2nd CP required for BBF3	The BBF3/BBF3B DS1PM circuit pack requires both companion FUNCTION UNITS slots in the group to be equipped with MXRVO or STS1E circuit packs.	Insert a second MXRVO or STS1E circuit pack in the companion FUNCTION UNITS slot.

Note: Similar descriptions of trouble may also appear in the CIT "Active Alarms and Status Report".

*May be provisioned for Critical, Major, Minor or no alarm.

16.  **NOTE:**
The alarm level for incoming DS3/EC-1 signal failure may be set for Critical. The "**set - t3**" (DS3) or "**set - ec1**" (EC-1) command is used to set the alarm level.

Is the **FAULT** LED on any **DS3/STS1E** circuit pack flashing?

If **YES**, then continue with **Step 17**.

If **NO**, then proceed to **Step 19**.

17. Issue a trouble report of a bad incoming DS3 (EC-1) signal from DSX-3 (STX) cross-connect point. Clear trouble using local procedures. If no trouble found, replace **STS1E** circuit pack at near end.

Reference: **DLP-523**

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. Is **FAULT** LED on an **OLIU** circuit pack lighted or flashing?

If **YES**, then do **TAP-111** if Release 8 (linear configuration).

Do **TAP-119** if Release 9 or 11 (ring configuration).

If **NO**, then continue with **Step 20**.

20.  **NOTE:**
Failure of both the service and protection **TGS**, **MXRVO**, **STS1E**, **DS3**, or **TMUX** circuit packs will activate a Critical alarm.

Are the **FAULT** LEDs lighted (not flashing) on a service and protection circuit pack of the same type?

If **YES**, then continue with **Step 21**.

If **NO**, then proceed to **Step 28**.

21.  **NOTE:**
Alarm may be caused by circuit packs inserted into the wrong slots or by invalid or wrong switch settings on the **TGS** circuit packs.

Are circuit packs installed in the correct slots?

If **YES**, then proceed to **Step 24**.

If **NO**, then continue with **Step 22**.

22. Remove circuit packs from wrong slots, check option switches (**DLP-513**) and reinstall circuit packs into the correct slots.
23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

24.  **CAUTION:**
*When removing circuit packs ensure that protection switching is available. Also, remove the circuit pack without the lighted **ACTIVE** LED first.*

Check switch settings ("**rtrv-sync**" command) on the **TGS** circuit packs for correct settings. If the circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced. Also check if the switches are set the same as the companion circuit pack.

Reference: **DLP-513**

25. Are switch settings correct?
If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 26**.
26. Change switch settings to the correct settings. (Use "**switch-sync**" command to switch to other circuit pack before removing pack.) If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.
27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
28. Have two of the same type (service and protection **TGS**, **MXRVO**, **OLIU**, **STS1E**, **DS3**, or **TMUX**) circuit packs been removed from the system?
If **YES**, then continue with **Step 29**.
If **NO**, then do **TAP-108**.
29. Determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.
30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. Indications are that there is an unprotected failure or removal of a **MXRVO(s)** or **DS3(s)** circuit pack at the far-end associated with the identified **OLIU** slot at the near-end. Determine location of the circuit pack(s) from office records or use the "**rtrv-crs-()**" commands to trace back through the STS1/VT1.5 cross-connections associated with the identified **OLIU** slot.
32. If circuit packs are removed, determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the "**upd**" command. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the "**upd**" command to remove the circuit pack from the inventory.
33. If the **MXRVO** or **DS3** circuit packs have not been removed, replace the **MXRVO** or **DS3** circuit pack associated with the identified **OLIU** slot in the alarm message.

Reference: **DLP-523**

34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

35. If the source address is a **FUNCTION UNITS** slot, the likely cause of trouble is a failure of the equipment at the far end of the EC-1 line (towards the STSX) or the near-end **STS1E** circuit pack. Replace **STS1E** circuit pack [DLP-523]. If trouble does not clear, issue a trouble report of equipment failure at the far end.

If the source address is an **OLIU** slot, the likely cause of trouble is a failure of the far-end **STS1E** circuit pack associated with the identified STS-1 signal. Determine location of the **STS1E** circuit pack from office records or use the "**rtrv-crs- ()**" commands to trace back through the STS1/VT1.5 cross-connections associated with the identified STS-1 signal. Replace far-end **STS1E** circuit pack.

Reference: **DLP-523**

36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
37. Replace **OLIUs** at far end that are associated with the Source Address of the "inc. 0C3 line AIS", "inc. 0C12 line AIS", or "inc. 0C1 line AIS" alarm message.

Reference: **DLP-523**

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Major (MJ) Alarm

1.  **NOTE:**
Major alarms are failures that cause loss of service to 96 or less DS0 customer channels. Table A lists conditions which may cause a major alarm.

Is a CIT available?

If **NO**, then continue with **Step 2**.

If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3.  **NOTE:**
The **FE SEL** button on the **SYSC TL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

4. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?
If **NO**, then continue with **Step 5**.
If **YES**, then proceed to **Step 15**.
5. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).
6. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?
If **YES**, then continue with **Step 7**.
If **NO**, then do **TAP-108**.

7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display) (**DLP-530**).
8. Issue a trouble report of critical alarm condition at the far-end DDM-2000 site indicated in **FE ID** display.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
10. **⇒ NOTE:**
For all network configurations except point-to-point, there will be multiple far-end far end terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

Connect the CIT to the **CIT** connector on the near-end User Panel and log in or remote log in to the near-end system, if not already performed.

Reference: **DLP-521**

11. **⇒ NOTE 1:**
The "**rtrv-alm**" command can be used to display a report of active DDM-2000 OC-3 alarm and status conditions. The "Commands and Reports" section of this manual gives a description of the command.
- ⇒ NOTE 2:**
The "Active Alarms and Status Report" is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line in the "Active Alarms and Status Report" (Figure 1) (for example, "MAJOR m1-1-1-1 MM-DD HH:MM:SS SA inc. VT AIS").

```
/* Active Alarms and Status Report
=====
Alarm      Source      Date   Time      Srv   Description
Level      Address      Detected
=====
MAJOR      m1-1-1-1    MM-DD HH:MM:SS  SA    inc. VT AIS
-----
ne-acty    m2-1-1-1    MM-DD HH:MM:SS  nsa    inc. VT AIS
*/
```

Figure 1. Example of Active Alarms and Status Report

12.  **NOTE:**
Far-end alarm or status conditions are listed in this report with a Source Address of farend. Local alarm or status conditions have a Source Address of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, TL1 (X.25), TBOS, etc.) where the event occurred. (See *Addresses* in the "Commands and Reports" section of this manual.) Use the "**rtrv-alm**" command to get another report, if necessary.
- Does the Source Address of any top entry in the alarm report indicate a **local** slot, channel, port or operations interface for the MAJOR alarm?
If **NO**, then do **TAP-107**.
If **YES**, then continue with **Step 13**.
13. Use "**opr-aco**" command to silence active audible office alarms, if required.
14. Note the **local** trouble indication in the Description column of the "Active Alarms and Status Report", starting with the highest alarm level (Major) listed in the Alarm Level column.
15. See Table A for trouble description for the highest alarm level and go to the indicated step or procedure.

Table A. Major (MJ) Alarm Conditions

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. MJ LED lighted.	AGNE communication failure	The AGNE has not been assigned in an alarm group. The AGNE and NE(s) are assigned different alarm group numbers. The AGNE has failed (Unless there are 2 or 3 AGNEs).	Use " rtrv-ne " command to check AGNE assignment and alarm group number assignment. Use " set-ne " command to change AGNE assignment and alarm group assignment.
	BBF5 required in LS-8	A BBF5 JMPR circuit pack is missing from a shelf (Group 3 or earlier) with two 27G-U OLIU circuit packs or a 27G-U and 27G2-U OLIU circuit packs in the corresponding FUNCTION UNITS slot pair.	Install BBF5 JMPR circuit pack in slot 8(P) of the LOW SPEED GROUP associated with the corresponding FUNCTION UNITS slots where the 27G-U/27G2-U OLIUs are installed.
	BBF5 required in LS-4	A BBF5 JMPR circuit pack is missing from a shelf (Group 3 or earlier) with two 27G2-U OLIU circuit packs in the corresponding FUNCTION UNITS slot pair.	Install BBF5 JMPR circuit pack in slot 4 of the LOW SPEED GROUP associated with the corresponding FUNCTION UNITS slots where the 27G2-U OLIUs are installed.
	CP not allowed - (eqpt)	A DS1/DS1PM circuit pack is installed in a LOW SPEED GROUP slot associated with the corresponding FUNCTION UNITS slot provisioned for DS3 , STS1E_L low speed, or OLIU circuit pack service.	Remove DS1 circuit pack or change FUNCTION UNITS to MXRVO or STS1E_H circuit pack high speed.

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. MJ LED lighted. FAULT LED lit on SYSCTL and OHCTL circuit pack.	duplicate site/ne address	Two or more shelves in the network have the same site address and the same network element address (determined by " set - ne " command).	Use " rtrv-ne " command to check site and network element assignments at each shelf. Use " set - ne " command to change site and network element assignments.
MAJOR. MJ LED lighted.	DSNE not reachable	No network element has been provisioned as a directory service network element (DSNE); non-DSNE network element starts up and does not get registered by a DSNE within a specified time; DCC failure between local NE and the DSNE; optical line failure in the subnetwork; a controller failure or pull; reset or initialization of the DSNE.	See the " set - ne " and " rtrv-ne " commands for DSNE provisioning information. Use the " set - ne " command to provision one (and only one) shelf as the DSNE.
	duplicate DSNE	A shelf has been provisioned as a directory services network element (DSNE) in a network that already has a DSNE. Only one network element in the network may be provisioned as the DSNE.	Use " rtrv-map-network " command to check DSNE assignments. Delete duplicate DSNE using " set - ne " command.
	duplicate TBOS display	Two or more shelves in the alarm group have the same TBOS display address (determined by " set - ne " command).	Use " rtrv-ne " command to check TBOS display address at each shelf. Use " set - ne " command to change TBOS display address.
	duplicate TID	Two or more shelves in the network have the same system name or TID set by the " set - ne " command.	Use " set - ne " to change TID of improperly named shelves.
	ExternalMinor [*]	External minor alarm (environmental alarm input 15) is active. DC power or cooling fan in RT failed.	Clear trouble using local procedures.

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. MJ LED lighted.	environment ⁿ *	An environmental alarm point (miscellaneous discrete input) is active.	Clear trouble using local procedures.
	frequency error	The DS1 external timing reference or the timing from a remote shelf has a frequency offset greater than 20 hertz.	Check the DS1 external timing source or the timing obtained from a remote shelf.
MAJOR. MJ LED lighted. FAULT LED flashing on TGS circuit pack.	inc. DS1 sync. ref. LOS inc. DS1 sync. ref. LOF inc. DS1 sync. ref. BER inc. DS1 sync. ref. AIS inc. DS1 sync. ref. 00L inc. DS1 sync. ref. E00F	Failure of TGS circuit pack at near or far end, or failure of upstream timing supply, timing eqpt., system set for SF and received DS1 is ESF.	Step 23
MAJOR. MJ LED lighted. FAULT LED flashing on DS3/TMUX circuit pack.	inc. (from DSX) DS3 AIS [*] inc. (from DSX) DS3 LOS [*] inc. (from DSX) DS3 00F [*]	Equipment failed or signal removed at DSX-3, unprotected failure of DS3/TMUX circuit pack.	Step 21
MAJOR. MJ LED lighted. FAULT LED flashing on STS1E circuit pack.	inc. EC1 LOS [*] inc. EC1 LOF [*] inc. EC1 sig failed (BER) [*] inc. EC1 sig degrade (BER) [*]	Failure of the STS1E or equivalent circuit pack at near end or far end of EC-1, failure of the incoming cable, failure of the STS1E circuit pack at the near end, cross talk in office wiring, or a cable disconnect at the EC-1 STSX cross-connect point or shelf connector.	Step 21
	inc. EC1 line AIS [*]	Failure of STS1E circuit pack or equivalent at far end of EC-1 line.	Step 21
	inc. STS1 LOP EC1 [*]	Failure of the far end STS1E circuit pack or failure of the STS1E circuit pack at the near end.	Step 21
MAJOR. MJ LED lighted.	inc. OC3 line AIS [*] inc. OC12 line AIS [*]	Failure of OLIU circuit pack at far end.	Step 78

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. MJ LED lighted. FAULT LED flashing on DS1/DS1PM circuit pack.	inc. (from DSX) DS1 LOS† inc. (from DSX) DS1 sig fail†	Equipment failed, DSX-1 signal removed, cross talk in office wiring, or DS1/DS1PM circuit pack failed.	Step 19
MAJOR. MJ LED lighted. FAULT LED lighted on circuit pack.	DS1 CP failed DS1PM CP failed	Two service DS1/DS1PM circuit packs failed. Unprotected service DS1/DS1PM circuit pack failure.	Step 65
	SYSCTL CP failed	Internal circuit pack failure	Step 42
	OHCTL CP failed	Internal circuit pack failure	Step 51
MAJOR. MJ LED lighted.	CP removed	Circuit packs removed without doing " upd " command to remove circuit packs from equipment list.	Perform " upd " command to remove circuit packs from equipment list.
	excessive holdover	System has been in holdover mode for more than 4 hours because of timing ref. fail or manual switch.	Check timing ref., check state of eqpt. (" rtrv-state-eqpt ")
	inc. STS1 AIS*	Incomplete or incorrect cross-connect provisioning in end-to-end network. In ring applications, unprotected removal or failure of DS3 , MXRVO , or STS1E circuit pack at far end; fiber or OLI circuit pack failure.	TAP-120
	inc. VT AIS*	Incomplete or incorrect cross-connect provisioning in end-to-end network. In ring applications, unprotected removal or failure of DS1/DS1PM circuit pack at far end; fiber or OLI circuit pack failure.	TAP-120
	inc. VT LOP	Unprotected failure of DS1/DS1PM or MXRVO circuit pack at near end or far end.	Replace failed circuit pack [DLP-523]
	inc. VT sig degrade (BER)	An OLI circuit pack failure, or a fiber failure at some point on the failed ring.	TAP-119
	inc. VT unequipped	VT1.5 cross-connects have been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring.	Find the deleted cross-connects in the upstream equipment.

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. MJ LED lighted.	inc. VT unequipped	VT1.5 cross-connects have been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring.	Find the deleted cross-connects in the upstream equipment.
	illegal CP type	An illegal or unknown circuit pack type has been inserted into the shelf.	Remove circuit pack and install correct circuit pack.
	inconsistent DCC values	The Network Side/User Side parameters are set the same at both ends of a DCC (optical span).	Use " rtrv-fecom " command to check Network Side/User Side parameters at each shelf in the network. Use " set-fecom " command to change Network Side/User Side parameters at one end of optical span.
	unexpected CP type unexpected CP switches	Switch settings invalid, different from other circuit pack, or different than they were before circuit pack was removed or replaced. Circuit pack inserted into slot provisioned for different pack.	Step 68
	Intersubsys com link failed	In the MegaStar [®] 2000 system, the SONET subsystem session is active, but is unable to communicate with the RADIO subsystem.	
	TID address map full	Network elements have been removed from the network but not from the DSNE database.	Use " dlt-tadmap " command to delete removed NEs from database.
	unsupported DCC connection	DCC is enabled on an OC-1 connection between the MAIN slots in two OC-3 shelves. The DDM-2000 OC-3 system does not support a DCC link over an OC-1 line terminating on the MAIN slots between two OC-3 shelves.	Use " set-fecom " command to disable the DCC on the OC-1 interface.
	X.25 communication failure	X.25 communication eqpt. failed; failure at the OS.	Issue trouble report to OS.

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. MJ LED lighted. Flashing FAULT LED on OHCTL circuit pack.	section DCC channel failed	SYSCTL circuit pack failure, reset, or initialization at far end. SYSCTL circuit pack removed from a site. Program installation in progress or failed at far end. SYSCTL or OHCTL circuit pack failed at near end. OLI circuit pack or fiber failure between this node and node connected to the source address (no communication with other end).	Step 25

Note: Similar descriptions of trouble may also appear in the CIT "Active Alarms and Status Report".

* May be provisioned for Critical, Major, Minor or no alarm.

† May be provisioned for Major, Minor or no alarm.

‡ Trademark of Harris Corporation.

16. **⇒ NOTE:**

If a program installation is being performed to a **SYSCTL** at the far end, it is normal for the **FAULT** LED on the near-end **OHCTL** to flash and the **MJ** and **NE ACTY** LEDs to light on the User Panel. If there is a **MJ** alarm at the end receiving the program, trouble is indicated. You should check if a program installation is being done.

Was new software generic being downloaded (program upgrade) to the **SYSCTL** at this end when alarm occurred?

If **YES**, then do **TAP-116**.

If **NO**, then continue with **Step 17**.

17. Is the **FAULT** LED on the faceplate of one or more circuit packs flashing?

If **YES**, then continue with **Step 18**.

If **NO**, then proceed to **Step 41**.

18. Find the circuit pack(s) with a flashing LED in Table B below and go to the indicated step or procedure.

Table B. Circuit Pack(s) With Flashing LED

Circuit Pack	Go To
DS1/DS1PM	Step 19
DS3/STS1E (SRV or PROTN)	Step 21
TGS	Step 23
OHCTL	Step 33
OLIU (Linear)	TAP-111
OLIU (Rings)	TAP-119

19. Switch service to protection. If LED is flashing on protection **DS1/DS1PM**, issue trouble report of bad incoming signal at input to **DS1/DS1PM** circuit pack with flashing LED(s). If LED is not flashing on protection **DS1/DS1PM**, replace service **DS1/DS1PM** circuit pack [**DLP-523**].
20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
21. Switch service to protection. If LED is flashing on protection **DS3/TMUX/STS1E**, issue trouble report of bad incoming DS3/EC-1 signal from DSX-3/STX cross-connect point. If LED is not flashing on protection **DS3/TMUX/STS1E**, replace service **DS3/TMUX/STS1E** circuit pack [**DLP-523**].
22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
23. Check **TGS** option switches for proper line coding and frame format settings ("**rtrv-sync**"). If no trouble found, check incoming timing reference signals. If timing reference signals are bad, issue trouble report of bad incoming timing reference signal(s). If no trouble found with timing references, replace **TGS** circuit packs.

Reference: **DLP-523**

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. **⇒ NOTE:**
If a program installation is being performed to a **SYSCTL** at the far end, it is normal for the **FAULT** LED on the near-end **OHCTL** to flash and the **MJ** and **NE ACTY** LEDs to light on the User Panel. If there is a **MJ** alarm at the end receiving the program, trouble is indicated. You should check if a program installation is being done.

Is new software generic being downloaded (program upgrade) to the **SYSCTL** at the far end terminal?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 26.**

26. In alarm report, is there any indication of **OLIU** or fiber trouble at near end or far end such as "inc. 0C3 FERF" or "inc. 0C12 FERF" alarm message?
If **YES**, then continue with **Step 27.**
If **NO**, then proceed to **Step 29.**

27. **⇒ NOTE:**
If there is a DCC failure, a remote login to the shelf connected through the Source Address cannot be done. The "**rtrv-alm**", "**rtrv-nmap**", "**rtrv-map-network**", and "**rtrv-map-neighbor**" commands can be used to check for DCC failure for **MAIN** (and **FUNCTION UNITS A, B, or C**). Also, use "**rtrv-fecom**" command to see if fecom has been disabled.

Note Source Address of DCC channel failure. Check optical fibers connected through the Source Address per local procedures. If no trouble found, replace near-end **OLIU** first then far-end **OLIU**.

Reference: **DLP-523**

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
29. Use CIT and "**reset**" command to reset **SYSCTL** at the near end or unplug and reseat the **SYSCTL**.
30. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing ("section DCC channel failed")?
If **YES**, then continue with **Step 31.**
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. If possible, use CIT and "**r lgn**" command to log in to the far-end terminal (**DLP-522**) and use the "**reset**" command to reset **SYSCTL** at the far end.
32. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing ("section DCC channel failed")?
 - If **YES**, then proceed to **Step 37**.
 - If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
33.  **NOTE:**
Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.
34. Is the **FAULT** LED on the affected circuit pack still flashing?
 - If **YES**, then continue with **Step 35**.
 - If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
35. Obtain a CIT and repeat this procedure.
36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
37. Refer to **DLP-501** and replace **SYSCTL** at near-end terminal.
38. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing?
 - If **YES**, then continue with **Step 39**.
 - If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
39. At far-end terminal, reset **SYSCTL** by unseating and reseating **SYSCTL** or by using a CIT and the "**reset**" command, if not already performed. If **FAULT** LED is still flashing after a reset, refer to **DLP-501** and replace **SYSCTL** at far-end terminal. If the **FAULT** LED is still flashing after the **SYSCTL** is replaced, replace the **OHCTL** [**DLP-523**] first at one end and then the other, if trouble still exists.
40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
41. Is the **FAULT** LED lighted on the **SYSCTL**?
 - If **YES**, then continue with **Step 42**.
 - If **NO**, then proceed to **Step 49**.

42. Remove **SYSCCTL** and check switch settings.

Reference: **DLP-513**

43. Are switch settings correct?

If **YES**, then proceed to **Step 45**.

If **NO**, then continue with **Step 44**.

44. Set switches to correct settings.

Reference: **DLP-513**

45. Reinstall the **SYSCCTL**. Is the **FAULT** LED still lighted?

If **YES**, then continue with **Step 46**.

If **NO**, then proceed to **Step 50**.

46. Use CIT and "**rtrv-ne**" command to check provisioning of site ID and network element number. Two or more shelves cannot have the same site ID and/or network element number. If provisioning is incorrect, use CIT and "**set-ne**" command to set site ID and/or network element number.

47. Is the **FAULT** LED still lighted on the **SYSCCTL**?

If **YES**, then proceed to **Step 48**.

If **NO**, then continue with **Step 50**.

48. Refer to **DLP-501** and replace the **SYSCCTL**.

49. Is the **FAULT** LED still lighted on the **SYSCCTL**?

If **YES**, then proceed to **Step 57**.

If **NO**, then continue with **Step 50**.

50. Is the **MJ** alarm LED still lighted?

If **YES**, then continue with **Step 51**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

51. Is the **FAULT** LED on **OHCTL** lighted?

If **YES**, then continue with **Step 52**.

If **NO**, then proceed to **Step 59**.

52. Use CIT and "**rtrv-ne**" command to check provisioning of site ID and network element number. Two or more shelves cannot have the same site ID and/or network element number. If provisioning is incorrect, use CIT and "**set-ne**" command to set site ID and/or network element number.

53. Is the **FAULT** LED on **OHCTL** still lighted?
If **YES**, then proceed to **Step 54**.
If **NO**, then continue with **Step 56**.
54. Refer to **DLP-523** and replace the **OHCTL**.
55. Is the **FAULT** LED still lighted on the **OHCTL**?
If **YES**, then proceed to **Step 57**.
If **NO**, then continue with **Step 56**.
56. Is the **MJ** alarm LED still lighted?
If **YES**, then proceed to **Step 59**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
57. The problem appears to be in the backplane of the DDM-2000 or another circuit pack in the shelf is causing the **FAULT** LED on the **SYSCTL** to light. Remove service from one **FUNCTION UNITS** group (**A**, **B**, or **C**) and unseat all circuit packs associated with that group. If the trouble clears, it means that one or more of the circuit packs removed is defective. If the trouble does not clear, reinsert the removed circuit packs and repeat the above for another **FUNCTION UNITS** group. If the trouble cannot be isolated by removing circuit packs, seek technical assistance and/or replace the shelf. Notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.
58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
59.  **NOTE:**
A major alarm may also be caused by a wrong circuit pack inserted into the **AUXCTL** slot, DS1 line code switch settings that are different from what they were before a **DS1/DS1PM** circuit pack was replaced, excessive holdover due to loss of synchronization reference, or a manual switch to holdover in effect too long.

Is any circuit pack except an **OHCTL** installed in the **AUXCTL** slot?

- If **YES**, then continue with **Step 60**.
If **NO**, then proceed to **Step 62**.

60. Remove wrong circuit pack from **AUXCTL** slot and install correct **OHCTL** circuit pack [DLP-523].
61. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
62.  **CAUTION:**
*If a DS1 is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A** Retainer Card in the same **LOW SPEED GROUP** will result in a loss of service to the protected DS1 and the removed **DS1/DS1PM** circuit pack.*

Has an unprotected **DS1/DS1PM** circuit pack or more than one **DS1/DS1PM** circuit pack been removed from the system?

If **YES**, then continue with **Step 63**.

If **NO**, then proceed to **Step 65**.

63. Determine the reason the circuit packs were removed. If the same circuit pack(s) is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.
64. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
65. Is **FAULT** LED lighted on any **DS1/DS1PM** circuit pack?
If **YES**, then continue with **Step 66**.
If **NO**, then proceed to **Step 70**.
66. Check switch settings on **DS1/DS1PM** circuit pack (with lighted **FAULT** LED) for correct line code settings. If circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced.

Reference: **DLP-513**

67. Are switch settings correct?
 If **YES**, then do **TAP-103**.
 If **NO**, then continue with **Step 68**.
68. Change switch settings to the correct settings. If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.
69. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
70. Is there an "inc. VT AIS" alarm indication?
 If **YES**, then do **TAP-120**.
 If **NO**, then do **TAP-103**.
71.  **NOTE:**
 Alarm may be caused by circuit packs inserted into the wrong slots or by invalid or wrong switch settings on the **TGS** circuit packs.
- Are circuit packs installed in the correct slots?
 If **YES**, then proceed to **Step 74**.
 If **NO**, then continue with **Step 72**.
72. Remove circuit packs from wrong slots, check option switches (**DLP-513**) and reinstall circuit packs into the correct slots.
73. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

74.  **CAUTION:**
*When removing circuit packs ensure that protection switching is available. Also, remove the circuit pack without the lighted **ACTIVE** LED first.*

Check switch settings on the circuit packs for correct settings. If the circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced. Also check if the switches are set the same as the companion circuit pack.

Reference: **DLP-513**

75. Are switch settings correct?
If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 76**.
76. Change switch settings to the correct settings. (Use "**switch-()**" command to switch to other circuit pack before removing pack.) If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.
77. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
78. Replace **OLIUs** at far end that are associated with the Source Address of the "inc. 0C3 line AIS" or "inc. 0C12 line AIS" alarm message.

Reference: **DLP-523**

79. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Multiple Failure

1.  **CAUTION:**
*Although the **FAULT** LEDs may be lighted or flashing on an **OLI**U, service may be interrupted if the **OLI**U is removed. The **OLI**Us may be in unidirectional switching mode and transmitting on one **OLI**U while receiving on the other. The state of the switch mode must be analyzed before removing an **OLI**U.*

 **NOTE:**
A multiple failure condition exists when a service circuit pack and its associated protection circuit pack have failed, when two service DS1 circuit packs in the same group have failed, or when the switch mode is inhibited or locked and a failure occurs on a service circuit pack.

Is the **FAULT** LED on an **OLI**U lighted ("CP failed") or flashing ("inc. OC3 LOS", etc.) or ("inc. OC12 LOS", etc.)?

If **YES**, then do **TAP-111** if linear.

Do **TAP-119** if ring configuration.

If **NO**, then continue with **Step 2**.

2. Are the **FAULT** LEDs on both a service and protection circuit pack of the same type lighted (not flashing) ("CP failed")?
If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 7**.

3.  **CAUTION:**
Replacement circuit pack may have option switches which must be properly set before the circuit pack is installed.

Replace the service circuit pack with the lighted **FAULT** LED.

Reference: **DLP-523**

4. Is the **FAULT** LED on the circuit pack just replaced off?

If **YES**, then continue with **Step 5**.

If **NO**, then do **TAP-106**.

5. Replace the protection circuit pack with the lighted **FAULT** LED.

Reference: **DLP-523**

6. Is the **FAULT** LED on the circuit pack just replaced off?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then do **TAP-106**.

7. Are the **FAULT** LEDs on two or more service **DS1** circuit packs lighted (not flashing)?

If **YES**, then continue with **Step 8**.

If **NO**, then proceed to **Step 12**.

8. Replace either of the service **DS1** circuit packs with the lighted **FAULT** LED.

Reference: **DLP-523**

9. Is the **FAULT** LED on the circuit pack just replaced off?

If **YES**, then continue with **Step 10**.

If **NO**, then do **TAP-106**.

10. Replace the other service **DS1** circuit pack with the lighted **FAULT** LED.

Reference: **DLP-523**

11. Is the **FAULT** LED on the circuit pack just replaced off?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then do **TAP-106**.

12. Use CIT and the **rtrv-()** commands (**rtrv-state**, **rtrv-sync**, etc.) to check switching mode for inhibits, locks, etc.

13. Was any trouble found?

If **YES**, then continue with **Step 14**.

If **NO**, then do **TAP-108**.

14. Determine reason for locks, inhibits, etc. to be in place. See the "Commands and Reports" section of this manual for a description of the **switch-()** commands and the **rtrv-alm** command report descriptions. Use the **switch-()** commands to reset switching mode or priority.

If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Power Minor (PMN) Alarm

1.  **CAUTION:**
There is an AC power failure at the remote DDM-2000 terminal. This will result in a service interruption if it is not restored.

Are you at the remote terminal site?

If **YES**, then proceed to **Step 5**.

If **NO**, then continue with **Step 2**.

2. Momentarily depress the **ACO** pushbutton on the DDM-2000 User Panel.

Response: The audible alarm is silenced.

3. Issue a trouble report of an AC power failure at the remote terminal.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. What type of RT configuration do you have?

If **Bulk Power**, then continue with **Step 6**.

If **Distributed Power**, then proceed to **Step 8**.

6. Use documentation for your bulk power plant to clear trouble. Check AC circuit breakers and verify AC power is present at the RT enclosure.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Using digital multimeter (DMM), measure incoming AC voltage (use **AC** and **GND** jacks on **LDU** faceplate in J1C182BA power shelf).

9. Is measured AC voltage between 105 and 129 volts?

If **YES**, then continue with **Step 10**.

If **NO**, then proceed to **Step 19**.

10. Is power shelf a J1C182BA Power Shelf?

If **YES**, then continue with **Step 11**.

If **NO**, then proceed to **Step 27**.

11. Is **FAIL** LED lighted on any **336A RECTIFIERs** at RT?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 14**.
12. Replace **336A RECTIFIERs** that have **FAIL** LED lighted.
13. Did alarm clear within 20 seconds?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 27**.
14. Is **BAT DISCHG** LED lighted on any **337A BATTERY CHARGER(s)**?
If **YES**, then continue with **Step 15**.
If **NO**, then proceed to **Step 27**.
15. Replace one **336A RECTIFIER**.
16. Did alarm clear within 20 seconds?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then continue with **Step 17**.
17. Replace another **336A RECTIFIER**.
18. Did alarm clear within 20 seconds?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 27**.
19. Is fuse blown or circuit breaker tripped at RT main AC circuit breaker box?
If **YES**, then continue with **Step 20**.
If **NO**, then proceed to **Step 23**.
20. Replace blown fuse or reset circuit breaker.
21. Does fuse blow or circuit breaker trip again?
If **YES**, then proceed to **Step 27**.
If **NO**, then continue with **Step 22**.
22. Did alarm clear within 20 seconds?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 27**.

23. Contact local power company if loss of AC power has occurred or if there is overvoltage or undervoltage condition.
24. Does local power company verify abnormal power condition?
If **YES**, then continue with **Step 25**.
If **NO**, then proceed to **Step 27**.
25. Estimate restoration time for AC power. If necessary, equip RT with fully charged batteries or other power source to maintain power until AC power is restored.
26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**
27.  **NOTE:**
If alarms remain, multiple troubles exist and trouble analysis must be repeated.

If you have a J1C182BA Power Shelf, use SD-7C117 and SD-7C118 to locate trouble. If another power shelf or powering arrangement is used, use the appropriate documentation and wiring diagrams to locate power trouble. If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

Clear Trouble Report

1. Is the **CR** alarm LED lighted on the User Panel?
If **YES**, then do **TAP-101**.
If **NO**, then continue with **Step 2**.
2. Is the **MJ** alarm LED lighted on the User Panel?
If **YES**, then do **TAP-102**.
If **NO**, then continue with **Step 3**.
3. Is the **MN** alarm LED lighted on the User Panel?
If **YES**, then do **TAP-112**.
If **NO**, then continue with **Step 4**.
4. Is the **FAULT** LED on the faceplate of a **DS1/DS1PM**, **DS3**, or **STS1E** circuit pack flashing ["inc. () LOS"]?
If **YES**, then continue to **Step 5**.
If **NO**, then proceed to **Step 7**.
5. There appears to be an incoming DS1, DS3, or EC-1 signal failure. Refer to **TAP-110** and clear the condition.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
7. Is the **FAULT** LED on the faceplate of any circuit pack in the DDM-2000 lighted (not flashing) ["() CP failed"]?
If **YES**, then continue with **Step 8**.
If **NO**, then proceed to **Step 10**.
8.  **NOTE:**
There is an inconsistent combination of alarms and diagnostic indications.

Refer to **TAP-108** and determine the true status of the system.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Perform an LED test by depressing the **ACO/TST** button or using the **"test - led"** command.

Reference: **DLP-509**

11. Did all the circuit packs pass the LED test?

If **YES**, then continue with **Step 12**.

If **NO**, then proceed to **Step 14**.

12.  **NOTE:**
The DDM-2000 appears to be operating correctly with no failures present.

Return a report of NO TROUBLE FOUND.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Replace the circuit pack that failed the LED test.

Reference: **DLP-523**

15. Repeat the LED test.

16. Did all the circuit packs pass the LED test?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then continue with **Step 17**.

17.  **NOTE:**
The failure is not in the circuit pack just replaced.

Refer to **TAP-106** to isolate and clear the failure.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Isolate and Clear Failure

1.  **NOTE:**
It is assumed that the **FAULT** LED on a circuit pack is lighted and replacing the circuit pack does not clear the problem.

Is the circuit pack with the lighted LED a **DS1/DS1PM** or **OLIU**?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 12**.

2. Unseat and reseal the standby (without lighted **ACTIVE** LED) **MXRVO (STS1E)** in the same group as the affected circuit pack with the lighted LED.
3. Is a CIT available?
If **YES**, then continue with **Step 4**.
If **NO**, then proceed to **Step 6**.
4. Use the CIT and **reset** command to reset **SYCTL**.
5. Is the **FAULT** LED on the affected circuit pack still lighted?
If **YES**, then proceed to **Step 8**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
6.  **NOTE:**
Unseating and reseating the **SYCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseal **SYCTL** circuit pack. Do not depress **UPD/INIT** button.

7. Is the **FAULT** LED on the affected circuit pack still lighted?
If **YES**, then continue with **Step 8**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

8. Have both **MXRVO (STS1E)** circuit packs been unseated and reseated?
If **YES**, then proceed to **Step 10**.
If **NO**, then continue with **Step 9**.
9. Unseat and reseal the active **MXRVO (STS1E)** in the same group as the affected circuit pack with the lighted LED. Repeat this procedure from **Step 3**.
10. Replace the standby **MXRVO (STS1E)** (without lighted **ACTIVE** LED) in the same group as the affected circuit pack with the lighted LED. If the **FAULT** LED on the affected circuit pack is still lighted, replace the active **MXRVO (STS1E)** in the same group as the affected circuit pack with the lighted LED.

Reference: **DLP-523**

11. Is the **FAULT** LED on the affected circuit pack still lighted?
If **YES**, then proceed to **Step 17**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
12. Is a CIT available?
If **YES**, then continue with **Step 13**.
If **NO**, then proceed to **Step 15**.
13. Use the CIT and **reset** command to reset **SYCTL**.
14. Is the **FAULT** LED on the affected circuit pack still lighted?
If **YES**, then proceed to **Step 17**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
15.  **NOTE:**
Unseating and reseating the **SYCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseal **SYCTL** circuit pack. Do not depress **UPD/INIT** button.

16. Is the **FAULT** LED on the affected circuit pack still lighted?
If **YES**, then continue with **Step 17**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

17.  **CAUTION:**
*Replacing the **SYSCTL** involves updating the internal memory on the circuit pack.*

Refer to **DLP-501** and replace the **SYSCTL**.

18. Is the **FAULT** LED on the affected circuit pack still lighted?

If **YES**, then continue with **Step 19**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19.  **NOTE:**
The problem appears to be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000 the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

Check for bent or broken pins, shorted pins, etc. If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Far End Alarm Using Craft Interface Terminal (CIT)

1.  **NOTE:**
It is assumed that a CIT is available and that there is a failure at a far end node (as indicated by an **FE ACTY** LED on the local system or by the Source Address of farend in the local "Active Alarms and Status Report").

Connect the CIT to the connector on the User Panel or remote login to the near-end system, if not already performed.

Reference: **DLP-521**

2.  **NOTE:**
The "Active Alarms and Status Report" is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line in the "Active Alarms and Status Report" (Figure 1) (for example, "MINOR farend MM-DD HH:MM:SS - SiteXNE1")

```
/* Active Alarms and Status Report
=====
Alarm      Source   Date   Time      Srv   Description
Level      Address   Detected
=====
MINOR      farend    MM-DD HH:MM:SS  -    SiteXNE1
MINOR      farend    MM-DD HH:MM:SS  -    SiteYNE1
-----
ne-acty    m1-1-1-1 MM-DD HH:MM:SS      inc. VT AIS
*/
```

Figure 1. Example of Active Alarms and Status Report

3.  **NOTE:**
Far-end alarm or status conditions are listed in this report with a Source Address of farend. Local alarm or status conditions have a Source Address of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, TL1 (X.25), TBOS, etc.) where the event occurred. (See *Addresses* in the "Commands and Reports" section of this manual.) Use the "**rtrv-alm**" command to get another report, if necessary.

Does the Source Address of any top entry above the first single-dashed line in the alarm report indicate a **local** alarm?

If **YES**, then continue with **Step 4**.

If **NO**, then proceed to **Step 6**.

4. Find the Alarm Level for the local alarm in Table A and go to the indicated procedure.

Table A. Trouble Conditions

Alarm Level	TAP
CRITICAL	TAP-101
MAJOR	TAP-102
MINOR	TAP-112
ne-acty	TAP-117
PWR MINOR (PMN)	TAP-104
abnormal (ABN)	TAP-109

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
6. Use the "**rtrv-nmap/rtrv-map-network**" command to get a network map report.
7.  **NOTE 1:**
The TID of the far-end system is the TID listed in the Description column of the near-end "Active Alarm and Status Report" obtained using the "**rtrv-alm**" command.

⇒ **NOTE 2:**

In a path protection switched ring network, FAILED Communication Status most likely indicates a total node failure (power failure, failure of both **OLIUs** or both fiber pairs). In a linear or hub configuration, it most likely indicates a failure of both service and protection paths between the last shelf without communication failure and the first shelf with a communication failure.

⇒ **NOTE 3:**

If any systems have a Communications Status of FAILED, you may have to log in to the system nearest to the system with a FAILED communications status or issue a trouble report on the system you cannot log into.

⇒ **NOTE 4:**

The far-end alarms refer to alarms in the same alarm group as the local network element. For systems you cannot log into (FT-2000), issue a trouble report on the system indicated in the "Active Alarms and Status Report".

If possible, enter the "**r lgn:TID**" command to log in to any far-end system indicated in the top entry in the "Active Alarms and Status Report" (for example,

MINOR farend MM-DD HH:MM:SS - SiteXNE1)

Reference: **DLP-522**

8. Use the "**rtrv-alm**" command at the far-end DDM-2000 system to get a report of status and alarms. See Table B for a detailed description of the messages in the "Active Alarms and Status Report". For systems other than DDM-2000 OC-3, FT-2000 OC-48, DDM-2000 FiberReach, DDM-2000 OC-12, and *SLC*[®]-2000, etc., use the User/Service Manual for that system for trouble clearing procedures.
9. Repeat this procedure from Step 3 for the DDM-2000 OC-3 shelf you are now logged into. Remember that when the procedures refer to local it is now the shelf from which you are getting the "Active Alarms and Status Report".

Table B. RTRV-ALM Message Descriptions

Description	Alarm Level	Meaning
2nd CP required for BBF3	CR or MN	The BBF3/BBF3B DS1PM circuit pack requires both corresponding FUNCTION UNITS slots in the group to be equipped with MXRVO or STS1E circuit packs. A second MXRVO or STS1E circuit pack should be inserted in the companion FUNCTION UNITS slot.
-48V power/fuse FA FB failed	MN	A -48 volt power feeder or a fuse on the user panel has failed. (FA or FB LED identifies failure.)
AC power failed	PMN	The AC power supply to a remote terminal cabinet has failed.
ACO active	Status	The parallel telemetry outputs and audible office alarms normally active due to the alarm conditions in the system are being suppressed. (See the " opr-aco " command.)
AGNE communication failure	MJ	A remote network element (NE) cannot establish and NE status association with an alarm gateway network element (AGNE). The alarm is also declared by an AGNE that can not establish an NE status association with one or more NEs in its alarm group. Likely cause: The AGNE has not been assigned in an alarm group. The AGNE and NEs are assigned different alarm group numbers.
APS - automatic lock	MN	The service associated with a DS1/DS1PM circuit pack has been automatically switched and locked onto the protection DS1/DS1PM circuit pack. The automatic protection switching (APS) lock will remain active until midnight. Likely cause: Four automatic switches of a single DS1/DS1PM circuit pack in 10 minutes, probably because of an intermittent failure of the DS1/DS1PM circuit pack.
APS channel failed	MN	The SONET Automatic Protection Switching (APS) channel on the protection OC-3 line has failed. Likely causes: Failure of the OLIU circuit pack on the protection line (MAIN-2(P)) at the far end or failure of the OLIU circuit pack on the protection line (MAIN-2(P)) at the near end.
auto turnup test IP	ABN	An automatic turnup test is in progress.
BBF5 required in LS-8	MJ	A BBF5 JMPR circuit pack is missing from a shelf (Group 3 or earlier) with two 27G-U OLIU circuit packs or a 27G-U and 27G2-U OLIU circuit packs in the corresponding FUNCTION UNITS slot pair. Install BBF5 JMPR circuit pack in slot 8(P) of the LOW SPEED GROUP associated with the corresponding FUNCTION UNITS slots where the 27G-U/27G2-U OLIUs are installed.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
BBF5 required in LS-4	MJ	A BBF5 JMPR circuit pack is missing from a shelf (Group 3 or earlier) with two 27G2-U OLIU circuit packs in the corresponding FUNCTION UNITS slot pair. Install BBF5 JMPR circuit pack in slot 4 of the LOW SPEED GROUP associated with the corresponding FUNCTION UNITS slots where the 27G2-U OLIUs are installed.
communication failure	Status	The system is not communicating with another shelf in the subnetwork. This system is normally communicating with that shelf through the SONET section DCC specified in the address column. The " rtrv-map-network " and " rtrv-map-neighbor " command will report the name of the system(s) with which this system is not communicating. Likely causes: An unprotected OC-3 line failure in the subnetwork, a controller failure, reset, or initialization on another shelf, section DCC channel failure on this or another shelf, or failure of the OHCTL circuit pack.
controln	Status	The specified environmental control point (miscellaneous discrete output) is active. Note: The actual message that appears in the "Active Alarms and Status Report" for this condition can be provisioned; this is the default message. (See the " rtrv-attr-cont " and " set-attr-cont " commands.) Likely cause: The system was instructed to close the environmental control point by either a TBOS control point or by the closing of the corresponding environmental control input at the far end.
CP not allowed - (crs)	CR or MN	The circuit pack does not support the manual cross-connection(s) currently provisioned for this slot. The user should change the circuit pack type or change the cross-connection(s) to the slot.
CP not allowed - (eqpt)	MJ or MN	A DS1 or DS1PM circuit pack is installed in a LOW SPEED slot associated with a FUNCTION UNITS slot currently provisioned for DS3 , STS1E_L (low speed), or OLIU circuit pack service. The DS1 or DS1PM circuit pack should be removed from the shelf, or the FUNCTION UNITS circuit pack should be replaced with an MXRVO or STS1E_H (high speed) circuit pack.
CP not allowed - (timing)	CR or MN	When associated with a TIMING slot, the current circuit pack switch settings do not support the synchronization timing provisioned. The user should change the circuit pack switches or change the settable synchronization parameters. When associated with FUNCTION UNITS slot C , the circuit pack type does not support the current provisioned synchronization parameters. The circuit pack type or the timing options should be changed.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
CP removed	CR, MJ or MN	A circuit pack previously installed in this system is removed. The circuit pack should be replaced, or an update ("upd") command should be done to remove it from the system equipment list.
dormant/executing code mismatch	Status	This alarm condition is raised when the network element (NE) detects that dormant software exists on the NE with a release number that does not match the release number of the executing software.
DS1 CP failed	MJ or MN	Internal equipment failure of the specified DS1 circuit pack.
DS1PM CP failed	MJ or MN	Internal equipment failure of the specified DS1PM circuit pack.
DS1 loopback	ABN	A loopback (toward the optical fiber) is active on the specified T1 port. (See the " opr-lpbk-t1 " and " rls-lpbk-t1 " commands.)
DS1 loopback (to fiber)	ABN	A loopback (toward the optical fiber) is active on the specified T1 port. (See the " opr-lpbk-t1 " and " rls-lpbk-t1 " commands.)
DS1 loopback (to DSX)	ABN	A loopback (toward the DSX) is active on the specified T1 port. (See the " opr-lpbk-t1 " and " rls-lpbk-t1 " commands.)
DS1 trmsn test IP	ABN	A transmission test using the internal test signal generator and monitor is in progress on the specified T1 port. (See the " test-trmsn-t1 " command.)
DS3 CP failed	CR or MN	Internal equipment failure of the specified DS3 circuit pack.
DS3 loopback	ABN	A loopback (toward the optical fiber) is active on the specified T3 port. (See the " opr-lpbk-t3 " and " rls-lpbk-t3 " commands.)
DS3 loopback (to fiber)	ABN	A loopback (toward the optical fiber) is active on the specified T3 port. (See the " opr-lpbk-t3 " and " rls-lpbk-t3 " commands.)
DS3 loopback (to DSX)	ABN	A loopback (toward the DSX) is active on the specified T3 port. (See the " opr-lpbk-t3 " and " rls-lpbk-t3 " commands.)
DS3 trmsn test IP	ABN	A transmission test using the internal test signal generator and monitor is in progress on the specified T3 port. (See the " test-trmsn-t3 " command.)

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
DSNE not reachable	MJ	No network element has been designated a directory service network element (DSNE); non-DSNE network element starts up and does not get registered by a DSNE within a specified time; DCC failure between local NE and the DSNE; optical line failure in the subnetwork; a controller failure or pull; reset or initialization of the DSNE. (Use the " set -ne " command to provision one (and only one) shelf as the DSNE. Use " rtrv -ne " command to check DSNE provisioning.)
duplicate DSNE	MJ	A shelf has been provisioned as a directory services network element (DSNE) in a network that already has a DSNE. Only one network element in the network may be provisioned as the DSNE. (See the " set -ne " and " rtrv -ne " commands for DSNE provisioning information.)
duplicate site/ne address	MJ	Two or more shelves in the network have the same site address. (Set by the " set -ne " command.)
duplicate TBOS display	MJ	Two or more shelves in the network have the same TBOS display number. (Set by the " set -ne " command.)
duplicate TID	MJ	Two or more shelves in the network have the same system name or TID. (Set by the " set -ne " command.)
EC1 loopback	ABN	A loopback (toward the optical fiber) is active on the specified EC1 port. (See " opr -lpbk-ec1 " and " rls -lpbk-ec1 " commands.)
EC1 loopback (to fiber)	ABN	A loopback (toward the optical fiber) is active on the specified EC1 port. (See " opr -lpbk-ec1 " and " rls -lpbk-ec1 " commands.)
EC1 loopback (to DSX)	ABN	A loopback (toward the STSX-1) is active on the specified EC1 port. (See " opr -lpbk-ec1 " and " rls -lpbk-ec1 " commands.)
environmentn	CR, MJ, MN or None	The specified environmental alarm point (miscellaneous discrete input) is active. Note: The actual message that appears in the "Active Alarms and Status Report" for this condition can be provisioned; this is the default message. (See the " rtrv-attr-env " and " set-attr-env " commands.)
excessive holdover	MJ	The system has been in holdover mode for more than 4 hours. This may cause degraded performance (high error rates) on the transmitted and/or received signals. Whenever this condition exists, the condition "holdover mode active" also exists. Likely cause: See holdover mode active.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
ExternalMinor	CR, MJ, MN or None	The external minor alarm input (environmental alarm input 15) is active. Typically, this input will be connected to the power shelf, and will indicate that the DC power or the cooling fan in a remote terminal cabinet has failed. Note: The actual message that appears in the "Active Alarms and Status Report" for this condition can be provisioned; this is the default message. (See the " rtrv-attr-env " and " set-attr-env " commands.)
fan control relay failed	MN	The thermostat on the SYCTL circuit pack indicates that the cooling fan should be turned on, and the fan control relay on the SYCTL circuit pack failed to operate. The system will continue to operate, but it might overheat, leading to degraded or interrupted transmission and/or circuit pack failures. Likely causes: Telemetry input common (TLMIC, pin 9) on J62 not grounded (adapter plug missing from J62 on RT shelf when J62 does not have a cable attached.) SYCTL circuit pack failure.
fan shelf failed	MN	The system has detected a failure of the DDM-2000 fan shelf. The ED-8C733-30, G7 CO cooling fan has failed. The system will continue to operate but it may overheat. The fan must be repaired within 4 hours of the failure, otherwise service may be interrupted and/or circuit packs may fail. Likely causes: Filter needs replacing, a fan pack failed, a fan pack has lost one or both power feeders, or the fan shelf control board has failed.
forced switch	ABN	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and an automatic or manual protection switch to make this the active receiving line will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. Note: OC-3 line switching is unidirectional. Because of this, the specified OC-3 line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. (See the " switch-line " command.) When associated with a FUNCTION UNITS slot or a LOW SPEED service slot, this message means that the identified equipment is not active, and an automatic or manual switch to make it active will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. (See the " switch-fn " and " switch-ls " commands.)

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
frequency error	MJ	This alarm condition indicates that an incoming timing signal has an unacceptable frequency offset. Likely causes: A DS1 external timing reference to the local shelf or a remote shelf has a frequency offset greater than about 20 hertz.
holdover mode active	NE ACTY	System is in holdover synchronization mode. Likely causes: System was manually switched to holdover mode (with " switch-sync " command or in a central office system, with TBOS control point 54) and switch has not been reset; or the system automatically switched to holdover mode due to failure of timing references, and either (1) the reference failures have not cleared, or (2) the system is provisioned for nonrevertive synchronization mode switching, or (3) the system is provisioned for External timing and no external timing references are available, or (4) the system is provisioned for loop-timed operation and the optical line or OLIU circuit pack has failed, or a message indicating an upstream clock problem has been received on the sync message bits of the optical line (" rtrv-sync " command) or (5) the system is provisioned for sync message signaling, but the upstream system from which it loop-times has not been provisioned for sync message signaling. The condition can be cleared by provisioning both systems the same (" set-sync " and " rtrv-sync " commands). Condition can be cleared by repairing at least one of timing references (if both are failed) and resetting synchronization mode protection switch with command " switch-sync:s=mode,pri=reset ". In a central office system, the synchronization mode can also be reset with a TBOS control point.
illegal CP type	CR, MJ or MN	An illegal or unknown circuit pack type has been inserted into the shelf.
inc. (from DSX) DS1 LOS	MJ, MN or None	At least 128 consecutive zeros are received in the DS1 signal incoming from the DSX-1, or the energy at the DS1 input is below a preset threshold. Likely causes: Hard failure of upstream equipment or facility (towards the DSX-1). The DS1 input is disconnected at the backplane or the DSX-1; equipment is failed or removed at DSX-1.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. (from DSX) DS1 sig fail	MJ, MN or None	The bit error ratio (BER) in the DS1 signal incoming from the DSX-1 exceeds the provisioned failure threshold, 10^{-3} , 10^{-6} , 10^{-7} , or 10^{-8} . Likely causes: Mismatch of line code (AMI/B8ZS). Failure of upstream equipment or facility (towards the DSX-1). Cross-talk in office wiring. Failure of the DS1/DS1PM circuit pack.
inc. DS1 sync. ref. AIS	MJ or MN	DS1 alarm indication signal (AIS) is being received from the DS1 synchronization reference signal. Likely causes: Failure of upstream equipment or facility (towards the DSX-1).
inc. DS1 sync. ref. BER	MJ or MN	The bit error ratio (BER) in the DS1 synchronization reference signal exceeds 10^{-3} . Likely causes: Failure of upstream equipment or facility (towards the DSX-1).
inc. DS1 sync. ref. E00F	MJ or MN	Excessive out-of-frame (OOF) events were detected in the DS1 synchronization reference signal. Excessive OOF is defined as more than 512 out of frame events in one day. Likely cause: Failure of the incoming DS1 synchronization reference signal.
inc. DS1 sync. ref. LOF	MJ or MN	The system is unable to frame on the DS1 synchronization reference signal. Likely causes: Upstream failure in the clock providing the reference signal; high bit error ratio on the received signal, caused by failure of the office timing supply that provides the DS1 timing reference. The system is provisioned for SF format on the specified DS1 synchronization reference signal and the received DS1 signal is in ESF format.
inc. DS1 sync. ref. LOS	MJ or MN	At least 128 consecutive zeros were received in the DS1 synchronization reference signal or the energy at the DS1 input is below a preset threshold. Likely causes: Failure of the office timing supply that provides the DS1 timing reference or failure of the connection to the timing supply.
inc. DS1 sync. ref. OOL	MJ or MN	The incoming DS1 synchronization reference signal is out-of-lock (OOL). The frequency of the clock providing the DS1 reference signal is out of specification. Likely cause: Failure of the office timing supply that provides the DS1 timing reference.
inc. (from DSX) DS3 AIS	CR, MJ, MN, or NE ACTY	The system has detected DS3 alarm indication signal (AIS) in the MUX direction (that is, coming from the DSX) for the specified DS3 signal. Likely causes: The incoming DS3 signal at the near end is failed, or DS3 AIS is received from the DSX-3 at the near end.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. (from fiber) DS3 AIS	NE ACTY	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. Likely causes: The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end.
inc. (from DSX) DS3 LOS	CR, MJ, MN, or None	At least 128 consecutive zeros were detected in the DS3 signal received from the DSX-3. Likely causes: Equipment failed or removed at DSX-3, DS3 input disconnected at the DSX-3, or at the DDM-2000 backplane.
inc. (from DSX) DS3 OOF	CR, MJ, MN, or None	The system has detected a DS3 out-of-frame (OOF) condition in the MUX direction (that is, coming from the DSX) for the specified DS3 signal. This condition is reported only if the DS3 interface is provisioned in VM or VMR mode. (See the " set-t3 " and " rtrv-t3 " commands.) Likely causes: An out-of-frame DS3 signal incoming to the DSX-3 at the near end, failure of the DS3 circuit pack at the near end, or the DS3 signal is looped at both ends.
inc. (from fiber) DS3 OOF	NE ACTY	The system has detected a DS3 out-of-frame (OOF) condition in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. This condition is reported only if the DS3 interface is provisioned in VM or VMR mode. (See the " set-t3 " and " rtrv-t3 " commands.) Likely causes: An out-of-frame DS3 signal incoming to the DSX-3 at the far end, failure of the DS3 circuit pack at the far end or near end, or the DS3 signal is looped at both ends.
inc. (from DSX) DS3 sig fail	CR	The bit error ratio (BER) in the incoming DS3 signal exceeds the provisioned failure threshold, 10^{-3} or 10^{-6} . Likely causes: Failure of the upstream equipment or facility (towards the DSX-3), cross-talk in office wiring, or unprotected failure of DS3 circuit pack.
inc. EC1 FERF	NE ACTY	The system has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal. Likely causes: The far end has detected an incoming signal failure on the specified EC-1 line. This may be caused by failure of the STS1E circuit pack at the near end, the STS1E circuit pack at the far end, or the transmit cable on the specified line.
inc. EC1 LOF	CR, MJ, MN, or None	The system has detected a loss-of-frame (LOF) condition in an incoming EC-1 signal. LOF is defined as an out of frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least three milliseconds. Likely cause: Failure of the STS1E or equivalent circuit pack at the far end, failure of the STS1E or equivalent circuit pack at the near end, failure of the incoming cable, or a cable disconnect at the STSX-1 or shelf connector.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. EC1 LOS	CR, MJ MN or None	The system has detected loss of signal (LOS) condition on the EC-1 line. Likely cause: Failure of the STS1E or equivalent circuit pack at far end, failure of the incoming cable, failure of the STS1E circuit pack at the near end, or a cable disconnect at the STSX-1 or shelf connector.
inc. EC1 line AIS	CR, MJ MN or None	The system has detected the EC-1 line alarm indication signal (AIS) on an incoming EC-1 line. Likely cause: Failure of an STS1E circuit pack at the far end.
inc. EC1 sig degrade (BER)	CR, MJ, MN, or None	The bit error ratio (BER) in the received EC-1 signal exceeds the provisioned threshold, 10^{-5} or 10^{-9} . Likely causes: Failure of the STS1E circuit pack at the near end, failure of the incoming cable, cross-talk in office wiring, or failure of the STS1E circuit pack at the far end.
inc. EC1 sig failed (BER)	CR, MJ, MN, or None	The bit error ratio (BER) in the received EC-1 signal exceeds the provisioned threshold of 10^{-5} or 10^{-9} . Likely causes: Failure of the STS1E circuit pack at the near end, failure of the incoming cable, cross-talk in office wiring, or failure of the STS1E circuit pack at the far end.
inc. OC1 FERF	NE ACTY	The system has detected the OC-1 far end receive failure (FERF) signal in the incoming OC-1 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-1 line. This may be caused by failure of the OLIUI circuit pack at the near end, the OLIUI circuit pack at the far end, or the transmit cable on the specified line.
inc. OC1 line AIS	CR or NE ACTY	The system has detected the OC-1 line alarm indication signal (AIS) on an incoming OC-1 line. Likely cause: Failure of an OLIUI circuit pack at the far end.
inc. OC1 LOF	CR or MN	The system has detected a loss-of-frame (LOF) condition in an incoming OC-1 signal. LOF is defined as an out of frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least three milliseconds. Likely cause: Failure of the OLIUI or equivalent circuit pack at the far end, failure of the OLIUI or equivalent circuit pack at the near end, or failure of the receive fiber.
inc. OC1 LOS	CR or MN	The system has detected loss of signal (LOS) condition on the OC-1 line. Likely cause: Failure of the OLIUI or equivalent circuit pack at far end, failure of the receive fiber, or failure of the OLIUI circuit pack at the near end.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. OC1 sig degrade (BER)	CR or MN	The bit error ratio (BER) in the specified OC-1 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3} . Likely causes: Failure of the OLI U circuit pack at the near end, failure of the OLI U circuit pack at the far end, or failure of the receive fiber.
inc. OC1 sig failed (BER)	CR or MN	The bit error ratio (BER) in the received OC-1 signal exceeds 10^{-3} . Likely causes: Failure of the OLI U circuit pack at the near end, failure of the receive fiber, or failure of the OLI U circuit pack at the far end.
inc. OC3 FERF	NE ACTY	The system has detected the OC-3 far end receive failure (FERF) signal in the incoming OC-3 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-3 line. This may be caused by failure of the OLI U circuit pack at the near end, the OLI U circuit pack at the far end, or the transmit fiber on the specified line.
inc. OC3 LOF	CR or MN	The system has detected a loss-of-frame (LOF) condition in an incoming OC-3 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the OLI U circuit pack at the near end, failure of the OLI U circuit pack at the far end, or failure of the receive fiber.
inc. OC3 LOS	CR or MN	The system has detected loss-of-signal (LOS) condition on the OC-3 line. Likely causes: Failure of the OLI U circuit pack at near end, failure of the OLI U circuit pack at far end, or failure of the receive fiber.
inc. OC3 line AIS	CR, MJ, MN, or None	The system has detected OC-3 line alarm indication signal (AIS) on an incoming OC-3 line. Likely cause: Failure of an OLI U circuit pack at the far end.
inc. OC3 sig degrade (BER)	CR or MN	The bit error ratio (BER) in the specified OC-3 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3} . Likely causes: Failure of the OLI U circuit pack at the near end, failure of the OLI U circuit pack at the far end, failure of the receive fiber, or incorrect setting of the optical power switch on the OLI U circuit pack.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. OC3 sig failed (BER)	CR or MN	The bit error ratio (BER) in the specified OC-3 signal exceeds 10^{-3} . Likely causes: Failure of the OLI circuit pack at the near end, failure of the OLI circuit pack at the far end, or failure of the receive fiber.
inc. OC12 FERF	NE ACTY	The system has detected the OC-12 far end receive failure (FERF) signal in the incoming OC-12 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-12 line. This may be caused by failure of the OLI circuit pack at the near end, the OLI circuit pack at the far end, or the transmit fiber on the specified line.
inc. OC12 LOF	CR or MN	The system has detected a loss-of-frame (LOF) condition in an incoming OC-12 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the OLI circuit pack at the near end, failure of the OLI circuit pack at the far end, or failure of the receive fiber.
inc. OC12 LOS	CR or MN	The system has detected loss-of-signal (LOS) condition on the OC-12 line. Likely causes: Failure of the OLI circuit pack at near end, failure of the OLI circuit pack at far end, or failure of the receive fiber.
inc. OC12 line AIS	CR, MJ, MN, or None	The system has detected OC-12 line alarm indication signal (AIS) on an incoming OC-12 line. Likely cause: Failure of an OLI circuit pack at the far end.
inc. OC12 sig degrade (BER)	CR or MN	The bit error ratio (BER) in the specified OC-12 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3} . Likely causes: Failure of the OLI circuit pack at the near end, failure of the OLI circuit pack at the far end, failure of the receive fiber, or incorrect setting of the optical power switch on the OLI circuit pack.
inc. OC12 sig failed (BER)	CR or MN	The bit error ratio (BER) in the specified OC-12 signal exceeds 10^{-3} . Likely causes: Failure of the OLI circuit pack at the near end, failure of the OLI circuit pack at the far end, or failure of the receive fiber.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. STS1 AIS	CR, MJ, MN, or None	The system has detected an incoming STS-1 alarm indication signal (AIS) in the active OC-3, OC-12, or OC-1 line. The system responds by transmitting DS1 or DS3 AIS toward the DSX and transmitting STS-1 yellow toward the fiber from which the AIS is being received. Likely causes: Incomplete or incorrect cross-connect provisioning in an end-to-end network. Unprotected removal or failure of a DS3 , MXRVO , or OLIUI circuit pack at the far end, or unprotected optical line failure.
inc. STS1 LOP EC1	CR, MJ, MN, or None	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely cause: Failure of the far end STS1E circuit pack or failure of the STS1E circuit pack at the near end.
inc. STS1 LOP OC1 slotaid	CR or MN	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-1 lines, the likely cause is an unprotected failure of an MXRVO or an OLIUI circuit pack at the far end. If this condition occurs on only one OC-1 line, the likely cause is failure of the OLIUI circuit pack at the near end or far end.
inc. STS1 LOP OC3 slotaid	CR or MN	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of an MXRVO or a DS3 circuit pack at the far end. If this condition occurs on only one OC-3 line, the likely cause is failure of the OLIUI circuit pack at the near end or far end.
inc. STS1 LOP OC12 slotaid	CR or MN	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-12 lines, the likely cause is an unprotected failure of an MXRVO or a DS3 circuit pack at the far end. If this condition occurs on only one OC-12 line, the likely cause is failure of the OLIUI circuit pack at the near end or far end.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. STS1 sig degrade (BER)	CR or MN	For STS-1 path ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold. Likely cause: Failure at a fiber or failure of an OLI circuit pack at some point in the STS-1 path.
inc. STS1 sig failed (BER)	CR or MN	For ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the signal fail threshold (10^{-6}). For VT1.5 path-switched rings, the system responds by inserting VT path AIS in each pass-through VT contained in the STS-1. Locally, the system will select the VTs from the STS-1 on the other ring, as appropriate. Likely causes: Failure of the near end OLI circuit pack reporting the STS-1 failure, failure of the far end OLI circuit pack, or failure of the receive fiber if the OC-3/OC-12 is also reporting a failure.
inc. STS1 unequipped	MN	The system has detected the unequipped code (SONET path overhead signal code label byte=0) on an in-service STS-1 channel. Likely causes: An upstream STS-1 cross-connect has been deleted.
inc. STS1 yellow	NE ACTY	The system has detected an incoming STS-1 yellow signal, which indicates that the far end is receiving STS-1 AIS on the active OC-3 line. The system responds to the STS-1 yellow signal by transmitting DS1 or DS3 yellow toward the DSX. Likely causes: Incomplete or incorrect cross-connect provisioning in end-to-end network, unprotected unidirectional failure of the OLI circuit pack, or fiber at some point in the end-to-end path.
inc. VT AIS	CR, MJ, MN, or None	The system has detected VT path alarm indication signal (AIS) incoming from the active OC-3 line. The system responds by transmitting DS1 AIS toward the DSX-1 and VT yellow toward the fiber from which the AIS is being received. Likely causes: Incomplete or incorrect cross-connect provisioning in end-to-end network (In ring applications, this alarm may be caused by fiber or OLI circuit pack failures). Unprotected removal or failure of a DS1 circuit pack at the far end.
inc. VT LOP	MJ or MN	The system has detected a VT loss-of-pointer (LOP) condition. Likely causes: Unprotected failure of a DS1 circuit pack at the near end, unprotected failure of a DS1 circuit pack at the far end, unprotected failure of a MXRVO circuit pack at the near end, or unprotected failure of a MXRVO circuit pack at the far end.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. VT sig degrade (BER)	MJ or MN	In a VT path switched ring, the system has detected a VT error rate that exceeds the provisioned threshold of 10^{-5} to 10^{-8} . The system selects a good VT signal from the other ring path. Likely causes: An OLI circuit pack failure or a fiber failure at some point on the failed ring.
inc. VT unequipped	MJ or MN	The system has detected the unequipped code (SONET path overhead VT signal code label byte=0) on an in-service VT1.5 channel. Likely causes: An upstream VT1.5 cross connect has been deleted or a DS1 LOW SPEED slot has been unequipped.
inc. VT yellow	NE ACTY	The far end is detecting VT AIS or VT LOP and inserting VT yellow in its transmit signal. Likely causes: Unprotected failure of a DS1 circuit pack at the near end, a DS1 circuit pack at the far end, an MXRVO circuit pack at the near end, an MXRVO circuit pack at the far end, or fiber at some point in the end-to-end path.
inconsistent DCC values	MJ	The Network Side/User Side parameters are set the same at both ends of a DCC (optical span). (See the " set - fecom " command.)
inhibit auto. OS messages	ABN	This message occurs when TL1 autonomous alarm reporting is inhibited by the TL1 " INH-MSG " command. This message is cleared by enabling autonomous message reporting with the TL1 " ALW-MSG " command.
inhibit switch	ABN	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be done. No further protection switching of specified line will be done until the protection switch is reset. Note: OC-3 line switching is unidirectional. Because of this, the specified OC-3 line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. (See the " switch-line " command.) When associated with a FUNCTION UNITS slot, TIMING slot, or timing reference, this message means that the identified equipment or reference is not active, and protection switches to the identified equipment or reference will not be done until the protection switch is reset. (See the " switch-fn " and " switch-sync " commands.)

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
Intersubsys com link failed	MJ	In a MegaStar* 2000 system, the SONET subsystem session is active, but is unable to communicate with the RADIO subsystem.
invalid CP switches	CR or MN	When associated with a TIMING slot, this message means that the timing mode switch settings on the TGS circuit pack are invalid.
lockout of protection	ABN	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be done. Note: OC-3 line switching is unidirectional. Because of this, the specified OC-3 line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. The lockout will remain in effect until the protection switch is reset or until a protection switch inhibit request is entered. (See the "switch-line" command.) When associated with a LOW SPEED protection slot, this message means that no service slot in the whole LOW SPEED GROUP will be allowed to switch to protection. The lockout will remain in effect until the protection switch is reset. (See the "switch-ls" command.)
lockout of service	ABN	When associated with a LOW SPEED service slot, this message means that the specified LOW SPEED service slot is active and will not be switched to protection. The lockout will remain in effect until the protection switch is reset. (See the " switch-ls " command.)
manual switch	ABN	The specified DS1 circuit pack is manually switched to protection. The manual switch will remain in effect until the protection switch is reset or until a failure occurs and an automatic switch preempts the manual switch. (See the " switch-ls " command.)
manual sync. mode switch	ABN	The synchronization mode has been manually switched to holdover or free running and will remain in that mode until the switch request is reset. (See the " switch-sync " command.)
MXRVO CP failed	CR or MN	Internal equipment failure of the specified MXRVO circuit pack.

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Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
OC12 connector failed	MN	Failure or removal of the OC-12 24G-U OLIU faceplate connector which carries STS-1/STS-3c ring pass through traffic on the OC-12 ring interface on the OC-3 shelf.
OHCTL CP failed	MJ	Internal equipment failure of the OHCTL circuit pack.
OHCTL standby boot fail	MN	OHCTL circuit pack failed during local or remote software download.
OLIU CP failed	CR or MN	Internal equipment failure of the specified OLIU circuit pack.
program installation IP	Status	This system is being used to install software into another system. If this procedure is interrupted prior to completion, the remote systems' control circuit packs will likely become inoperable until another install program attempt is successful.
section DCC channel failed	MJ or MN	The system cannot communicate with the far-end system through the SONET section data communications channel (DCC). Likely causes: SYSCTL or OHCTL circuit pack failure, reset, or initialization at the far end, failed program installation at far end, program installation in progress at the far end, or SYSCTL or OHCTL circuit pack failure at the near end.
STS1E_H CP failed STS1E_L CP failed	CR or MN	Internal equipment failure of the specified high speed or low speed STS1E circuit pack.
SYSCTL CP failed	MJ	Internal equipment failure of the SYSCTL circuit pack. The system has determined that some part of the SYSCTL circuit pack has failed. Note: Some types of failures cannot be reported since the SYSCTL circuit pack cannot function under these conditions.
SYSCTL standby boot fail	MN	SYSCTL circuit pack failed during local or remote software download.
TID address map full	MJ	The size of the directory services network element (DSNE) database has been exceeded. Likely causes: Network elements have been removed from the network but not from the DSNE database. (See the " dlt-tadrmap " command.)
TGS CP failed	CR or MN	Internal equipment failure of the specified TGS circuit pack or the systems at both ends of the span are loop timed.
TMUX CP failed	CR or MN	Internal equipment failure of the specified TMUX circuit pack.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
unexpected CP switches	CR, MJ, or MN	When associated with the SYS (SYSCTL) slot, this message means that an invalid switch setting has been selected or some of the unused switches are not in the prescribed position. For MAIN or FUNCTION UNITS slots equipped with OLIU circuit packs, it indicates that the optical power switch on the OLIU circuit pack was different from what it was before the OLIU circuit pack was replaced. For LOW SPEED slots equipped with DS1 circuit packs or FUNCTION UNITS slots equipped with DS3 circuit packs, this message means that a change in a circuit pack switch setting was made. When associated with a TIMING slot equipped with TGS circuit packs, this message means: 1. The timing mode switch settings on the TGS circuit pack are a. invalid, b. different from those on the companion TGS circuit pack, or c. different from what they were before the TGS circuit pack was replaced, 2. The DS1 format or line coding switches on the TGS circuit pack are not the same as they were before the TGS circuit pack was replaced.
unexpected CP type	CR, MJ, MN, or Status	When associated with a FUNCTION UNITS slot, this message means that a different but supported circuit pack is inserted in a slot already provisioned. When associated with a LOW SPEED slot equipped with a DS1 circuit pack, this message means that a different but supported DS1 circuit pack type (for example, BBF3 circuit pack) is inserted in a slot already provisioned. When associated with a FUNCTION UNITS slot equipped with a STS1E circuit pack, this message means that the circuit pack type switch (located on the circuit pack) is different from that already provisioned for the slot. When associated with a MAIN slot, if a 24G-U OLIU is inserted into a MAIN slot of a Release 11 OC-3 shelf expecting a 22-type OLIU, the alarm level for the resulting "unexpected CP type" alarm is "status". If the 24G-U OLIU fails, a "OLIU CP failed" alarm is reported; but the status condition is maintained until the circuit pack is removed.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
unsupported DCC connection	MJ	DCC is enabled on an OC-1 connection between the MAIN slots in two OC-3 shelves. The alarm is cleared by disabling the DCC on the OC-1 interface using the " set - fecom " command. The DDM-2000 OC-3 system does not support a DCC link over an OC-1 line terminating on the MAIN slots between two OC-3 shelves.
X.25 communication failure	MJ	Failure in the X.25 communication channel. Likely causes: Failure of the X.25 communication equipment or failure at the OS.

Clear Obscure Failure Condition

1.  **NOTE:**
It is assumed that a set of alarms or conditions exist which are inconsistent or may not have associated LEDs indications.

Perform LED test by depressing the **ACO** button or using the CIT command **test - led**.

Reference: **DLP-509**

2. Did any LED fail the LED test?
If **YES**, then do **TAP-115**.
If **NO**, then continue with **Step 3**.
3. Is a CIT available?
If **YES**, then proceed to **Step 7**.
If **NO**, then continue with **Step 4**.
4. Are there associated LED indications (for example, **NE ACTY** or **FE ACTY** LED lighted; **CR**, **MJ**, **MN**, **PMN**, etc. LED lighted when alarm is present, etc.)?
If **YES**, then continue with **Step 5**.
If **NO**, then proceed to **Step 11**.
5.  **NOTE:**
Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

6. Is trouble still present?

If **YES**, then proceed to **Step 9**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Use the CIT and **reset** command to reset **SYSCTL**.

8. Is the trouble still present?

If **YES**, then continue with **Step 9**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9.  **CAUTION:**

*Replacing the **SYSCTL** involves updating the internal memory on the circuit pack.*

Replace the **SYSCTL**.

Reference: **DLP-501**

10. Is the trouble still present?

If **YES**, then continue with **Step 11**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11.  **NOTE 1:**

The problem may be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000, the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

⇒ **NOTE 2:**

A CIT and the system **rtrv-()** commands may be helpful in determining the condition of the system.

Use CIT and **rtrv-alm** command to get an "Active Alarms and Status Report". See the "Commands and Reports" section of this manual under **RTRV-ALM** for a description of each message retrieved with the **rtrv-alm** command.

If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Abnormal (ABN) Indication

1.  **NOTE:**
The **ABN** LED indicates a manually caused abnormal condition. Table A lists the conditions which may cause an **ABN** alarm. These conditions may have been initiated locally, from another DDM-2000 at the other end of the facility, or through telemetry.

Is the **CR**, **MJ**, **MN**, or **PMN** LED on the User Panel lighted?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 4**.

2.  **NOTE 1:**
It is better to clear the higher priority alarms (**CR**, **MJ**, etc.) first, although in most cases this will not clear an **ABN** alarm. If the higher priority alarm is cleared first, you can then use this procedure to clear the **ABN** alarm.

 **NOTE 2:**
In some cases, clearing an **ABN** alarm will result in a higher priority alarm being cleared. For example, clearing the abnormal condition "manual sync. mode switch" may cause an "excessive holdover" **MJ** alarm to clear.

Refer to Task Index **IXL-001** for procedure to clear the indicated alarm.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. Is a CIT available?

If **NO**, then continue with **Step 5**.

If **YES**, then proceed to **Step 12**.

5.  **NOTE:**

The **FE SEL** button on the **SYSCTL** is used to display local and remote alarm and status conditions [**DLP-530**].

Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

6. Was **NE ACTY** LED lighted on the User Panel when local shelf alarm conditions are displayed (**L.** displayed in **FE ID** display)?

If **YES**, then proceed to **Step 27**.

If **NO**, then continue with **Step 7**.

7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

8. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?

If **YES**, then continue with **Step 9**.

If **NO**, then do **TAP-108**.

9. Refer to **DLP-530** and use **FE SEL** pushbutton on **SYSCTL** to display far-end alarm conditions for other sites/shelves in the network.

10. Issue a trouble report of abnormal (**ABN**) alarm condition at the far-end DDM-2000 terminal.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12.  **NOTE:**

For all network configurations except point-to-point, there will be multiple far-end far end terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system, if not already performed.

Reference: **DLP-521**

13.

⇒ **NOTE 1:**

The **rtrv-alm** command can be used to display a report of active alarm and status conditions. The "Commands and Reports" section of this manual gives a description of the command.

⇒ **NOTE 2:**

The "Active Alarms and Status Report" is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line in the "Active Alarms and Status Report" (Figure 1) (for example, "abnormal a-1-1 MM-DD HH:MM:SS nsa DS1 loopback").

```
/* Active Alarms and Status Report
=====
Alarm      Source   Date   Time      Srv   Description
Level      Address  Detected
=====
abnormal   a-1-1    MM-DD HH:MM:SS  nsa   DS1 loopback
-----
*/
```

Figure 1. Example of Active Alarms and Status Report

14.  **NOTE:**
 Far-end alarm or status conditions are listed in this report with a Source Address of `farend`. Local alarm or status conditions have a Source Address of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, TL1 (X.25), TBOS, etc.) where the event occurred. (See *Addresses* in the "Commands and Reports" section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

Does the Source Address of any top entry in the alarm report indicate local slot, channel, port or operations interface for the `abnormal` alarm?

If **NO**, then do **TAP-107**.

If **YES**, then continue with **Step 15**.

15. Use **`opr-aco`** command to silence active audible office alarms, if required.
16. Note the **local** trouble indication in the Description column of the "Active Alarms and Status Report", starting with the highest alarm level (abnormal) listed in the Alarm Level column.
17. Find the trouble description in Table A for the highest alarm level and note the related commands.

Table A. Abnormal (ABN) Alarm and Status Conditions

Description	Related Commands
forced switch inhibit switch	<code>switch-line</code> <code>switch-fn</code> <code>switch-sync</code>
lockout of protection	<code>switch-line</code> <code>switch-ls</code>
lockout of service manual switch	<code>switch-ls</code>
manual sync. mode switch	<code>switch-sync</code>
DS1 loopback DS1 loopback (to Fiber) DS1 loopback (to DSX)	<code>opr-lpbk-t1</code> <code>rls-lpbk-t1</code>
DS3 loopback DS3 loopback (to Fiber) DS3 loopback (to DSX)	<code>opr-lpbk-t3</code> <code>rls-lpbk-t3</code>

Table A. Abnormal (ABN) Alarm and Status Conditions (Continued)

Description	Related Commands
EC1 loopback EC1 loopback (to Fiber) EC1 loopback (to DSX)	opr-lpbk-ec1 rls-lpbk-ec1
DS1 trmsn test IP DS3 trmsn test IP auto turnup test IP	test-trmsn-t1 test-trmsn-t3 test-auto
inhibit auto. OS messages	INH-MSG ALW-MSG

18.  **CAUTION:**
*You must determine the reason for the **ABN** indication before attempting to clear it.*

Use the command **rtrv-state-()** to see if you can determine the condition associated with the **ABN** indication.

19. Contact the appropriate personnel at your location, at the far-end location, and at any central maintenance location to determine the reason for the **ABN** indication before clearing it.
20. Have you determined that it is appropriate for you to clear the condition causing the **ABN** indication?
 If **YES**, then proceed to **Step 23**.
 If **NO**, then continue with **Step 21**.
21. There is nothing more to be done until the reason for the **ABN** condition is known.
22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
23. Use the appropriate command to clear the abnormal condition. The command will be **rls-lpbk-()** or **switch-()**.
24. Is the **ABN** indicator still lighted?
 If **YES**, then continue with **Step 25**.
 If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. Use the **rtrv-alm** command to determine if there are other conditions causing the **ABN** alarm. See Table A.
26. See Table A. Does the **rtrv-alm** command report any other abnormal conditions.
 - If **NO**, then do **TAP-108**.
 - If **YES**, then repeat this procedure from **Step 16**.
27. Unseat and reseal the **SYSCTL** to perform a reset.
28. Is the **ABN** LED still lighted?
 - If **YES**, then continue with **Step 29**.
 - If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
29. Obtain CIT and repeat this procedure from **Step 12**.

Clear Flashing FAULT LED Indication

1. Is the **MN** LED lighted on the User Panel?
If **YES**, then do **TAP-112**.
If **NO**, then continue with **Step 2**.
2. Is the **MJ** LED lighted on the User Panel?
If **YES**, then do **TAP-102**.
If **NO**, then continue with **Step 3**.
3. Is the **CR** LED lighted on the User Panel?
If **YES**, then do **TAP-101**.
If **NO**, then continue with **Step 4**.
4. Is the **FAULT** LED flashing on the faceplate of one or more **DS1/DS1PM** circuit packs?
If **YES**, then continue with **Step 5**.
If **NO**, then proceed to **Step 10**.
5.  **NOTE:**
There is an incoming DS1 signal failure. This failure can be further isolated using a CIT.

Is a CIT available?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 8**.
6. Connect the CIT to the connector on the User Panel and establish session.

Reference: **DLP-521**

7. Refer to the "Commands and Reports" section of this manual under **RTRV-()** and use the **rtrv-()** commands to further isolate the particular incoming DS1 signal failure.
8. Switch service to protection. If LED is flashing on protection **DS1/DS1PM**, issue trouble report of bad incoming signal at input to **DS1/DS1PM** circuit pack with flashing LED(s). If LED is not flashing on protection **DS1/DS1PM**, replace service **DS1/DS1PM** circuit pack [**DLP-523**].
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
10. Is the **FAULT** LED flashing on the faceplate of one or more **DS3/STS1E** circuit packs?
 If **YES**, then continue with **Step 11**.
 If **NO**, then do **TAP-108**.
11. Switch service to protection. If LED is flashing on protection **DS3/TMUX/STS1E**, issue trouble report of bad incoming DS3/EC-1 signal from DSX-3 (STXS) cross-connect point. If LED is not flashing on protection **DS3/TMUX/STS1E**, replace service **DS3/TMUX/STS1E** circuit pack [**DLP-523**]. With a CIT, use the command **rtrv-alm** to verify the alarm.
12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear OLIU or Fiber Trouble Linear Extensions/Configurations

1.  **WARNING:**
Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION 1:**
When removing circuit packs, ensure that protection switching is available. When available, use a CIT and the "switch-line" command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a "switch-line" at the near end and far end to switch both transmit and receive to the same line.

-  **CAUTION 2:**
*When removing circuit packs, always remove the one without a lighted **ACTIVE LED** first.*

-  **NOTE 1:**
A lighted **FAULT** LED on the **OLIU** indicates that either the receiver, the transmitter, or both has failed. A flashing **FAULT** LED on the **OLIU** indicates that either the near-end receiver, far-end transmitter, or incoming (receive) fiber has failed. A lighted **ACTIVE** LED indicates that the **OLIU** is carrying service (transmitting, receiving, or both).

⇒ **NOTE 2:**

Because the OC-3 line protection switching request is unidirectional in all releases, it is possible to have lighted **FAULT** LEDs on both the service and protection **OLIUs** and still be in service. When troubleshooting **OLIU** problems, you must first fully analyze the trouble indications. This may be done by noting LED indications at both ends of the system or using a CIT to log in to the far-end terminal and using the "**rtrv-alm**" and "**rtrv-state-eqpt**" commands to check the far-end status.

⇒ **NOTE 3:**

This procedure can be used to clear some troubles, but a knowledge of the **OLIU** protection switching arrangement and use of CIT commands are necessary to clear other troubles where a service interruption might occur.

Was **OLIU(s)** removed or being replaced, installed, or having switch setting changed when alarm occurred?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 11**.

2. ⇒ **NOTE:**

An alarm will occur if a circuit pack is removed without performing an update by momentarily depressing the **UPD/INIT** button or using the "**upd**" command.

Is any previously installed **OLIU(s)** removed from the shelf?

If **YES**, then continue with **Step 3**.

If **NO**, then proceed to **Step 5**.

3. Determine the reason the circuit pack(s) was removed. If the same circuit pack is to be reinserted and switch setting is not changed, reinstall the circuit pack. If the circuit pack was removed and switch setting changed, reinstall the circuit pack (**DLP-514**) and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from equipment inventory.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Is **OLIU**(s) installed in correct slot(s) ("**rtrv-eqpt**")?
If **NO**, then continue with **Step 6**.
If **YES**, then proceed to **Step 8**.
6. Remove optical fibers from circuit packs, if connected, then remove circuit pack(s) from wrong slot(s). Check option switch setting (**DLP-513**), and install circuit pack(s) into correct slot(s). Reconnect optical fibers (**DLP-514**).
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
8. Was circuit pack installed with switch setting(s) changed from what it was previously ("**rtrv-oc3**")?
If **YES**, then continue with **Step 9**.
If **NO**, then proceed to **Step 11**.
9. Ensure switch setting on the **OLIU** circuit pack(s) is correct (**DLP-513**). If an **OLIU** circuit pack(s) was replaced or installed with switch setting changed from what it was previously, momentarily depress the **UPD/INIT** button on the **SYSCTL**.
10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
11. Are **FAULT** LEDs flashing ("inc. OC3 LOS, LOF, sig. failed", etc.) on both the service and protection **OLIUs**?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 14**.
12. **⇒ NOTE:**
Indications are that both incoming (receive) optical fiber lines have failed, or both near-end or far-end service and protection **OLIUs** have failed, or both **TGS**, **MXRVO**, or **DS3** circuit packs have failed or been removed.

Check for failed or removed **TGS**, **MXRVO**, or **DS3** circuit packs. Replace failed circuit packs [**DLP-523**]. Use local procedures to check optical fiber connections and transmission. If no trouble is found on the optical fibers, replace **OLIUs** at near end first (**DLP-523**). If trouble still exists, replace **OLIUs** at far end. If alarm still exists, trouble is in the optical fibers.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Is **FAULT** LED lighted ("OLIU CP fail", "unexpected CP type/switches", etc.) or flashing ("inc. OC3 LOS, LOF, sig. failed", etc.) on only ONE **OLIU** at either near end or far end?
If **YES**, then continue with **Step 15**.
If **NO**, then proceed to **Step 24**.
15. Is **ACTIVE** LED lighted on both service and protection **OLIUs** ("rtrv-state-eqpt")?
If **YES**, then proceed to **Step 17**.
If **NO**, then continue with **Step 16**.
16. Is alarm Critical or Minor?
If **MINOR**, then proceed to **Step 19**.
If **CRITICAL**, then continue with **Step 17**.
17.  **NOTE:**
Indications are that the near-end or far-end **OLIU** or incoming fiber line has failed and protection switching has been inhibited or locked at one or both ends. Also, if the protection fiber fails, the **ACTIVE** LEDs on both **OLIUs** will be lighted because of the uncertain state of the far end. If the "rtrv-state-eqpt" report indicates active-? for the protection line [slot **2(P)**], indications are that the protection line is failed. If the service line (slot **1**), indicates active-rx at both ends of the system, the service line is carrying all service.

Use CIT and "rtrv-state-eqpt" command to check switch status at BOTH ends of the system.

18. Use CIT and "switch-line" command to reset switch and switch both near-end and far-end lines to **OLIU** pair without lighted **FAULT** LED.
19.  **NOTE:**
Local procedures may require you to check optical fibers first before replacing **OLIUs**.

Replace **OLIU** with lighted or flashing **FAULT** LED.

Reference: **DLP-523**

20. Did trouble clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 21.**
21. Is **FAULT** LED lighted or flashing?
If **FLASHING**, then continue with **Step 22.**
If **LIGHTED**, then do **TAP-106.**
22. Replace **OLIU** at far-end (**DLP-523**). If trouble does not clear, trouble is in incoming optical fiber.
23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
24.  **NOTE:**
Remember that the OC-3 line protection switching request is unidirectional. It is possible to have a lighted **FAULT** LED on an **OLIU** and still have that **OLIU** active (for example, if the transmitter failed, the receiver could still be receiving). It is necessary to analyze the lighted or flashing **OLIU** LEDs before replacing an **OLIU**. If the **ACTIVE** LED is lighted on an **OLIU**, it is in service (**ACTIVE**) either transmitting or receiving or both. It may be necessary to perform a "**switch-line**" at the near end and at the far end to switch both transmit and receive to the same line.
- Is **FAULT** LED lighted or flashing on both service and protection **OLIUs**?
If **NO**, then continue with **Step 25.**
If **YES**, then proceed to **Step 32.**
25. Is **ACTIVE** LED lighted on **OLIUs** with lighted **FAULT** LEDs?
If **YES**, then continue with **Step 26.**
If **NO**, then proceed to **Step 27.**
26. Use CIT and "**rtrv-state-eqpt**" command to check switch status at both ends of the system. Use CIT and "**switch-line**" command to reset switch and switch both near-end and far-end lines to **OLIUs** without lighted **FAULT** LED.

27.  **NOTE:**
Local procedures may require you to check optical fibers first before replacing **OLIUs**.

Replace **OLIUs** with lighted **FAULT** LEDs.

Reference: **DLP-523**

28. Did trouble clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 29.**
29. Is **FAULT** LED(s) lighted or flashing?
If **FLASHING**, then continue with **Step 30.**
If **LIGHTED**, then do **TAP-106.**
30. Trouble is in optical fiber. Clear trouble using local procedures.
31. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
32. Multiple troubles exist which are beyond the scope of this document. Without knowing the exact LED indications, the alarm and status indications (obtained with the "**rtrv-alm**" command), or the state of the protection switch (using the "**rtrv-state-eqpt**" command), this procedure can not go any further.

Use the LED indications, the "**rtrv-alm**" and "**rtrv-state-eqpt**" commands to analyze the trouble. Look for protection switch locks or inhibits. If the system is found to be completely out of service, replace circuit packs with lighted **FAULT** LEDs. If system is still in-service and a protection switch can place all service on either the protection or service **OLIUs**, perform the switch then replace circuit packs with lighted **FAULT** LEDs.

If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Minor (MN) Alarm

1.  **NOTE:**
Table A lists some possible causes and indications of minor alarms.

Is a CIT available?

If **NO**, then continue with **Step 2**.

If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3.  **NOTE:**
The **FE SEL** button on the **SYSCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

4. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?
If **NO**, then continue with **Step 5**.
If **YES**, then proceed to **Step 15**.
5. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).
6. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?
If **YES**, then continue with **Step 7**.
If **NO**, then do **TAP-108**.
7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display). (**DLP-530**).

8. Issue a trouble report of critical alarm condition at the far-end DDM-2000 site indicated in **FE ID** display.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
10.  **NOTE:**
For all network configurations except point-to-point, there will be multiple far-end far end terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

Connect the CIT to the **CIT** connector on the near-end User Panel and log in or remote log in to the near-end system, if not already performed.

Reference: **DLP-521**

11.  **NOTE 1:**
The "**rtrv-alm**" command can be used to display a report of active alarm and status conditions. The "Commands and Reports" section of this manual gives a description of the command.
-  **NOTE 2:**
The "Active Alarms and Status Report" is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line in the "Active Alarms and Status Report" (Figure 1) (for example, "MINOR dcc-m2 MM-DD HH:MM:SS nsa section dcc channel failed").

```

/* Active Alarms and Status Report
=====
Alarm      Source   Date   Time      Srv   Description
Level      Address  Detected
=====
MINOR      farend   MM-DD HH:MM:SS   nsa   SiteXNE1
MINOR      dcc-m2   MM-DD HH:MM:SS   nsa   section dcc channel failed
-----
ne-acty    farend   MM-DD HH:MM:SS   -     SiteYNE1
ne-acty    m2-1     MM-DD HH:MM:SS   -     inc. STS1 yellow
ne-acty    m2-2     MM-DD HH:MM:SS   -     inc. STS1 yellow
ne-acty    main-2   MM-DD HH:MM:SS   -     inc. OC3 FERF
*/

```

Figure 1. Example of Active Alarms and Status Report

12.  **NOTE:**
Far-end alarm or status conditions are listed in this report with a Source Address of farend. Local alarm or status conditions have a Source Address of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, TL1 (X.25), TBOS, etc.) where the event occurred. (See *Addresses* in the "Commands and Reports" section of this manual.) Use the "**rtrv-alm**" command to get another report, if necessary.

Does the Source Address of any top entry in the alarm report indicate **local** slot, channel, port or operations interface for the MINOR alarm?

If **NO**, then do **TAP-107**.

If **YES**, then continue with **Step 13**.

13. Use "**opr-aco**" command to silence active audible office alarms, if required.
14. Note the trouble indication in the Description column of the "Active Alarms and Status Report", starting with the highest alarm level (Minor) listed in the Alarm Level column.
15. Find the trouble description in Table A for the highest alarm level and go to the indicated step or procedure.

Table A. Minor Alarm Conditions

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted.	2nd CP required for BBF3	The BBF3/BBF3B DS1PM circuit pack requires both FUNCTION UNITS slots in the group to be equipped with MXRVO or STS1E circuit packs.	Insert a second MXRVO or STS1E circuit pack in the companion FUNCTION UNITS slot.
	–48V power/fuse FA FB failed	–48V power feeder or fuse on User Panel failed.	Check –48V power feeders or replace fuse. [DLP-555]
	automatic protection switch (APS) channel failed	Failure of near-end or far-end protection OLI circuit pack in MAIN-2(P) slot or failure of receive fiber on the protection line at near end.	TAP-111
	automatic protection switch (APS) automatic lock	Four automatic switches of one DS1 circuit pack in 10 minutes; DS1 intermittent failure.	Replace DS1 circuit pack. [DLP-523]
	CP not allowed - (crs)	Circuit pack does not support the manual cross-connection(s) currently provisioned for this slot.	Change circuit pack or change cross-connections.
	CP not allowed - (eqpt)	A DS1 or DS1PM circuit pack is installed in a LOW SPEED slot associated with FUNCTION UNITS slot provisioned for DS3 , STS1E_L low speed, or OLI circuit pack service.	Remove DS1 circuit pack or change FUNCTION UNITS slot to MXRVO or STS1E-H high speed circuit pack.
	CP not allowed - (timing)	When associated with TIMING slot, current circuit pack switch settings do not support the sync. timing provisioned.	Change TGS circuit pack switches [DLP-513] or change sync. parameters (" set - sync ").
		When associated with FUNCTION UNITS slot C , circuit pack type does not support the current provisioned sync. parameters.	Change circuit pack type or change timing options.

See notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted. FAULT LED lighted on circuit pack	DS1 CP failed DS1PM CP fail DS3 CP fail TMUX CP fail STS1E_L CP fail STS1E_H CP fail TGS CP fail MXRVO CP fail OLIU CP fail	Internal failure of circuit pack with lighted LED.	Step 17
	DS1 CP removed DS1PM CP removed DS3 CP removed TMUX CP removed STS1E_L CP removed STS1E_H CP removed TGS CP removed MXRVO CP removed OLIU CP removed	Circuit packs removed without doing "upd" command to remove circuit packs from equipment list.	Step 29
	environmentn*	The specified environmental alarm point (misc. discrete input) is active at RT. Note: The actual message that appears in the "Active Alarms and Status Report" for this condition can be provisioned; this is the default message. See the "rtrv-attr-env" and "set-attr-env" commands.	Use "rtrv-attr-env" command at RT to determine trouble.
	ExternalMinor*	The external minor alarm input (environmental alarm input 15) is active. Typically, this input will be connected to the power shelf, and will indicate that the DC power or the cooling fan in a remote terminal cabinet has failed. Note: The actual message that appears in the "Active Alarms and Status Report" for this condition can be provisioned; this is the default message. See "rtrv-attr-env" and "set-attr-env" commands.	Use "rtrv-attr-env" command at RT to determine trouble.

See notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted. FAULT LED lighted on SYSCTL circuit pack	fan control relay failed	Telemetry output common is not grounded. SYSCTL circuit pack failed.	Step 18
MN LED lighted. LEDs lighted on fan shelf	fan shelf failed	Fan filter needs replacing. Fan pack failed. Fan shelf control board failed. Fan power feeder failed. The fan must be repaired within 4 hours, otherwise service interruption may occur.	TAP-118
MN LED lighted. FAULT LED lighted on circuit pack.	illegal CP type	An illegal or unknown circuit pack type has been inserted into the shelf.	Remove circuit pack and install correct circuit pack.
MN LED lighted. FAULT LED flashing on DS1 circuit pack	inc. (from DSX) DS1 LOS† inc. (from DSX) DS1 sig fail†	Equipment failed or removed at DSX-1	Step 23
MN LED lighted. FAULT LED flashing on TGS circuit pack	inc. DS1 sync. ref. LOS inc. DS1 sync. ref. LOF inc. DS1 sync. ref. BER inc. DS1 sync. ref. AIS inc. DS1 sync. ref. 00L inc. DS1 sync. ref. E00F	Failure of incoming sync. ref. signal. TGS circuit pack provisioned for wrong frame format (SF or ESF).	Step 27
MN LED lighted. FAULT LED flashing on DS3/TMUX circuit pack	inc. (from DSX) DS3 AIS* inc. (from DSX) DS3 LOS* inc. (from DSX) DS3 00F*	Equipment failed or removed at DSX-3	Step 25
MN LED lighted. FAULT LED flashing on OLI circuit pack	inc. OC1 loss of signal (LOS) inc. OC1 LOF inc. OC1 sig degrade (BER) inc. OC1 sig failed (BER)	Failure of OLI circuit pack at near or far end, or failure of receive fiber.	TAP-119 (ring, 0X1)

See notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted. FAULT LED flashing on OLI U circuit pack	inc. STS1 LOP OC1 <i>slotaid</i>	If failure on both OC-1 lines: unprotected removal or failure of MXRVO or DS3 circuit pack at far end.	Step 48
		If failure on only one OC-1 line: Failure of OLI U circuit pack at near or far end.	TAP-119 (ring, 0X1)
	inc. OC3 LOS inc. OC3 LOF inc. OC3 sig degrade (BER) inc. OC3 sig failed (BER)	Failure of OLI U circuit pack at near or far end, or failure of receive fiber.	TAP-111 (linear, 1+1) TAP-119 (ring, 0X1)
	inc. STS1 LOP OC3 <i>slotaid</i>	If failure on both OC-3 lines: unprotected removal or failure of MXRVO or DS3 circuit pack at far end.	Step 48
		If failure on only one OC-3 line: Failure of OLI U circuit pack at near or far end.	TAP-111 (linear, 1+1) TAP-119 (ring, 0X1)
	inc. OC12 LOS inc. OC12 LOF inc. OC12 sig degrade (BER) inc. OC12 sig failed (BER)	Failure of OLI U circuit pack at near or far end, or failure of receive fiber.	TAP-119 (ring, 0X1)
	inc. STS1 LOP OC12 <i>slotaid</i>	If failure on both OC-12 lines: unprotected removal or failure of MXRVO or DS3 circuit pack at far end.	Step 48
		If failure on only one OC-12 line: Failure of OLI U circuit pack at near or far end.	TAP-119 (ring, 0X1)
	inc. OC3 line AIS [*] inc. OC12 line AIS [*]	Failure of OLI U circuit pack at far end.	Step 63
	inc. EC1 sig failed (BER) [*] inc. EC1 LOF [*] inc. STS1 LOP EC1 inc. EC1 LOS [*] inc. EC1 sig degrade (BER) [*] inc. EC1 line AIS [*]	Failure of STS1E circuit pack at near or far end, or failure of receive fiber.	Step 25

See notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted.	inc. STS1 AIS [*]	Incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or failure of DS3 , MXRVO , STS1E , or OLI circuit pack at far end; or unprotected optical line failure.	TAP-120
	inc. STS1 sig degrade (BER) inc. STS1 sig failed (BER)	Failure of OLI circuit pack at near end or far end or failure of receive fiber.	TAP-111 (linear, 1+1) TAP-119 (ring, 0X1)
	inc. STS1 unequipped	An STS-1 cross-connect has been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring.	Find the deleted cross-connect in the upstream equipment.
	inc. VT AIS [*]	Incomplete or incorrect cross-connect provisioning in end-to-end network; unprotected removal or failure of DS1 circuit pack at far end. In ring applications: upstream OLI circuit pack or fiber failure affecting only one ring direction. A VT yellow alarm message is not returned for a non-service affecting VT AIS.	TAP-120
	inc. VT LOP	Unprotected failure of DS1 or MXRVO circuit pack at near end or far end.	Replace circuit pack associated with alarm.
	inc. VT sig degrade (BER)	An OLI circuit pack failure or a fiber failure at some point on the failed ring.	TAP-119
	inc. VT unequipped	An VT1.5 cross-connect has been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring.	Find the deleted cross-connect in the upstream equipment.
	invalid CP switches	When associated with TIMING slot, timing mode switch settings on TGS circuit packs are invalid.	Step 44
	OC12 connector failed	Failure or removal of the OC-12 faceplate connector (ribbon cable) which carries STS-1/STS-3c ring pass through traffic on the OC-12 ring interface on the OC-3 shelf.	Reconnect faceplate connector or replace, if failed.

See notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MJ LED lighted. Flashing FAULT LED on OHCTL circuit pack	section DCC channel failed	SYSCTL circuit pack failure, reset, or initialization at far end. SYSCTL circuit pack removed from a site. Program installation in progress or failed at far end. SYSCTL or OHCTL circuit pack failed at near end or removed at far end. OLI circuit pack or fiber failure between this node and node connected to the source address (no communication with other end).	Step 52
MN LED lighted. FAULT LED lighted on affected circuit pack.	OHCTL standby boot fail SYSCTL standby boot fail	SYSCTL or OHCTL circuit pack failed during local or remote software download.	Replace SYSCTL or OHCTL circuit pack and try software download again or download a compatible version of software.
	unexpected CP switches unexpected CP type	Switch settings invalid, different from other circuit pack, or different than they were before circuit pack was removed or replaced. Circuit pack inserted into slot provisioned for different circuit pack.	Step 41

Note: Similar descriptions of trouble may also appear in the CIT "Active Alarms and Status Report".

* May be provisioned for Critical, Major, Minor or no alarm.

† May be provisioned for Major, Minor or no alarm.

16. Is a **FAULT** LED lighted or flashing on an **OLI** circuit pack?

If **YES**, then do **TAP-111** if linear configuration.

Do **TAP-119** if ring configuration.

If **NO**, then continue with **Step 17**.

17. Is the **FAULT** LED lighted (not flashing) on the faceplate of one and only one circuit pack of the **DDM-2000**?

If **YES**, then continue with **Step 18**.

If **NO**, then proceed to **Step 21**.

18.  **CAUTION:**
Replacement circuit packs may have option switches which must be properly set before the circuit pack is installed.

Check circuit pack option switch settings for improper or invalid settings. If no trouble is found, refer to **DLP-523** and replace the circuit pack with the lighted **FAULT** LED.

19. Is the **MN** LED off on the User Panel?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 20.**
20. Is the **FAULT** LED lighted on the faceplate of the replacement circuit pack just installed?
If **YES**, then do **TAP-106.**
If **NO**, then return to **Step 1.**
21. Is the **FAULT** LED on the faceplate of one or more circuit packs flashing?
If **YES**, then continue with **Step 22.**
If **NO**, then proceed to **Step 29.**
22. Find the circuit pack(s) with the flashing LED(s) in Table B below and go to the indicated step.

Table B. Flashing LEDs

Circuit Pack With Flashing LED	Go To
DS1/DS1PM	Step 23
DS3/STS1E	Step 25
TGS	Step 27

23. There is an incoming DS1 signal failure. Switch service to protection. If LED is flashing on protection **DS1/DS1PM**, issue trouble report of bad incoming signal at input to **DS1/DS1PM** circuit pack with flashing LED(s). If LED is not flashing on protection **DS1/DS1PM**, replace service **DS1/DS1PM** circuit pack [**DLP-523**].
24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. Switch service to protection. If LED is flashing on protection **DS3/TMUX/STS1E**, issue trouble report of bad incoming DS3/EC-1 signal from DSX-3/STSX cross-connect point. If LED is not flashing on protection **DS3/TMUX/STS1E**, replace service **DS3/TMUX/STS1E** circuit pack [DLP-523].
26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
27. Check **TGS** option switches for proper line coding and frame format settings ("**rtrv-sync**"). If no trouble found, check incoming timing reference signals. If timing reference signals are bad, issue trouble report of bad incoming timing reference signal(s). If no trouble found with timing references, replace **TGS** circuit packs.

Reference: **DLP-523**

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
29. Have two of the same type (service and protection **TGS**, **MXRVO**, **STS1E**, or **DS3**) circuit packs been removed from the system?
If **YES**, then continue with **Step 30**.
If **NO**, then proceed to **Step 32**.
30. Determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.
31. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
32. Is ED-8C733-30, G7 Fan Shelf installed?
If **YES**, then continue with **Step 33**.
If **NO**, then proceed to **Step 35**.
33. Is **POWER ON** LED lighted on fan shelf?
If **YES**, then continue with **Step 34**.
If **NO**, then go to **TAP-118**.
34. Is **FILTER REPLACE** or any **FAULT** LED lighted on fan shelf?
If **NO**, then continue with **Step 35**.
If **YES**, then go to **TAP-118**.

35.  **CAUTION:**
*If fuse on User Panel is not blown, trouble may be a failure of **one** of the –48V DC power feeders. Removing the wrong fuse or disconnecting the wrong feeder for power measurement will cause service interruption. Blown fuses are detected by noting that the fuse indicator pin is extended through the fuse holder.*

 **NOTE:**
If fuse is not blown on the User Panel, check office battery distribution fuse board for blown fuses or tripped breakers. Replace fuse or reset breaker if necessary.

Is –48V fuse blown on User Panel?

If **YES**, then continue with **Step 36**.
If **NO**, then do **TAP-113**.

36.  **NOTE:**
The fuses on the G1 shelf User Panel are 5 amp indicator type fuses, COMCODE 405697442. With older indicator type fuses, insure the indicator end of the fuse is placed into the fuse cap so the indicator can protrude through the hole in the fuse cap, if the fuse blows. The fuses on the G3 and G4 shelf User Panel are 5 amp fuses, COMCODE 406203976. The extraction tool COMCODE for these fuses is 406420273.

Replace blown –48V fuse on User Panel?

37. Did fuse blow again?
If **YES**, then proceed to **Step 39**.
If **NO**, then continue with **Step 38**.
38. Is MINOR alarm cleared?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 41**.

39.  **CAUTION:**
Removal of an unprotected circuit pack may cause service interruption.

 **NOTE:**
The –48V power feeders/fuses on the User Panel supply power to DC-to-DC converters on the **TGS**, **OLIU**, **MXRVO**, **DS3**, and **SYCTL** circuit packs. It is unlikely that a circuit pack failure would cause only one feeder fuse to blow. The more probable cause of failure of only one feeder fuse would be a short of the backplane feeder path or a problem with a circuit pack shelf connector. After a thorough inspection of the backplane, if no trouble is found, the circuit packs can be removed one at a time to try and isolate the trouble.

Remove **one** of each pair of circuit packs listed in the above note and replace blown –48V fuse. If fuse does not blow again, reinstall all removed circuit packs one at a time, beginning with the **SYCTL**. Replace any circuit pack that causes the fuse to blow (**DLP-523**). If fuse blows again with one of each pair of circuit packs removed, reinstall removed circuit packs and repeat the procedure for the remaining circuit packs (except DS1s). If fuse blows after all circuit packs have been removed, trouble is in the backplane.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

41.  **NOTE:**
Alarm may be caused by circuit packs inserted into the wrong slots or by invalid or wrong switch settings on the **TGS** circuit packs.

Are circuit packs installed in the correct slots ("**rtrv-eqpt**")?

If **YES**, then proceed to **Step 44**.

If **NO**, then continue with **Step 42**.

42. Remove circuit packs from wrong slots, check option switches (**DLP-513**) and reinstall circuit packs into the correct slots.
43. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
44.  **CAUTION:**
*When removing circuit packs ensure that protection switching is available. Also, remove the circuit pack without the lighted **ACTIVE** LED first.*

Check switch settings ("**rtrv-sync**" command) on the **TGS** circuit packs for correct settings. If the circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced. Also check if the switches are set the same as the companion circuit pack.

Reference: **DLP-513**

45. Are switch settings correct?
If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 46**.
46. Change switch settings to the correct settings. (Use "**switch-sync**" command to switch to other circuit pack before removing pack.) If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.
47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
48. Indications are that there is an unprotected failure or removal of a **MXRVO** or **DS3** circuit pack at the far-end associated with the identified **OLI** slot at the near-end. Determine location of the circuit pack(s) from office records or use the "**rtrv-crs-()**" commands to trace back through the STS1/VT1.5 cross-connections associated with the identified **OLI** slot.

49. If circuit packs are removed, determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the "**upd**" command. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the "**upd**" command to remove the circuit pack from the inventory.
50. If the **MXRVO** or **DS3** circuit packs have not been removed, replace the **MXRVO** or **DS3** circuit pack associated with the identified **OLI**U slot in the alarm message.

Reference: **DLP-523**

51. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
52. In alarm report, is there any indication of **OLI**U or fiber trouble at near end or far end such as "inc. 0C3 FERF" or "inc. 0C12 FERF" alarm message?
If **YES**, then continue with **Step 53**.
If **NO**, then proceed to **Step 55**.
53. **⇒ NOTE:**
If there is a DCC failure, a remote login to the shelf connected through the Source Address cannot be done. The "**rtrv-alm**" and "**rtrv-map-neighbor**" commands can be used to check for DCC failure for main (and **FUNCTION UNITS A, B, or C**). Also, use "**rtrv-fecom**" command to see if "fecom" has been disabled.

Note Source Address of DCC channel failure. Check optical fibers connected through the Source Address per local procedures. If no trouble found, replace near-end **OLI**U first then far-end **OLI**U.

Reference: **DLP-523**

54. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

55. Use CIT and "**reset**" command to reset **SYSCTL** at the near end or unplug and reseal the **SYSCTL**.
56. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing ("section DCC channel failed")?
If **YES**, then continue with **Step 57**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
57. If possible, use CIT and "**rlgn**" command to log in to the far-end terminal (**DLP-522**) and use the **reset** command to reset **SYSCTL** at the far end.
58. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing ("section DCC channel failed")?
If **YES**, then continue with **Step 59**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
59.  **NOTE:**
You may prefer to go to the far end first and check if the **OHCTL** is failed or removed before replacing the **SYSCTL** at the near end.

Refer to **DLP-501** and replace **SYSCTL** at near-end terminal.

60. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing?
If **YES**, then continue with **Step 61**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
61. At far-end terminal, reset **SYSCTL** by unseating and reseating **SYSCTL** or by using a CIT and the "**reset**" command, if not already performed. If **FAULT** LED is still flashing after a reset, refer to **DLP-501** and replace **SYSCTL** at far-end terminal. If the **FAULT** LED is still flashing after the **SYSCTL** is replaced, replace the **OHCTL** [**DLP-523**] first at one end and then the other, if trouble still exists.
62. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
63. Replace **OLIUs** at far end that are associated with the Source Address of the "inc. 0C3 line AIS", "inc. 0C12 line AIS", or "inc. 0C1 line AIS" alarm message.

Reference: **DLP-523**

64. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Obscure Minor (MN) Alarm

1. Perform an LED test by depressing the **ACO** button or using the **test - led** command from a CIT.

Reference: **DLP-509**

2. Did any circuit pack fail the LED test?
If **YES**, then do **TAP-115**.
If **NO**, then continue with **Step 3**.
3. Is this site a remote terminal location with separate J1C182BA Power Shelf and/or fan unit?
If **YES**, then continue with **Step 4**.
If **NO**, then proceed to **Step 5**.
4. Look for blown fuses and/or lighted LEDs on the battery shelf, battery charger, or fan assembly. Is there any indication of trouble?
If **YES**, then do **TAP-114**.
If **NO**, then continue with **Step 5**.
5. Is a CIT available?
If **YES**, then proceed to **Step 11**.
If **NO**, then continue with **Step 6**.
6.  **NOTE:**
Unseating and reseating the **SYSC TL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSC TL** circuit pack. Do not depress **UPD/INIT** button.

7. Is the **MN** alarm LED still lighted, after about 1 minute?

If **YES**, then continue with **Step 8**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8.



CAUTION:

*Replacing the **SYSCTL** involves updating the internal memory on the circuit pack.*

Replace the **SYSCTL (DLP-501)**.

9. Is **MN** alarm LED still lighted?

If **YES**, then continue with **Step 10**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10.



NOTE:

Without a CIT it is difficult to determine the cause of the minor alarm. Table A lists some remaining possible causes of a minor alarm.

Obtain a CIT and establish session with the DDM-2000 system.

Reference: **DLP-521**

11. Use CIT and **rtrv-alm** command to get an "Active Alarms and Status Report". See the REPORT DESCRIPTIONS section of this manual under **RTRV-ALM** for a description of each message retrieved with the **rtrv-alm** command.
12. Refer to Table A. Are any of the conditions listed in the Description column reported in the "Active Alarms and Status Report"?
- If **YES**, then continue with **Step 13**.
- If **NO**, then proceed to **Step 26**.

13. Refer to Table A. Note the suspected trouble and go to the indicated step or procedure.

Table A. Obscure Minor Alarm Conditions

Description	Meaning	Step
APS - automatic lock	Service associated with a DS1 circuit pack has been automatically switched and locked onto the protection DS1 circuit pack. The APS lock will remain active until midnight.	Step 14
APS channel failed	The APS channel on the protection OC-3 line has failed.	Step 17
ExternalMinor	DC power or fan failure at a remote terminal far end.	TAP-114
environmentn	A miscellaneous discrete input is active. This message may be changed using the set-attr-env command. The description may be an alphanumeric string up to 26 characters long (for example, Fire, Open door, etc.).	Step 19
protected CP removed	A circuit pack previously installed in the system is removed. The pack should be replaced or an update (upd) should be done to remove it from the equipment list.	Step 21
unexpected CP type unexpected CP switches	A circuit pack is installed in a slot provisioned for a different circuit pack, or switch settings have been changed from what they were before the circuit pack was removed.	Step 23

14.  **NOTE:**
There is an automatic lock. An automatic lock occurs when an *automatic* protection switch is made and then broken four times within a 10-minute interval.

From the "Active Alarms and Status Report", determine the source address of the **DS1** circuit pack locked onto the protection **DS1**.

15.  **CAUTION:**
*When a **DS1** is switched to protection, removal of any other **DS1** circuit pack or **177A Retainer Card** in the same **LOW SPEED GROUP** will result in a loss of service to the protected **DS1** and the removed **DS1** circuit pack.*

Replace **DS1** service circuit pack locked onto protection.

Reference: **DLP-523**

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17.  **NOTE:**
Indications are that the **OLIU** circuit pack on the protection line (slot **2(P)**) has failed at the near end or far end, or the receive fiber on the protection line at the near end has failed.

Go to **TAP-111** and isolate trouble on the **OLIUs**.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. Use local procedures to clear condition(s) that caused environmental alarm.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. Locate source address of removed circuit pack from the "Active Alarms and Status Report", then determine the reason the **DS1** circuit pack was removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23.  **NOTE:**
Indications are that a circuit pack has been installed in a wrong slot;
switch settings are invalid or different from a companion circuit pack;
or switches are set differently from what they were before a circuit
pack was replaced.

Determine the source address from the "Active Alarms and Status Report". Refer to the "Commands and Reports" section of this manual under **RTRV-ALM** for a more detailed description of the meaning of the report.

24. If a circuit pack(s) is installed in the wrong slot, remove the circuit pack. Determine correct position of the circuit pack and install circuit pack into the correct slot.

Check circuit pack switch settings for valid settings or wrong settings (**DLP-513**). If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
26. Has the **SYSCTL** been replaced?
If **YES**, then proceed to **Step 31**.
If **NO**, then continue with **Step 27**.
27. Use the CIT and **reset** command to reset **SYSCTL**.
28. Is the **MN** alarm LED still lighted after about 1 minute?
If **YES**, then continue with **Step 29**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. **⇒ NOTE:**
Replacing the **SYSCTL** involves updating the internal memory on the circuit pack.

Replace the **SYSCTL (DLP-501)**.

30. Is **MN** alarm LED still lighted?
If **YES**, then continue with **Step 31**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. **⇒ NOTE:**
The problem appears to be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000 the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

Check for broken or bent pins, shorted pins, etc. If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

32. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear External Minor Alarm at RT

1. Are there any blown fuses on battery shelf or **BFU** (for bulk powering)?
If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 4**.
2. Replace blown fuse(s).
3. Does alarm clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 4**.
4. Is bulk power (J1C182BB bulk power shelf) being used?
If **YES**, then proceed to **Step 25**.
If **NO**, then continue with **Step 5**.
5. Is **OPEN BATT** LED on **337A BATTERY CHARGER** lighted at RT battery shelf?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 25**.
6. Condition DMM (digital multimeter) to measure voltage.
7. Measure voltage at **–48B** and **GND** and **–48L** and **GND** jacks on the **LDU** faceplate.
8. Does voltage measure between **–42** and **–58** volts?
If **YES**, then continue with **Step 9**.
If **NO**, then proceed to **Step 18**.
9. Use SD-7C119 to check wiring between **337A BATTERY CHARGER** and batteries.
10. Was a problem found in wiring?
If **YES**, then continue with **Step 11**.
If **NO**, then proceed to **Step 12**.
11. Correct wiring problem and proceed to **Step 17**.

12. Is fuse blown on **337A BATTERY CHARGER**?
If **YES**, then proceed to **Step 16**.
If **NO**, then continue with **Step 13**.
13. Is **BAT DISCHG** LED on **337A BATTERY CHARGER** lighted?
If **YES**, then continue with **Step 14**.
If **NO**, then proceed to **Step 16**.
14. Depress and hold **HIGH RATE CHG ACTIVATE** pushbutton on **337A BATTERY CHARGER**. Is **BAT DISCHG** LED lighted?
If **YES**, then continue with **Step 15**.
If **NO**, then proceed to **Step 16**.
15.  **NOTE:**
HIGH RATE CHG ON LED will remain lighted until batteries reach approximately -58 volts. If batteries are completely discharged, it may take approximately one day for **HIGH RATE CHG ON** LED to go out.

Release **HIGH RATE CHG ACTIVATE** pushbutton. Does **BAT DISCHG** LED go off and is **HIGH RATE CHG ON** LED lighted?
If **YES**, then proceed to **Step 17**.
If **NO**, then continue with **Step 16**.
16. Replace **337A BATTERY CHARGER** and proceed to **Step 17**.
17. Did alarm clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 23**.
18. Use DMM to measure voltage at battery shelf jacks **J5 (+BAT)** and **J6 (-BAT)**.
19. Does voltage measure between -42 and -58 volts?
If **YES**, then proceed to **Step 37**.
If **NO**, then continue with **Step 20**.
20. Is **197A BATTERY LOAD TEST SET** available for use in testing batteries?
If **YES**, then continue with **Step 21**.
If **NO**, then proceed to **Step 23**.

21. Test batteries using **197A** test set.

Reference: **DLP-536**

22. Replace any failed battery pack(s) and reconnect battery leads to battery shelf and proceed to **Step 24**.
23. Replace battery packs one at a time until –48 volts is present at output jacks on battery shelf.
24. Does alarm clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 25**.
25. Is **FAN ALARM** LED lighted on a fan assembly?
If **YES**, then continue with **Step 26**.
If **NO**, then proceed to **Step 37**.
26. Remove **FAN H** and **FAN L** fuses on corresponding **BFU** on power shelf.
Are fuses blown?
If **YES**, then continue with **Step 27**.
If **NO**, then proceed to **Step 30**.
27. Replace **FAN H** and **FAN L** fuses on corresponding **BFU**.
28. Does alarm clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 29**.
29. Is **FAN ALARM** LED lighted on fan assembly?
If **YES**, then continue with **Step 30**.
If **NO**, then proceed to **Step 37**.
30.  **WARNING:**
To avoid possible damage, do not overextend fan assembly power cable.

Remove fan assembly from bay.

31. Examine fan assembly for anything that will prevent fan from operating properly.
32. Remove any blockages and reinstall fan assembly and fuses.
33. Is fan assembly **FAN ALARM** LED off?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 34.**
34. Remove **FAN H** and **FAN L** fuses on corresponding **BFU**.
35. Replace fan assembly with new fan assembly and install fuses.
36. Is fan assembly **FAN ALARM** LED off?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 37.**
37. Replace one of the **336 RECTIFIERS**.
38. Does alarm clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 39.**
39. Reinstall original **336A RECTIFIER**.
40. Replace second **336A RECTIFIER**.
41. Does alarm clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 42.**
42. Reinstall original **336A RECTIFIER**.
43. If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.
44. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear LED Test Trouble

1. Did all of the LEDs in the **DDM-2000** fail to light?
If **YES**, then proceed to **Step 4**.
If **NO**, then continue with **Step 2**.
2.  **CAUTION:**
Replacement circuit packs may have option switches which must be properly set before the circuit pack is installed.

Refer to **DLP-523** and replace the circuit pack that failed the LED test.
Repeat the LED test.

3. Did the same LED fail the test again?
If **YES**, then continue with **Step 4**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
4.  **NOTE:**
Using the CIT and **reset** command or unseating and reseating the **SYCTL** restarts the software program.

Enter **reset** command or unseat and reseal **SYCTL** circuit pack. Do not depress **UPD/INIT** button.

5. Repeat the LED test.
6. Did the same LED(s) fail the test again?
If **YES**, then continue with **Step 7**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7.  **CAUTION:**
*Replacing the **SYSCTL** involves updating the internal memory on the circuit pack.*

Replace the **SYSCTL (DLP-501)** and repeat the LED test.

8. Did the LED test fail again?
If **YES**, then continue with **Step 9**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
9.  **NOTE:**
The problem appears to be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000 the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble During Program Upgrade

1.  **NOTE:**
Program installation may fail due to failure of communication link between PC and DDM-2000, failure of the floppy disk or hard disk on the PC, failure or loss of power in the PC, or failure of the **SYCTL** or **OHCTL**. See **ins-prog** and **cpy-prog** command pages in the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for other failure indications.

Was the following message received?

SCSN

/* Status, invalid Command Sequence. */

/* Incompatible software. */

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 4**.

2. Indications are that you are trying to download software that is incompatible with the shelf type (for example, DDM-2000 OC-12 software into a DDM-2000 OC-3 shelf) or Controller type (for example, software prior to Release 8 and later into **BBG8/BBG8B/BBG9** controllers. Find compatible software.

If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. Was the following message received?
/* Status, execution stopped. */
/* Communication link could not be established.
Please connect PC with program to be installed and
start again. */

If **YES**, then continue with **Step 5**.

If **NO**, then proceed to **Step 6**.

5. Indications are that the **ins-prog** command was not executed from a PC. A program upgrade to the near end DDM-2000 cannot be performed with a CIT. Use PC to repeat software download.
6. Was the following message received?
/* Status, execution stopped. */
/* Communication link cannot be established.
Please connect PC with DDM-2000 upgrade program and
start again. */

If **YES**, then continue with **Step 7**.

If **NO**, then proceed to **Step 8**.

7. Indications are that the PC is not functioning properly, the disk drive is inoperable, the diskette has been removed, or the program has previously been erased from the **SYSCTL**. Check that the PC is operating properly and the diskette has not been removed. Check PC to CIT port connections.

Has program installation procedure been tried more than once?

If **YES**, then continue with **Step 8**.

If **NO**, then proceed to **Step 15**.

8. Was the following or similar message received?
ins-prog:tid DENY
SSTP
/* Status, execution stopped. */
/* Far end not responding.

If **YES**, then continue with **Step 9**.

If **NO**, then proceed to **Step 12**.

9. Are **SYSCTL** and **OHCTL** circuit packs installed at far end?
If **YES**, then proceed to **Step 12**.
If **NO**, then continue with **Step 10**.

10. Determine reason **SYSCTL** or **OHCTL** is not installed. The **SYSCTL** and **OHCTL** must be installed to upgrade program. Reinstall the **SYSCTL** and **OHCTL** and repeat the program installation procedure.
11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. Did **SYSCTL** or **OHCTL** fail, indicated by the following or similar SYSCTL CP failed message?

```
ins-prog:tid DENY
```

```
SSTP
```

```
/*Status, execution stopped.*/
```

```
/*Installation cannot be done because of SYSCTL test failure. */
```

If **YES**, then proceed to **Step 17**.

If **NO**, then continue with **Step 13**.

13. Did **FAULT** LED on **SYSCTL** light and did the **SYSCTL FE ID** display go off?

If **YES**, then proceed to **Step 19**.

If **NO**, then continue with **Step 14**.

14.  **NOTE:**

It is assumed that the program installation failed in one of two ways: before the old program was erased or after the old program was erased. If the program installation failed after 1 minute, the DDM-2000 may have erased its old program and will be unable to report alarms or do protection switches. If program installation failed within 1 minute, the old program may not have been erased and the DDM-2000 may have automatically reset and restarted its old program. A new attempt must be made to install the program.

Check PC COM() port to CIT connection. Check PC disk drive and floppy diskette.

15. **NOTE:**

The new program installation may have failed because of faulty diskettes.

Disconnect PC and repeat program installation procedure. Use your *backup diskettes* containing new generic program, if available. If new program installation cannot be completed and the old program has been erased, one the following procedures may be used to restore the old program or install a different version program.

- A. If a "P." was displayed in the **FE ID** display during a software download, indications are that a portion of the program has been erased and you will have to reinstall the program. You may be able to use the **ins-prog:tid** or **cpy-prog:tid** command from a far-end shelf to reload software. Go to the far-end shelf and establish session with a CIT. Enter the **ins-prog:tid** or **cpy-prog:tid** command where the *tid* is the *tid* (shelf name) for the failed shelf where you want to install the old program.
- B. If a "P." was displayed in the **FE ID** display during a software download and you cannot load the program from the far-end, you can force the download. To load another version of software, unseat and then reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a "P" appears in the **FE ID** display. Release buttons and repeat the download procedure.
- C. Replace the **SYSCTL** and **OHCTL** with ones that have compatible software. [DLP-523]
- D. If a "C" was displayed in the **FE ID** display after a software download, indications are that the software loaded will not support the current system transmission configuration. This indicates a problem with the version of software you are trying to install, or you are trying to install a version of software that does not support the system configuration that you have. To load another version of software, unseat and then reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a "P" appears in the **FE ID** display. Release buttons and repeat the download procedure.

If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Unseat and reseat **SYSCCTL** to perform reset.

18. Is alarm still present?

If **YES**, then continue with **Step 19**.

If **NO**, then proceed to **Step 21**.

19. Has **SYSCCTL** or **OHCTL** been replaced?

If **NO**, then continue with **Step 20**.

If **YES**, then proceed to **Step 23**.

20.



CAUTION:

*Replacing the **SYSCCTL** involves updating the internal memory on the circuit pack.*

Replace the **SYSCCTL** or **OHCTL**.

Reference: **DLP-523**

21. Repeat program installation procedure.

Reference: **DLP-532**

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. If you need technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear NE ACTY/FE ACTY Alarm Only

1. Is a CIT available?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 8**.

2.  **NOTE:**

For all network configurations except point-to-point, there will be multiple far-end far-end terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system.

Reference: **DLP-521**

3.  **NOTE 1:**

The **rtrv-alm** command can be used to display a report of active alarm and status conditions. The "Commands and Reports" section of this manual gives a description of the command.

-  **NOTE 2:**

The "Active Alarms and Status Report" is output automatically following CIT log in. The report shown in Figure 1 is an example that shows one entry. There may be many entries in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line in the "Active Alarms and Status Report" (Figure 1) (for example, "ne-acty m2-1-1-1 MM-DD HH:MM:SS nsa inc. VT AIS").

```
/* Active Alarms and Status Report
=====
Alarm      Source   Date   Time      Srv   Description
Level      Address  Detected
=====
ne-acty    m2-1-1-1  MM-DD HH:MM:SS  nsa   inc. VT AIS
-----
*/
```

Figure 1. Example of Active Alarms and Status Report

4.  **NOTE:**
Far-end alarm or status conditions are listed in this report with a Source Address of farend. Local alarm or status conditions have a Source Address of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, TL1 (X.25), TBOS, etc.) where the event occurred. (See *Addresses* in the "Commands and Reports" section of this manual.) Use the **rtrv-alm** command to get another report, if necessary.

Does the Source Address of any top entry in the alarm report indicate a **local** slot, channel, port or operations interface for the "NE ACTY/FE ACTY" alarm?

If **NO**, then do **TAP-107**.

If **YES**, then continue with **Step 5**.

5. Note the trouble indication in the Description column of the "Active Alarms and Status Report".
6. Find the trouble description in Table A and perform the indicated repair procedure(s).
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8.  **NOTE:**
The **FE SEL** button on the **SYSCCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

9. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?
If **NO**, then continue with **Step 10**.
If **YES**, then proceed to **Step 12**.

10.  **NOTE:**
The **FE SEL** button on the **SYSCCTL** is used to display local and remote alarm and status conditions [**DLP-530**].

Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

11. Was **NE ACTY** LED lighted on the User Panel when alarms were displayed for any selected site?
If **NO**, then do **TAP-108**.
If **YES**, then continue with **Step 12**.
12. See the description of activity indications in Table A. Without a CIT it is difficult to diagnose the trouble further. If trouble cannot be isolated using the conditions listed in Table A, obtain a CIT for further analysis.
13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. Alarm and Status - NE ACTY

Activity	Meaning
holdover mode active	System is in holdover synchronization mode. Likely causes: System was manually switched to holdover mode (with switch-sync command or in a central office system, with TBOS control point 54) and switch has not been reset; or the system automatically switched to holdover mode due to failure of timing references, and either (1) the reference failures have not cleared, or (2) the system is provisioned for nonrevertive synchronization mode switching, or (3) the system is provisioned for External timing and no external timing references are available, or (4) the system is provisioned for loop-timed operation and the optical line or OLIU circuit pack has failed, or a message indicating an upstream clock problem has been received on the sync message bits of the optical line (rtrv-sync command) or (5) the system is provisioned for sync message signaling, but the upstream system from which it loop-times has not been provisioned for sync message signaling. The condition can be cleared by provisioning both systems the same (set-sync and rtrv-sync commands). Condition can be cleared by repairing at least one of timing references (if both are failed) and resetting synchronization mode protection switch with command switch-sync:s=mode,pri=reset. In a central office system, the synchronization mode can also be reset with a TBOS control point.
inc. OC1 line AIS	System detects inc. OC-1 line AIS on active OC-1 line. Likely cause: Failure of OLIU circuit pack at far end [TAP-119].
inc. (from fiber) DS3 AIS	The system has detected DS3 AIS in the demux direction (coming from the fiber) for the specified DS3 signal. Likely causes: The incoming DS3 signal at the far end has failed, DS3 AIS is received from the DSX-3 at the far end, or incomplete or missing STS1 (DS3) cross-connections at a far end terminal. Check incoming DS3 signal at far end and/or look for missing cross-connections [TAP-120].
inc. (from fiber) DS3 OOF	System detects a DS3 out-of-frame condition in demux direction (coming from fiber). Likely causes: An OOF DS3 signal inc. to the DSX-3 at the far end; or failure of DS3 circuit pack at near or far end. If no trouble with DSX-3 signal, replace DS3 circuit pack [DLP-523].
inc. (from DSX) DS3 AIS	The system has detected DS3 AIS in the mux direction (coming from the DSX) for the specified DS3 signal. Likely causes: The incoming DS3 signal at the near end has failed, DS3 AIS is received from the DSX-3 at the near end. Check incoming DS3 signal at near end.

Table A. Alarm and Status - NE ACTY (Continued)

Activity	Meaning
inc. EC1 FERF	The system has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal. Likely causes: The other end has detected an incoming signal failure on the specified EC-1 line. This may be caused by failure of the STS1E circuit pack at the near end, the STS1E circuit pack at the far end, or the transmit cable on the specified line. Replace STS1E circuit pack at near end and/or far end [DLP-523] or repair EC-1 cable.
inc. OC1 FERF	System detects the OC-1 Far End Receive Failure (FERF) signal in the incoming OC-1 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-1 line. This may be caused by failure of the OLIUI circuit pack at the near end, the OLIUI circuit pack at the far end, or the transmit fiber on the specified line [TAP-119].
inc. OC3 FERF	System detects the OC-3 Far End Receive Failure (FERF) signal in the incoming OC-3 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-3 line. This may be caused by failure of the OLIUI circuit pack at the near end, the OLIUI circuit pack at the far end, or the transmit fiber on the specified line [TAP-111] or [TAP-119].
inc. OC12 FERF	System detects the OC-12 Far End Receive Failure (FERF) signal in the incoming OC-12 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-12 line. This may be caused by failure of the OLIUI circuit pack at the near end, the OLIUI circuit pack at the far end, or the transmit fiber on the specified line [TAP-119].
inc. STS1 yellow	System detects an incoming STS-1 yellow signal inserted by the far end path terminating equipment. Likely causes: Incomplete or incorrect cross-connect provisioning in the end-to-end network [TAP-120], or unprotected unidirectional failure of the OLIUI circuit pack or fiber at some point in the end-to-end path.
inc. VT yellow	The far end is detecting VT AIS or VT LOP and inserting VT yellow in its transmit signal. Likely causes: Unprotected unidirectional failure of a circuit pack or fiber at some point in the end-to-end path.

Clear Fan Shelf Alarm

1.  **NOTE:**
POWER ON LED not lighted indicates power failure. **POWER FAULT** LED lighted indicates a single power feeder failure. **CONTROL FAULT** LED lighted indicates fan shelf assembly failure. **FILTER REPLACE** LED lighted indicates fan filter needs replacing. **FAN FAULT 1, 2, 3, or 4** LED lighted indicates single fan failure. Execute **ALARM RESET** after failure is cleared.

Is **POWER ON** LED lighted on fan shelf?

If **NO**, then continue with **Step 2**.

If **YES**, then proceed to **Step 9**.

2. Are **POWER RESET A** and **B** circuit breakers tripped (pins extended)?

If **YES**, then continue with **Step 3**.

If **NO**, then proceed to **Step 7**.

3. Reset circuit breakers (depress pins).

4. Did circuit breakers trip again?

If **YES**, then continue with **Step 5**.

If **NO**, then proceed to **Step 35**.

5.  **CAUTION:**
Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

 NOTE:

To remove the front cover of a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 or G4 shelf.

Trouble in fan shelf. Remove front cover, disconnect cables to all 4 fan packs, and reset circuit breakers. If circuit breakers trip again, replace the fan shelf. If circuit breakers do not trip, reconnect fan units one at a time and replace the fan unit that causes the breaker to trip. The fan shelf must be repaired within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
7. Trouble in power feeder(s). Check office battery distribution fuse panel for blown fuses. Check power feeders to fan shelf. Power must be restored within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if power is not restored and fan made operational.
8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
9. Is **POWER FAULT** LED lighted on fan shelf?
 If **YES**, then continue with **Step 10**.
 If **NO**, then proceed to **Step 17**.
10. Is circuit breaker tripped?
 If **NO**, then continue with **Step 11**.
 If **YES**, then proceed to **Step 13**.
11. Trouble in one of the power feeders. Check office battery distribution fuse panel for blown fuses. Check power feeders to fan shelf.
12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
13. Reset circuit breaker (depress pin).
14. Did circuit breaker trip again?
 If **YES**, then continue with **Step 15**.
 If **NO**, then proceed to **Step 35**.

15.  **CAUTION:**
Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

 **NOTE:**
To remove the fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 or G4 shelf.

Trouble in fan shelf. Replace fan shelf.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Is **CONTROL FAULT** LED lighted on fan shelf?

If **YES**, then continue with **Step 18**.

If **NO**, then proceed to **Step 20**.

18.  **CAUTION:**
Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

 **NOTE:**
To remove a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 or G4 shelf.

Trouble in fan shelf. Replace fan shelf within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

20. Is **FILTER REPLACE** LED lighted on fan shelf?

If **YES**, then continue with **Step 21**.

If **NO**, then proceed to **Step 33**.

21.  **NOTE:**

The fan filter is located on the bottom of the DDM-2000 OC-3 shelf that is installed immediately below the fan shelf. It is held in place by magnetic strips. To remove the filter, simply pull it out. To install a filter, insert the filter, with magnetic strips facing up, into the bottom cavity of the shelf.

Replace fan filter. Momentarily depress **ALARM RESET** button.

Reference: **DLP-540**

22. Is **FILTER REPLACE** LED lighted on fan shelf?

If **YES**, then continue with **Step 23**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23.  **CAUTION:**

If the air flow sensor element is disturbed during cleaning, it may cause the fan shelf to go out of calibration and cause the DDM-2000 equipment to overheat. If experienced personnel are not available to clean the air flow sensor element, it is recommended you replace the fan shelf.

 **NOTE:**

Trouble in fan shelf or air flow sensor. Replace fan shelf or clean air flow sensor within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

Are you going to clean the air flow sensor or replace the fan shelf?

If **REPLACE FAN SHELF**, then continue with **Step 24**.

If **CLEAN SENSOR**, then proceed to **Step 26**.

24.  **CAUTION:**
If the fan shelf is removed, exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.
-  **NOTE:**
To remove a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 or G4 shelf.
- Replace fan shelf.
25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
26.  **NOTE:**
The air flow sensor could get contaminated with dust in environments where excessive dust is present and/or in situations where the fan filter was not installed. The air flow sensor is located in the area where fan pack #2 is located. When fan pack #2 is removed, it is still difficult to see if the air flow sensor has accumulated dust. If dust is suspected and a replacement fan shelf is not available, then personnel experienced in the air flow sensor cleaning procedures may clean the sensor element.
27. Remove fan shelf front cover.
28.  **NOTE:**
Fan packs are numbered from left to right as viewed from the front of the fan shelf. To remove fan pack, disconnect fan cable from fan pack. Remove 2 screws holding fan in place. Slide out fan pack.
- Remove fan pack #2. See Figure 2.
29. Locate air flow sensor (Figure 2) and direct a gentle blast of clean dry air toward the center of the vertical sensor orifice.

30. Reinsert fan pack #2. Reinstall screws and connect fan cable.
31. Reinstall front cover and momentarily depress the **ALARM RESET** button.
32. Is **FILTER REPLACE** LED lighted on fan shelf?
If **YES**, then proceed to **Step 15**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
33. Is **FAN FAULT 1, 2, 3, or 4** LED lighted on fan shelf?
If **YES**, then continue with **Step 34**.
If **NO**, then proceed to **Step 35**.
34.  **NOTE:**
Fan packs are numbered from left to right as viewed from the front of the fan shelf. To replace fan pack, remove front cover and disconnect fan cable from failed fan pack. Remove 2 screws holding fan in place. Slide out old fan and install new one. Reinstall screws and connect fan cable.

Trouble is in fan pack associated with lighted LED. Replace ED-8C733-30, G6 fan pack.

Reference: **DLP-548**

35. Momentarily depress the **ALARM RESET** button to reset alarms.
36. Verify that all fan shelf alarm LEDs are extinguished and no circuit breakers are tripped.
37. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

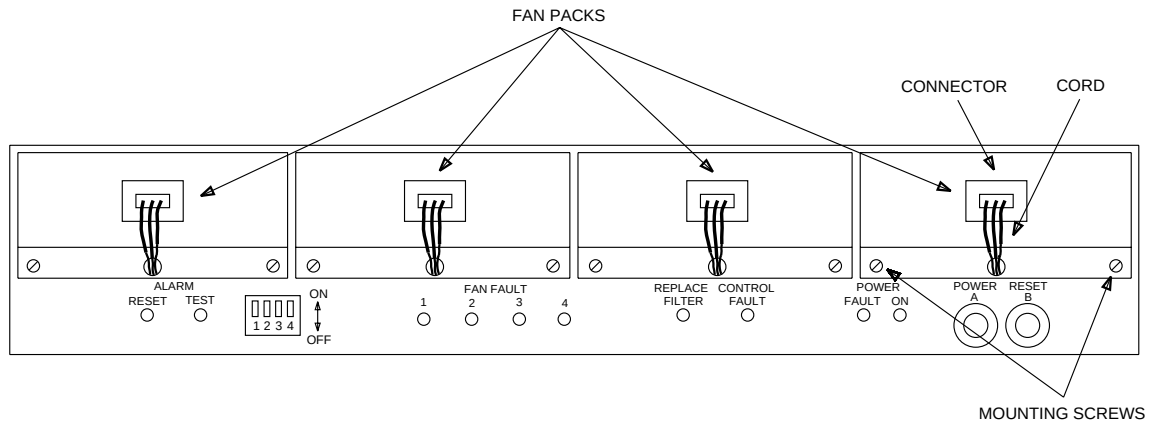


Figure 1. DDM-2000 Fan Shelf — Front Cover Removed

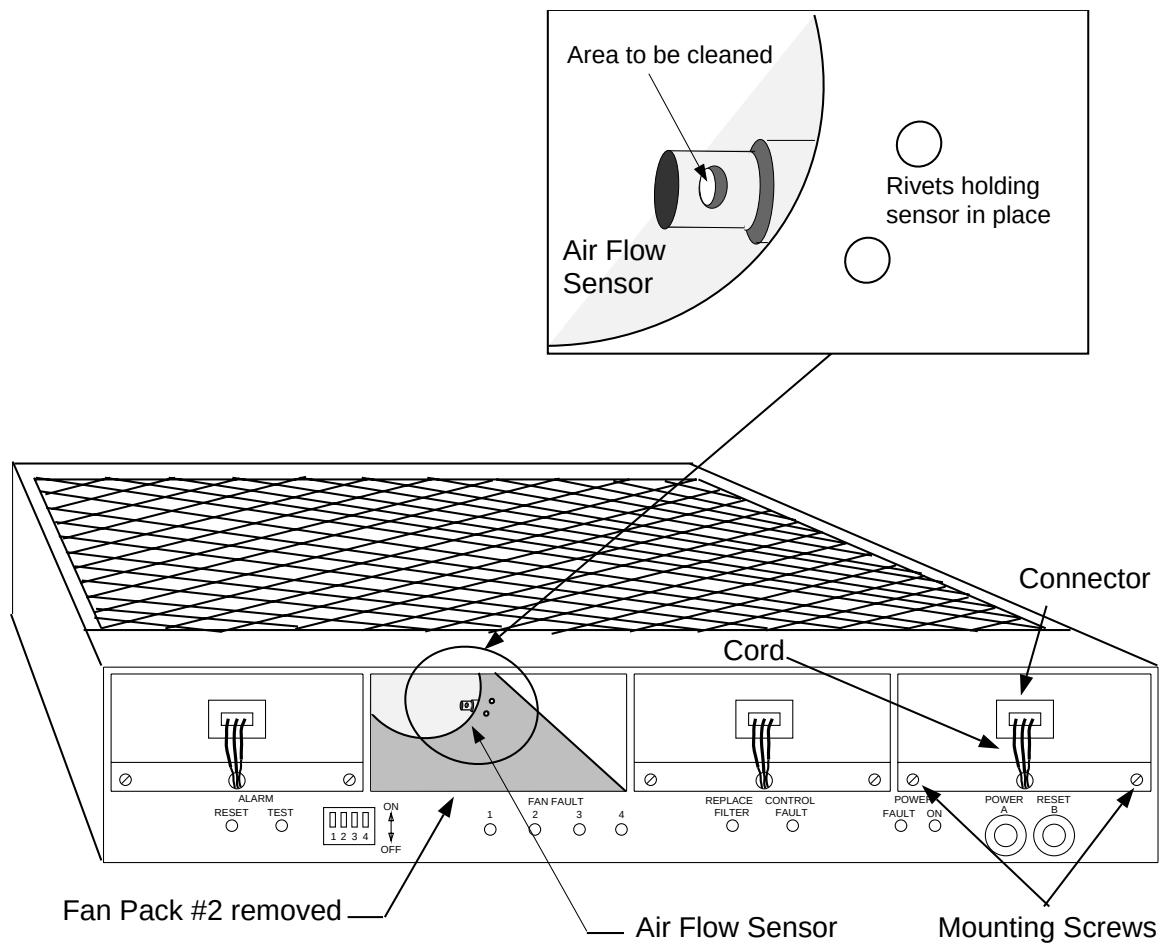


Figure 2. DDM-2000 Fan Shelf — Air Flow Sensor Location

Clear OLIU or Fiber Trouble Path Protected Ring

1.  **WARNING:**
Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION 1:**
*When removing **OLIU** circuit packs or replacing fiber, ensure that all VT/STS paths are active on the **OLIU** and fiber that is **NOT** being removed or replaced. When available, use a CIT and the "**switch-path-():all:pri>manual**" command to switch all VT/STS paths to the **OLIU** and fiber that are not being removed or replaced. It is also recommended to login to the far end of the **OLIU** and use the "**switch-path-():all:pri>manual**" command to switch all VT/STS paths to the **OLIU** and fiber that are not being removed or replaced.*

-  **CAUTION 2:**
*If timing source has been previously set to optical line (main-1 or main-2) that has failed, use the "**set-sync:src=main-1**" or "**main-2**" command to select timing source from good optical line.*

⇒ **NOTE:**

A lighted **FAULT** LED on the **OLIU** indicates that either the receiver, the transmitter, or both has failed. A flashing **FAULT** LED on the **OLIU** indicates that either the near-end receiver, far-end transmitter, or incoming (receive) fiber has failed. In a Path Protected Ring network, both **OLIUs** are normally **ACTIVE**. One **OLIU** carries service on one path of the ring and the other **OLIU** carries service on the other path. If possible, log into shelf associated with source address (for example, main-2) of "inc. 0C3 LOS", "inc. 0C12 LOS", or "inc. 0C1 LOS", etc. to see if circuit pack is removed or failed.

Was **OLIU(s)** removed or being replaced or installed when alarm occurred?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 8**.

2. ⇒ **NOTE:**

An alarm will occur if a circuit pack is removed without performing an update by momentarily depressing the **UPD/INIT** button or using the update "**upd**" command.

Is any previously installed **OLIU(s)** removed from the shelf?

If **YES**, then continue with **Step 3**.

If **NO**, then proceed to **Step 5**.

3. Determine the reason the circuit pack was removed. If the same circuit pack is to be reinserted, reinstall the circuit pack. If the circuit pack was removed and is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from equipment inventory.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Is **OLIU(s)** installed in correct slot(s) ("**rtrv-eqpt**")?

If **NO**, then continue with **Step 6**.

If **YES**, then proceed to **Step 8**.

6. Remove optical fibers from circuit packs, if connected, then remove circuit pack(s) from wrong slot(s). Install circuit pack(s) into correct slot(s). Reconnect optical fibers (**DLP-514**).
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
8. Is **FAULT** LED lighted ("OLIU CP failed") on **OLIU** at any location associated with source address?
 If **YES**, then continue with **Step 9**.
 If **NO**, then proceed to **Step 11**.
9. Replace **OLIU** with lighted **FAULT** LED.

Reference: **DLP-523**

10. Is **FAULT** LED still lighted ("OLIU CP failed") on **OLIU**?
 If **YES**, then do **TAP-106**.
 If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
11. Is **FAULT** LED flashing ("inc. OC3 LOS", "inc. OC12 LOS", or "inc. OC1 LOS") on **OLIU(s)**?
 If **YES**, then continue with **Step 12**.
 If **NO**, then proceed to **Step 14**.
12.  **NOTE:**
 Indications are that the incoming (receive) optical fiber line has failed or near-end or far-end **OLIUs** have failed.

Check optical fiber lines per local procedures, repair if necessary. If no trouble is found in the optical fibers, replace **OLIU(s)** at near end first (**DLP-523**). If trouble still exists, replace **OLIU(s)** at far end. Check for removed or failed **TGS**, **MXRVO**, or **DS3** circuit packs at the far end. If trouble still exists, trouble is in receive optical fiber associated with **OLIU** with flashing LED. Clear trouble in optical fiber per local procedures.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
14. For technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.
15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear STS/VT AIS Alarm Conditions

1.  **NOTE 1:**
Incoming VT and/or STS1 AIS often indicates missing or incorrect cross-connects. In linear or add/drop configurations these are reported in the "Active Alarms and Status Report" and the "Maintenance History Report" with an alarm level of "ne-acty." In ring configurations they may have an alarm level of "ne-acty", MJ or CR. Incoming STS1 AIS may also indicate an unprotected failure or removal of a **DS3**, **MXRVO**, **STS1E** or **OLIU** at the far end associated with the Source Address of the alarm message. Incoming VT AIS may indicate an unprotected failure or removal of a **DS1** or **OLIU** failures in ring applications.

 **NOTE 2:**
VT and STS1 AIS conditions are only reported at service termination (drop) points. Incoming VT and/or STS AIS reported as "ne-acty" at a shelf where the service is cross-connected to a DS1, DS3 or EC1 drop can be caused by missing or incorrect cross-connections at the other terminal shelf or at any shelves where the service should be pass-through cross-connected.

 **NOTE 3:**
An STS1 may contain only one VT, when dropped causes an "inc. STS1 AIS" since it is the only one connected in the STS1.

Does the "Active Alarms and Status Report" indicate incoming VT AIS or STS1 AIS ("inc. VT AIS" or "inc. STS1 AIS")?

- If **STS1 AIS**, then continue with **Step 2**.
- If **VT AIS**, then proceed to **Step 12**.

2. Note the Source Address of the STS1 AIS condition reported in the "Active Alarms and Status Report" (for example, m-1). Based on the circuit layout or other office records, determine the other shelf where that time slot is supposed to be terminated (cross-connected to a DS1, DS3 or EC-1 termination).
3. Use the "**r1gn**" command to login to the other terminating shelf, then use the "**rtrv-crs-sts1**" command to determine if the time slot identified in Step 2 is cross-connected as specified in circuit layout or other office records.
4. Were there incomplete or incorrect cross-connects?
 If **YES**, then continue with **Step 5**.
 If **NO**, then proceed to **Step 7**.
5. Use the commands "**ent-crs-sts1**" and "**dlt-crs-sts1**", as necessary, to correct the provisioning.
6. Have all indications of STS1 AIS cleared?
 If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
 If **NO**, then continue with **Step 7**.
7.  **NOTE:**
 If the service is STS1 cross-connected at either terminating shelf, both terminating shelves must be properly equipped to terminate the entire STS1. For example, if DS1 service is being provided, the **FUNCTION UNITS** groups at both ends must be equipped with **MXRVO** circuit packs and the same number of **DS1/DS1PM** circuit packs in the **LOW SPEED GROUPS** that are STS1 cross-connected.

Use the "**rtrv-eqpt**" command at both shelves to verify that the shelves are properly equipped for the service being provided. If the shelves are not properly equipped, install circuit packs as required.

8. Have all indications of STS1 AIS cleared?
 If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
 If **NO**, then continue with **Step 9**.

9. Using the "**rlgn**" command, login to every shelf where the service should be pass-through cross-connected (for example, **m-1** to **c-1**) and use the "**rtrv-crs-sts1**" command to determine if the time slot identified in Step 2 is cross-connected as specified in circuit layout or other office records. If service is cross-connected through other maintenance subnetworks, such as dual ring interworking (DRI), look for missing cross-connections in the other subnetworks.
10. At any shelves with missing cross-connects use the "**ent-crs-sts1**" command to provision the pass-through cross-connect (for example, **m-1** to **c-1**).
11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
12. Note the Source Address of the VT AIS condition reported in the "Active Alarms and Status Report" (for example, **m-1-1-1**). Based on the circuit layout or other office records, determine the other shelf where that time slot is supposed to be terminated (cross-connected to a DS1 or EC-1 termination).
13. Use the "**rlgn**" command to login to the other terminal shelf, then "**rtrv-crs-sts1**" and "**rtrv-crs-vt1**" to determine if the time slot identified in Step 12 is cross-connected as specified in circuit layout or other office records.
14. Were there incomplete or incorrect cross-connects?
 If **YES**, then continue with **Step 15**.
 If **NO**, then proceed to **Step 17**.
15. Use the commands "**ent-crs-()**" and "**dlt-crs-()**", as necessary, to correct the provisioning.
16. Have all indications of VT AIS cleared?
 If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
 If **NO**, then continue with **Step 17**.

17.  **NOTE:**
If the service is STS1 cross-connected at either terminating shelf, both terminating shelves must be equipped to terminate the entire STS1. For example, if DS1 service is being provided, both ends must be equipped with **MXRVO** circuit packs and the same number of **DS1/DS1PM** circuit packs in the groups that are STS1 cross-connected.
- Use the "**rtrv-eqpt**" command at both shelves to verify that the shelves are properly equipped for the service being provided. If the shelves are not properly equipped, install circuit packs as required.
18. Have all indications of VT AIS cleared?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 19.**
19. Use the "**rlgn**" command to login to a shelf where the service should be pass-through cross-connected (for example, **m-1-1-1** to **c-1-1-1**). Use the "**rtrv-crs- ()**" command to determine if the time slot identified in Step 12 is cross-connected as specified in circuit layout or other office records. If service is cross-connected through other maintenance subnetworks, such as dual ring interworking (DRI), look for missing cross-connections in the other subnetworks.
20. Are there any missing cross-connects?
If **YES**, then continue with **Step 21.**
If **NO**, then proceed to **Step 24.**
21. At any shelves with missing cross-connects use "**ent-crs- ()**" to provision the pass-through cross-connect.
22. Use the "**rtrv-alm**" command to see if alarms have cleared.
23. Did alarms clear?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 24.**
24. Repeat this procedure from Step 19 to look for other missing cross-connections.

Clear Brownout Condition Flashing L in FE ID Display

1. Is fuse **FA** or **FB** blown?
If **YES**, then do **DLP-555**.
If **NO**, then proceed to **Step 2**.
2. Condition DMM (digital multimeter) to measure voltage.
3.  **CAUTION:**
*If fuse on User Panel is not blown, trouble may be a failure of **one** of the -48V DC power feeders. Removing the wrong fuse or disconnecting the wrong feeder for power measurement will cause service interruption.*

Measure voltage at fuse holder **FA** or **FB**.

4. Does voltage measure less than -40 volts DC?
If **YES**, then continue with **Step 5**.
If **NO**, then proceed to **Step 7**.
5.  **CAUTION:**
*During brownout conditions the **SYCTL** will suspend normal operations. No alarms will be generated and CIT commands will **not** work. Local and remote logins will **not** work.*

Trouble in power feeder(s). Check office battery distribution panel for low-voltage condition.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Are frame ground and battery return feeders at the same potential?
If **NO**, then continue with **Step 8**.
If **YES**, then proceed to **Step 10**.
8. Trouble in frame ground or battery return. Frame ground and battery return should be at about the same potential (traceable to the same source). Find and correct problem.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
10.  **NOTE:**
Unseating and reseating **SYSCTL** circuit pack performs a **reset** procedure which restarts the software program.

Unseat and reseal **SYSCTL** circuit pack or use "**reset**" command. Do not press **UPD/INIT** pushbutton.
11. Is trouble cleared?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 11**.
12.  **CAUTION:**
*Replacing the **SYSCTL** involves updating the internal memory on the circuit pack.*

Replace the **SYSCTL (DLP-501)**.
13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install OHCTL Circuit Pack New Shelf

1.  **NOTE 1:**
For Release 8 or later standard applications, the **OHCTL** must be a **BBG9 OHCTL**. For special applications with MegaStar* 2000 SONET Radio Systems (Releases 8.1 (linear) or 9.1 (ring) or later), the **OHCTL** must be a **BBG10 OHCTL**. This procedure is used to install the **OHCTL** for the first time in a new shelf. To replace an **OHCTL** in an in-service system, refer to **DLP-523**.

-  **NOTE 2:**
The shelf must be equipped with both **OHCTL** and **SYSCTL** [**DLP-549**] circuit packs before new software can be installed [**DLP-561**]. An **OHCTL** must have software installed and it must be the same as the software in the **BBG8/BBG8B SYSCTL**. If no software is installed or if the software is not compatible with software in the **SYSCTL**, you must find circuit packs with compatible software or install new software in both the **OHCTL** and **SYSCTL** when the **SYSCTL** is installed.

Are you installing a **BBG10** or **BBG9 OHCTL**?

If **BBG10**, then continue with **Step 2**.

If **BBG9**, then proceed to **Step 3**.

2. Set orderwire option jumper on **BBG10** plug **P3** for type of orderwire interface required (Multiplexed or E1-only). See Figure 1.

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3.  **NOTE 3:**
When the **OHCTL** is installed, the **FAULT** LED will light and remain lighted until the **SYSCTL** is installed.

Install **OHCTL** into **AUXCTL** slot.

Response: **FAULT** LED lights.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
-

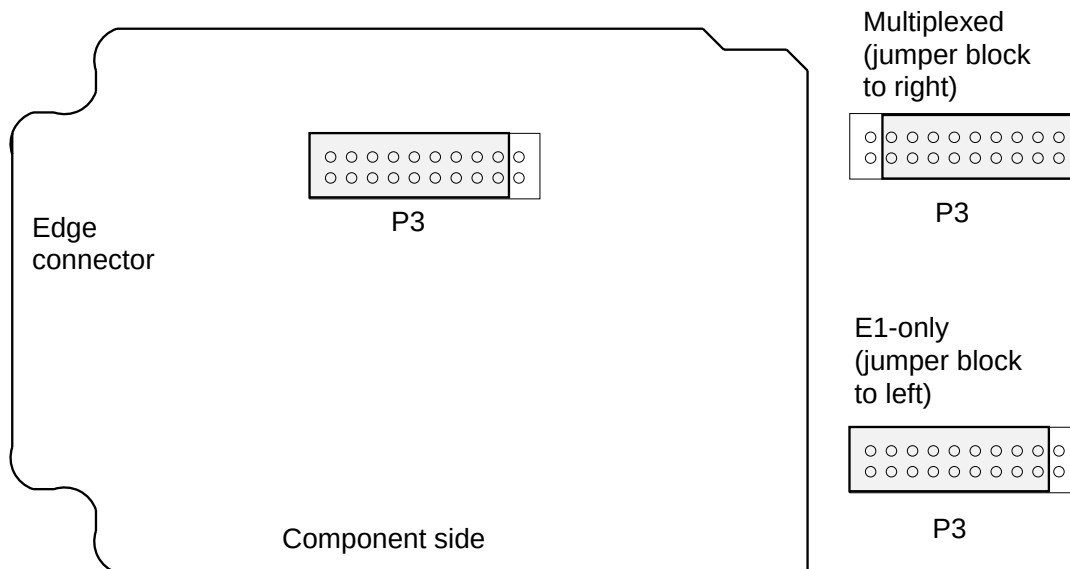


Figure 1. BBG10 OHCTL Option Settings

Replace SYSCTL In-Service

This procedure is used for replacing a **BBG8/BBG8B/BBG5 SYSCTL** in an in-service shelf. For procedures to install the **SYSCTL** in a new shelf (initial installation), refer to **DLP-549**.

1.  **CAUTION:**
***TIMING slot 2** should always be equipped with a **TGS** circuit pack and be active prior to replacing the **SYSCTL**. To clear a "C" condition from the **SYSCTL FE ID** display, procedures will require removal of the **TGS** circuit pack from **TIMING slot 1** to force the system to run the new software.*

Before performing this procedure, ensure that both **TGS** circuit packs are installed in the shelf. If possible, use the **switch-sync:s=circuitpack,pri>manual** command to switch to the protection **TGS** circuit pack in **TIMING slot 2**, if not already **ACTIVE**. Use **rtrv-sync:** command to verify that the **TGS** circuit pack in **TIMING slot 2** is **ACTIVE**.

2. Are you replacing a **BBG8/BBG8B SYSCTL** with another **BBG8/BBG8B SYSCTL** or replacing a **BBG5 SYSCTL** with a **BBG8/BBG8B SYSCTL**?
If **REPLACING BBG8/BBG8B**, then continue with **Step 3**.
If **REPLACING BBG5**, then proceed to **Step 4**.

3. Remove and inspect circuit pack being replaced for proper option switch settings. Set option switches on the replacement **BBG8/BBG8B SYSCTL** the same as the original. See Figure 1.

Proceed to **Step 8**.

4.  **CAUTION:**
*Removing the **BBG5 SYSCTL** without performing a 10-second countdown sequence on the **FE ID** display may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

Momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown (9, 8, 7, etc.) on the **FE ID** display. During this countdown, remove the **SYSCTL**. If the **SYSCTL** is failed, the countdown may not occur.

5. Set **SYSCTL** switch **S1** sections **S1-1**, **S1-2**, and **S1-3** to **OFF**, **OFF**, **OFF**, respectively, to set the product (shelf) type. See Figure 1.
6. Set TBOS termination switch **S2** per Table A.
7. Set all **SYSCTL** switch **S2** sections **S2-2**, **S2-3**, **S2-4**, **S2-5**, **S2-6**, **S2-7**, and **S2-8** to **OFF**.

Table A. SYSCTL Switch 2 (S2)
TBOS Link Terminator

Shelf Position	Switch
	S2-1
Last	ON
Not Last	OFF

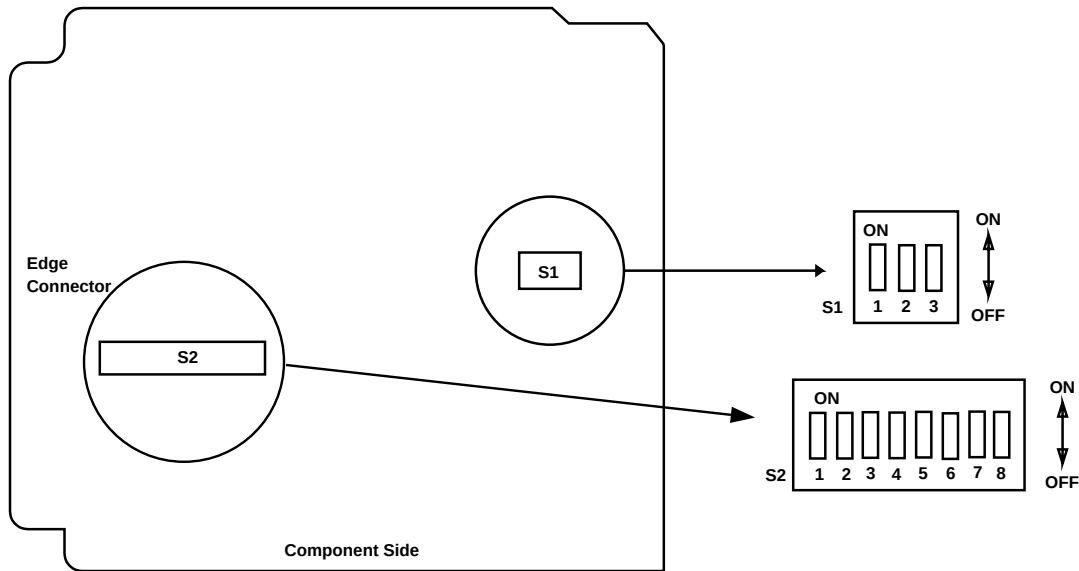


Figure 1. BBG8/BBG8B SYCTL Option Settings

8.  **NOTE:**
Steps 9 and 10 must be performed without unnecessary delays.
Familiarize yourself with these steps before continuing with the procedure.

Read Steps 9 and 10 before proceeding.

9.  **CAUTION 1:**
*Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **SYSCTL**.*

 **CAUTION 2:**
*Initializing the **SYSCTL** in the following steps will momentarily interrupt service if protection switches are activated.*

-  **NOTE:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ballpoint pen to operate it.

Read the remainder of Steps 9 and 10 before installing the **SYSCTL**, then seat the **SYSCTL**.

If the following responses do not occur, proceed to **Step 11**.

Response: **FAULT** LED on **BBG8/BBG8B SYSCTL** lights and **ABN** LED on the User Panel lights after approximately 5 seconds. **MJ** and **NE** LEDs may light or flash briefly. **FAULT** LED on the **SYSCTL** goes off after approximately 5 seconds. **ABN** LED goes off after approximately 15 seconds. Approximately 1 minute and 30 seconds after the **ABN** LED goes off, the **FAULT** LED on the **OHCTL** goes off and the **CR** LED on the User Panel begins to flash.

10. Momentarily depress the **UPD/INIT** button on the **SYSCTL** while the **CR** LED is flashing (**you have 10 SECONDS** to do this).

If the following responses do not occur, continue with **Step 11**.

Response: **CR** LED on the User Panel stops flashing when the **UPD/INIT** button is pressed.

FAULT LED on **BBG9 OHCTL** and **ABN** LED on the User Panel are lighted after approximately 15 seconds. **ABN** LED goes off after approximately 30 seconds. Approximately 1 minute and 45 seconds after the **ABN** LED goes off, the **CR** LED on the User Panel flashes again. **DO NOT** depress **UPD/INIT** pushbutton again when the **CR** LED flashes.

All red LEDs on all circuit packs in the **DDM-2000** should be off. Any red LEDs remaining on or flashing represent a failure condition.

Initialization may take 2-3 minutes.

11. **NOTE:**

Compatible software must be installed in both the **BBG9 OHCTL** and the **BBG8/BBG8B SYSCTL**. When the new **SYSCTL** is installed, if software is not installed in the **SYSCTL**, or the software is not compatible with the software in the **OHCTL**, or the software in the **SYSCTL** and **OHCTL** is not compatible with the transmission configuration of the shelf, the letter **P**, **d**, or **C** will be displayed in the **FE ID** display.

Observe one of the following indications on the **FE ID** display. Note the indication and follow the suggested procedure.

A. **Letter "P" in FE ID Display**

Indicates no software installed in **SYSCTL**.

Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-532**.

B. **Letter "P." in FE ID Display**

Letter "**P**" followed by a period (**P.**) indicates a previous download attempt has failed.

Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-532**.

C. **FE ID Display Blank:**

Indicates compatible software is installed in **OHCTL** and **SYSCTL**.

Proceed to **Step 16**.

D. **Letter "d" in FE ID Display:**

Indicates **OHCTL** has no software or that software in **OHCTL** and **SYSCTL** is incompatible.

Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-532**.

E. **Letter "C" in FE ID Display:** _____

Indicates software is installed in **OHCTL** and **SYSCTL**, but it will not support the current shelf provisioning.

Proceed to **Step 12**.

F. **Letter "U" in FE ID Display:** _____

Indicates **SYSCTL** Switch **S1** is not set properly for type of shelf being equipped.

Remove **SYSCTL**. Correct switch settings and repeat this procedure.

G. **Letter "E" in FE ID Display:** _____

Indicates **SYSCTL** must be replaced.

Get replacement **SYSCTL** and repeat this procedure.

H. **Letter "F" in FE ID Display:** _____

Indicates **SYSCTL** faceplate latch is not fully seated. Unplug **SYSCTL** and repeat this procedure properly seating the faceplate latch.

I. **Flashing Letter "L" in FE ID Display:** _____

Indicates a low voltage condition (brownout) on the shelf.

Clear trouble using **Trouble Clearing: TAP-121**.

Letter "C" in FE ID display

12.



CAUTION:

*If the system is in service and is forced to run the current software in the **SYSCTL** that is displaying a **C**, service interruption may result.*



NOTE:

Indications are that the software in the **SYSCTL** and **OHCTL** you have installed will not support the system transmission configuration that you have. If this occurs, you must reload the original version of software, load another version of software, or *force* the system to run the current software that is in the **SYSCTL**

You must decide if you want the system to run this current version of software or if you want to download another version (original version or new version) of software.

Do you want to run the current version of software that is in the **SYSCTL**?

If **NO**, then continue with **Step 13**.

If **YES**, then proceed to **Step 15**.

13. Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-532**.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
15. To *force* the system to run the current software, perform the following:
 - a. Ensure that a **TGS** circuit pack is installed in **TIMING** slot **2**.
 - b. Check that **TGS** circuit pack in **TIMING** slot **2** is active (**ACTIVE** LED lighted)
 - c. Remove the **TGS** circuit pack in **TIMING** slot **1** and reset (unplug and reseal) the **SYSCTL** to force it to run the current software.
 - d. After the current software is up and running (no alarm LEDs lighted or you can log into the shelf), reinstall the **TGS** circuit pack in **TIMING** slot **1**.

16. Retrieve generic software version ID by depressing the **ACO** button longer than 2 seconds and observing version code on the **FE ID** display. If the software version is not the correct version, you must find circuit packs with the correct software or install new software using the procedures of **DLP-532**.
17.  **NOTE:**
If you are using this procedure to replace a **SYSCTL** that was already in service, there may have been some options set using the craft interface terminal (CIT).

Refer to **DLP-512** and set any required options.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install STS1E Circuit Packs

1.  **CAUTION:**
*Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **BBG6 STS1E**.*

 **NOTE:**
BBG6 STS1E circuit packs may be installed in **FUNCTION UNITS** group slots **A**, **B**, or **C**. Service **BBG6 STS1E** circuit packs are installed in **FUNCTION UNITS** slots labeled () **1**. Protection **BBG6 STS1E** circuit packs are installed in **FUNCTION UNITS** slots labeled () **2(P)**.

Determine which **FUNCTION UNITS** group slots (**A**, **B**, or **C**) are to be equipped with **BBG6 STS1E** circuit packs.

2. Determine from office records the length of the STS1E cabling between the DDM-2000 and the STSX cross-connect point.
3. Refer to Table A and Figure 1. Install the STS1E option jumpers per Table A.
4.  **NOTE:**
The **BBG6 STS1E** circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 Multiplexer. **BBG6 STS1E** high speed mode interfaces with the **DS1** circuit packs in a **LOW SPEED GROUP** at the VT-G rate. **BBG6 STS1E** low speed mode interfaces with the **OLIU** circuit packs at the STS-1 rate.

Set switch **S1** to mode of operation required (HIGH-SPEED MODE or LOW-SPEED MODE).

Table A. STS1E LBO Settings

Cable Length (Ft)		LBO Setting
734D Cable	735A Cable	
0 to 225	0 to 125	LBO IN
>225 to 450	>125 to 250	LBO OUT

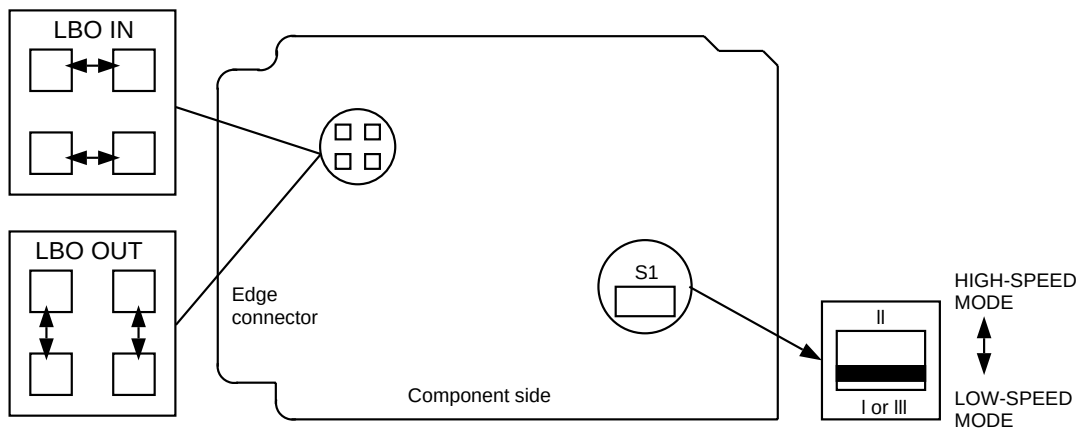


Figure 1. BBG6 STS1E Option Settings

5.  **NOTE:**
If the response is not correct in the following procedures, replace the **BBG6 STS1E** circuit pack.

Seat a **BBG6 STS1E** circuit pack in **FUNCTION UNITS** group slot **A 1**, **B 1**, or **C 1**.

Response: **FAULT** LED on the **BBG6 STS1E** lights for about 20 seconds then goes off. **ACTIVE** LED lights on the first **BBG6 STS1E** circuit pack of the pair installed.

6. If required, seat a second (protection) **STS1E** circuit pack in **FUNCTION UNITS** group slot **A 2(P)**, **B 2(P)**, or **C 2(P)** of the same **FUNCTION UNITS** group.

Response: **FAULT** LED on the **BBG6 STS1E** lights for about 20 seconds then goes off. **ACTIVE** LED remains off.

7. Repeat this procedure from Step 1 for each pair of **BBG6 STS1E** circuit packs to be installed.
8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install TGS Circuit Packs

1.  **CAUTION:**
The timing mode of all nodes should be checked before a node is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).

 **NOTE 1:**
The timing mode may be provisioned as Free Running, DS1 External, or Line Timed. In free-running mode, the **TGS** gets timing from an oscillator on the **TGS**. In DS1 external timing mode, the **TGS** gets timing from an external DS1 reference input. In line-timed mode, the **TGS** gets timing from a reference clock recovered from a received OC-3 line rate signal. In Releases 8, 9, and 11, free-running is the factory default. In Releases 8, 9, and 11, when a **BBF2B TGS** is installed, either the **MAIN OLIUs** or **FUNCTION UNIT C OLIUs** can be selected as the synchronization source using the command **set-sync:src={main,fn-c};**.

 **NOTE 2:**
In addition to the same options as the **BBF2 TGS**, the **BBF2B TGS** may be provisioned to provide a DS1 output for intershelf timing distribution (mult mode) or for network timing distribution (sync mode). When in *sync out* mode, the DS1 output signal derives its timing from the incoming OC-3 line signal from the **MAIN OLIUs** or optionally from the **FUNCTION UNIT C OLIUs** using the **set-sync:src={main,fn-c};** command.

 **NOTE 3:**
Tables A and B depict all the possible timing topologies for the **BBF2 TGS** and **BBF2B TGS** which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for line timing or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table A. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.

Table A. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the set-sync command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

Table B. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	Line Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS. In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging. In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Free Running	External - Sync Out	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	Line Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located. The NE provisioned for Line Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Line Timing	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the timing loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Line Timing - Sync Out	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the timing loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.
External - Mult	External - Sync Out	This topology is used to distribute network timing to a target location from a location with access to a synchronization reference. The NE provisioned for External - Mult, is providing timing to the NE provisioned for External - Sync Out, which in turn generates a DS1 output reference regenerated from the optical interface shared by both NE's. This DS1 output is used to provide a synchronization reference to a BITS.

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's. In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop. If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal.
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the set-sync command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

⇒ **NOTE 4:**

To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

⇒ **NOTE 5:**

If an invalid switch setting is selected, the **TGS FAULT** LED lights and an alarm is generated.

Refer to Table C and Figure 1 (**BBF2 TGS**) or Table D and Figure 2 (**BBF2B TGS**). Set the timing mode as required for the **TGS** circuit pack being installed.

Table C. BBF2 TGS Timing Mode Switch Setting

Timing Mode	Switch S1 Settings	
	S1-3	S1-4
Free Running	ON	ON
DS1 External, MULT Mode	OFF	ON
Line Timed	ON	OFF
Invalid	OFF	OFF

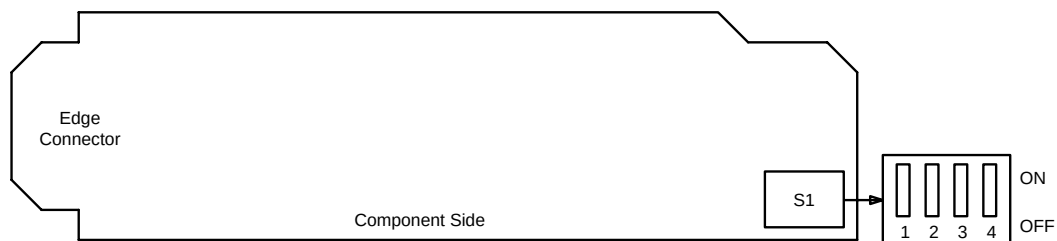


Figure 1. BBF2 TGS Option Switch

Table D. BBF2B TGS Timing Mode Switch Settings

Timing Mode	Switch S1 Settings		
	S1-3	S1-4	S1-5 (DS1 Output)
Free Running*	ON	ON	OFF
DS1 External, MULT Mode	OFF	ON	OFF
Line Timing, MAIN†	ON	OFF	OFF
Line Timing, SYNC OUT Mode†	ON	OFF	ON
DS1 External, SYNC OUT Mode†	ON	ON	ON
Invalid	OFF	OFF	ON
Invalid	OFF	OFF	OFF
Invalid	OFF	ON	ON

* Factory default.

† Main **OLI** is default; **FUNCTION UNITS C** by **set - sync** command.

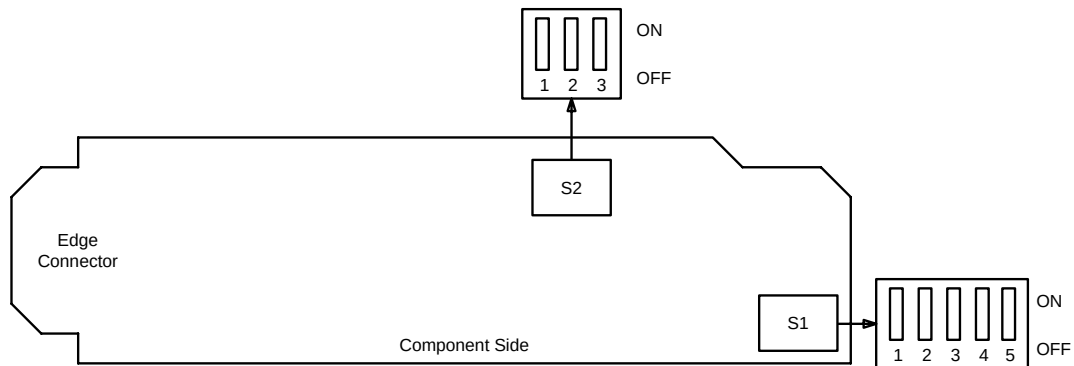


Figure 2. BBF2B TGS Option Switches

2. If the **BBF2B TGS** circuit pack is being installed and is provisioned for either *sync out* mode, refer to Table E and set the equalizer switches for proper cable length.

Table E. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid	OFF	OFF	OFF
Invalid	OFF	OFF	ON
Invalid	ON	ON	ON

3.  **NOTE:**
Switches **S1-1** and **S1-2** are ignored by the system unless the timing mode is set to *DS1 External* or *Loop Timed sync out mode*.

Is timing mode set to either *DS1 External* or *Line Timed sync out mode*?

If **YES**, then continue with **Step 4**.

If **NO**, then proceed to **Step 5**.

4. Refer to Table F and set the DS1 line coding and frame format as required for the **TGS** circuit pack. See Figures 1 and 2.

Table F. TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch	DS1 Frame Format	Switch
	S1-1		S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

5.  **CAUTION:**
*Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **TGS**.*

 NOTE 1:

If external timing mode is used and other installed shelves above this shelf are connected together with bay mult cables for DS1 timing, installing a **TGS** circuit pack causes a momentary loss of an incoming DS1 timing reference. This may result in an "inc. DS1 sync. ref. LOS" alarm on all shelves above this shelf that are connected to the same bay mult cabling. This momentary loss of timing reference does not affect transmission.

 NOTE 2:

A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS** circuit pack. If the information is incompatible with the controller software information, an alarm is generated.

 NOTE 3:

If a signal has previously been applied to the original **BBF2B TGS** circuit pack, the **FAULT** lamp will flash when the new **BBF2B TGS** is installed until the signal tests good.

 NOTE 4:

If the response is not correct in the following procedures, check option switches and replace the **TGS**. When a circuit pack is inserted, the **FAULT** LED lights immediately and remains lighted until the circuit pack tests good. The green **ACTIVE** LED lights on the first **TGS** circuit pack installed. After the **TGS** tests good, the **FAULT** LED goes off.

Install first **TGS** in **TIMING** slot **1**.

Response: **FAULT** LED on the **TGS** lights. **ACTIVE** LED lights.
FAULT LED goes off after about 15 seconds.

6.  **NOTE:**
If the timing mode option switches are not set the same on the two **TGS** circuit packs, the **FAULT** LED will remain lighted on the second circuit pack installed.

Install second (protection) **TGS** in **TIMING** slot **2**.

Response: **FAULT** LED on **TGS** lights for about 15 seconds then goes off. **ACTIVE** LED remains off.

7. Is timing mode set to external DS1?
If **YES**, then continue with **Step 8**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
8. If the **NE ACTY** LED on the User Panel remains on, use the CIT command **rtrv-sync** to verify that the operational mode of the system is *External*. If the operational mode is *Holdover*, check the DS1 timing references.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install OLIU Circuit Packs

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION 1:**
*The **HIGH/LOW POWER** option switch on a **21G/21G-U OLIU** must be set to the **LOW POWER** position when the **21G/21G-U OLIU** is looped on itself. There are no option switches on the other type **OLIUs**. **22D-U, 22G-U, 24G-U, 26G2-U, 27G-U, and 27G2-U OLIUs** require a 10 dB LBO when looped.*

-  **CAUTION 2:**
*Before installing **OLIUs**, ensure all optical fiber connectors and couplings have been properly cleaned [DLP-527]. Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

-  **NOTE:**
*To ensure proper path protection switching in ring configurations, if optical spans terminate in **22F/22F-U/22F2-U OLIUs** at one node and **22G-U/22G2-U/22G3-U OLIUs** at another node, use the "**set-sts1:dgr=**" command to provision the bit error ratio (BER) to 10^{-6} at all nodes in the ring network.*

Are **21G/21G-U OLIUs** being installed?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 3**.

2. **⇒ NOTE:**
It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

Refer to Table A and Figure 1 and set the **HIGH/LOW POWER** option switch to proper setting.

Table A. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

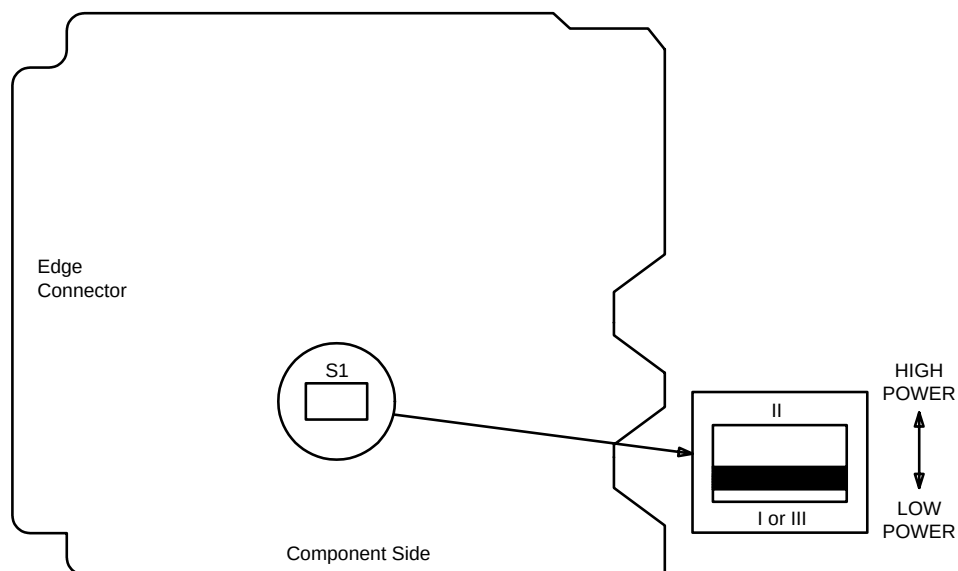


Figure 1. 21G/21G-U OLIU Option Switch

3.  **CAUTION:**
*If optical fiber cables are routed beneath the **OLIUs**, be careful not to pinch or crush the fibers when the **OLIUs** are inserted.*

 **NOTE 1:**
The red **FAULT** LED flashes when no signal is present to the **OLIUs**.

 **NOTE 2:**
When using the following procedures to install the **OLIUs**, if the responses are not correct, check option switches and connections. If switches and connections are correct, replace the **OLIU** that has the wrong response.

 **NOTE 3:**
In a Stand-Alone DDM-2000 OC-1 ring application, the DDM-2000 OC-3 FiberReach host requires **26G2-U** or **27G-U/27G2-U OLIUs** be installed in the **MAIN** slots.

 **NOTE 4:**
The single-homed DDM-2000 OC-3/FiberReach ring configuration requires that the **FUNCTION UNITS () 1 OLIU** on the OC-3 host shelf connect to the **MAIN-1 OLIU** at the first FiberReach shelf from the OC-3 host shelf. **MAIN-2 OLIU** at an adjacent FiberReach shelf (node) connects to the **MAIN-1 OLIU** at an adjacent FiberReach shelf (node). The **MAIN-2 OLIU** at the last FiberReach shelf on the OC-1 ring connects to **FUNCTION UNITS() 2(P) OLIU** on the OC-3 host shelf.

 **NOTE 5:**
A dual-homed ring configuration requires that the first FiberReach **MAIN-1 OLIU** connect to **FUNCTION UNITS () 1 OLIU** on one host OC-3 shelf. The last FiberReach **MAIN-2 OLIU** connects to the **FUNCTION UNITS () 2(P) OLIU** on the other OC-3 host shelf. Intermediate FiberReach shelves on the same OC-1 ring connect from **MAIN-2 OLIU** at one FiberReach shelf to the **MAIN-1 OLIU** at an adjacent FiberReach shelf (node).

⇒ **NOTE 6:**

The DDM-2000 OC-3 shelf OC-12 ring application requires **24G-U OLIUs** be installed in the **MAIN** slots.

Install **OLIU** into required **MAIN 1** or **FUNCTION UNITS () 1** slot.

Response: **FAULT** LED and **ACTIVE** LED lights. **FAULT** LED begins flashing after about 10 seconds.

[**OHCTL FAULT** LED may begin flashing if far-end communications (fecom) is enabled.]

Comment: Critical, major or minor alarm LEDs light depending on the version of software installed. Generally, the **CR** LED will light for linear releases, and the **MJ** (fecom enabled) or **MN** (fecom disabled) LED will light for ring releases.

4. ⇒ **NOTE:**

When the second **24G-U OLIU** is seated in the **MAIN 2(P)** slot, an "OC12 connector failed" alarm will occur. Normally, the alarm occurs because the OC-12 connector (ribbon cable) is not yet installed. To clear the alarm, install the OC-12 connector on the **24G-U OLIUs** seated in the **MAIN 1** and **MAIN 2(P)** slots.

Install second **OLIU** (if required) into **MAIN 2(P)** or **FUNCTION UNITS () 2(P)** slot.

Response: **FAULT** LED and **ACTIVE** LED lights. **FAULT** LED begins to flash after about 10 seconds. (The **FAULT** LED may go off for a few seconds before starting to flash.)

5. Are **24G-U OLIUs** being installed?

If **YES**, then continue with **Step 6**.

If **NO**, then proceed to **Step 9**.

6. Connect OC-12 connector (ribbon cable) between **24G-U OLIUs** in the **MAIN 1** and **MAIN 2(P)** slots.
7. Verify that the connectors on the OC-12 connector cable are properly seated and latched.
8. Verify that the "OC12 connector failed" alarm has cleared.
9. Have all required **OLIUs** been installed?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then repeat this procedure for all **OLIUs** being installed.

Connect Optical Loop

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
-  **CAUTION 1:**
*Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **OLIU**.*
-  **CAUTION 2:**
*The level control on the **21G/21G-U OLIU** must be set to **LOW POWER** when the **21G/21G-U OLIU** is looped on itself. Other **OLIUs** have no switch settings. The **22D-U**, **22G-U**, **24G-U**, **26G2-U** and **27G-U/27G2-U OLIUs** require a 10 dB LBO when it is looped on itself.*
-  **CAUTION 3:**
*Avoid excessive bending of the optical jumper used to loop the **OLIU** on itself.*
-  **CAUTION 4:**
*All optical fiber connectors and couplings should be properly cleaned [**DLP-527**]. Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

Which **OLIUs** are being looped?

If **21G/21G-U**, then continue with **Step 2**.

If **21D/21D-U/21G2-U/22F/22F-U/22F2-U/22G2-U/22G3-U**,
then proceed to **Step 3**.

If **22D-U/22G-U/24G-U/26G2-U/27G-U/27G2-U**, then proceed
to **Step 8**.

2. Refer to Figure 1 and set the option switch on the **21G/21G-U OLIU** to the **LOW POWER** position, if not already performed. Continue with Step 4.

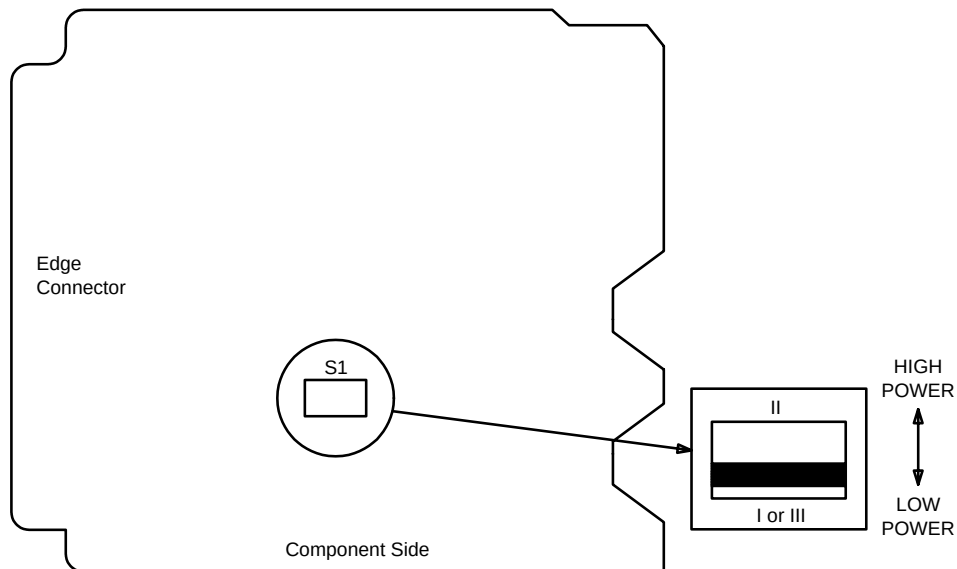


Figure 1. 21G/21G-U OLIU Option Settings

3.  **NOTE 1:**
It may take from 15 seconds to 3 minutes and 25 seconds for the **FAULT** LEDs to stop flashing, depending on the setting of the signal degrade threshold (–5 to –9).
-  **NOTE 2:**
The lightguide jumpers used to loop the **OLIUs** must be equipped with **ST[®]**, FCPC, or SC connectors at both ends, depending on the type of **OLIU** connector. See Figures 2, 3, and 4.
-  **NOTE 3:**
The **21D**, **21G**, and **22F** are equipped with *ST*-type connectors.
-  **NOTE 4:**
The **21D-U**, **21G-U**, **21G2-U**, **22F-U**, **22F2-U**, **22G2-U** and **22G3-U** **OLIUs** are shipped with a 0 dB *ST*-type universal LBO installed (code - **A3070**, comcode - **106795354**). If an SC or FCPC connector is required; the universal 0 dB LBOs can be ordered separately. See Table A.
-  **NOTE 5:**
The **21G**, **21G-U**, **21G2-U**, **22F**, **22F-U**, **22F2-U**, **22G2-U** and **22G3-U** **OLIUs** require single-mode lightguide jumpers. See Table B.
21D/21D-U **OLIUs** require multimode lightguide jumpers. See Table C.

Replace the 0 dB LBO on the **21D-U**, **21G-U**, **21G2-U**, **22F-U**, **22F2-U**, **22G2-U** or **22G3-U** **OLIUs** with a 0 dB LBO with a SC or FCPC connector on the **MAIN 1** or **FUNCTION UNITS () 1** **OLIUs**, if required. See Table A.

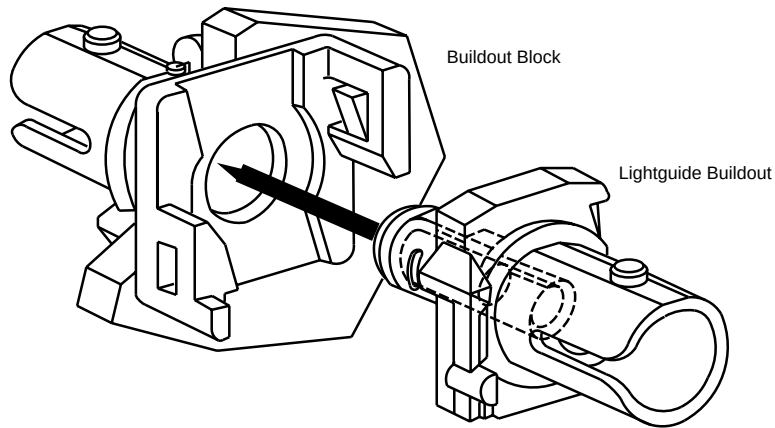


Figure 2. ST[®]-Type Universal Buildout

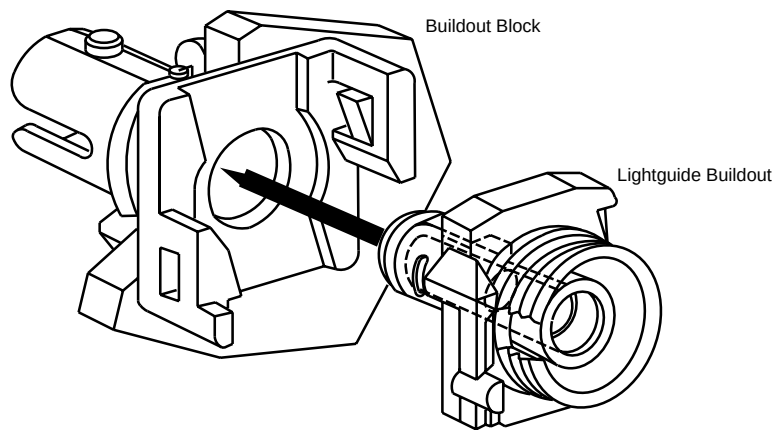


Figure 3. FCPC-Type Universal Buildout

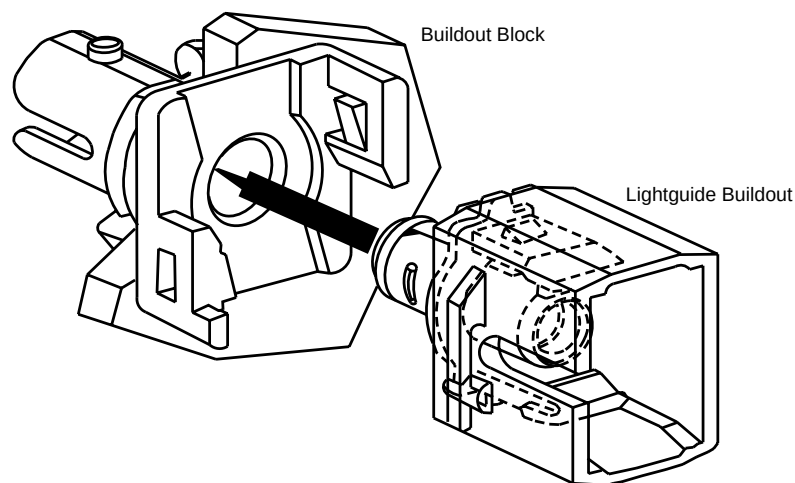


Figure 4. SC-Type Universal Buildout

Table A. Universal 0 dB Lightguide Buildouts

Code	Comcode	Connector Type	Cable Connection	Label Color
A3060	106708951	SC	SM-SM & MM-MM	None
A3070	106795354	ST [®]	SM-SM & MM-MM	None
A3080	106795404	FCPC	SM-SM & MM-MM	None

Table B. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1EP-EP-2	107149494	2	ST [®] -ST
LS1SC-SC-2	106908247	2	SC-SC
LS1FP-FP-10	106593825	10	FCPC-FCPC

Table C. Multimode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FL1E-E-2	105351795	2	ST [®] -ST
LL1SC-SC-2	106908668	2	SC-SC
LL1FC-FC-10	107095549	10	FC-FC

4. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 1** or **FUNCTION UNITS () 1 OLIU(s)**. See Table B or C.

Response: **FAULT** LED stops flashing.

ACTIVE LED remains on.

(If flashing, **FAULT** LED on **OHCTL** goes off after all number one **OLIUs** are looped.)

If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 4. If responses are still not correct, replace **OLIU**.

Comment: In linear releases, critical (**CR**) LED goes off and minor (**MN**) LED lights.

In ring releases, the lighted major (**MJ**) or minor (**MN**) LED remains lighted.

It may take 1 minute or more for LEDs and alarms to stabilize after the **OLIU(s)** are looped.

5. Replace the 0 dB LBO on the **21D-U, 21G-U, 21G2-U, 22F-U, 22F2-U, 22G2-U** or **22G3-U OLIUs** with a 0 dB LBO with a SC or FCPC connector on the **MAIN 2(P)** or **FUNCTION UNITS () 2(P) OLIUs**, if required. See Table A.
6. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 2(P)** or **FUNCTION UNITS () 2(P) OLIU(s)**. See Table B or C.

Response: **FAULT** LED stops flashing.

In linear releases, **ACTIVE** LED goes off.

In ring releases, **ACTIVE** LED remains on.

Minor (**MN**) [major/minor (**MJ/MN**), if rings] alarm goes off.

If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 6.

If responses are still not correct, replace **OLIU**.

It may take 1 minute or more for LEDs and alarms to stabilize after the **OLIU(s)** are looped.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8.  **CAUTION:**
22D-U, 22G-U, 24G-U, 26G2-U and 27G-U/27G2-U OLIUs are shipped with 0 dB ST-type universal LBOs installed (code - A3070, comcode - 106795354). The 0 dB LBO must be replaced with a 10 dB LBO when the 22D-U, 22G-U, 24G-U, 26G2-U or 27G-U/27G2-U OLIU is looped on itself. See Table D.

 **NOTE 1:**
It may take from 15 seconds to 3 minutes and 25 seconds for the **FAULT** LEDs to stop flashing, depending on the setting of the signal degrade threshold (–5 to –9).

 **NOTE 2:**
The lightguide jumpers used to loop the **OLIUs** must be equipped with **ST[®]**, **FCPC**, or **SC** connectors at both ends, depending on the type of **OLIU** connector. See Figures 2, 3, and 4.

 **NOTE 3:**
The **22D-U OLIU** requires multimode lightguide jumpers. See Table F. The **26G2-U OLIU** requires either single-mode or multimode lightguide jumpers. See Tables E and F. The **22G-U, 24G-U** and **27G-U/27G2-U OLIUs** require single-mode lightguide jumpers. See Table E.

For the **22D-U, 22G-U, 24G-U, 26G2-U** or **27G-U/27G2-U OLIUs**, replace the 0 dB LBO on the **OUT** buildout block(s) with the required 10 dB LBO on the **MAIN 1** or **FUNCTION UNITS () 1 OLIUs**. See Table D.

Table D. Universal 10 dB Lightguide Buildouts

Code	Comcode	Connector Type	Cable Connection	Label Color
A3060D1	107406159	SC	SM-SM	Black
A3070D1	107406191	ST [®]	SM-SM	Black
A3080D1	107406233	FCPC	SM-SM	Black
A2060D	106795289	SC	MM-MM	Black
A2070D	106795321	ST	MM-MM	Black

Table E. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1EP-EP-2	107149494	2	ST [®] -ST
LS1SC-SC-2	106908247	2	SC-SC
LS1FP-FP-10	106593825	10	FCPC-FCPC

Table F. Multimode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FL1E-E-2	105351795	2	ST [®] -ST
LL1SC-SC-2	106908668	2	SC-SC
LL1FC-FC-10	107095549	10	FC-FC

9. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 1** or **FUNCTION UNITS () 1 OLIU(s)**. See Tables E and F.

Response: **FAULT** LED stops flashing.

ACTIVE LED remains on.

(If flashing, **FAULT** LED on **OHCTL** goes off after all number one **OLIUs** are looped.)

If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 9.

If responses are still not correct, replace **OLIU**.

Comment: In linear releases, critical (**CR**) LED goes off and minor (**MN**) LED lights.

In ring releases, the lighted major (**MJ**) or minor (**MN**) LED remains lighted.

It may take 1 minute or more for LEDs and alarms to stabilize after the **OLIU(s)** are looped.

10. For the **22D-U**, **22G-U**, **24G-U**, **26G2-U** or **27G-U/27G2-U OLIUs**, replace the 0 dB LBO on the **OUT** buildout block(s) with the required 10 dB LBO on the **MAIN 2(P)** or **FUNCTION UNITS () 2(P) OLIUs**. See Table D.

11. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 2(P)** or **FUNCTION UNITS () 2(P) OLIU(s)**. See Tables E and F.

Response: **FAULT** LED stops flashing.

In linear releases, **ACTIVE** LED goes off.

In ring releases, **ACTIVE** LED remains on.

Minor (**MN**) [major/minor (**MJ/MN**), if rings] alarm goes off.

If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 11.

If responses are still not correct, replace **OLIU**.

It may take 1 minute or more for LEDs and alarms to stabilize after the **OLIU(s)** are looped.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install MXRVO Circuit Packs

1.  **NOTE 1:**
If the response is not correct in the following procedures, replace the **BBG2 MXRVO**.

 **NOTE 2:**
BBG2 MXRVO circuit packs may be installed in **FUNCTION UNITS** group slots **A**, **B**, or **C**.

Determine which **FUNCTION UNITS** group slots (**A**, **B**, or **C**) are to be equipped with **BBG2 MXRVO** circuit packs.

2. Seat a **BBG2 MXRVO** circuit pack into **FUNCTION UNITS** group slot **A 1**, **B 1**, or **C 1**, as required.

Response: **FAULT** LED on the **MXRVO** lights for about 20 seconds then goes off. **ACTIVE** LED lights on first **MXRVO** installed in each **FUNCTION UNITS** group slot.

3.  **NOTE:**
If the **LOW SPEED GROUP ()** is to be equipped with any **BBF3/BBF3B DS1PM** circuit packs, both service and protection **BBG2 MXRVO** circuit packs must be installed.

If required, seat a second **BBG2 MXRVO** into slot **2(P)** of the same **FUNCTION UNITS** group (**A**, **B**, or **C**).

Response: **FAULT** LED on protection **MXRVO** lights for about 13 seconds then goes off. **ACTIVE** LED remains off.

4. Repeat this procedure from Step 1 for each **BBG2 MXRVO** circuit pack being installed.
5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install DS3/TMUX Circuit Packs

1.  **CAUTION:**
*Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **DS3/TMUX**.*

 **NOTE:**
DS3/TMUX circuit packs may be installed in **FUNCTION UNITS** group slots **A**, **B**, or **C**. **BBG4/BBG4B DS3** and **BBG20 TMUX** service circuit packs are installed in slots labeled **FUNCTION UNITS () 1**. **BBG4/BBG4B DS3** and **BBG20 TMUX** protection circuit packs are installed in slots labeled **FUNCTION UNITS () 2(P)**. **BBG19 DS3** data interface circuit packs are installed in both **FUNCTION UNITS () 1** and **() 2(P)** slots and are independent. There is no protection between the **BBG19 DS3** circuit packs.

Determine which **FUNCTION UNITS** group slot(s) (**A ()**, **B ()**, or **C ()**) is being equipped with **DS3/TMUX** circuit packs.

2. Determine from office records the length of the DS3 cabling between the DDM-2000 and the DSX-3 cross-connect point.
3.  **NOTE:**
The only hardware option settings on DS3 circuit packs are the LBO settings shown in Figures 1 and 2. If there are other jumpers on the circuit pack similar to the LBO jumpers, they are factory test points and should be ignored.

Refer to Table A and Figures 1 and 2. Install the DS3 option jumpers per Table A.

Table A. DS3 LBO Settings

Cable Length (Ft)		LBO Setting
734D Cable	735A Cable	
0 to 225	0 to 125	LBO IN (ON)
>225 to 450	>125 to 250	LBO OUT

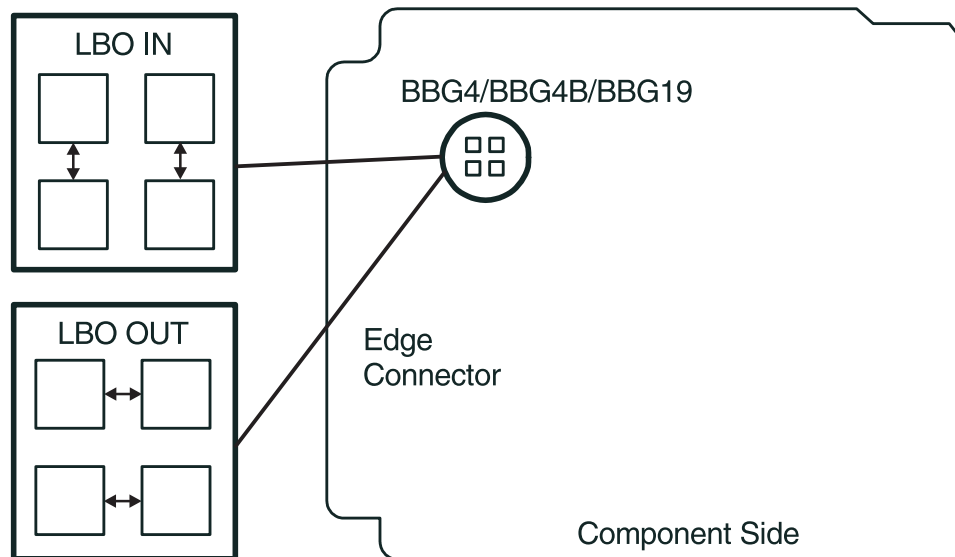


Figure 1. BBG4/BBG4B/BBG19 DS3 LBO Option Settings

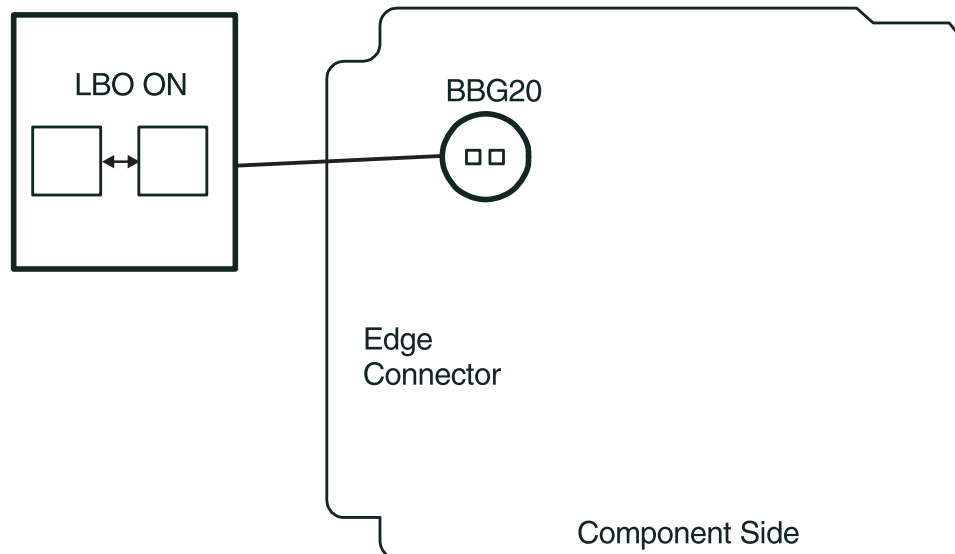


Figure 2. BBG20 TMUX Option Settings

4. Are you installing **BBG4/BBG4B DS3/BBG20 TMUX** circuit packs or **BBG19** DS3 circuit packs?

If **BBG4/BBG4B/BBG20**, continue with **Step 5**.

If **BBG19**, proceed to **Step 9**.

5.  **NOTE:**

If the response is not correct in the following procedures, replace the **DS3/TMUX** circuit pack.

Seat a **DS3/TMUX** circuit pack in **FUNCTION UNITS** group slot **A 1**, **B 1**, or **C 1**.

Response: **FAULT** LED on the **DS3/TMUX** lights for about 20 seconds then goes off. **ACTIVE** LED lights on the first **DS3/TMUX** circuit pack of the pair installed.

6. If required, seat a second (protection) **DS3/TMUX** circuit pack in **FUNCTION UNITS** group slot **A 2(P)**, **B 2(P)**, or **C 2(P)** of the same **FUNCTION UNITS** group.

Response: **FAULT** LED on the **DS3/TMUX** lights for about 20 seconds then goes off. **ACTIVE** LED remains off.

7. Repeat this procedure from Step 1 for each pair of **DS3/TMUX** circuit packs to be installed.
8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9.  **NOTE 1:**
Since cross-connections associated with **BBG19 DS3** circuit packs are non-path-switched locked cross-connections, a **BBG19 DS3** circuit pack installed in **FUNCTION UNITS** group slot () **1** at one terminating node is associated with the **BBG19 DS3** circuit pack in **FUNCTION UNITS** group slot () **2(P)** at the other terminating node.

-  **NOTE 2:**
If response is not correct in the following procedures, replace the **BBG19 DS3** circuit pack.

Seat **BBG19 DS3** circuit packs in **FUNCTION UNITS** group slots **A ()**, **B ()**, or **C ()** being equipped.

Response: **FAULT** LED on the **DS3** lights for about 20 seconds then goes off. **ACTIVE** LED lights on **DS3** circuit pack.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install DS1/DS1PM Circuit Packs

1.  **CAUTION:**
*Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **DS1/DS1PM** circuit pack.*

Determine from office records the length of the DS1 cabling between the DDM-2000 and the DSX-1 cross-connect point.

2.  **NOTE 1:**
Switch 1, sections 1 through 3 (**S1-1**, **S1-2**, **S1-3**), are set according to the length of DS1 cabling between the DDM-2000 and the DSX-1 cross-connection. Switch 1, sections 4 through 7 (**S1-4**, **S1-5**, **S1-6**, **S1-7**), are set for the type of line coding (B8ZS or AMI) required of the DS1 signal. Switch 1, section 8 (**S1-8**) is unused and ignored by the system.

 **NOTE 2:**
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Refer to Figure 1 and Table A and set LBO option switches.

Table A. DS1/DS1PM Cable LBO Settings

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 kHz	Switch S1 Settings (Note)		
			S1-1	S1-2	S1-3
0 to 133	0 to 90	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

Note: Invalid switch settings will cause the **FAULT** LED to light and a "DS1 CP failed" alarm.

3. **⇒ NOTE:**

DS1 line coding may be set using either the option switches OR the "**set-t1**" command. It is recommended that a policy be established to set line coding using either the switches OR the command. If DS1 line code (lc) parameters are set using the "**set-t1**" command, a software override will be active and the circuit pack switch settings will have no effect. The software override will remain active until the "**set-t1**" command is executed again and the **noOverride** option is selected. The "**rtrv-t1**" command may be used to check line code settings.

Refer to Table B and Figure 1 and set the line code option switches, if required.

Table B. DS1/DS1PM Line Code Settings

Line Code Format	Switch S1 Settings				
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)	S1-8 (Note)
B8ZS	OFF	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON	OFF

Note: Switch 1, section 8 (S1-8) is unused and ignored by the system.

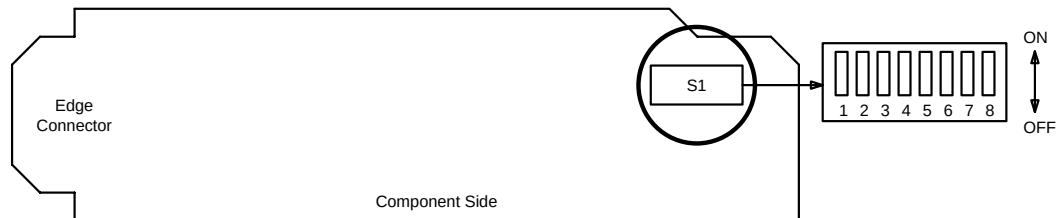


Figure 1. DS1/DS1PM Option Settings

4. **⇒ NOTE:**

If the response is not correct when the **DS1/DS1PM** circuit pack is installed, check option switch setting. If settings are correct, replace the **DS1/DS1PM** circuit pack.

Seat **DS1/DS1PM** circuit pack in required slot of **LOW SPEED GROUP** being equipped.

Response: **FAULT** LED on **DS1/DS1PM** circuit pack lights and may remain lighted for about 40 seconds and then goes off.

5. Repeat this procedure from Step 1 for each service **DS1/DS1PM** circuit pack being installed.

6. **⇒ NOTE 1:**

One protection **DS1/DS1PM** circuit pack may be installed in slot **8(P)** of each **LOW SPEED GROUP** being equipped. The **SYSCTL** automatically provisions the protection **DS1/DS1PM** circuit pack to match the line code setting (B8ZS or AMI) of any service **DS1/DS1PM** circuit pack that it protects.

⇒ NOTE 2:

If **BBF3/BBF3B DS1PM** circuit packs are installed in service slots, then a **BBF3/BBF3B DS1PM** circuit pack must be installed in the protection slot, if protection is required.

Is protection DS1 circuit pack being installed?

If **YES**, then continue with **Step 7**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Refer to Figure 1 and Table A and set LBO option switches on protection **DS1/DS1PM** circuit pack.
8. Install protection **DS1/DS1PM** circuit pack into slot **8(P)** of **LOW SPEED GROUP** being equipped.
9. Install **177A** Retainer Cards into all unequipped service DS1 slots in a **LOW SPEED GROUP** equipped with protection **DS1/DS1PM** circuit packs.
10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform LED Test

1.  **CAUTION:**
Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the circuit packs.

Is a CIT available?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 5**.

2. Connect CIT to User Panel.

Reference: **DLP-521**

3. Use the **test-led:address:r=()** command to test LEDs.

Where address = address identifier of the system, slot, or user panel that contains the LEDs to be tested. Default is **all**.

r = number of times (1 through 10) test is repeated.

Response: All LEDs for the specified address identifier light. For a **SYSCTL** LED test, all segments of the **SYSCTL FE ID** display (including the period) light. After 10 seconds, all LEDs go off. After another 10 seconds, a completion message is printed and all LEDs are updated to show the current status of the system.

4. Did LED test pass?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 7**.

5.  **NOTE:**
When the **ACO** pushbutton is depressed, all LEDs and the 7-segment **FE ID** display on the **SYSCTL** light. If the **ACO** pushbutton is released within 2 seconds, the LED test completes and the 7-segment display and all LEDs revert to normal operation. If the **ACO** pushbutton is depressed longer than 2 seconds, the 7-segment display goes blank for 2 seconds and then each digit of the generic software version code is scrolled through the display. The LEDs remain lighted while the code is being displayed. When the **ACO** pushbutton is released, the LEDs remain lighted until the full software version code is displayed. If the **ACO** pushbutton is still depressed when the software version code has completed cycling, the display goes blank for 2 seconds and starts cycling through the software version code again. This continues as long as the **ACO** pushbutton is depressed.

Depress the **ACO** pushbutton on the User Panel.

Response: All LEDs and the **SYSCTL** 7-segment display light.

6. Was response correct?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 7.**
7. Were you sent here by another procedure to perform an LED test?
If **YES**, then continue with **Step 8.**
If **NO**, then do **Trouble Clearing: TAP-115.**
8. Record the circuit pack(s) (LEDs) that failed the LED test and return to the procedure that sent you here.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS1 Transmission Test

1.  **NOTE 1:**
This procedure may be used to perform individual DS1 transmission tests in the *mux* (toward the fiber) or *demux* (toward the DSX) direction. When this procedure is being used to perform end-to-end DS1 tests, it is assumed that the complete end-to-end system has already been tested and that only a particular DS1 port is being tested at this time. It is further assumed that the DS1 options (DS1/DS1PM circuit packs) and DS3 options (TMUX circuit packs) have been set correctly (using the **set-t1:** and **set-t3:** command) at both ends of the circuit being tested. The **rtrv-t1:** and **rtrv-t3:** command may be used to check for proper DS1 or DS3 option settings. Ensure proper DS1 line coding settings (AMI/B8ZS) at DS1 ends of the circuit.
-  **NOTE 2:**
Transmission tests in the *mux* direction may be local or end-to-end tests (see Figure 1). Transmission tests in the *demux* direction may be local cross-connect tests (see Figure 2). The "Commands and Reports" section of this manual, under TEST-TRMSN-T1, gives an explanation of commands.
-  **NOTE 3:**
This test can be performed either with a CIT and the automated test command **test-trmsn-t1:** or with a suitable low speed test set (such as a KS-20775, L1 DS1 Error Rate Test Set, a KS-22331, L1/KS-22332, L2 DS1/DS1C/DS2 Error Rate Test Set, or M13 Error Rate Test Set).
-  **NOTE 4:**
When this procedure is used to do end-to-end tests, one DDM-2000 shelf will be referred to as the near end and the other shelf as the far end. These designations are arbitrary; either shelf can be the near-end or the far-end shelf.

⇒ **NOTE 5:**

Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS1 circuit being tested. Release 8 linear software supports default and full manual STS-1 and VT1.5 (DS1) cross-connections to support STS-1 add/drop and DS1 add/drop applications. Release 9 and later ring software has no default cross-connections and supports only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the "Commands and Reports" section of this manual: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, **rtrv-crs-vt1**, **set-ne**, and **rtrv-ne**. See *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

⇒ **NOTE 6:**

A CIT is required for this test on a ring configuration because manual cross-connections have to be made at all shelves.

Is a CIT available?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 3**.

2. At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-521**

3. ⇒ **NOTE:**

Work orders, office records, or CIT **ent-crs-{sts1 or vt1}** or **rtrv-crs-{sts1 or vt1}** commands may be used to make or verify cross-connections.

At each shelf in the network, make/verify that proper STS-1/VT1(DS1) terminating and pass-through cross-connections have been made for each DS1 circuit being tested, as required.

4. Are you using CIT and **test-trmsn-t1:** command to perform this test?

If **YES**, then continue with **Step 5**.

If **NO**, then proceed to **Step 21**.

5. **⇒ NOTE 1:**

If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS1/DS1PM** circuit packs, the DS1 transmission test is performed from the DS1 terminating end. If the CIT and **test-trmsn-t1:** command is being used to perform the test and you are at the EC-1 terminating end, log into the DS1 end to perform the test using the **test-trmsn-t1:** command.

⇒ NOTE 2:

When both terminating ends are equipped with **STS1E** circuit packs, one end may be temporarily equipped with either **DS1/DS1PM** or **DS3** circuits packs and the procedures of **DLP-510** or **DLP-511** used to perform the transmission tests.

⇒ NOTE 3:

Local tests cannot be performed in the DEMUX direction for **STS1E** circuit packs.

⇒ NOTE 4:

If one terminating end is equipped with a **TMUX** circuit pack to provide for bidirectional termination of one M13 or C-bit formatted DS3 signal and the other terminating end is equipped with **DS1/DS1PM** circuit packs, the DS1 transmission test can be performed from the DS3 terminating end using the **test-trmsn-t1:** command after using the **opr-lpbk-t1:** command at the far end equipped with **DS1/DS1PM** circuit packs to loop back the test signal. The DS1 transmission test can also be performed from the DS1 terminating end using the **test-trmsn-t1:** command after using the **opr-lpbk-t3:** command at the far end equipped with a **TMUX** circuit pack to loop back the test signal.

See Figures 1 and 2. If local tests are being performed, the fiber loopbacks at the near-end **OLIUs** must be in place. If end-to-end tests are being performed, do ONE of the following:

- (a) Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-1, STSX, or DSX-3 cross-connection associated with the DS1 channel to be tested.
- (b) Use the **r lgn** command to log in to the far-end shelf and use the **opr - lpbk - t1: address**, **opr - lpbk - ec1: address**, or **opr - lpbk - t3: address** command to loop back the DS1, EC-1, or DS3 port(s) at the far end. Use **logout** or **toggle** (ctrl t) command to return control of CIT to near end.

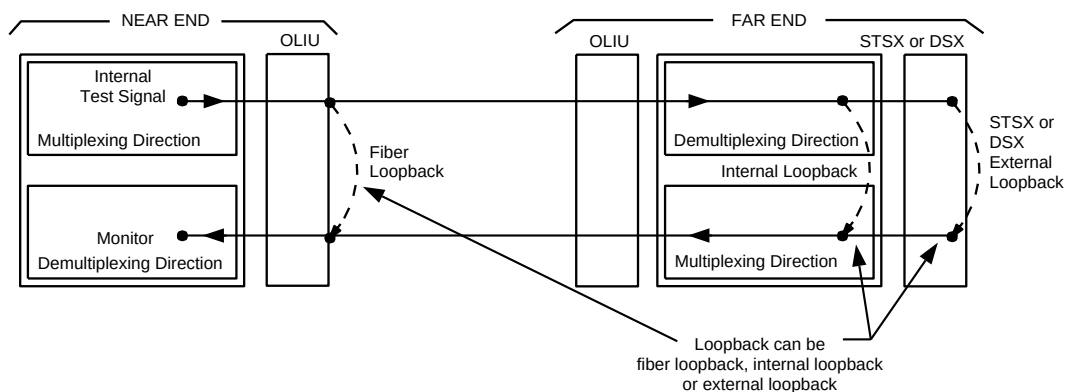


Figure 1. Transmission Test of DS1 Signal in MUX Direction

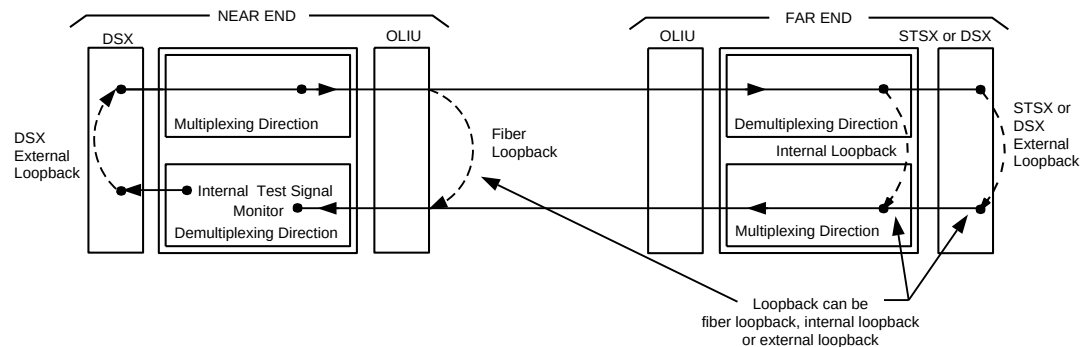


Figure 2. Transmission Test of DS1 Signal in DEMUX Direction

6. Are you doing this test in the mux or demux direction?

If **MUX** direction, then continue with **Step 7**.

If **DEMUX** direction, then proceed to **Step 9**.

7. At the near end, use the following command to perform a test of the DS1 loop in the fiber direction:

```
test-trmsn-t1:address:dirn=mux:dur=( );
```

Where *address* = address identifier of the DS1 signal.

dirn = direction of the test. If **dirn=mux**, direction is toward fiber.

dur = duration of the test in minutes (1-120); default is 1.

8. Was the test successful (error free)?

If **YES**, then proceed to **Step 12**.

If **NO**, then proceed to **Step 34**.

9.  **NOTE:**

The **DS1/DS1PM** circuit packs are connected to a DSX-1 cross connect and the **TMUX** circuit pack is connected to a DSX-3 cross connect.

See Figure 2. At the near-end DSX-1 or DSX-3 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS1 channel to be tested.

10. Use the following command to perform a DS1 transmission test in the demux direction to test the DS1 loop in the DSX direction:

```
test-trmsn-t1:address:dirn=demux:dur=( );
```

Where *address* = address identifier of the DS1 signal.

dirn = direction of the test. If **dirn=demux**, direction is toward DSX.

dur = duration of the test in minutes (1-120); default is 1.

11. Was the test successful (error free)?

If **YES**, then continue with **Step 12**.

If **NO**, then proceed to **Step 34**.

12. Is this first service being placed on the group and is a protection **DS1/DS1PM/TMUX** circuit pack installed?

If **YES**, then continue with **Step 13**.

If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:
switch-ls:address:pri=manual;
 14. Repeat the transmission test in the mux (or demux) direction using the following command:
test-trmsn-t1:address:dirn=mux (or demux):dur=();
 15. Was the test successful (error free)?
If **YES**, then continue with **Step 16**.
If **NO**, then proceed to **Step 34**.
 16. Use the following command to clear active switch requests:
switch-ls:address:pri=reset;
 17.  **NOTE:**
If this is a single-ring configuration and the transmission test is being performed in the **mux** direction, use the **switch-path** command to switch the path to the other ring and then repeat this test before releasing loopbacks.
- The DS1 circuit under test has passed the DS1 transmission test. Remove the looping patch cords from the cross-connect point. Use the **rls-lpbk-t1:** or **rls-lpbk-t3:** command to release loopback(s) at the far end, if required.
18. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** (or use the **upd** command) to update the **SYSCTL** and remove alarms after the loopbacks have been removed.
 19. Repeat this procedure from Step 2 for any additional DS1 circuits to be tested.
 20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
 21. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLI** must be in place. If end-to-end tests are being performed, at the far-end DSX-1, STSX, or DSX-3 cross-connect point associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS1 channel to be tested.

22.  **NOTE:**
The DS1 test set is used at the end equipped with **DS1/DS1PM** circuit packs and the M13 test set is used at the end equipped with **TMUX** circuit packs.
- At the near-end DDM-2000 cross-connect point, connect the DS1 or M13 test set to the **IN** and **OUT** jacks associated with the circuit under test.
23. Use the DS1 or M13 test set to test for error-free transmission.
24. Was the test successful (error free)?
If **YES**, then continue with **Step 25**.
If **NO**, then proceed to **Step 34**.
25. Is this first service being placed on the group and is protection circuit pack installed?
If **YES**, then continue with **Step 26**.
If **NO**, then proceed to **Step 30**.
26. Unseat the service **DS1/DS1PM/TMUX** circuit pack associated with the circuit under test.
27. Repeat the DS1 transmission test with the DS1 or M13 test set.
28. Was the test successful (error free)?
If **YES**, then continue with **Step 29**.
If **NO**, then proceed to **Step 34**.
29. Reseat the **DS1/DS1PM/TMUX** circuit pack associated with the circuit under test.
30. The DS1 circuit under test has passed the DS1 transmission test. Remove the looping patch cords from the cross-connections.
31. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.
32. Repeat this procedure from Step 21 for any additional DS1 circuits to be tested.
33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. **⇒ NOTE:**

The line code parameter is not applicable to the **TMUX** circuit pack.

Check for line code (AMI/B8ZS) mismatch at near end and far end. If mismatch is found, set line code [**DLP-513**] to correct value and repeat this test. If no trouble is found, continue with the next step.

35. **⇒ NOTE:**

The dlc parameter is not applicable to the **TMUX** circuit pack.

In some releases, if **dlc=yes** as set by the **set -t1** command, loopbacks are not recognized (loopback not recognized) in this test. Use **rtrv -t1** command to check if **dlc=yes**.

36. Is dlc set to yes?

If **YES**, then continue with **Step 37**.

If **NO**, then proceed to **Step 38**.

37. Use **set -t1** command to temporarily set **dlc=no** and repeat this test. If the test fails again, continue with the next step.

38. Has the **DS1/DS1PM/TMUX** circuit pack that failed the test been replaced?

If **YES**, then proceed to **Step 41**.

If **NO**, then continue with **Step 39**.

39. Replace the **DS1/DS1PM/TMUX** circuit pack that failed the test.

Reference: **DLP-523**

40. Repeat this procedure for the **DS1/DS1PM/TMUX** circuit pack that failed.

41. Trouble may be in the DSX cross-connect wiring, VT1/STS1 cross-connections in the ring network, or the shelf backplane. Use the **rtrv-crs-()** command to ensure proper VT1/STS1 cross-connections have been made at each shelf in the ring for the DS1 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, **rtrv-alm**, **rtrv-hsty**, etc.) to check for other trouble indications.
42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3 Transmission Test

1.  **NOTE 1:**
This procedure may be used to perform DS3 transmission tests in the *mux* (toward the fiber) or *demux* (toward the DSX) direction. When this procedure is being used to perform end-to-end DS3 tests, it is assumed that the complete end-to-end system has already been tested and that only a particular DS3 channel is being tested at this time. Transmission tests in the *mux* direction may be local or end-to-end tests (See Figure 1). Transmission tests in the *demux* direction are local cross-connect tests (See Figure 2). The "Commands and Reports" section of this manual, under TEST-TRMSN-T3, gives an explanation of commands.
-  **NOTE 2:**
This test can be performed either with a CIT and the automated test command **test-trmsn-t3** or with a DS3 test set or M13 test set.
-  **NOTE 3:**
When this procedure is used to do end-to-end tests, one DDM-2000 shelf will be referred to as the near end and the other shelf as the far end. These designations are arbitrary; either shelf can be the near-end or the far-end shelf.
-  **NOTE 4:**
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3 circuit being tested. Release 8 linear software supports default and full manual STS-1 and VT1.5 (DS1) cross-connections to support STS-1 add/drop and DS1 add/drop applications. Release 9 ring software has no default cross-connections and supports only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the "Commands and Reports" section of this manual: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, **rtrv-crs-vt1**, **set-ne**, and **rtrv-ne**. See *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

⇒ **NOTE 5:**

A CIT is required for this test if manual cross-connections have to be made at any shelf.

Is a CIT available?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 3**.

2. ⇒ **NOTE 1:**

If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS3** circuit packs, the DS3 transmission test is performed from the DS3 terminating end. If the CIT and **test-trmsn-t3:** command is being used to perform the test and you are at the EC-1 terminating end, the **rlgn** command may be used to log into the DS3 end to perform the test using the **test-trmsn-t3:** command.

⇒ **NOTE 2:**

When both terminating ends are equipped with **STS1E** circuit packs, either DS1 or DS3 transmission tests may be performed. For DS3 tests, one end may be temporarily equipped with **DS3** circuit packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **STS1E** at the near end, perform an update (upd), and install the **DS3** circuit pack(s). This configuration may only be tested in the MUX direction. After the tests are completed, remove the temporary circuit packs, perform an update, and reinstall the **STS1E** circuit packs.

⇒ **NOTE 3:**

If one terminating end is equipped with **TMUX** circuit packs to provide for bidirectional termination of one M13 or C-bit formatted DS3 signal and the other terminating end is equipped with **DS1/DS1PM** circuit packs, either DS1 or DS3 transmission tests may be performed. For DS3 tests, both ends may be temporarily equipped with **TMUX** circuit packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **DS1** circuit packs at the far end, perform an update (upd), and install **TMUX** circuit pack(s). This configuration may only be tested in the MUX direction. After the tests are completed, remove the temporary circuit packs, perform an update, and reinstall the **DS1/DS1PM** circuit packs.

At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-521**

3. **⇒ NOTE:**
Work orders, office records, or CIT **ent-crs-sts1** or **rtrv-crs-sts1** commands may be used to make or verify STS-1 cross-connections.

At each shelf in the network, make/verify that proper STS-1 cross-connections have been made for each DS3 channel being tested.

4. Are you using CIT and **test-trmsn-t3** command to perform this test?
If **YES**, then continue with **Step 5**.
If **NO**, then proceed to **Step 22**.

5. Are you testing **DS3** or **TMUX** circuit packs?
If **DS3**, then continue with **Step 6**.
If **TMUX**, then proceed to **Step 10**.

6. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLIU** must be in place. If end-to-end tests are being performed, do ONE of the following:

- (a) **⇒ NOTE:**
When an end-to-end DS3 test is run in the mux direction and an external loopback is established at the far end, provision the far end DS3 for CC mode with no AIS (**set-t3:address:mode=cc,ais=no**). Otherwise, if the VMR mode is used, then only errors in the receive direction will be monitored and the system may not recognize that a loopback is up.

Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-3 or STSX cross-connect point associated with the DS3 channel to be tested.

- (b) Use the **rlgn** command to log in to the far-end shelf and use the **opr-lpbk-t3:address** or **opr-lpbk-ec1:address** command to loop back the DS3 or EC-1 port(s) at the far end. Use **logout** or **toggle** (ctrl t) command to return control of CIT to near end.

7. Are you doing this test in the mux or demux direction?

If **MUX** direction, then continue with **Step 8**.

If **DEMUX** direction, then proceed to **Step 10**.

8. At the near end, use the following command to perform a test of the DS3 loop in the fiber direction:

test-trmsn-t3:address:dirn=mux:dur=();

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If **dirn=mux**, direction is toward fiber.

dur = duration of the test in minutes (1-120), default is 1.

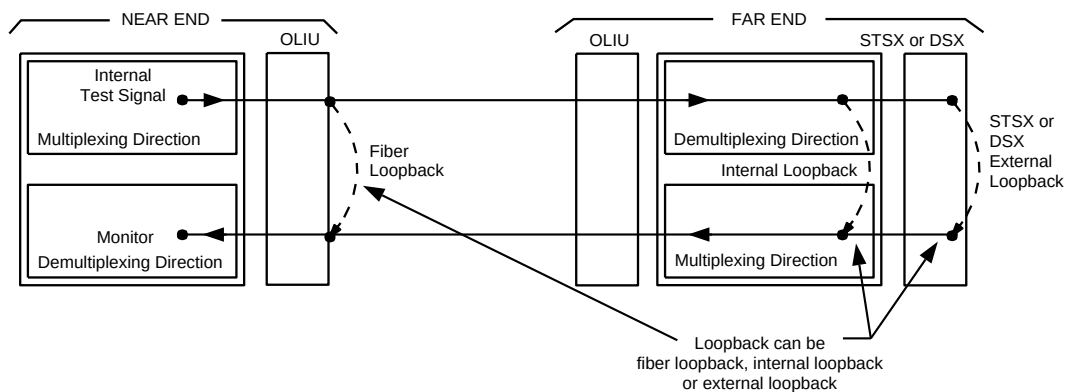


Figure 1. Transmission Test of DS3 Signal in MUX Direction

9. Was the test successful (error free)?

If **YES**, then continue with **Step 13**.

If **NO**, then proceed to **Step 35**.

10. See Figure 2. At the near-end DSX-3 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.
 11. Use the following command to perform a DS3 transmission test in the demux direction to test the DS3 loop in the DSX direction:
test-trmsn-t3:address:dirn=demux:dur=();
Where *address* = address identifier of the DS3 signal.
dirn = direction of the test. If **dirn=demux**, direction is toward DSX.
dur = duration of the test in minutes (1-120), default is 1.
 12. Was the test successful (error free)?
If **YES**, then continue with **Step 13**.
If **NO**, then proceed to **Step 35**.
-

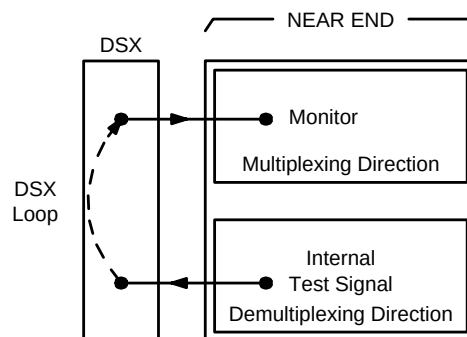


Figure 2. Transmission Test of DS3 Signal in DEMUX Direction

13. Is this the first service being placed on the group and is a protection DS3 circuit pack installed?

If **YES**, then continue with **Step 14**.

If **NO**, then proceed to **Step 18**.

14. Use the following command to switch from service to protection circuit pack:

switch-fn:address:pri=manual;

Response: The green **ACTIVE** LED lights on the protection circuit pack.

15.  **NOTE:**

If this is a single-ring configuration and the transmission test is being performed in the **mux** direction, the **switch-path** command should be used to switch the path to the other ring and then repeat this test.

Repeat the transmission test in the mux (or demux) direction using the following command:

test-trmsn-t3:address:dirn=mux (or demux):dur=();

16. Was the test successful (error free)?

If **YES**, then continue with **Step 17**.

If **NO**, then proceed to **Step 35**.

17. Use the following command to clear active switch requests:

switch-fn:address:pri=reset;

18. The DS3 circuit under test has passed the DS3 transmission test. Remove the looping patch cords from the cross-connect point. Use the **rls-lpbk-t3** command to release loopback(s) at the far end, if required.

19. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the **upd** command) on the **SYSCTL** to update the **SYSCTL**.

20. If violation monitor removal mode was set differently than the original mode in Step 5, reprovision the mode to the original or required setting using the **set-t3** command. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

22. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLI** must be in place. If end-to-end tests are being performed, at the far-end DSX-3 or STSX cross-connect point associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.
23.  **NOTE:**
The DS3 test set is used at the end equipped with **DS3** circuit packs and the M13 test set is used at end equipped with **TMUX** circuit packs.

At the cross-connection associated with the near-end DDM-2000, connect the DS3 or M13 test set to the **IN** and **OUT** jacks associated with the circuit under test.
24. Use the DS3 or M13 test set to test for error-free transmission.
25. Was the test successful (error free)?
If **YES**, then continue with **Step 26**.
If **NO**, then proceed to **Step 35**.
26. Is this the first service being placed on the group and is protection circuit pack installed?
If **YES**, then continue with **Step 27**.
If **NO**, then proceed to **Step 30**.
27. Unseat the service **DS3** or **TMUX** circuit pack associated with the circuit under test.
28. Repeat the DS3 transmission test with the DS3 or M13 test set.
29. Was the test successful (error free)?
If **YES**, then continue with **Step 30**.
If **NO**, then proceed to **Step 35**.
30. Reseat the **DS3** or **TMUX** circuit pack associated with the circuit under test.
31. The DS3 circuit under test has passed the DS3 transmission test. Remove the looping patch cords from the cross-connections.

32. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.
33. Repeat this procedure from Step 22 for any additional DS3 circuits to be tested.
34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
35. Has the **DS3** or **TMUX** circuit pack that failed been replaced?
 If **YES**, then proceed to **Step 38**.
 If **NO**, then continue with **Step 36**.
36. Replace the **DS3** or **TMUX** circuit pack that failed the test.

Reference: **DLP-523**

37. Repeat this procedure for the **DS3** or **TMUX** circuit pack that failed.
38. Trouble may be in the DSX cross-connect wiring, STS1 cross-connections in the ring network, or the shelf backplane. Use the **rtrv-crs-sts1** command to ensure proper STS1 cross-connections have been made at each shelf in the ring for the DS3 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, **rtrv-alm**, **rtrv-hsty**, etc.) to check for other trouble indications.
39. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Activate Optional System Features Using CIT

1. Connect CIT to **CIT** connector on User Panel and establish session.

Reference: **DLP-521**

2. Refer to the "Commands and Reports" section of this user/service manual for the descriptions and syntax of the various optional features and parameters of the DDM-2000 that may be set using the CIT (see Tables A and B). These optional features and parameters can be found under numerous listings.

The following lists optional features which may be lost if the **SYSCTL** is replaced:

ent-tl1msgmap	Maps the DDM-2000 TL1 message types to the operations systems (OS) for this network element in the subnetwork. Users may change the default mapping by using this command. Users may check the current provisioning by using the rtrv-tl1msgmap command.
ent-osacgmap	Creates entries in the X.25 subnetwork application context map. This map lists the permanent virtual circuits (PVCs) and switched virtual circuit (SVC) available in the X.25 channel and maps them to operation systems (OS) application contexts. Command is available to privileged users only for all CIT or DCC ports on the shelf.
ent-ulsdcc	Provisions the user-settable fields of the network service access point (NSAP) address. Command parameters should not be changed from default values except by users who intend to provision the SONET subnetwork and partition DCC communications.
set-attr-alm	Sets alarm delay and clear delay.
set-attr-env	Names and sets alarm level of miscellaneous discrete input points at RT only.
set-attr-cont	Names miscellaneous discrete control output points at RT only.

set-date	Sets date and time.
set-fecom	Enables or disables far end communication over the data communication channel and sets Network Side/User Side parameters.
set-lgn	Enters, edits, and deletes logins and passwords. Privileged users can change other users' passwords by using this command.
set-link	Sets length of page output on the CIT.
set-ne	Sets the name [Target Identifier (TID)] of the network element. Designates the shelf as a directory services network element (DSNE) for OSI protocol. One , and only one, shelf in the subnetwork must be provisioned as a DSNE. It designates a shelf as an alarm gateway network element (AGNE) and sets alarm group numbers and sets cross-connect mode to default or manual. It designates the Site, Network Element, and Shelf numbers and designates the Central Office/Remote Terminal parameter. It sets the TBOS display address, link function, and remote reporting status. It sets the Idle Channel Signal parameter.
set-passwd	Sets or changes a users' password. All users can change their own passwords.
set-pmthres-line	Sets the thresholds of the line performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-sect	Sets the thresholds of the section performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-t1	Sets the thresholds of the DS1 performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.

set-pmthres-t3	Sets the thresholds of the DS3 performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-sts1	Sets the STS-1 path performance parameter thresholds. Available only in Release 2 or later software.
set-pmthres-vt1	Sets the thresholds of the VT1.5 path performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-secu	Sets security on each CIT port and DCC interface. Enabling security requires users to enter login and password to access the system.
set-sync	Sets synchronization mode switching to revertive or nonrevertive. After the end-to-end system is established, sets synchronization source to select the line from which shelf loop-timing and/or the DS1 sync output will be derived. Sets output mode to select the source of the DS1 sync output.

Other optional features are set from the CIT but are not lost if the **SYSCTL** is replaced.



CAUTION:

Execution of these commands may be service affecting.

These features may be found under the following listings:

ent-crs-sts1	Specifies STS-1 cross-connect routing. Used in establishing service and/or performing transmission tests.
ent-crs-vt1	Specifies VT1.5 (DS1) cross-connect routing. Used in establishing service and/or performing transmission tests.
set-ec1	Sets the characteristics of an EC-1 port.
set-feat	Enables feature options that are licensed for use: sts3c, vtpm, ds1pm.

set-oc1	Sets the characteristics of a OC-1 line. Sets the signal degrade threshold of the OC-1 line as a bit error rate (BER).
set-oc3	Sets the characteristics of an OC-3 line pair. Sets the signal degrade threshold of the OC-3 line as a bit error rate (BER). Specifies if sync message signaling uses kbyte or sbyte or is enabled or disabled. Specifies if the concatenation mode (concat) of the OC-3 line is to be independent STS-1 channels or an sts-3c channel.
set-oc12	Sets the characteristics of an OC-12 line pair. Sets the signal degrade threshold of the OC-12 line as a bit error rate (BER). Specifies if sync message signaling uses kbyte or sbyte or is enabled or disabled.
set-ow	Sets the orderwire routing for the network element.
set-state-oc1	Sets the state of OC-1 line(s) to be monitored (IS) for a good signal or not monitored (NMON).
set-state-ec1	Sets the state of a low-speed EC-1 port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-state-t1	Sets the state of a low-speed port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-state-t3	Sets the state of a DS3 port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-state-sts1	Sets the state of a STS-1 channel to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-state-vt1	Sets the state of a VT1.5 channel to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-sts1	Sets the signal degrade characteristics of an STS-1 channel.

set - t1	Sets the characteristics of a DS1 port.
set - t3	Sets the characteristics of a DS3 port.
set - vt1	Sets the signal degrade characteristics of a VT1.5 channel.
set - x25	Sets the packet size of X.25 link to either 128 or 256.

3. Determine options required from office records.
4. Set options using the syntax of the "Commands and Reports" section in this manual.
5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. DDM-2000 OC-3 Parameters Provisionable Via the CIT

Parameter	Range	Default (Note 1)	Command (Note 2)
Date	current value	70-01-01	set -date
Time	current value	00:00:00	set -date
Target ID (system name)	20 characters	Site#NE#	set -ne
DSNE ¶¶	yes, no	no	set -ne
Alarm group number	1-255	255	set -ne
AGNE	yes, no	no	set -ne
Site number	1-64	64	set -ne
Network element #	1-5	5	set -ne
Shelf number	1-8	1	set -ne
Cross-connect mode §§	default, manual	default	set -ne
CO/RT select	CO, RT	RT	set -ne
TBOS address	1-8	1	set -ne
TBOS link	normal, primary, secondary, no TBOS	no TBOS	set -ne
TBOS remote	enabled, disabled	disabled	set -ne
IdleChannelSignal	AIS, Uneqpd.	AIS	set -ne
CIT page length	0 (pager off), 3-150 rows	24	set -link
PM thresholds	See PM Table	-	set -pmthres
Alarm holdoff delay	0-30 sec	2	set -attr -alm
Alarm clear delay	0-30 sec	15	set -attr -alm
Power minor almn. level	MN, MJ	MN	set -attr -alm
OC1 degrade threshold	10^{-5} to 10^{-9}	10^{-6}	set -oc1
AIS almn. level of NSA OC-1			
AIS alarm	CR, MJ, MN, NA	NA	set -oc1
OC3 degrade threshold	10^{-5} to 10^{-9}	10^{-6}	set -oc3
Kbyte¶¶¶¶	enabled, disabled	enabled	set -oc3
Sync messaging	K byte, S byte, disabled	K byte	set -oc3
Concatenation mode §§	enabled, disabled	disabled	set -oc3
Radio for MegaStar**** 2000	yes, no	no	set -oc3
AIS almn. level of NSA OC-3			
Line AIS	CR, MJ, MN, NA	NA	set -oc3
OC12 degrade threshold§§§	10^{-5} to 10^{-9}	10^{-6}	set -oc12
Kbyte¶¶¶¶	enabled, disabled	enabled	set -oc12
Sync messaging§§§	K byte, S byte, disabled	K byte	set -oc12
AIS almn. level of NSA OC-12			
Line AIS§§§	CR, MJ, MN, NA	NA	set -oc12
Orderwire* (E1-Only)	thru, e1dropmain, e1dropfnc, eldropmain1, eldropmain2	e1dropmain (Linear) thru (Ring)	set -ow set -ow set -ow
Orderwire* (Multiplexed)	thru, muxdrop	muxdrop (Linear) muxdrop (Ring)	set -ow set -ow

See notes and footnotes at end of table.

Table A. DDM-2000 Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
STS-1 path signal degrade threshold †††	10^{-5} to 10^{-9}	0 (disabled)(R9.0)	set-sts1
STS-1 path signal failure	10^{-3} to 10^{-6}	-6 (R9.1 & Later)	set-sts1
NSA STS-1 path AIS alarm level	MN, NR	MN	set-sts1
SA STS-1 path AIS alarm level	CR, MN, NA, NR	MN	set-sts1
STS-1 channel state***	NMON, AUTO‡	AUTO	set-state-sts1
OC-1 line state†††	NMON, IS	IS	set-state-oc1
VT1.5 path signal degrade threshold***	10^{-5} to 10^{-8}	0 (disabled)	set-vt1
NSA VT path AIS	MN, NR	MN	set-vt1
SA VT path AIS	MJ, MN, NA, NR	MJ for ring MN for linear	set-vt1
VT channel state***	NMON, AUTO‡	AUTO	set-state-vt1
DS3 VMR mode†	VMR, VM, clear channel	VMR	set-t3
Clear channel DS3 AIS insertion†	yes, no	no	set-t3
DS3 sig failure alm. level†	CR, MJ, MN, NA	CR	set-t3
DS3 AIS alm.†	CR, MJ, MN, NA	NA	set-t3
DS3 failure threshold†	10^{-3} , 10^{-6} BER	10^{-3}	set-t3
DS3 PM mode†	off, on	on	set-t3
DS3 PM frame†	m13, cbit	m13	set-t3
DS3 Xbit†	1, 0	1	set-t3
DS3 port state†	NMON, AUTO‡	AUTO	set-state-t3
DS1 line coding†	AMI, B8ZS, noOverride§	noOverride	set-t1
DS1 alarm level†	MJ, MN, NA	NA	set-t1
DS1 failure threshold†	10^{-3} , 10^{-6} , 10^{-7} , 10^{-8} BER	10^{-3}	set-t1
DS1 BPV to LOS†	yes, no	no	set-t1
DS1 AIS insertion†	yes, no	yes	set-t1
DS1 PM Mode†	off, on	off	set-t1
DS1 PM Format†	sf, esf, esfn	esf	set-t1
DS1 primary port state†	NMON, AUTO‡	AUTO	set-state-t1
Environmental alarm level	CR, MJ, MN, NA	MN	set-attr-env
Environmental alarm type	10 characters		set-attr-env
Environmental alarm description	26 characters		set-attr-env
Control point description	26 characters		set-attr-cont
Far end communication over DCC	enabled, disabled	enabled	set-fecom**
DCC identity for OSI ntws.	userside, networkside	see command pgs.	set-fecom**
Set security	enabled, disabled, lockout	disabled	set-secu**
CIT/DCC security	enabled, disabled, lockout	disabled	set-secu**
CIT/DCC timeout (minutes)	0-120	15	set-secu**

See notes and footnotes at end of table.

Table A. DDM-2000 Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
SYNC mode switching	revertive, nonrevertive	revertive	set - sync
Sync Timing Source §§ ‡‡	main, fn-c,	main	set - sync
Sync Output Mode §§	lock1, lock2, track¶	track	set - sync
AIS Threshold	level 5, level 4, level 3, level 2	level 5	set - sync
Sync Timing Source †† ‡‡	main-1, main-2, fn-c	main-1	set - sync
Auto. sync. reconfig.	enabled, disabled	disabled	set - sync
EC-1 alarm level†	CR, MJ, MN, NA	CR	set - ec1
EC-1 degrade threshold†	10 ⁻⁵ to 10 ⁻⁹ BER	10 ⁻⁶	set - ec1
EC-1 port state †	NMON, AUTO‡	AUTO	set - state - ec1
Feature package **	enabled, disabled	disabled	set - feat
VT PM, DS1 PM, or STS3c			
X.25 packet size	128, 256	256	set - x25
NSAP			
OrganizationID (Operator ID)	6 hex digits	000000	ent - ulsdcc
Reserved (Reserved)	4 hex digits	0000	ent - ulsdcc
Routing Data (Domain/Area)	8 hex digits	00000000	ent - ulsdcc
VC ckt. type X.25 attach.	PVC, SVC	PVC	ent - osacmap
SNPA: LCN for PVCs	LCN, DTE	see command pgs.	ent - osacmap
or DTE address for SVC	see command pgs.	see command pgs.	ent - osacmap
OS type (ACID)	see command pgs.	see command pgs.	ent - osacmap
ACID (OS type or funct.)	see command pgs.		ent - tl1msgmap
TL1 message type	see command pgs.		ent - tl1msgmap
Action to assoc. message type to OS	enabled, disabled	enabled	ent - tl1msgmap
Cross-connection type	twoway, dc, locked	twoway	ent - crs - sts1
Ring ID for drop&continue	m1, m2	see command pgs.	ent - crs - sts1
Cross-connection type	twoway, dc, locked	twoway	ent - crs - vt1
Ring ID for drop&continue	m1, m2	see command pgs.	ent - crs - vt1
Outgoing STS-1 path trace message	62 characters	see command pgs.	set - trace - sts1
Expected STS-1 path trace message	62 characters	see command pgs.	set - trace - sts1

See notes and footnotes at end of table.

Table A. DDM-2000 Parameters Provisionable Via the CIT (Contd)

Notes:

1. Default means factory default (the CIT prompts display current provisioned values).
 2. To view the current values, precede these commands with **rtrv-** instead of **set-**.
- * **BBG10 OHCTL** required for Release 8.1 and 9.1. MegaStar**** applications only.
- † Parameter can be set for each port.
- ‡ AUTO means the port or channel is ready to be automatically provisioned via signal detection.
- § noOverride means read and use switch settings on circuit pack.
- ¶ Track means the source for timing will be selected from the active received OC-3 line specified.
- ** This command is available to privileged users only.
- †† Rings.
- ‡‡ Setting this parameter also affects DS1 output source and DS1 sync output mode. See **set-sync** command in Section 11, "Commands and Reports".
- §§ Linear releases.
- ¶¶ One and only one shelf in a subnetwork must be set to "yes" for proper DCC communications.
- ***
Parameters can be set for each channel.
- †††
Ring releases. Requires **22D-U/22G-U/22G2-U/22G3-U OLIUs**.
- ‡‡‡
Ring releases.
- §§§
With **24G-U OLIUs** in **MAIN** slots.
- ¶¶¶
Applicable to OC-3 Release 8.0 and 9.0 and OC-12 Release 5.0 only.
-

Table B. DDM-2000 OC-3 Performance Monitoring Parameters Provisionable Via the CIT

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres-
OC-3 Optics	Optical Transmit Power* (21G/21G-U only)	-1 dB, -2 dB	-1 dB, -2 dB	sect
	Laser Bias Current* (21G/21G-U only)	enable/disable	enable/disable	sect
OC-12 Section	SE Frame Seconds (SEFS)	1-63[10]	1-4095[30]	sect
OC-3 Section	SE Frame Seconds (SEFS)	1-63[10]	1-4095[30]	sect
OC-1 Section	SE Frame Seconds (SEFS)	1-63[10]	1-4095[30]	sect
OC-12 Line	B2 Coding Violations (CV)	1-55365[5537]	1-5315040[531504]	line
	B2 Errored Seconds (ES)	1-900[40]	1-65535[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	1-65535[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	1-65535[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	1-4095[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	1-4095[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	1-255[4]	line
	STS Pointer Justification (PJC)	1-65535[60]	1-9999999[5760]	line
OC-3 Line	B2 Coding Violations (CV)	1-13841[1384]	1-1328736[132874]	line
	B2 Errored Seconds (ES)	1-900[40]	1-65535[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	1-65535[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	1-65535[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	1-4095[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	1-4095[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	1-255[4]	line
	STS Pointer Justification (PJC)	1-65535[60]	1-9999999[5760]	line
OC-1 Line	B2 Coding Violations (CV)	1-4613[461]	1-442848[44285]	line
	B2 Errored Seconds (ES)	1-900[40]	1-65535[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	1-65535[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	1-65535[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	1-4095[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	1-4095[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	1-255[4]	line
	STS Pointer Justification (PJC)	1-65535[60]	1-9999999[5760]	line
EC-1 Line	B2 Coding Violations (CV) EC-1	1-4613[461]	1-442848 [44285]	line
	B2 Errored Seconds (ES)	1-900[40]	1-65535[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	1-65535[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	1-65535[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	1-4095[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	1-4095[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	1-255[4]	line
	STS Pointer Justification (PJC)	1-65535[60]	1-9999999[5760]	line
STS-1 Path	B3 Coding Violations (CV)	1-4510[451]	1-432960 [43296]	sts1
	B3 Errored Seconds (ES)	1-900[40]	1-65535[900]	sts1
	B3 Errored SecondsType A (ESA)	1-900[30]	1-65535[90]	sts1
	B3 Errored SecondsType B (ESB)	1-900[30]	1-65535[90]	sts1
	B3 Severely Errored Seconds (SES)	1-63[20]	1-4095[60]	sts1
	B3 Unavailable Seconds (UAS)	1-63[30]	1-4095[90]	sts1

See footnotes at end of table.

Table B. Performance Monitoring Parameters Provisionable Via the CIT (Contd)

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set - pmthres
DS3 Path for P-Bit, F&M-Bit, and C-Bit from Fiber and DSX	CV-P Coding Violations	1-16383[40]	1-1048575[3820]	t3
	ES-P Errored Seconds	1-900[25]	1-65535[250]	t3
	SES-P Severely Errored Seconds	1-63[4]	1-4095[40]	t3
	UAS-P Unavailable Seconds	1-63[10]	1-4095[10]	t3
	SEFS Severely Errored Seconds	1-63[2]	1-4095[8]	t3
	CV-FM Coding Violations	1-16383[40]	1-1048575[3820]	t3
	CP Coding Violations	1-16383[40]	1-1048575[3820]	t3
DS3 Line	CV-L Coding Violations	1-16383[40]	1-1048575[3865]	t3
	Errored Seconds, Line (ES-L)	1-900[25]	1-65535[250]	t3
	Severely Errored Seconds, Line (SES-L)	1-63[4]	1-4095[40]	t3
VT1.5 Path	V5 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	vtl
	V5 Severely Errored Seconds (SES)	1-63[20]	1-4095 [60]	vtl
	V5 Unavailable Seconds (UAS)	1-63[30]	1-4095 [90]	vtl
DS-1 Path	CV-P (SF) Coding Violations	1-16383[72]	1-1048575 [691]	tl
	CV-P (ESF) Coding Violations	1-16383[13296]	1-1048575 [132960]	tl
	ES-P Errored Seconds	1-900[65]	1-65535 [648]	tl
	SES-P Severely Errored Seconds	1-63[10]	1-4095 [100]	tl
	UAS-P Unavailable Seconds	1-63[10]	1-4095 [10]	tl
	CV-PFE Coding Violations	1-16383[13296]	1-1048575 [132960]	tl
	ES-PFE Errored Seconds	1-900[65]	1-65535 [648]	tl
	SES-PFE Severely Errored Seconds	1-63[10]	1-4095 [100]	tl
	UAS-PFE Unavailable Seconds	1-63[10]	1-4095 [10]	tl
DS-1 Line	ES-L Line Errored Seconds	1-900[65]	1-65535 [648]	tl

* Threshold is set once for both current quarter hour and current day.

Set Circuit Pack Options

1.  **NOTE:**
When a replacement circuit pack (except the **SYSCTL**) is configured the same as the original circuit pack, it may be inserted with no further action. When a replacement circuit pack is different (different code or different switch options) from the original, the **SYSCTL UPD/INIT** button must be momentarily depressed (or use the "update" command) to update the inventory.

Find the circuit pack in Table A and go to the indicated step. If you were sent here from another procedure, return to that procedure after setting options.

Table A. Circuit Packs

Circuit Pack	Step
BBG8/BBG8B SYSCTL	Step 2
BBG9 OHCTL*	—
BBG10 OHCTL	Step 8
BBF2 TGS	Step 10
BBF2B TGS	Step 14
BBF5 JMPR*	—
21G/21G-U OLIU	Step 19
21G2-U/21D/21D-U OLIU*	—
22D-U/22F/22F-U/22F2-U OLIU*	—
22G-U/22G2-U/22G3-U/24G-U OLIU*	—
26G2-U/27G-U/27G2-U OLIU*	—
BBG2 MXRVO*	—
BBG4/BBG4B/BBG19 DS3	Step 21
BBG20 TMUX	Step 21
BBF1/BBF1B DS1	Step 24
BBF3/BBF3B DS1PM	Step 24
BBG6 STS1E	Step 28
BBF8 HDL	Step 33
177A Retainer Card*	—

*There are no option switches on these circuit packs.

SYSCTL

2. **⇒ NOTE:**

The **BBG8/BBG8B SYSCTL** is required for Releases 8, 9, or later.

Determine the desired **SYSCTL** option switch settings from office records and see Figure 1.

3. **⇒ NOTE:**

To set switch to **ON**, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to **OFF**, depress rocker or slide switch toward side labeled **OFF** in the figure.

4. If **SYSCTL** is being installed in shelf for the first time (initial shelf turnup, only **OHCTL** installed at this time) and switches have not been set, set TBOS termination switch **S2-1** per Table B. See Figure 1.

Table B. SYSCTL Switch 2 (S2)
TBOS Link Terminator

Shelf Position	Switch
	S2-1
Last	ON
Not Last	OFF

5. Set all remaining **S2** switch sections, **S2-2**, **S2-3**, **S2-4**, **S2-5**, **S2-6**, **S2-7**, and **S2-8** to **OFF**. See Figure 1.
6. Set all **SYSCTL S1** switch sections, **S1-1**, **S1-2**, and **S1-3** to **OFF**, to set the product (shelf) type.

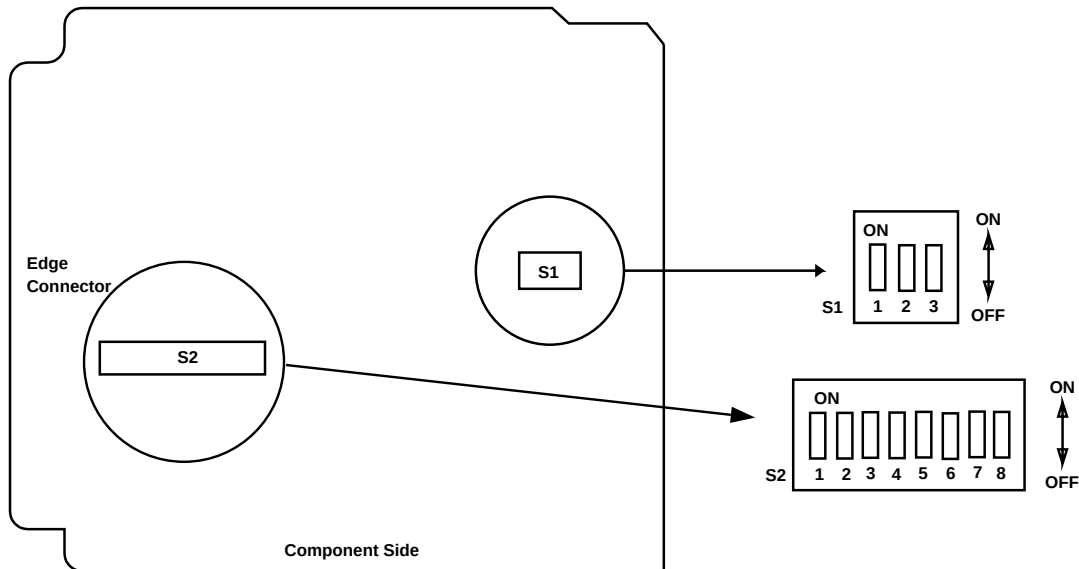


Figure 1. SYSCTL Option Settings

7. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

BBG10 OHCTL

8. Set orderwire option jumper on **BBG10** plug **P3** for type of orderwire interface required (Multiplexed or E1-only). See Figure 2.
-

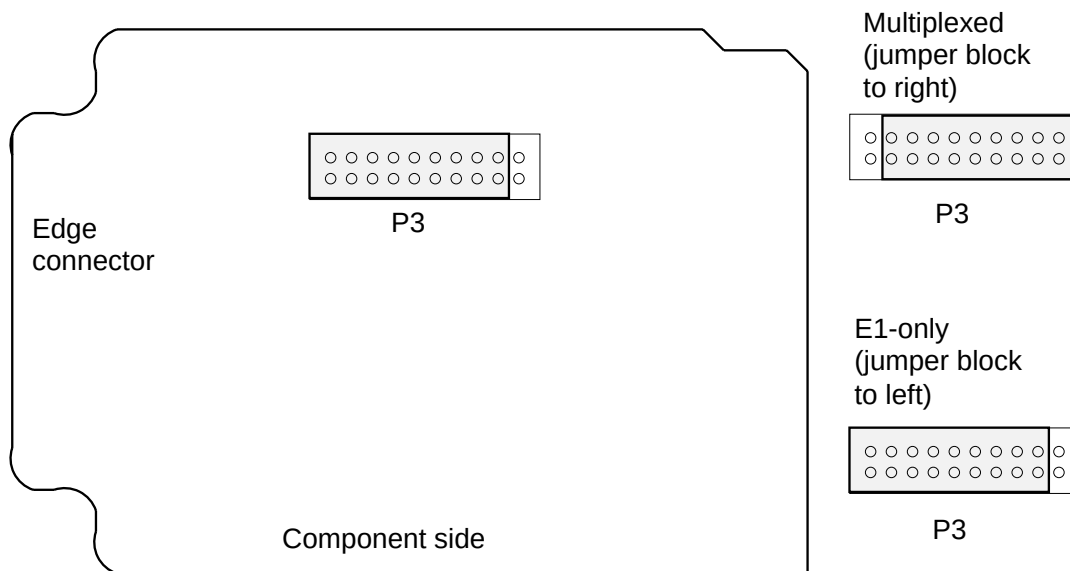


Figure 2. BBG10 OHCTL Option Settings

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2 TGS

10. ➤ **NOTE 1:**
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).
- **NOTE 2:**
The **BBF2 TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Line Timed*. In free-running mode, the **BBF2 TGS** gets timing from an oscillator on the **BBF2 TGS**. In external timing, the **BBF2 TGS** gets timing from an external DS1 reference input. In line-timed mode, the **BBF2 TGS** gets timing from an **OLI** from a reference clock recovered from the received OC-3 line rate signal.
- **NOTE 3:**
Table C depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application.

Table C. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.

Table C. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Line Timing with the proper source using the " set - sync " command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

⇒ NOTE 4:

To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Determine the timing mode from work order or office records. Refer to Table D and Figure 3 and set the timing mode as required for the **TGS** circuit pack(s).

Table D. BBF2 TGS Timing Mode Switch Setting

Timing Mode	Switch S1 Settings	
	S1-3	S1-4
Free Running	ON	ON
DS1 External, MULT Mode	OFF	ON
Line Timed	ON	OFF
Invalid*	OFF	OFF

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated ("unexpected CP type" or "unexpected CP switches")

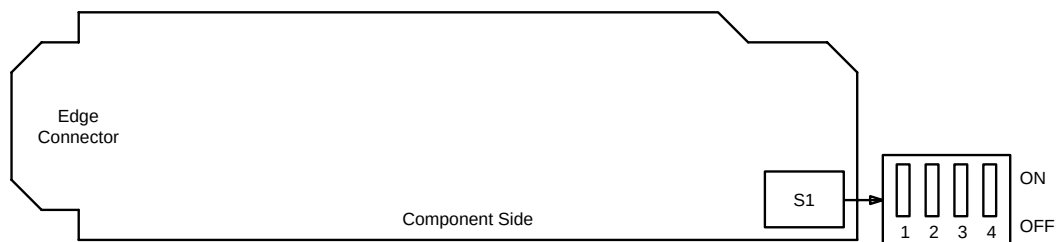


Figure 3. BBF2 TGS Option Switch

11. **⇒ NOTE:**
Switches **S1-1** and **S1-2** are ignored by the system the first time the **TGS** is installed unless the timing mode is set to *DS1 External*. Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update ("upd") command must be performed.

Is timing mode set to *DS1 External*?

If **YES**, then continue with **Step 11**.

If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. Refer to Table E and Figure 3 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table E. BBF2 TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch	DS1 Frame Format	Switch
	S1-1		S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

14.  **NOTE 1:**
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).

 **NOTE 2:**
The **BBF2B TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Line Timed*. In free-running mode, the **BBF2B TGS** gets timing from an oscillator on the **BBF2B TGS**. In external timing mode, the **BBF2B TGS** gets timing from an external DS1 reference input.

 **NOTE 3:**
In line-timed mode, the **BBF2B TGS** gets timing from a reference clock recovered from a received OC-3 line rate signal. Either the **MAIN 1**, **MAIN 2(P)**, or **FUNCTION UNIT C OLIU** can be selected as the synchronization source using the command
`"set-sync:src={main,main-1,main-2,fn-c};"`.

 **NOTE 4:**
Table F depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for line timing or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table F. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	Line Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS. In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging. In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
Free Running	External - Sync Out	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.

Table F. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Mult	Line Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located. The NE provisioned for Line Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Line Timing	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.

Table F. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Line Timing - Sync Out	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.
External - Mult	External - Sync Out	This topology is used to distribute network timing to a target location from a location with access to a synchronization reference. The NE provisioned for External - Mult, is providing timing to the NE provisioned for External - Sync Out, which in turn generates a DS1 output reference regenerated from the optical interface shared by both NE's. This DS1 output is used to provide a synchronization reference to a BITS.

Table F. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's. In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop. If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal.
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Line Timing with the proper source using the " set - sync " command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

➡ **NOTE 5:**

To set switch to ON, depress rocker or slide switch toward side labeled **ON** in figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in figure.

Determine timing mode from work order or office records. Refer to Table G and Figure 4 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table G. BBF2B TGS Timing Mode Switch Settings

Timing Mode	Switch S1 Settings		
	S1-3	S1-4	S1-5 (DS1 Output)
Free Running*	ON	ON	OFF
DS1 External, MULT Mode	OFF	ON	OFF
Line Timing, MAIN†	ON	OFF	OFF
Line Timing, SYNC OUT Mode†	ON	OFF	ON
DS1 External, SYNC OUT Mode†	ON	ON	ON
Invalid‡	OFF	OFF	ON
Invalid‡	OFF	OFF	OFF
Invalid‡	OFF	ON	ON

* Factory default.

† Main **OLI** is default; **FUNCTION UNIT C** by "set - sync" command.

‡ If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated ("unexpected CP type" or "unexpected CP switches").

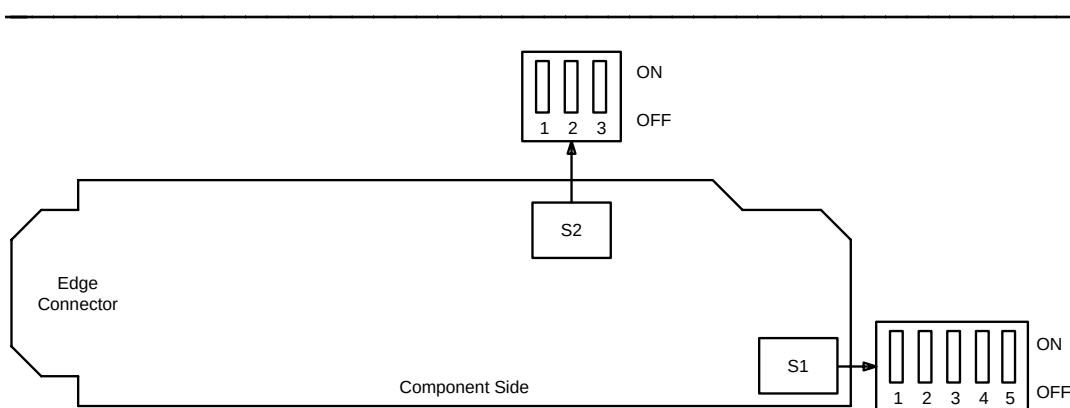


Figure 4. BBF2B TGS Option Switch

15. If the **BBF2B TGS** is provisioned for *sync out mode*, refer to Table H and Figure 4 and set equalizer switches for the proper cable length.

Table H. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid*	OFF	OFF	OFF
Invalid*	OFF	OFF	ON
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated ("unexpected CP type" or "unexpected CP switches").

16.  **NOTE:**
Switches **S1-1** and **S1-2** are ignored by the system the first time the **TGS** is installed unless the timing mode is set to *DS1 External* or *Line Timing sync out mode*. Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update ("**upd**") command must be performed.

Is timing mode set to either *DS1 External* or *Line Timed sync out*?

If **YES**, then continue with **Step 16**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Refer to Table I and Figure 4 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table I. BBF2B TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch	DS1 Frame Format	Switch
	S1-1		S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21G/21G-U OLIU

19.



WARNING:

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.



CAUTION:

*Before installing **OLIUs**, ensure all optical fiber connectors and couplings have been properly cleaned [DLP-527]. Signal performance may be degraded if the connectors and couplings are not cleaned properly.*



NOTE 1:

The **HIGH/LOW POWER** option switch on the **21G/21G-U OLIU** must be set to the **LOW POWER** position when the **OLIU** is looped on itself.



NOTE 2:

It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

Refer to Table J and Figure 5 and set the **HIGH/LOW POWER** option switch to proper setting.

Table J. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

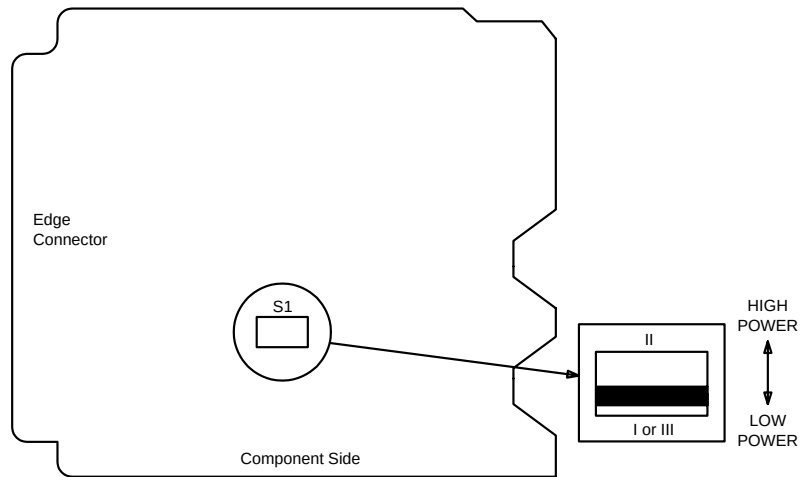


Figure 5. 21G/21G-U OLIU Option Switch

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG4/BBG4B/BBG19 DS3/BBG20 TMUX

21. Determine from office records the length of the DS3 cabling between the DDM-2000 and the DSX-3 cross-connect point.
22. **⇒ NOTE:**
The only option settings on the **DS3/TMUX** circuit pack are the LBO settings shown in Figure 6. If there are other jumpers on the circuit pack similar to the LBO jumpers, they are factory test points and should be ignored.

Install the **DS3** option jumpers per Table K and Figures 6 and 7.

Table K. DS3 LBO Settings

Cable Length (Ft)		LBO Setting
734D Cable	735A Cable	
0 to 225	0 to 125	LBO IN (ON)
>225 to 450	>125 to 250	LBO OUT

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

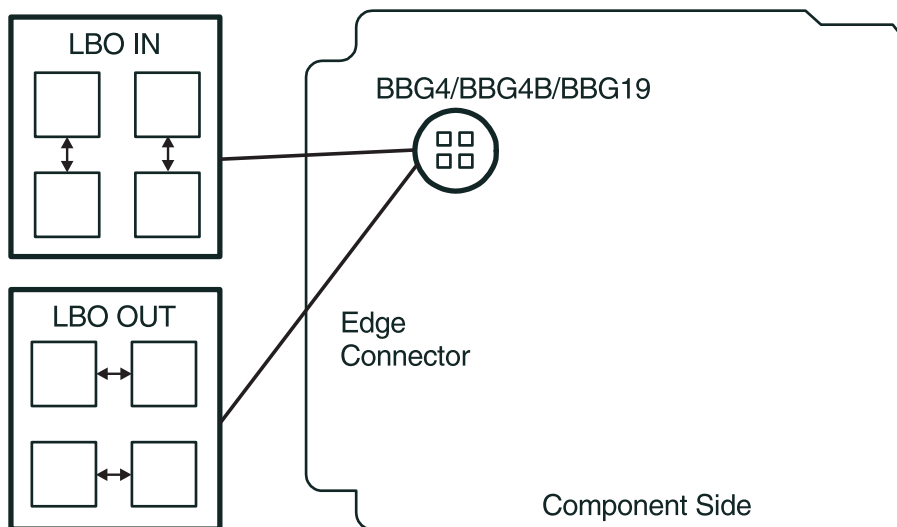


Figure 6. BBG4/BBG4B/BBG19 DS3 Option Settings

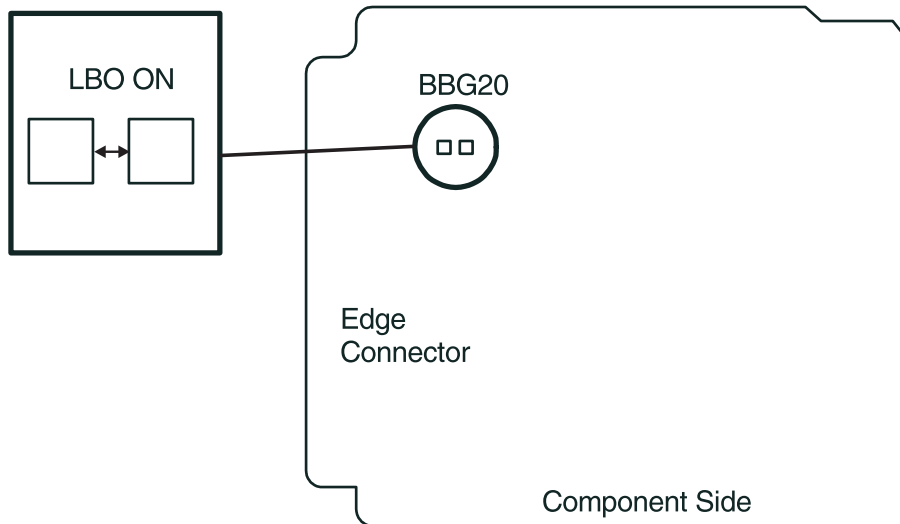


Figure 7. BBG20 TMUX Option Settings

BBF1/BBF1B DS1/BBF3/BBF3B DS1PM

24. Determine from office records the length of the DS1 cabling between the DDM-2000 and the DSX-1 cross-connect point.
25.  **NOTE 1:**
Switch 1, sections 1 through 3 (**S1-1, S1-2, S1-3**), are set according to the length of DS1 cabling between the DDM-2000 and the DSX-1 cross-connection. Switch 1, sections 4 through 7 (**S1-4, S1-5, S1-6, S1-7**), are set for the type of line coding (B8ZS or AMI) required of the DS1 signal. Switch 1, section 8 (**S1-8**) is unused and ignored by the system.
-  **NOTE 2:**
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Refer to Table L and Figure 8 and set LBO option switches.

Table L. DS1/DS1PM Cable LBO Settings

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 kHz	Switch S1 Settings (Note)		
			S1-1	S1-2	S1-3
0 to 133	0 to 90	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

Note: Invalid switch settings will cause the **FAULT** LED to light and a "DS1 CP failed" alarm.

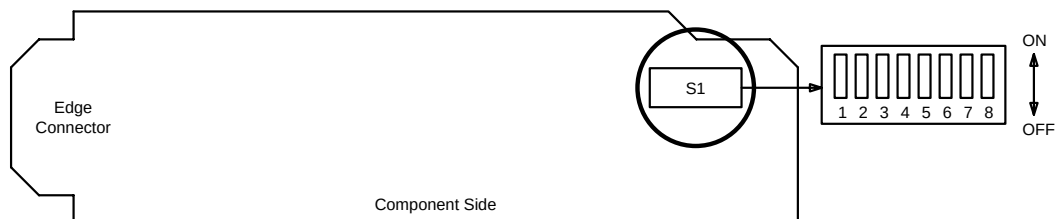


Figure 8. DS1/DS1PM Option Settings

26. **NOTE:**
It is recommended that a policy be established to set line coding either using the option switches OR using the "**set -t1**" command. If line code (lc) parameters are set using the "**set -t1**" command, the circuit pack switch settings will have no effect. The "**rtrv -t1**" command may be used to check line code settings.

Refer to Table M and Figure 8 and set the line code option switches, if required.

Table M. DS1/DS1PM Line Code Settings

Line Code Format	Switch S1 Settings				
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)	S1-8 (Note)
B8ZS	OFF	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON	

Note: Switch 1, section 8 (**S1-8**) is unused and ignored by the system.

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG6 STS1E

28. Determine from office records the length of the STS1E cabling between the DDM-2000 and the STSX cross-connect point.
29. Install the **STS1E** option jumpers per Table N and Figure 9.

Table N. STS1E LBO Settings

Cable Length (Ft)		
734D Cable	735A Cable	LBO Setting
0 to 225	0 to 125	LBO IN
>225 to 450	>125 to 250	LBO OUT

30.  **NOTE:**
The **STS1E** circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 Multiplexer. **STS1E** high speed mode interfaces with the **DS1/DS1PM** circuit packs at the VT-G rate. **STS1E** low speed mode interfaces with the **OLI** circuit packs at the STS-1 rate.

Determine **STS1E** mode of operation (high speed or low speed).

31. Set switch **S1** to mode of operation required (**HIGH-SPEED MODE** or **LOW-SPEED MODE**).
32. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

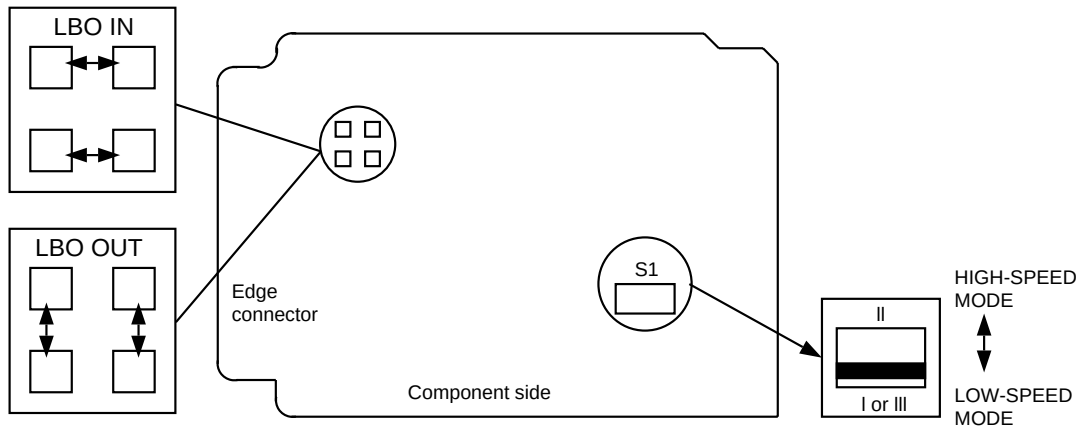


Figure 9. BBG6 STS1E Line Build-Out Jumpers and Mode Switch

BBF8 HDSL

33. Determine circuit pack option switch settings from office records or work order.
34. Set **HDSL** option switches per Table O and Figure 10.

Table O. HDSL Control Switch Settings

Control Settings	Switch S1 Settings			
	S1-1	S1-2	S1-3	S1-4
Master	—	OFF	—	OFF
Slave	—	ON	—	ON
Local	OFF	—	OFF	—
Remote	ON	—	ON	—

35. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
-

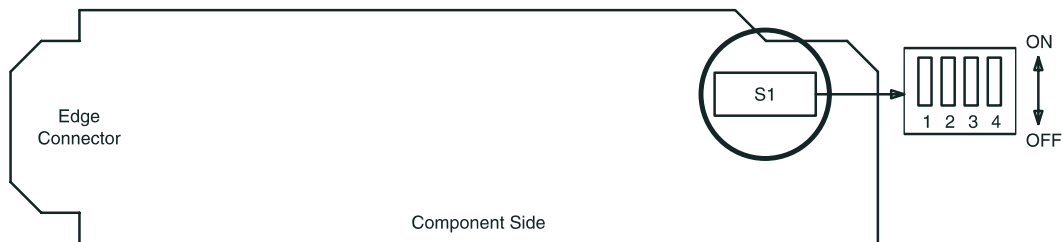


Figure 10. BBF8 HDSL Control Switch

Perform Optical Fiber Connections and Verification of Optical Facility

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
When handling optical pigtails or jumpers, take care to keep bending radius as large as possible.

 **NOTE 1:**
This procedure is used to connect OC-12, OC-3, and OC-1 optical fiber spans. For each span, determine the loss of each optical fiber and install the proper LBO. Then connect the fibers to the associated **IN** and **OUT** connectors of each **OLI**U at the end of the span.

 **NOTE 2:**
When installing LBOs, the rule for single-mode optical fibers is for the LBO to be installed on the **OUT** transmit connector of the **OLI**U. For multimode optical fibers, install the LBO on the **IN** receive connector of the **OLI**U.

 **NOTE 3:**
It is assumed that the optical jumpers used to connect the DDM-2000 OC-3 Multiplexer to an optical interconnection point are equipped with *ST*[®], FCPC, or SC lightguide cable connectors.

Dress optical cables at bottom front of the shelf.

2. Route the optical jumpers up through the slotted hole(s) at the bottom left-front corner of the shelf and up to the **OLIUs**. See Tables A and B.

Table A. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1EP-EP-2	107149494	2	ST [®] -ST
FS1EP-EP-10	107149536	10	ST-ST
FS1EP-EP-25	107149569	25	ST-ST
FS1EP-EP-50	107149601	50	ST-ST
FS1EP-EP-100	107149627	100	ST-ST
FS1E-A-2	105420905	2	ST-2016A Biconic
FS1E-A-10	105420947	10	ST-2016A Biconic
FS1E-A-25	105423958	25	ST-2016A Biconic
FS1E-A-50	105424006	50	ST-2016A Biconic
FS1E-A-100	105424022	100	ST-2016A Biconic
LS1SC-SC-2	106908247	2	SC-SC
LS1SC-SC-10	106908270	10	SC-SC
LS1SC-SC-25	106908304	25	SC-SC
LS1SC-SC-50	106908346	50	SC-SC
LS1SC-SC-100	106908395	100	SC-SC
LS1FP-FP-10	106593825	10	FCPC-FCPC
LS1FP-FP-25	106932908	25	FCPC-FCPC
LS1FP-FP-50	106932916	50	FCPC-FCPC
LS1FP-FP-100	106932924	100	FCPC-FCPC

Table B. Multimode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FL1E-E-2	105351795	2	ST [®] -ST
FL1-EP-EP-04	107150161	4	ST-ST
FL1-EP-EP-10	107150195	10	ST-ST
FL1-EP-EP-25	107150229	25	ST-ST
FL1-EP-EP-50	107150260	50	ST-ST
FL1-EP-EP-100	107150286	100	ST-ST
FL1E-A-2	105613954	2	ST-2016A Biconic
FL1E-A-10	105613988	10	ST-2016A Biconic
FL1E-A-25	105614010	25	ST-2016A Biconic
FL1E-A-50	105614051	50	ST-2016A Biconic
FL1E-A-100	105614119	100	ST-2016A Biconic
LL1SC-SC-2	106908668	2	SC-SC
LL1SC-SC-10	106908692	10	SC-SC
LL1SC-SC-25	106908734	25	SC-SC
LL1SC-SC-50	106908775	50	SC-SC
LL1SC-SC-100	10690879	100	SC-SC
LL1FC-FC-10	107095549	10	FC-FC
LL1FC-FC-25	107095556	25	FC-FC
LL1FC-FC-50	107095564	50	FC-FC
LL1FC-FC-100	107095572	100	FC-FC

3. Establish communication with technician at other end of the optical span.

4. **⇒ NOTE 1:**

The optical connector labeled **OUT** is the output from the **OLIU**. The optical connector labeled **IN** is the input to the **OLIU**.

⇒ NOTE 2:

For DDM-2000 **21G/21G-U/21G2-U/22F/22F-U/22F2-U** OLIUs, the recommended optical fiber is single mode, but multimode can be used. DDM-2000 **22G-U/22G2-U/22G3-U** OLIUs require single-mode optical fibers. DDM-2000 **24G-U** OLIU and FT-2000 **T939A OC12** Optical Interface require single-mode optical fibers. DDM-2000 **21D/21D-U/22D-U** OLIUs and FT-2000 **LAA5 IS3** Optical Interface require multimode optical fibers. For the FT-2000 **LAA10 OC3** Optical Interface the recommended optical fiber is single mode, but multimode can be used. For the DDM-2000 FiberReach **26G2-U** and DDM-2000 **27G-U/27G2-U** OLIUs the recommended optical fiber is single mode, but multimode can be used. For the DDM-2000 FiberReach **28G-U** OLIU the recommended optical fiber is single mode, but multimode can be used.

⇒ **NOTE 3:**

Optical fibers connecting this shelf with a far end shelf should not be connected to the **OLI** until at least 45 seconds after an optical loopback is removed.

⇒ **NOTE 4:**

It may take from 15 seconds to 3 minutes and 25 seconds for the **FAULT** LEDs to stop flashing after the cables are connected, depending on the setting of the OC-12, OC-3, or OC-1 signal degrade threshold (–5 to –9).

Remove protective covers from transmit optical jumper cables and lightguide buildout(s) [LBO(s)] and clean *ST*, FCPC, or SC connectors and LBO(s).

Reference: **DLP-527**

5. Have you determined the value of the lightguide buildouts (LBOs) for this span?

If **YES**, then proceed to **Step 9**.

If **NO**, then continue with **Step 6**.

Optical Power Measurement

Steps 6 through 9 are used to measure optical power. Replace LBOs with 0 dB LBOs per Figures 1, 2, 3, and/or 4. Connect the optical fiber transmit cable to the **OLI** **OUT** connection. Measure the optical power of the optical fiber receive cables at the other ends using an optical power meter.

6. At both ends of the optical span, replace the *ST*, FCPC, or SC LBOs with 0 dB LBOs per Figures 1, 2, 3, and/or 4 [**DLP-552**].

7.  **NOTE 1:**
For DDM-2000 OC-3 ring configurations, optical fibers extend in two different directions to make up the ring. At each shelf (node) in the ring, the **MAIN 1 OLIU** will connect to the **MAIN 2(P) OLIU** in one adjacent node, and the **MAIN 2(P) OLIU** will connect to the **MAIN 1 OLIU** in the other adjacent node. In Dual 0x1 configurations, the **MAIN 1 OLIU** will connect to the OC-12 **FUNCTION UNITS () 1 OLIU** and the **MAIN 2(P) OLIU** will connect to the OC-12 **FUNCTION UNITS () 2(P) OLIU**.
-  **NOTE 2:**
For DDM-2000 OC-3 & OC-12 to FT-2000 single-homing and dual-homing configurations, the DDM-2000 OC-3 Multiplexer **MAIN 1 OLIU** and/or **MAIN 2(P) OLIU** will connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, 8A, or 8B** depending on the application.
-  **NOTE 3:**
For DDM-2000 OC-3 to DDM-2000 FiberReach Wideband single-homing, dual-homing configurations, and stand alone optical fibers connect from DDM-2000 FiberReach Wideband **MAIN-1** and **MAIN-2** slots to the DDM-2000 OC-3 Multiplexer **FUNCTION UNITS A 1** and **A 2(P), B 1** and **B 2(P), or C 1** and **C 2(P) or MAIN 1** and **MAIN 2(P)** slots depending on the application.
-  **NOTE 4:**
For DDM-2000 OC-12 ring configurations, optical fibers extend in two different directions to make up the ring. At each shelf (node) in the ring, the DDM-2000 OC-3 **MAIN 1 OLIU** or DDM-2000 OC-12 **MAIN B 1 OLIU** will connect to the OC-3 **MAIN 2(P) OLIU** or OC-12 **MAIN B 2(P) OLIU** in another node, and the OC-3 **MAIN 2(P) OLIU** or OC-12 **MAIN B 2(P) OLIU** will connect to the OC-3 **MAIN 1 OLIU** or OC-12 **MAIN B 1 OLIU** in a separate node.

⇒ **NOTE 5:**

For DDM-2000 FiberReach Wideband OC-3 ring configurations, optical fibers extend in two different directions to make up the ring. At each shelf (node) in the ring, the DDM-2000 FiberReach OC-3 **MAIN-1 OLIU** will connect to the DDM-2000 OC-3 **MAIN 2(P) OLIU** or DDM-2000 FiberReach **MAIN-2** in another node, and the FiberReach OC-3 **MAIN-2 OLIU** will connect to the DDM-2000 OC-3 **MAIN 1 OLIU** or DDM-2000 FiberReach **MAIN-1**.

At each end of the span, connect the optical fiber transmit cables to the **OLIU OUT** connections.

8. At each end of the span, measure the optical power of the optical fiber receive cables using an optical power meter.
9. Replace the lightguide buildout assemblies with the correct buildout assemblies per Figures 1, 2, 3, and/or 4 and Tables C, D, E, F, G, H, I, J, K, L, M, and/or N [**DLP-552**].

Reconnect the optical fiber transmit cables at both ends.

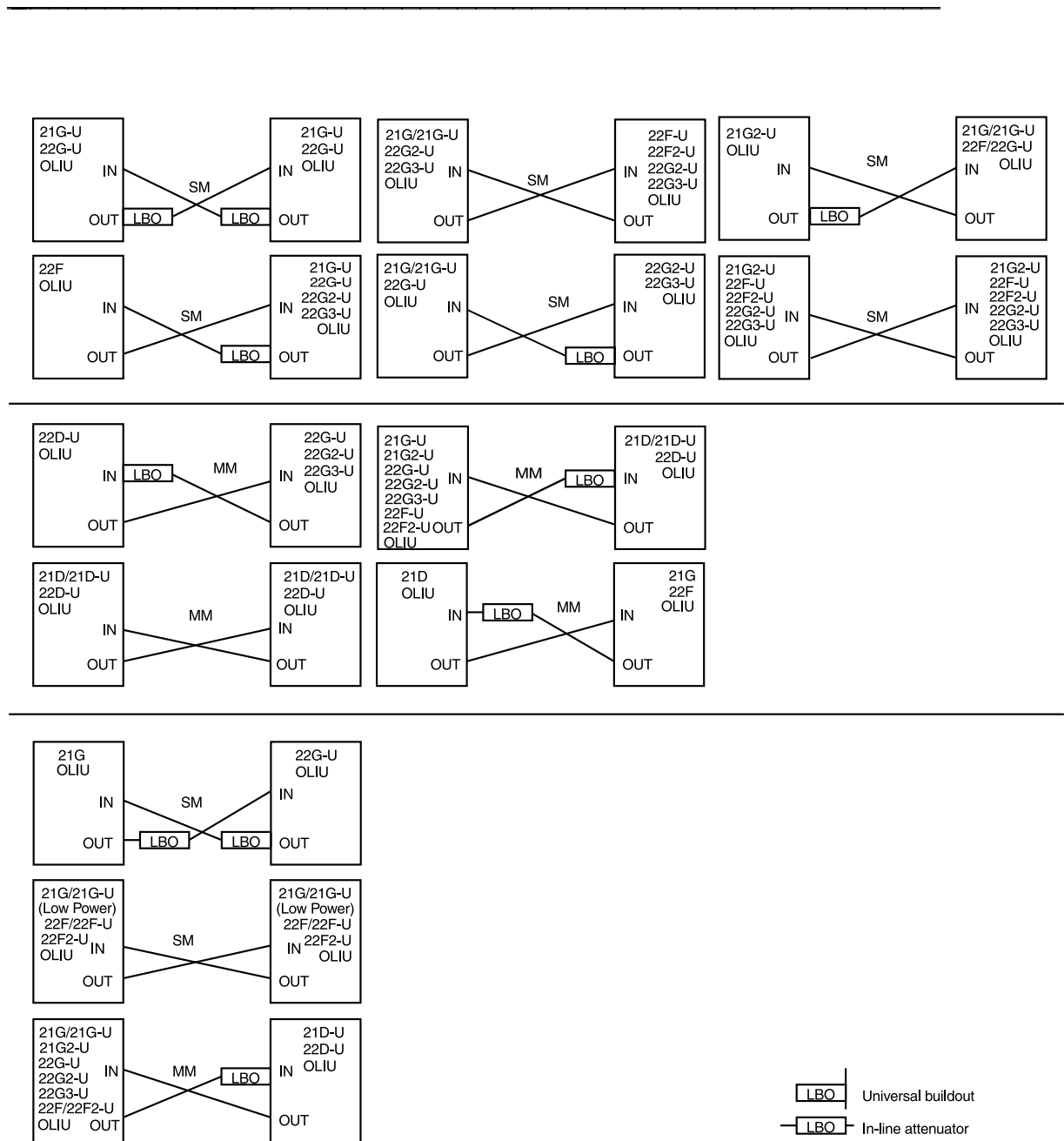


Figure 1. DDM-2000 OC-3 to OC-3 or OC-3 to OC-12 FN Fiber Optic Connections and Line Buildouts

Table C. DDM-2000 OC-3 to OC-3 or OC-3 to OC-12 FN Measured Optical Power and Required LBO

Transmitter	Receiver							
	22F OLIU 22G-U OLIU 21G/21G-U OLIU (High/Low Power)		21G2-U OLIU 22F-U OLIU 22F2-U OLIU 22G2-U OLIU 22G3-U OLIU		21D/21D-U/22D-U OLIU (Controlled Env.)		21D/21D-U/22D-U OLIU (Uncontrolled Env.)	
	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
21G/21G-U OLIU (High Power)					-2.5 to -5.0	15	-2.5 to -5.0	15
	-2.5 to -3.0	10			-5.0 to -10.0	10	-5.0 to -10.0	10
	-3.0 to -8.0	5			-10.0 to -15.0	5	-10.0 to -15.0	5
	-8.0 to -34.0	0	-2.5 to -34.0	0	-15.0 to -33.8	0	-15.0 to -31.8	0
21G/21G-U OLIU (Low Power)					-7.5 to -10.0	10	-7.5 to -10.0	10
	-7.5 to -8.0	5			-10.0 to -15.0	5	-10.0 to -15.0	5
	-8.0 to -34.0	0	-7.5 to -34.0	0	-15.0 to -33.8	0	-15.0 to -31.8	0
21G2-U OLIU					0.0 to -5.0	15	0.0 to -5.0	15
	0.0 to -3.0	10			-5.0 to -10.0	10	-5.0 to -10.0	10
	-3.0 to -8.0	5			-10.0 to -15.0	5	-10.0 to -15.0	5
	-8.0 to -34.0	0	0.0 to -34.0	0	-15.0 to -33.8	0	-15.0 to -31.8	0
22F/22F-U/22F2-U OLIU					-8.0 to -10.0	10	-8.0 to -10.0	10
					-10.0 to -15.0	5	-10.0 to -15.0	5
	-8.0 to -34.0	0	-8.0 to -34.0	0	-15.0 to -33.8	0	-15.0 to -31.8	0
22G-U/22G2-U/22G3-U OLIU					0.0 to -5.0	15	0.0 to -5.0	15
	0.0 to -3.0	10			-5.0 to -10.0	10	-5.0 to -10.0	10
	-3.0 to -8.0	5			-10.0 to -15.0	5	-10.0 to -15.0	5
	-8.0 to -34.0	0	0.0 to -34.0	0	-15.0 to -33.8	0	-15.0 to -31.8	0
21D/21D-U/22D-U OLIU (Controlled & Uncontrolled Env.) (MM Fiber Only)					-14.0 to -15.0	5	-14.0 to -15.0	5
	-14.0 to -34.0	0	-14.0 to -34.0	0	-15.0 to -33.8	0	-15.0 to -31.8	0

Notes:

1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.
2. The minimum measured received power allows for optical path penalty and unallocated margin. Connector loss is not allotted for; it should already be accounted for in the optical power measurement.
3. The margin for falling within the max rx power is 1.0 dB.

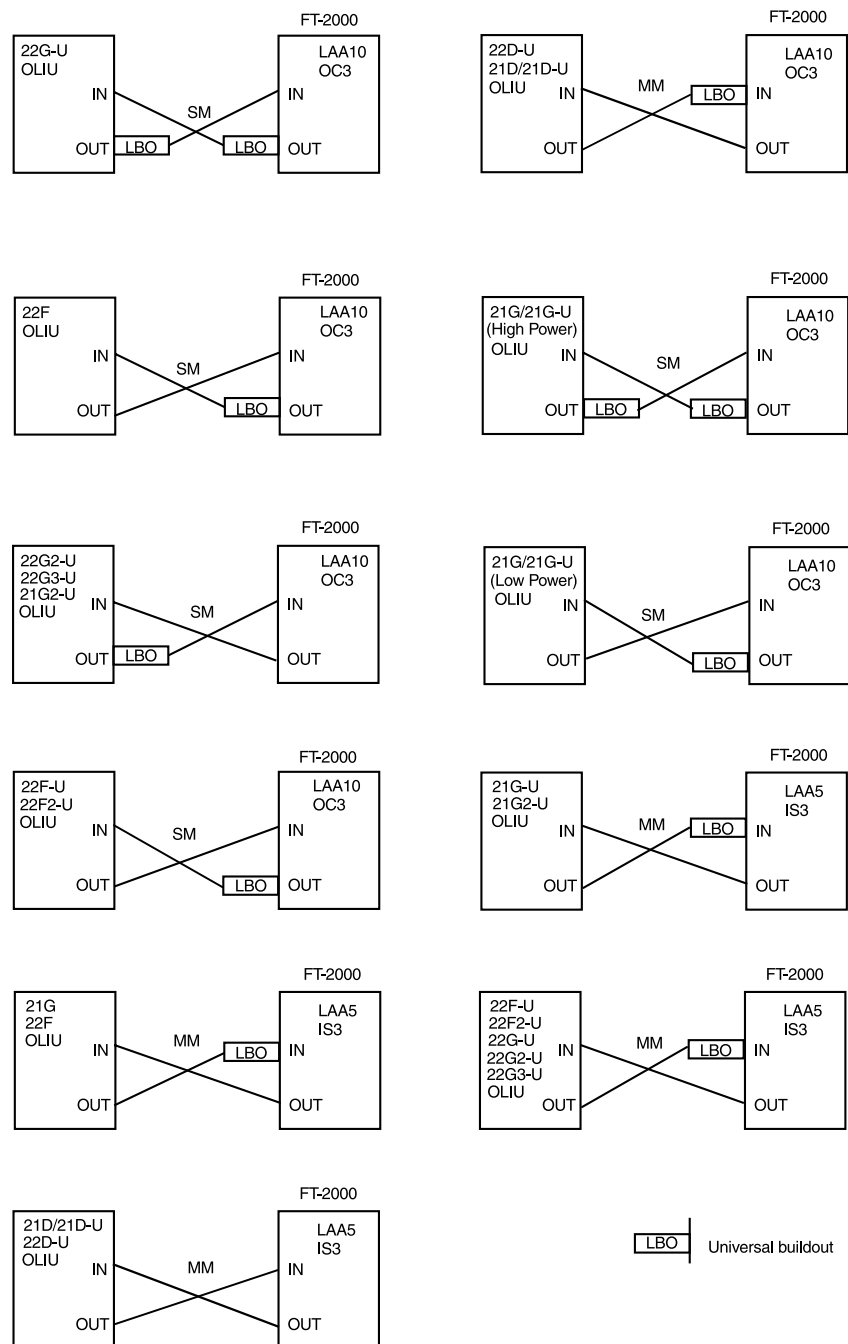


Figure 2. DDM-2000 OC-3 to FT-2000 LS INTFC Fiber Optic Connections and Line Buildouts

Table D. DDM-2000 OC-3 to FT-2000 LS INTFC Measured Optical Power and Required LBO

Transmitter	Receiver							
	LAA10 OC3 (FT-2000)	LAA5 IS3 (FT-2000)	22F-U OLIU	22F2-U OLIU 22G2-U OLIU 21G2-U OLIU	21D21D-U/22D-U OLIU (Controlled Env.)	21G21G-U OLIU (High/Low Power)		
LAA10 OC3 (FT-2000)	Received Power(dBm)	LBO Power(dBm)	Received Power(dBm)	LBO Power(dBm)	Received Power(dBm)	LBO Power(dBm)	Received Power(dBm)	LBO Power(dBm)
			0.0 to -5.0	15			0.0 to -5.0	15
			-5.0 to -10.0	10			-5.0 to -10.0	10
			-10.0 to -15.0	5			-10.0 to -15.0	5
			-15.0 to -34.0	0	-7.0 to -34.0	0	-15.0 to -33.8	0
LAA5 IS3 (FT-2000)							-5.0 to -14.0	10
			-14.0 to -15.0	5	-14.0 to -15.0	5	-14.0 to -15.0	5
			-15.0 to -34.0	0	-15.0 to -34.0	0	-15.0 to -33.8	0
22G-U/22G2-U/22G3-U OLIU			0.0 to -5.0	15				
			-5.0 to -10.0	10				
			-10.0 to -15.0	5				
			-15.0 to -30.8	0				
21D21D-U/22D-U OLIU			-14.0 to -15.0	5				
			-15.0 to -30.8	0				
22F22F-U/22F2-U OLIU			-8.0 to -10.0	10				
			-10.0 to -15.0	5				
21G21G-U OLIU (High Power)			-8.0 to -34.0	0				
			-15.0 to -30.8	0				
			-2.5 to -5.0	15				
			-5.0 to -10.0	10				
			-10.0 to -15.0	5				
21G21G-U OLIU (Low Power)			-7.5 to -10.0	10				
			-10.0 to -15.0	5				
			-15.0 to -34.0	0				
21G2-U OLIU			0.0 to -5.0	15				
			-5.0 to -10.0	10				
			-10.0 to -15.0	5				
			-15.0 to -30.8	0				

- Notes:
1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.
 2. The minimum measured received power allows for optical path penalty and unallocated margin. Connector loss is not allotted for; it should already be accounted for in the optical power measurement.
 3. The margin for failing within the max rx power is 1.0 dB.

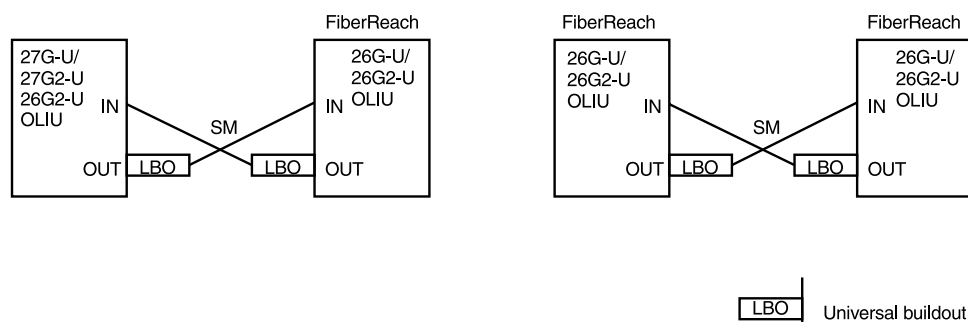


Figure 3. DDM-2000 OC-3 to DDM-2000 FiberReach OC-1 Optic Connections and Line Buildouts

Table E. DDM-2000 OC-3 to DDM-2000 FiberReach OC-1 Measured Optical Power and Required LBO

Transmitter	Receiver			
	26G-U/26G2-U OLIU (FiberReach)		27G-U/27G2-U OLIU (DDM-2000)	
	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
26G-U/26G2-U OLIU (FiberReach)	0.0 to -5.0	15	0.0 to -5.0	15
	-5.0 to -10.0	10	-5.0 to -10.0	10
	-10.0 to -15.0	5	-10.0 to -15.0	5
	-15.0 to -31.0	0	-15.0 to -31.0	0
27G-U/27G2-U OLIU (DDM-2000)	0.0 to -5.0	15		
	-5.0 to -10.0	10		
	-10.0 to -15.0	5		
	-15.0 to -31.0	0		
26G2-U OLIU (DDM-2000)	0.0 to -5.0	15		
	-5.0 to -10.0	10		
	-10.0 to -15.0	5		
	-15.0 to -31.0	0		

Notes:

1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.
2. The minimum measured received power allows for optical path penalty and unallocated margin. Connector loss is not allotted for; it should already be accounted for in the optical power measurement.
3. The margin for falling within the max rx power is 1.0 dB.

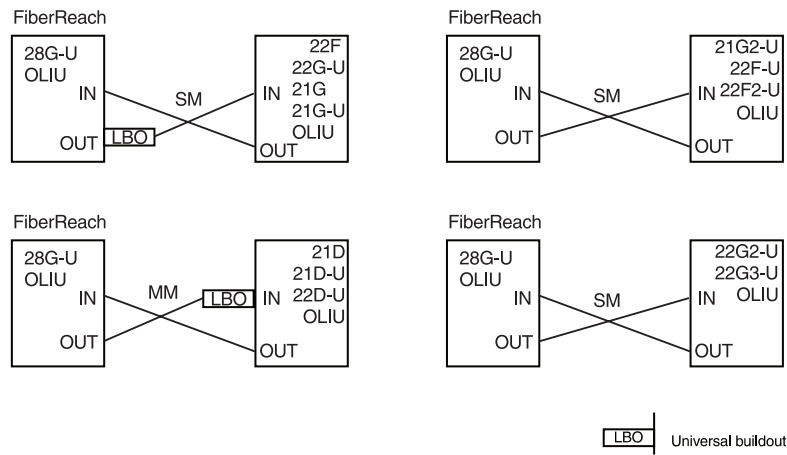


Figure 4. DDM-2000 OC-3 to DDM-2000 FiberReach OC-3 Fiber Optic Connections and Line Buildouts

Table F. DDM-2000 OC-3 to DDM-2000 FiberReach OC-3 Measured Optical Power and Required LBO

Transmitter	Receiver									
	28G-U OLIU		22F OLIU 22G-U OLIU 21G/21G-U OLIU (High/Low Power)		21G2-U OLIU 22F-U OLIU 22F2-U OLIU 22G2-U OLIU 22G3-U OLIU		21D/21D-U/22D-U OLIU (Controlled Env.)		21D/21D-U/22D-U OLIU (Uncontrolled Env.)	
	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
28G-U OLIU							0.0 to -5.0	15	0.0 to -5.0	15
			0.0 to -3.0	10			-5.0 to -10.0	10	-5.0 to -10.0	10
			-3.0 to -8.0	5			-10.0 to -15.0	5	-10.0 to -15.0	5
	0.0 to -34.0	0	-8.0 to -34.0	0	0.0 to -34.0	0	-15.0 to -33.8	0	-15.0 to -31.8	0
21G/21G-U OLIU (High Power)										
	-2.5 to -34.0	0								
21G/21G-U OLIU (Low Power)										
	-7.5 to -34.0	0								
21G2-U OLIU										
	0.0 to -34.0	0								
22F/22F-U/22F2-U OLIU										
	-8.0 to -34.0	0								
22G-U/22G2-U/22G3-U OLIU										
	0.0 to -34.0	0								
21D/21D-U/22D-U OLIU (Controlled & Uncontrolled Env.) (MM Fiber Only)										
	-14.0 to -34.0	0								

Notes:

1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.
2. The minimum measured received power allows for optical path penalty and unallocated margin. Connector loss is not allotted for; it should already be accounted for in the optical power measurement.
3. The margin for falling within the max rx power is 1.0 dB.

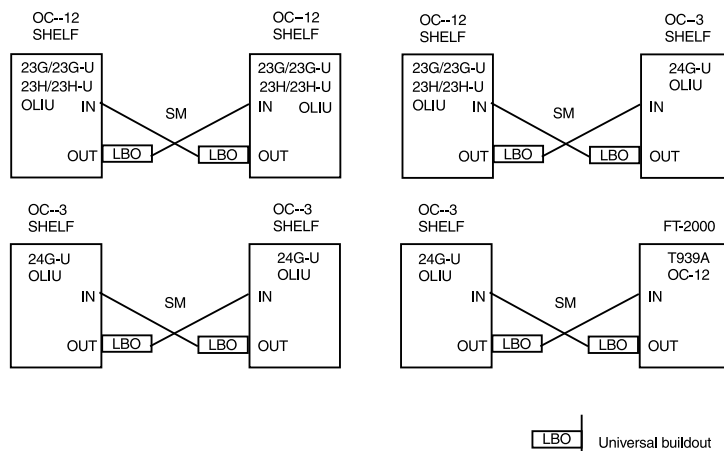


Figure 5. DDM-2000 OC-3 Shelf to OC-12 Shelf or FT-2000 OC-12 LS INTFC Fiber Optic Connections and Line Buildouts

Table G. DDM-2000 OC-3 Shelf to FT-2000 OC-12 LS INTFC Measured Optical Power and Required LBO

Transmitter	Receiver			
	T939A OC12 (FT-2000)		24G-U OLIU (OC-3 Shelf)	
	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
T939A OC12 (FT-2000)				
			2.0 to 1.0	15
			1.0 to -4.0	10
			-4.0 to -9.0	5
			-9.0 to -31.0	0
24G-U OLIU (OC-3 Shelf)				
	2.0 to 1.0	15		
	1.0 to -4.0	10		
	-4.0 to -9.0	5		
	-9.0 to -31.0	0		

Notes:

1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.
2. The minimum measured received power allows for optical path penalty and unallocated margin. Connector loss is not allotted for; it should already be accounted for in the optical power measurement.
3. The margin for falling within the max rx power is 1.0 dB.

Table H. DDM-2000 OC-3 Shelf to OC-12 Shelf OC-12 Measured Optical Power and Required LBO

Transmitter	Receiver					
	24G-U OLIU (OC-3 Shelf)		23G/23G-U OLIU (OC-12 Shelf)		23H/23H-U OLIU (OC-12 Shelf)	
	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
24G-U OLIU (OC-3 Shelf)					2.0 to -3.0	20
	2.0 to 1.0	15	2.0 to 1.0	15	-3.0 to -8.0	15
	1.0 to -4.0	10	1.0 to -4.0	10	-8.0 to -13.0	10
	-4.0 to -9.0	5	-4.0 to -9.0	5	-13.0 to -18.0	5
	-9.0 to -31.0	0	-9.0 to -31.0	0	-18.0 to -34.0	0
23G/23G-U OLIU (OC-12 Shelf)					2.0 to -3.0	20
	2.0 to 1.0	15	2.0 to 1.0	15	-3.0 to -8.0	15
	1.0 to -4.0	10	1.0 to -4.0	10	-8.0 to -13.0	10
	-4.0 to -9.0	5	-4.0 to -9.0	5	-13.0 to -18.0	5
	-9.0 to -31.0	0	-9.0 to -31.0	0	-18.0 to -34.0	0
23H/23H-U OLIU (OC-12 Shelf)					2.0 to -3.0	20
	2.0 to 1.0	15	2.0 to 1.0	15	-3.0 to -8.0	15
	1.0 to -4.0	10	1.0 to -4.0	10	-8.0 to -13.0	10
	-4.0 to -9.0	5	-4.0 to -9.0	5	-13.0 to -18.0	5
	-9.0 to -31.0	0	-9.0 to -31.0	0	-18.0 to -34.0	0

Notes:

1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.
2. The minimum measured received power allows for optical path penalty and unallocated margin.
Connector loss is not allotted for; it should already be accounted for in the optical power measurement.
3. The margin for falling within the max rx power is 1.0 dB.

Table I. In-Line Single-Mode (SM) and Multimode (MM) Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2000B	106597297	<i>ST</i>	MM-MM	Blue
10 dB	A2000D	106597446	<i>ST</i>	MM-MM	Black
5 dB	A3000B	106060718	<i>ST</i>	SM-SM	Blue
10 dB	A3000D	106060734	<i>ST</i>	SM-SM	Black

Table J. Universal Single-Mode (SM) *ST*[®] Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3070	106795354	<i>ST</i>	SM-SM & MM-MM	None
5 dB	A3070B1	107406183	<i>ST</i>	SM-SM	Blue
10 dB	A3070D1	107406191	<i>ST</i>	SM-SM	Black
15 dB	A3070F1	107406209	<i>ST</i>	SM-SM	Green

Table K. Universal Single-Mode (SM) FCPC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3080	106795404	FCPC	SM-SM & MM-MM	None
5 dB	A3080B1	107406225	FCPC	SM-SM	Blue
10 dB	A3080D1	107406233	FCPC	SM-SM	Black
15 dB	A3080F1	107406241	FCPC	SM-SM	Green

Table L. Universal Single-Mode (SM) SC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3060	106708951	SC	SM-SM & MM-MM	None
5 dB	A3060B1	107406142	SC	SM-SM	Blue
10 dB	A3060D1	107406159	SC	SM-SM	Black
15 dB	A3060F1	107406167	SC	SM-SM	Green

Table M. Universal Multimode (MM) ST[®] Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2070B	106795313	ST	MM-MM	Blue
10 dB	A2070D	106795321	ST	MM-MM	Black
15 dB	A2070F	106795339	ST	MM-MM	Green

Table N. Universal Multimode (MM) SC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2060B	106795271	SC	MM-MM	Blue
10 dB	A2060D	106795289	SC	MM-MM	Black
15 dB	A2060F	106795297	SC	MM-MM	Green

Fiber Connection

10. At far end, connect the input optical fiber to the proper **OLIU IN** (receive) connector.
11. Did **FAULT** LED go off on the far-end **OLIU**?
If **NO**, then continue with **Step 12**.
If **YES**, then proceed to **Step 13**.
12. Check optical fiber connections. Verify integrity of fiber connections by ensuring correct output at one end is connected to correct input at the other end. Replace **OLIU** with flashing LED. Continue with this procedure when trouble is cleared.
13. At near end, connect the input optical fiber(s) to the corresponding **OLIU IN** (receive) connector.
14. Did **FAULT** LED go off on the near-end **OLIU**?
If **NO**, then continue with **Step 15**.
If **YES**, then proceed to **Step 16**.
15. Check optical fiber connections at both ends of the fiber. Verify the integrity of the fiber connections by ensuring **OLIU** output at one end is connected to the correct **OLIU** input at the other end. Verify proper systems have been connected by using the "**rtrv-map-neighbor**" command (Figure 6).

Fiber Verification

16. Disconnect the fiber cable from the **OUT** connector on the **OLIU** at one end of the span. At the other end, verify that the associated **FAULT** LED is flashing, indicating a loss of signal. Reconnect the fiber and repeat the process for the other direction of transmission.
17. Verify proper systems have been connected by using the "**rtrv-map-network**" and "**rtrv-map-neighbor**" commands to retrieve a map of the network (Figures 5 and 6).

```
Site6NE1 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-network: COMPLD
/* Network Map for Site6NE1
=====
System Name      Comm.   Product      NE      Alarm
(TID)            Status  Type          Type    Group
=====
Site6NE1                DDM-2000 OC-3      DSNE      3
Site7NE1                FT-2000              3
Site3NE1                DDM-2000 OC-12      3
Site4NE1      FAILED   DACS IV-2000        3
Site5NE1                FT-2000              201
Site8NE1                DDM-2000 OC-12      201
Site9NE1                FiberReach           250
Site10NE1               FiberReach           250
Site11NE1               FiberReach           250
*/
```

Figure 6. Sample Report From rtrv-map-network Command

```
Site6NE1 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-neighbor: COMPLD
/* Neighbor Map for Site6NE1
=====
System Name      Connected  Link      Product
(TID)            Through   Comm.     Type
Status
=====
Site6NE1                main-1    FAILED   DDM-2000 OC-3
Site7NE1                main-2    FAILED   DDM-2000 OC-3
Site5NE1                main-2    FAILED   DDM-2000 OC-3
*/
```

Figure 7. Sample Report From rtrv-map-neighbor Command

18. After all connections and tests have been made, verify optical fiber cables are placed correctly in fiber tray/rings and properly routed in bay framework. Reinstall front cover and tighten three screws.
19. Repeat this procedure for each fiber span to be connected until the end-to-end system is established.
20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform End-to-End Optical Line Test

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **NOTE 1:**
This test is used in ring releases to verify the integrity of the OC-3 or OC-12 fiber lines between two DDM-2000 shelves and may be performed with the DDM-2000 in service or out of service. It is also used in linear releases when adding a shelf in the middle of an optical span. Refer to **DLP-525** for optical line tests in other cases.

 **NOTE 2:**
It is assumed that each DDM-2000 has passed the local (looped) transmission tests and a CIT is available. If these tests have not been completed, refer to the appropriate procedure and perform the tests.

 **NOTE 3:**
This test must be performed locally at each shelf location associated with the optical span(s) being tested. See Figure 1.

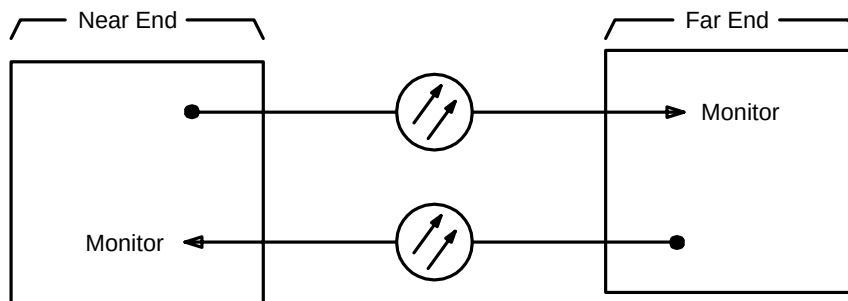


Figure 1. End-to-End Optical Line Test Monitoring

2. At test location, connect CIT to User Panel **CIT** connector and establish session.

Reference: **DLP-521**

3.  **CAUTION:**
*The **init-pm:reg=all** command initializes (clears) all current day and/or all current quarter-hour performance-monitoring storage registers.*

 **NOTE:**
If local procedures prohibit you from doing the **init-pm:reg=all** command, you may perform the following in Steps 5 and 6. Use the **rtrv-pm-line** command to obtain the line performance monitoring status report, note the readings on the Today line in the report, wait 20 seconds and then obtain another report. There should be no change in readings from the first report.

Enter the command **init-pm:reg=all**, if allowed.

4. Wait 20 seconds.

5. Enter one of the following commands:

- **rtrv-pm-line:main-1** if service line is being tested.
- **rtrv-pm-line:main-2** if protection line is being tested.
- **rtrv-pm-line:main-all** if both lines are being tested.

Response: The following CIT report will indicate the status of the equipment. The Today line should indicate that there are no errors. Other Time lines may exist with numbers greater than zero. (The "Commands and Reports" section of this manual under **RTRV-PM-LINE** describes this report.)

For OC-3 Release 9.1 and earlier, the output report appears as follows:

```
/* Line Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
                   quarter hour registers at yy-mm-dd hh:mm:ss
=====
Address      Start  B2 CV  B2 ES  B2 ES  B2 ES  B2 SES  B2 UAS  PSC-L
              Time
              Type A  Type B
=====
address      time    nn..   nn..   nn..   nn..   nn..   nn..   nn..
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
-----
address      time    nn..   nn..   nn..   nn..   nn..   nn..   nn..
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
*/
```

For OC-3 Release 11.0 and later, the output report appears as follows:

```

/* Line Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                     quarter hour registers at yy-mm-dd hh:mm:ss
=====
Address      Start   B2 CV   B2 ES   B2 ESA  B2 UAS  PSC-L  PJC
              Time
              B2 SES  B2 ESB
=====
address      time      nn..    nn..    nn..    nn..    nn..    nn..
.            .         .        .        .        .        .        .
.            .         .        .        .        .        .        .
.            .         .        .        .        .        .        .
-----
address      time      nn..    nn..    nn..    nn..    nn..    nn..
.            .         .        .        .        .        .        .
.            .         .        .        .        .        .        .
.            .         .        .        .        .        .        .
*/

```

6. If test is being performed on **OLIU(s)** installed in **FUNCTION UNIT** slot(s), enter one of the following commands:
 - **rtrv-pm-line:fn-{a or b or c}-1** if service line is being tested.
 - **rtrv-pm-line:fn-{a or b or c}-2** if protection line is being tested.
 - **rtrv-pm-line:fn-{a or b or c}-all** if both lines are being tested.
7. Has performance-monitoring report been obtained from all shelf locations associated with optical span(s) being tested?
 - If **NO**, then continue with **Step 8**.
 - If **YES**, then proceed to **Step 9**.
8. Repeat this procedure from Step 3 at other locations.
9. Did report indicate errors?
 - If **YES**, then continue with **Step 10**.
 - If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Trouble may be in optical fiber and/or connections. Trouble may also be in **OLIUs**. If the report indicated trouble when the report was obtained from the near end of the span, trouble may be in the receive direction (see Figure 1). If the report indicated trouble when the report was obtained from the far end of the span, trouble may be in the transmit direction. Check optical fiber and connections. Clean optical fiber connections [**DLP-527**]. If no trouble found in the optical fibers, replace **OLIU(s)** [**DLP-523**] associated with the address indicated in the report.
11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Local Office Alarms

1.  **CAUTION:**
This test will interrupt service if it is performed without a CIT. If done with a CIT, this test can be performed on an in-service system.

-  **NOTE:**
It is assumed that you were sent here by another procedure to test the DDM-2000 alarms.

- Is a CIT available?
If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 5**.

2. Connect CIT to **CIT** connector on the User's Panel.

3.  **NOTE:**
The "Commands and Reports" section of this user's manual under **TEST-ALM** gives a description of the **test-alm** command.

Use the **test-alm** command to perform alarm tests. Note the audible and visual alarm indications during the test.

4. Did the **DDM-2000** pass the alarm tests?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 17**.

5. **NOTE:**

It is assumed that the DDM-2000 is powered and running with loops at the low-speed cross-connections and that the high-speed terminations are either looped on themselves or connected in an end-to-end looped configuration. It is also assumed that protection circuit packs are installed and that no alarms or other diagnostic indications are activated.

Unseat the service circuit pack in **FUNCTION UNITS** slot **A 1**, **B 1**, or **C 1**.

6. Wait 30 seconds.

7. Is the minor (**MN**) alarm activated?

If **YES**, then continue with **Step 8**.

If **NO**, then proceed to **Step 16**.

8. Leave the service circuit pack unseated and unseat the protection circuit pack in **FUNCTION UNITS** slot **A 2(P)**, **B 2(P)**, or **C 2(P)**.

9. Wait 30 seconds.

10. **NOTE:**

In some offices the critical and major alarms may be wired together if a separate critical alarm is not available. The following step will activate a critical (**CR**) alarm on the User Panel.

Is the critical (**CR**) or major (**MJ**) office alarm activated?

If **YES**, then continue with **Step 11**.

If **NO**, then proceed to **Step 16**.

11. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the circuit packs.

12. Unseat the protection **DS1/DS1PM** and service **DS1/DS1PM** circuit pack in the same **LOW SPEED GROUP** (**A ()** and **8(P)**, **B ()** and **8(P)**, or **C ()** and **8(P)**).
13. Is the major (**MJ**) alarm activated?
 If **YES**, then continue with **Step 14**.
 If **NO**, then proceed to **Step 16**.
14. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.
15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
16. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.
17. The **DDM-2000** has failed the alarm test. The most likely source of the problem is the alarm wiring. Check that the alarms are connected correctly. If the wiring is correct and the failure persists, refer to **Trouble Clearing: TAP-108** to clear the failure.
18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Parallel Telemetry

1.  **CAUTION:**
This test will interrupt service if it is done without a CIT. If done with a CIT, this test can be done on an in-service system.

 **NOTE:**
It is assumed that you were sent here by another procedure to test the DDM-2000 parallel telemetry.

Is a CIT available?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 6**.

2. Connect the CIT to the **CIT** connector on the User Panel.
3. Refer to the "Commands and Reports" section of this user's manual under **TEST-TLM-PAR** for a description of the tests.
4. Contact the monitoring location and use the **test-tlm-par** command to perform the parallel telemetry tests as described in the "Commands and Reports" section of this manual.
5. Did the DDM-2000 pass the parallel telemetry tests?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then proceed to **Step 18**.

6. **⇒ NOTE 1:**

It is assumed that the DDM-2000 is powered and running with loops at the low-speed cross-connection and that the high speed terminations are either looped on themselves or connected in an end-to-end looped configuration. It is also assumed that the system is equipped with protection circuit packs and that no alarms or other diagnostic indications are activated.

⇒ NOTE 2:

It is assumed that the DDM-2000 is connected to a telemetry system and that the state of the telemetry inputs and outputs to that system can be determined.

Unseat the service circuit pack in **FUNCTION UNITS** slot **A 1**, **B 1**, or **C 1**.

7. Wait 30 seconds.
8. Is the minor (**MN**) alarm telemetry point activated?
If **YES**, then continue with **Step 9**.
If **NO**, then proceed to **Step 17**.
9. Leave the service circuit pack unseated and unseat the protection circuit pack in **FUNCTION UNITS** slot **A 2(P)**, **B 2(P)**, or **C 2(P)**.
10. Wait 30 seconds.
11. Is the critical (**CR**) alarm telemetry point activated?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 17**.
12. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.
13. Unseat the protection **DS1/DS1PM** and service **DS1/DS1PM** circuit pack in the same **LOW SPEED GROUP** (**A ()** and **8(P)**, **B ()** and **8(P)**, or **C ()** and **8(P)**).
14. Is the major (**MJ**) alarm activated?
If **YES**, then continue with **Step 15**.
If **NO**, then proceed to **Step 17**.

15. The remaining telemetry points can be tested in the same manner. For example, to check the **INC** telemetry point, disconnect one or more of the incoming DS1 signals. To test the **CLF** point, disconnect one of the receive optical fibers.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
17. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.
18. The **DDM-2000** has failed the parallel telemetry alarm test. The most likely source of the problem is the telemetry wiring. Check that the telemetry is connected correctly. If the wiring is correct and the failure persists, refer to **Trouble Clearing: TAP-108** to clear the failure.
19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Telemetry Byte-Oriented Serial (TBOS) Telemetry

1.  **NOTE 1:**
It is assumed that the DDM-2000 under test is powered and running and that no alarms or other diagnostic indicators are activated.
-  **NOTE 2:**
It is assumed that the DDM-2000 under test is connected to a serial telemetry system and that access to the central telemetry equipment is available.

Is a CIT available?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 7**.

2. Connect the CIT to the **CIT** connector on the User Panel.
3. Refer to the "Commands and Reports" section of this manual under **TEST-TLM-SER** for a description of the tests.
4. Contact the monitoring location and use the **test-tlm-ser** command to perform the serial telemetry tests as described in the "Commands and Reports" section of this manual.
5. Did the DDM-2000 pass the serial telemetry tests?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 15**.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
7. At the central telemetry equipment send a message to the DDM-2000 to Lockout Switching - LS-A (Command **22**).

8. Is scan point **58** (Valid Command Received) raised?
If **YES**, then continue with **Step 9**.
If **NO**, then proceed to **Step 15**.
9. Is scan point **56** (Lockout LS Equipment Protection Switching) raised?
If **YES**, then continue with **Step 10**.
If **NO**, then proceed to **Step 15**.
10. At the central telemetry equipment send a message to the DDM-2000 to Reset Switching - LS-A (Command **25**).
11. Is scan point **58** (Valid Command Received) raised?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 15**.
12. Is scan point **56** (Lockout LS Equipment Protection Switching) retired?
If **YES**, then continue with **Step 13**.
If **NO**, then proceed to **Step 15**.
13. The DDM-2000 has passed the serial telemetry test.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
15. The DDM-2000 has failed the serial telemetry test. A likely source of the trouble is the telemetry wiring. Check the connections. If the wiring is correct and the trouble persists, refer to **Trouble Clearing: TAP-108** to clear the failure condition.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Test Protection Switching Function

1. Is a CIT available?
 If **YES**, then continue with **Step 2**.
 If **NO**, then proceed to **Step 7**.
2. To test for a switch to protection using a CIT, connect the CIT to the **CIT** connector on the User Panel. Enter the command: "**rtrv-state-eqpt**". The terminal will display the current protection status.
3. Use one of the switch commands (for example, "**switch-ls:address:pri>manual**", "**switch-line:address:pri>manual**" (linear) or "**switch-fn:address:pri>manual**" to perform a switch.
4. Enter the command: "**rtrv-state**" to verify the switch was done.
5. Use the "**switch-():address:pri=reset**" command to reset switch.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
7.  **NOTE:**
 The alarm delay is provisionable from 0 to 30 seconds. This procedure assumes the alarm delay is set for the default of 2 seconds.

To test a low-speed switch to protection, unseat one of the **DS1/DS1PM** circuit packs, if installed.

Response: **NE ACTY** LED on User Panel lights. **MN** LED lights after 2 seconds.

8. Reseat the circuit pack that was removed.

Response: All LEDs go OFF after 2 seconds.

9. Repeat Step 7 for each equipped muldem.

10. To test a high-speed switch to protection, unseat a **MXRVO/STS1E** circuit pack with a lighted **ACTIVE** LED.

Response: The green **ACTIVE** LED on the companion circuit pack lights. The **NE ACTY** LED on User Panel lights. The **MN** alarm lights after 2 seconds.

11. Reseat the circuit pack that was removed.

Response: After 2 seconds, all LEDs go OFF.

12. Is the system a linear or ring configuration?

If **linear** configuration , then continue with **Step 13**.

If **ring** configuration, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13.  **WARNING:**

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

Are both **ACTIVE** LEDs lighted on a pair of **OLIUS**?

If **YES**, then continue with **Step 14**.

If **NO**, then proceed to **Step 17**.

14. Remove and immediately reconnect the upper **IN** fiber from one **OLIU**. Wait for the red **FAULT** LED to stop flashing.

15. Did the green **ACTIVE** LED go off on the **OLIU**.

If **NO**, then continue with **Step 16**.

If **YES**, then proceed to **Step 17**.

16. Remove and immediately reconnect the upper **IN** fiber from the other **OLIU**. Wait for the red **FAULT** LED to stop flashing.

17. Remove the upper **IN** fiber from the **OLI** with the lighted **ACTIVE** LED.

Response: The **NE ACTY** LED on User Panel and **ACTIVE** LED on companion **OLI** light. **MN** LED lights after 2 seconds. **ACTIVE** LED remains lighted on **OLI** with fiber disconnected.

18. Reconnect the fiber.
19. Remove and immediately reconnect the upper **IN** fiber from the other **OLI**.

Response: **ACTIVE** LED goes off on the **OLI** that just had the fiber removed.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Condition DS1/DS1PM Circuit Pack/Port for New DS1 Service

1.  **NOTE 1:**
The commands "**rtrv-alm**" and "**rtrv-state-eqpt**" may be used to check for alarms, locks, loops, and switches.
-  **NOTE 2:**
If line code (lc) parameters have been previously set using the "**set-t1**" command, the circuit pack line code switch settings will have no effect. There will be no indication of improper switch settings until you try to establish service. It is recommended that a policy be established to set line coding either using the switches OR using CIT commands. Use the "**rtrv-t1**" command to check line code settings.

Use "**rtrv-alm**" command to verify that no alarms, locks, loops, or switches are present.

2. Is a new **DS1/DS1PM** circuit pack being installed?
If **YES**, then proceed to **Step 12**.
If **NO**, then continue with **Step 3**.
3.  **CAUTION 1:**
*To minimize hits on in-service ports on the **DS1/DS1PM** circuit pack having a DS1 port added, it is recommended to either use a CIT to manually switch the DS1 to protection if the **DS1/DS1PM** circuit pack must be removed, or use the CIT to set DS1 port options without removing the circuit pack.*
-  **CAUTION 2:**
*If the protection **DS1/DS1PM** circuit pack is not available for a protection switch, removing a service **DS1/DS1PM** circuit pack will interrupt service on all DS1 ports on that circuit pack. If a CIT is available, use the "**rtrv-state-eqpt**" command to check the status of the protection switch.*



CAUTION 3:

*When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A Retainer Card** in the same **LOW SPEED GROUP** will result in a loss of service to the protected **DS1/DS1PM** circuit pack and the removed **DS1/DS1PM** circuit pack.*

Are line code (AMI or B8ZS) settings set manually (with switches) or with a CIT?

If **MANUALLY**, then continue with **Step 4**.

If **CIT**, then proceed to **Step 10**.

4. Is protection **DS1/DS1PM** circuit pack available for protection switch?

If **YES**, then continue with **Step 5**.

If **NO**, then proceed to **Step 8**.

5. Remove service **DS1/DS1PM** circuit pack, set option switches as required and reinstall **DS1/DS1PM** circuit pack.

Reference: **DLP-513**

6. Momentarily depress **UPD/INIT** pushbutton on **SYSCTL** to update equipment list.
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
8. Option settings on the **DS1/DS1PM** circuit pack must be set or verified as set before placing the DS1 port in service. Wait until the protection **DS1/DS1PM** circuit pack is available or obtain a CIT to set the options.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
10. Use "**set - t1**" command to set **DS1/DS1PM** circuit pack port options.
11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12.  **CAUTION 1:**
*When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A Retainer Card** in the same **LOW SPEED GROUP** will result in a loss of service to the protected **DS1/DS1PM** circuit pack and the removed **DS1/DS1PM** circuit pack.*

-  **CAUTION 2:**
*No service **DS1/DS1PM** circuit pack locations (slots) should be left empty.*

-  **NOTE:**
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 **LOW SPEED GROUP** slots from the DDM-2000's internal protection bus.

Remove **177A Retainer Card** from the DS1 slot being equipped.

13. Set option switches and install new **DS1/DS1PM** circuit pack.

Reference: **DLP-508**

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect CIT and Establish Session

1.  **CAUTION:**
You must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly whenever working with the DDM-2000.

 NOTE 1:

If all shelves in a bay are connected together with CIT bay mult cabling, the CIT may be connected to the front or rear **CIT** connector on any shelf equipped with new **BBG8/BBG9** controllers to gain access to any other shelf by entering a shelf number. If the CIT is connected to the rear **CIT** connector, it must be connected through a null modem.

If you connect the CIT to a shelf with old **BBG5/BBG7** controllers, you cannot access other bay shelves with new **BBG8/BBG9** controllers unless you first log into the old controller shelf, then log out. Shelves with new controllers can then be accessed.

 NOTE 2:

If shelves are connected together with bay mult cabling and ANY shelf in the chain becomes unpowered with the **SYSCTL** inserted, CIT communications will be lost to all shelves. Once the shelf is repowered, CIT communications are restored without established login sessions being dropped. If shelves are not powered, the **SYSCTL** should not be inserted.

 NOTE 3:

With a CIT baud rate of 19200, CIT communication to a shelf may fail if the CIT bay mult cabling is connected to the shelf but not terminated on the next shelf. This condition is only present at baud rates greater than 9600 and does not affect communication at lower baud rates.

Connect CIT to the RS-232C **CIT** connector on the DDM-2000 User Panel or rear **CIT** connector.

2. Turn on CIT and set terminal parameters as follows (consult your terminal's manual for setup procedures):
 - Full duplex.
 - 8 data bits.
 - 1 start bit.
 - 1 stop bit.
 - No flow control.
 - Baud rate setting is automatically set by DDM-2000 when connection is made.
3.  **NOTE:**
To set baud rate automatically, enter two carriage returns (<cr>), two lowercase "a"s (**aa**), or two uppercase "A"s (**AA**). All other characters are ignored.

Enter two carriage returns.

Response: CIT prompts with:

```
/* Enter a shelf number from 1 to 8 */  
shelf [default] =
```

4.  **NOTE:**
Entering just a carriage RETURN at the shelf prompt will connect you to the default shelf physically connected to the CIT.

Enter the shelf number and/or carriage RETURN for the shelf being accessed.

Response: CIT prompts with login <

5. **⇒ NOTE 1:**

Security is available to protect against unauthorized access to the system. System security requires the defaults for the privileged user logins/password to be changed and CIT and/or DCC port security to be enabled. If security is enabled on a port, users must enter a valid login and password to access the system through that port.

⇒ NOTE 2:

The system always has three privileged user logins to minimize the chance that both users will forget their passwords at the same time. You must be logged into the system as a *privileged user* to set security; add, change, or delete logins; and to execute some commands. The default *privileged user* logins for Releases 8.1 and 9.1 or later are LUC01 (uppercase LUC-zero-one), LUC02 (uppercase LUC-zero-two), and LUC03 (uppercase LUC-zero-three). The default *privileged user* logins for Release 9.0 or earlier are ATT01 (uppercase ATT-zero-one), ATT02 (uppercase ATT-zero-two), and ATT03 (uppercase ATT-zero-three). The default *privileged user* password is DDM-2000. The login banner for Release 9.0 and earlier reads:
AT&T, DDM-2000 OC-3 Multiplexer, Release a.b.c.

Were you sent here from **DLP-541** to connect CIT?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then continue with **Step 6**.

6. If security has been enabled, enter your login, and then enter your password when prompted.

If security has not been enabled, enter a carriage RETURN.

Response: CIT prints the following message followed by an alarm and status report:

```

/*****
*
*      Lucent Technologies
*      DDM-2000 OC-3 Multiplexer
*
*      Release a.b.c
*
*****/
```

•
•
•

```

TID date time
M rtrv-alm:all COMPLD
/* Active Alarms and Status Report
```

7. **⇒ NOTE 1:**
The system prompt may be something other than < if there is an alarm condition (for example, if there is an MJ alarm condition on the system, the prompt will be MJ <).
- ⇒ NOTE 2:**
After the prompt (<), the system will respond to commands entered. The command **set-link:pg=()** may be used to set the vertical size of the displayed page on the CIT. Page (pg) length may be set from 3 to 150 lines with a default length of 24 lines. The page length is set to default each time a new CIT session is started.

See the "Commands and Reports" section of this manual for a description of the command formats.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Establish Remote Login

1. Connect CIT and establish session with near-end DDM-2000.

Reference: **DLP-521**

2.  **NOTE 1:**
The command **toggle** (CTRL T) may be used to toggle back and forth between a remote DDM-2000 terminal and the near-end terminal. If no remote session is in progress, the toggle command will be rejected.

 **NOTE 2:**
A remote login within a remote login or a remote login entered to the near end while a remote session is suspended by the toggle command is not allowed. (A remote session is suspended when a remote session is under way and **toggle** (CTRL T) is entered to toggle control to the near end.) A remote login will also be denied if one is already in progress at the remote site.

 **NOTE 3:**
If security has been enabled on the DCC port being accessed, a login and password are required to do the remote login.

 **NOTE 4:**
Far-end communications (fecom) must be enabled in the far-end shelf in order to remote login to that shelf. The command **rtrv-fecom** can be used locally at the far-end shelf to determine if *fecom* (DCC/LAN) is enabled or disabled. The command **set-fecom** can be used at the far-end shelf to enable DCC/LAN communications. If security is enabled, the **set-fecom** command can be executed by privileged users only.

⇒ **NOTE 5:**

Remote login to FT-2000 OC-48 systems are not allowed from the DDM-2000 OC-3 system.

⇒ **NOTE 6:**

A remote login session may be terminated in some cases due to events in distant shelves and may not be noticeable until you begin typing in the *rlgn* session. Events such as disabling fecom, failure of the DCC or LAN, **init-sys** or **reset**, removing **OLIUs**, etc., may abruptly terminate a remote login session. This is normal because all the network elements must relearn the network after one of these events.

⇒ **NOTE 7:**

To set baud rate automatically if security has not been enabled, enter two carriage returns (<cr>), two lowercase "a"s (**aa**), or two uppercase "A"s (**AA**) after the login prompt. All other characters are ignored.

Enter command **rlgn:tid**

Where tid = the target identifier (shelf or site/shelf name) of the remote terminal.

Response: **CIT** prompts with: login <

3. If security has been enabled, enter your login and password when you are prompted.

If security has not been enabled, enter two carriage RETURNS.

Response: System responds with:

```

/*****
*
*      Lucent Technologies
*      DDM-2000 OC-3 Multiplexer
*
*      Release a.b.c
*
*****/

      .
      .
      .

TID date time
M rtrv-alm:all COMPLD
/* Active Alarms and Status Report
```

4.  **NOTE:**
After the prompt, the remote system will respond normally to any commands entered just as if you were physically connected to the remote terminal.

See the "Commands and Reports" section of this manual for a description of the commands formats.

5.  **NOTE:**
A logout entered to the remote terminal will end the remote session and return control to the near-end CIT. A logout entered to the near-end terminal will terminate the local and remote sessions.

Use the command **logout** to log out of the remote terminal session and return control to the near-end terminal.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Circuit Pack

1.  **CAUTION 1:**
*Circuit packs must not be installed or replaced if the **SYSCTL** is not installed and operating normally. If the **SYSCTL** is not installed and operating normally, unpredictable provisioning of the replaced/installed circuit pack can result.*

-  **CAUTION 2:**
*Ensure that protection switching is available (protection circuit pack and/or line good and no locks, inhibits, or forced switches in effect). When available, use a CIT and a protection "**switch-line:**" command to do a protection switch.*

-  **CAUTION 3:**
*When removing circuit packs, always remove the one without the lighted **ACTIVE** LED first.*

-  **NOTE:**
When a replacement circuit pack (except the **SYSCTL**) is configured the same as the original circuit pack, it may be inserted with no further action. When a replacement circuit pack is different (different code or different switch options) from the original, the **SYSCTL UPD/INIT** button must be momentarily depressed to update the inventory.

Find the circuit pack in Table A and go to the indicated step.

Table A. Circuit Pack Replacement

Circuit Pack	Step
BBG8/BBG8B SYSCTL	Step 2
BBG2 MXRVO	Step 4
BBG9 OHCTL	Step 6
BBG10 OHCTL	Step 6
BBF2 TGS	Step 8
BBF2B TGS	Step 13
21G/21G-U/21G2-U OLIU	Step 19
21D/21D-U/22D-U OLIU	Step 19
22F/22F-U/22F2-U OLIU	Step 19
22G-U/22G2-U/22G3-U OLIU	Step 19
26G2-U/27G-U/27G2-U OLIU	Step 19
24G-U OLIU	Step 19
BBG4/BBG4B/BBG19 DS3	Step 32
BBG20 TMUX	Step 32
BBF1 DS1/BBF1 DS1	Step 36
BBF3/BBF3B DS1PM	Step 36
BBF5 JMPR	Step 41
BBG6 STS1E	Step 43
BBF8 HDL	Step 49

BBG8/BBG8B SYSCTL

2. Refer to **DLP-501** to replace the **BBG8/BBG8B SYSCTL**.
3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG2 MXRVO

4.  **CAUTION:**
*To prevent errors, use the "sw-fn:address:pri>manual" command to switch service to the standby slot before removing the **MXRVO** circuit pack being replaced.*

There are no options to be set on the **BBG2 MXRVO** circuit pack. Remove old **MXRVO** and install replacement **MXRVO**.

Response: **FAULT** LED on the **MXRVO** lights for about 13 seconds and then goes off.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG9/BBG10 OHCTL

6. **⇒ NOTE 1:**
For Release 8 or later standard applications, the **OHCTL** must be a **BBG9 OHCTL**. For special applications with MegaStar* 2000 SONET Radio Systems (Releases 8.1 (linear) or 9.1 (ring) or later), the **OHCTL** must be a **BBG10 OHCTL**. Refer to **DLP-500** for option settings on the **BBG10 OHCTL**. There are no options to be set on the **BBG9 OHCTL**.

- ⇒ NOTE 2:**
If no software is installed in the **OHCTL** or if the software is not compatible with the software in the **SYSCTL**, the letter **d** will be displayed in the **FE ID** display on the **SYSCTL**. If this occurs, you must find circuit packs with compatible software or install new software in both the **OHCTL** and **SYSCTL** [**DLP-532**].

Install **OHCTL** into **AUXCTL** slot. (If software is not loaded or is incompatible, load new software using **DLP-532**).

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

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BBF2 TGS

8.  **CAUTION:**
BBF2 TGS and **BBF2B TGS** *timing mode switch settings are not set the same. Check switch settings carefully.*
-  **NOTE 1:**
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).
-  **NOTE 2:**
The **BBF2 TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Line Timed*. In free-running mode, the **BBF2 TGS** gets timing from an oscillator on the **BBF2 TGS**. In external timing, the **BBF2 TGS** gets timing from an external DS1 reference input. In line timing, the **BBF2 TGS** gets timing from an **OLI**U from a reference clock recovered from the received OC-3 line rate signal.
-  **NOTE 3:**
Table B depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application.

Table B. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.

Table B. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Line Timing with the proper source using the " set - sync " command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

Refer to Table C and Figure 1 and set the timing mode as required for the new **BBF2 TGS** circuit pack(s).

Table C. BBF2 TGS Timing Mode Switch Setting

Timing Mode	Switch S1 Settings	
	S1-3	S1-4
Free Running	ON	ON
DS1 External, MULT Mode	OFF	ON
Line Timed	ON	OFF
Invalid*	OFF	OFF

* If an invalid setting is selected, **FAULT** LED is lighted and an "unexpected CP type" or "unexpected CP switches" alarm is generated.

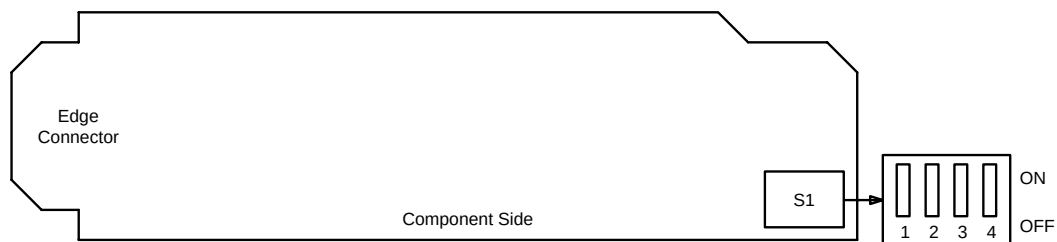


Figure 1. BBF2 TGS Option Switch

9. **NOTE:**
Switches **S1-1** and **S1-2** were ignored by the system the first time the **TGS** was installed unless the timing mode was set to *DS1 External*. Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update ("upd") must be performed.

Is timing mode set to *DS1 External*?

If **YES**, then continue with **Step 10**.

If **NO**, then proceed to **Step 11**.

10. Refer to Table D and Figure 1 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table D. TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch	DS1 Frame Format	Switch
	S1-1		S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

11.  **CAUTION:**
*When all OC-3 shelves in a bay are timed from a common external timing supply, removal of the bottom shelf **TGS** circuit pack will cause a momentary transmission hit on all shelves in the bay.*

 **NOTE 1:**
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS** circuit pack in **TIMING** slot **1**. If the information is incompatible with the controller software information, an alarm is generated.

 **NOTE 2:**
If a signal has previously been applied to the original **TGS** circuit pack, the **FAULT** lamp will flash when the new **TGS** is installed until the signal tests good.

Remove old **TGS** and install replacement **TGS**.

Response: **FAULT** LED on the **TGS** lights (flashes) for about 15 seconds and then goes off.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

13.  **CAUTION:**
BBF2 TGS and **BBF2B TGS** timing mode switch settings are not set the same. Check switch settings carefully.
-  **NOTE 1:**
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).
-  **NOTE 2:**
In line-timed mode, the **BBF2B TGS** gets timing from a reference clock recovered from a received OC-3 line rate signal. Either the **MAIN 1**, **MAIN 2(P)**, or **FUNCTION UNITS C OLIU** can be selected as the synchronization source using the command
`"set-sync:src={main, main-1, main-2, or fn-c};"`.
-  **NOTE 3:**
Table E depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for line timing or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table E. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	Line Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS. In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging. In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
Free Running	External - Sync Out	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.

Table E. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Mult	Line Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located. The NE provisioned for Line Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Line Timing	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.

Table E. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Line Timing - Sync Out	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.
External - Mult	External - Sync Out	This topology is used to distribute network timing to a target location from a location with access to a synchronization reference. The NE provisioned for External - Mult, is providing timing to the NE provisioned for External - Sync Out, which in turn generates a DS1 output reference regenerated from the optical interface shared by both NE's. This DS1 output is used to provide a synchronization reference to a BITS.

Table E. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's. In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop. If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal.
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Line Timing with the proper source using the " set - sync " command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

⇒ **NOTE 4:**

To set switch to ON, depress rocker or slide switch toward side labeled **ON** in figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in figure.

Determine timing mode from work order or office records. Refer to Table F and Figure 2 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table F. BBF2B TGS Timing Mode Switch Settings

Timing Mode	Switch S1 Settings		
	S1-3	S1-4	S1-5 (DS1 Output)
Free Running*	ON	ON	OFF
DS1 External, MULT Mode	OFF	ON	OFF
Line Timing, MAIN†	ON	OFF	OFF
Line Timing, SYNC OUT Mode†	ON	OFF	ON
DS1 External, SYNC OUT Mode†	ON	ON	ON
Invalid‡	OFF	OFF	ON
Invalid‡	OFF	OFF	OFF
Invalid‡	OFF	ON	ON

* Factory default.

† **MAIN (MAIN 1) OLIU** is default; **FUNCTION UNITS C** by "set -sync" command.

‡ If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated ("unexpected CP type" or "unexpected CP switches").

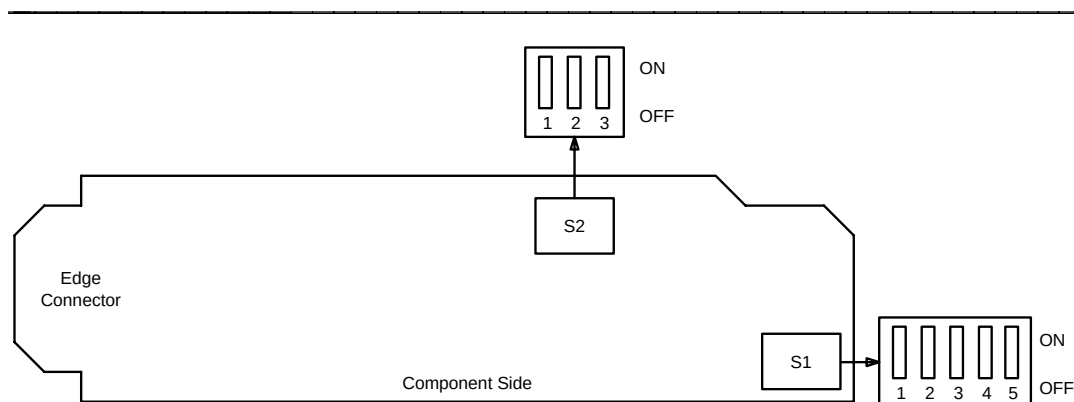


Figure 2. BBF2B TGS Option Switch

14. If the **BBF2B TGS** is provisioned for *sync out mode*, refer to Table G and Figure 2 and set equalizer switches for the proper cable length.

Table G. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid*	OFF	OFF	OFF
Invalid*	OFF	OFF	ON
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated ("unexpected CP type" or "unexpected CP switches").

15.  **NOTE:**
Switches **S1-1** and **S1-2** were ignored by the system the first time the **TGS** was installed unless the timing mode was set to *DS1 External* or *Line Timed sync out mode*. Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update ("**upd**") must be performed.

Is timing mode set to either *DS1 External* or *Line Timed sync out*?

If **YES**, then continue with **Step 16**.

If **NO**, then proceed to **Step 17**.

16. Refer to Table H and Figure 2 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table H. BBF2B TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch	DS1 Frame Format	Switch
	S1-1		S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

17.  **CAUTION:**
*When all OC-3 shelves in a bay are timed from a common external timing supply, removal of the bottom shelf **TGS** circuit pack will cause a momentary transmission hit on all shelves in the bay.*

 NOTE 1:

A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS** circuit pack in **TIMING** slot **1**. If the information is incompatible with the controller software information, an alarm is generated.

 NOTE 2:

If a signal has previously been applied to the original **BBF2B TGS** circuit pack, the **FAULT** lamp will flash when the new **BBF2B TGS** is installed until the signal tests good.

Remove old **BBF2B TGS** and install replacement **BBF2B TGS**.

Response: **FAULT** LED on the **BBF2B TGS** lights (flashes) for about 15 seconds and then goes off.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

OLIU

19.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
-  **CAUTION 1:**
*Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use a CIT and the "**switch-path:**" command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a "**switch-path:**" command at the near end and far end to switch both transmit and receive to the same line.*
-  **CAUTION 2:**
*When removing circuit packs, always remove the one without the lighted **ACTIVE** LED first. Remove optical fiber cables before removing circuit pack and take care to avoid damage to fibers during removal or installation of the circuit pack.*
-  **CAUTION 3:**
*Before installing **OLIUS**, ensure all optical fiber connectors and couplings have been properly cleaned [**DLP-527**]. Signal performance may be degraded if the connectors and couplings are not cleaned properly.*
-  **NOTE:**
It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

Use "**rtrv-state-eqpt**" command to ensure service has been switched to the other line then remove optical cables from **OLI**U to be replaced.

20. Is a **21G/21G-U OLI**U being replaced?

If **YES**, then continue with **Step 21**.

If **NO**, then proceed to **Step 22**.

21. Refer to Table I and Figure 3 and set the **HIGH/LOW POWER** option switch on replacement **21G/21G-U OLI**U to proper setting.

Table I. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

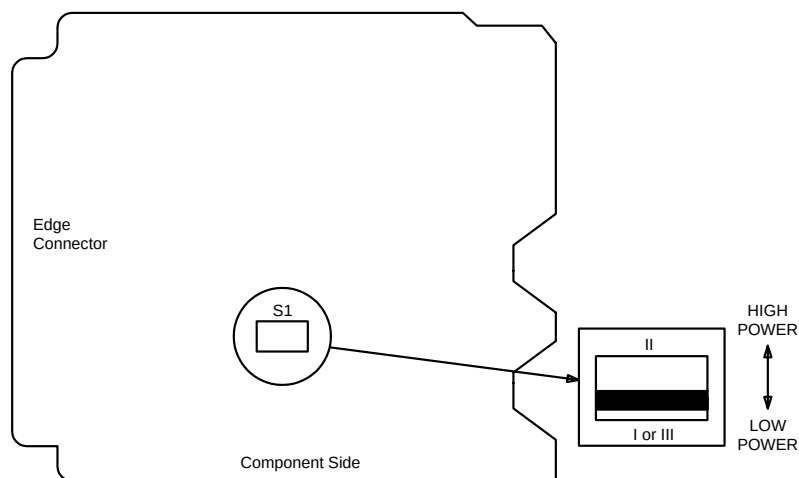


Figure 3. 21G/21G-U OLIU Option Switch

22. Is a **24G-U OLI**U being replaced?

If **YES**, then proceed to **Step 26**.

If **NO**, then continue with **Step 23**.

23. Remove old **OLI**U and install same type replacement **OLI**U.

Response: **FAULT** LED on **OLI**U flashes.

24.  **NOTE:**
The **FAULT** LED on the **OLIU** may flash from 15 seconds to 3 minutes and 25 seconds depending on the provisioned signal degrade threshold.

Connect optical cables to replacement **OLIU**.

Response: **FAULT** LED on the **OLIU** goes off.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. Disconnect the OC-12 connector (ribbon cable) from the **24G-U OLIU** being replaced.

Response: **MN** LED ("OC12 connector failed") alarm will light.

27. Remove old **OLIU** and install same type replacement **OLIU**.

Response: **FAULT** LED on **OLIU** flashes.

28.  **NOTE:**
The **FAULT** LED on the **OLIU** may flash from 15 seconds to 3 minutes and 25 seconds depending on the provisioned signal degrade threshold.

Connect optical cables to replacement **OLIU**.

Response: **FAULT** LED on the **OLIU** goes off.

29. Connect the OC-12 connector (ribbon cable) to the **24G-U OLIU** being replaced.

Response: **MN** LED ("OC12 connector failed") alarm should go off.

30. Verify that the connectors on the OC-12 connector cable are properly seated and latched.

31. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG4/BBG4B/BBG19 DS3/BBG20 TMUX

32. Determine from office records the length of the DS3 cabling between the **DDM-2000** and the **DSX-3** cross-connect point.
33. **⇒ NOTE:**
The only option settings on the **DS3/TMUX** circuit pack are the LBO settings shown in Figures 4 and 5. If there are other jumpers on the circuit pack similar to the LBO jumpers, they are factory test points and should be ignored.

Refer to Table J and Figures 4 and 5 and install the DS3 option jumpers.

Table J. DS3 LBO Settings

Cable Length (Ft)		LBO Setting
734D Cable	735A Cable	
0 to 225	0 to 125	LBO IN (ON)
>225 to 450	>125 to 250	LBO OUT

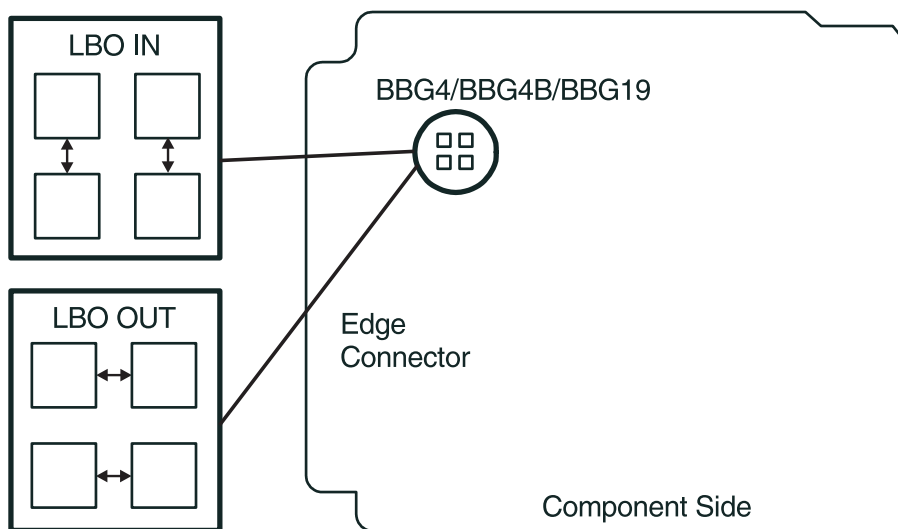


Figure 4. BBG4/BBG4B/BBG19 DS3 Option Settings

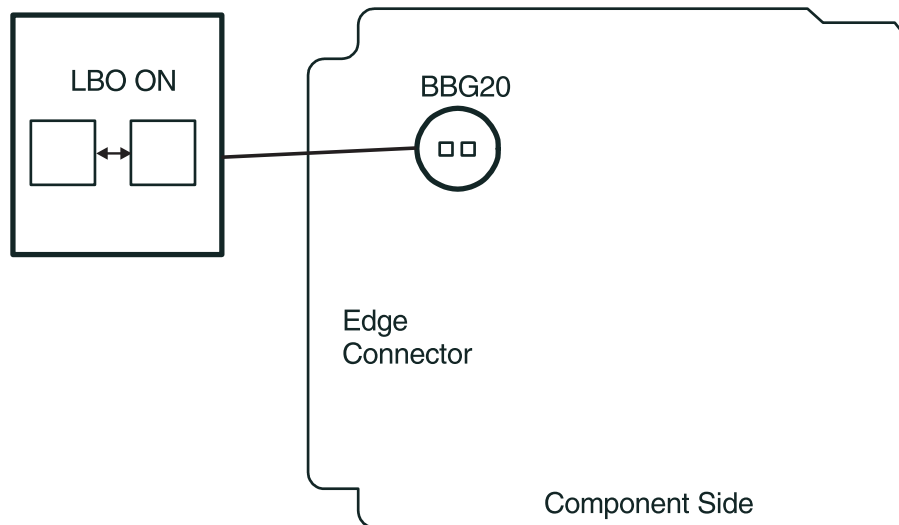


Figure 5. BBG20 TMUX Option Settings

34. **⇒ NOTE:**
If a signal has previously been applied to the original **DS3/TMUX** circuit pack, the **FAULT** lamp will flash when the new **DS3/TMUX** is installed until the signal tests good.

Remove old **DS3/TMUX** and install replacement **DS3/TMUX**.

Response: **FAULT** LED on the **DS3/TMUX** flashes for about 15 seconds and then goes off.

35. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF1/BBF1B DS1/BBF3/BBF3B DS1PM

36. Determine from office records the length of the DS1 cabling between the DDM-2000 and the DSX-1 cross-connect point.
37.  **NOTE 1:**
Switch 1, sections 1 through 3 (**S1-1, S1-2, S1-3**), are set according to the length of DS1 cabling between the DDM-2000 and the DSX-1 cross-connection. Switch 1, sections 4 through 7 (**S1-4, S1-5, S1-6, S1-7**), are set for the type of line coding (B8ZS or AMI) required of the DS1 signal. Switch 1, section 8 (**S1-8**) on the **BBF1/BBF1B DS1** is unused and ignored by the system. On the **BBF3/BBF3B DS1PM**, **S1-8** must be set to OFF.
-  **NOTE 2:**
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Refer to Table K and Figure 6 and set LBO option switches.

Table K. DS1/DS1PM Cable LBO Settings (Note)

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 kHz	Switch S1 Settings		
			S1-1	S1-2	S1-3
0 to 133	0 to 90	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

Note: Invalid switch settings will cause the **FAULT** LED to light and a "DS1 CP failed" alarm.

38. **⇒ NOTE:**
If line code (lc) parameters are generally set using the "**set -t1**" command, the circuit pack switch settings will have no effect. The "**rtrv -t1**" command may be used to check line code settings.

Refer to Table L and Figure 6 and set the line code option switches, if required.

Table L. DS1/DS1PM Line Code Settings

Line Code Format	Switch S1 Settings				
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)	S1-8 Unused (Note)
B8ZS	OFF	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON	OFF

Note: Switch 1, section 8 (**S1-8**) on the **BBF1/BBF1B DS1** is unused and ignored by the system. On the **BBF3 DS1PM**, **S1-8** must be set to OFF.

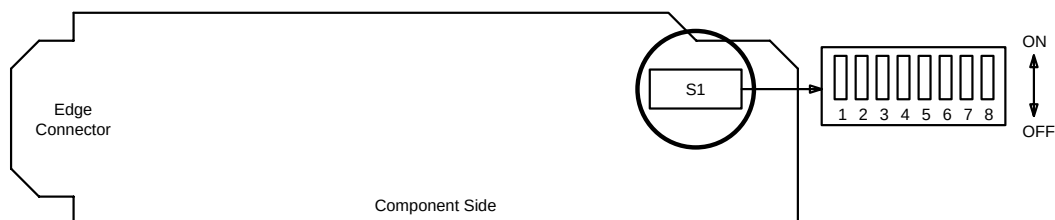


Figure 6. DS1/DS1PM Option Settings

39.  **CAUTION:**
*When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A Retainer Card** in the same group will result in a loss of service to the protected **DS1/DS1PM** circuit pack and the removed **DS1/DS1PM** circuit pack.*

 **NOTE 1:**
If a signal has previously been applied to the original **DS1/DS1PM** circuit pack, the **FAULT** lamp will flash when the new **DS1/DS1PM** circuit pack is installed until the signal tests good.

 **NOTE 2:**
A **DS1PM** circuit pack must be replaced with the same type circuit pack to retain the proper feature applications. Also, if protection is required and **DS1PM** circuit packs are installed in the service slots, the protection circuit pack must be a **DS1PM** circuit pack. A "*CP not allowed (eqpt)*" alarm will be generated if a **DS1PM** circuit pack is installed in a service slot with no **DS1PM** circuit pack in the protection slot.

Remove old **DS1/DS1PM** circuit pack and install replacement **DS1/DS1PM** circuit pack.

Response: **FAULT** LED on the **DS1/DS1PM** circuit pack may light (flash) for up to 40 seconds and then goes off.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF5 JMPR

41. There are no options to be set on the **BBF5 JMPR** circuit pack. Remove old **JMPR** and install replacement **JMPR**.
42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG6 STS1E

43. Determine from office records the length of the STS1E cabling between the DDM-2000 and the STSX cross-connect point.
44. Install the **BBG6 STS1E** option jumpers per Table M and Figure 7.
45.  **NOTE:**
The **STS1E** circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 Multiplexer. **STS1E** high speed mode interfaces with the **DS1/DS1PM** circuit packs at the VT-G rate. **STS1E** low speed mode interfaces with the **OLI** circuit packs at the STS-1 rate.

Determine **STS1E** mode of operation (high speed or low speed).

46. Set switch **S1** to mode of operation required (**HIGH-SPEED MODE** or **LOW-SPEED MODE**).
47.  **NOTE:**
If a signal has previously been applied to the original **STS1E** circuit pack, the **FAULT** LED will flash when the new **STS1E** is installed until the signal tests good.

Remove old **STS1E** circuit pack and install replacement **STS1E** circuit pack.

Response: **FAULT** LED on the **STS1E** may light (flash) for about 15 seconds and then goes off.

48. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table M. STS1E LBO Settings

Cable Length (Ft)		
734D Cable	735A Cable	LBO Setting
0 to 225	0 to 125	LBO IN
>225 to 450	>125 to 250	LBO OUT

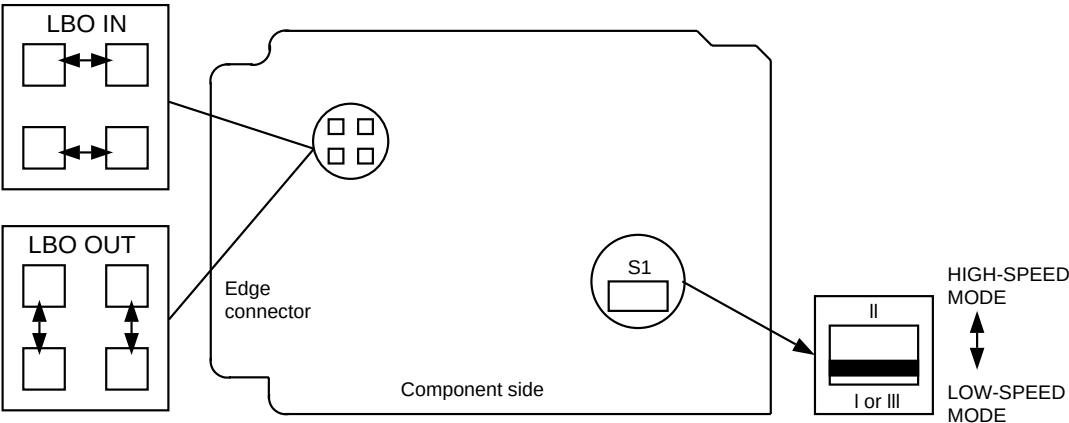


Figure 7. BBG6 STS1E Option Settings

BBF8 HDSL

49. Determine circuit pack option switch settings from office records, work order, or old circuit pack settings.
50. Set **BBF8 HDSL** option switches per Table N and Figure 8.

Table N. HDSL Control Switch Settings

Control Settings	Switch S1 Settings			
	S1-1	S1-2	S1-3	S1-4
Master	—	OFF	—	OFF
Slave	—	ON	—	ON
Local	OFF	—	OFF	—
Remote	ON	—	ON	—

51. **⇒ NOTE:**
If a signal has previously been applied to the original **HDSL** circuit pack, the **FAULT** LED may flash when the new **HDSL** is installed until the signal tests good.

Remove old **HDSL** and install replacement **HDSL**.

Response: **FAULT** LED on the **HDSL** flashes for about 15 seconds and then goes off.

52. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
-

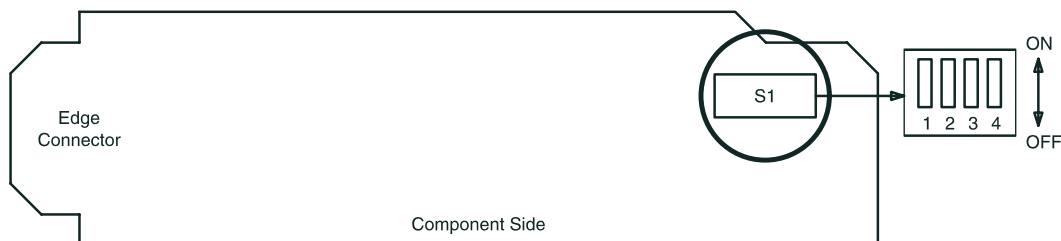


Figure 8. BBF8 HDSL Control Switch

Check –48 V DC Office Battery

1. Obtain multimeter capable of measuring DC voltage in the 40 to 60 volt range.

2.  **WARNING:**
–48 V DC is present in the fuse holders and the P1 and P2 power connections at rear of User Panel.

 **CAUTION:**
If system is in service, service interruption will occur if both fuses are removed or both power feeders are disconnected while in service.

Are fuses installed in User Panel?

If **YES**, then continue with **Step 3**.

If **NO**, then proceed to **Step 4**.

3. Remove ONE of the –48 V fuses at the top of the User Panel.

Reference: **DLP-555**

4.  **CAUTION:**
Exercise care not to short meter probe across fuse contacts in fuse holder.

Use multimeter to measure DC voltage at front of fuse holder(s). Place negative probe on top fuse contact (G3 or G4 shelves) and the other probe to a solid chassis ground.

Requirement: Voltage must be between –40.00 V and –60.0 V DC

5. Was requirement met?
If **YES**, then proceed to **Step 8**.
If **NO**, then continue with **Step 6**.
6. Trouble in User Panel, power feeder(s), or office battery distribution. Refer trouble to organization that installed the shelf.
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Have both fuse holders been checked?
If **YES**, then proceed to **Step 10**.
If **NO**, then continue with **Step 9**.
9. Reinstall fuse if removed. Remove other fuse if installed and repeat this procedure from **Step 4** for other fuse holder.
10. Are fuses installed?
If **YES**, then proceed to **Step 12**.
If **NO**, then continue with **Step 11**.
11.  **NOTE:**
The fuses on the G3 or G4 shelf User Panel are 5 amp fuses, COMCODE 406203976. The fuses on the G1 shelf User Panel are 5 amp indicator type fuses, COMCODE 405697442.

Install –48 V DC fuses in User Panel fuse holders.
12. Is any fuse blown?
If **YES**, then continue with **Step 13**.
If **NO**, then proceed to **Step 17**.
13. Replace blown fuse.

Reference: **DLP-555**
14. Did fuse blow again?
If **YES**, then continue with **Step 15**.
If **NO**, then proceed to **Step 17**.
15. Trouble in User Panel or backplane connector. Refer trouble to the organization that installed the shelf.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
17. Are **PWR ON A** and **B** LEDs lighted?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then continue with **Step 18**.
18. Trouble in User Panel. Refer trouble to organization that installed the shelf.
19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic End-to-End OC-3 Line Test

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **NOTE 1:**
This test is used to verify the integrity of the OC-3 optical fiber lines between two DDM-2000 shelves. It may be performed with the DDM-2000 in service or out of service. This test checks the transmission across the optical interfaces in the **MAIN** and **FUNCTION UNITS** slots equipped with **OLI** circuit packs. For example, this test performed at an intermediate shelf checks the optical span from both the **MAIN** and **FUNCTION UNITS C** slots.

 **NOTE 2:**
It is assumed that each DDM-2000 has passed the automatic local transmission tests. If these tests have not been completed, refer to the appropriate NTP procedure and perform the tests.

 **NOTE 3:**
Far-end communications (fecom) must be enabled at both shelves in the optical span being tested. See SET-FECOM in the "Commands and Reports" section of this manual.

At each end of the optical span being tested, ensure that both the service and protection **OLI**Us have been connected to the optical facility (a total of four connections at each end of the span). See Figure 1.

Reference: **DLP-514**

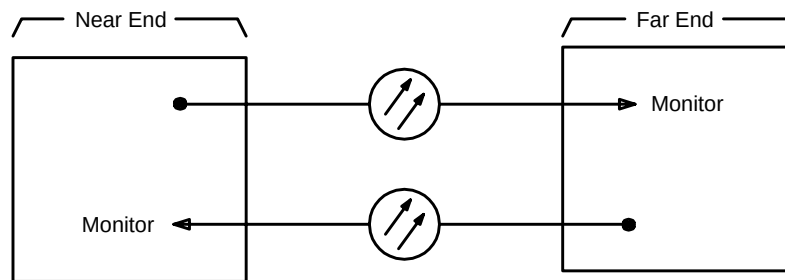


Figure 1. Automated End-to-End Line Test (test-auto:md=optics)

2. Is a CIT available?
If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 8**.
3. Connect CIT to User Panel **CIT** connector.
4. Enter the command **test-auto:md=optics**.
5. The following CIT report will indicate the status of the equipment. It should indicate that there are no failures. If report indicates a failure with **OLIUS**, do **Trouble Clearing: TAP-111**.

```

/* Auto-Turnup Report -- Optical Span Test
=====
EQUIPMENT  -----Main-----  -----Function Units-----
main-1 main-2 a-1 a-2 b-1 b-2 c-1 c-2
          g      g      g      g      g      F      -      -

TRANSMIT   -----Main-----  -----Function Units-----
main-1 main-2 a-1 a-2 b-1 b-2 c-1 c-2
          g      g      g      g      g      F      -      -

RECEIVE    -----Main-----  -----Function Units-----
main-1 main-2 a-1 a-2 b-1 b-2 c-1 c-2
          g      g      g      g      g      F      -      -

DCC        -----Main-----  -----Function Units-----
          g      a      b      c
          g      g      g      -

*/

```

where g stands for *good* and F stands for *Failed*, ? stands for *unknown due to other failures*, and - stands for *not applicable* (that is, slots not equipped with **OLIUS**).

6.  **NOTE:**
Optical span tests for other shelves in the network may be made physically at each shelf or by remote login (**rlgn**).

If other spans are being tested, log in to other shelves in the same network and repeat this test for all optical spans.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8.  **NOTE 1:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to depress it.

 **NOTE 2:**
The following five steps (9 through 13) must be performed with no unnecessary delays. Read through them to familiarize yourself with the sequence of operations and the expected responses.

Read Steps 9 through 13 before continuing.

9. On the User Panel, depress and hold the **ACO** pushbutton.

Response: All LEDs on the DDM-2000 are lighted.

10. With the **ACO** pushbutton still depressed, momentarily depress the **UPD/INIT** pushbutton. Then release both pushbuttons.

Response: All lighted **ACTIVE** LEDs remain lighted.

11. While all the LEDs are lighted, momentarily depress the **UPD/INIT** pushbutton one time. You have **1 MINUTE** to do this.

Response: On User Panel, **CR** LED is flashing. **MJ** LED is lighted. All other LEDs, except **PWR ON** LED on User Panel, go off.

12. **⇒ NOTE:**

The **CR** LED will flash for 10 SECONDS. The **UPD/INIT** pushbutton must be momentarily depressed two times while the **CR** LED is flashing. You have **10 SECONDS** to do this.

While the **CR** LED is flashing, momentarily depress the **UPD/INIT** pushbutton two times.

Response: On User Panel, **CR** LED is flashing. **MJ** LED is lighted. After push button is depressed the first time, **MN** LED lights. After push button is depressed the second time, **PMN** LED lights. All other LEDs, except **ACTIVE** LEDs and **PWR ON** LED on User Panel, are off.

⇒ NOTE:

10 seconds after the **UPD/INIT** pushbutton is depressed the last time, the **CR** LED will stop flashing and remain lighted; the **MJ**, **MN**, and **PMN** LEDs also remain lighted. This indicates the beginning of the automatic end-to-end transmission test. The **CR**, **MJ**, **MN**, and **PMN** LEDs remain lighted for the duration of the test. The **ACTIVE** LEDs go off. The test may take as long as 5 minutes.

13. **⇒ NOTE:**

During the test, any failure will be indicated by a lighted or flashing **FAULT** LED on the affected **OLI** circuit pack. This indication will remain on for 1 minute. If no failures are detected, the green **ACO** LED on the User Panel will be lighted for 1 minute.

Wait until the test ends as described above. Was the **ACO** LED lighted?

If **YES**, then continue with **Step 14**.

If **NO**, then proceed to **Step 16**.

14. The DDM-2000 has passed the automatic end-to-end transmission test. Repeat this procedure from Step 8 for all shelves in the network requiring optical spans to be tested.
15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
16.  **NOTE:**
A lighted or flashing **FAULT** LED on an **OLI** indicates that either an **OLI** circuit pack is failed or there is trouble in the optical fiber line or connections between the DDM-2000 shelves.

Clean optical fiber connections.

Reference: **DLP-527**

17. Is **FAULT** LED lighted or flashing on any **OLI**?
If **YES**, then do **Trouble Clearing: TAP-111**.
If **NO**, then continue with **Step 18**.
18. There is an inconsistent set of diagnostic indications. Refer to **Trouble Clearing: TAP-108** to clear the failure condition.
19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Condition and Connect Modems to Establish Communication From Remote CIT Location

1.  **CAUTION:**
*DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.*

-  **NOTE 1:**
This procedure may be used to connect modems and a craft interface terminal (CIT) to the DDM-2000 OC-3 Multiplexer system for use in provisioning the system from a remote location.

-  **NOTE 2:**
This procedure must be performed at both the DDM-2000 location and remote CIT location to set the parameters of modems and terminal.

-  **NOTE 3:**
Modems supporting a large set of options and error detection capabilities may require other options to be set before using the modems to download generic software. Refer to manufacturer's manuals for instructions on setting modem parameters.

Verify the generic parameters of the modem are set to the following:

- 300, 1200, 2400, 4800, 9600, or 19,200 baud

The Lucent Technologies 4024 and Lucent Technologies 2224 CEO modems support 1200 and 2400 baud rates. The Lucent Technologies 2296 modem supports 4800 or 9600 baud rates.

- Full duplex
- 8 data bits
- No parity bits
- 1 start bit
- 1 stop bit
- No flow control
- Transparent data mode - ON (Required for software download on some modems.)
- Direct operating mode - ON (Required for software download on some modems.).

2. Are you at the DDM-2000 location or remote CIT location?

If **DDM-2000 LOCATION**, continue with **Step 3**.

If **REMOTE CIT LOCATION**, proceed to **Step 7**.

3. Set the modem to answer incoming calls. For example, if you are using an Lucent Technologies 2224 CEO modem, do the following to program the modem:

a. **⇒ NOTE:**

It is assumed the PC and modem ("AT" command compatible) are powered and the PC is loaded with communications software.

Set all front panel switches to DOWN (factory default) for AT command mode.

- b. Connect PC serial port to the modem RS-232C port using modem cable or using a null modem adapter.
- c. Establish communications between the PC and modem using the communications software set for the generic parameters in Step 2.
- d. At the prompt, enter the following "AT" commands.

PC	Response	Comment
ATH	OK	#hang-up (on-hook)
AT&F	OK	#resets to factory defaults
AT&C1	OK	#data carrier is present when on
ATS0=2	OK	answer on 2 rings
AT&W	OK	wait for second dial tone

4. Remove the connector at the PC serial port and plug into the front (requires null modem) or rear access port on the DDM-2000 shelf. Dialup access to the network element via the modem is now ready. Tables A and B show the EIA-232-D pins required for use with the DDM-2000.

Table A. Pin Connections for Modem Using DB-25 Cable

EIA-232-D Pin	Front Access CIT (DCE)	Rear Access CIT (DTE) Modem Port
Pin 2 - Circuit BA Transmitted Data	Carries data from terminal or modem to DDM-2000	Carries data from DDM-2000 to modem or terminal
Pin 3 - Circuit BB Received Data	Carries data from DDM-2000 to terminal or modem	Carries data from modem or terminal to DDM-2000
Pin 7 - Circuit AB Signal Ground	Signal ground	Signal ground
Pin 8 - Circuit CF Received Line Signal Detector	Not used	Indicates to DDM-2000 that Modem or terminal is connected
Pin 20 - Circuit CD DTE Ready	Indicates to DDM-2000 that modem or terminal is connected	Indicates to modem or terminal that DDM-2000 is connected (always ON when SYSCTL is powered)

Table B. Pin Connections for Modem Using DB-9 Cable

PC DB-9 Connector	CIT
Pin 1 - Carrier Detect	This modem detects carrier from the remote modem.
Pin 2 - Receive Data	Receives data from modem
Pin 3 - Transmit Data	Transmits data to the modem
Pin 4 - Data Terminal Ready	CIT notifies the modem that they are connected
Pin 5 - Signal ground	Signal ground
Pin 6 - Data Set Ready	Modem notifies the CIT that the modem is connected and ready to receive data.
Pin 7 - Request to Send	CIT is requesting clearance from the modem so it can send data.
Pin 8 - Clear to Send	Modem notifies the CIT that it is clear to send.
Pin 9 - Ring indicator	Modem notifies the CIT that ring signal is present when the modem is in an auto-answer mode.

5. Verify the telephone line is plugged into the modem.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Remote CIT Location

7. At the remote CIT location, set the terminal parameters to match those set at the DDM-2000 location. Refer to manufacturer's manual for instructions on setting modem parameters.

8. Connect the remote modem to the CIT terminal using the appropriate modem cable. Tables B and C list the pins for the DB-25 connector and DB-9 connector, respectively.
9. Verify the telephone line is plugged into the modem.
10. **⇒ NOTE 1:**
Characters other than a question mark (?), carriage return (<cr>), semicolon (;), dollar sign (\$), or the numbers 1 through 8 are ignored. Typing a carriage return more than twice by mistake will cause the system to start a session with the default shelf. The default shelf is the shelf that is physically connected to the CIT.

⇒ NOTE 2:
Security is available to protect against unauthorized access to the system. If security is enabled, users must enter a valid login and password to access the system.

⇒ NOTE 3:
To set baud rate automatically, enter two carriage returns (<cr>), two lowercase "a"s (**aa**), or two uppercase "A"s (**AA**). All other characters are ignored.

Dial into the DDM-2000 system by entering the correct telephone number. When the modem at the DDM-2000 end answers, establish a login session by pressing RETURN (<cr>) until the system answers. CIT should return with the following prompt:

```
/* Enter a shelf number from 1 to 8 */  
shelf [default] =
```

11. **⇒ NOTE:**
Entering just a carriage RETURN at the shelf prompt will connect you to the shelf physically connected to the CIT.

Enter the shelf number and/or carriage RETURN for the shelf being accessed.

Response: CIT prompts with login <

12. **NOTE:**

Systems with security always have three privileged user logins to minimize the chance that both users will forget their passwords at the same time. You must be logged into the system as a *privileged user* to set security; add, change, or delete logins; and to execute some commands. The default *privileged user* logins for Release 8.1 and 9.1 or later are LUC01 (uppercase LUC-zero-one), LUC02 (uppercase LUC-zero-two), and LUC03 (uppercase LUC-zero-three). For Release 9.0 or earlier, the defaults for the privileged user logins are ATT01 (uppercase ATT-zero-one), ATT02 (uppercase ATT-zero-two), and ATT03 (uppercase ATT-zero-three). The login banner for Release 9.0 and earlier reads: AT&T, DDM-2000 OC-3 Multiplexer, Release a.b.c.

If security has been enabled, enter your login, and then enter your password when prompted.

If security has not been enabled, enter a carriage RETURN.

Response: CIT prints the following message followed by a proprietary system message and an alarm and status report:

```

/*****
*
*          Lucent Technologies
*      DDM-2000 OC-3 Multiplexer
*
*          Release a.b.c
*
*****/

      .
      .
      .

TID date time
M rtrv-alm:all COMPLD
/* Active Alarms and Status Report
```

13.  **NOTE 1:**
The system prompt may be something other than `<` if there is an alarm condition (for example, if there is an MJ alarm condition on the system, the prompt will be `MJ <`).
-  **NOTE 2:**
After the prompt (`<`), the system will respond to commands entered. The command "**set-link:pg=()**" may be used to set the vertical size of the displayed page on the CIT. Page (**pg**) length may be set from 3 to 150 lines with a default length of 24 lines. The page length is set to default each time a new CIT session is started.
- See the "Commands and Reports" section of this manual for a description of the command formats.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clean Optical Fibers, Connectors, and Lightguide Buildouts (LBOs)

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **NOTE:**
All optical fiber connectors (*ST*[®], FC/PC, and SC types), lightguide buildouts, and buildout blocks or equivalent should be cleaned before making initial connections or reconnections per the following instructions. Only the components being assembled at this particular time should be cleaned.

Keep all dust caps and plugs in place until time to make connections.

Clean optical fibers and connectors on **OLIU** or LBOs.

If **21G/21D/22F OLIU**, go to **Step 2**.

If **21G-U/21G2-U/21D-U/22F-U/22F2-U/22G-U/22G2-U/22G3-U/22D-U/24G-U/26G2-U/27G-U/27G2-U OLIU** using universal LBOs, go to **Step 7**.

If in-line **LBOs**, go to **Step 15**.

If **lightguide fibers**, go to **Step 21**.

2. On printed wiring board side of **OLIU** faceplate, disconnect one of *ST* connectors from faceplate coupling.
3. Clean end and sides of connector tips with lint-free, optical quality tissue moistened with isopropyl alcohol.

4. Carefully wipe connector end again with clean, dry, lint-free optical quality tissue.
5. Blow any lint or dust from connector using canned air at least 3 inches (8 cm) from face of connector.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
7. Remove lightguide connector from buildout (if necessary).
8. Remove lightguide buildout from buildout block by unlocking tab and pushing in and turning in counter-clockwise direction (if necessary).

Reference: **DLP-552**

9. Clean the end and the sides of the connectors, buildouts, and blocks with a lint-free, optical quality tissue dampened with isopropyl alcohol.
10. Carefully wipe the connector, buildouts, and blocks again with a clean, dry, lint-free optical quality tissue.
11. Blow any lint or dust from the connectors, buildouts, and blocks using canned air held at least 3 inches (8 cm) away.
12. Clean the inside of the block using a pipe cleaner moistened with isopropyl alcohol.
13. Blow any lint or dust from inside the block, using canned air at least 3 inches (8 cm) away.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
15. Is LBO 0 dB or attenuated?
 If **0 dB LBO**, go to **Step 16**.
 If **attenuated LBO**, go to **Step 19**.
16. Clean LBO by placing a pipe cleaner, moistened with isopropyl alcohol, inside LBO and rotating the pipe cleaner.
17. Blow any lint or dust from inside the LBO, using canned air at least 3 inches (8 cm) from LBO.
18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19.  **CAUTION:**
Attenuated LBO has lens. Do not use pipe cleaner.

Clean LBO by canned air only. Blow any lint or dust from inside LBO, using canned air at least 3 inches (8 cm) from LBO.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
21. Clean fiber-end face and sides of connector with lint-free, optical quality tissue moistened with isopropyl alcohol.
22. Carefully wipe fiber-end face and sides of connector again with clean, dry, lint-free optical quality tissue.
23. Blow any lint or dust from fiber-end face and sides of connector using canned air at least 3 inches (8 cm) from connector.
24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic Local Transmission Test

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
-  **CAUTION 1:**
*This test may only be performed with the DDM-2000 out of service. No circuit packs should be inserted or removed while this test is in progress. If either the **SYSCTL** or **OHCTL** is removed while the test is in progress, or if the system is reset while the test is in progress, the test must be run again and allowed to complete normally.*
-  **CAUTION 2:**
Unterminated ports should be terminated or looped back before performing this test. Reflections from unterminated low-speed cross-connections can cause low-speed circuit packs to incorrectly appear failed.
-  **NOTE 1:**
Automatic local turnup tests will **not** operate properly if a local DDM-2000 shelf is provisioned for line-timed mode. The timing mode must be set to external or free running (**DLP-513**) before executing the **test-auto:** command. The timing mode should be returned to the correct state after these tests have been run.
-  **NOTE 2:**
It is assumed that the DDM-2000 is installed, powered, and running and that no alarms or LED indicators are activated.

⇒ **NOTE 3:**

This test is automatically performed on all groups and cannot be done on an individual group.

⇒ **NOTE 4:**

It is recommended that all group slots and signal paths be equipped and tested before the shelf is put into service. If circuit packs are not available for all groups, test one group, move the circuit packs to another group and do an update (**upd**), then repeat this test on the next group. If a **FUNCTION UNITS** group is equipped with a **DS3** or **OLI** circuit pack, it is recommended that the group first be tested with the **DS3** or **OLI** circuit pack, then the circuit pack be replaced with a **MXRVO** circuit pack and the test be repeated with all **LOW SPEED GROUP** slots equipped with **DS1/DS1PM** circuit packs. This will ensure that all **LOW SPEED GROUP** slots are good if you later want to convert a group to DS1 service.

⇒ **NOTE 5:**

This test assumes that default STS-1 cross-connections are in place (see **ent-crs-sts1** command). If cross-connections have been manually entered prior to this test, they may have to be deleted and new ones entered before performing this test. See the "Commands and Reports" section of this manual for a description of the following commands: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, **rtrv-crs-vt1**, and **set-ne**.

Use **rtrv-crs-sts1** command to verify proper cross-connections are in place for each group. Use **ent-crs-sts1** command to make proper cross-connections.

2. Install optical loops on all **OLI**s, if not already installed. See Figure 1.

Reference: **DLP-505**

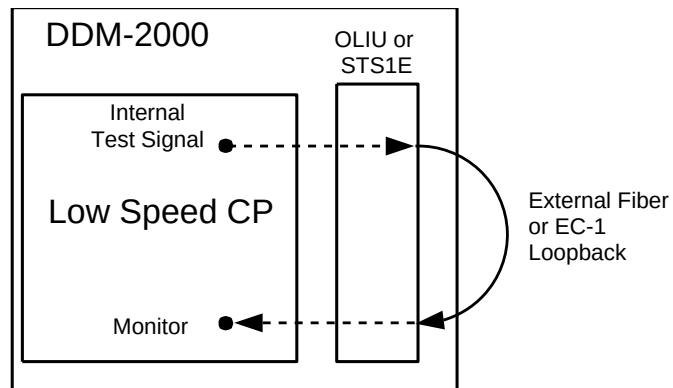


Figure 1. Automated Internal Test of Local Equipment (test-auto:md=local)

3. If **STS1E** circuit packs are installed, loopback the electrical EC-1 signal at the STSX cross-connect point or at the backplane BNC connectors [**J38-J39** (Group A)] [**J40-J41** (Group B)] [**J42-J43** (Group C)]. See Figure 1.
4. Is a CIT available?
If **YES**, then continue with **Step 5**.
If **NO**, then proceed to **Step 9**.
5. Connect the CIT to the **CIT** connector on the User Panel.

Reference: **DLP-521**

6. Enter the command: **test-auto:md=local**.

7. **⇒ NOTE 1:**

If question marks appear in all places except tg-1, tg-2 and --Control--, timing may be set for line-timed instead of free run or external. Also, if the looping fibers on the **MAIN OLIUS** are crossed, all **OLIUS** will appear failed (F) and all Low Speed slots and Function Units slots will show a question mark.

⇒ NOTE 2:

An inconsistent DCC switches alarm will occur when the test is completed and the DDM-2000 OC-3 shelf resets. To clear the alarm, use the **set-fecom:address:com=disable** command to disable the DCC.

The following CIT report will indicate the status of the equipment. It should indicate that there are no failures. If there is a failure, refer to the Trouble Clearing section of this manual. Replace any circuit pack that fails the automatic test [DLP-523].

```
/* Auto-Turnup Report -- Local Equipment Test and Timing Ref. Check
=====
-----Timing-----      -----Main-----      -----Function Units-----
tg-1 tg-2 ref-1 ref-2    main-1 main-2    a-1 a-2 b-1 b-2 c-1 c-2
g   F   g   ?         g       g       g   g   g   F   -   -

Low Speed Group A  Low Speed Group B  Low Speed Group C  --Control--
 1 2 3 4 5 6 7 8   1 2 3 4 5 6 7 8   1 2 3 4 5 6 7 8   sysctl auxctl
- - - g g F g g   - - - - - - - - - - - - - - - -   g       g
*/
```

where g stands for *good* and F stands for *Failed*, ? stands for *unknown due to other failures*, and - stands for *not applicable* (that is, slots not equipped).

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9.  **NOTE 1:**
The **UPD/INIT** pushbutton on the **SYSCCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ballpoint pen, to depress it.

-  **NOTE 2:**
Steps 10 through 12 must be performed with no unnecessary delays. Read the steps first to familiarize yourself with the sequence of operations and the expected responses.

Read Steps 10 through 12 before continuing.

10. Depress and hold the **ACO** pushbutton on the User Panel.

Response: All LEDs on the DDM-2000 are lighted.

11. With the **ACO** pushbutton still depressed, momentarily depress the **UPD/INIT** pushbutton. Then release both pushbuttons.

Response: All User Panel LEDs and **ACTIVE** LEDS remain lighted.

12. While all the LEDs are lighted, momentarily depress the **UPD/INIT** pushbutton ONE time. You have **1 MINUTE** to do this.

Response: On the User Panel, **CR** LED is flashing and **MJ** LED is lighted. All other LEDs, except **PWR ON** LED and **ACTIVE** LEDs, go off. 10 seconds after the **UPD/INIT** pushbutton is depressed, **CR** LED will stop flashing and remain lighted. **MJ** LED also remains lighted. **ACTIVE** LEDs go off. This indicates the beginning of the automatic looped transmission test. **CR** and **MJ** LEDs remain lighted for duration of test. The test may take as long as 5 minutes.

-  **NOTE:**
During the test, any failure will be indicated by a lighted **FAULT** LED on the affected circuit pack. This indication will remain on for 1 minute at the end of the test. If no failures are detected, the **ACO** LED on the User Panel will be lighted for 1 minute at the end of the test.

13. Wait until the test ends as described above. Was **ACO** LED lighted?
If **YES**, then continue with **Step 14**.
If **NO**, then proceed to **Step 16**.
14. The DDM-2000 has passed the automatic looped transmission test.
15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
16. Was any LED on the DDM-2000 lighted besides the **ACTIVE** LEDs and **CR**, **MJ**, and **ACO** LEDs on the User Panel?
If **YES**, then continue with **Step 17**.
If **NO**, then proceed to **Step 19**.
17. Lighted LED(s) in addition to the LEDs mentioned above indicates the circuit pack(s) that failed the automatic looped transmission test. Replace any circuit pack that failed the automatic looped transmission test.

Reference: **DLP-523**

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
19. There is an inconsistent set of diagnostic indications. Refer to **Trouble Clearing: TAP-108** to clear the failure condition.
20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic Cross-Connect Wiring Test

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION:**
*This test may only be performed with the DDM-2000 out of service. No circuit packs should be inserted or removed while this test is in progress. If either the **SYSCTL** or **OHCTL** is removed while the test is in progress, or if the system is reset while the test is in progress, the test must be run again and allowed to complete normally.*

-  **NOTE 1:**
Automatic cross-connect turnup tests will **not** operate properly if a local DDM-2000 shelf is provisioned for line-timed mode. The timing mode must be set to external or free running (**DLP-513**) before executing the "**test-auto:**" command. The timing mode should be returned to the correct state after these tests have been run.

-  **NOTE 2:**
It is assumed that the DDM-2000 is installed, powered and running, connected to the cross-connect points, and that no alarms or LED indicators are activated. It is also assumed that the DDM-2000 has passed the automatic local transmission test. If this test has not been completed, refer to the appropriate installation procedure and perform that test.

-  **NOTE 3:**
This test is automatically performed on all groups and cannot be done on an individual group.

⇒ **NOTE 4:**

This test assumes that default STS-1 cross-connections are in place. Default cross-connections are automatically made when each **FUNCTION UNITS** slot is equipped. If cross-connections have been manually entered prior to this test, they may have to be deleted and new ones entered before performing this test. See the "Commands and Reports" section of this manual for a description of the following commands: "**cnvt-crs**", "**dlt-crs-sts1**", "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**rtrv-crs-sts1**", "**rtrv-crs-vt1**", and "**set-ne**".

Use "**rtrv-crs-sts1**" command to verify proper cross-connections are in place for each group.

2. Install **OLI** optical loops, if not already installed.

Reference: **DLP-505**

3. ⇒ **NOTE:**

When an external DS3 loopback is established, provision for CC mode with no AIS ("**set-t3:address:mode=cc,ais=no**"). Otherwise, if the VMR mode is used, an inc. DS3 00F alarm will be generated.

At the low-speed cross-connect point (DSX-1, DSX-3 or STSX), install a patch cord from the **OUT** jack to the **IN** jack for each DS1, DS3, or EC-1 (STS1E) circuit associated with the DDM-2000 under test. See Figure 1.

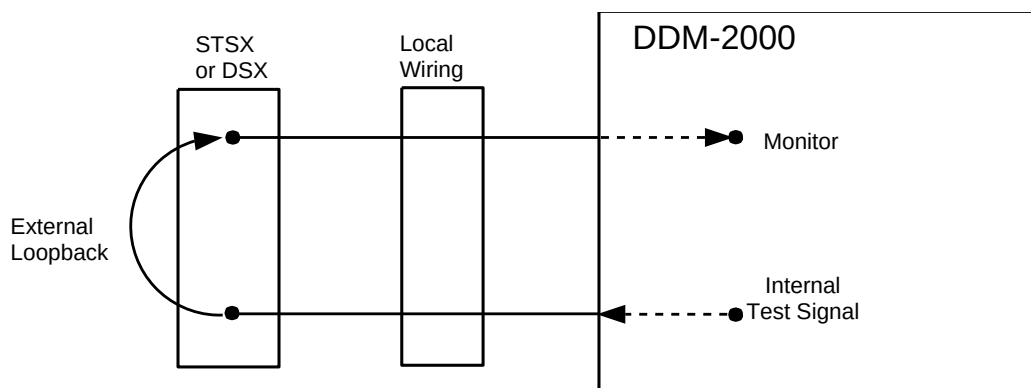


Figure 1. Automated Test of Local Wiring to Cross-Connection (test-auto:md=dsx)

4. Is a CIT available?

If **YES**, then continue with **Step 5**.

If **NO**, then proceed to **Step 10**.

5. Connect the CIT to the **CIT** connector on the User Panel.

Reference: **DLP-521**

6. Enter the command: "**test-auto:md=dsx**".

7.  **NOTE:**

An "inconsistent DCC switches" alarm may occur when the test is completed and the DDM-2000 OC-3 shelf resets. To clear the alarm, use the "**set-fecom:address:com=disable**" command to disable the DCC.

The following CIT report will indicate the status of the equipment. It should indicate that there are no failures. If report indicates a failure, disconnect the cross-connect cables from the DDM-2000 and use an ohmmeter to further isolate the failure in the cross-connect wiring.

```
/* Auto-Turnup Report -- Local Wiring Cross-Connect Test
=====
--Function Units--
fn-a  fn-b  fn-c
-      F      -

      Low Speed Group A      Low Speed Group B      Low Speed Group C
port  1 2 3 4 5 6 7      1 2 3 4 5 6 7      1 2 3 4 5 6 7
1      - - - g g ? g      - - - - - -      - - - - - -
2      - - - g F ? g      - - - - - -      - - - - - -
3      - - - g g ? g      - - - - - -      - - - - - -
4      - - - g F ? g      - - - - - -      - - - - - -
*/
```

where *g* stands for *good* and *F* stands for *Failed*, *?* stands for *unknown due to other failures*, and *-* stands for *not applicable* (that is, slots not equipped).

8. If violation monitor removal mode was set differently than the original mode in Step 3, reprovision the mode to the original or required setting using the "**set-t3**" command.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10.  **NOTE 1:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ballpoint pen to depress it.

-  **NOTE 2:**
Steps 11 through 14 must be performed with no unnecessary delays. Read the steps first to familiarize yourself with the sequence of operations and the expected responses.

Read Steps 11 through 14 before continuing.

11. Depress and hold the **ACO** pushbutton on the User Panel.

Response: All LEDs on the DDM-2000 are lighted.

12. With the **ACO** pushbutton still depressed, momentarily depress the **UPD/INIT** pushbutton. Then release both pushbuttons.

Response: All User Panel LEDs and **ACTIVE** LEDs remain lighted.

13. While all the LEDs are lighted, momentarily depress the **UPD/INIT** pushbutton one time. You have **1 MINUTE** to do this.

Response: On the User Panel, **CR** LED is flashing and **MJ** LED is lighted. All other LEDs, except **PWR ON** LED and **ACTIVE** LEDs, go off.

14. While the **CR** LED is flashing, momentarily depress **UPD/INIT** pushbutton ONE time. You have **10 SECONDS** to do this.

Response: On the User Panel, **MN** LED is lighted, **MJ** LED remains lighted, and **CR** LED is flashing. All other LEDs, except **PWR ON** LED and **ACTIVE** LEDs, are off. 10 seconds after the **UPD/INIT** pushbutton is depressed this last time, the **CR** LED will stop flashing and remain lighted, **MJ** and **MN** LEDs also remain lighted, and **ACTIVE** LEDs go off. This indicates the beginning of the automatic looped cross-connect test. **CR**, **MJ**, and **MN** LEDs remain lighted for duration of the test. The test may take as long as 5 minutes.

⇒ **NOTE:**

During the test, any failure will be indicated by a flashing **FAULT** LED on the affected circuit pack. This indication will remain on for 1 minute. If no failures are detected, the **ACO** LED on the User Panel will be lighted for 1 minute.

15. Wait until the test ends as described above. Was **ACO** LED lighted?
If **YES**, then continue with **Step 16**.
If **NO**, then proceed to **Step 19**.
16. The DDM-2000 has passed the automatic looped transmission test. Remove DSX/STX patch cords and momentarily depress the **UPD/INIT** pushbutton.
17. If violation monitor removal mode was set differently than the original mode in Step 3, reprovision the mode to the original or required setting using the "**set - t3**" command.
18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
19. Was any **FAULT** LED on any DS1 circuit pack flashing?
If **YES**, then continue with **Step 20**.
If **NO**, then proceed to **Step 22**.
20. The flashing LED(s) on the DS1 circuit pack(s) indicates the circuit pack(s) that failed the automatic cross-connect transmission test. Disconnect the cross-connect cables from the DDM-2000 and use an ohmmeter to further isolate the failure in the cross-connect wiring.
21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
22. There is an inconsistent set of diagnostic indications. Refer to **Trouble Clearing: TAP-108** to clear the failure condition.
23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Operate FE SEL Pushbutton on SYSCTL

1. **NOTE 1:**

The **FE SEL** pushbutton on the **SYSCTL** can be used to display the near-end and far-end alarm/status condition. The 7-segment **FE ID** display indicates which site/shelf conditions are currently being displayed on the local User Panel. When the 7-segment display is blank, a composite of the local and far-end alarm and status conditions is displayed on the User Panel.

 NOTE 2:

When the **FE SEL** pushbutton is pushed for the first time, the **FE ID** display shows **L.** and the User Panel LEDs show the conditions of the local shelf only.

If the **FE SEL** pushbutton is pushed again within 15 seconds, the **FE ID** display shows the local shelf SITE address (with the decimal point), and the User Panel LEDs show the alarm and status condition of all shelves at this site. In OC-3 applications, there will be only one shelf at each site and the set of LEDs lighted will be the same for the first and second button pushes. In OC-3/OC-12 applications, there may be up to five shelves at one site. The first button push allows isolation of a fault to a single shelf at the local site, and subsequent button pushes allow isolation of a fault to the local site or one of the remote sites.

In OC-3/OC-12 applications, each time the **FE SEL** button is pushed again within 15 seconds, the **FE ID** display and User Panel increment to display the next highest SITE address in the network and the alarm or status condition of the shelves at that site. If the local DDM-2000 OC-12 Multiplexer cannot communicate with another site due to a failure, all LEDs on the User Panel will be lighted when the FE ID display shows that site number. In OC-3 applications, each time the **FE SEL** button is pushed again within 15 seconds, the **FE ID** display increments to display the next highest SITE address in the network and the User Panel LEDs show the composite alarm and status condition of the shelves in the network at that site. If the local DDM-2000 OC-3 Multiplexer cannot communicate with another site due to a failure, then all LEDs on the User Panel will be lighted when the **FE ID** display shows that site number.

If there are more than eight sites, a dash will appear in the **FE ID** display for each site greater than eight. After cycling through the sites, **L.** and the conditions of the local shelf are again displayed.

When the **FE SEL** is released and not pushed again for 15 seconds, or if the **ACO/TST** pushbutton is pushed, the **FE ID** display will go blank and the User Panel will return to the composite display.

Momentarily depress and release the **FE SEL** pushbutton until the required SITE address and conditions are displayed.

2. Note the alarm LEDs displayed on the local User Panel. You have **15 SECONDS** to observe the alarm indications.
3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Retrieve Generic Software Version ID

1. Is a CIT available?

If **YES**, then continue with **Step 2**.

If **NO**, then proceed to **Step 5**.

2. Connect CIT to User Panel and establish session.

Reference: **DLP-521**

3. Use the **rtrv-eqpt:sysctl** command to retrieve generic software version number.

Response: System outputs an "Equipage and Version Report" which contains the program version presently loaded into the system.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. **NOTE:**

When the **ACO** pushbutton is depressed, all LEDs and the 7-segment display on the **SYSCTL** light. If the **ACO** pushbutton is released within 2 seconds, the LED test completes and the 7-segment display and all LEDs will revert to normal operation. If the **ACO** pushbutton is depressed longer than 2 seconds, the 7-segment display goes blank for 2 seconds and then each digit of the generic software version code is scrolled through the display. The LEDs remain lighted while the code is being displayed. When the **ACO** pushbutton is released, the LEDs remain lighted until the full software version code is displayed. If the **ACO** pushbutton is still depressed when the software version code has completed cycling, the display goes blank for 2 seconds and starts cycling through the software version code again. This continues as long as the **ACO** pushbutton is depressed. When the **ACO** pushbutton is released the cycle will complete and the display and all LEDs go to normal operation.

Depress and hold (for longer than 2 seconds) the **ACO** pushbutton on the User Panel.

Response: All LEDs and the 7-segment display light. The display goes blank for 2 seconds and then scrolls through the full software version code.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install New Software Generic Program In-Service System Local Shelf Download

1. Before beginning the software installation, refer to the "Software Installation and Upgrade Procedure" section of the Software Release Description. This section contains a description of any special considerations required when installing this version of software.
2.  **NOTE:**
This procedure is used to install a new software program in a local in-service DDM-2000 OC-3 shelf. For procedures to download software in a new shelf (initial installation), see **DLP-561**. For procedures to download software to a remote shelf (using **ins-prog** or **cpy-prog** command), see **DLP-562**.

Verify that no DCC failures or transmission failures (OC-3 LOS, flashing **OLIUFault** LEDs, etc.) are present on the network element or system receiving the program.

3.  **CAUTION:**
TIMING slot 2 should always be equipped with a **TGS** circuit pack and be active prior to software download. To clear a "**C**" condition from the **SYSCTL FE ID** display, procedures will require removal of the **TGS** circuit pack from **TIMING slot 1** to force the system to run the new software. See Table A.

-  **NOTE 1:**
- When upgrading from releases without synchronization messaging to releases with this feature, it is suggested to upgrade first the shelves which are provisioned for "external timed" or "external mult" timed. This is to prevent timing "holdover" conditions at nodes that derive timing from the OC-3 line.

Table A. DDM-2000 OC-3 In-Service Upgrade Compatibility

Current Release in Shelf (OLD)	Software Release To Be Installed (NEW)						
	Linear		Ring				
	8.0	8.1.n	7.2.n	9.0.n	9.1.n	11.0.n	11.1.n
7.1.n or earlier	NA	NA	C	C	C	C	C
7.2.n (Ring)	NA	NA	X	C	C	C	C
8.0.n (Linear)	X	X	C	C	C	C	C
8.1.n (Linear)	NA	X	NA	C	C	C	C
9.0.n (Ring)	NA	NA	NA	X	X	X	X
9.1.n (Ring)	NA	NA	NA	NA	X	X	X
11.0.n (Ring)	NA	NA	NA	NA	NA	X	X
11.1.n (Ring)	NA	NA	NA	NA	NA	NA	X

C - Indicates software incompatibility. Upon completion of the software download, a "C" will be displayed in the **SYSCTL FE ID** display. This is a caution indicating that the newly installed software has major changes from the previous release. Transmission will not be affected but shelf access, protection switching, alarm reporting, and control functions will be disabled while the "C" is displayed. You must verify that the correct software version has been downloaded and that a "C" was expected as a result of the download (See Table above). After verifying that the correct software download occurred, the system may be forced to run the new software by following the steps provided in this procedure.

NA - Not Applicable. If an NA conversion is required, contact your local technical support organization.

X - Indicates software compatibility. Download procedures will not require the system to be forced to run the software installed. No "C" should appear in the **SYSCTL FE ID** display. Other equipment/fiber changes and/or software/equipment provisioning may be required before and/or after the upgrade. See **System Turnup: IXL-001** for particular upgrade procedures and the Software Release Description for the software release being installed.

⇒ **NOTE 2:**

If a linear shelf is in the STS3c mode (**concat** mode enabled by the **set-oc3** command) and a different software generic that does not have the STS3c feature is loaded, the **OLIUs** will stay in the **concat** mode until they are removed and reseated.

⇒ **NOTE 3:**

If the **ins-prog** command is used for software upgrades from Release 9.1 to Release 11, or later, the software is loaded as a dormant copy in the **SYSTL** receiving the software. At the end of the download, the **rtrv-alm** report will show a status message of "*dormant/exec code mismatch*". The **apply** command must be used to overwrite the original executing copy of software with the new dormant software version. See the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume 1*, for a description of the **apply** command.

Before performing this procedure, ensure that both **TGS** circuit packs are installed in the shelf, then use the **switch-sync:s=circuitpack,pri>manual** command to switch to the protection **TGS** circuit pack in **TIMING** slot 2, if not already **ACTIVE**. Use **rtrv-sync:** command to verify that the **TGS** circuit pack in **TIMING** slot 2 is **ACTIVE**.

4. ⇒ **NOTE:**

If you are using a PC operating in a *Windows*^{*} environment, you must **exit Windows** and restart your PC in *MS-DOS*^{*} mode before performing these download procedures. For example, if your PC is running *Windows 95* you must exit *Windows* by clicking on the **Start** button, then **Shut Down**, then **Restart the computer in MS-DOS mode**.

Obtain equipment, check software, and connect PC for download if new software is being loaded from floppies or hard disk. Connect CIT to login to shelf if **APPLY** command is being used to load a dormant copy of software (Release 9.1 or later).

Reference: **DLP-566** to connect PC.

Reference: **DLP-521** to connect CIT.

* Registered trademark of Microsoft Corporation.

5. Observe one of the following indications on the **FE ID** display. Note the indication and follow the suggested procedure.

A. **Letter "P" in FE ID Display**

Indicates no software installed in **SYSCTL**. Software must be downloaded locally using these procedures.

Continue with **Step 6**.

B. **Letter "P." in FE ID Display**

Letter "**P**" followed by a period (**P.**) indicates a previous download attempt has failed. New software must be downloaded locally using these procedures.

Proceed to **Step 20**.

C. **FE ID Display Blank:**

Indicates compatible software is installed in **OHCTL** and **SYSCTL**. This procedure assumes the installed executing software version is not the correct version. (Depress **ACO** button for longer than 2 seconds to display software version on the **FE ID** display.)

Proceed to **Step 9**.

D. **Letter "d" in FE ID Display:**

Indicates **OHCTL** has no software or that software in **OHCTL** and **SYSCTL** is incompatible.

Proceed to **Step 20**.

E. **Letter "C" in FE ID Display:**

Indicates software is installed in **OHCTL** and **SYSCTL**, but it will not support the current shelf provisioning.

Proceed to **Step 24**.

F. Letter "U" in FE ID Display:

Indicates **SYSCTL** Switch **S1** is not set properly for type of shelf being equipped.

Remove **SYSCTL**. Repeat procedures of **DLP-501** to correct switch settings and to reinstall **SYSCTL**.

G. Letter "E" in FE ID Display:

Indicates **SYSCTL** must be replaced.

Get replacement **SYSCTL** and repeat procedures of **DLP-501**.

H. Letter "F" in FE ID Display:

Indicates **SYSCTL** faceplate latch is not fully seated. If **SYSCTL** has just been replaced, unplug **SYSCTL** and repeat procedures of **DLP-501**. If original **SYSCTL** has just been unplugged and reseated, properly seat the faceplate latch. (A reset occurs after the faceplate is seated.)

I. Flashing Letter "L" in FE ID Display:

Indicates a low voltage condition (brownout) on the shelf.

Clear trouble using **Trouble Clearing: TAP-121**.

Letter "P" in FE ID Display

6.  **CAUTION:**
*If PC hard drive is being used, ensure you are in the correct directory.
If floppies are being used, ensure the first (number 1) diskette is
installed in floppy drive. Ensure PC is connected to the front CIT
(CIT-1) connector.*

 **NOTE:**
After the terminal emulator (**term**) is started, the software download
automatically begins. The download may take up to 45 minutes.

Enter **term** or **term COMn** command, where $n = 1$ or 2 . If **term** is
entered without the **COMn** option, then **COM1** will be selected by default.
Disregard message "Can't find script <init>" if you see it after
starting the terminal emulator.

Response: Two brief messages are printed and you are instructed to
Press any key to continue . . . after the
second message. After you press any key, the
terminal emulator is loaded and the terminal responds
as follows within 2 minutes:
Interface ready. (Type Alt-h for help.)
Communications established.

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress

The dots continue to print until program installation is
complete. If using floppies, insert each diskette when
prompted. After installation is completed, the PC
prints the following completion message:

```
ins-prog: TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the
system.

7. Was response correct?

If **YES**, then continue with **Step 8**.

If **NO**, then proceed to **Step 28**.

8. Did the letter "**C**" appear in the **FE ID** display?

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

If **YES**, then proceed to **Step 24**.

FE ID Display Blank

9. Is new software being loaded from a PC or are you using the **apply** command to install a dormant copy of software as an executing copy?

If **PC**, then continue with **Step 10**.

If **APPLY COMMAND**, then proceed to **Step 34**.

10.



CAUTION:

*If PC hard drive is being used, ensure you are in the correct directory.
If floppies are being used, ensure the first (number 1) diskette is
installed in floppy drive.*

Enter **term** or **term COMn** command, where $n = 1$ or 2 . If **term** is entered without the **COMn** option, then **COM1** will be selected by default. Disregard message "Can't find script <init>" if you see it after starting the terminal emulator.

Response: Two brief messages are printed and you are instructed to
Press any key to continue . . . after the
second message. After you press any key, the
terminal emulator is loaded and the terminal responds
as follows:
Interface ready. (Type Alt-h for help.)
Communications established.

11.



NOTE:

The default shelf is the shelf physically connected to the PC. To set baud rate automatically, enter two carriage returns (<cr>), two lower case "a"s (**aa**), or two upper case "A"s (**AA**). All other characters are ignored.

Enter two carriage returns.

Response: PC prompts with:

```
/* Enter a shelf number from 1 to 8 */  
shelf [default] =
```

12. Was response correct?

If **YES**, then continue with **Step 13**.

If **NO**, then proceed to **Step 29**.

13. Enter the shelf number for the shelf being used for new program download.

Response: PC responds with:

```
login<
password<

/*****
*
*
*      Lucent Technologies      *
*      DDM-2000 OC-3 Multiplexer  *
*
*      Release a.b.c          *
*
*****/

      .
      .
      .

TID date time
M  rtrv-alm: all COMPLD
/* Active Alarms and Status Report
```

14.  **NOTE:**

After the system prompt (<), the system will respond normally to commands entered. The "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, gives a description of the commands.

Use **rtrv-ne** command to retrieve the name (*tid*) of the shelf having new program installed or see TID in response above.

15. Enter the command **ins-prog:tid**

Where tid = the target identifier (shelf name) for the DDM-2000 shelf having the new program installed.

Response: /* Testing For Program Installation... */

After several seconds, the PC prints a Caution! message followed by the prompt:

Execute? y/n =.

16. Was response correct?

If **YES**, then continue with **Step 17**.

If **NO**, then do **Trouble Clearing: TAP-116**.

17. Enter a y or yes and a carriage return to execute the program. Software download may take up to 45 minutes.

Response: **ABN** LED lights on User Panel and a **P** is displayed in **SYSCTL FE ID** display in the shelf receiving the program. PC starts download and prints the following message:

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress

The dots continue to print until program installation is complete. If floppy disks are being used, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

ins-prog:TID COMPLD
/* Generic a.b.c is installed */

18. Was response correct?
If **YES**, then continue with **Step 19**.
If **NO**, then do **Trouble Clearing: TAP-116**.
19. Did the letter "**C**" appear in the **FE ID** display?
If **NO**, then proceed to **Step 34**.
If **YES**, then proceed to **Step 24**.

Letter "d" or "P." in FE ID Display

20.  **CAUTION:**
*If PC hard drive is being used, ensure you are in the correct directory.
If floppies are being used, ensure the first (number 1) diskette is
installed in floppy drive. Ensure PC is connected to the front CIT
(CIT-1) connector.*

Enter **term** or **term COM n** command, where $n = 1$ or 2 . If **term** is entered without the **COM n** option, then **COM1** will be selected by default. Disregard message "Can't find script <init>" if you see it after starting the terminal emulator.

Response: Two brief messages are printed and you are instructed to
Press any key to continue . . . after the
second message. After you press any key, the
terminal emulator is loaded and the terminal responds
as follows:
Interface ready. (Type Alt-h for help.)
Communications established.

21. Unplug and reseal the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display (takes approximately 15 seconds). The software download automatically begins and may take up to 45 minutes.

Response: PC starts download and prints the following message:

```
Searching for optimal transfer rate.  
Handshake established at <baudrate> baud.
```

```
In progress . . . .
```

The dots continue to print until program installation is complete. If using the floppy disks, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog: TID COMPLD  
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

22. Was response correct?
If **YES**, then continue with **Step 23**.
If **NO**, then proceed to **Step 28**.
23. Did the letter "C" appear in the **FE ID** display?
If **NO**, then proceed to **Step 34**.
If **YES**, then continue with **Step 24**.

Letter "C" in FE ID display

24.  **CAUTION:**
*If the system is in service and is forced to run the current software that is displaying a **C**, service interruption may result.*

 **NOTE:**
Indications are that there may be a problem with the version of software you are installing or you are trying to install a version of software that will not support the current shelf provisioning. If you are downloading an older version of software or upgrading to a new version of software which has major changes or is incompatible with the version that you have, this indication will occur (See Table A). You can *force* the system to run the current software or back out of this procedure by loading another version of software.

You must decide if you want the system to run this current version of software that has been loaded or if you want to download another version (original version or new version) of software.

Do you want to run the current version of software in the **SYSCTL**?

If **NO**, then continue with **Step 25**.

If **YES**, then proceed to **Step 26**.

25. Exit TERM (Alt-F2). Find new version of software and repeat this procedure from Step 20.
26. To *force* the system to run the current software, perform the following:
- Ensure that a **TGS** circuit pack is installed in **TIMING** slot **2**.
 - Remove the **TGS** circuit pack in **TIMING** slot **1**.
 - Reset (unplug and reseat) the **SYSCTL** to force it to run the current software.
 - After the current software is up and running (no alarm LEDs lighted or you can log into the shelf), reinstall the **TGS** circuit pack in **TIMING** slot **1**.
27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

28. Did the download start as indicated by the In progress message and rows of dots?

If **NO**, then continue with **Step 29**.

If **YES**, then proceed to **Step 31**.

29. Perform the following:

- A. Check that the DDM-2000 is connected to the PC through the **COM** port. If it is not, reconnect the PC to DDM-2000 using the **COM** port and repeat this procedure.
- B. Ensure first (number 1) disk of program being installed is inserted, if using floppies.
- C. Ensure diskette is inserted in correct drive.
- D. Ensure the proper command was used to go to the drive with the diskette or to the proper directory containing the software.
- E. Check for invalid COM port. Exit TERM (Alt-F2), then restart TERM using **term COM1** or **term COM2**.
- F. If the download still does not start, as indicated by the In progress message and rows of dots, within 2 minutes after the **P** appears in the **FE ID** display, change the baud rate as follows and repeat this procedure: if the baud rate is currently set to 9600, change it to 4800 or if the baud rate is currently set to 4800, change it to 9600. The baud rate is changed by:
 1. Momentarily depress the "Alt C" keys.
 2. Use the RETURN key to move to the "Speed" field.
 3. Press the "Space" bar until the desired rate appears.
 4. Momentarily depress the "Escape/Esc" key to activate the new baud rate.
- G. If the download still does not start, refer to **Trouble Clearing: TAP-116**.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. If the download *starts and fails* during its progress, exit term (Alt-F2) and then restart a new term session.
32. Unplug and reseat the **SYCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display (takes approximately 15 seconds).

If the download still does not complete, refer to
Trouble Clearing: TAP-116.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
34. Use the **rtrv-alm** command to display alarm and status information.
35. Does status message "dormant/exec code mismatch" appear in the report for this shelf?
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **YES**, then continue with **Step 36.**

36.  **NOTE:**
The software you downloaded has been loaded as a dormant copy in this shelf. The original software is still the executing software. The **apply** command must be used at this shelf to install the dormant copy of software as an executing copy. When the **apply** command is executed during an upgrade from Release 9.1 to later releases, there is a 30-minute delay before the dormant copy installation begins.

When the **apply** command is executed during an upgrade from Release 11 to later releases, if you do not specify a *time* and *date* parameter, there is a default 15-minute delay before the dormant copy installation begins. Once the installation begins, the dormant copy is installed in approximately 10 minutes.

See the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the **apply** command. The **apply** command allows you to coordinate the software download across the network.

Are you going to use the **apply** command at this time to install the dormant version of software?

If **YES**, then continue with **Step 37**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. Use the **rtrv-ne:** command to verify the *Dormant_Version* release.

38. Is the *Dormant_Version* release number listed and correct?

If **YES**, then continue with **Step 39**.

If **NO**, then proceed to **Step 41**.

39. Execute the **apply** command at the shelf to receive the software.

Response: A "**P**" appears in the **FE ID** display when the installation begins.

The **SYSCTL** resets after the software is installed.

LEDs and **FE ID** display go off on **SYSCTL** and User Panel.

You are logged off the system.

After approximately 5 minutes you can log back into the shelf and reestablish communications.

40. Was response correct?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then proceed to **Step 42**.

41. If the *Dormant_Version* release number is not listed, the dormant software is missing or corrupted. You will have to load new software.

42. Repeat this procedure to load new software using the **cpy-prog** or **ins-prog** command. If software installation fails again, perform trouble clearing procedures. You may need to replace the **SYSCTL**. If the letter "**C**" appeared in the **FE ID** display, then repeat this procedure from **Step 24**.

43. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Introduction to the Personal Computer (PC)

General

This Detailed Level Procedure (DLP) provides a brief introduction to the PC. It includes proper handling and storage of diskettes and some of the important procedures you should follow when working with your PC. This DLP is a brief review of PC concepts. Refer to your PC user's guide for a complete description.

Anatomy of a PC

PCs vary in physical appearance and size, most *IBM** compatible PCs consist of three basic parts — a main unit, a monitor, and a keyboard. Note that some PCs, particularly portables, integrate the keyboard, monitor, and main unit into a briefcase-size package. The DDM-2000 generic program may be installed with either a desktop PC or a portable PC. The diskettes may be either 3-½ inch floppy disks or 5-¼ inch floppy disks.

Main Unit

The main unit of the PC contains the CPU (central processing unit), disk drive(s), and memory, among other things. All main units have some common features which include:

- **ON/OFF Switch** — This switch is used to switch the PC **ON** or **OFF**. It is usually located on the back of the PC, near where the AC power cord plugs in to the PC.
- **Serial Port** — This is the port which the PC uses to communicate with the customer equipment. When using the PC to install a new generic program to DDM-2000, the COM1 port must be used. Refer to your PC documentation to determine which port is the COM1 port. There are two types of serial port connectors:
 - 25-pin RS-232 connector (male)
 - 9-pin connector (male).

* Registered trademark of International Business Machines Corporation.

If your PC has the 9-pin connector, you will need a serial port adapter which converts the 9-pin connector to a 25-pin connector. This is a cable which has a 9-pin connector on one end and a 25-pin male connector on the other end.

- **Parallel Port** — This port is used to connect to some printers.
- **Disk Drives** — PCs come in several basic types, some of which are as follows:
 - **Single floppy disk, no hard disk** — This type PC is the most basic configuration. The PC has a single floppy disk drive, with no hard (fixed) disk. The floppy drive is referred to as drive **A**.
 - **Dual floppy disk, no hard disk** — This type PC is identified by the two floppy disk drives installed. One floppy drive is referred to as drive **A**. The second is referred to as drive **B**.
 - **Single floppy disk with hard disk** — This type PC has a single floppy disk drive and a hard disk, which can typically store 10 or more megabytes of data. The single floppy disk drive is referred to as drive **A**, and the hard disk is usually referred to as drive **C**.

Other combinations of floppy and hard drives are possible but all that is required is a single floppy drive as a minimum. The procedures in this manual for installing a new generic program indicate using drive **A**.

Monitor

The monitor, sometimes called a display screen, may be either monochrome or color.

Keyboard

The keyboard is used to enter commands. This section reviews some of the features of the keyboard and points out some of the special keys.

The keyboard is divided into two different sections:

- *Typewriter section* — This area has the alphanumeric keys that resemble the layout of a typewriter. In particular, you should locate the **ENTER** key (sometimes referred to as **RETURN**). This key is located on the right side of the typewriter section. It usually has the word **ENTER** or **RETURN** printed on the key. When you are asked to select **<ENTER>** or **RETURN**, you should momentarily depress that key, or equivalent.
- *Special Keys* — The keyboard has many special keys which are interpreted differently by various software packages. Locate the **CANCEL** or **DELETE** key. This key may be used to abort a command.

Rebooting the PC

Occasionally, you may have to reboot the PC. There are three ways to accomplish this:

- Power **ON/OFF** switch — If the PC is **OFF**, you should set the **ON/OFF** switch to the **ON** position. If the PC is already **ON**, it is preferable to reset it using one of the following two methods:
- **RESET** button — Not all PCs have a **RESET** button, but if yours does, it provides an easy way to reset the PC. Alternatively, the following method may work.
- Hold down the **CTRL**, **ALT**, and **DELETE** keys all at the same time.

If **RESET** or **CTRL**, **ALT**, and **DEL** keys are not effective, turn **OFF** the PC, wait a few seconds, and turn it back **ON**. Rebooting the PC clears all data you had in memory. If the time of day clock is not indicating the current time and date, set the time of day clock.

Diskettes — Care and Handling

Diskettes are sometimes called floppy disks, or floppies for short. Diskettes are similar to cassette tapes—magnetically encoded information is stored on the diskette for later retrieval. By adhering to the following guidelines you will increase the useful life of your diskettes:

DO:

- Keep the diskette in a protective envelope when not in use.
- Keep the diskette in a dry place.
- Keep the diskettes away from magnetic fields or objects (for example, magnetic screwdriver.)

DO NOT:

- Touch any of the exposed surfaces of the diskette itself; handle it by the edge of the jacket. Very tiny scratches, fingerprints, or dust can ruin a diskette.
- Bend a diskette.
- Write on a diskette label with a ballpoint pen or pencil. Use a felt-tipped pen instead. Write the label before applying it to the diskette if possible.
- Erase the diskette label with a pencil eraser. The dust may destroy the diskette. Instead, place a new label over the old one.

Inserting Diskettes

You should **never** remove or insert a diskette while the disk drive indicator light is on. (The computer turns the indicator light on to let you know that it is reading or writing from the disk.) Always wait for the indicator light to go off before opening the disk drive door. Failure to do this may result in damaging the diskette or loss of data on the diskette. Insert a diskette into a disk drive as follows:

1. Open the diskette drive door.
2. Gently insert the diskette with the label facing up and the notch on the left, if provided.
3. Slide the diskette in as far as it will go, but do not force it. You may hear a click when the diskette is all the way in.



CAUTION:

Do not attempt to force the diskette into the drive.

If resistance is felt or it does not slide in easily, remove the diskette and insert it again.

4. Close (latch) the disk drive door.

When you are instructed to insert a diskette into a drive, it is implied that you should open the door, slide the diskette in all the way, and close (latch) the door.

Removing Diskettes

Wait for the indicator light on the disk drive to go off. Open the disk drive door. The diskette may pop out for easy removal. (Opening up a disk drive door is similar to ejecting a cassette from a cassette recorder.) After the diskette has been removed, place it into its protective envelope or storage facility.

Copy Diskettes and Make Backups

General

If you are using new generic program diskettes for the first time, there are two things that you should do:

1. Create a working copy.
2. Make backup copies.

Before installing the program, it is a good idea to make backup copies of the working copy. If the working copy is ever lost or damaged, you will have a backup copy and will not have to create a new working copy from the original.

Create a Working Copy

The diskette(s) sent to you contains the new generic program software. However, before you can install this new program, you have to load the *MS-DOS*^{*} operating system software. (If you are not sure how to do this, instructions are given in the "Starting *MS-DOS* Software" section.) The new generic program software requires *MS-DOS* software (Release 2.1 or later).

To load the version of *MS-DOS* software, you can copy the *MS-DOS* onto the first diskette, and then copy the new generic program software to that diskette also. Once you have done that, simply insert that diskette into the drive and reboot the PC. The new diskette(s) that you create will be your working copy of the new generic program. The original diskette(s) that you received should be stored in a clean, dry place.

You will need the following to create a working copy:

- The *MS-DOS* software disk with Release 2.1 or later.
- A blank diskette(s) (this will become the working copy).
- The original diskette(s) containing the new generic program.

* Registered trademark of Microsoft Corporation.

There are three steps required to create a working copy:

1. Start *MS-DOS* software.
2. Format a new diskette(s).
3. Copy the original diskette(s) that you received with your package to the working diskette(s).

Starting *MS-DOS* Software

Starting *MS-DOS* on some PCs may require you to insert your copy of the *MS-DOS* diskette into your floppy drive, close the door, and reboot or turn on the PC. The disk drive indicator light will come on, and the PC may print out diagnostic results on the monitor. PCs which operate in a *Windows*^{*95} environment require you to exit *Windows* by clicking on the **Start** button, then **Shut Down**, then **Restart the computer in *MS-DOS* mode**. In *Windows* 3.1, exit windows using the **File** menu to operate your PC in *MS-DOS* mode. When *MS-DOS* software is ready, a prompt (for example, **A>**) appears on the display screen. This is how *MS-DOS* software lets you know it is ready for you to type a command.

Formatting a New Diskette

You will need a blank diskette(s). It is a good practice to label diskettes so that you can keep track of them. You should prepare a label for the diskette(s) marked as DDM-2000 OC-3 Release a.b.c - working copy. The a.b.c is the release version that you are copying.



WARNING:

Do not write on diskette label using a ballpoint pen or pencil.

When the prompt **A>** appears, type the following command, and then press **<ENTER>**. (If you make a mistake while entering this command, you can press the **BACKSPACE** key, or equivalent, which will erase one character at a time.)

format a:/s <ENTER>

* Registered trademark of Microsoft Corporation.

You will see a message similar to the following (the exact wording of the message may vary depending on which PC you are using):

Insert new diskette for drive A:
and strike any key when ready

Now open the drive door and remove the *MS-DOS* diskette. Place the *MS-DOS* diskette in its envelope, and set it aside for the time being.

Next, insert the blank diskette into the drive and close the door. Depress any key on the keyboard to begin formatting. After you depress a key, a message similar to the following will appear:

Formatting...

You will see the disk drive indicator light come on. The formatting process takes several minutes. When the formatting is complete, a message appears to tell you that the format is complete. In addition, you will see several lines of messages about total disk space available. Finally, you will be prompted to format another disk with the following message:

Format another (Y/N)?

If you do not need to format another disk, type **n** and **<ENTER>**. The system will respond with a prompt **A>** display.

Remove the diskette from the disk drive and place it in a protective envelope or storage location. If you have not already done so, label the diskette(s) as DDM-2000 OC-3 Release a.b.c - working copy. You are now ready to copy the files from the original diskette(s) to the working copy diskette(s).

Copying Files — General

The process of copying files from one diskette to another varies slightly depending on whether you have one or two floppy disk drives.

If you have a dual floppy PC, *MS-DOS* software refers to one disk drive as drive **A** and the other disk drive as drive **B**. If you have a single floppy PC (one floppy drive, with or without a hard disk), *MS-DOS* software treats the floppy disk drive as both drive **A** and drive **B**. The hard disk is usually referred to as drive **C**.

To do the new generic program installation using floppy diskettes, all the following files must be on a single diskette:

CHECKPGM.EXE	CRTM.EXE	CTRM.INI	CTRM.SCR	GENERIC.0
PCLOAD.EXE	README	TERM.BAT	STAGE_1.0	STAGE_10.0

The remaining files similar to the following can be on the same diskette or on another diskette:

GENERIC.1	GENERIC.2	GENERIC.3	GENERIC.4	GENERIC.5 ...
GENERIC0.0	GENERIC0.1	GENERIC0.2 ...		

To do the new generic program installation using the PC hard disk, all the files listed in the README file must be on the hard disk in the directory from which you will do the installation.

To read the contents of the README file, use the **more < README** command. To list the files on the hard disk or floppy diskette, use the **dir/p** command.

Copying Files — Hard Disk System

Set up your hard disk so that when you turn on your computer, it starts up using the hard disk instead of the *MS-DOS* system diskette. When prompt **C:>** appears, type the following commands:

```
mkdir ngp <ENTER>  
cd ngp <ENTER>
```

Insert the original generic program diskette in drive **A**, and close the door. Type the following command:

```
copy a:*. * <ENTER>
```

This command tells *MS-DOS* software to copy all of the files from the **A** drive to the **C** drive (hard disk). Open the drive door, and remove the original diskette from the drive. Repeat this procedure for all diskettes.

Copying Files — Single Floppy System

If you have a single floppy system (with or without a hard disk), insert the original new generic program diskette into drive **A**, and close the door. Type the following command after the prompt:

```
copy a:*. * b: <ENTER>
```

This command tells *MS-DOS* software to copy all of the files from drive **A** to drive **B**. Since there is no drive **B** physically installed, *MS-DOS* software will pretend that there is one. It does this by copying a file from drive **A** (as much as it can fit) into the PC's memory. It then displays the following message:

```
Insert diskette for drive B:  
Strike any key when ready...
```

Open the drive door, and remove the original diskette from the drive. Insert the working copy diskette into the drive, and close the door. Depress any key. The *MS-DOS* software now copies the file from the PC memory to the working copy diskette which you inserted into drive **A**. When the copy is complete, it will display the following message:

```
Insert diskette for drive A:  
Strike any key when ready...
```

Open the drive door, and remove the working copy diskette from the drive. Insert the original diskette into the drive, and close the door. Depress any key. The *MS-DOS* software now begins where it left off. This process repeats until the entire diskette has been copied. In summary:

- When you are prompted to insert diskette for drive **A**, insert the original diskette into the floppy drive.
- When you are prompted to insert diskette for drive **B**, insert the working copy diskette into the floppy drive.
- Repeat until the prompt **A>** appears on the display screen.

When the process is complete, the prompt **A>** will be displayed on the screen. Repeat this procedure for all original diskettes. Before using the diskette(s) to install the new program, it is a good idea to make backup copies of the working copy. If the working copy is ever lost or damaged, you will have a backup copy and will not have to create a new working copy from the original(s).

Making Backups — Single Floppy System

Insert the *MS-DOS* diskette into drive **A**. Type:

diskcopy a: b: <ENTER>

A message similar to the following appears:

Insert SOURCE diskette in drive A:
Strike any key when ready

Wait for the disk drive indicator light to go off. Remove the *MS-DOS* disk from drive **A** and insert the working copy diskette (the source) into the drive. Press any key. The disk drive indicator light will come on to indicate that the copying is in progress. The *MS-DOS* software copies as much of the diskette as it can into the PC's memory and then displays the following message:

Insert TARGET diskette in drive A:
Strike any key when ready

Remove the working copy (source) diskette, insert the new (target) diskette, and press any key. It is not necessary to preformat the new diskette; the diskcopy command will do this for you. Depending on the amount of memory in your computer, you may be prompted to repeat this several times. When the copy is complete, the following message will appear:

Copying complete

Copy another (Y/N)?

If you wish to make additional backups, type **y** and follow the same instructions. If you are done, type an **n** and **<ENTER>**. When the prompt **A>** appears, wait for the disk drive indicator light to go OFF and remove floppy. Label the backup floppy with an appropriate label (for example, DDM-2000 OC-3 Release a.b.c - working copy backup).

Copying Files — Dual Floppy System

Insert the first original new generic program diskette into drive **A** and close the door. Insert the formatted copy diskette into drive **B** and close the door. Type the following command:

```
copy a:*. * b: <ENTER>
```

The files from the original diskette will be copied to the working diskette one at a time. When the process is complete, the prompt **A>** will be displayed on the screen. Repeat the procedure for all remaining original diskettes. Label all diskettes.

Making Backups — Dual Floppy System

Insert the *MS-DOS* diskette into drive **A**. Type in the following command:

```
diskcopy a: b: <ENTER>
```

A message similar to the following is displayed:

```
Insert SOURCE diskette in drive A:  
Insert TARGET diskette in drive B:  
Strike any key when ready
```

Wait for the disk drive indicator light to go off. Remove the *MS-DOS* disk from drive **A** and insert the working copy diskette (the source). Insert a new diskette into drive **B** (the target). It is not necessary to preformat the new diskette; the disk copy command will do this for you. Press any key when ready.

The disk drive indicators on both the **A** and **B** drives will light, indicating that the copying is in progress. Do not open a drive door while the disk drive indicator light is on. When copying is complete, a message similar to the following appears:

```
Copying complete  
Copy another (Y/N)?
```

If you wish to make additional backups, type **y** and follow the same instructions. If you are done, type **n** and **<ENTER>**. When the prompt **A>** appears, wait for the disk drive indicator light to go OFF and remove both floppies. Label the backup floppy with an appropriate label (for example, DDM-2000 OC-3 Release a.b.c - working copy backup).

Upgrade BBF2 TGS To BBF2B TGS

1.  **CAUTION:**
If shelves in a bay are connected together with timing mult cabling, changing the timing mode on one system may affect the timing for other systems. Ensure that proper timing arrangements are made for all affected shelves.

 **NOTE:**
This procedure may be used to replace existing **BBF2 TGS** circuit packs with **BBF2B TGS** circuit packs.

Verify that there are no alarms or protection switches present on the system.

2. Set new **BBF2B TGS** circuit pack option switches as required.

Reference: **DLP-513**

3. Is timing mode DS1 External?
If **YES**, then continue with **Step 4**.
If **NO**, then proceed to **Step 6**.

4. Check external timing references to ensure they are good.

5.  **NOTE 1:**
ED-8C724-20, G339, G340, or G341 cables are used to connect timing references to shelf 1 in a bay. ED-8C724-20, G373 or G374 (rear access) or ED-8C724-21, G414 and G415 (front access) cables are used to multiple timing references to subsequent shelves in the bay (for example, from shelf 1 to shelf 2, from shelf 2 to shelf 3, etc.). The cable from the timing reference source to shelf 1 is connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). The cable from shelf 1 (or lower shelf) to the next higher shelf is connected from jack **J44 (P237)** of the lower shelf to jack **J37 (J237)** of the next higher shelf.

➤ **NOTE 2:**

If the **BBF2B TGS** timing mode is set to DS1 External sync out mode, an ED-8C724-20, G394 cable must be connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). This cable has a relay to disconnect the incoming external timing supply if the **TGS** circuit pack is removed.

Make DS1 external timing reference connections as shown in Table A.

Table A. DS1 External Timing Reference Source Connections

Name	Desig.	Conn.	Term.	Color
Receive from Primary DS1 Reference	T	P37	6	BK
	R		1	O
Receive from Secondary DS1 Reference	T		7	R
	R		2	G

- Make synchronization DS1 timing output connections as shown in Table B, if required.

Table B. DS1 Timing Output Connections

Name	Desig.	Conn.	Term.	Color
Transmit Primary DS1 Reference	T	P44	6	BK
	R		1	O
Transmit Secondary DS1 Reference	T		7	R
	R		2	G

- CAUTION:**
*A momentary transmission hit (error) will occur when the **TGS** circuit pack is switched.*

Is a CIT available?

If **YES**, then continue with **Step 8**.

If **NO**, then proceed to **Step 9**.

- Use **switch-sync:s=circuitpack,pri>manual** command to switch timing to protection **TGS** in **TIMING** slot 2, if not already active.

Response: **ACTIVE** LED lights on **TGS** circuit pack in **TIMING** slot 2.

9.  **NOTE:**
If external timing mode is used and bay mult cables for DS1 timing references connect shelves in a bay, removing a **TGS** circuit pack causes a momentary loss of the associated incoming DS1 timing reference. This may result in a "inc. DS1 sync. ref. LOS" alarm on all shelves above this shelf that are connected to the same bay mult cabling. This momentary loss of timing reference does not affect transmission.

Remove old **TGS** circuit pack from **TIMING** slot **1**.

10. Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.
11. Insert new **BBF2B TGS** circuit pack into **TIMING** slot **1**.

Response: **FAULT** LED lights on **TGS** circuit pack in slot **1**.

12.  **NOTE:**
The critical (**CR**) alarm LED may light for up to 15 seconds after the **UPD/INIT** button is depressed on the **SYSCTL**. This does not indicate a service interruption.

Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

Response: **FAULT** LED lights on **TGS** circuit pack in **TIMING** slot **2**.
FAULT LED goes off on **TGS** circuit pack in **TIMING** slot **1** after about 15 seconds. **ACTIVE** LED goes off on **TGS** circuit pack in **TIMING** slot **2** and lights on **TGS** circuit pack in **TIMING** slot **1**.

13. Remove old **TGS** circuit pack from **TIMING** slot **2**.
14. Insert new **BBF2B TGS** circuit pack into **TIMING** slot **2**.

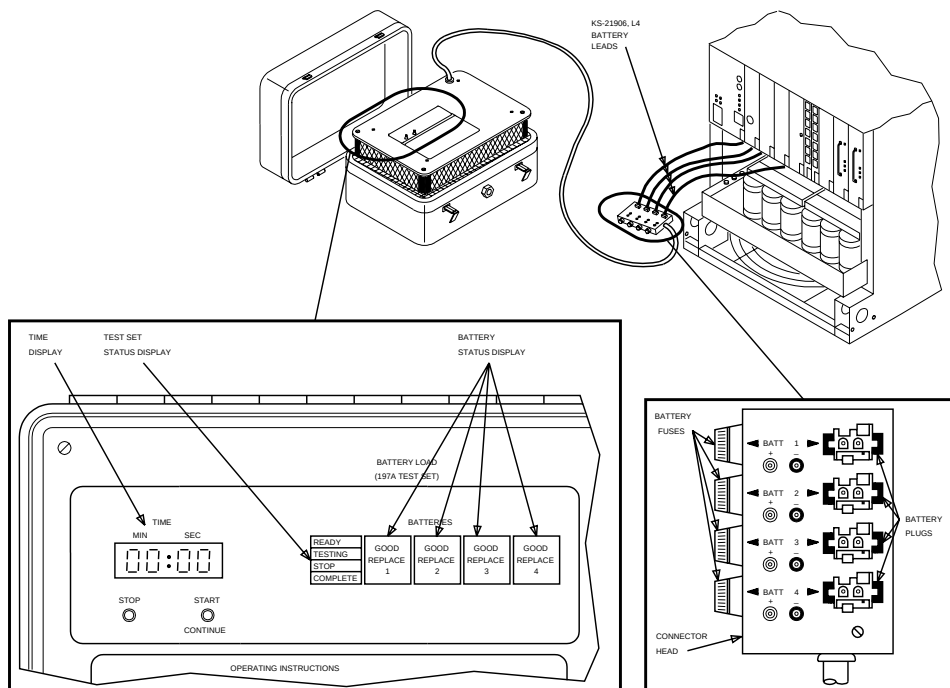
Response: Red **FAULT** LED on **TGS** circuit pack in slot **2** lights for about 15 seconds then goes off.

15. If a CIT is available, use the **rtrv-sync** command to display the provisioning and operational information of the synchronization interface.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Test of RT Batteries Using 197A BATTERY LOAD TEST SET

1.  **CAUTION:**
Service interruption will occur if batteries are disconnected and AC power is not available.

Obtain **197A BATTERY LOAD TEST SET (197A)** and place near batteries to be tested (Figure 1).



tpa 769169/01

Figure 1. 197A Battery Load Test Set Test Connections

2.  **NOTE:**
The **197A** test set is intended to test batteries that are fully charged. A minimum of two days must be allowed between the time the batteries (new or replacement) are put on high rate charge and this test is made. After testing is completed, the batteries must be put on high rate charge using the **337A BATTERY CHARGER**.

Remove cover from **197A** test set.

3. Check **197A** test set for proper operation (if not already performed).

Reference: **DLP-537**

4. Ensure that system(s) associated with batteries to be tested has AC power available (**PMN** or **P/M** indicator on **BCU** circuit pack not lighted).
5. On **337A BATTERY CHARGER** associated with batteries to be tested, is **HIGH RATE CHG/ON** indicator lighted?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 7**.
6. Batteries are on high charge and may require up to 24 hours to charge. Do not perform this procedure until **HIGH RATE CHG/ON** indicator on **BATTERY CHARGER** goes off.
7.  **CAUTION:**
Service interruption will occur if batteries are disconnected and AC power is not available.

Disconnect battery leads of batteries to be tested from battery shelf.

8.  **NOTE:**
Under normal conditions, when the first battery is connected, the following occurs: (a) The test set **TIME** display indicates **00 MIN:00 SEC**; (b) the status display indicates which test set **BATT** plug the battery is connected to, status of the battery (**GOOD** or **REPLACE**), and the **READY** indicator lights; (c) test set fan operates.

At test set connector head (Figure 1), connect battery leads (up to four) to **BATT 1, 2, 3, and 4** plugs.

9.  **NOTE:**
If status display does not indicate battery number of battery status, **BATT** fuse may be blown, connector head or test set may be defective, or battery pack is defective.

Does test set display indicate **REPLACE** for all batteries being tested?

If **YES**, then continue with **Step 10**.

If **NO**, then proceed to **Step 12**.

10. Replace all batteries and connect good batteries to battery shelf.
11. Place batteries on high charge by depressing **HIGH RATE CHG/ACTIVATE** pushbutton on **BATTERY CHARGER** and repeat from Step 6.
12.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

-  **NOTE:**
This test must run for a full 15 minutes to be valid or until all batteries indicate **REPLACE**. The **STOP** button should only be used if a problem occurs during the test, if the test is to be terminated early because of loss of AC power, or all batteries indicate **REPLACE**. The **START/CONTINUE** button is used to continue the test if no problem is found.

Depress **197A** test set **START/CONTINUE** button.

Response: At **197A** test set, **TESTING** indicator is lighted, **READY** indicator is off, and **TIME** display is counting time.

13.  **NOTE:**
If one, two, or three, but not all, batteries show **REPLACE** during the test period, the remaining batteries still must be tested for the full 15 minutes.

Does test set show **REPLACE** for all batteries within the 15-minute test period shown on **TIME** display?

If **YES**, then continue with **Step 14**.

If **NO**, then proceed to **Step 15**.

14.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

Depress test set **STOP** button. Proceed to **Step 17**.

Response: **STOP** indicator on test set lights

15. After 15 minutes, the test set **COMPLETE** indicator lights.
16. Is any **REPLACE** indicator on test set lighted?
If **YES**, then continue with **Step 17**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
17. Unplug and set aside all defective batteries.
18. Install and connect replacement batteries to battery shelf. Reconnect any remaining good batteries to battery shelf.
19. Place batteries on high charge by depressing **HIGH RATE CHG ACTIVATE** pushbutton on **BATTERY CHARGER** and repeat from Step 6.

Check 197A BATTERY LOAD TEST SET

1. Obtain **197A BATTERY LOAD TEST SET**. See Figure 1.

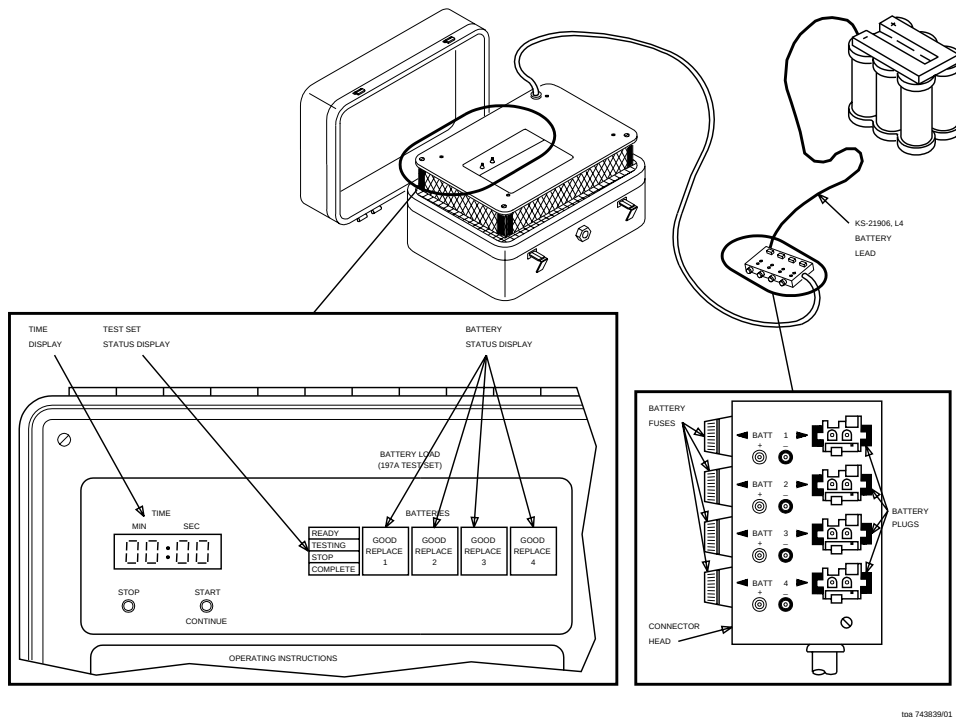


Figure 1. 197A Battery Load Test Set Arrangement

2. Remove cover from test set.
3. At test connector head, verify battery fuse holders each contain a 20 Amp fast-blow fuse.
4. Obtain one KS-21906, L4 battery.

5.  **NOTE:**
Under normal conditions, when the first battery is connected, the following occurs: (a) Test set **TIME** display indicates **00 MIN: 00 SEC**; (b) status display indicates which test set **BATT** plug that battery is connected to, status of the battery (**GOOD** or **REPLACE**), and the **READY** indicator lights; (c) test set fan operates.

At test set connector head, connect battery lead to **BATT 1, 2, 3, or 4** plug being tested.

6.  **WARNING:**
Damage will occur if test set is operated without fan operating.

Does test set fan operate?

If **YES**, then proceed to **Step 15**.
If **NO**, then continue with **Step 7**.

7. Connect battery lead to remaining **BATT** plugs, one at a time, and note if fan operates.
8. Did test set fan operate for any **BATT** plug connection?
If **YES**, then proceed to **Step 11**.
If **NO**, then continue with **Step 9**.
9.  **NOTE:**
The test set is intended to test fully charged batteries. Before new batteries or replacement batteries are tested, a minimum of two days must have passed between the time the batteries were put on high rate charge and this test is made.

Disconnect lead. Using a different battery pack, connect battery lead to any **BATT** plug.

10. Does test set fan operate?
If **YES**, then proceed to **Step 15**.
If **NO**, then proceed to **Step 35**.

11. On test set connector head, remove battery lead and check for blown fuse(s).
12. Is fuse(s) blown?
 If **YES**, then continue with **Step 13**.
 If **NO**, then proceed to **Step 14**.
13. Replace fuse(s) and repeat from Step 5.
14.  **NOTE:**
 Test set may be used for testing using one, two, three, or all four **BATT** plug positions.

There is a defective test set or connector head. Note defective **BATT** plug position(s). Continue with test procedures using remaining **BATT** plugs.

15. Does test set **TIME** display indicate **00 MIN:00 SEC** without blinking?
 If **YES**, then continue with **Step 16**.
 If **NO**, then proceed to **Step 35**.
16. Does status display indicate which battery was connected, status (**GOOD** or **REPLACE**) of the battery, and is **READY** indicator lighted?
 If **YES**, then continue with **Step 17**.
 If **NO**, then proceed to **Step 35**.
17. Does status display indicate **GOOD** or **REPLACE**?
 If **YES**, then proceed to **Step 19**.
 If **NO**, then continue with **Step 18**.
18.  **DANGER:**
 *A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

Battery pack is defective. Ensure that **TESTING** indicator is not lighted (**READY** indicator lighted), unplug and set aside defective battery pack, and repeat from Step 5.

19. Have **TIME** display and **STATUS** indicators been tested for each good **BATT** plug position?

If **YES**, then proceed to **Step 21**.

If **NO**, then continue with **Step 20**.

20.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

Ensure that **TESTING** indicator is not lighted. (**READY** indicator lighted).
Unplug battery pack and repeat from Step 5.

21.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

Depress test set **START/CONTINUE** button.

22. Does test set **TESTING** indicator light, **READY** indicator go off, and **TIME** display start counting time?
- If **YES**, then proceed to **Step 24**.
If **NO**, then continue with **Step 23**.

23.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

There is a defective test set. Depress **STOP** button, unplug battery, and return test set for repair.

24. Depress test set **STOP** button.

25. Does test set **STOP** indicator light and **TIME** display stop counting time?
If **YES**, then proceed to **Step 27**.
If **NO**, then continue with **Step 26**.

26.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

There is a defective test set. Allow test to run for 15 minutes as shown on **TIME** display. When **COMPLETE** indicator lights, unplug battery, and return test set for repair.

27.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

Depress test set **START/CONTINUE** button.

28. Does test set **TESTING** indicator light, **STOP** indicator go off, and **TIME** display start counting time?
If **YES**, then continue with **Step 29**.
If **NO**, then proceed to **Step 34**.
29. Allow test set to run for 15 minutes as shown on **TIME** display.
30. During 15-minute test period, does test set show **REPLACE**?
If **YES**, then continue with **Step 31**.
If **NO**, then proceed to **Step 32**.
31. Note that battery being used is defective.
32. After 15 minutes, does **COMPLETE** indicator light?
If **YES**, then continue with **Step 33**.
If **NO**, then proceed to **Step 34**.
33. Unplug battery. Store connector head in test set cover. Reinstall cover.

STOP. YOU HAVE COMPLETED THIS PROCEDURE

34.  **DANGER:**
*A high discharge current is present at connector head if **TESTING** indicator is lighted. Batteries must not be connected or disconnected when **TESTING** indicator is lighted.*

Defective test set. Depress **STOP** button, unplug battery, and return test set for repair.

35. There is a defective test set. Return for repair.

Upgrade Telemetry Byte-Oriented Serial (TBOS)/Parallel Telemetry to TL1/X.25

1.  **NOTE:**
The "Technical Specifications" section of this manual, under TL1/X.25 Telemetry, describes the parameters and connections for the TL1/X.25 telemetry interface.

At central office operations interface shelf, connect the TL1/X.25 cable to **J45** on the shelf backplane.

2. Connect CIT and establish session.

Reference: **DLP-521**

3. Are you upgrading TBOS or parallel telemetry to TL1/X.25.
If **PARALLEL**, continue with **Step 4**.
If **TBOS**, proceed to **Step 6**.
4. Disconnect parallel telemetry and discrete cables from **P54**, **P55**, and **P61** on the shelf backplane.
5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
6. Use the **set-ne:tb link=noTBOS** command to disable the TBOS link.
7. Disconnect TBOS cable from **J53** on shelf backplane, if required.
8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Test ED-8C733-30, G7 Fan Shelf

1. On fan shelf, verify that only green **POWER ON** LED is lighted. If other LEDs are lighted, refer trouble to organization that installed shelf.
2. Depress and hold **ALARM TEST** button.

Response: All LEDs, except **CONTROL FAULT**, light. All fans slow down during time button is depressed.

3. Release **ALARM TEST** button.
4. Momentarily depress **ALARM RESET** button to reset alarms.
5.  **CAUTION:**
Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

 NOTE:

To remove the front cover of a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 or G4 shelf.

Remove front cover of fan shelf.

6. Locate 4-part switch to left of center on front of fan shelf. See Figure 1.

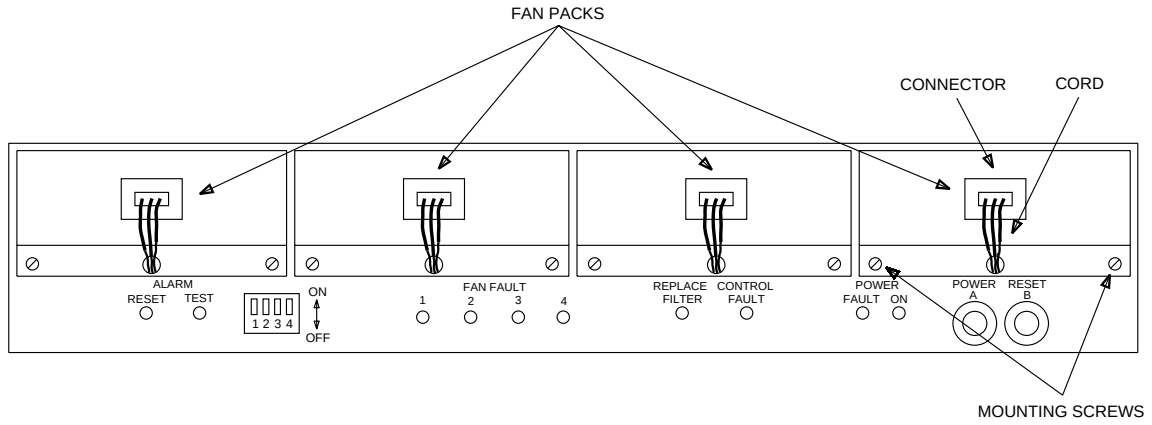


Figure 1. DDM-2000 Fan Shelf — Front Cover Removed

7. Set switches as shown in Table A.

Table A. DDM-2000 Fan Shelf Switch Settings

Cooling Arrangement	Set Point	Switch Settings			
		S1	S2	S3	S4
DDM-2000 OC-3	400 fpm	ON	OFF	ON	ON
DDM-2000 OC-12	400 fpm	ON	OFF	ON	ON

8. If switch settings are changed, depress and hold the **RESET** button on the fan shelf for 5 seconds to allow the fan shelf controller to recognize the change in switch setting.
9. **NOTE:**
The fan filter is located on the bottom of the DDM-2000 OC-3 shelf that is installed immediately below the fan shelf. Magnetic strips around the perimeter of the filter hold the filter in place in the bottom cavity of the DDM-2000 OC-3 shelf.

Verify that fan filter is properly installed.

10. Reinstall front cover of shelf.
11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace ED-8C733-30, G4 Fan Filter

1.  **NOTE:**
The fan filter is located on the bottom of the DDM-2000 OC-3 shelf that is installed immediately below the fan shelf. Magnetic strips around the perimeter of the filter hold the filter in place in the bottom cavity of the DDM-2000 OC-3 shelf.

Remove fan filter by pulling on it.

2. Install new filter, with magnetic strips facing up, into the bottom cavity of the DDM-2000 shelf.
3. Momentarily depress the **ALARM RESET** button to reset alarms, if required.
4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Enable or Disable System Security and/or Edit, Delete, or Enter a User's Login

1.  **CAUTION:**
You must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly whenever working with the DDM-2000.

 **NOTE:**
If all shelves in a bay are connected together with CIT bay mult cabling, the CIT may be connected to any shelf front or rear **CIT** connector and gain access to any other shelf by entering a shelf address. If the CIT is connected to the rear **CIT** connector, it must be connected through a null modem.

Connect CIT and establish session.

Reference: **DLP-521**

2. Are you going to enable or disable system security or are you going to edit, delete, or enter a user's login?

If **Enable or Disable System Security**, continue with **Step 3**.

If **Edit, Delete, or Enter a User's Login**, proceed to **Step 15**.

3.  **NOTE 1:**
You must be logged into the system as one of the three privileged users to enable or disable system security. Initially, the defaults for the privileged user logins (Release 9.1 or later) are LUC01 (uppercase LUC-zero-one), LUC (uppercase LUC-zero-two), and LUC03 (uppercase ATT-zero-three); however, these defaults may have been changed. For Release 9.0 or earlier, the defaults for the privileged user logins are ATT01 (uppercase ATT-zero-one), ATT02 (uppercase ATT-zero-two), and ATT03 (uppercase ATT-zero-three). The login banner for Release 9.0 and earlier reads: AT&T, DDM-2000 OC-3 Multiplexer, Release a.b.c.

⇒ NOTE 2:

System security requires the defaults for the privileged user logins/password to be changed and CIT and/or DCC port security to be enabled.

At the login< prompt, enter a valid privileged user login (provided by your DDM-2000 administrator).

Response: password<

4. **⇒ NOTE 1:**

Initially, the default for the privileged user password is DDM-2000; however, this default may have been changed.

⇒ NOTE 2:

Passwords are not displayed on the CIT.

At the password< prompt, enter a valid privileged user password (provided by your DDM-2000 administrator).

Response: CIT prints the following message followed by an Alarm and Status Report:

```

/*****
*
*      Lucent Technologies
*      DDM-2000 OC-3 Multiplexer
*
*      Release a.b.c
*
*****/

      .
      .
      .

TID date time
M rtrv-alm:all COMPLD
/* Active Alarms and Status Report
```

5.  **NOTE:**
After the prompt (<), the system will respond to commands entered. The **set-link:pg=()** command may be used to set the vertical size of the displayed page on the CIT. Page (**pg**) length may be set from 3 to 150 lines with a default length of 24 lines.

Did you use the default privileged user login (LUC01, LUC02, or LUC03) and password (DDM-2000) to log into the system?

If **YES**, continue with **Step 6**.

If **NO**, proceed to **Step 8**.

6.  **NOTE:**
The defaults for privileged user logins (LUC01, LUC02, and LUC03) and password (default DDM-2000) must be changed for system security. There are always three privileged user logins. (Privileged user logins cannot be added or deleted.) See the "Commands and Reports" section of this manual for a description of the **set-lgn** command format.

Use the **set-lgn:** command to change the defaults for the privileged user logins (LUC01, LUC02, and LUC03) and password (default DDM-2000).

7.  **NOTE:**
The **rtrv-lgn:** command retrieves the "Login Provisioning Report". This report lists each user's login and authorization level (user type). The report does not contain passwords. See the "Commands and Reports" section of this manual for a description of the **rtrv-lgn:** command format.

Use the **rtrv-lgn:** command to obtain the "Login Provisioning Report" and verify that the privileged user logins have been changed.

8. **⇒ NOTE:**
The **rtrv-secu:** command retrieves the "Port Security Configuration Report". This report provides CIT and DCC port security and timeout information. See the "Commands and Reports" section of this manual for a description of the **rtrv-secu:** command format.

Use the **rtrv-secu:** command to obtain the "Port Security Configuration Report" and note the CIT/DCC port security and timeout information.

9. **⇒ NOTE 1:**
The **set-secu:** command determines whether security is enabled or disabled or in lockout state on each CIT and DCC interface using one or more CIT and/or DCC port addresses [**dcc-all** or **cit-{1,2,all}**]. This command is also used to specify the timeout period for each port address. The timeout period is the time, in minutes, before an inactive session is automatically terminated. See the "Commands and Reports" section of this manual for a description of the command format. For example, **set-secu:cit-1:sec=enabled** enables security on the front CIT port.

⇒ NOTE 2:
When security is enabled for a CIT or DCC port address, a valid login and password must be entered to access the system through that port. When security is in lockout state, only a privileged user can access the system through the locked out CIT/DCC port.

⇒ NOTE 3:
For applications that have a remote terminal located on a customer premise site, you may want to disable security on the DCC interface at the remote terminal. This allows the user at the terminal in the central office to login remotely (via the DCC) to the remote terminal without a login/password. At the terminal in the central office, you may want to enable security on the DCC. This means that a user at the remote terminal must have a valid login/password to login remotely (via the DCC) to the terminal at the central office.

Use the **set-secu:** command to enable or disable security on each CIT and/or DCC port and specify the corresponding timeout period, as required.

10. Use the **rtrv-secu:** command to obtain the "Port Security Configuration Report" and verify the security and timeout information for the CIT and/or DCC ports.

11. **⇒ NOTE 1:**

There are four types of users:

General users may execute any commands that are not restricted to privileged users.

Maintenance users may execute commands that obtain nonprivileged system reports, perform protection switching, loopback activities, and perform some other maintenance activities.

Privileged users may execute any command, including restricted commands.

Reports-only users may only execute commands that obtain nonprivileged system reports.

Refer to *Security* in the "Administration and Provisioning" section of this manual for more information about restricted commands.

⇒ NOTE 2:

Three privileged and up to 100 nonprivileged (general, maintenance, and/or reports-only) logins are supported. If a user attempts to enter another login when the maximum supported logins already exist, the command will be denied. See the "Commands and Reports" section of this manual for a description of the **set -lgn** command format.

Use the **set -lgn:** command to enter, edit, or delete nonprivileged (general, maintenance, and/or reports-only) logins/passwords and user types, as required.

12. Use the **rtrv-lgn:** command to obtain the "Login Provisioning Report" and verify the nonprivileged user logins and user types.
13. See the "Commands and Reports" section of this manual for descriptions of related security commands: **set-passwd**, **rtrv-lgn**, and **rtrv-secu**.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. **⇒ NOTE:**
You must be logged into the system as one of the three privileged users to edit, delete, or enter a user's login. Initially, the defaults for the privileged user logins are LUC01 (uppercase LUC-zero-one), LUC02 (uppercase LUC-zero-two), and LUC03 (uppercase LUC-zero-three); however, these defaults may have been changed.

At the `login<` prompt, enter a valid privileged user login (provided by your DDM-2000 administrator).

Response: `password<`

16. **⇒ NOTE 1:**
Initially, the default for the privileged user password is DDM-2000; however, this default may have been changed.

⇒ NOTE 2:
Passwords are not displayed on the CIT.

At the `password<` prompt, enter a valid password (provided by your DDM-2000 administrator).

Response: CIT prints the following message followed by an Alarm and Status Report:

```

/*****
*
*          Lucent Technologies
*      DDM-2000 OC-3 Multiplexer
*
*          Release a.b.c
*
*****/

      .
      .
      .

TID date time
M rtrv-alm:all COMPLD
/* Active Alarms and Status Report
```


17. **⇒ NOTE 1:**
After the prompt (<), the system will respond to commands entered. The **set-link:pg=()** command may be used to set the vertical size of the displayed page on the CIT. Page (**pg**) length may be set from 3 to 150 lines with a default length of 24 lines.

⇒ NOTE 2:

There are four types of users:

General users may execute any commands that are not restricted to privileged users.

Maintenance users may execute commands that obtain nonprivileged system reports, perform protection switching, loopback activities, and perform some other maintenance activities.

Privileged users may execute any command, including restricted commands.

Reports-only users may only execute commands that obtain nonprivileged system reports.

Refer to *Security* in the "Administration and Provisioning" section of this manual for more information about restricted commands.

⇒ NOTE 3:

Three privileged and up to 100 nonprivileged (general, maintenance, and/or reports-only) logins are supported. If a user attempts to enter another login when the maximum supported logins already exist, the command will be denied.

⇒ NOTE 4:

The three privileged user logins may be edited to change the login name and/or password, but privileged user logins cannot be added or deleted. See the "Commands and Reports" section of this manual for a description of the **set-lgn** command format.

Use the **set-lgn:** command to edit, delete, or enter logins/passwords and user types, as required.

18. **⇒ NOTE:**
The **rtrv-lgn:** command retrieves the "Login Provisioning Report". This report lists each user's login and authorization level (user type). The report does not contain passwords. See the "Commands and Reports" section of this manual for a description of the **rtrv-lgn:** command format.

Use the **rtrv-lgn:** command to obtain the "Login Provisioning Report" and verify the user logins and user types.

19. **⇒ NOTE:**
Setting logins/passwords does not set system security. In addition to assigning valid logins/passwords, CIT and/or DCC port security must be enabled to secure a system.

Repeat this procedure to enable system security, if required.

20. See the "Commands and Reports" section of this manual for descriptions of related security commands: **set-passwd**, **rtrv-lgn**, and **rtrv-secu**.
21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Existing OLIU With Different Type OLIU

1.  **WARNING 1:**
Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.
-  **WARNING 2:**
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
-  **CAUTION 1:**
*Circuit packs must not be installed or replaced if the **SYCTL** is not installed and operating normally. If the **SYCTL** is not installed and operating normally, unpredictable provisioning of the replaced/installed circuit pack can result.*
-  **CAUTION 2:**
*Ensure that protection switching is available (**OLIU** installed in slot **2(P)**, protection line good, and no locks, inhibits, or forced switches in effect).*
-  **CAUTION 3:**
*Before installing **OLIUs**, ensure all optical fiber connectors and couplings have been properly cleaned [**DLP-527**]. Signal performance may be degraded if the connectors and couplings are not cleaned properly.*
-  **CAUTION 4:**
*Ensure that necessary optical power levels will be met with different type of **OLIU** installed. Use optical line power measurements and check **OLIU** output specifications.*

⇒ **NOTE 1:**

This procedure may be used to replace existing **OLIUs** with **22-Type OLIUs** to convert a shelf to a DS1 add/drop shelf. It may also be used to replace existing **OLIUs** with **21D/21D-U/22D-U OLIUs** to provide a cost effective interconnect for intraoffice applications such as OC-3 optical extensions from an OC-12 shelf.

⇒ **NOTE 2:**

Not all **OLIUs** are supported by every software release. For example, **21G/21G-U/21G2-U OLIUs** are supported by all releases, but **21D/21D-U, 22D-U, 22G-U/22G2-U/22G3-U, 22F/22F-U/22F2-U, 24G-U, 26G2-U, and 27G-U/27G2-U OLIUs** are supported only by Release 3 and later.

⇒ **NOTE 3:**

If this procedure is being used to replace **OLIUs** with **21D/21D-U/22D-U OLIUs**, note that the **21D/21D-U/22D-U OLIU** uses only multimode optical fiber connections.

If new software is required to support the **OLIU** being installed, download the required new software to the system.

Reference: **DLP-532**

2. ⇒ **NOTE:**

When available, use a CIT and the **^"switch-line:address:pri>manual"** (linear) or **^"switch-path-(sts1/vt1):address:pri>manual"** (rings) command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a switch command at both the near end and far end to switch both transmit and receive to the same line.

Is a CIT available?

If **YES**, then continue with **Step 3**.

If **NO**, then proceed to **Step 5**.

3.  **NOTE:**
The "**rtrv-state-eqpt**" command may be used to verify that only the protection line is active. In the Equipment State Report report, the Switch State should show active only for the protection **OLI****U**. Also, the green **ACTIVE** LEDs should be lighted only on protection **OLI****U**s in slot **2(P)**.

Use the "**switch-line:**" or "**switch-path:**" command to switch service to protection slot **2(P)**, if not already performed.

4. Use the "**rtrv-state-eqpt**" command to ensure that service is switched to protection slot **2(P)**.
5. Disconnect optical fiber from **OLI****U** in service slot **1** of **MAIN** or **FUNCTION UNITS** slots being equipped.
6. Remove service **OLI****U** from slot **1**.
7.  **NOTE 1:**
The optical connector labeled **OUT** is the output from the **OLI****U**. The connector labeled **IN** is the input to the **OLI****U**.

 **NOTE 2:**
Optical fibers connecting the system with the other end should not be connected to the **OLI****U** until at least 45 seconds after an optical loopback is removed.

Remove the protective covers from the new **OLI****U** connectors. Clean the fibers and connectors with optical quality, lint-free tissue and a compressed air duster.

Reference: **DLP-527**

8.  **NOTE:**
When a different **OLI** replaces an existing **OLI**, the **FAULT** LED on the new **OLI** will light until the **UPD/INIT** button is momentarily depressed in the following step.

Install new **OLI** into service slot **1** and connect optical fibers. Ensure **OLI** output at one end is connected to the correct **OLI** input at the other end.

Reference: **DLP-514**

9. Momentarily depress the **UPD/INIT** button on the **SYSCTL**.

Response: **FAULT** LED lights on **OLI** in slot **2(P)**. **FAULT** LED goes off on **OLI** in slot **1**.

10. Did **FAULT** LED go off on **OLI** in service slot **1**?

If **YES**, then continue with **Step 11**.

If **NO**, then do **TAP-111**.

11.  **NOTE:**
If existing cross-connections to the new circuit pack are not supported, the new circuit pack will be declared bad and the switch to the new circuit pack will not be completed. For example, if a **22-Type OLI** is being replaced by a **21D/21D-U OLI** and DS1 cross-connections exist, the new **21D/21D-U OLI** circuit pack will fail and service will continue on the old circuit pack in slot **2(P)**. All cross-connections not supported by the new circuit pack have to be deleted before the switch will be successful.

Use the "**rtrv-state-eqpt**" command to ensure service has switched to **OLI** in service slot **1**.

12. Disconnect optical fiber from **OLI** in protection slot **2(P)** and remove the **OLI**.

13. Remove the protective covers from the new **OLIU** connectors. Clean the fibers and connectors with optical quality, lint-free tissue and a compressed air duster.

Reference: **DLP-527**

14. Install new **OLIU** into protection slot **2(P)** and connect optical fibers. Ensure **OLIU** output at one end is connected to the correct **OLIU** input at the other end.

Reference: **DLP-514**

15. Did **FAULT** LED go off on **OLIU** in protection slot **2(P)**?
If **YES**, then continue with **Step 16**.
If **NO**, then do **TAP-111**.
16. Verify optical fiber cables are placed correctly in the fiber tray and are properly routed in the bay framework.
17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Change Timing Mode on TGS Circuit Pack

1.  **CAUTION:**
If shelves in a bay are connected together with timing mult cabling, changing the timing mode on one system may affect the timing for other systems. Ensure that proper timing arrangements are made for all affected shelves.

-  **NOTE:**
This procedure may be used to change the timing mode on an installed **TGS** circuit pack. For example, you may want to change the timing mode on an installed **TGS** from Free Running to DS1 External, or you may want to provision the DS1 timing output on the **BBF2B TGS** to *sync out mode*. The DS1 timing output on the **BBF2B TGS** can be provisioned for *sync out mode* only when the timing mode is set to *DS1 External sync out* or *Line Timing sync out*. See the Transmission and Synchronization Interfaces section of this manual for a description of DS1 timing outputs.

Verify that there are no alarms or protection switches present on the system.
2. Are you changing timing mode to *DS1 External*?
 If **YES**, then continue with **Step 3**.
 If **NO**, then proceed to **Step 5**.
3. Check external timing references to ensure they are good.
4.  **NOTE 1:**
ED-8C724-20, G339, G340, or G341 cables are used to connect timing references to shelf 1 in a bay. ED-8C724-20, G373 or G374 (rear access) or ED-8C724-21, G414 and G415 (front access) cables are used to multiple timing references to subsequent shelves in the bay (for example, from shelf 1 to shelf 2, shelf 2 to shelf 3, etc.). The cable from the timing reference source to shelf 1 is connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). The cable from shelf 1 (or lower shelf) to the next higher shelf is connected from jack **J44 (P237)** of the lower shelf to jack **J37 (J237)** of the next higher shelf.

⇒ **NOTE 2:**

If **BBF2B TGS** circuit packs are installed and the timing mode is set to DS1 External sync out mode, an ED-8C724-20, G394 cable must be connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). This cable has a relay to disconnect the external timing supply if the **TGS** circuit pack is removed.

Make DS1 external timing reference connections as shown in Table A.

Table A. DS1 Timing Reference Source Connections

Name	Desig.	Conn.	Term.	Color
Receive from Primary DS1 Reference	T R	P37	6 1	BK O
Receive from Secondary DS1 Reference	T R		7 2	R G

5. Make synchronization DS1 timing output connections as shown in Table B, if required.

Table B. DS1 Timing Output Connections

Name	Desig.	Conn.	Term.	Color
Transmit Primary DS1 Reference	T R	P44	6 1	BK O
Transmit Secondary DS1 Reference	T R		7 2	R G

6.  **CAUTION:**
*A momentary transmission hit will occur whenever the **TGS** circuit pack is switched.*

Is a CIT available?

If **YES**, then continue with **Step 7**.

If **NO**, then proceed to **Step 8**.

7. Use the **switch-sync:s=circuitpack,pri>manual** command to switch timing to **TIMING** slot 2, if not already active.

Response: **ACTIVE** LED lights on **TGS** circuit pack in **TIMING** slot 2.

8. If Sync Autoreconfiguration has been enabled (**rtrv-sync**) on a line-timed shelf and you are changing timing to DS1 External or Free Running, use the (**set-sync**) command to disable Sync Autoreconfiguration.
9. Remove **TGS** circuit pack from **TIMING** slot **1** and set option switches to timing mode required.

Reference: **DLP-513**

10. Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.
11. Reinsert **TGS** circuit pack into **TIMING** slot **1**.

Response: **FAULT** LED lights on **TGS** circuit pack in **TIMING** slot **1**.

12.  **NOTE:**
The critical (**CR**) alarm LED may light for up to 15 seconds after the **UPD/INIT** button is depressed on the **SYSCTL**. This does not indicate a service interruption.

Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

Response: **FAULT** LED goes off on **TGS** circuit pack in **TIMING** slot **1** and lights on **TGS** circuit pack in **TIMING** slot **2**.
ACTIVE LED goes off on **TGS** circuit pack in **TIMING** slot **2** and lights on **TGS** circuit pack in **TIMING** slot **1**.

13. Remove **TGS** circuit pack from **TIMING** slot **2** and set option switches to timing mode required.

Reference: **DLP-513**

14. Reinsert **TGS** circuit pack into **TIMING** slot **2**.

Response: **FAULT** LED on **TGS** circuit pack in **TIMING** slot **2** lights for about 15 seconds then goes off.

15. If a CIT is available, use the **rtrv-sync** command to display the provisioning and operational information of the synchronization interface.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform OC-3c (STS-3c) Transmission Test

1.  **NOTE 1:**
Ensure that the OC-3c feature has been enabled.

 -  **NOTE 2:**
This procedure may be used to perform OC-3c transmission tests in the mux (toward the fiber) direction. When this procedure is being used to perform end-to-end OC-3c tests, it is assumed that the complete end-to-end system has already been tested and that only the OC-3c signal is being tested at this time. Transmission tests in the *mux* direction may be local or end-to-end tests (see Figure 1).

 -  **NOTE 3:**
This test is performed with a SONET test set.

 -  **NOTE 4:**
When this procedure is used to do end-to-end tests, one DDM-2000 OC-3 Multiplexer will be referred to as the near end and the other assembly as the far end. These designations are arbitrary; either assembly can be the near-end or the far-end assembly.
2. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **21G/21G-U/21G2-U** or **21D/21D-U OLIU** must be in place. If end-to-end tests are being performed, at the far-end *LGX*[®] cross-connection associated with the DDM-2000 OC-3 Multiplexer being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the OC-3c signal to be tested.
 3. At the cross-connection associated with the near-end DDM-2000 OC-12 Multiplexer, connect the SONET test set to the **IN** and **OUT** jacks associated with the circuit under test.

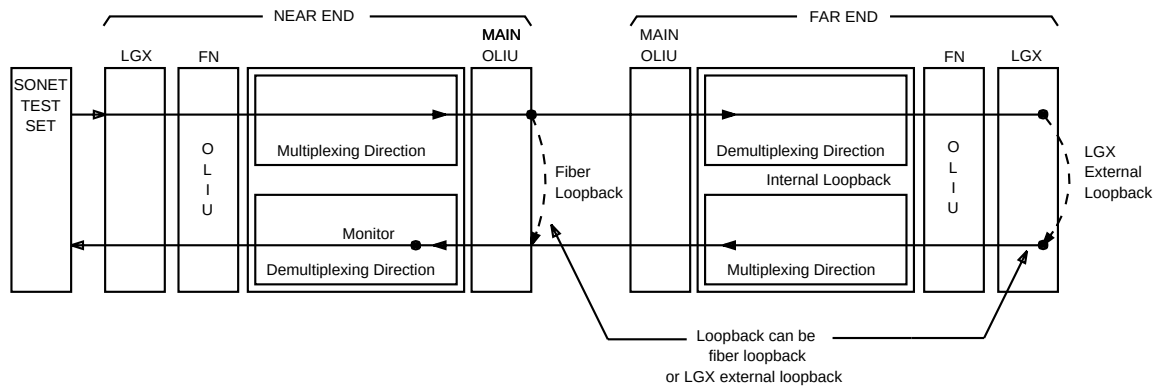


Figure 1. Transmission Test of OC-3c Signal in MUX Direction

4. Use the SONET test set to test for error-free transmission.
5. Was the test successful (error free)?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 15**.
6. Is this first service being placed on the group and is protection circuit pack installed?
If **YES**, then continue with **Step 7**.
If **NO**, then proceed to **Step 11**.
7. Unseat the service **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack associated with the circuit under test.
8. Repeat the OC-3c transmission test with the SONET test set.
9. Was the test successful (error free)?
If **YES**, then continue with **Step 10**.
If **NO**, then proceed to **Step 15**.
10. Reseat the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack associated with the circuit under test.

11. The **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack under test has passed the OC-3c transmission test. Remove the looping patch cords from the cross-connections.
12. At the near-end (and the far-end) DDM-2000 OC-3 Multiplexer, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** to update the **SYSCTL**.
13. Repeat this procedure from Step 1 for any additional OC-3c circuits to be tested.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
15. Has the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack that failed been replaced?
 If **YES**, then proceed to **Step 18**.
 If **NO**, then continue with **Step 16**.
16. Replace the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack that failed the test.

Reference: **DLP-518**

17. Repeat this procedure for the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack that failed.
18. Trouble may be in the *LGX* cross-connections or the shelf backplane. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the **RETRIEVE** commands (for example, **rtrv-alm**, **rtrv-hsty**, etc.) to check for other trouble indications.
19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Linear or Add/Drop Configuration

1. **⇒ NOTE 1:**

If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual: **"ent-crs-sts1"**, **"ent-crs-vt1"**, **"rtrv-crs-sts1"**, **"rtrv-crs-vt1"**, **"dlt-crs-sts1"**, **"dlt-crs-vt1"**, **"set-ne"**, and **"cnvt-crs"**.

⇒ NOTE 2:

You may have to log in to more than one node to get a complete map of the network using the **"rtrv-map-network"** and **"rtrv-map-neighbor"** commands. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

Log in to any node in the network and use the **"rtrv-map-network"** and **"rtrv-map-neighbor"** commands to retrieve a map of the network which lists all the systems and how they are connected to each other. See Figures 2 and 3.

```
Site1NE1 97-04-27 13:09:53 DDM-2000 OC-3, R8.1.1
M  rtrv-map-network: COMPLD
/* Network Map for Site1NE1
=====
System Name      Comm.   Product      NE      Alarm
(TID)            Status  Type          Type    Group
=====
Site1NE1         Failed  DDM-2000 OC-3          3
Site2NE1         DDM-2000 OC-3          3
Site3NE1         DDM-2000 OC-3          3
Site4NE1         DDM-2000 OC-3          3
Site5NE1         DDM-2000 OC-3      DSNE    3
Site6NE1         DDM-2000 OC-3          3
*/
```

Figure 1. Sample Report From rtrv-map-network Command

```
Site2NE1 97-04-27 13:09:53 DDM-2000 OC-3, R8.1.1
M  rtrv-map-neighbor: COMPLD
/* Neighbor Map for Site4NE1
=====
System Name      Connected  Link      Product
(TID)            Through   Comm.     Type
Status
=====
Site4NE1         DDM-2000 OC-3
Site2NE1         main      Failed    DDM-2000 OC-3
Site3NE1         fn-c      DDM-2000 OC-3
*/
```

Figure 2. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order.
3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.
4.  **NOTE:**
In configurations other than point-to-point, cross-connections may consist of pass-through cross-connections in addition to the terminating cross-connections. For example in Figure 1, if the terminating nodes are at Site1NE1 and Site5NE1, then pass-through cross-connections will have to be made at Site2NE1 and Site3NE1.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the "**rtrv-eqpt**:" command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **MXRVO** and/or **DS1** circuit packs?

6. **NOTE 1:**

Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS-1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group (see "**ent-crs-sts1**" command). In order to make manual cross-connections, the cross-connect mode must be set to manual using the "**set-ne:crs>manual**" command. If STS-1 cross-connections are already made and individual VT1.5 cross-connections are required, the "**cnvt-crs:**" command may be used to convert the STS-1 cross-connection to 28 individual VT1.5 cross-connections. Certain restrictions and requirements must be followed before converting an STS-1 cross-connect to individual VT1.5 cross-connections. See **NTP-020** to convert an OC-3 shelf to a DS1 add/drop shelf. Also see the descriptions of the "**set-ne**" and "**cnvt-crs**" commands in the "Commands and Reports" section of this manual.

 NOTE 2:

The following commands may be used to delete, enter, and retrieve cross-connections: "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**ent-crs-sts1**", "**rtrv-crs-vt1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands.

From work order or circuit order, determine the cross-connections to be made at each node associated with the service being established.

7. Starting at one of the terminating nodes for the DS1/DS3 circuit being established, use the "**rtrv-crs-()**:" command at each node to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #2 low speed port in the **DS1** circuit pack in slot #1 of **LOW SPEED GROUP A** (a-1-2) is to be connected to timeslot m-1-1-2 and the "**rtrv-crs-vt1**" command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the "**dlt-crs-()**" commands.

8.  **NOTE 1:**
Channel state provisioning provides IS, AUTO, and NMON channel states for VT1.5 and STS-1 channels similar to the port states for DS1 and DS3 ports. At installation or when a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from the fiber to cause the channel to transition to in-service (IS).

At the first terminating node, use the "**ent-crs-vt1**:" or "**ent-crs-sts1**:" command to make the terminating cross-connection. For example, "**ent-crs-vt1:a-1-2,m-1-1-2**".

9. Use the "**rtrv-crs-vt1**:" or "**rtrv-crs-sts1**:" command to verify that the proper connection has been made. If an improper cross-connection is made, use the "**dlt-crs-vt1**:" or "**dlt-crs-sts1**:" command to delete the improper cross-connection, then reenter the cross-connection.

10. At the next node closest to the terminating node, use the "**ent-crs-vt1:**" or "**ent-crs-sts1:**" command to make the pass-through cross-connection, as required. For example, "**ent-crs-vt1:m-1-1-2,c-1-1-2**".
11. Continue logging into each node in the path of the service being established and using the "**ent-crs-vt1:**" command to make the required cross-connections.
12. After all cross-connections are made, use the "**rtrv-alm:**" command to verify no alarms are present.
13. If DS3 cross-connections have been established and the terminating nodes are equipped with **BBG4B DS3** circuit packs, use "**set-trace-sts1**" command to check integrity of cross-connect path.

Reference: **DLP-563**

14. If "ne-acty", "inc. VT AIS", or "inc. STS1 AIS" alarms are present, look for missing or improperly made cross-connections. Use **TAP-120** to locate missing cross-connections, if required.
15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Single OC-3 Ring Configuration

1. **⇒ NOTE 1:**

If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section and read the description of the following commands in the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*:
**"ent-crs-sts1", "ent-crs-vt1", "rtrv-crs-sts1",
"rtrv-crs-vt1", "dlt-crs-sts1", "dlt-crs-vt1", and
"cnvt-crs".**

⇒ NOTE 2:

You may have to log in to more than one node to get a complete map of the network using the **"rtrv-map-network"** and **"rtrv-map-neighbor"** command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

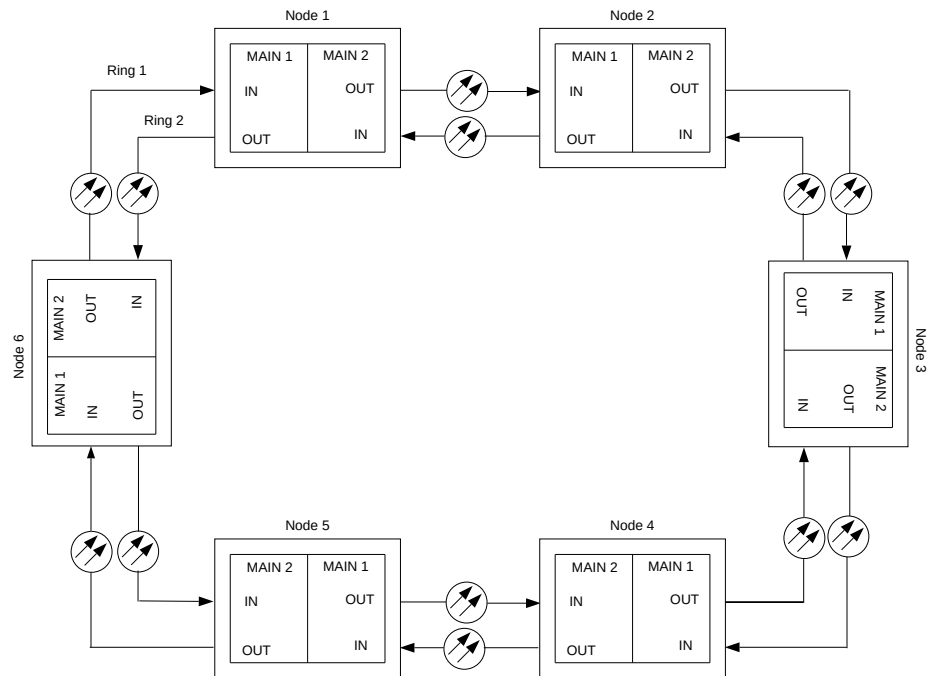


Figure 1. Sample Network Schematic

Log in to any node in each ring in the network and use the **"rtrv-map-network"** and **"rtrv-map-neighbor"** command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:


```
Node6 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-network: COMPLD
/* Network Map for Node6
=====
System Name      Comm.  Product      NE      Alarm
(TID)           Status Type          Type    Group
=====
Node6                        DDM-2000 OC-3      DSNE      3
Node5                        DDM-2000 OC-3              3
Node4                        DDM-2000 OC-3              3
Node3          Failed      DDM-2000 OC-3              3
Node2                        DDM-2000 OC-3              3
Node1                        DDM-2000 OC-3              3
*/
```

Figure 2. Sample Report From rtrv-map-network Command

```
Node6 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-neighbor: COMPLD
/* Neighbor Map for Node6
=====
System Name      Connected  Link      Product
(TID)           Through   Comm.     Type
Status
=====
Node6                        DDM-2000 OC-3
Node5          main-1      DDM-2000 OC-3
Node1          main-2      Failed      DDM-2000 OC-3
*/
```

Figure 3. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order.
3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.
4.  **NOTE 1:**
In single ring configurations, cross-connections consist of pass-through cross-connections in addition to the terminating cross-connections. For example in Figure 1, if the terminating nodes are at Node 1 and Node 5, then pass-through cross-connections will have to be made at Nodes 2, 3, 4 and 6.

 NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted ("**cnvt - crs**") to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the "**rtrv-eqpt:**" command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **MXRVO** and/or **DS1/DS1PM** circuit packs if DS1 service is being established?

6. **⇒ NOTE 1:**

Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group (see "**ent-crs-sts1**" command). If STS1 cross-connections are already made and individual VT1.5 cross-connections are required, the "**cnvt-crs:**" command may be used to convert the STS1 cross-connection to 28 individual VT1.5 cross-connections. Certain restrictions and requirements must be followed before converting an STS1 cross-connection to individual VT1.5 cross-connections. See the description of the "**cnvt-crs**" command in the "Commands and Reports" section of this manual.

⇒ NOTE 2:

The following commands may be used to delete, enter, and retrieve cross-connections: "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**ent-crs-sts1**", "**rtrv-crs-vt1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands.

From work order or circuit order, determine the cross-connections to be made at each node associated with the service being established. See Figures 4 through 10 for examples.

7. Starting at one of the terminating nodes for the DS1/DS3 circuit being established, use the "**rtrv-crs-():**" command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #3 low speed port in the **DS1** circuit pack in slot #2 of **LOW SPEED GROUP A** (a-2-3) is to be connected to timeslot m-1-2-3 and the "**rtrv-crs-vt1**" command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the "**dlt-crs-()**" commands.

8. **NOTE:**

The channel state provisioning feature provides IS, AUTO, and NMON states for VT and STS channels similar to the channel states for DS1 and DS3 ports. At installation, or when a cross-connection is made to a point of termination, the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

At all nonterminating nodes in the network, use the "**ent-crs-vt1:**" or "**ent-crs-sts1:**" command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-2-3, use the "**ent-crs-vt1:m-1-2-3,m-1-2-3**" command. To make pass-through cross-connections for STS-1 #1, use the "**ent-crs-sts1:m-1,m-1**" command.]

9. At the terminating (drop) nodes of the circuit being established, use the "**ent-crs-vt1:**" or "**ent-crs-sts1:**" command to make the terminating cross-connections (for example, "**ent-crs-vt1:m-1-2-3,a-2-3**") or "**ent-crs-sts1:m-1,a**")
10. Use the "**rtrv-crs-vt1:**" or "**rtrv-crs-sts1:**" command to verify that the proper connection has been made. If an improper cross-connection is made, use the "**dlt-crs-vt1:**" or "**dlt-crs-sts1:**" command to delete the improper cross-connection and reenter the cross-connection.
11. After all cross-connections are made, use the "**rtrv-alm:**" command to verify no alarms are present.
12. If DS3 cross-connections have been established and the terminating nodes are equipped with **BBG4B DS3** circuit packs, use "**set-trace-sts1**" command to check integrity of cross-connect path.

Reference: **DLP-563**

13. If "ne-acty", "inc. VT AIS", "inc. STS1 AIS", "inc. VT unequipped", or "inc. STS1 unequipped", alarms are present, look for missing or improperly made cross-connections. Use **TAP-120** to locate missing cross-connections, if required.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

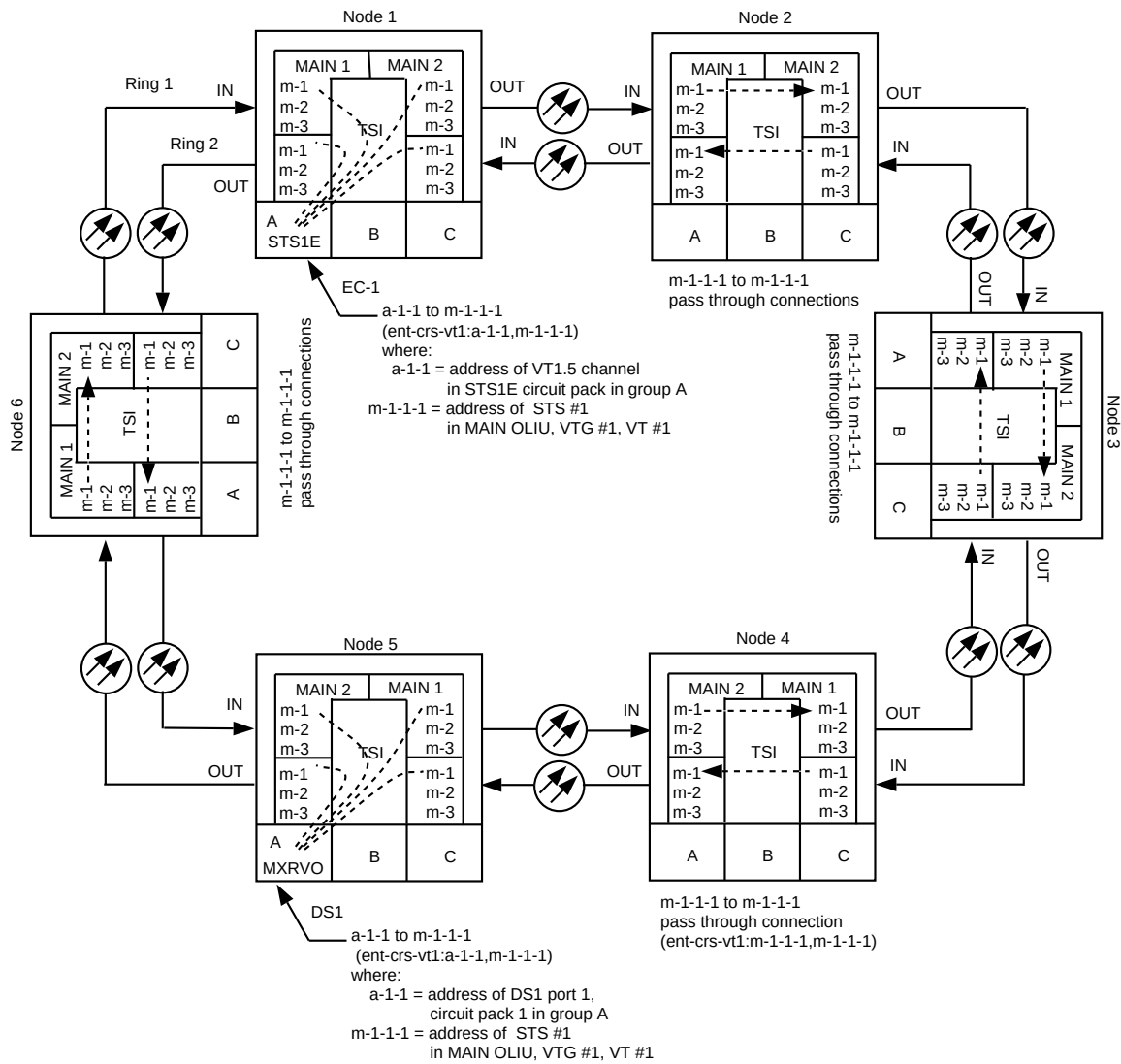


Figure 4. Path Protected Ring Network (DS1 to DS1) with VT1.5 Cross-Connections

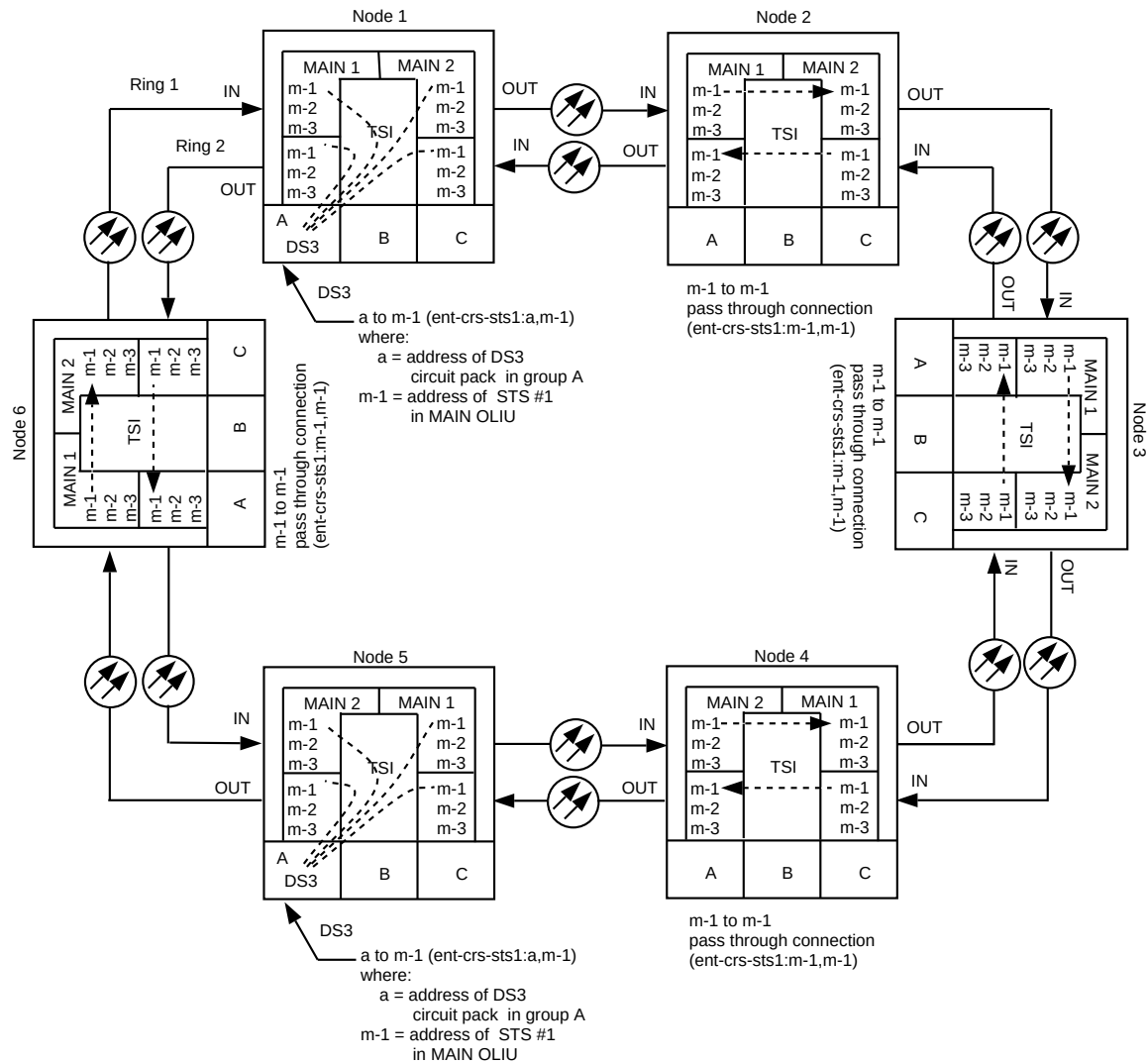
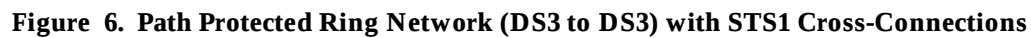


Figure 5. Path Protected Ring Network (DS3 to DS3) with STS1 Cross-Connections



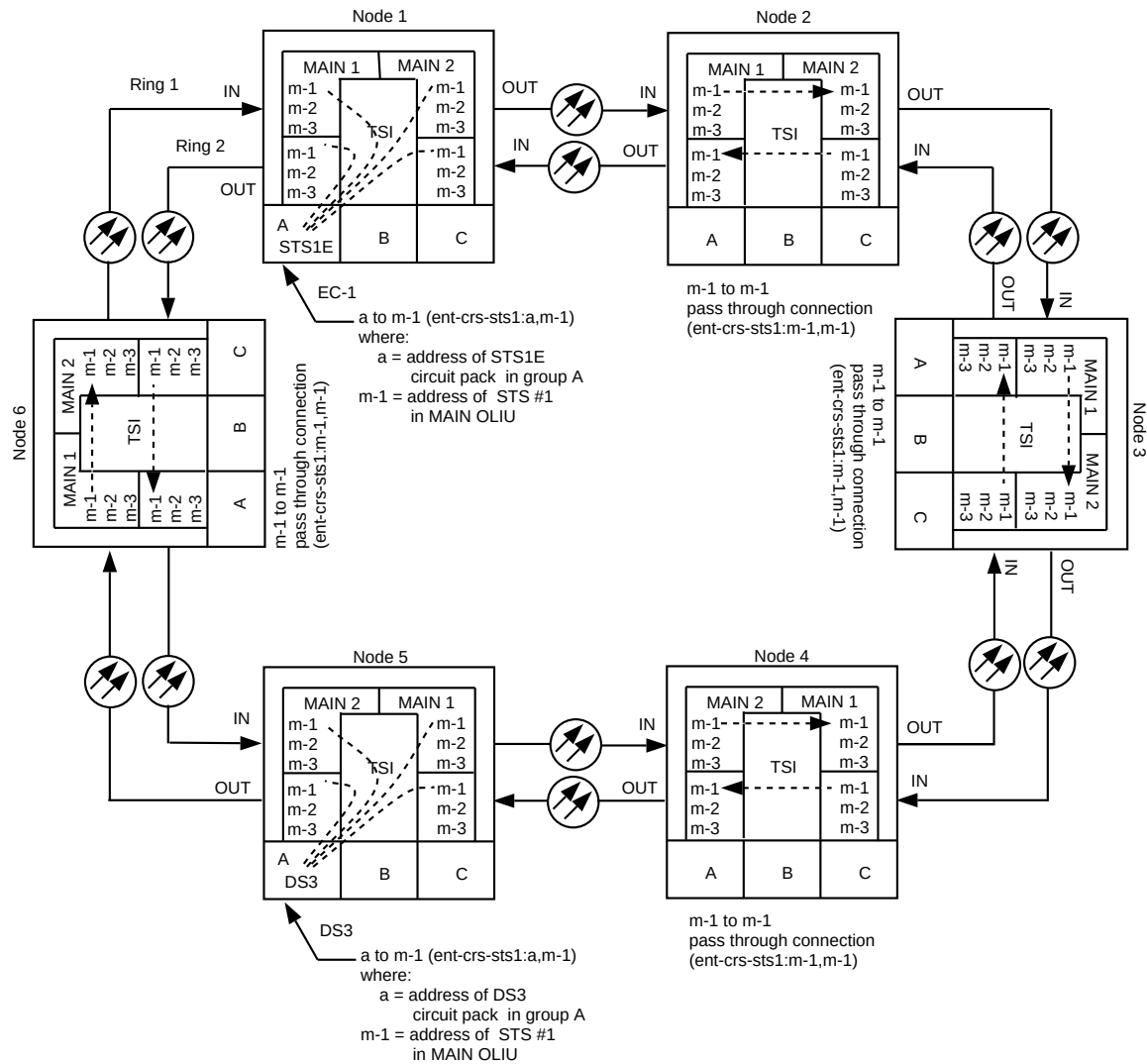


Figure 7. Path Protected Ring Network (DS3 to EC-1) with STS1 Cross-Connections

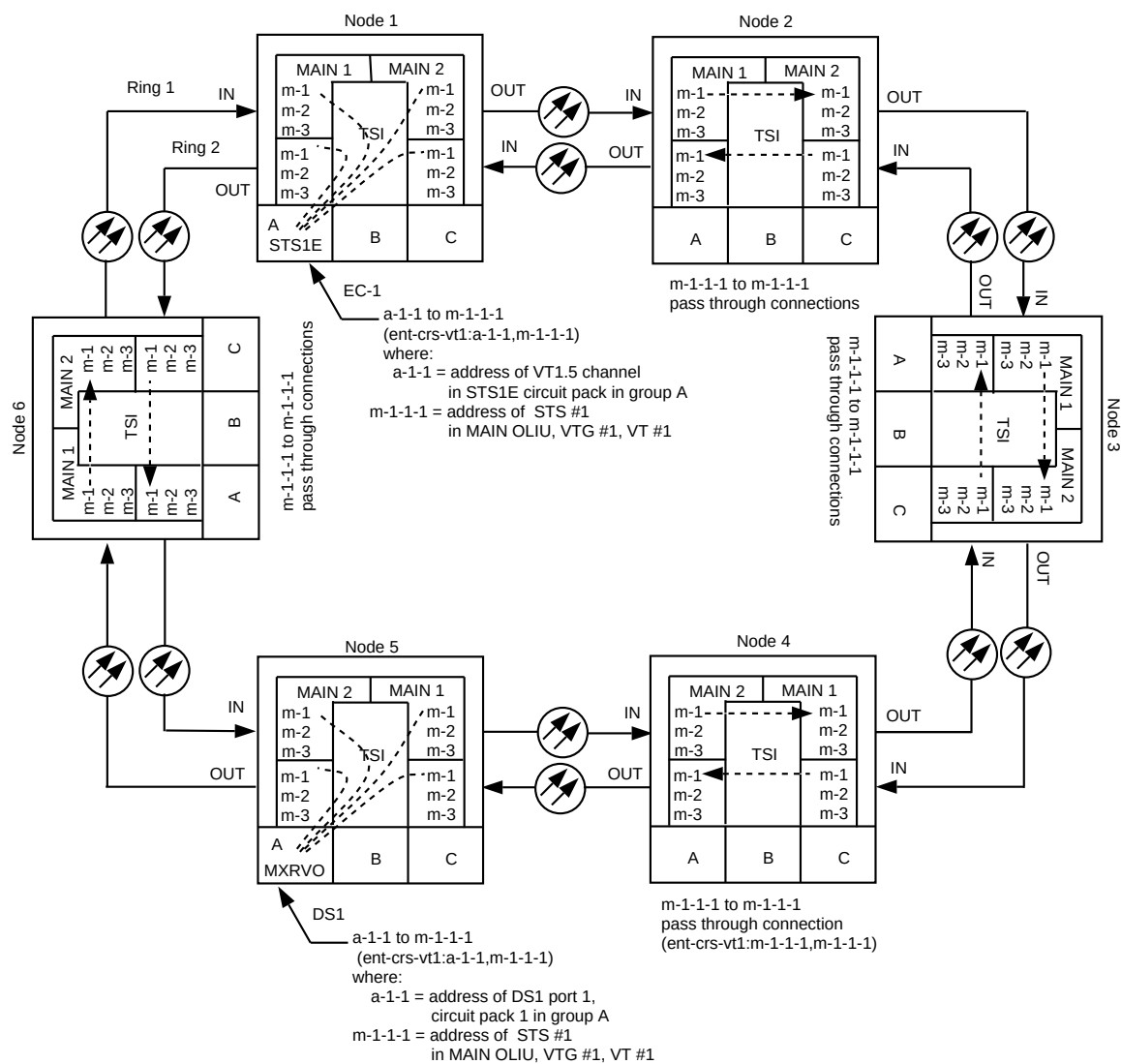


Figure 8. Path Protected Ring Network (one DS1 to EC-1) with VT1.5 Cross-Connections

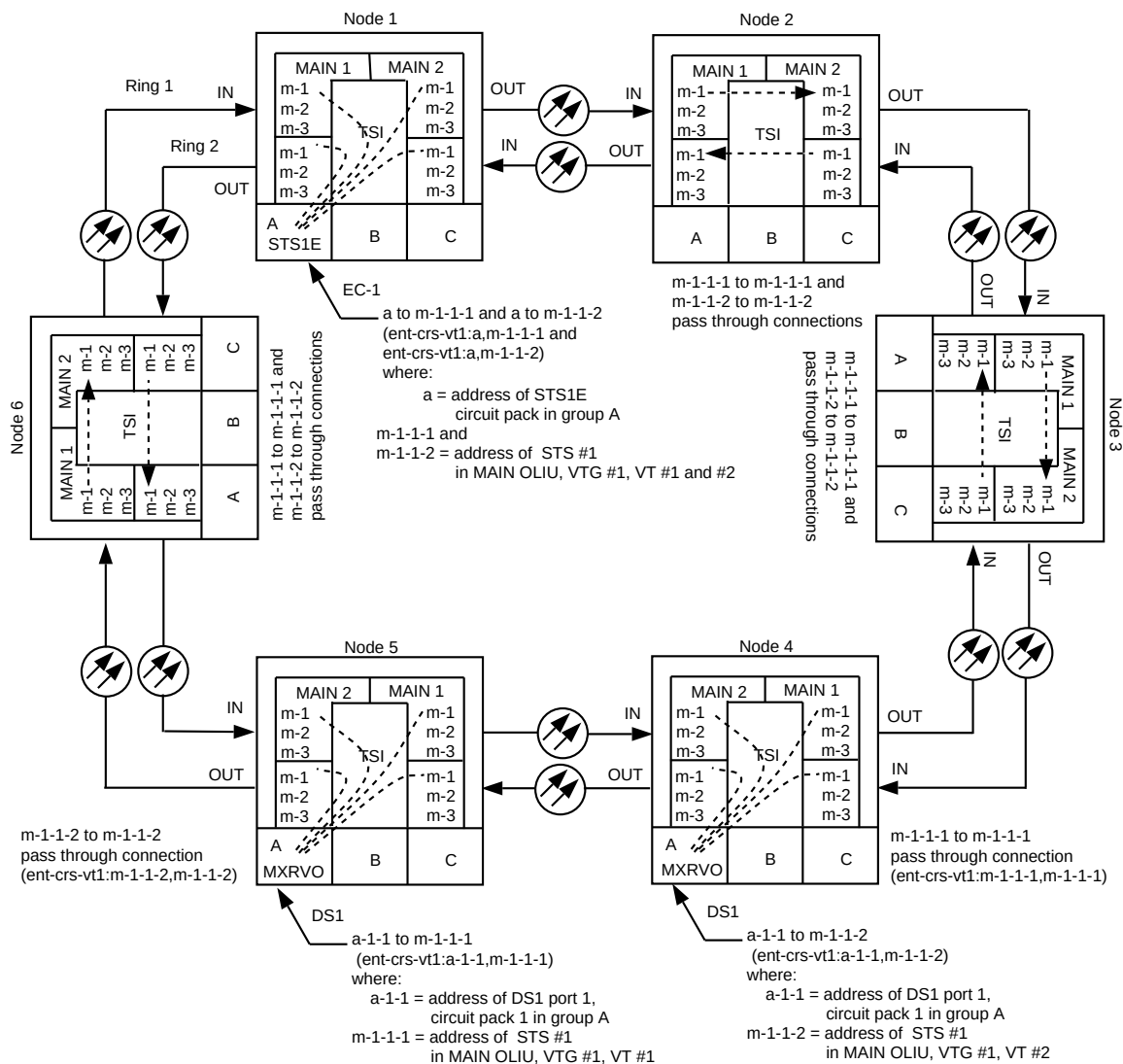
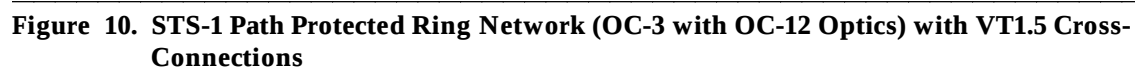


Figure 9. Path Protected Ring Network (two DS1s to EC-1) with VT1.5 Cross-Connections



DDM-2000 Receiver Sensitivity Test

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
-  **CAUTION 1:**
Take care to avoid damaging light emitting diodes (LEDs) that protrude through opening in faceplate of optical line interface unit (OLIU).
-  **CAUTION 2:**
Avoid excessive bending of optical jumper and cables.
-  **CAUTION 3:**
All optical fiber connectors, couplings, and buildouts should be properly cleaned [DLP-527]. Signal performance may be degraded if connectors, couplings, or buildouts are not cleaned properly.
-  **NOTE 1:**
It may take from 15 seconds to 3 minutes and 25 seconds for **FAULT** LEDs to stop flashing, depending on setting of signal degrade threshold (–5 to –9).
-  **NOTE 2:**
This test may be accomplished with one shelf by simply using an optical loopback after the optical splitter.

Configure the DDM-2000 shelf and test equipment as shown in Figure 1.

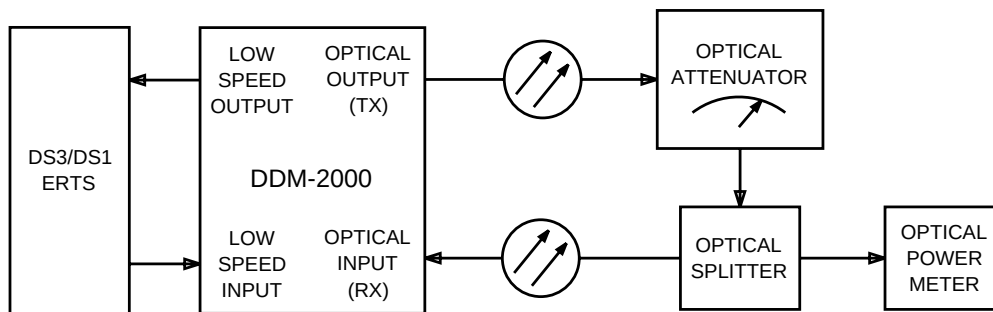


Figure 1. DDM-2000 Receiver Sensitivity Test Configuration

2. Set variable optical attenuator to obtain power level reading on optical power meter as required from Table A.

Table A. OC-3 OLIU Optical Power Levels

OC-3 OLIU	Power Level (dBm)
21D, 21D-U, 22D-U	-33.8(Cont. Env.) -31.8(Uncont. Env.)
22F, 22F-U, 22F2-U	-34.0
21G, 21G-U, 21G2-U	-34.0
22G-U, 22G2-U, 22G3-U	-34.0
26G2-U, 27G-U, 27G2-U	-30.8
24G-U	-30.0

3. Monitor the DS1/DS3 received signal with the DS1/DS3 Error Rate Test Set (ERTS) for 30 minutes and insure a bit error rate (BER) result of 10^{-10} or better.
4. Did **OLIU** pass BER test?
 - If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
 - If **NO**, then continue with **Step 5.**
5. Clean optical attenuators and connectors and repeat test. If test fails again, replace **OLIU**.

Replace Defective Fan Pack

1.  **CAUTION:**
Exercise care in removing the fiber tray or fiber support bracket, if required, to prevent damage to the optical fibers.

-  **NOTE 1:**
Fan packs are numbered from left to right as viewed from front of fan shelf.

-  **NOTE 2:**
This procedure is the same for both front and rear access arrangements.

-  **NOTE 3:**
Fan pack removal does not require the removal of the fan shelf.

-  **NOTE 4:**
To remove the front cover of a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 or G4 shelf.

Remove fan shelf front cover by turning front latch assemblies according to the markings on the front cover.

2. Disconnect the fan pack cable and unscrew the two mounting screws holding the fan pack in place. See Figure 1.

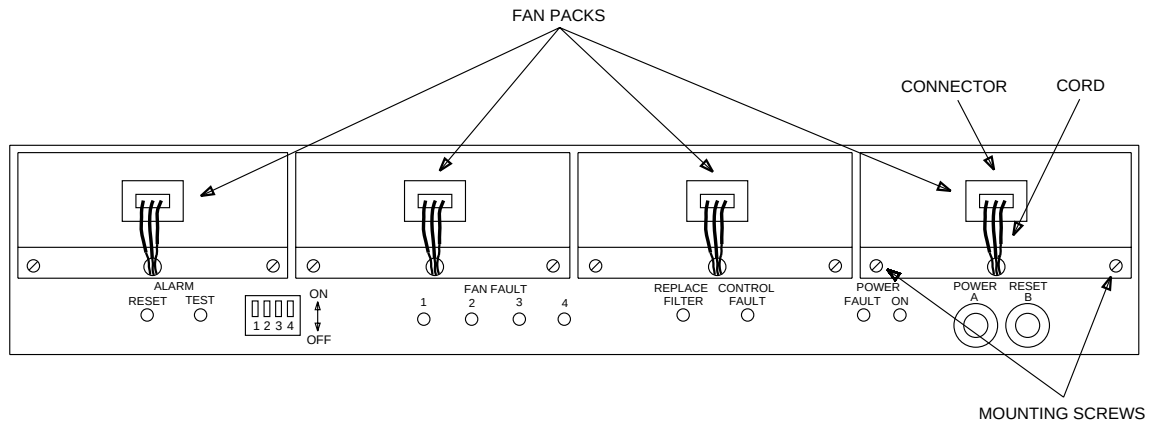


Figure 1. DDM-2000 Fan Shelf — Front Cover Removed

3. Slide out defective fan pack and install new fan pack (ED-8C733-30, G6).
4. Reinstall fan pack screws and reconnect the fan cable.
5. Remount fan shelf front cover and tighten latch assemblies.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install BBG8/BBG8B SYSCTL New Shelf Only BBG9 OHCTL Installed

1. **NOTE:**
This procedure is used for installing the **SYSCTL** in a new shelf for the first time (initial shelf turnup, only **OHCTL** installed at this time). For procedures to replace an in-service **SYSCTL**, refer to **DLP-501**.

Set **SYSCTL** switch **S1** sections **S1-1**, **S1-2**, and **S1-3** to **OFF**, **OFF**, **OFF**, respectively, to set the product (shelf) type. See Figure 1.

2. Set TBOS termination switch **S2-1** per Table A.

**Table A. SYSCTL Switch 2
TBOS Link Terminator**

Shelf Position	Switch S2-1
Last	ON
Not Last	OFF

3. Set all remaining **SYSCTL** switch **S2** sections **S2-2**, **S2-3**, **S2-4**, **S2-5**, **S2-6**, **S2-7**, and **S2-8** to **OFF**.

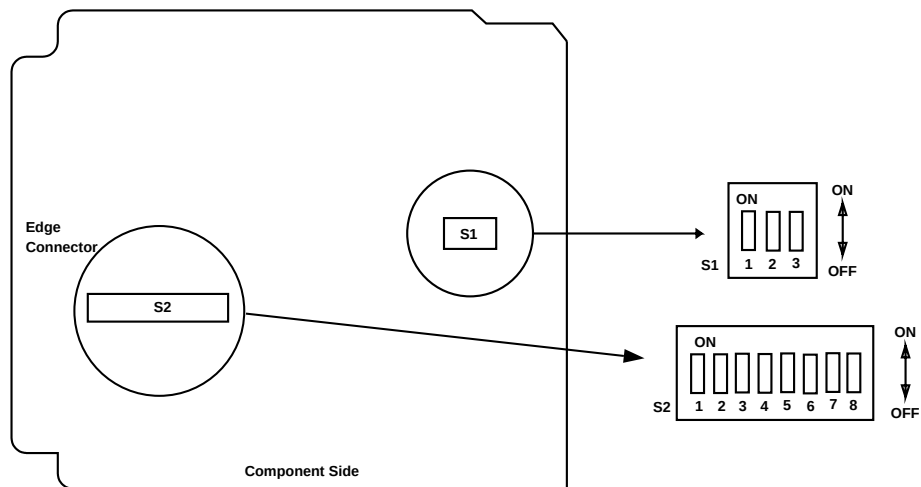


Figure 1. SYSCTL Option Settings

4.  **NOTE:**
Both the **BBG8/BBG8B SYSCTL** and **BBG9 OHCTL** must be installed for the controllers to function.

Ensure the **BBG9 OHCTL** is installed.

Reference: **DLP-500**

5.  **NOTE:**
Steps 6 and 7 must be performed without unnecessary delays. Familiarize yourself with these steps before continuing with the procedure.

Read Steps 6 and 7 before proceeding.

6.  **CAUTION:**
*Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **SYSCTL**.*

 **NOTE 1:**
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ballpoint pen to operate it.

 **NOTE 2:**
Ignore the **MJ**, **MN**, and **NE ACTY** LEDs on the User Panel.

Read the remainder of this step and Step 7 before installing the SYSCTL, then seat the SYSCTL.

If the following responses do not occur, proceed to **Step 8**.

Response: **FAULT** LED on **BBG8/BBG8B SYSCTL** lights and **ABN** LED on the User Panel lights after approximately 5 seconds. **MJ** and **NE** LEDs may light or flash briefly. **FAULT** LED on the **SYSCTL** goes off after approximately 5 seconds. **ABN** LED goes off after approximately 15 seconds. Approximately 1 minute and 30 seconds after the **ABN** LED goes off, the **FAULT** LED on the **OHCTL** goes off and the **CR** LED on the User Panel begins to flash.

7. Momentarily depress the **UPD/INIT** button on the **SYSCTL** while the **CR** LED is flashing (**you have 10 SECONDS to do this**).

If the following responses do not occur, continue with **Step 8**.

Response: **CR** LED on the User Panel stops flashing when the **UPD/INIT** button is pressed.

FAULT LED on **BBG9 OHCTL** and **ABN** LED on the User Panel are lighted after approximately 15 seconds. **ABN** LED goes off after approximately 30 seconds. Approximately 1 minute and 45 seconds after the **ABN** LED goes off, the **CR** LED on the User Panel flashes again. **DO NOT** depress **UPD/INIT** pushbutton again when the **CR** alarm LED flashes.

Initialization may take 2-3 minutes.

8. Observe one of the following indications in the **FE ID** display. Note the indication and follow suggested procedure:

- A. Nothing displayed in the **FE ID** display indicates that compatible software is installed in the **OHCTL** and **SYSCTL**.

Proceed to **Step 11**.

- B. The letter **P** displayed in the **FE ID** display indicates that no software is installed in the **SYSCTL**. If the **P** is followed by a period (**P.**), it means that a previous download attempt has failed and a new software download will have to be attempted either locally or remotely using the **ins-prog:tid** or **cpy-prog:tid** command. If there is no period (**P**) the software can only be downloaded locally.

Continue with **Step 9**.

- C. The letter **d** displayed in the **FE ID** display indicates the **OHCTL** has no software or that the software in the **OHCTL** and **SYSCTL** is incompatible.

Continue with **Step 9**.

- D. The letter **U** displayed in the **FE ID** display indicates that **SYSCTL** Switch **S1** is not set properly for type of shelf being equipped.

Remove **SYSCTL** and repeat this procedure from **Step 1**.

- E. The letter **E** displayed in the **FE ID** display indicates that the **SYSCTL** must be replaced.

Get replacement **SYSCTL** and repeat this procedure from **Step 1**.

- F. The letter **F** displayed in the **FE ID** display indicates that the **SYSCTL** faceplate latch is not fully latched.

Unplug the **SYSCTL** and repeat this procedure from **Step 5**. Ensure you properly seat the faceplate latch when you seat the **SYSCTL**.

- G. A flashing letter **L** displayed in the **FE ID** display indicates a low voltage condition (brownout) on the shelf.

Use **TAP-121** to clear brownout condition.

9. Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-561**.
10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
11. Retrieve generic software version ID by depressing the **ACO** button longer than 2 seconds and observing version code on the **FE ID** display.
12. Is proper software version installed?
 If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
 If **NO**, then continue with **Step 13**.
13. Find circuit packs with the correct software and repeat this procedure or install new software using the procedures of **DLP-561**.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration Release 9 and Later

1.  **NOTE 1:**
This procedure assumes that the "drop and continue" feature will be used to interconnect two rings at two locations to support service between nodes in each ring. The two rings interface through EC-1 or OC-3 connections at two interworking nodes.

-  **NOTE 2:**
If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section and read the description of the following commands in the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*: **"ent-crs-sts1"**, **"ent-crs-vt1"**, **"rtrv-crs-sts1"**, **"rtrv-crs-vt1"**, **"dlt-crs-sts1"**, and **"dlt-crs-vt1"**.

-  **NOTE 3:**
You will have to login to more than one node in each ring to get a complete map of the network using the **"rtrv-map-network"** and **"rtrv-map-neighbor"** command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

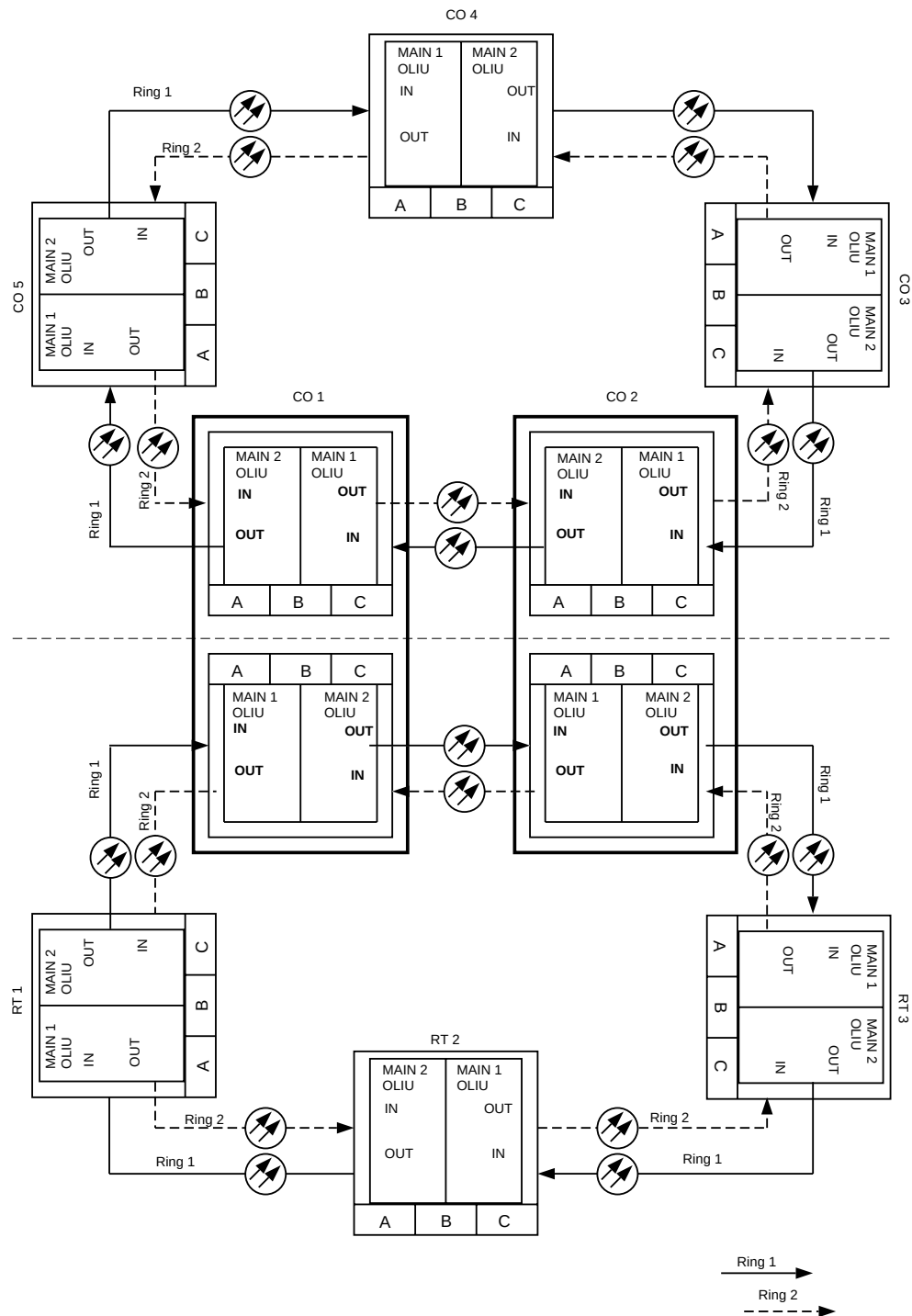


Figure 1. Sample Network Schematic

Log in to any node in each ring in the network and use the "**rtrv-map-network**" and "**rtrv-map-neighbor**" command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2, and 3:

```
C01 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-network: COMPLD
/* Network Map for C01
=====
System Name      Comm.  Product      NE      Alarm
(TID)            Status Type          Type      Group
=====
C01                      DDM-2000 OC-3      DSNE       3
C02                      DDM-2000 OC-3              3
C03                      DDM-2000 OC-3              3
C04                      DDM-2000 OC-3              3
C05                      DDM-2000 OC-3              3
C06                      DDM-2000 OC-3              5
C07                      DDM-2000 OC-3              5
RT1      Failed  DDM-2000 OC-3              5
RT1      DDM-2000 OC-3              5
RT1      DDM-2000 OC-3              5
*/
```

Figure 2. Sample Report From rtrv-map-network Command

```
C01 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-neighbor: COMPLD
/* Neighbor Map for C01
=====
System Name      Connected  Link      Product
(TID)            Through   Comm.     Type
Status
=====
C01                      main-2    DDM-2000 OC-3
C05                      fn-b      DDM-2000 OC-3
C06                      Failed    DDM-2000 OC-3
*/
```

Figure 3. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order.
3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. **⇒ NOTE 1:**

In dual ring configurations, cross-connections consist of "drop and continue" connections in addition to pass-through and terminating cross-connections. For example in Figure 4, drop and continue connections are made at the four nodes in CO 1 and CO 2 located between the two rings. Also, cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and FT-2000 OC-48 rings, as required.

⇒ NOTE 2:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted ("**cnvt - crs**") to 28 VT1.5 cross-connections to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the "**rtrv-eqpt:**" command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **MXRVO** and/or **DS1/DS1PM** circuit packs if DS1 service is being established?
6.  **NOTE 1:**
Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group (see "**ent-crs-sts1**" command).
-  **NOTE 2:**
The following commands may be used to delete, enter, and retrieve cross-connections: "**dlt-crs-vt1**", "**ent-crs-sts1**", "**ent-crs-vt1**", "**ent-crs-sts1**", "**rtrv-crs-vt1**", and "**rtrv-crs-sts1**". See the "Commands and Reports" section of this manual for a description of commands.

From work order or circuit order, determine the cross-connections (STS-1 or VT1.5) to be made at each node associated with the kind of service being established.

7. Starting at one of the terminating nodes for the DS1/DS3 circuit being established, use the "**rtrv-crs-()**:" command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #3 low speed port in the **DS1** circuit pack in slot #2 of **LOW SPEED GROUP A** (a-2-3) is to be connected to timeslot m-1-2-3 and the "**rtrv-crs-vt1**" command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the "**dlt-crs-()**" commands.

8.  **NOTE:**
Channel state provisioning provides IS, AUTO, and NMON states for VT and STS channels similar to the port states for DS1 and DS3 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

At all nonterminating nodes in the network, use the "**ent-crs-vt1**:" or "**ent-crs-sts1**:" command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-2-3, use the "**ent-crs-vt1:m-1-2-3,m-1-2-3:cct=twoway**" command. To make pass-through cross-connections for STS-1 #1, use the "**ent-crs-sts1:m-1,m-1:cct=twoway**" command.]

9. At the terminating (drop) nodes of the circuit being established, use the "ent-crs-vt1:" or "ent-crs-sts1:" command to make the terminating cross-connections (for example, "ent-crs-vt1:m-1-2-3,a-2-3:cct=twoway") or "ent-crs-sts1:m-1,b:cct=twoway")
10. From work order or circuit order, determine the dual ring interworking node sites where the two rings are being interconnected.
11. From work order or circuit order at each dual ring interworking node, determine the "drop and continue" cross-connections to be made at each node.
12. At the dual ring interworking node sites, make or verify proper backplane EC-1 cable connections [**J38-J39** (Group A), **J40-J41** (Group B), **J42-J43** (Group C)] between **FUNCTION UNITS** groups used for service being provided. See CO 1 and CO 2 in Figure 4.
13. ➤ **NOTE:**
Ring 1 is the ring being received on the **MAIN 1 OLIU**. Ring 2 is the ring being received on the **MAIN 2(P) OLIU**. The *ring* parameter of the "ent-crs" commands is used to identify which ring rotation will be continued as well as dropped at a node. For example, if Ring 2 continues to the next node, then *ring=m2*

At the dual ring interworking node sites, determine the ring (Ring 1 or Ring 2) rotation that will be continued to each node. For example, in Figure 4, note that at CO 1 in the top ring configuration, Ring 2 is continued to CO 2. In the bottom ring configuration, Ring 1 is continued from CO 1 to CO 2.

14.  **NOTE:**
If VT1.5 cross-connections in the same STS-1 are made at a dual ring interworking node site, all VT1.5 "drop and continue" cross-connections at that node must be made in the same direction.

At the dual ring interworking node sites, make proper "drop and continue" cross-connections. For example, at the top node at CO 1 if STS-1 #1 in **MAIN OLIU** (m-1) is to be cross-connected to **FUNCTION UNITS** group **B** (b) then the command "**ent-crs-sts1:m-1,b:cct=dc,ring=m2**" would be used to make the cross-connection. This command makes both the drop cross-connection as well as the continue cross-connection. If FT-2000 is a part of the DRI configuration, use 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*, to make DRI cross-connections.

15. Use the "**rtrv-crs-vt1:**" or "**rtrv-crs-sts1:**" command to verify that the proper connection has been made. If an improper cross-connection is made, use the "**dlt-crs-vt1:**" or "**dlt-crs-sts1:**" command to delete the improper cross-connection and reenter the cross-connection.
16. At terminating nodes equipped with **BBG4B DS3** circuit packs, use the "**set-trace-sts1**" command to verify the proper cross-connect path of a STS-1 cross-connected STS-1 signal.
17. After all cross-connections are made, use the "**rtrv-alm:**" command to verify no alarms are present.
18. If DS3 cross-connections have been established and the terminating nodes are equipped with **BBG4B DS3** circuit packs, use "**set-trace-sts1**" command to check integrity of cross-connect path.

Reference: **DLP-563**

19. If "ne-acty", "inc. VT AIS", "inc. STS1 AIS", "inc. VT unequipped", or "inc. STS1 unequipped" alarms are present, look for missing or improperly made cross-connections. Use **TAP-120** to locate missing cross-connections, if required.



Replace DDM-2000 OC-3 Shelf User Panel Out of Service

1.  **CAUTION:**
For an in-service shelf, it will be necessary to remove service prior to performing this procedure.

 **NOTE 1:**
The **ED-8C724-31, G1** User Panel in the **ED-8C724-30, G1** DDM-2000 OC-3 Shelf can **not** be replaced in the field.

 **NOTE 2:**
This procedure provides instructions for replacement of the User Panel in an **ED-8C724-30, G3** or **G4** DDM-2000 OC-3 Shelf.

Tools, Accessories, and Material

The following is required:

Table A. Tools, Accessories, and Material

Quantity	Description
1	ED-8C724-31, G2 or G3 User Panel
1	Screwdriver
1	Pliers
1	Wrist Strap*

* A grounded wrist strap must be worn when handling circuit packs.

Preparation

2. If the shelf is in service, verify that the shelf is free of alarms and that no protection switches are active. Remove service from the shelf.

Modification Procedure

3. Remove the **OHCTL** and **SYSCCTL** circuit packs from the shelf.
4. Disconnect the shelf power lead connectors **P1** and **P2** from the bay power riser connectors **J1** and **J2**. The green **PWR ON** LED on the front of the user panel should gradually extinguish.
5. Unseat the remaining circuit packs in the shelf.
6. Remove the screw at the top of the User Panel faceplate.
7. Unscrew the **ESD** jack at the bottom of the User Panel faceplate.
8. Slide out the User Panel and disconnect the three cable plugs from the connectors on the User Panel printed wiring board.
9. Install the new User Panel, reconnecting the three cable plugs. (Cable plug **J4** connects to the top connector, **J5** to the middle connector, and **J6** to the bottom connector.)
10. Reconnect shelf power lead connector **P1** to the bay power riser connector **J1** and verify that the **PWR ON** LED on the User Panel lights.

Verification and Completion

11. Disconnect shelf power lead connector **P1**. Reconnect shelf power lead connector **P2** to bay power riser connector **J2** and verify that the **PWR ON** LED on the User Panel lights.
12. Reconnect power lead connector **P1** to bay power riser connector **J1**.
13. Install the **OHCTL** circuit pack and then the **SYSCCTL** circuit packs in the shelf.
14. Reseat the remaining circuit packs in the following order: **TGS**, **OLIU**, **MXRVO**, **DS3**, **TMUX**, **STS1E**, **HDSL**, and **DS1/DS1PM**.

15. After about 10 minutes the shelf should be free of alarm indications.
16. Depress the **ACO/TST** pushbutton on the User Panel and verify that all LEDs on the User Panel light. Continue to depress the **ACO/TST** pushbutton and the release number of the software installed in the shelf should be displayed in the **SYSCTL** window.
17. Use CIT and verify that you can log into the shelf. If you cannot establish a session, check cable connections.

Reference: **DLP-521**

18. Service may now be restored to the shelf.
19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install/Remove Lightguide Buildout

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

-  **CAUTION:**
Use static ground wrist strap whenever handling circuit packs or working on DDM-2000 terminal to prevent electrostatic discharge damage to sensitive components.

Is buildout being installed or removed?

If **Installing**, then continue with Step 2.

If **Removing**, then continue with Step 5.

2. Remove protector caps and plugs (if equipped) from buildout and buildout block.
3. Align lightguide buildout locking tab with slot in buildout block (unlocked position), push in, and rotate clockwise until locked into position. Refer to the appropriate figure for the specific buildout type.

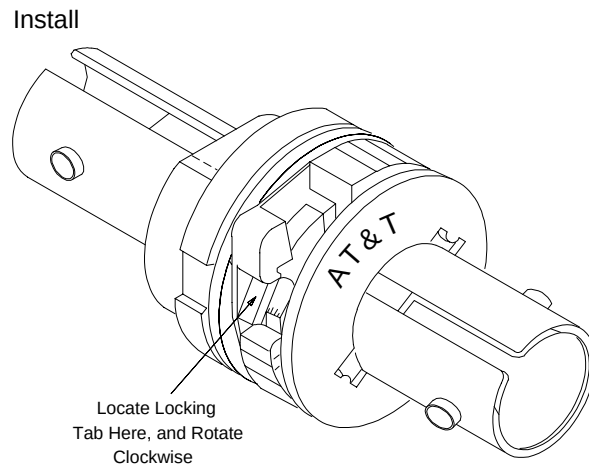


Figure 1. *ST*[®]-Type Buildout (Old Version)

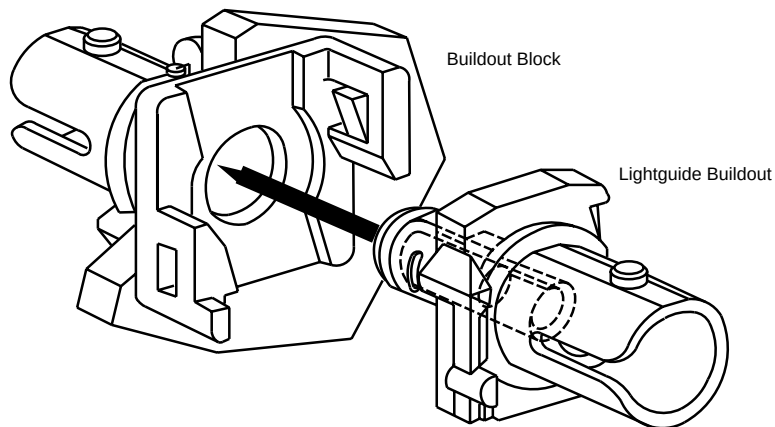


Figure 2. *ST*-Type Universal Buildout

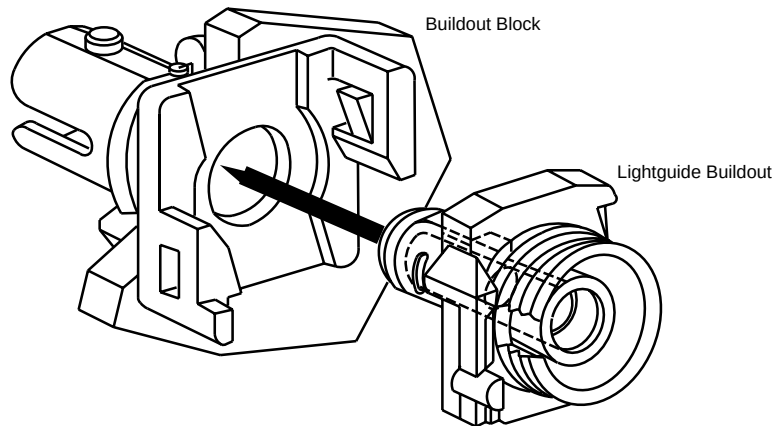


Figure 3. FC/PC-Type Universal Buildout

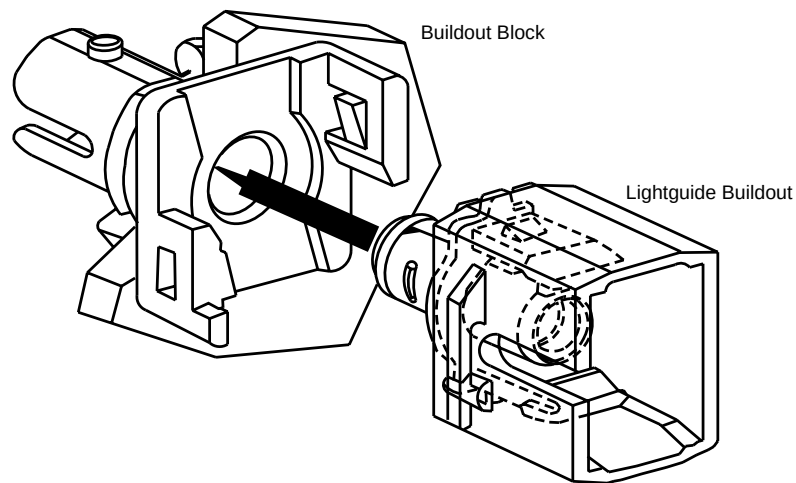


Figure 4. SC-Type Universal Buildout

4. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

5. Depress locking tab on the buildout until locking tab is free from the locked position, rotate the buildout counterclockwise to the stop position, and separate the buildout block by pulling it toward you. Only the old version of the *ST*-type buildout is shown. Refer to the appropriate figure in Step 3 for the specific buildout type.
-

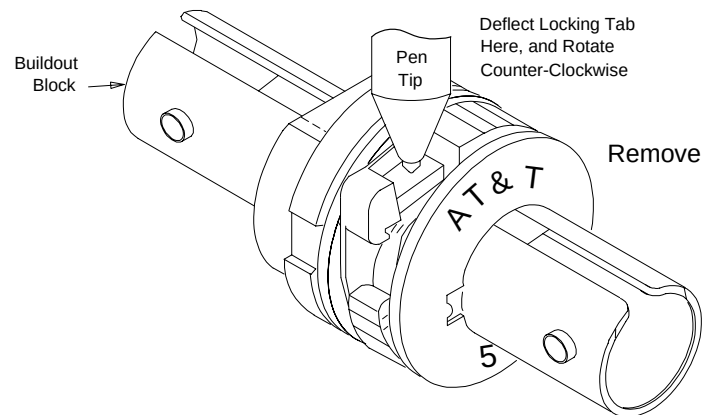


Figure 5. *ST*-Type Buildout (Old Version)

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3 Transmission Test Dual Ring Interconnection

Overview: This procedure is performed on one or more out-of-service circuits to test the dual ring interconnections (DRI) from a DDM-2000 ring network to another DDM-2000 ring network or to an FT-2000 ring network. Numerous configurations are possible when interconnecting DDM-2000 networks. Therefore, this procedure provides you with typical examples and explanations of some of the possible configurations and instructs you on the procedures used in testing these configurations.

1. **⇒ NOTE 1:**

This procedure may be used to perform DS3 transmission tests for a Dual Ring Interconnection (DRI) between DDM-2000 networks and FT-2000 ring networks. When this procedure is being used to perform end-to-end DS3 tests, it is assumed that the complete end-to-end systems have already been tested and that only a particular DS3 channel is being tested at this time.

⇒ NOTE 2:

A CIT is required for this test to make/verify cross-connections and to switch paths of the DS3 being tested. The transmission test can be performed either with a CIT and the automated test command **test - trmsn - t3** or with a DS3 test set.

⇒ NOTE 3:

The DS3 circuit being tested is assumed to originate at equipment external to the DDM-2000 source node and is carried around the DDM-2000 ring to the dual ring interconnection nodes where it is connected to the corresponding DDM-2000 DRI nodes or to the primary and secondary FT-2000 DRI nodes. The DS3 is then carried around the next ring network to the final destination node where it is terminated on external equipment. If more than two rings are interconnected, the DS3 signal may be passed through another set of DRI nodes.

⇒ **NOTE 4:**

Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3 circuit being tested. Release 9 and later has no default cross-connections and supports only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, **rtrv-crs-vt1**, **cnvt-crs-sts1**, **set-ne**, and **rtrv-ne**. See *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

⇒ **NOTE 5:**

If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS3** circuit packs, the DS3 transmission test is performed from the DS3 terminating end. If the CIT and **test-trmsn-t3:** command is being used to perform the test and you are at the EC-1 terminating end, the **rlgn** command may be used to log into the DS3 end to perform the test using the **test-trmsn-t3:** command.

⇒ **NOTE 6:**

When both terminating ends are equipped with **STS1E** circuit packs, DS3 transmission tests may be performed. For DS3 tests, one end may be temporarily equipped with **DS3** circuit packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **STS1E** at the near end, perform an update (**upd**), and install the **DS3** circuit pack(s). After the tests are completed, remove the temporary circuit packs, perform an update, and reinstall the **STS1E** circuit packs.

At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-521**

2. **⇒ NOTE:**

Work orders, office records, or CIT **ent-crs-sts1** or **rtrv-crs** commands may be used to make or verify STS-1 cross-connections.

At each shelf in the network, make/verify that proper pass-through, terminating, and "drop and continue" STS-1 cross-connections have been made for each DS3 channel being tested.

3. Do one of the following:

(a) **⇒ NOTE:**

When an end-to-end DS3 test is run in the mux direction and an **external** loopback is established at the far end, provision the far end DS3 for CC mode with no AIS (**set - t3:address:mode=cc,ais=no**). Otherwise, if the VMR mode is used, then only errors in the receive direction will be monitored and the system may not recognize that a loopback is up.

Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-3 or STSX cross-connect point associated with the DS3 channel to be tested.

- (b) Log into the far-end DDM-2000 terminal, either locally or by using the **rlgn** command, if possible, and use the **opr-lpbk-t3:address** or **opr-lpbk-ec1:address** command to loop back the DS3 or EC-1 port(s) at the far end. Use **logout** or **toggle** (ctrl t) command to return control of CIT to near end.

4.  **CAUTION:**
Execution of switch commands may affect service. Check local procedures before performing switch commands.

 **NOTE 1:**
If this transmission test is to be performed for each path in the end-to-end network, the **switch-path-sts1** command must be used at some of the DDM-2000 nodes to switch paths for each test. If FT-2000 is part of the network, the **FAULT-Switch-Path-STS3** command must be used at the FT-2000 Primary DRI node(s) if the FT-2000 secondary path and the DDM-2000 DRI connections to the FT-2000 secondary node are to be tested. Up to four tests may have to be performed for each DS3 circuit if all protection paths are required to be tested. See Figures 3 through 14.

 **NOTE 2:**
For configurations not shown in the examples, local procedures should be developed to test the DS3 circuits being equipped. A sketch of the network may need to be made and the paths to be tested should be determined as shown in the examples in this procedure.

Use the necessary switch commands to set up the DS3 path being tested. [For example, if the configuration looks like Figure 3, use the **switch-path-sts1** command for test 1 to make Ring 1 active at both terminating nodes and all DDM-2000 DRI nodes. Other DS3 path tests for the same configuration would be set up as follows (Figures 4 through 6)]:

Test	Terminating Nodes	DRI Nodes	Figure
Test 1	Ring 1 active	Ring 1 active	Figure 3
Test 2	Ring 2 active	Ring 1 active	Figure 4
Test 3	Ring 2 active	Ring 2 active	Figure 5
Test 4	Ring 1 active	Ring 2 active	Figure 6

5. Are you using CIT and **test-trmsn-t3** command to perform this test?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 23**.

6. Are you doing this test in the mux or demux direction?

If **MUX** direction, then continue with **Step 7**.

If **DEMUX** direction, then proceed to **Step 9**.

7. At the near end DDM-2000, use the following command to perform a test of the DS3 loop in the fiber direction:

test-trmsn-t3:address:dirn=mux:dur=();

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If **dirn=mux**, direction is toward fiber.

dur = duration of the test in minutes (1-120), default is 1.

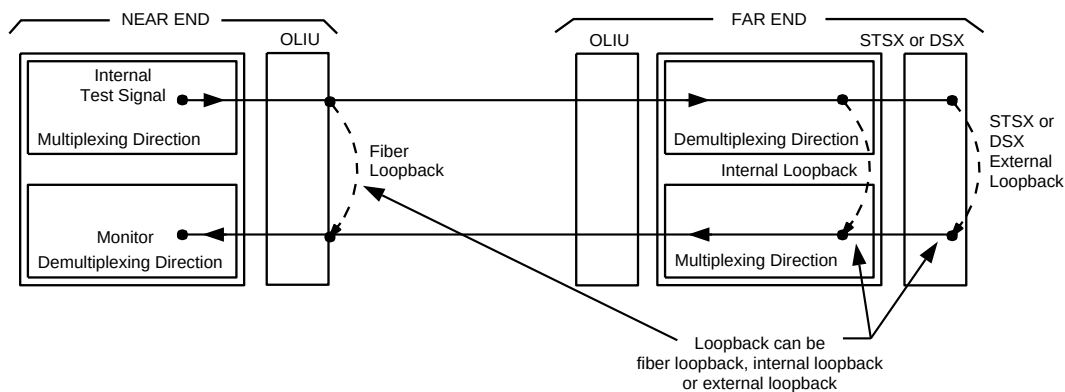


Figure 1. Transmission Test of DS3 Signal in MUX Direction

8. Was the test successful (error free)?

If **YES**, then continue with **Step 12**.

If **NO**, then proceed to **Step 37**.

9. See Figure 2. At the near-end DSX-3 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.
 10. Use the following command to perform a DS3 transmission test in the demux direction to test the DS3 loop in the DSX direction:
test-trmsn-t3:address:dirn=demux:dur=();
Where *address* = address identifier of the DS3 signal.
dirn = direction of the test. If **dirn=demux**, direction is toward DSX.
dur = duration of the test in minutes (1-120), default is 1.
 11. Was the test successful (error free)?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 37**.
-

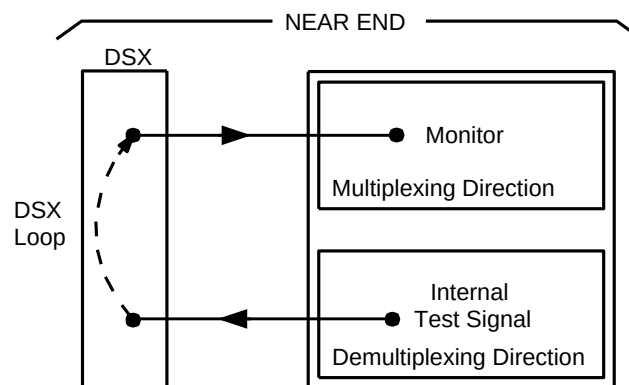


Figure 2. Transmission Test of DS3 Signal in DEMUX Direction

12. Is this the first service being placed on the group and is a protection circuit pack installed?

If **YES**, then continue with **Step 13**.

If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:

switch-fn:address:pri=manual;

Response: The green **ACTIVE** LED lights on the protection circuit pack.

14. Repeat the transmission test in the mux (or demux) direction using the following command:

test-trmsn-t3:address:dirn=mux (or demux):dur=();

15. Was the test successful (error free)?

If **YES**, then continue with **Step 16**.

If **NO**, then proceed to **Step 37**.

16. Use the following command to clear active switch requests on the protection circuit pack:

switch-fn:address:pri=reset;

17. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?

If **NO**, then continue with **Step 18**.

If **YES**, then proceed to **Step 19**.

18. Repeat this procedure from Step 4 for the next path to be tested.

19. Remove the looping patch cords from the cross-connect point. Use the **rls-lpbk-t3** command to release loopback(s) at the far end, if required.

20. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the **upd** command) on the **SYSCTL** to update the **SYSCTL**.

21. If violation monitor removal mode was set differently from the original mode in Step 3, reprovision the mode to the original or required setting using the **set-t3** command. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. At the cross-connection associated with the near-end DDM-2000, connect the DS3 test set to the **IN** and **OUT** jacks associated with the circuit under test.
24. Use the DS3 test set to test for error-free transmission.
25. Was the test successful (error free)?
 - If **YES**, then continue with **Step 26**.
 - If **NO**, then proceed to **Step 37**.
26. Is this the first service being placed on the group and is protection circuit pack installed?
 - If **YES**, then continue with **Step 27**.
 - If **NO**, then proceed to **Step 31**.
27. Unseat the service **DS3** circuit pack associated with the circuit under test.
28. Repeat the DS3 transmission test with the DS3 test set.
29. Was the test successful (error free)?
 - If **YES**, then continue with **Step 30**.
 - If **NO**, then proceed to **Step 37**.
30. Reseat the **DS3** circuit pack associated with the circuit under test.
31. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?
 - If **NO**, then continue with **Step 32**.
 - If **YES**, then proceed to **Step 33**.
32. Repeat this procedure from Step 4 for the next path to be tested.
33. Remove the looping patch cords from the cross-connections.
34. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.
35. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.
36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. Has the **DS3** circuit pack that failed been replaced?

If **YES**, then proceed to **Step 40**.

If **NO**, then continue with **Step 38**.

38. Replace the **DS3** circuit pack that failed the test.

Reference: **DLP-523**

39. Repeat this procedure for the **DS3** circuit pack that failed.

40. Trouble may be in the DSX cross-connect wiring, STS-1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the **rtrv-crs-sts1** command to ensure proper STS-1 cross-connections have been made at each shelf in the ring for the DS3 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, **rtrv-alm**, **rtrv-hsty**, etc.) to check for other trouble indications.

41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

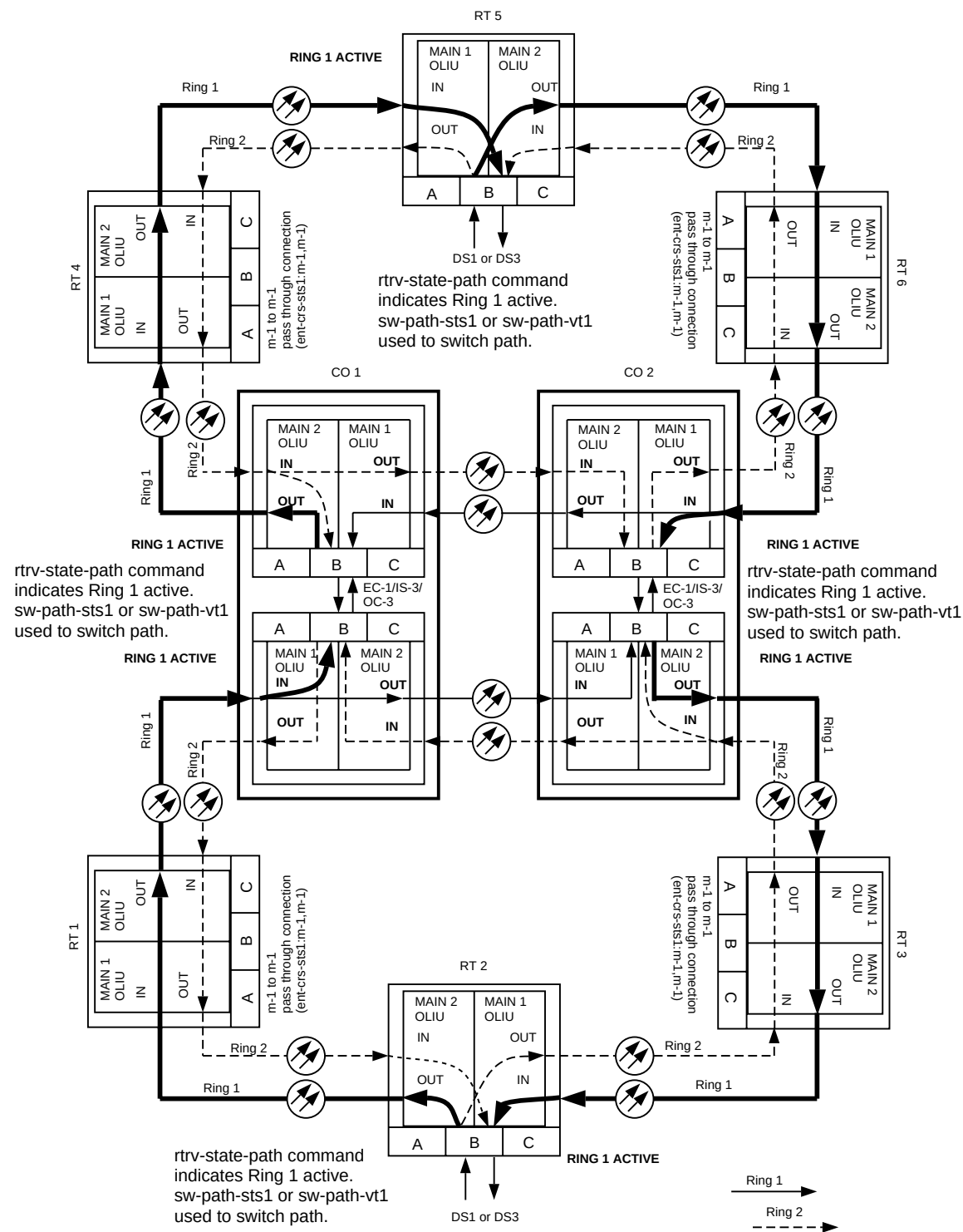


Figure 3. Example of DS3 Transmission Test in Dual Ring Interworking Network

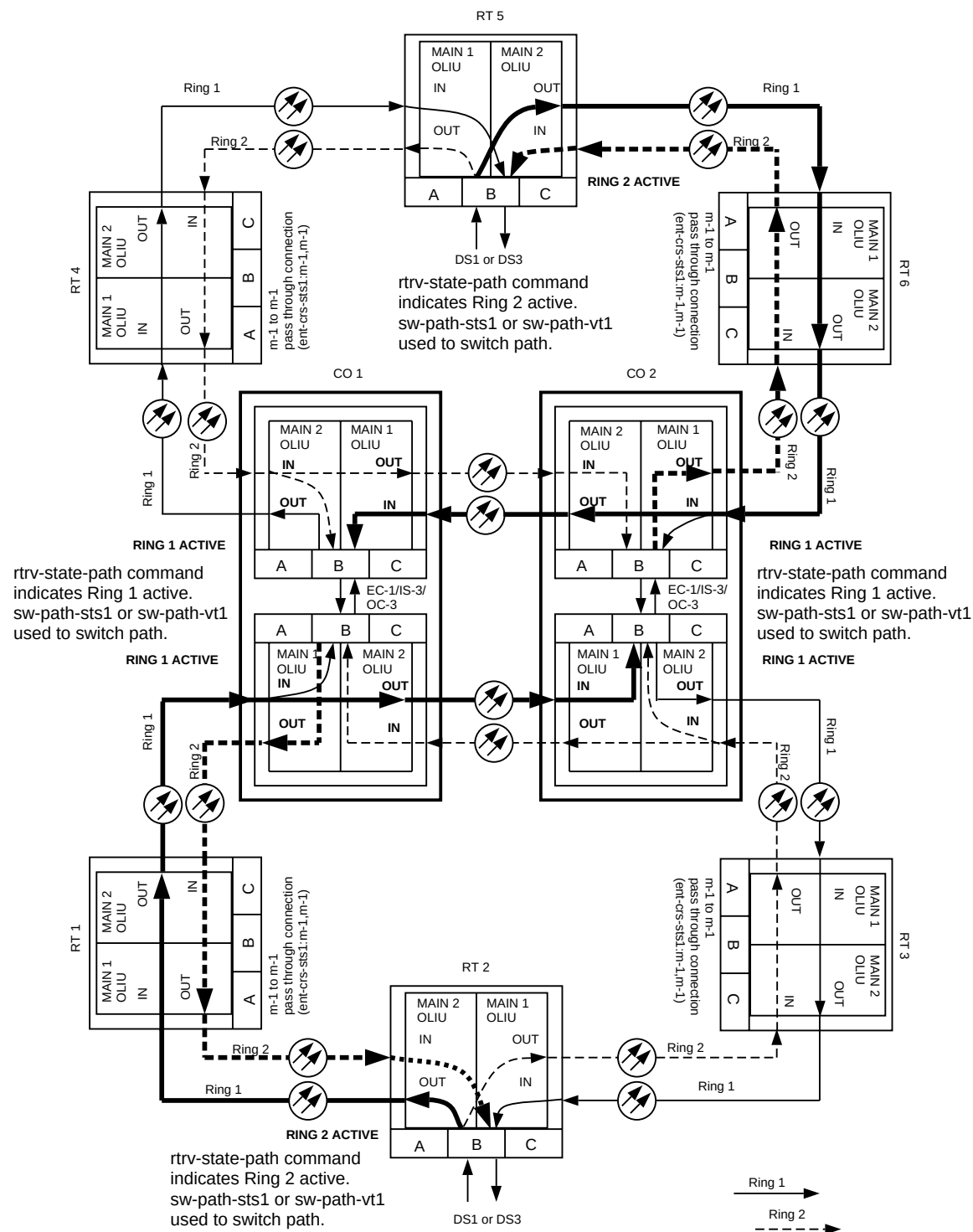


Figure 4. Example of DS3 Transmission Test in Dual Ring Interworking Network

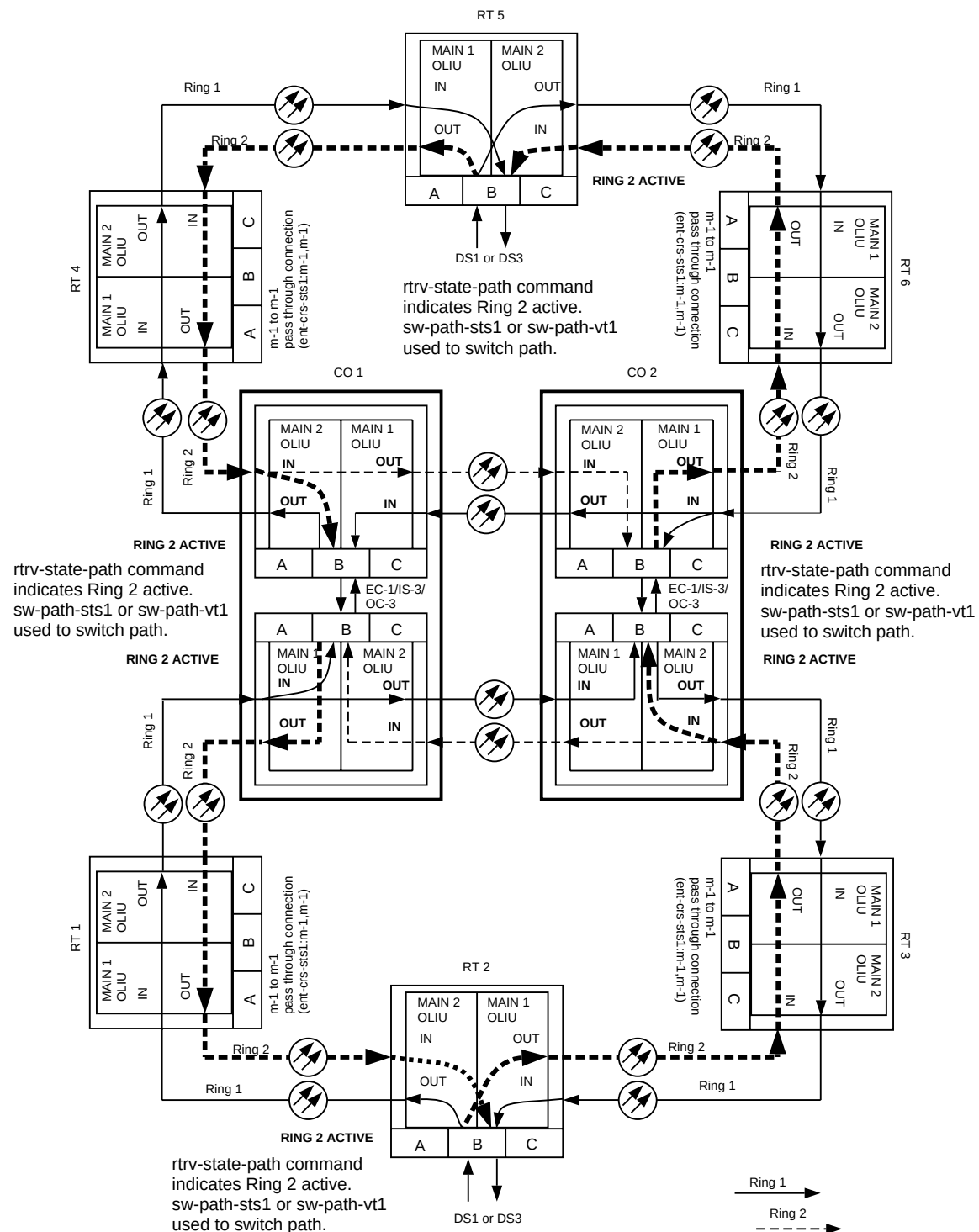


Figure 5. Example of DS3 Transmission Test in Dual Ring Interworking Network

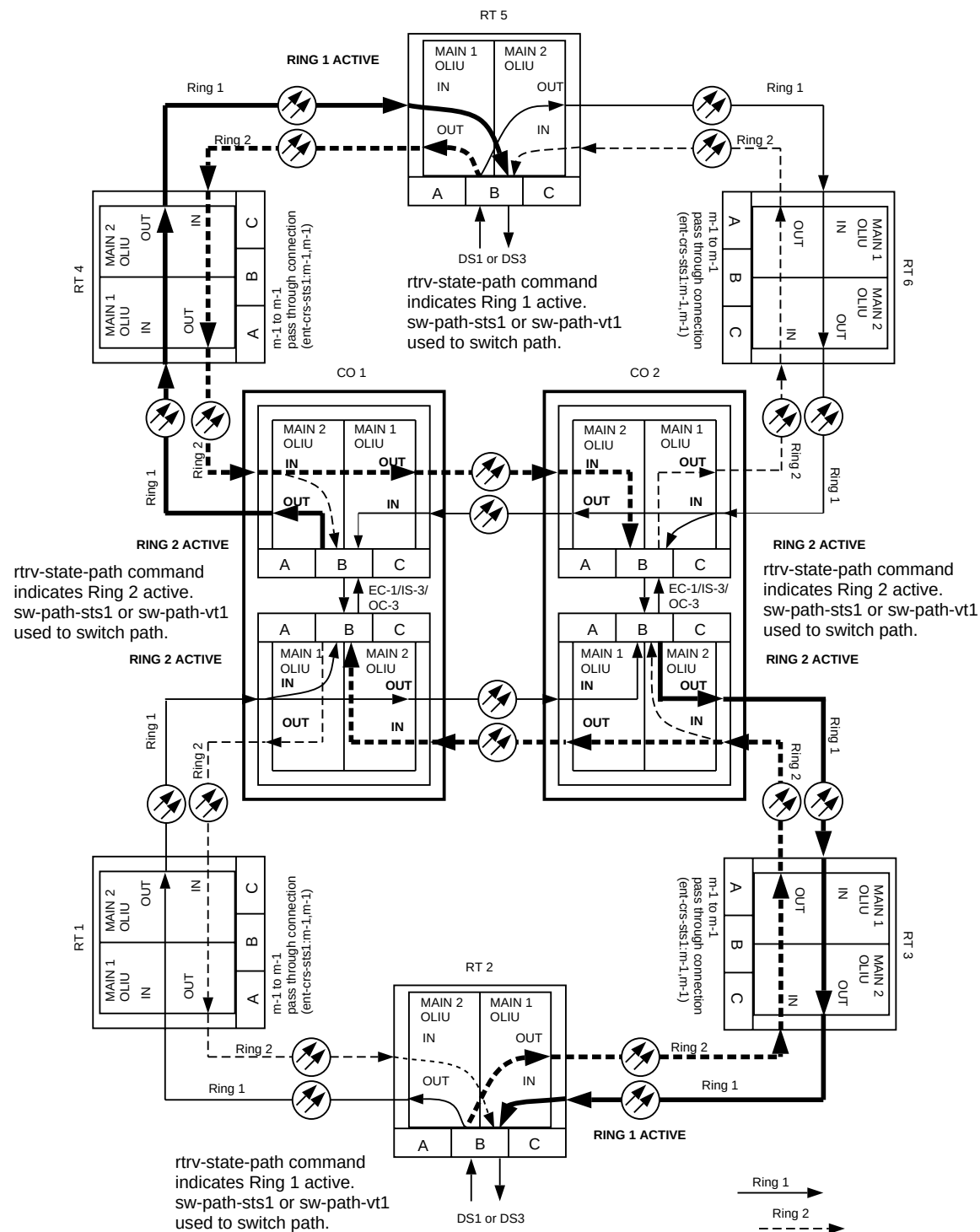


Figure 6. Example of DS3 Transmission Test in Dual Ring Interworking Network

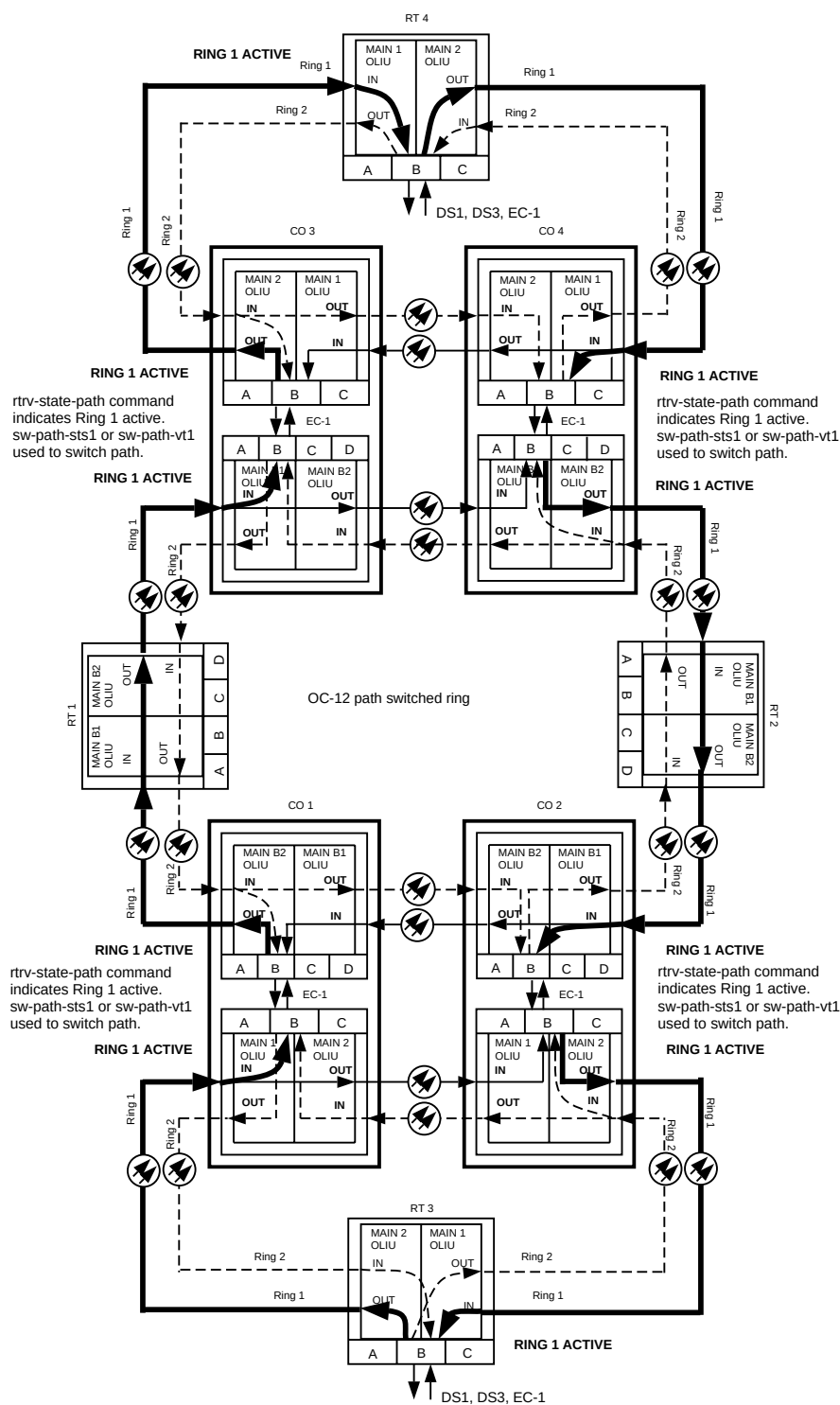


Figure 7. Example of DS3 Transmission Test in Dual Ring Interworking Network

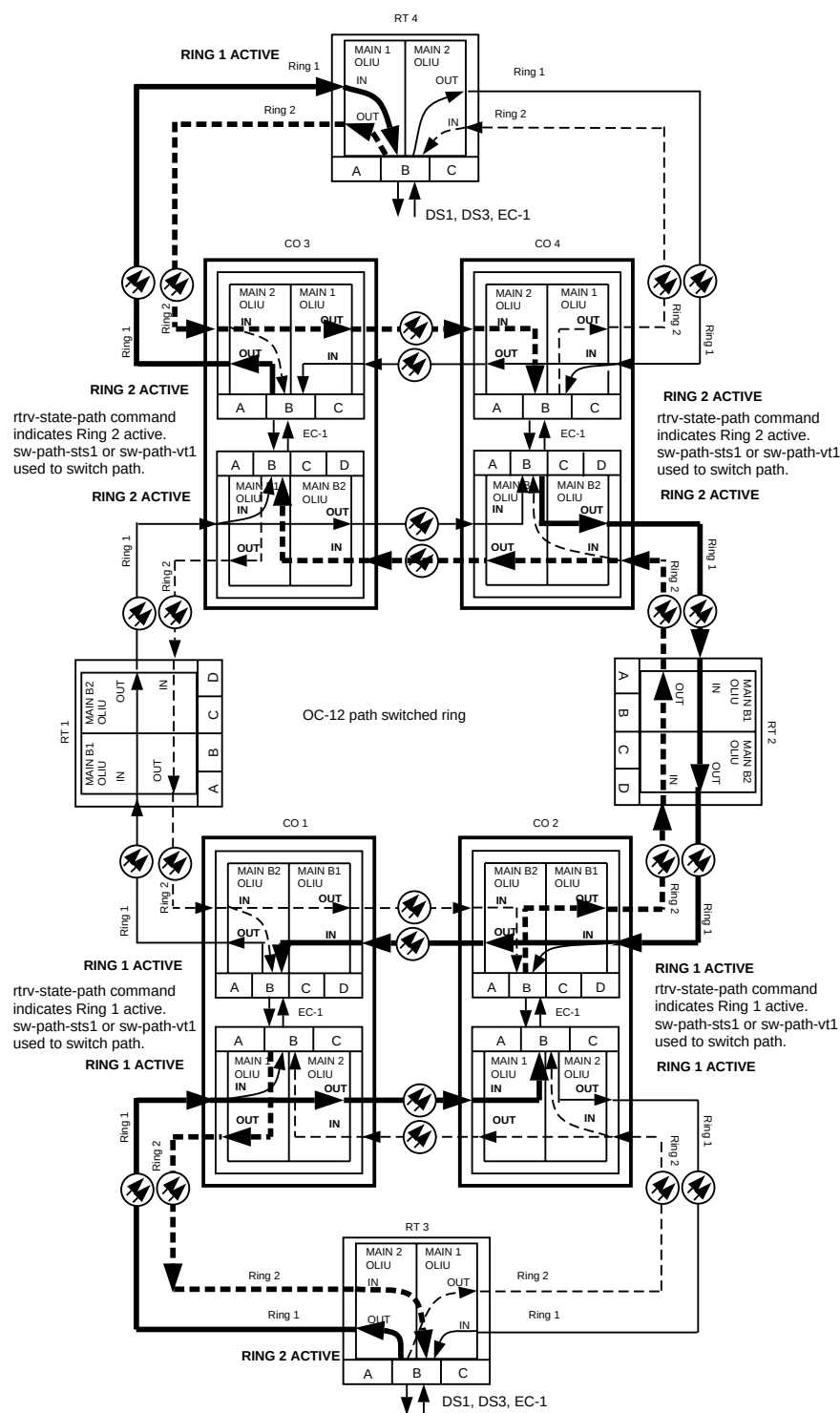


Figure 8. Example of DS3 Transmission Test in Dual Ring Interworking Network

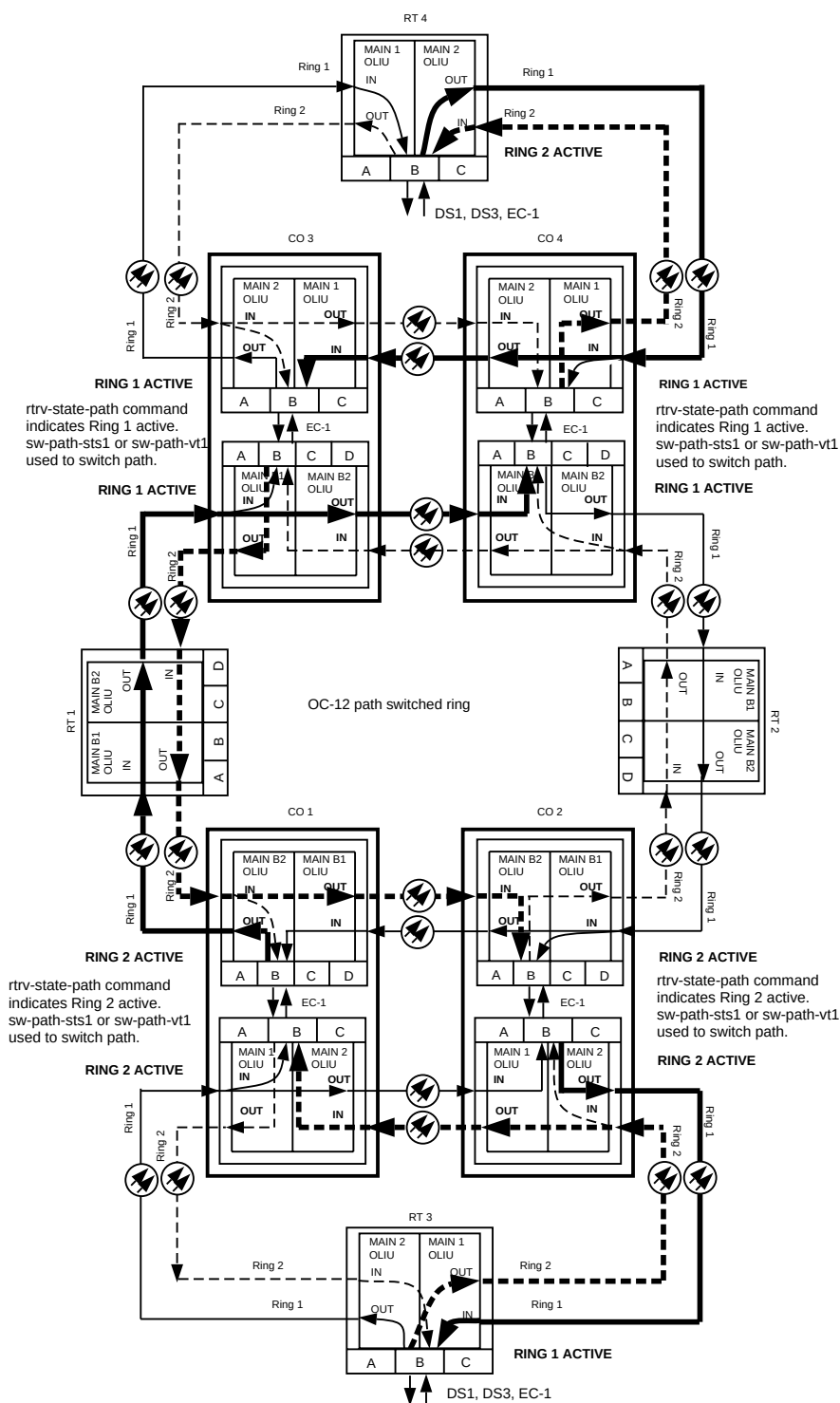


Figure 9. Example of DS3 Transmission Test in Dual Ring Interworking Network

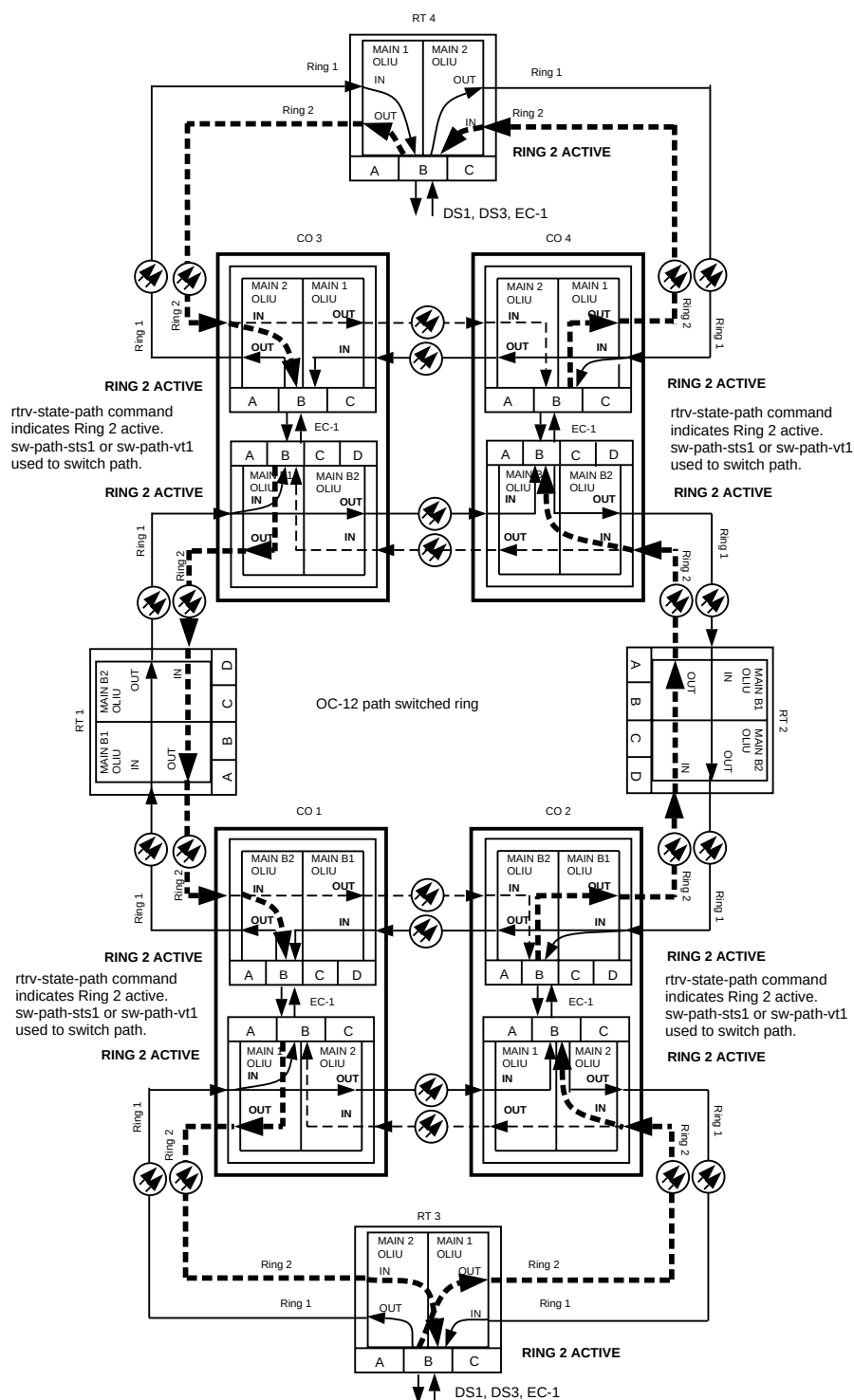


Figure 10. Example of DS3 Transmission Test in Dual Ring Interworking Network

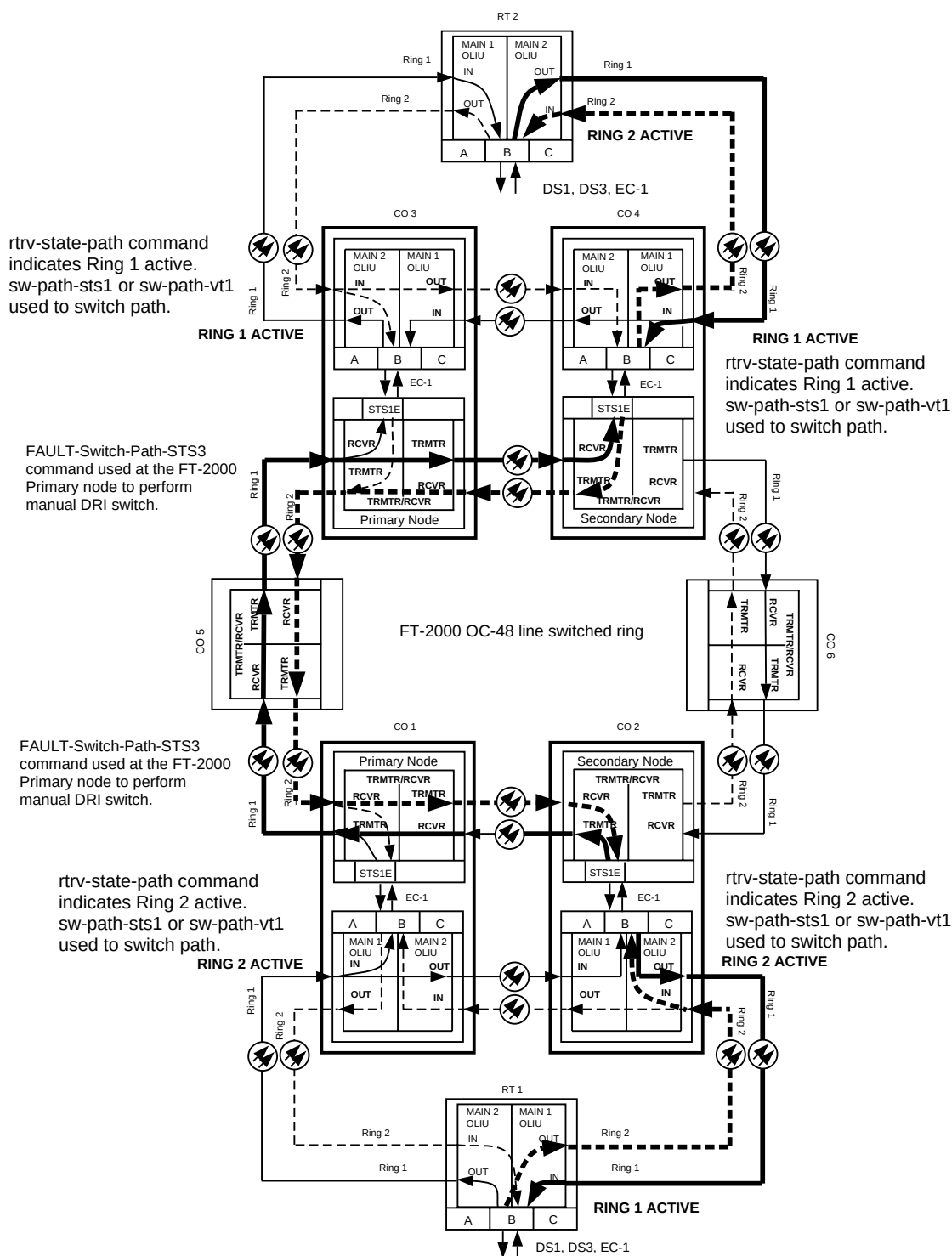


Figure 11. Example of DS3 Transmission Test in Dual Ring Interworking Network

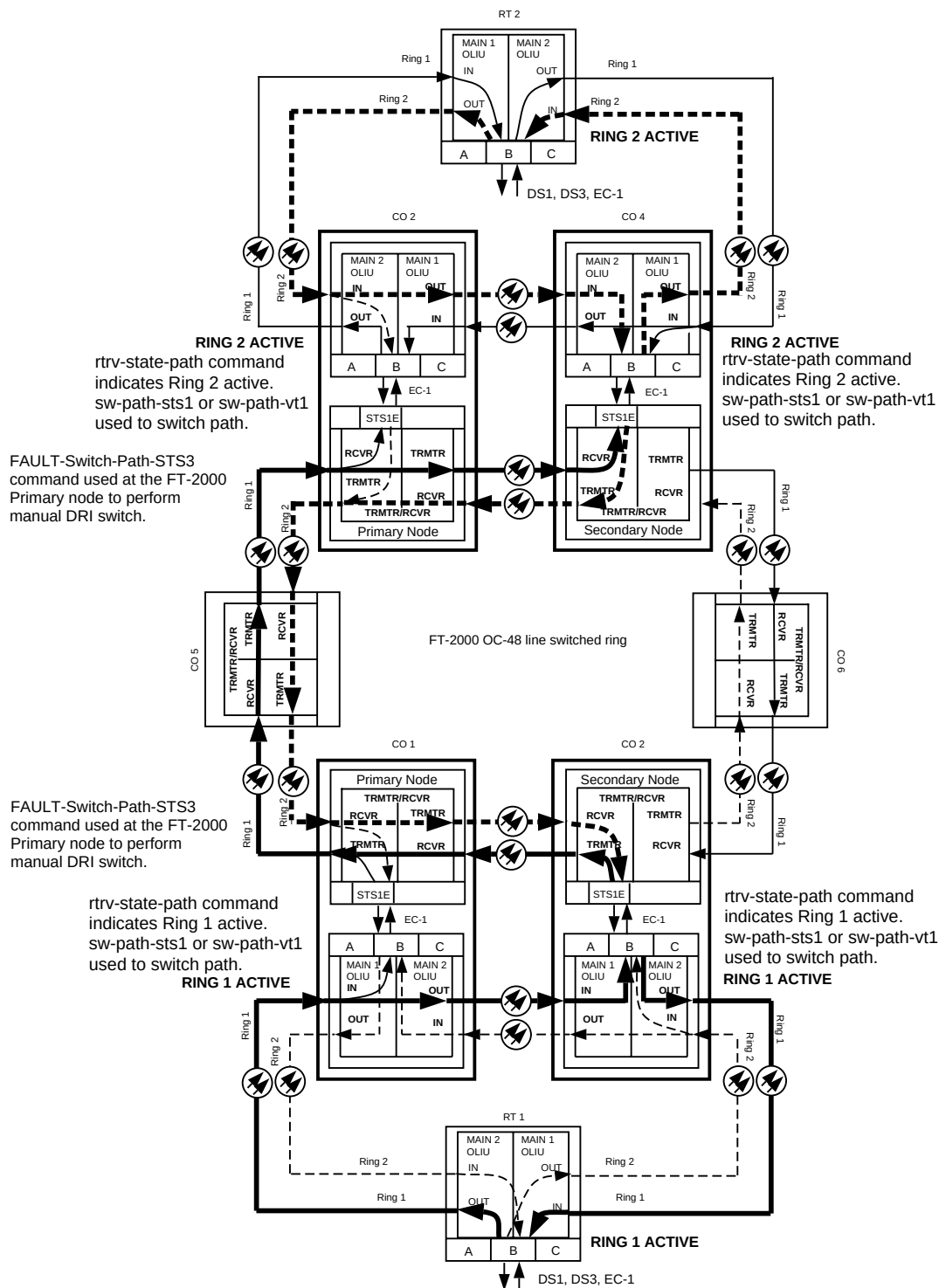


Figure 12. Example of DS3 Transmission Test in Dual Ring Interworking Network

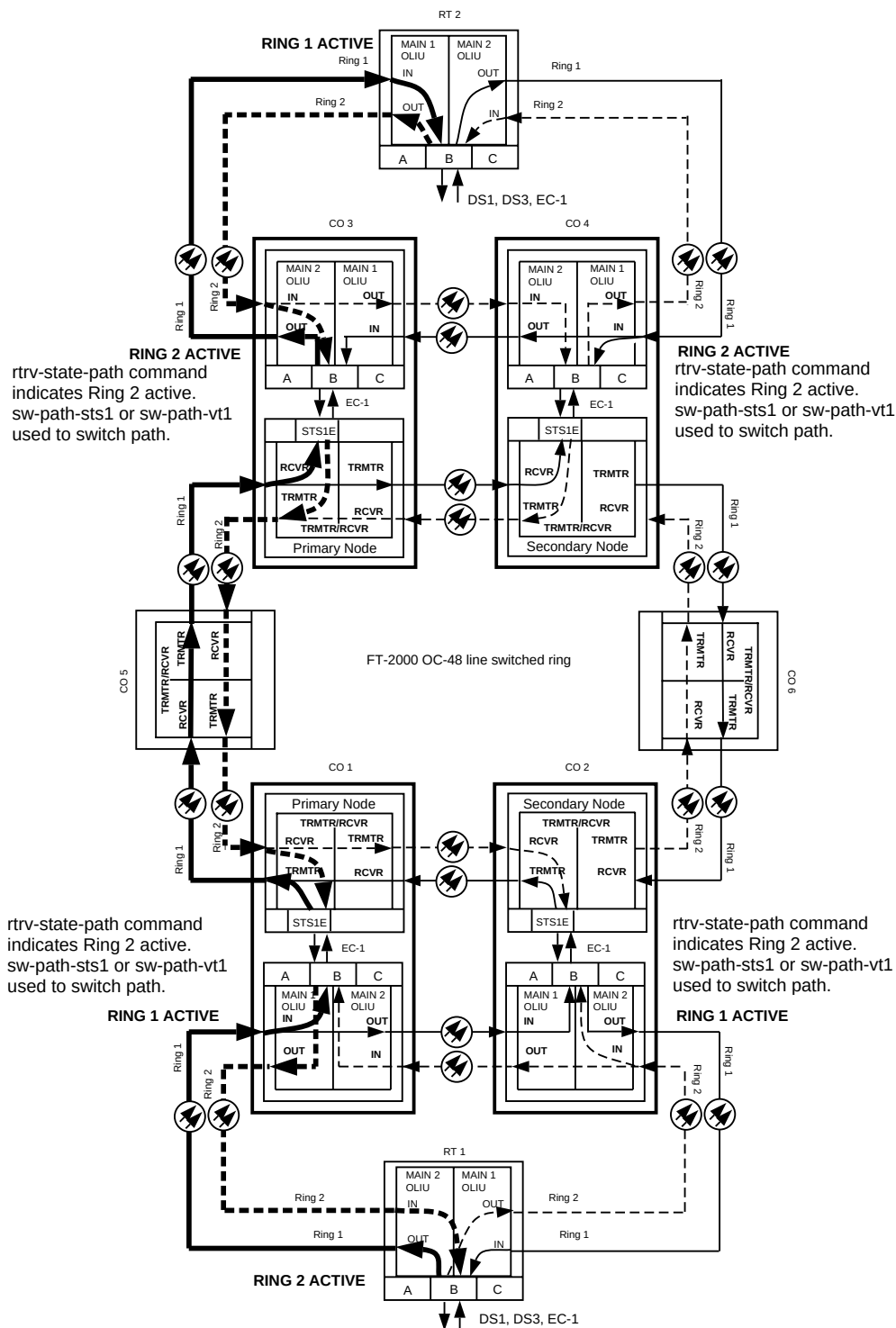


Figure 13. Example of DS3 Transmission Test in Dual Ring Interworking Network

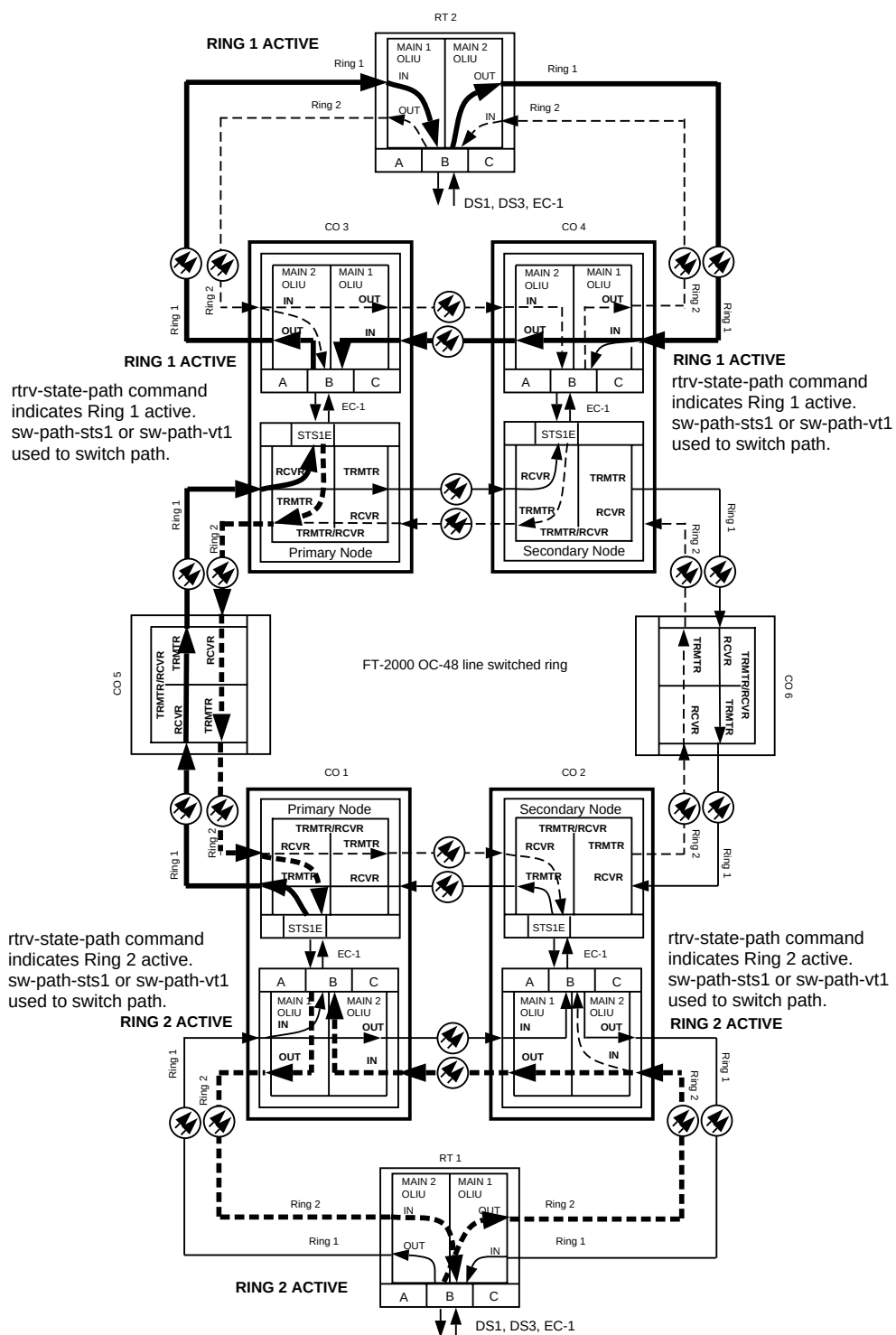


Figure 14. Example of DS3 Transmission Test in Dual Ring Interworking Network

Perform DS1 Transmission Test Dual Ring Interconnection

Overview: This procedure is performed on one or more out-of-service circuits to test the dual ring interconnections (DRI) from a DDM-2000 ring network to another DDM-2000 ring network or through an FT-2000 ring network. Numerous configurations are possible when interconnecting DDM-2000 networks. Therefore, this procedure provides you with typical examples and explanations of some of the possible configurations and instructs you on the procedures used in testing these configurations.

1. **⇒ NOTE 1:**

This procedure may be used to perform DS1 transmission tests for a Dual Ring Interconnection (DRI) between DDM-2000 networks and FT-2000 ring networks. When this procedure is being used to perform end-to-end DS1 tests, it is assumed that the complete end-to-end systems have already been tested and that only a particular DS1 channel is being tested at this time.

⇒ NOTE 2:

A CIT is required for this test to make/verify cross-connections and to switch paths of the DS1 being tested. The transmission test can be performed either with a CIT and the automated test command **test - trmsn - t1** or with a DS1 test set.

⇒ NOTE 3:

The DS1 circuit being tested is assumed to originate at equipment external to the DDM-2000 source node and is carried around the DDM-2000 ring to the dual ring interconnection nodes where it is connected to the corresponding DDM-2000 DRI nodes or to the primary and secondary FT-2000 DRI nodes. The DS1 is then carried around the next ring network to the final destination node where it is terminated on external equipment. If more than two rings are interconnected, the DS1 signal may be passed through another set of DRI nodes.

⇒ **NOTE 4:**

Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS1 circuit being tested. Release 9 and later has no default cross-connections and supports only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the "Commands and Reports" section of this manual: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, **rtrv-crs-vt1**, **cnvt-crs-sts1**, **set-ne**, and **rtrv-ne**. See *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

⇒ **NOTE 5:**

If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS1/DS1PM** circuit packs, the DS1 transmission test is performed from the DS1 terminating end. If the CIT and **test-trmsn-t1:** command is being used to perform the test and you are at the EC-1 terminating end, you may be able to use the **rlgn** command to log into the DS1 end to perform the test using the **test-trmsn-t1:** command.

⇒ **NOTE 6:**

When both terminating ends are equipped with **STS1E** circuit packs, one end may be temporarily equipped with **DS1/DS1PM** and **MXRVO** circuit packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **STS1E** at the near end, perform an update (**upd**), and install the **DS1/DS1PM** and **MXRVO** circuit pack(s). After the tests are completed, remove the temporary circuit packs, perform an update, and reinstall the **STS1E** circuit packs.

At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-521**

2.  **NOTE:**
Work orders, office records, or CIT **ent-crs-sts1**, **ent-crs-vt1**,
or **rtrv-crs** commands may be used to make or verify STS-1
cross-connections.

At each shelf in the network, make/verify that proper pass-through,
terminating, and "drop and continue" STS-1 cross-connections have been
made for each DS1 channel being tested.

3.  **NOTE:**
Local tests cannot be performed in the DEMUX direction for **STS1E**
circuit packs.

See Figures 1 and 2. If local tests are being performed, the fiber
loopbacks at the near-end **OLIUs** must be in place. If end-to-end tests are
being performed, do ONE of the following:

- (a) Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end
DSX-1 or STSX cross-connection associated with the DS1 channel to
be tested.
- (b) Log into the far-end terminal and use the **opr-lpbk-t1:address**
or **opr-lpbk-ec1:address** command to loop back the DS1 or
EC-1 port(s) at the far end. Use **logout** or **toggle** (ctrl t)
command to return control of CIT to near end.

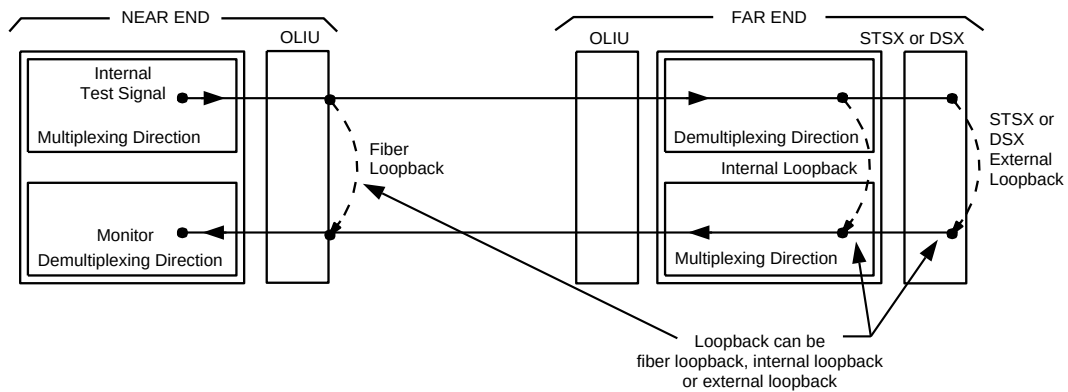


Figure 1. Transmission Test of DS1 Signal in MUX Direction

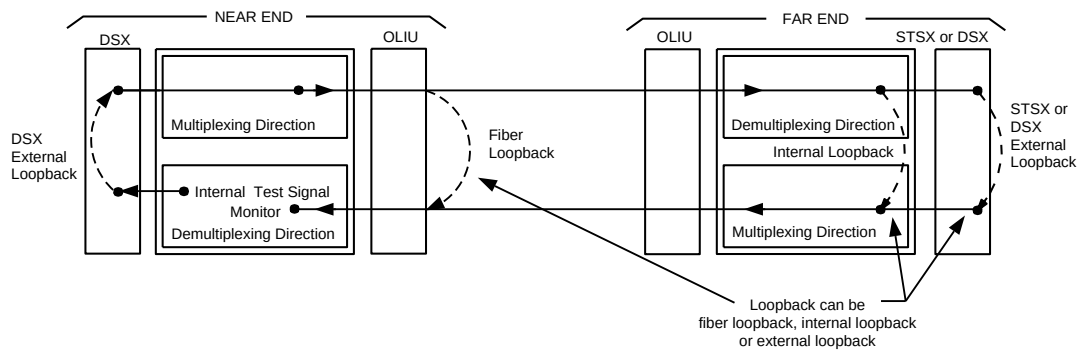


Figure 2. Transmission Test of DS1 Signal in DEMUX Direction

4.  **CAUTION:**
Execution of switch commands may affect service. Check local procedures before performing switch commands.

 **NOTE 1:**
If this transmission test is to be performed for each path in the end-to-end network, the **switch-path-sts1** or **switch-path-vt1** command must be used at some of the DDM-2000 nodes to switch paths for each test. If FT-2000 is part of the network, the **FAULT-Switch-Path-STS3** command must be used at the FT-2000 Primary DRI node(s) if the FT-2000 secondary path and the DDM-2000 DRI connections to the FT-2000 secondary node are to be tested. Up to four tests may have to be performed for each DS1 circuit if all protection paths are required to be tested. See Figures 3 through 14.

 **NOTE 2:**
For configurations not shown in the examples, local procedures should be developed to test the DS1 circuits being equipped. A sketch of the network may need to be made and the paths to be tested should be determined as shown in the examples in this procedure.

Use the necessary switch commands to set up the DS1 path being tested. [For example, if the configuration looks like Figure 3, use the **switch-path-sts1** command for test 1 to make Ring 1 active at both terminating nodes and all DDM-2000 DRI nodes. Other DS1 path tests for the same configuration would be set up as follows (Figures 4 through 6)]:

Test	Terminating Nodes	DRI Nodes	Figure
Test 1	Ring 1 active	Ring 1 active	Figure 3
Test 2	Ring 2 active	Ring 1 active	Figure 4
Test 3	Ring 2 active	Ring 2 active	Figure 5
Test 4	Ring 1 active	Ring 2 active	Figure 6

5. Are you using CIT and **test-trmsn-t1** command to perform this test?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 23**.
6. Are you doing this test in the mux or demux direction?
If **MUX** direction, then continue with **Step 7**.
If **DEMUX** direction, then proceed to **Step 9**.
7. At the near end DDM-2000, use the following command to perform a test of the DS1 loop in the fiber direction:
test-trmsn-t1:address:dirn=mux:dur=();
Where *address* = address identifier of the DS1 signal.
dirn = direction of the test. If **dirn=mux**, direction is toward fiber.
dur = duration of the test in minutes (1-120), default is 1.
8. Was the test successful (error free)?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 37**.
9. See Figure 2. At the near-end DSX-1 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS1 channel to be tested.
10. Use the following command to perform a DS1 transmission test in the demux direction to test the DS1 loop in the DSX direction:
test-trmsn-t1:address:dirn=demux:dur=();
Where *address* = address identifier of the DS1 signal.
dirn = direction of the test. If **dirn=demux**, direction is toward DSX.
dur = duration of the test in minutes (1-120), default is 1.
11. Was the test successful (error free)?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 37**.

12. Is this the first service being placed on the group and is a protection circuit pack installed?

If **YES**, then continue with **Step 13**.

If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:

switch-ls:address:pri>manual;

Response: The green **ACTIVE** LED lights on the protection circuit pack.

14. Repeat the transmission test in the mux (or demux) direction using the following command:

test-trmsn-t1:address:dirn=mux (or demux):dur=();

15. Was the test successful (error free)?

If **YES**, then continue with **Step 16**.

If **NO**, then proceed to **Step 37**.

16. Use the following command to clear active switch requests on the protection circuit pack:

switch-ls:address:pri=reset;

17. The **DS1** circuit path under test has passed the DS1 transmission test. Have all required paths been tested?

If **NO**, then continue with **Step 18**.

If **YES**, then proceed to **Step 19**.

18. Repeat this procedure from Step 4 for the next path to be tested.

19. Remove the looping patch cords from the cross-connect point. Use the **r1s-lpbk-t1** command to release loopback(s) at the far end, if required.

20. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the **upd** command) on the **SYSCTL** to update the **SYSCTL**.

21. Repeat this procedure from Step 2 for any additional DS1 circuits to be tested.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. At the cross-connection associated with the near-end DDM-2000, connect the DS1 test set to the **IN** and **OUT** jacks associated with the circuit under test.
24. Use the DS1 test set to test for error-free transmission.
25. Was the test successful (error free)?
 - If **YES**, then continue with **Step 26**.
 - If **NO**, then proceed to **Step 37**.
26. Is this the first service being placed on the group and is protection circuit pack installed?
 - If **YES**, then continue with **Step 27**.
 - If **NO**, then proceed to **Step 31**.
27. Unseat the service **DS1/DS1PM** circuit pack associated with the circuit under test.
28. Repeat the DS1 transmission test with the DS1 test set.
29. Was the test successful (error free)?
 - If **YES**, then continue with **Step 30**.
 - If **NO**, then proceed to **Step 37**.
30. Reseat the **DS1/DS1PM** circuit pack associated with the circuit under test.
31. The **DS1** circuit path under test has passed the DS1 transmission test. Have all required paths been tested?
 - If **NO**, then continue with **Step 32**.
 - If **YES**, then proceed to **Step 33**.
32. Repeat this procedure from Step 4 for the next path to be tested.
33. Remove the looping patch cords from the cross-connections.
34. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the **upd** command) on the **SYSCTL** to update the **SYSCTL**.
35. Repeat this procedure from Step 2 for any additional DS1 circuits to be tested.
36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. Check for line code (AMI/B8ZS) mismatch at near end and far end. If mismatch is found, set line code [DLP-513] to correct value and repeat this test. If no trouble is found, continue with the next step.
38. In some releases, if **dlc=yes** as set by the **set -t1** command, loopbacks are not recognized (loopback not recognized) in this test. Use **rtrv-t1** command to check if **dlc=yes**.
39. Is dlc set to yes?
 If **YES**, then continue with **Step 40**.
 If **NO**, then proceed to **Step 41**.
40. Use **set -t1** command to temporarily set **dlc=no** and repeat this test. If the test fails again, continue with the next step.
41. Has the **DS1/DS1PM** circuit pack that failed the test been replaced?
 If **YES**, then proceed to **Step 44**.
 If **NO**, then continue with **Step 42**.
42. Replace the **DS1/DS1PM** circuit pack that failed the test.

Reference: **DLP-523**

43. Repeat this procedure for the **DS1/DS1PM** circuit pack that failed.
44. Trouble may be in the DSX cross-connect wiring, VT1/STS-1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the **rtrv-crs-()** command to ensure proper VT1/STS-1 cross-connections have been made at each shelf in the ring for the DS1 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, **rtrv-alm**, **rtrv-hsty**, etc.) to check for other trouble indications.
45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

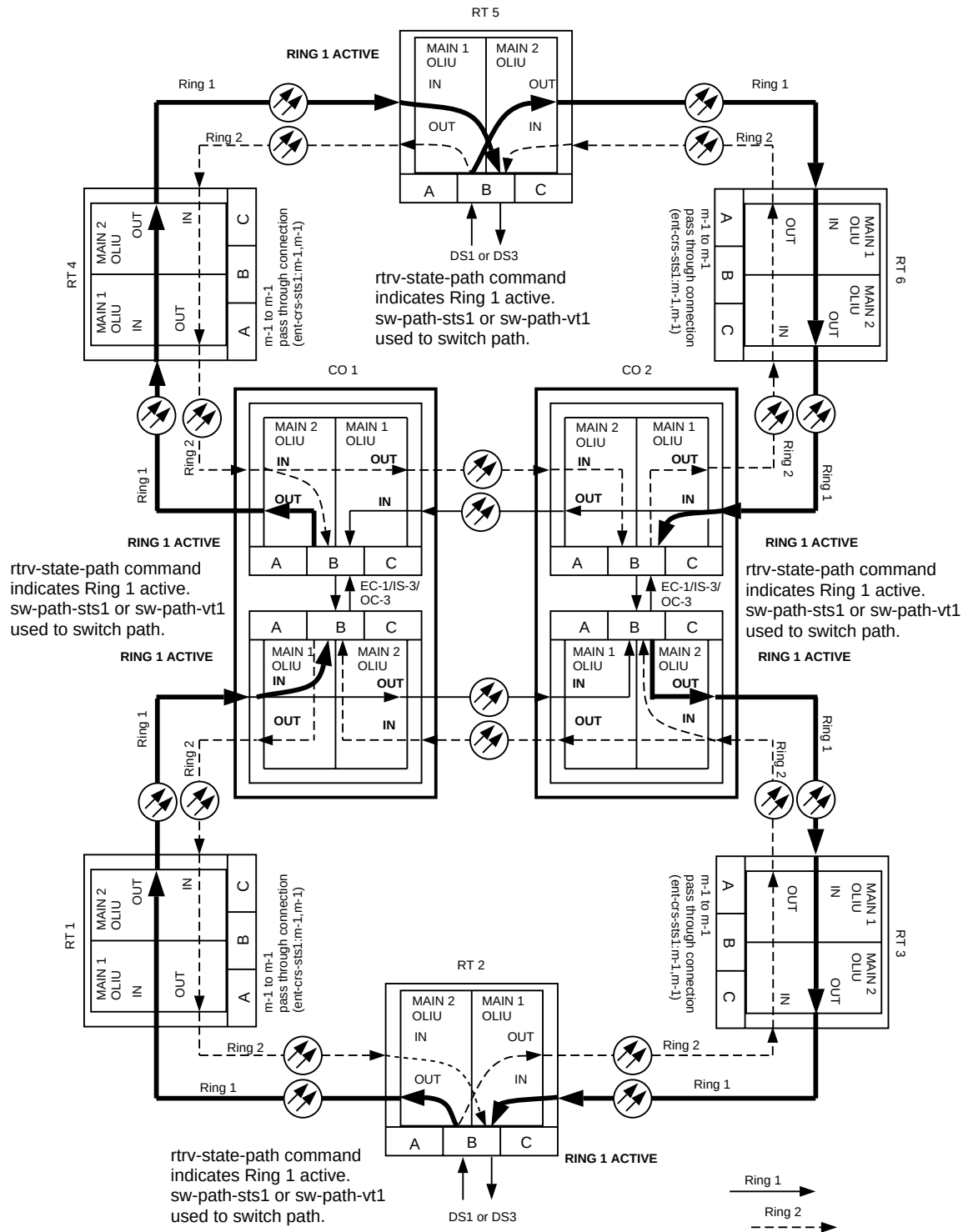


Figure 3. Example of DS1 Transmission Test in Dual Ring Interworking Network

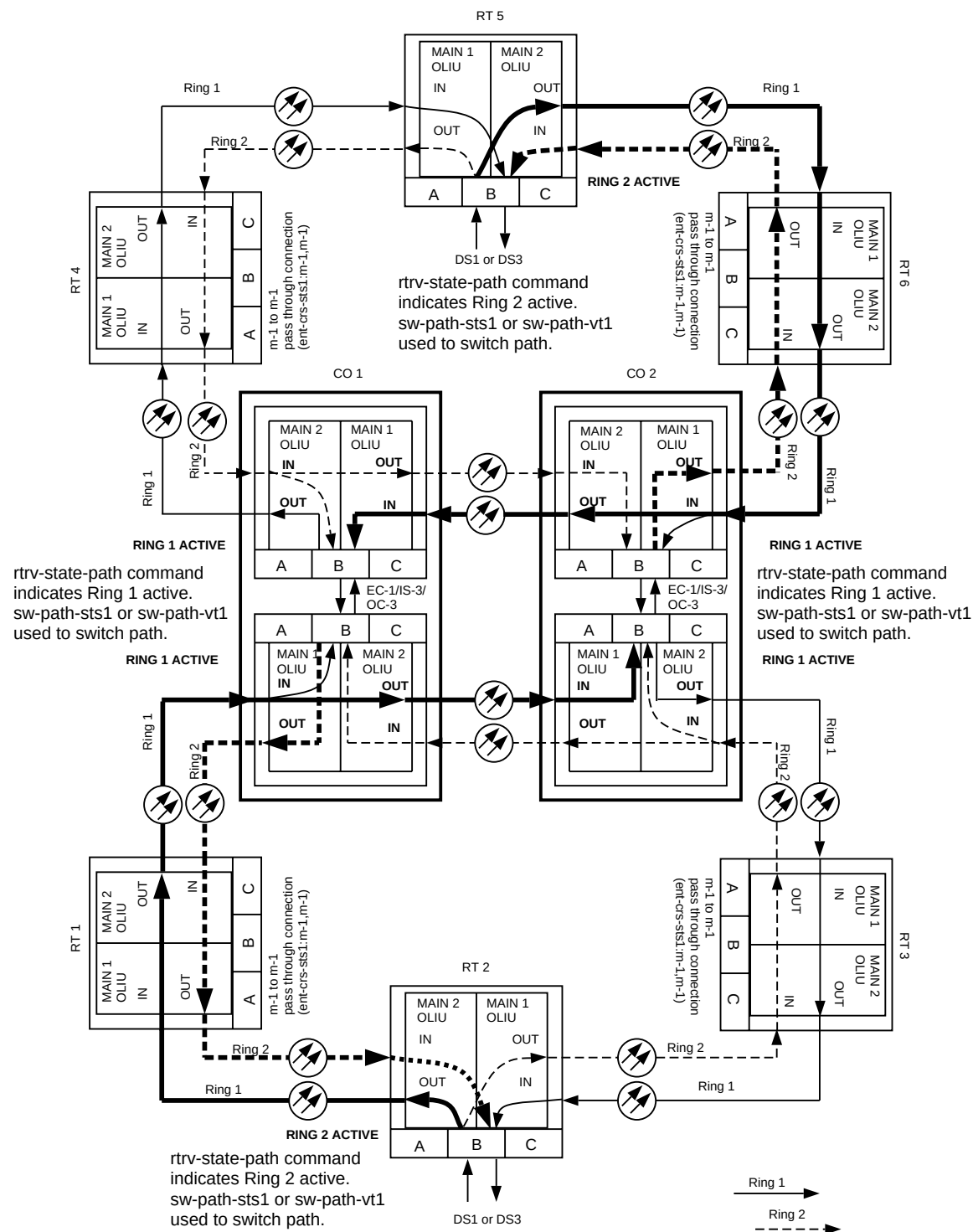


Figure 4. Example of DS1 Transmission Test in Dual Ring Interworking Network

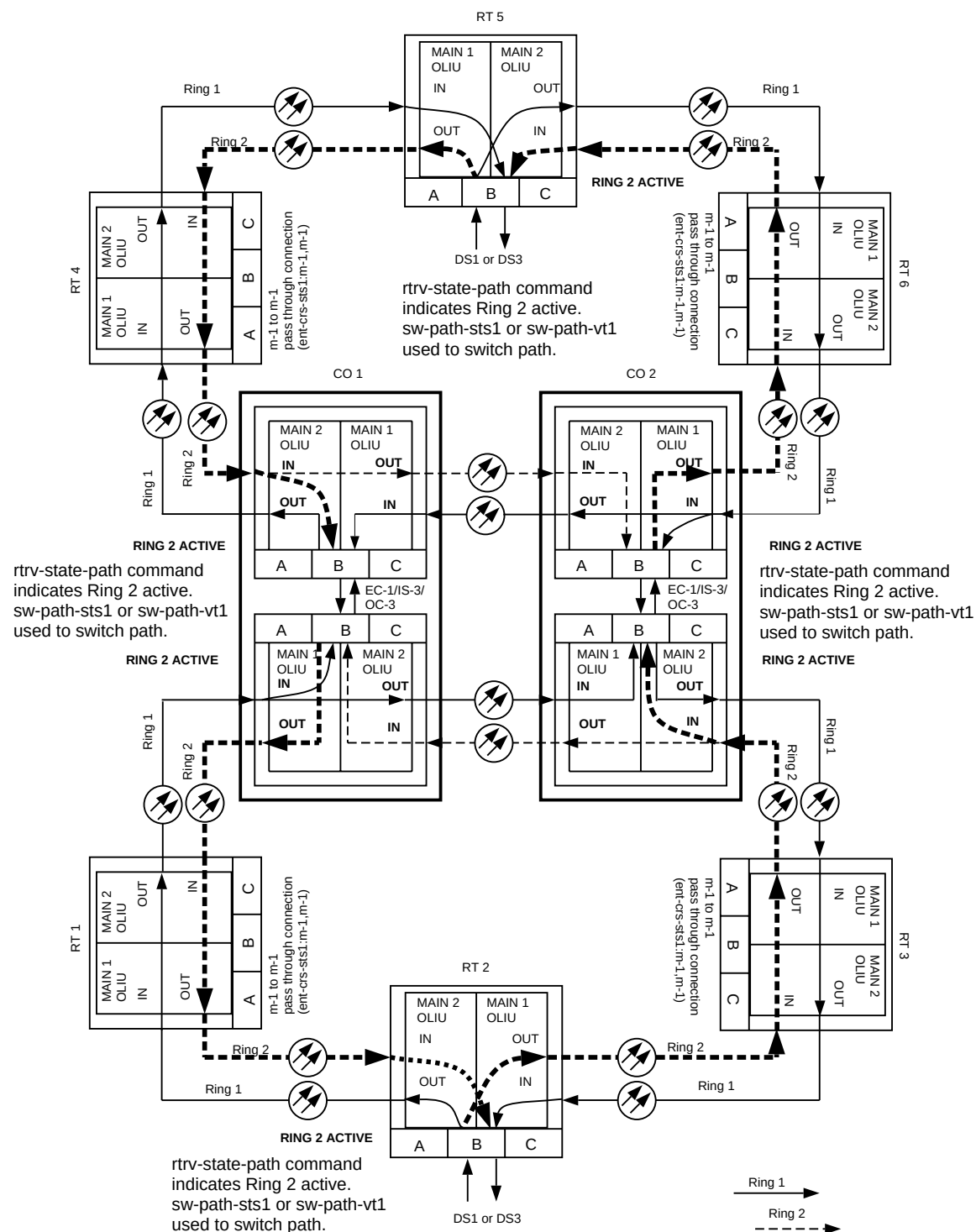


Figure 5. Example of DS1 Transmission Test in Dual Ring Interworking Network

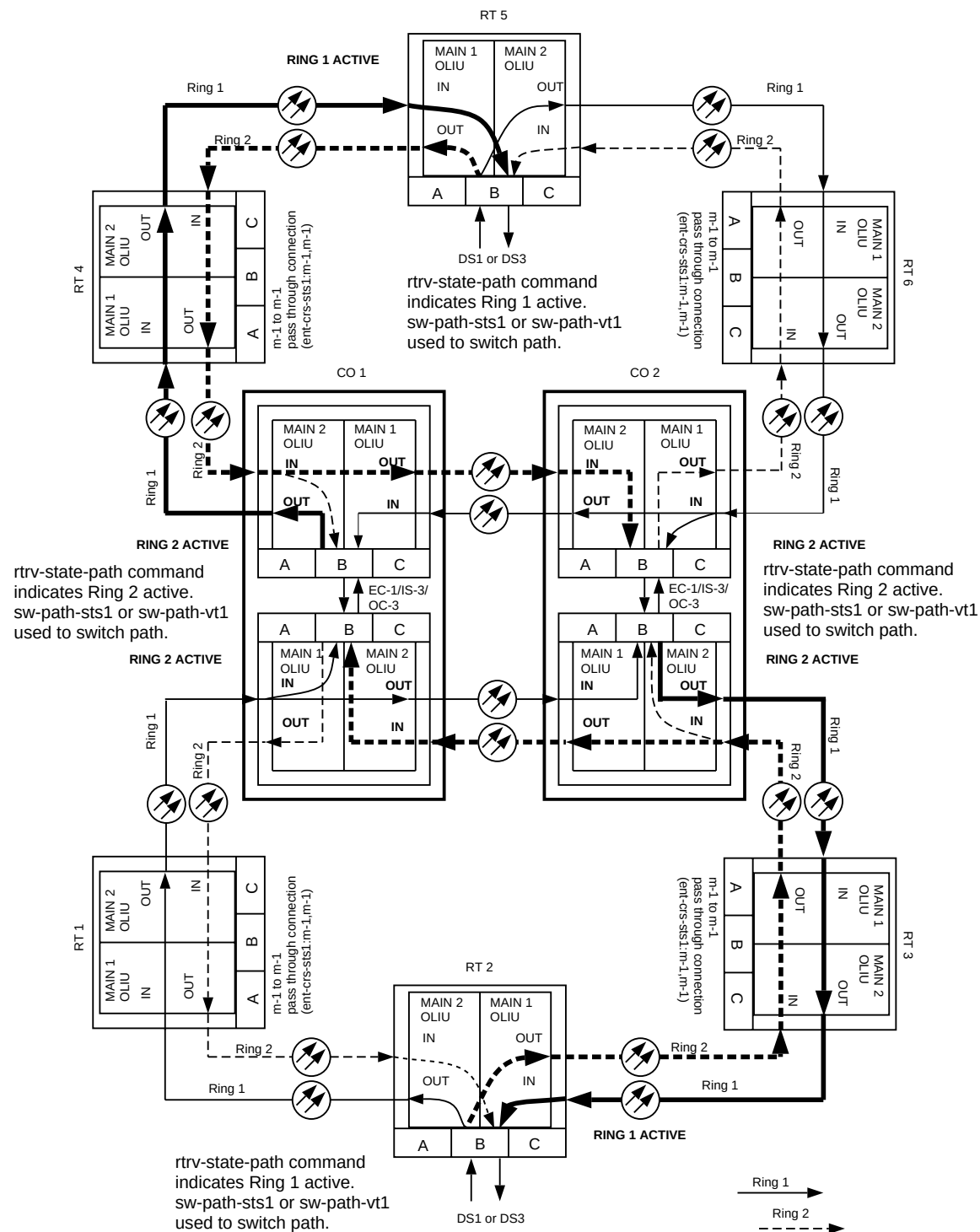


Figure 6. Example of DS1 Transmission Test in Dual Ring Interworking Network

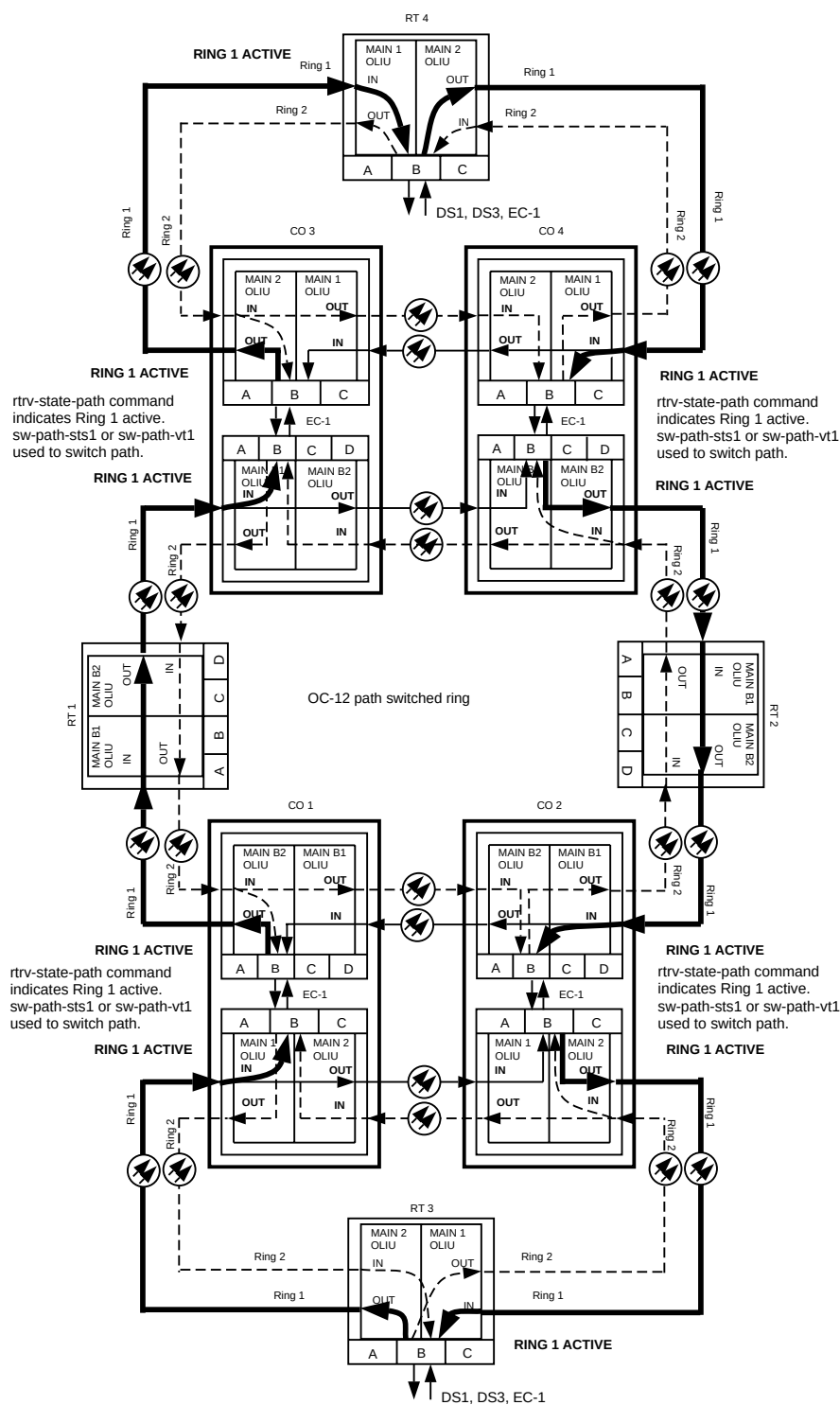


Figure 7. Example of DS1 Transmission Test in Dual Ring Interworking Network

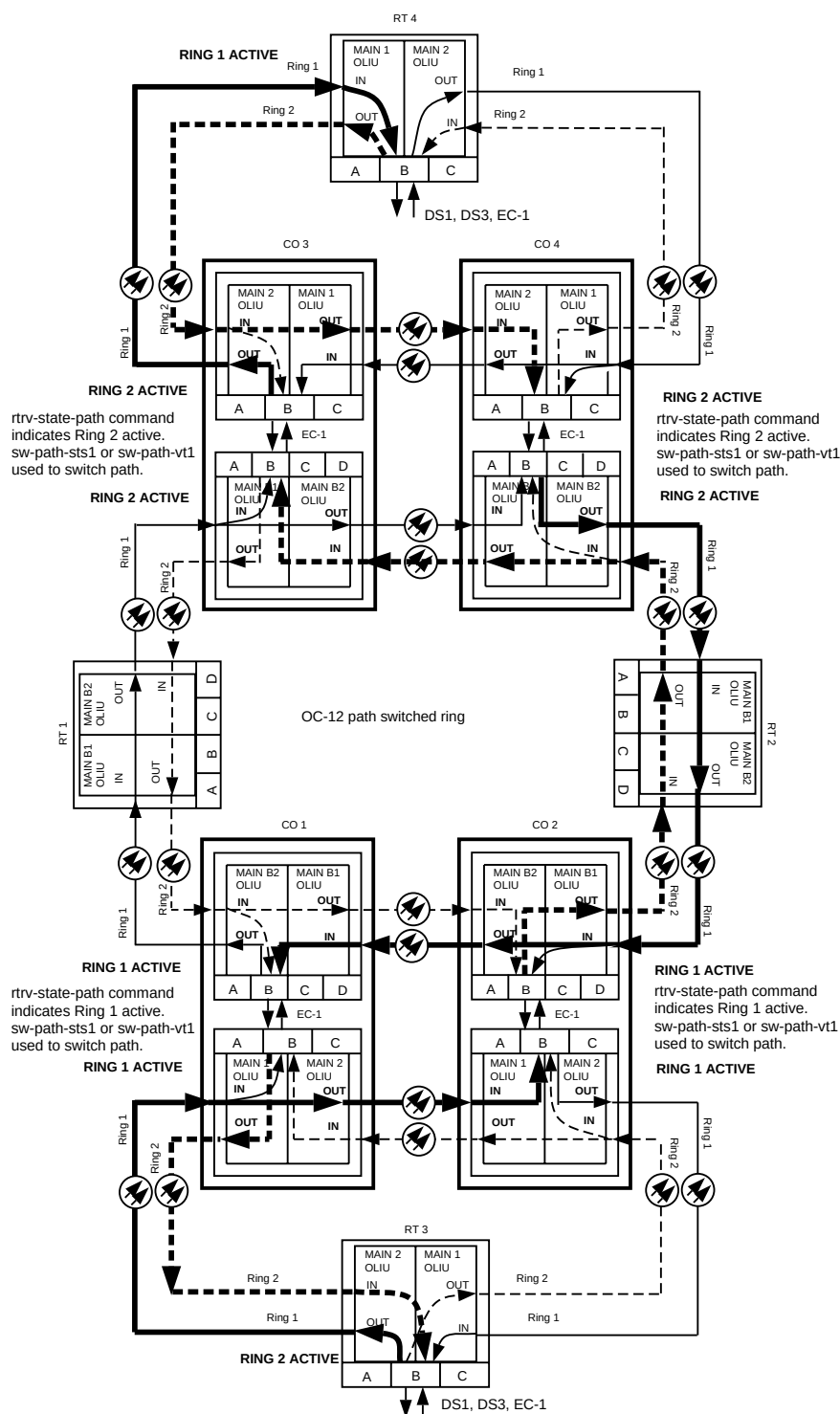


Figure 8. Example of DS1 Transmission Test in Dual Ring Interworking Network

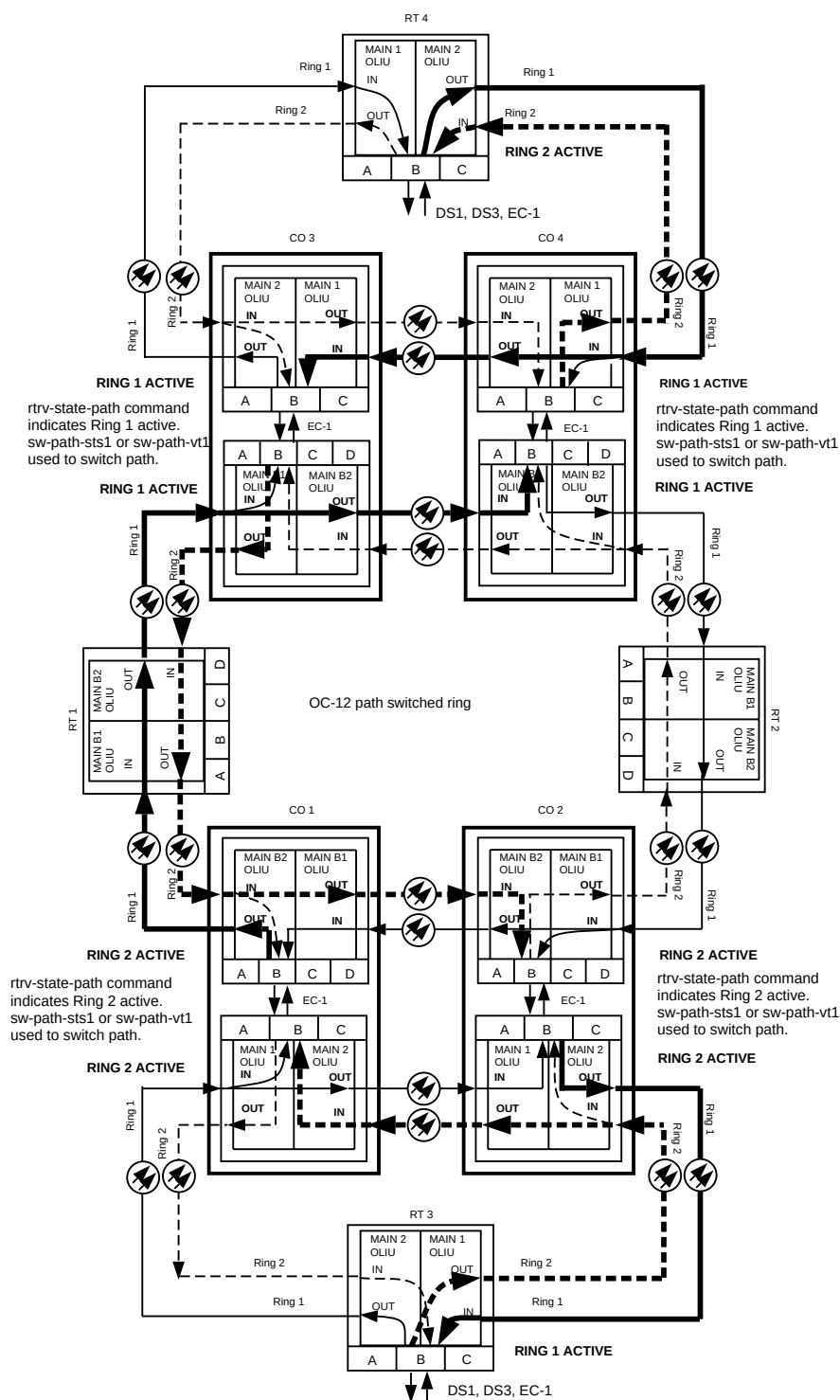


Figure 9. Example of DS1 Transmission Test in Dual Ring Interworking Network

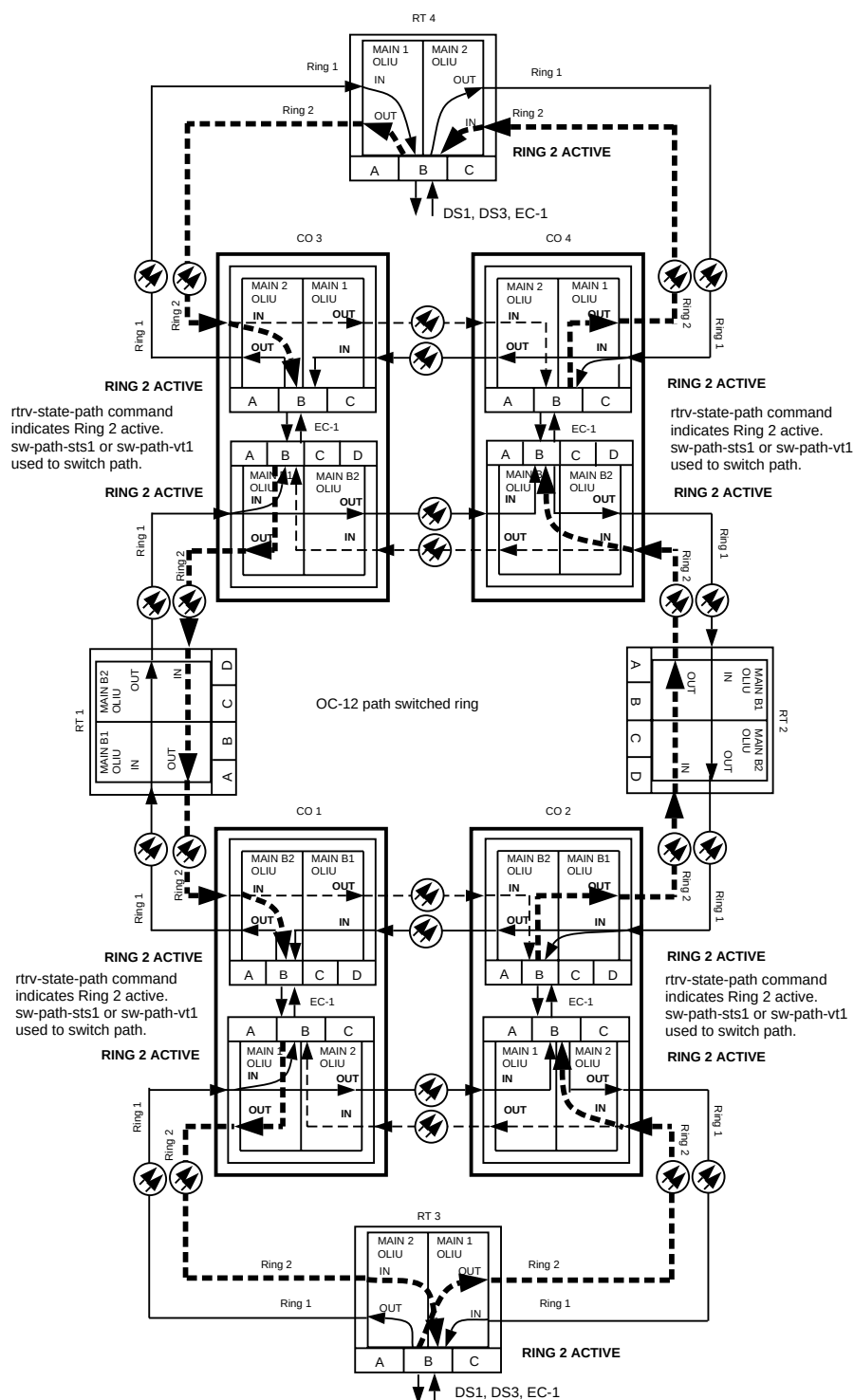


Figure 10. Example of DS1 Transmission Test in Dual Ring Interworking Network

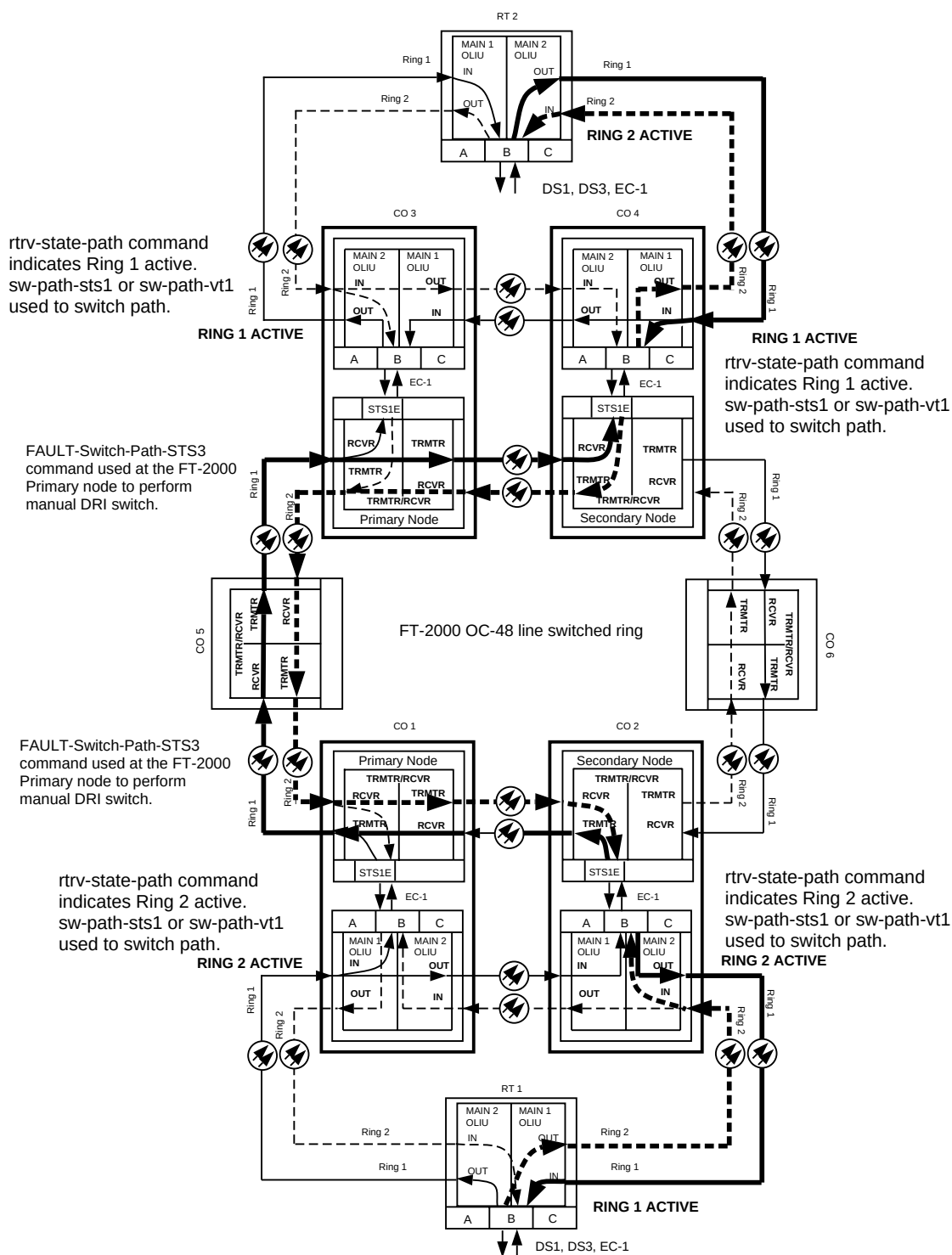


Figure 11. Example of DS1 Transmission Test in Dual Ring Interworking Network

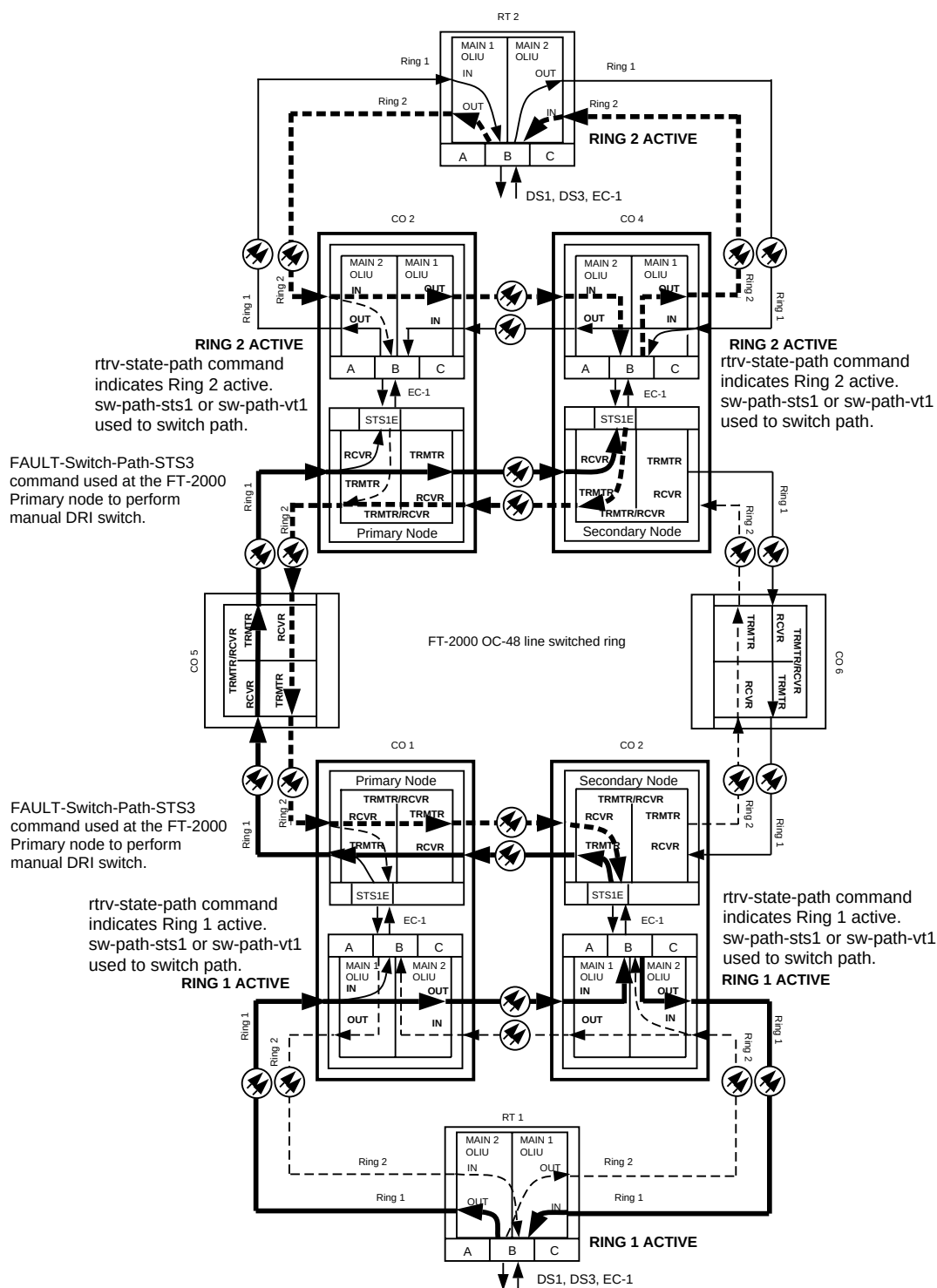


Figure 12. Example of DS1 Transmission Test in Dual Ring Interworking Network

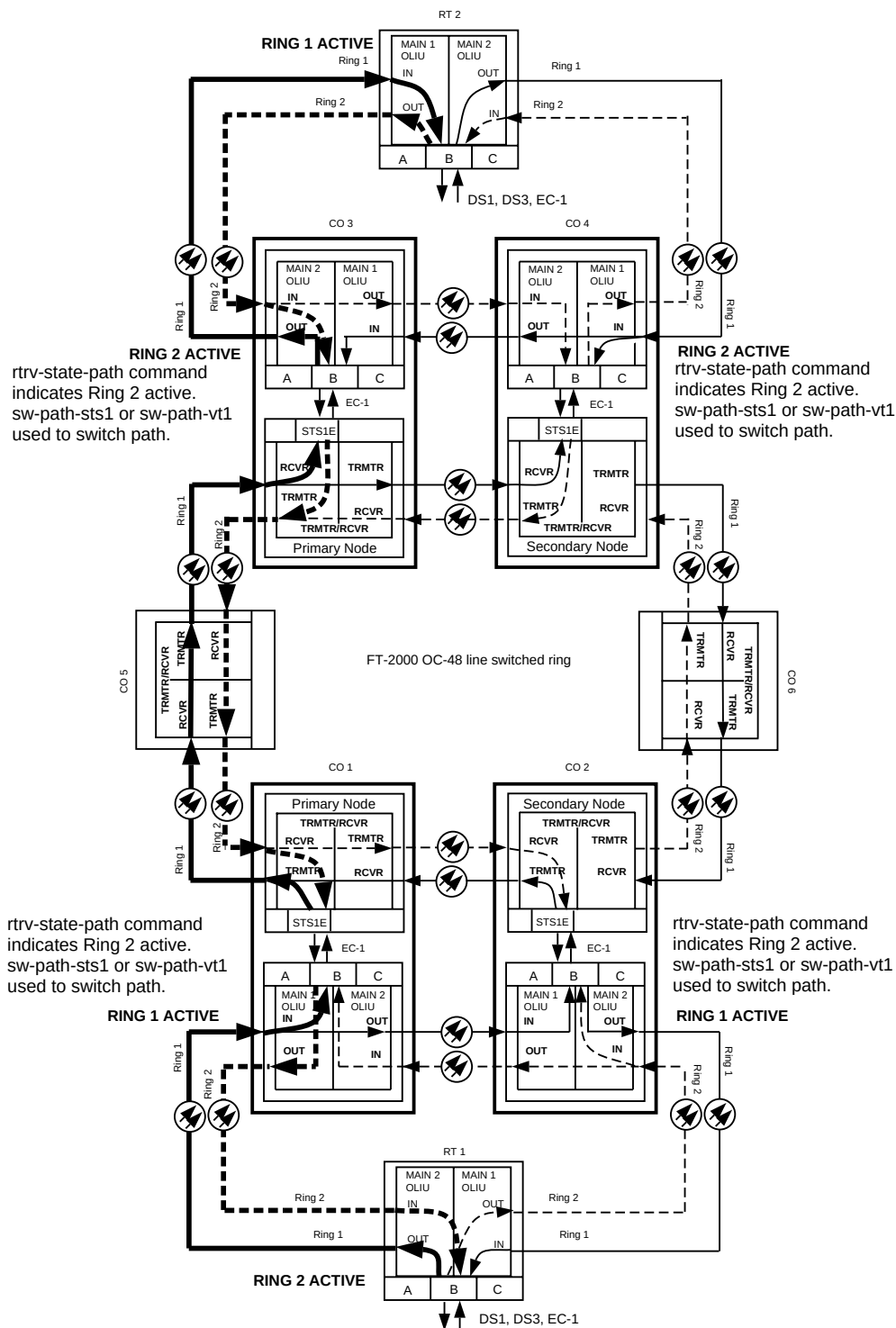


Figure 13. Example of DS1 Transmission Test in Dual Ring Interworking Network

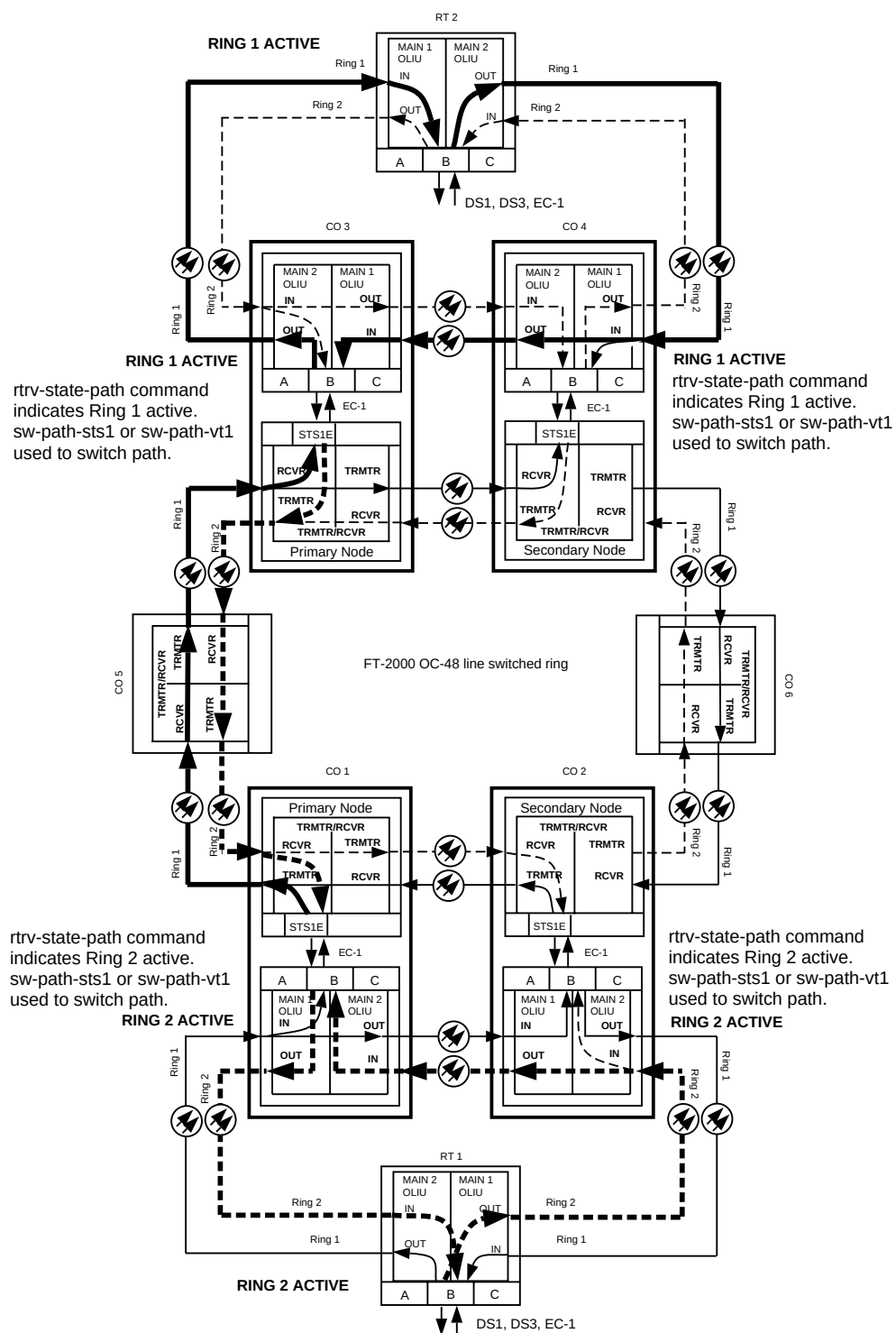


Figure 14. Example of DS1 Transmission Test in Dual Ring Interworking Network

Remove –48 V DC User Panel Fuse

1. Obtain multimeter capable of measuring DC voltage in the 40 to 60 volt range.

2.  **WARNING:**
–48 V DC is present in the fuse holders and the P1 and P2 power connections at rear of User Panel.

 **CAUTION:**
If system is in service, service interruption will occur if both fuses are removed or both power feeders are disconnected. Do not remove any User Panel fuse that does not indicate blown without first verifying that –48 V is present on the other incoming power feeder.

Does fuse indicator indicate blown fuse?

If **YES**, then continue with **Step 3**.

If **NO**, then proceed to **Step 7**.

3. Replace –48 V blown fuse.
4. Did fuse blow again?
If **YES**, then continue with **Step 5**.
If **NO**, then proceed to **Step 7**.
5. Trouble in User Panel or backplane connector. If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions. If User Panel needs to be replaced, see **DLP-551**.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7.  **CAUTION:**
Before removing a fuse that does not have a failure indicator activated, you must first verify that –48 V is available to the shelf through the fuse that is not going to be removed.

Momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown (9, 8, 7, etc.) on the **FE ID** display. During this countdown, remove the **SYSCTL**, then the **OHCTL**.

8. Refer to Figures 1, 2, and 3. Is your shelf an ED-8C724-30, G1 shelf (Figure 1) or an ED-8C724-30, G3 or G4 shelf (Figure 2 or 3)?
If **ED-8C724-30, G1**, then continue with **Step 9**.
If **ED-8C724-30, G3** or **G4**, then proceed to **Step 14**.
9. See Figure 1.
If fuse **FA** is being removed, verify that –48 V DC is present between pin **8** of Filter A6257 (positive lead) and terminal **E1** of terminal board **TB1** (negative lead).

If fuse **FB** is being removed, verify that –48 V DC is present between pin **6** of Filter A6257 (positive lead) and terminal **E2** of terminal board **TB1** (negative lead).

Requirement: Voltage must be between –41.75 V and –60.0 V DC

10. Was requirement met?
If **YES**, then continue with **Step 11**.
If **NO**, then proceed to **Step 19**.
11. Reinstall **SYSCTL** and **OHCTL**.
12. You can safely remove one fuse as required, if power is maintained to the shelf through the other fuse.
13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. See Figure 2 or 3.
If fuse **FA** is being removed, verify that –48 V DC is present between pin **3** (positive lead) and pin **4** (negative lead) of **P2**.

If fuse **FB** is being removed, verify that –48 V DC is present between pin **2** (positive lead) and pin **1** (negative lead) of **P2**.

Requirement: Voltage must be between –41.75 V and –60.0 V DC

15. Was requirement met?
If **YES**, then continue with **Step 16**.
If **NO**, then proceed to **Step 19**.
16. Reinstall **SYSCTL** and **OHCTL**.
17. You can safely remove one fuse as required, if power is maintained to the shelf through the other fuse.
18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
19. Trouble in User Panel, power feeder(s), or office battery distribution. If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions. If User Panel needs to be replaced, see **DLP-551**.
20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

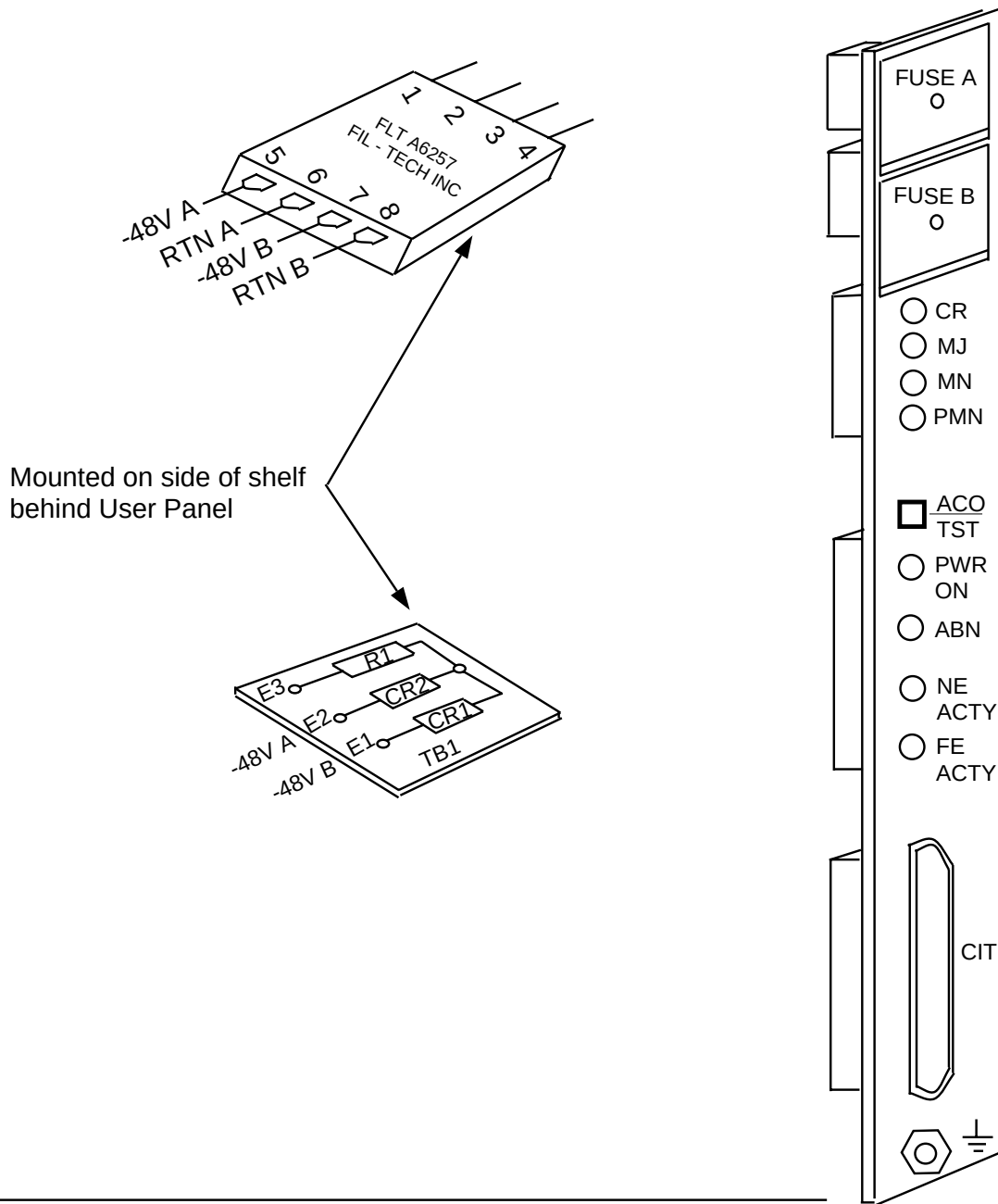


Figure 1. ED-8C724-31, G1 User Panel for ED-8C724-30, G1 DDM-2000 OC-3 Shelf

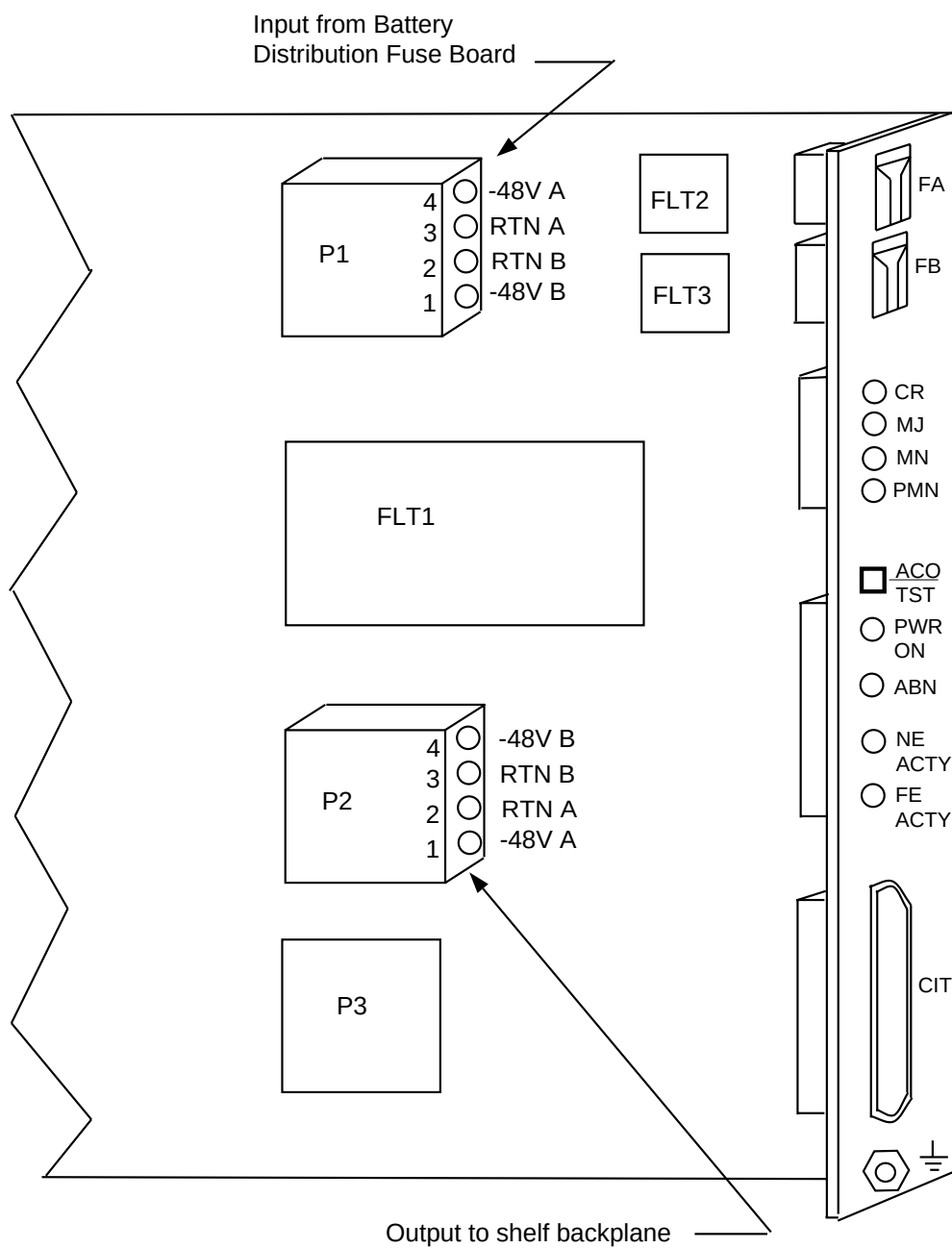


Figure 2. ED-8C724-31, G2 User Panel for ED-8C724-30, G3 DDM-2000 OC-3 Shelf

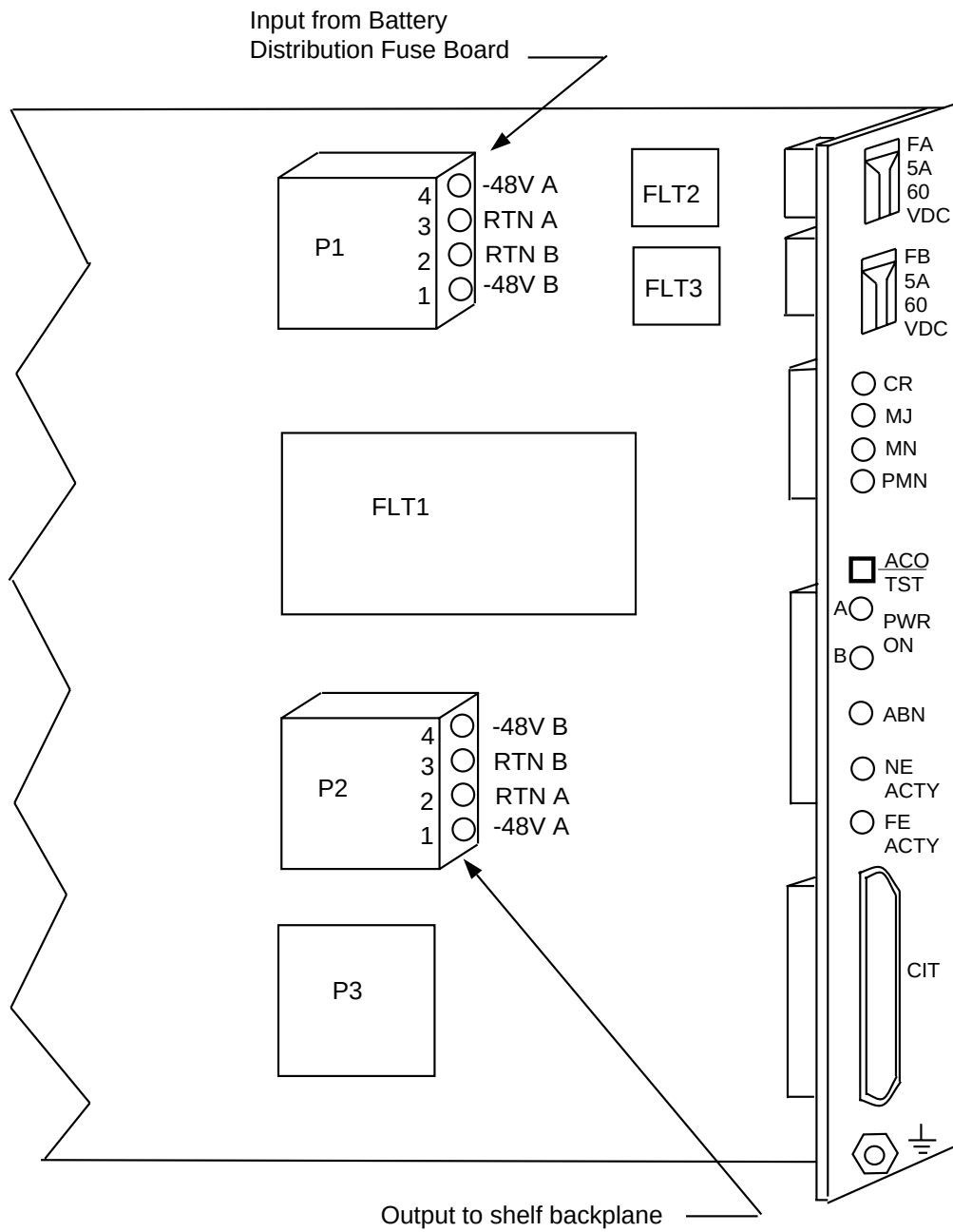


Figure 3. ED-8C724-31, G3 User Panel for ED-8C724-30, G4 DDM-2000 OC-3 Shelf

Perform End-to-End OC-1 Optical Line Test

1.  **WARNING:**
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **NOTE 1:**
This test is used in ring Release 9 and later to verify the integrity of the OC-1 fiber lines between the DDM-2000 OC-3 and DDM-2000 FiberReach shelves and may be performed with the DDM-2000 OC-3 and DDM-2000 FiberReach in service or out of service.

 **NOTE 2:**
It is assumed that each DDM-2000 OC-3 and DDM-2000 FiberReach have passed the local (looped) transmission tests and a CIT is available. If these tests have not been completed, refer to the appropriate procedure and perform the tests.

 **NOTE 3:**
This test must be performed locally at each shelf location associated with the optical span(s) being tested. See Figure 1.

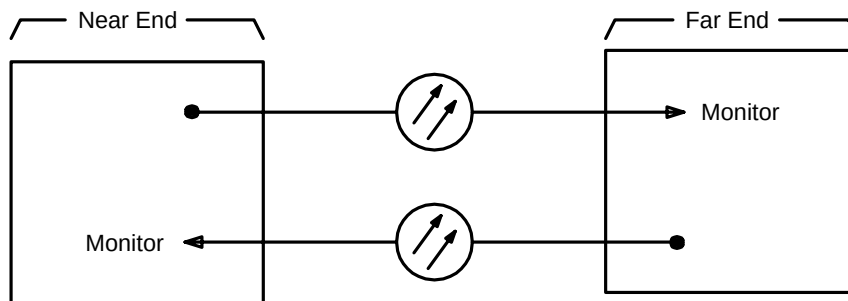


Figure 1. End-to-End Optical Line Test Monitoring

2. At test location, connect CIT to User Panel **CIT** connector and establish session.

Reference: **DLP-521**

3. **CAUTION:**
*The **init-pm:reg=all** command initializes (clears) all current day and/or all current quarter-hour performance-monitoring storage registers.*

NOTE:
If local procedures prohibit you from doing the **init-pm:reg=all** command, you may perform the following in Steps 5 and 6. Use the **rtrv-pm-line** command to obtain the line performance monitoring status report, note the readings on the Today line in the report, wait 20 seconds and then obtain another report. There should be no change in readings from the first report.

Enter the command **init-pm:reg=all**, if allowed.

4. Wait 20 seconds.

5. Enter one of the following commands:

- **rtrv-pm-line:fn-{a or b or c}-1-1** if service line is being tested.
- **rtrv-pm-line:fn-{a or b or c}-1-2** if service line is being tested.
- **rtrv-pm-line:fn-{a or b or c}-2-1** if protection line is being tested.
- **rtrv-pm-line:fn-{a or b or c}-2-2** if protection line is being tested.
- **rtrv-pm-line:fn-{a or b or c}-all** if both lines are being tested.

Response: The following CIT report will indicate the status of the equipment. The Today line should indicate that there are no errors. Other Time lines may exist with numbers greater than zero. (The "Commands and Reports" section of this manual under **RTRV-PM-LINE** describes this report.)

For OC-3 Release 9.1 and earlier, the output report appears as follows:

```
/* Line Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
                   quarter hour registers at yy-mm-dd hh:mm:ss
=====
Address      Start  B2 CV  B2 ES  B2 ES  B2 ES  B2 SES  B2 UAS  PSC-L
              Time
=====
address      time    nn..   nn..   nn..   nn..   nn..   nn..   nn..
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
-----
address      time    nn..   nn..   nn..   nn..   nn..   nn..   nn..
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
.            .       .       .       .       .       .       .       .
*/
```

For OC-3 Release 11.0 and later, the output report appears as follows:

```

/* Line Performance Monitoring Status Report
   Last initialized: day registers at yy-mm-dd hh:mm:ss
                   quarter hour registers at yy-mm-dd hh:mm:ss
=====
Address      Start   B2 CV   B2 ES   B2 ESA   B2 UAS   PSC-L   PJC
              Time
              B2 SES   B2 ESB
=====
address      time      nn..    nn..    nn..    nn..    nn..    nn..
.            .          .        .        .        .        .        .
.            .          .        .        .        .        .        .
.            .          .        .        .        .        .        .
-----
address      time      nn..    nn..    nn..    nn..    nn..    nn..
.            .          .        .        .        .        .        .
.            .          .        .        .        .        .        .
.            .          .        .        .        .        .        .
*/

```

6. Has performance-monitoring report been obtained from all shelf locations associated with optical span(s) being tested?
 If **NO**, then continue with **Step 7**.
 If **YES**, then proceed to **Step 8**.
7. Repeat this procedure from Step 3 at other locations.
8. Did report indicate errors?
 If **YES**, then continue with **Step 9**.
 If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
9. Trouble may be in optical fiber and/or connections. Trouble may also be in **OLIUs**. If the report indicated trouble when the report was obtained from the near end of the span, trouble may be in the receive direction (see Figure 1). If the report indicated trouble when the report was obtained from the far end of the span, trouble may be in the transmit direction. Check optical fiber and connections. Clean optical fiber connections [**DLP-527**]. If no trouble found in the optical fibers, replace **OLIU(s)** [**DLP-523**] associated with the address indicated in the report.
10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make VT1.5 (DS1) or STS1 Cross-Connections Using CIT Single/Dual Homing OC3/OC1 Ring Configuration

1. **⇒ NOTE 1:**

This procedure may also be found in the 363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*.

⇒ NOTE 2:

If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section and read the description of the following commands in the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I* and 363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*: "**ent-crs-sts1**" (OC-3 only), "**ent-crs-vt1**", "**rtrv-crs-sts1**" (OC-3 only), "**rtrv-crs-vt1**", "**dlt-crs-sts1**" (OC-3 only), and "**dlt-crs-vt1**".

⇒ NOTE 3:

You will have to log in to more than one node in each ring to get a complete map of the network using the "**rtrv-map-network**" and "**rtrv-map-neighbor**" command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections.

Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

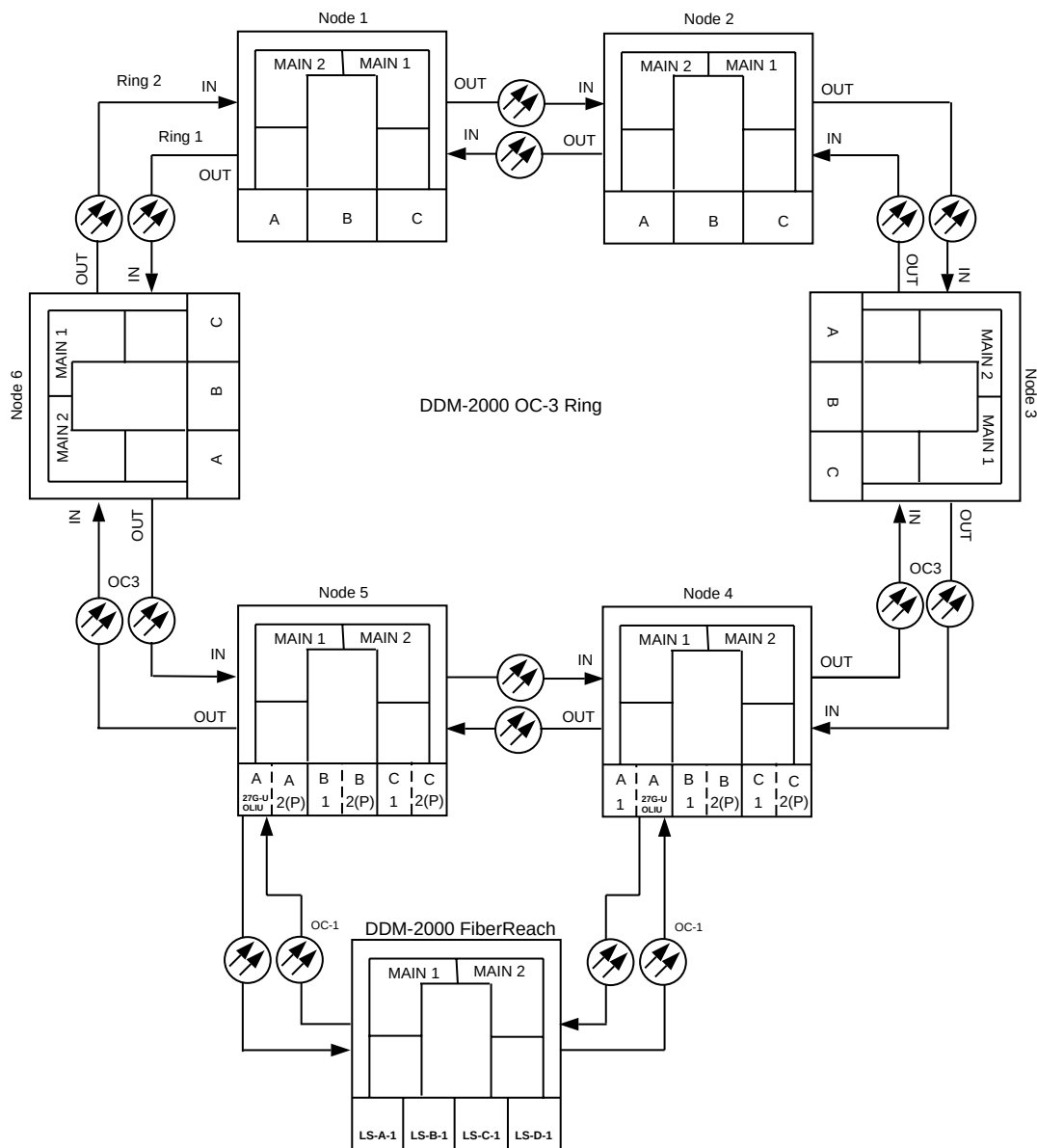


Figure 1. Sample Network Schematic

Log in to any node in each ring in the network and use the "**rtrv-map-network**" and/or "**rtrv-map-neighbor**" command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
Node5 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M rtrv-map-network: COMPLD
/* Network Map for Node5
```

System Name (TID)	Comm. Status	Product Type	NE Type	Alarm Group
Node5		DDM-2000 OC-3	DSNE	3
Node4		DDM-2000 OC-3		3
Node3		DDM-2000 OC-3		3
Node2		DDM-2000 OC-3		3
Node1		DDM-2000 OC-3		3
Node6		DDM-2000 OC-3		3
Node7		FiberReach		3

```
*/
```

Figure 2. Sample Report From rtrv-map-network Command

```
Node7 98-05-27 13:09:53 FiberReach, R2.2.1
M rtrv-map-neighbor: COMPLD
/* Neighbor Map for Node7
```

System Name (TID)	Connected Through	Link Comm. Status	Product Type
Node7			FiberReach
Node5	main-1		DDM-2000 OC-3
Node4	main-2		DDM-2000 OC-3

```
*/
```

Figure 3. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order. For example, see Figures 4 through 13.
3.  **NOTE:**
Cross-connections consist of drop and pass-through connections. For example in Figure 4, drop connections are made at Nodes 1, 4, 5, and the FiberReach node. Pass-through cross-connections are made at Nodes 2, 3, and 6. Also, cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and FT-2000 OC-48 rings, as required.

From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.
5. From work order or circuit order, determine the host OC-3 node(s) that connects to the OC-1 FiberReach ring(s).

6.  **NOTE:**
The **cct** parameter of the "**ent-crs-vt1**" command specifies the cross-connect type. The valid values are **two-way**, **dc**, and **locked**. Two-way applies to add/drop, hairpin, OX1 ring, and pass-through connections. The **dc** parameter applies to dual ring interconnection (DRI) applications. The **locked** parameter supports non-path-switched DS1 applications where a DS1 is cross-connected to a specified channel in a specified direction of the ring interface (Figure 13). Provisioned AIS or unequipped signal is transmitted in the other direction around the ring, but is not alarmed at any pass-through nodes or the other terminating node with locked cross-connections present for the same channel. Any signal received in the same channel from the other ring interface is ignored.

Determine the cross-connect type (**cct**) to be made at each node for the service being established.

7. **NOTE 1:**

In dual homing configurations (Figures 4-7), **OLIU** circuit packs must be installed in the correct slots in the host OC-3 nodes to support the direction of traffic required. For example in Figure 4, for traffic to be routed between Node 1 and the FiberReach system, **27G-U/27G2-U OLIUs** must be installed in **FUNCTION UNITS** group **A, B, or C**, slot **1** of Node 5 and **FUNCTION UNITS** group **A, B, or C**, slot **2(P)** of Node 4. This is required because traffic entering Node 5, slot **FUNCTION UNITS A 1** from the FiberReach shelf is automatically connected to the **MAIN-1 OLIU** when cross-connections are made. Traffic entering slot **FUNCTION UNITS A 2(P)** is automatically connected to the **MAIN-2 OLIU**.

In single homing configurations (Figures 6-12), **27G-U/27G2-U OLIUs** in **FUNCTION UNITS** group **A, B, or C**, slot **1** of the OC-3 shelf must be connected to the **MAIN-1 OLIU** in the FiberReach shelf. The **27G-U/27G2-U OLIUs** in **FUNCTION UNITS** group **A, B, or C**, slot **2(P)** of the OC-3 shelf must be connected to the **MAIN-2 OLIU** in the FiberReach shelf.

 NOTE 2:

When only one OC-1 single-homed or dual-homed ring will be required, the **26G2-U OLIU** may be substituted for the **27G-U/27G2-U OLIU** in the OC-3 shelf **FUNCTION UNITS** slots.

Use the "**rtrv-eqpt:**" command at each node in the network to verify that each shelf is properly equipped for the service being established. Ensure that **OLIU** circuit packs are installed in the correct slots in the host OC-3 nodes.

8. **⇒ NOTE 1:**

Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections in DDM-2000 OC-3. Only VT1.5 cross-connections are allowed in DDM-2000 FiberReach. In an OC-3 shelf, use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at an OC-3 shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group [see "**ent-crs-sts1**" command (OC-3 only)].

⇒ NOTE 2:

The following commands may be used to delete, enter, and retrieve cross-connections: "**dlt-crs-vt1**", "**dlt-crs-sts1**" (OC-3 only), "**ent-crs-vt1**", "**ent-crs-sts1**" (OC-3 only), "**rtrv-crs-vt1**", and "**rtrv-crs-sts1**" (OC-3 only). See the "Commands and Reports" section of each system manual for a description of commands.

⇒ NOTE 3:

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All terminating drop connections (including DRI drop and continue, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order or circuit order, determine the cross-connections [STS-1 (OC-3 only) or VT1.5] to be made at each node [pass-through, terminating (drop), and host OC-3 node(s)] associated with the kind of service being established.

9. Starting at one of the terminating nodes for the DS1 circuit being established, use the "**rtrv-crs-()**:" command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #1 low speed port in the **DS1** circuit pack in slot #1 of **LOW SPEED GROUP A** (a-1-1) is to be connected to timeslot m-1-1-1 and the "**rtrv-crs-vt1**" command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the "**dlt-crs-()**" commands.

10.  **NOTE:**
Channel state provisioning provides IS, AUTO, and NMON states for VT channels similar to the port states for DS1 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

At all nonterminating pass-through nodes in the network, use the "**ent-crs-vt1**:" or "**ent-crs-sts1**:" (OC-3 only) command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-1-1, use the "**ent-crs-vt1:m-1-1-1,m-1-1-1:cct=twoway**" command. To make pass-through cross-connections for STS-1 #1 in an OC-3 shelf, use the "**ent-crs-sts1:m-1,m-1:cct=twoway**" command.]

11. At both terminating (drop) nodes of the circuit being established, use the "**ent-crs-vt1:**" command to make the terminating cross-connections (for example, Node 1 and FiberReach node in Figure 4, "**ent-crs-vt1:m-1-1-1,a-1-1:cct=twoway**")
12. At the host OC-3 ring node sites, make proper cross-connections. For example in Figure 4, at Node 5, if VT1.5 channel #1, VTG #1, STS #1 from the MAIN 1 OLIU is to be cross-connected to **FUNCTION UNITS** group **A**, OC-1 line #1, then the command "**ent-crs-vt1:m-1-1-1,a-1-1-1:cct=twoway**" would be used to make the cross-connection.
13. Use the "**rtrv-crs-vt1:**" or "**rtrv-crs-sts1:**" (OC-3 only) command to verify that the proper connections have been made. If an improper cross-connection is made, use the "**dlt-crs-vt1:**" or "**dlt-crs-sts1:**" (OC-3 only) command to delete the improper cross-connection and reenter the cross-connection.
14. After all cross-connections are made, use the "**rtrv-alm:**" command to verify no alarms are present.
15. If "ne-acty", "inc. VT AIS", "inc. STS1 AIS", "inc. VT unequipped", or "inc. STS1 unequipped" alarms are present, look for missing or improperly made cross-connections. Use **TAP-118** to locate missing cross-connections, if required.

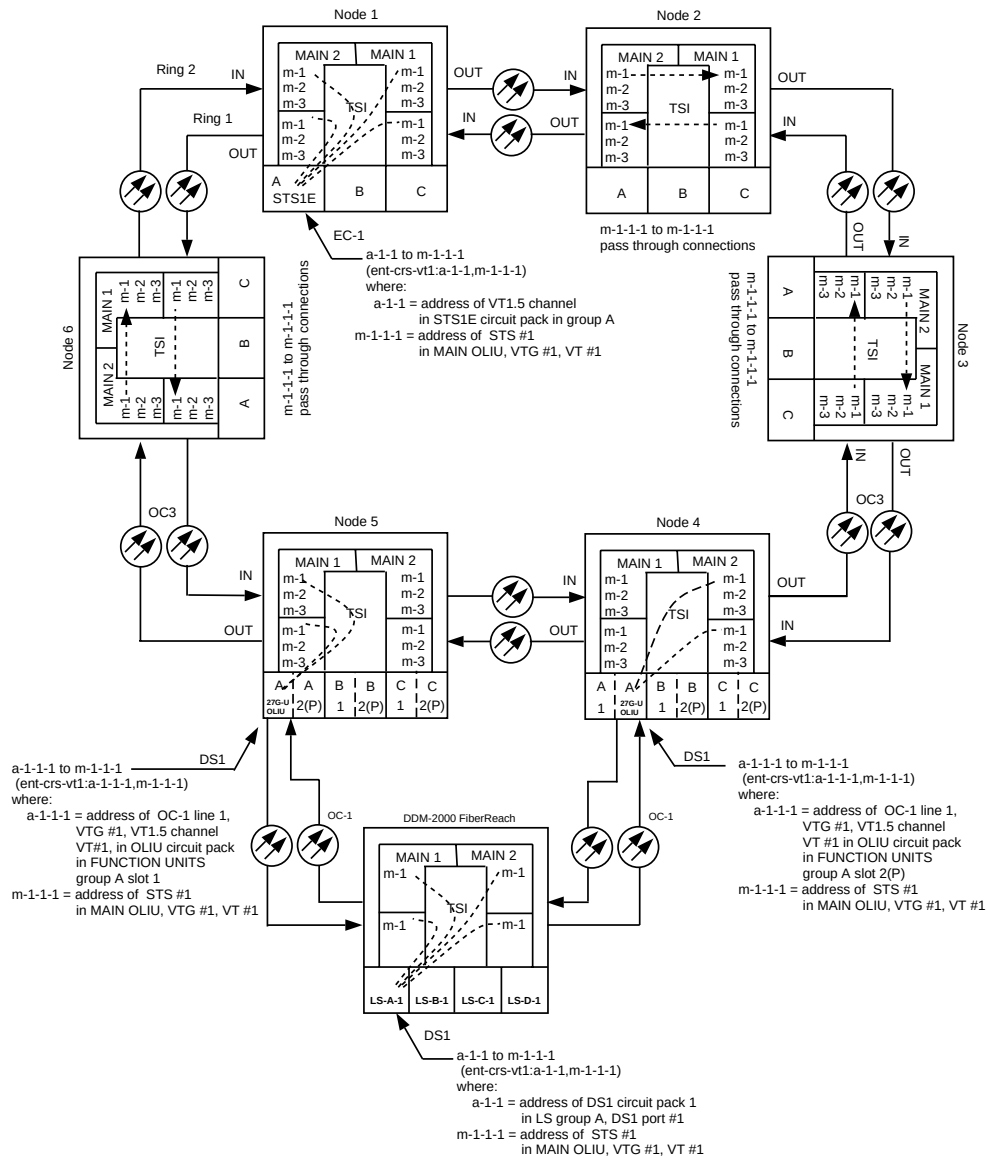


Figure 4. Example of Dual Homing OC-3/OC-1 Cross-connections

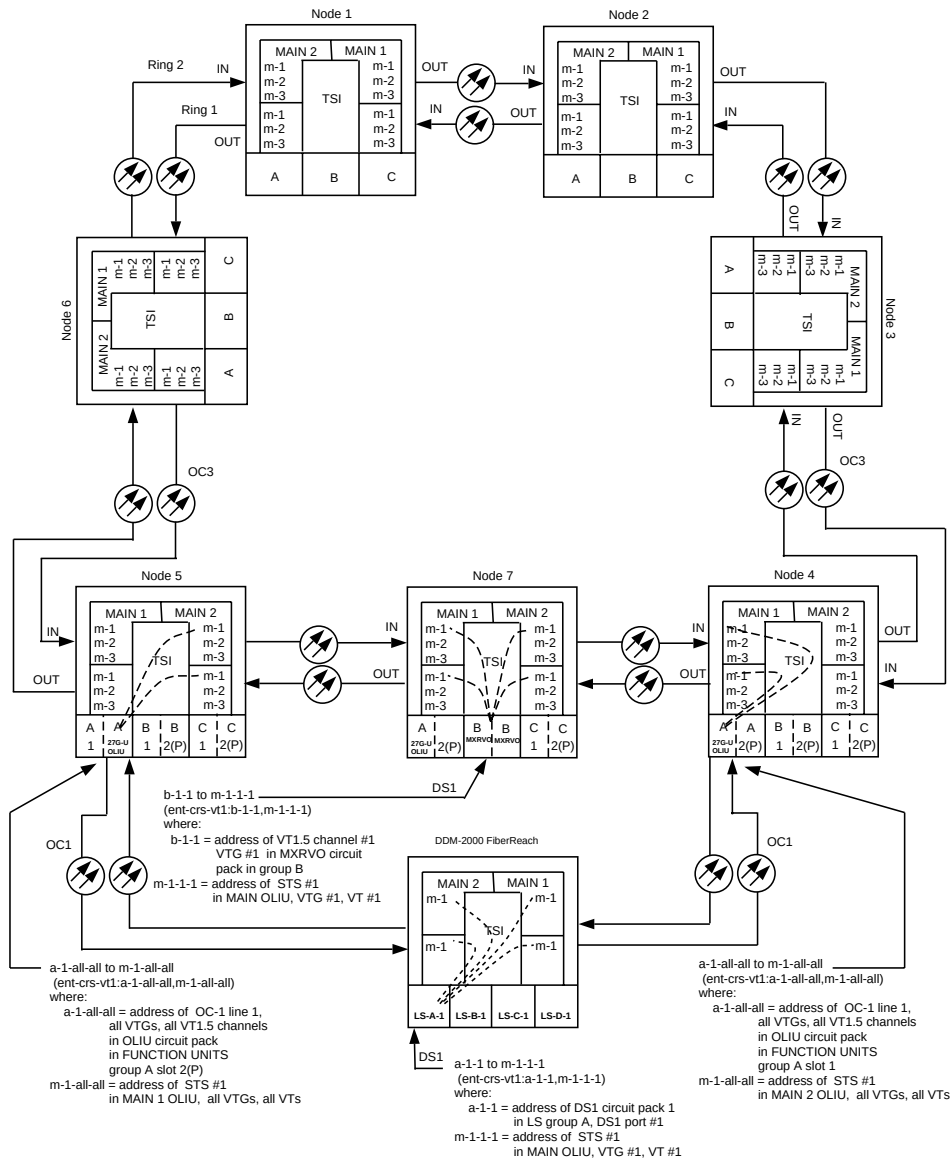


Figure 5. Example of Dual Homing OC-3/OC-1 Cross-connections

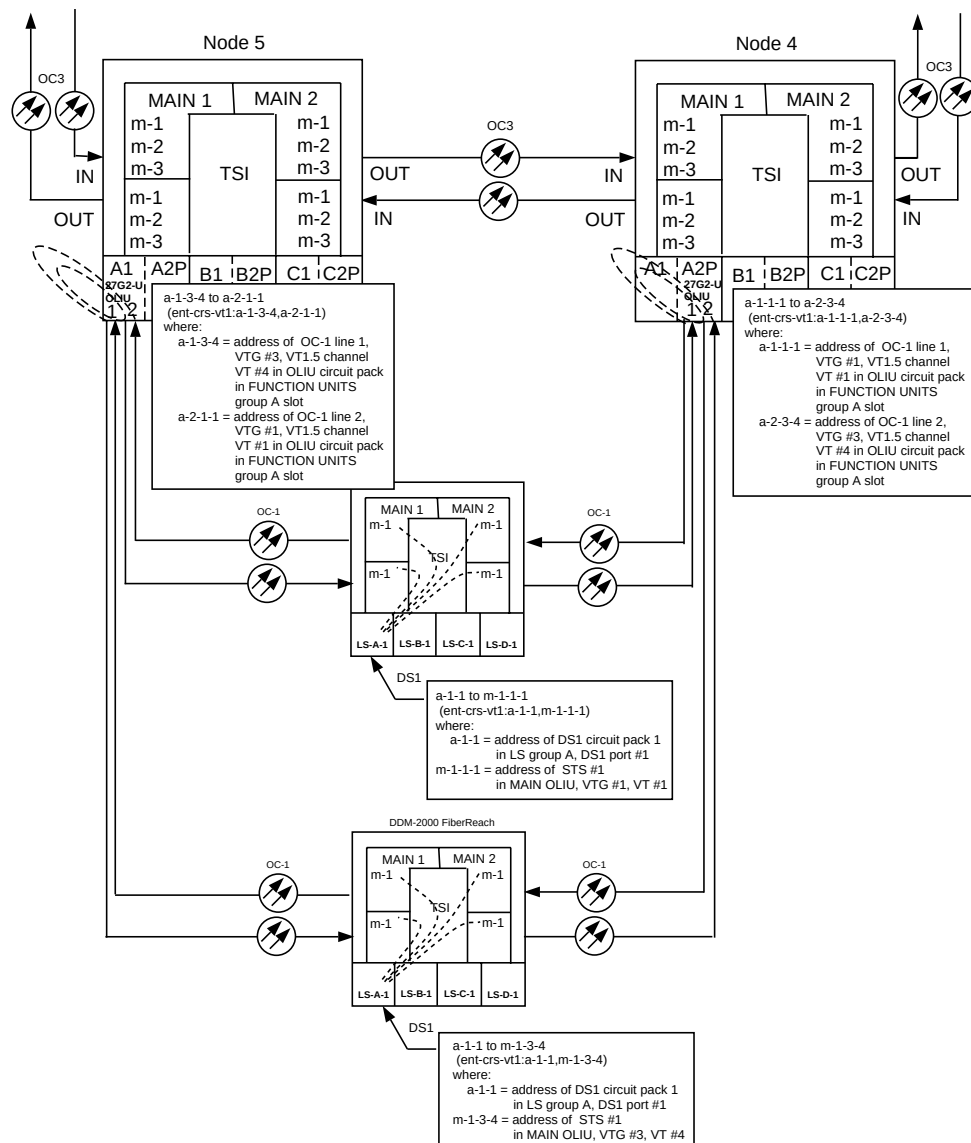


Figure 6. Example of Dual Homing Intra-Function Unit OC-3/OC-1 Cross-connections

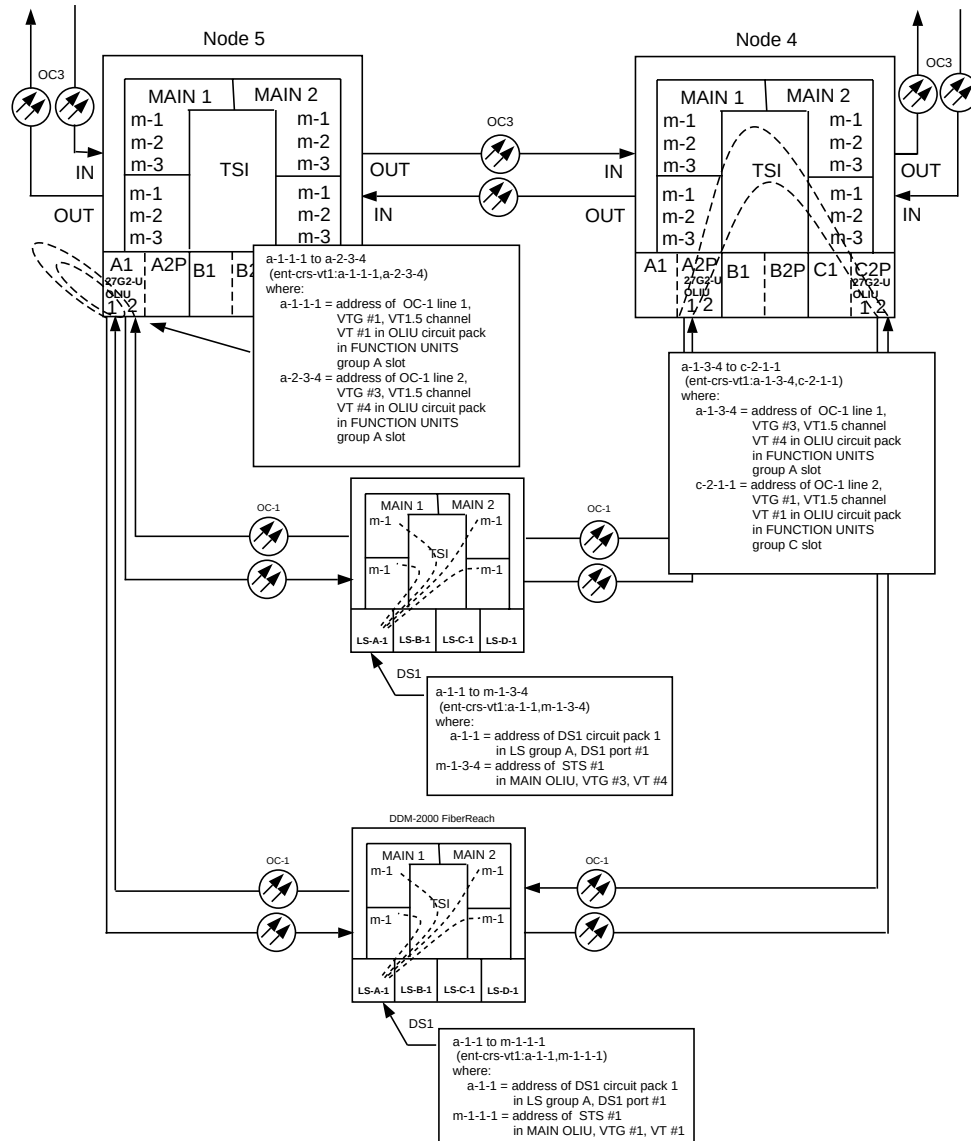


Figure 7. Example of Dual Homing Intra- and Inter-Function Unit OC-3/OC-1 Cross-connections



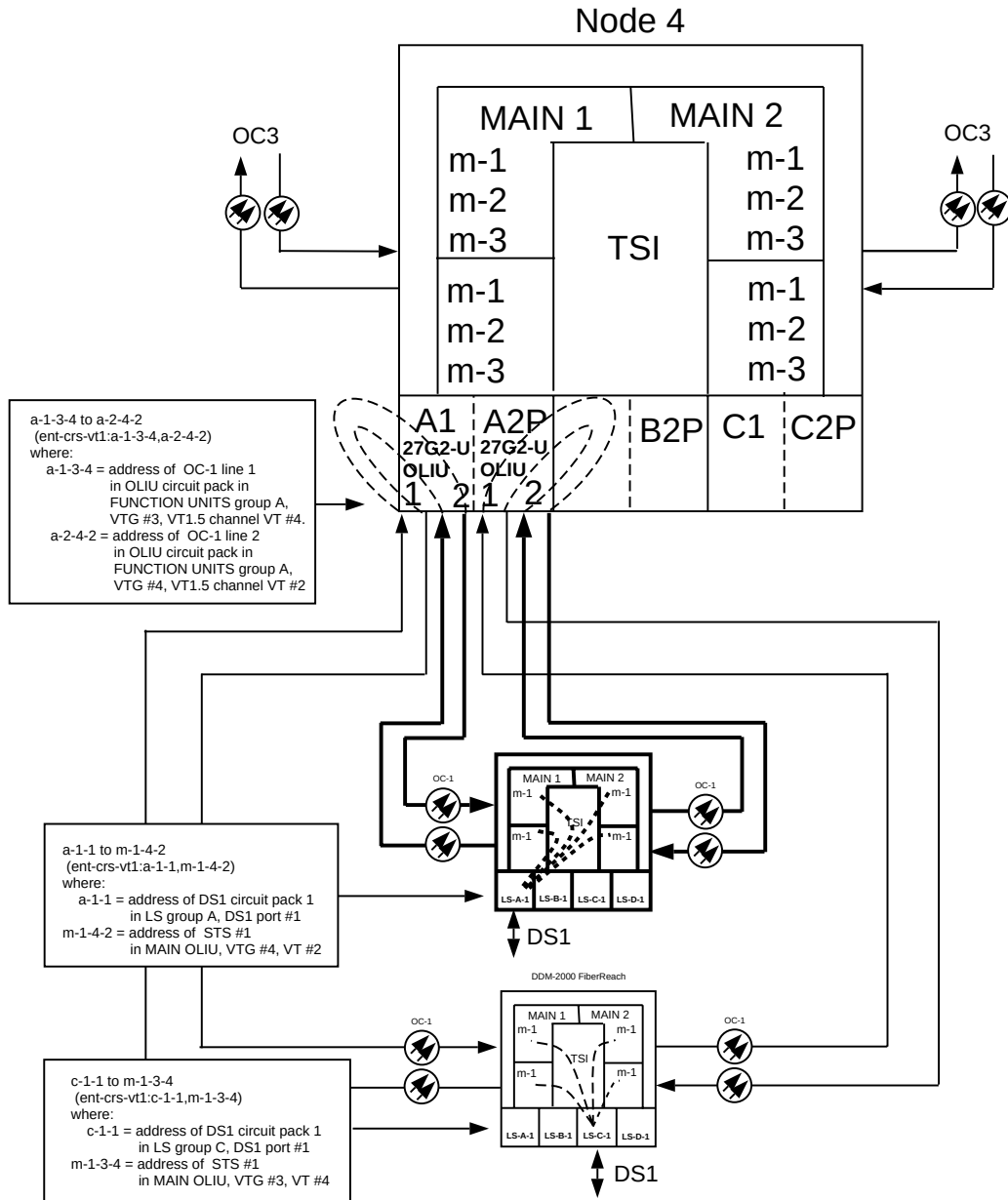


Figure 9. Example of Single Homing Intra-Function Unit OC-3/OC-1 Cross-connections

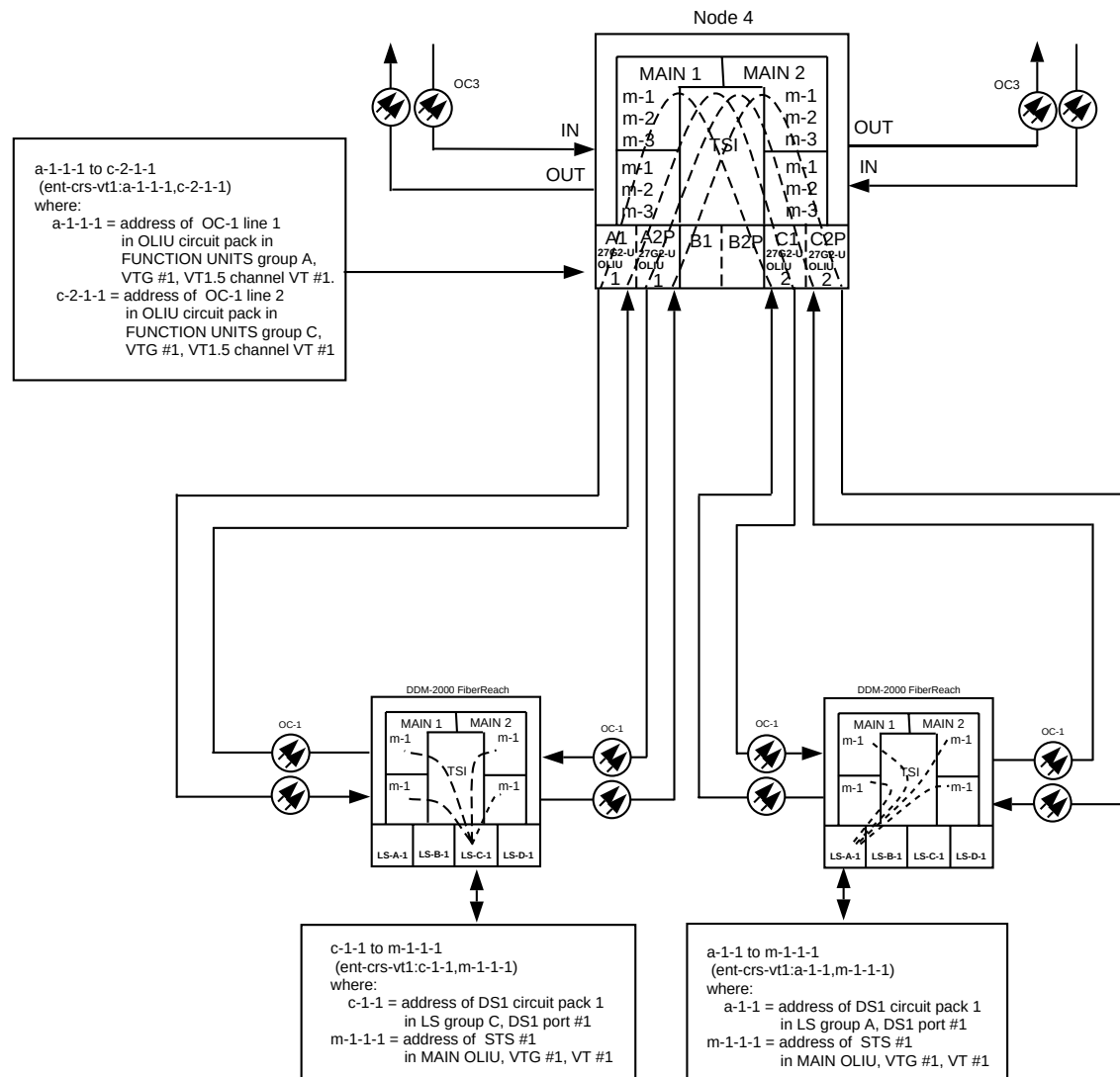


Figure 10. Example of Single Homing Inter-Function Unit OC-3/OC-1 Cross-connections

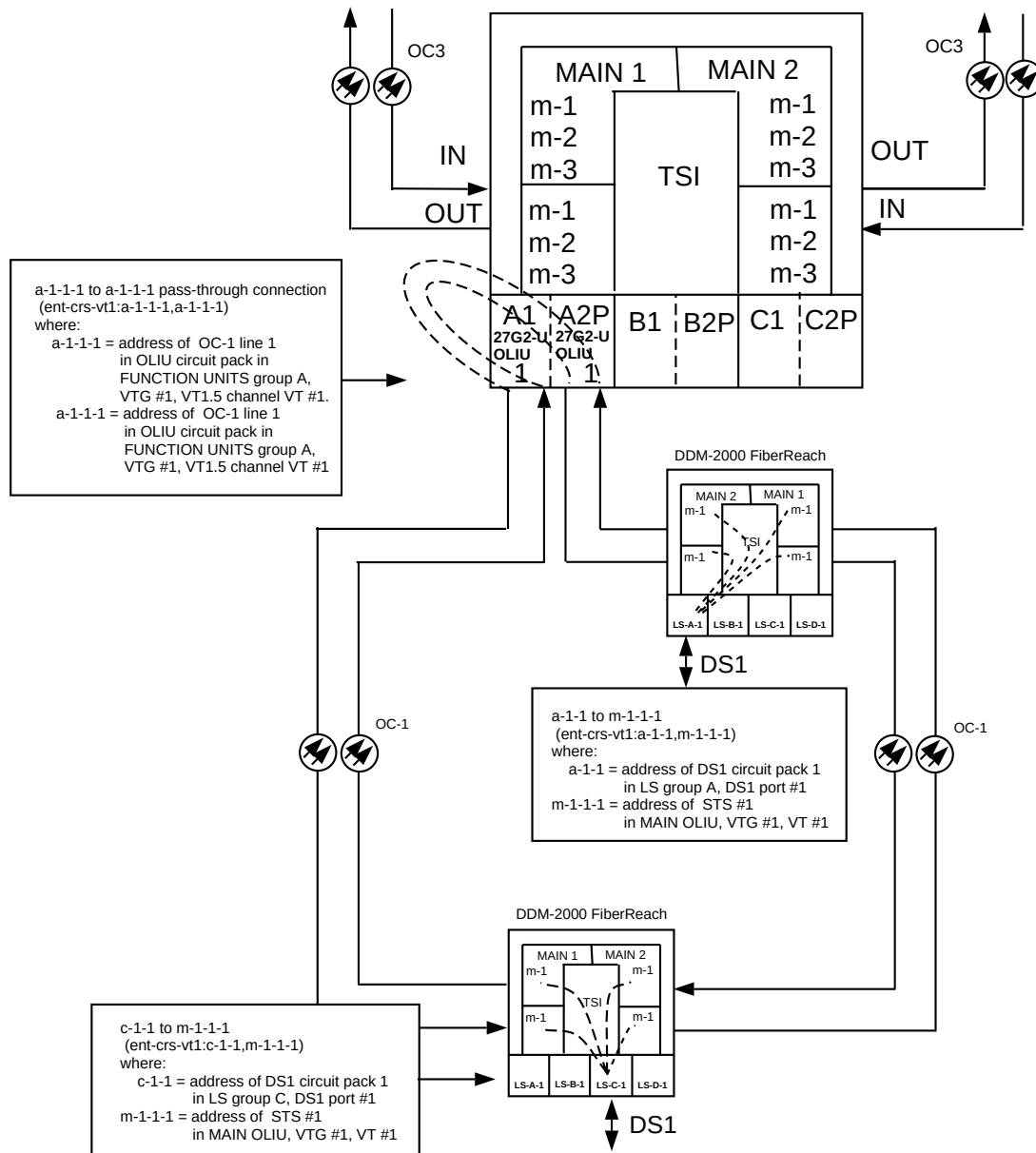


Figure 11. Example of Single Homing Intra-Ring Hairpin OC-3/OC-1 Cross-connections

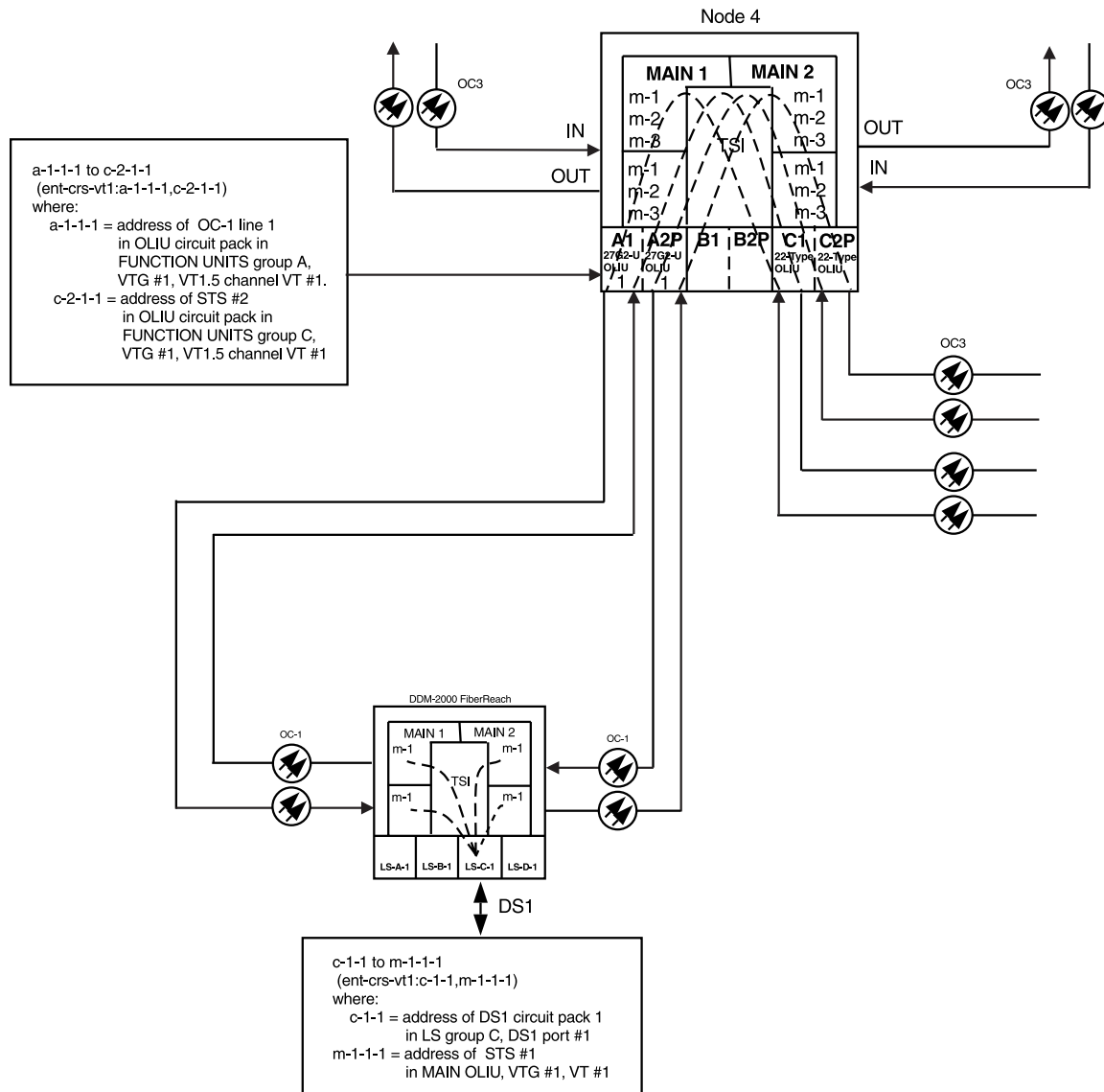


Figure 12. Example of Single Homing Function Unit Local Drop Hairpin Cross-connections

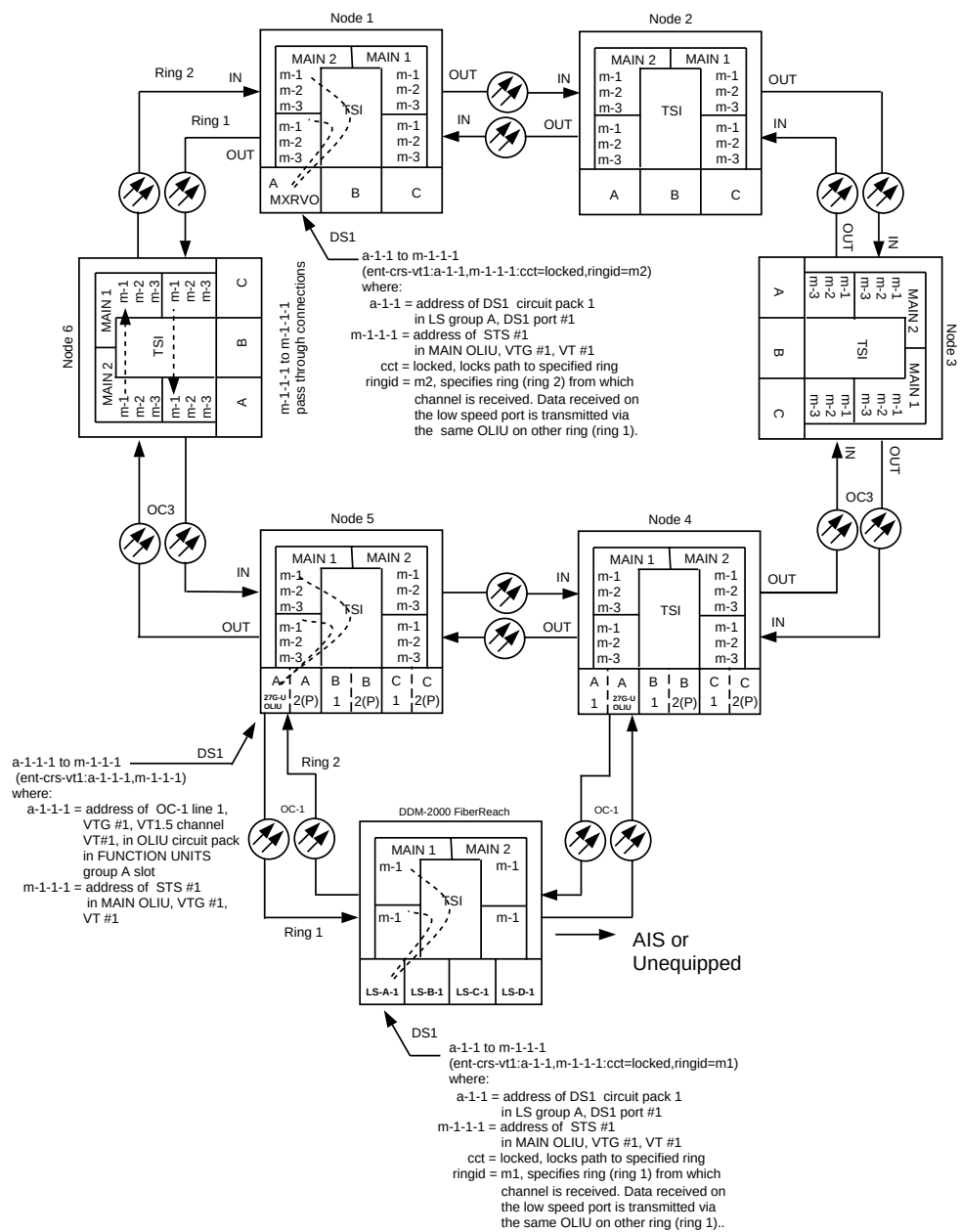


Figure 13. Example of Locked Cross-connections

Make VT1.5 (DS1) or STS1 Cross-Connections Using CIT Stand Alone OC3/OC1 Ring Configuration

1. **⇒ NOTE 1:**
This procedure may also be found in the 363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*.

- ⇒ NOTE 2:**
If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section and read the description of the following commands in the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I* and 363-206-301, *DDM-2000 FiberReach Multiplexer, Wideband/Narrowband Shelf, User/Service Manual*: **ent-crs-vt1**, **rtrv-crs-vt1**, and **dlt-crs-vt1**.

- ⇒ NOTE 3:**
You will have to login to more than one node in each ring to get a complete map of the network using the **rtrv-map-network** and **rtrv-map-neighbor** command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections.

Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

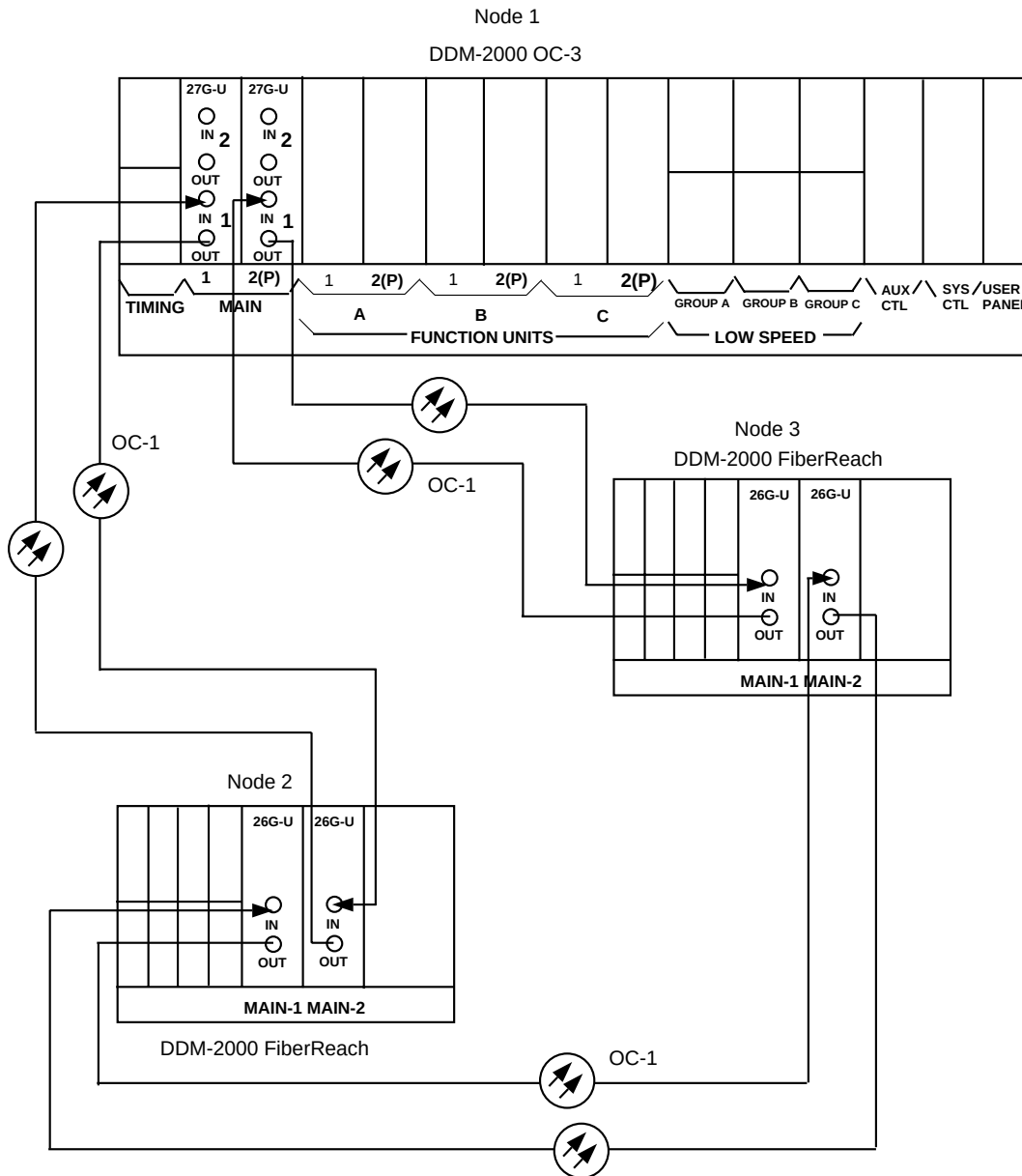


Figure 1. Sample Network Schematic

Log in to any node in the ring and use the **rtrv-map-network** and/or **rtrv-map-neighbor** command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
Node1 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-network: COMPLD
/* Network Map for Node1
=====
System Name      Comm.  Product      NE      Alarm
(TID)            Status Type          Type      Group
=====
Node1              DDM-2000 OC-3  DSNE        3
Node2              FiberReach      3
Node3              FiberReach      3
*/
```

Figure 2. Sample Report From rtrv-map-network Command

```
Node1 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-neighbor: COMPLD
/* Neighbor Map for Node1
=====
System Name      Connected  Link      Product
(TID)            Through   Comm.     Type
Status
=====
Node1              DDM-2000 OC-3
Node2              main-1    FiberReach
Node3              main-2    FiberReach
*/
```

Figure 3. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order.
3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. **⇒ NOTE 1:**

Cross-connections consist of drop and pass-through connections. For example in Figure 4, drop connections are made at Nodes 1 and 2. Pass-through cross-connections are made at Node 3. In Figure 5, pass-through cross-connections are made at Node 1.

⇒ NOTE 2:

If all 28 VT1.5s (DS1s) in the STS-1 are being passed through at the OC-3 host node, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the OC-3 node in the future, you should provision the OC-3 as VT1.5 cross-connections. Provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the **rtrv-eqpt:** command at each node to verify that each shelf is properly equipped for the service being established.

6. **⇒ NOTE:**

The following commands may be used to delete, enter, and retrieve cross-connections: **dlt-crs-vt1**, **ent-crs-vt1**, and **rtrv-crs-vt1**. See the "Commands and Reports" section of this manual for a description of commands.

From work order or circuit order, determine the cross-connections to be made at each node associated with the DS1 service being established.

7. Starting at one of the terminating nodes for the DS1 circuit being established, use the **rtrv-crs-vt1:** command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #1 low speed port in the **DS1** circuit pack in slot #1 of **LOW SPEED GROUP A** (a-1-1) is to be connected to timeslot m-2-1-1 and the **rtrv-crs-vt1** command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the **dlt-crs-vt1** commands.

8.  **NOTE:**
Channel state provisioning provides IS, AUTO, and NMON states for VT channels similar to the port states for DS1 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

At all nonterminating nodes in the network, use the **ent-crs-vt1:** command to provision pass-through connections. [For example, in Figure 4, node 3, to make the DS1 pass-through cross-connection for channel m-1-1-1, use the **ent-crs-vt1:m-1-1-1,m-1-1-1:cct=twoway** command.

9. At the terminating (drop) nodes of the circuit being established, use the **ent-crs-vt1:** command to make the terminating cross-connections. For example in Figure 4, at Node 1, if DS1 port #1, circuit pack #1 in **FUNCTION UNITS** group **A** is cross-connected to VT1.5 channel #1, VTG #1, STS #1, OC1 line 2, then the command **ent-crs-vt1:a-1-1,m-2-1-1:cct=twoway** would be used to make the cross-connection. At Node 2 in Figure 4, the command **ent-crs-vt1:m-1-1-1,a-1-1:cct=twoway** would be used to make the cross-connection.
10. Use the **rtrv-crs-vt1:** command to verify that the proper connection has been made. If an improper cross-connection is made, use the **dlt-crs-vt1:** command to delete the improper cross-connection and reenter the cross-connection.
11. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.
12. If "ne-acty", "inc. VT AIS", "inc. STS1 AIS", "inc. VT unequipped", or "inc. VT unequipped" alarms are present, look for missing or improperly made cross-connections. Use **TAP-118** to locate missing cross-connections, if required.

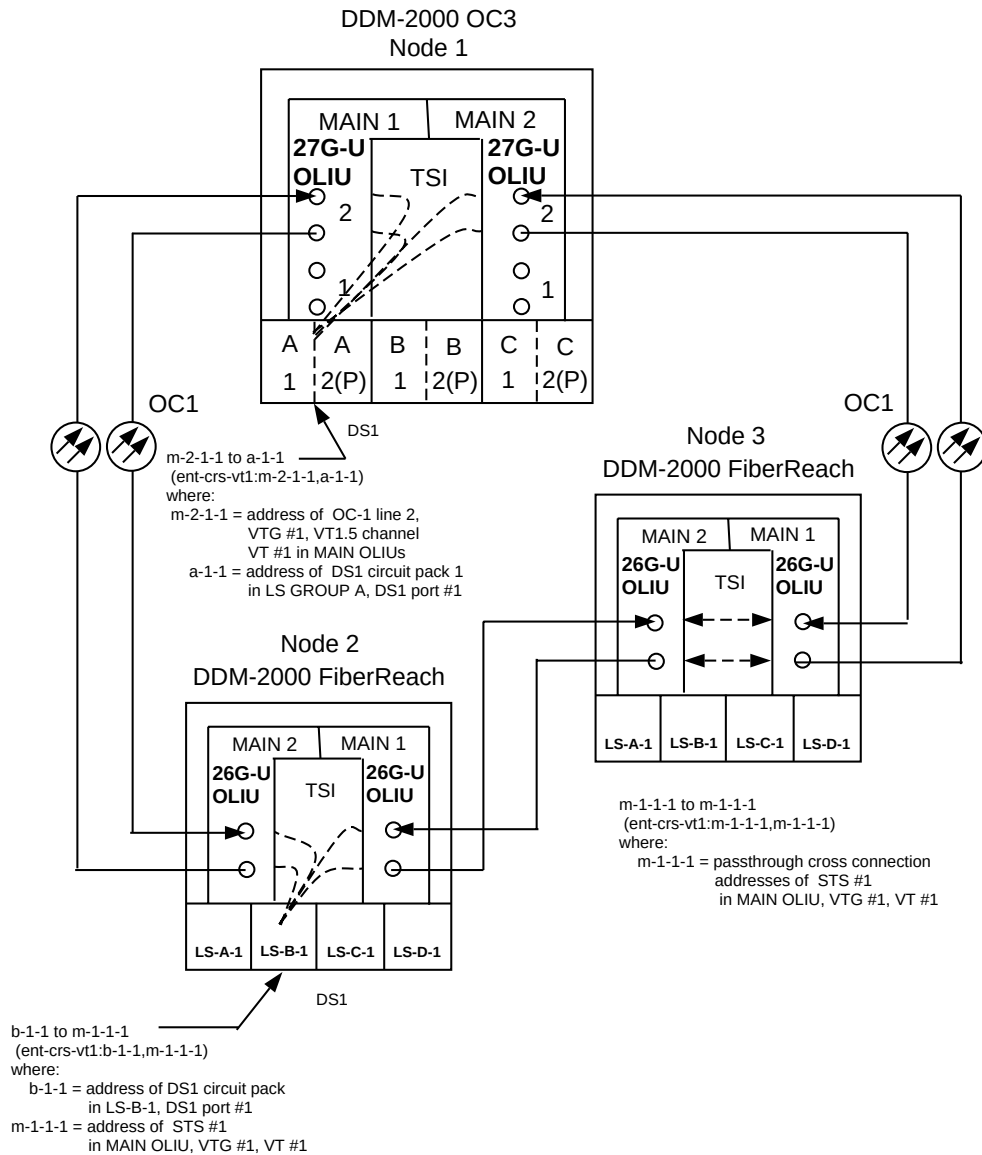


Figure 4. Example of Stand Alone OC-3/OC-1 Cross-connections

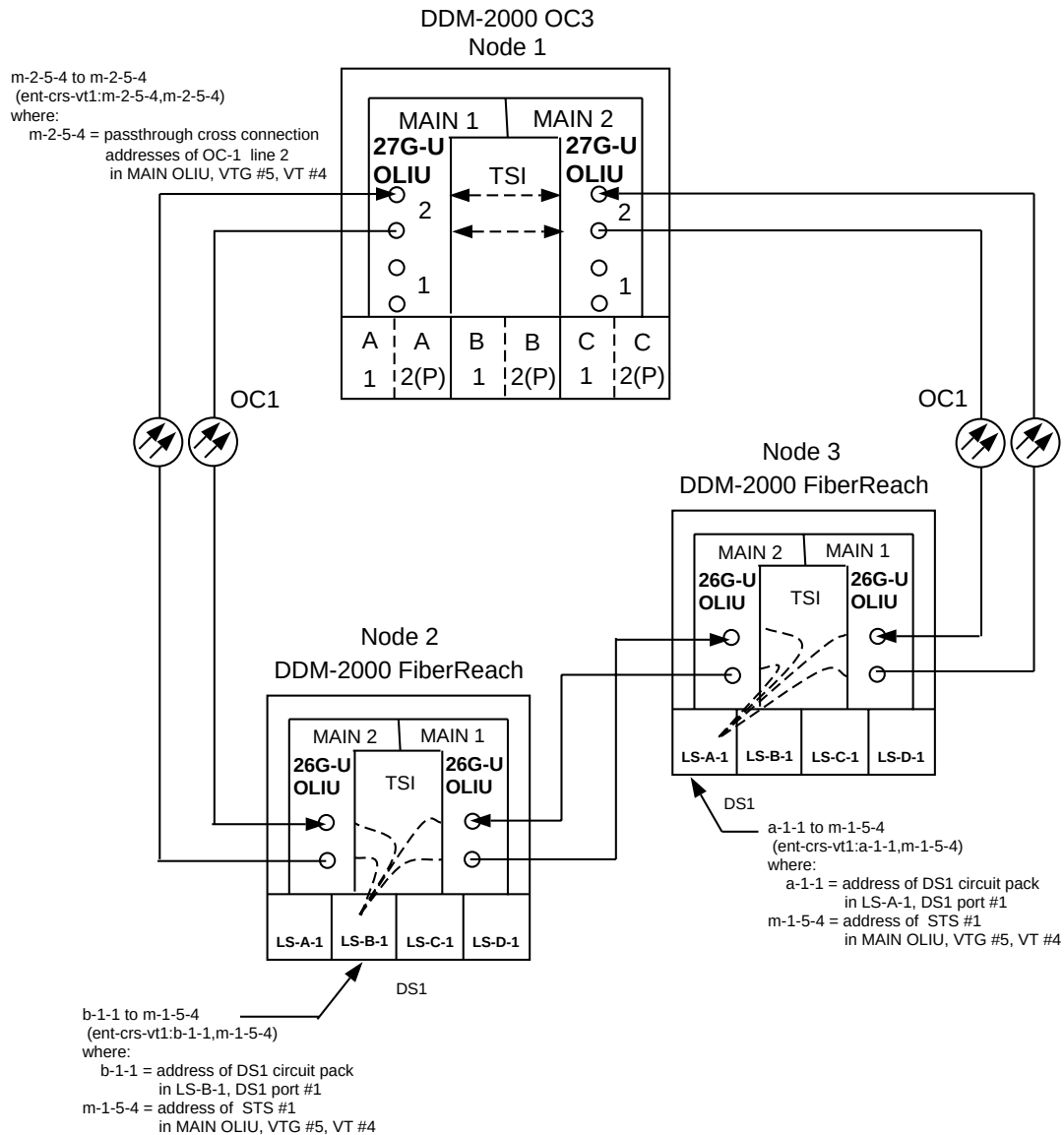


Figure 5. Example of Stand Alone OC-3/OC-1 Cross-connections

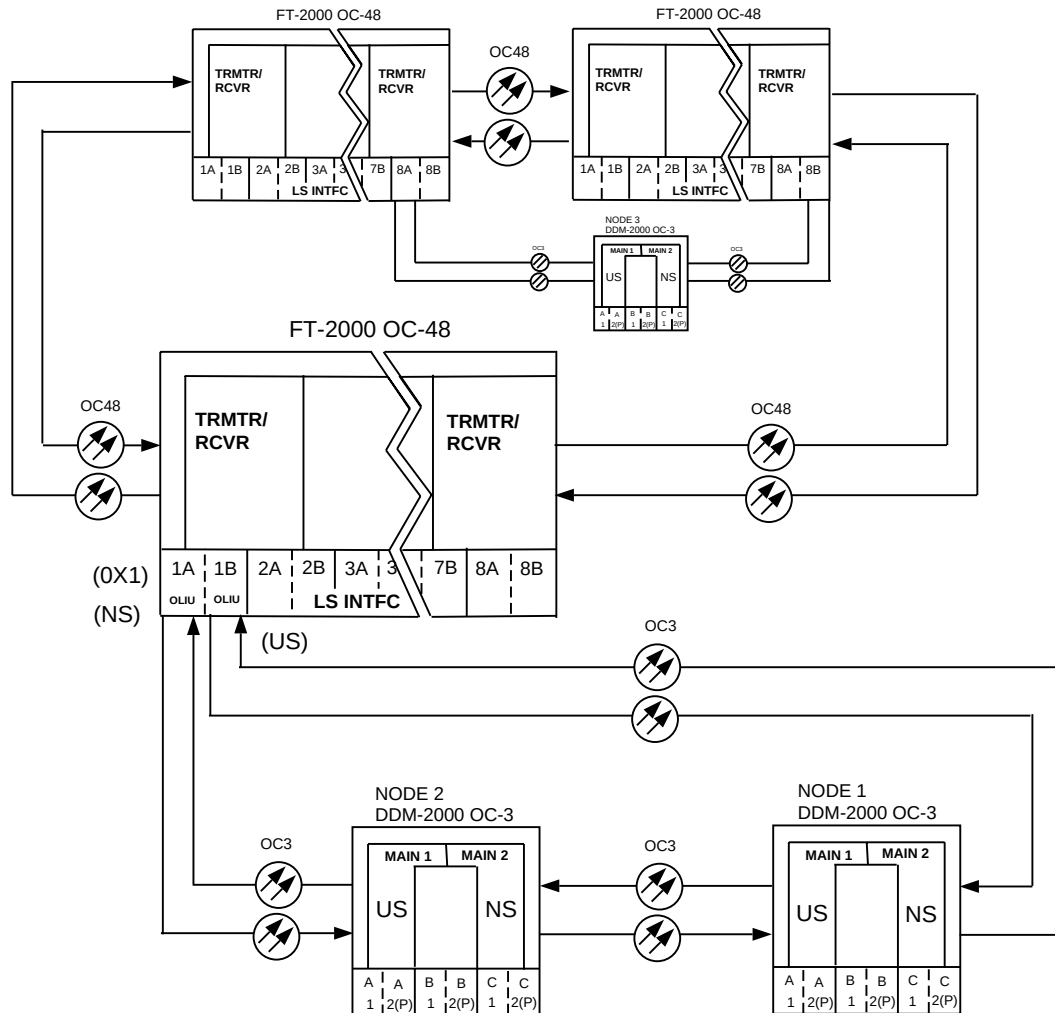
Make Cross-Connections Using CIT Single/Dual Homing and OC-3 Extensions OC-48/OC-3 Configuration

1.  **NOTE 1:**
If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I* and the appropriate documentation in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*. Also, read the description of the following commands in the "Commands and Reports" section of 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I* and the appropriate documentation in 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual*: **ent-crs-sts1**, **ent-crs-vt1** (OC-3 only), **rtrv-crs-sts1**, **rtrv-crs-vt1** (OC-3 only), **dlt-crs-sts1**, and **dlt-crs-vt1** (OC-3 only).

-  **NOTE 2:**
You will have to log in to more than one node in each ring to get a complete map of the network using the **rtrv-map-network** and **rtrv-map-neighbor** command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections.

Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figures 1, 2, 3, and 4 show examples of simple schematics.

2. Log in to any node in each ring in the network and use the **rtrv-map-network** and/or **rtrv-map-neighbor** command to retrieve a map of the network which lists all the systems and how they are connected to each other.



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)					
22-Type OLIUs (0X1 Rings application)	MAIN 1 dcc-m1	MAIN 2 dcc-m2	FN-A dcc-a	FN-B dcc-b	FN-C dcc-c
	US	NS	NS	NS	NS

Figure 1. Sample Single Homed Network Schematic

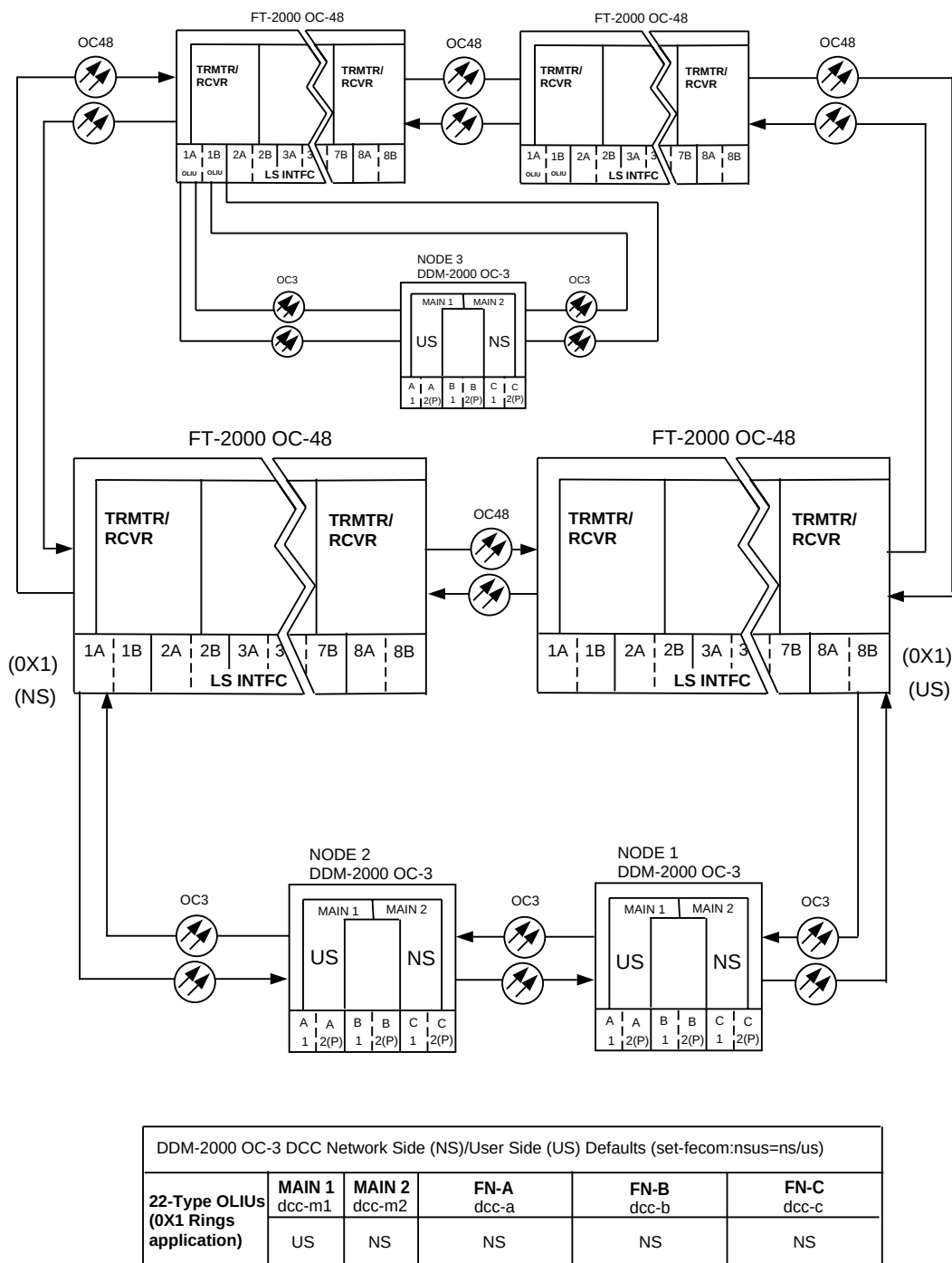


Figure 2. Sample Dual Homed Network Schematic

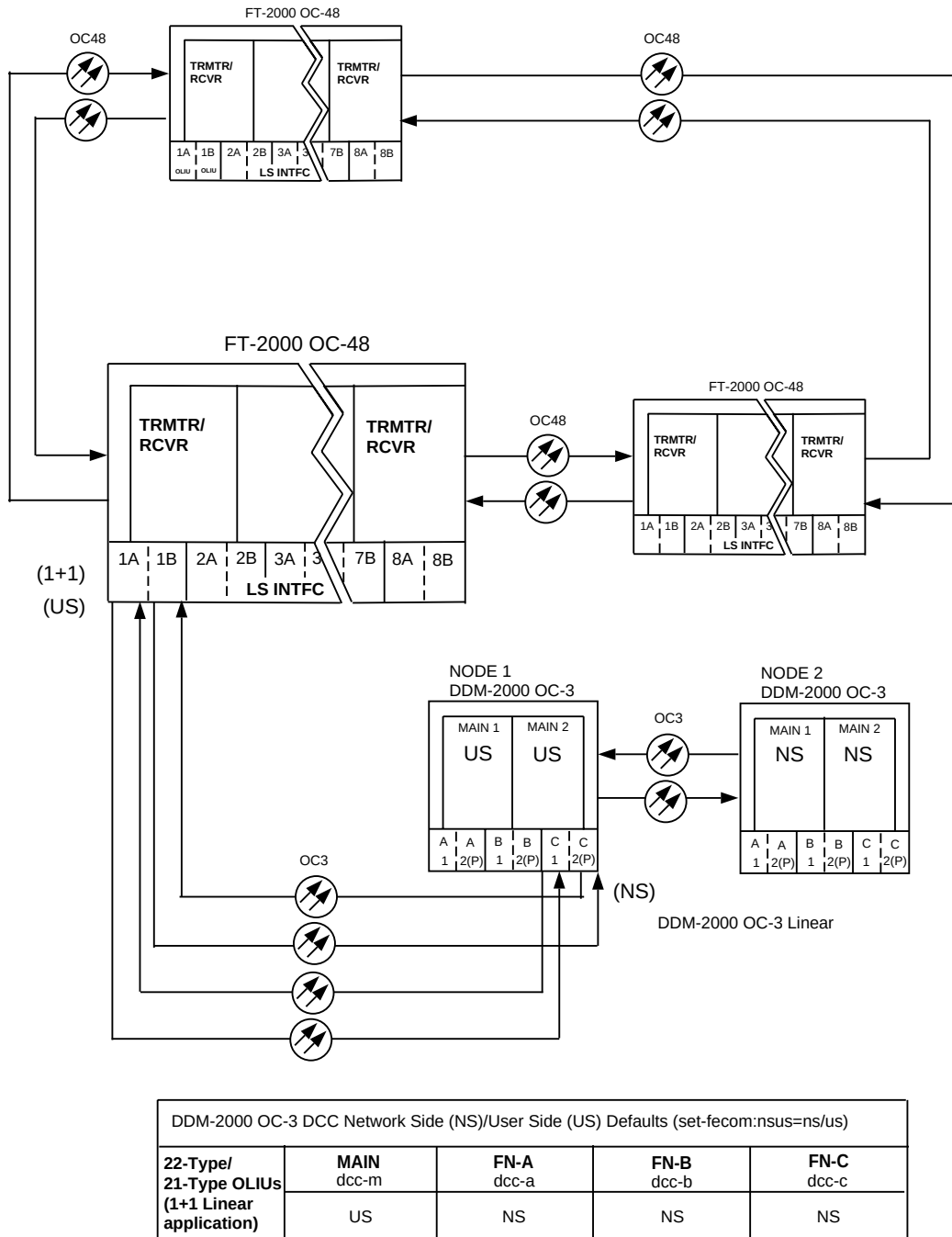


Figure 3. Sample OC-3 Linear Extension Network Schematic

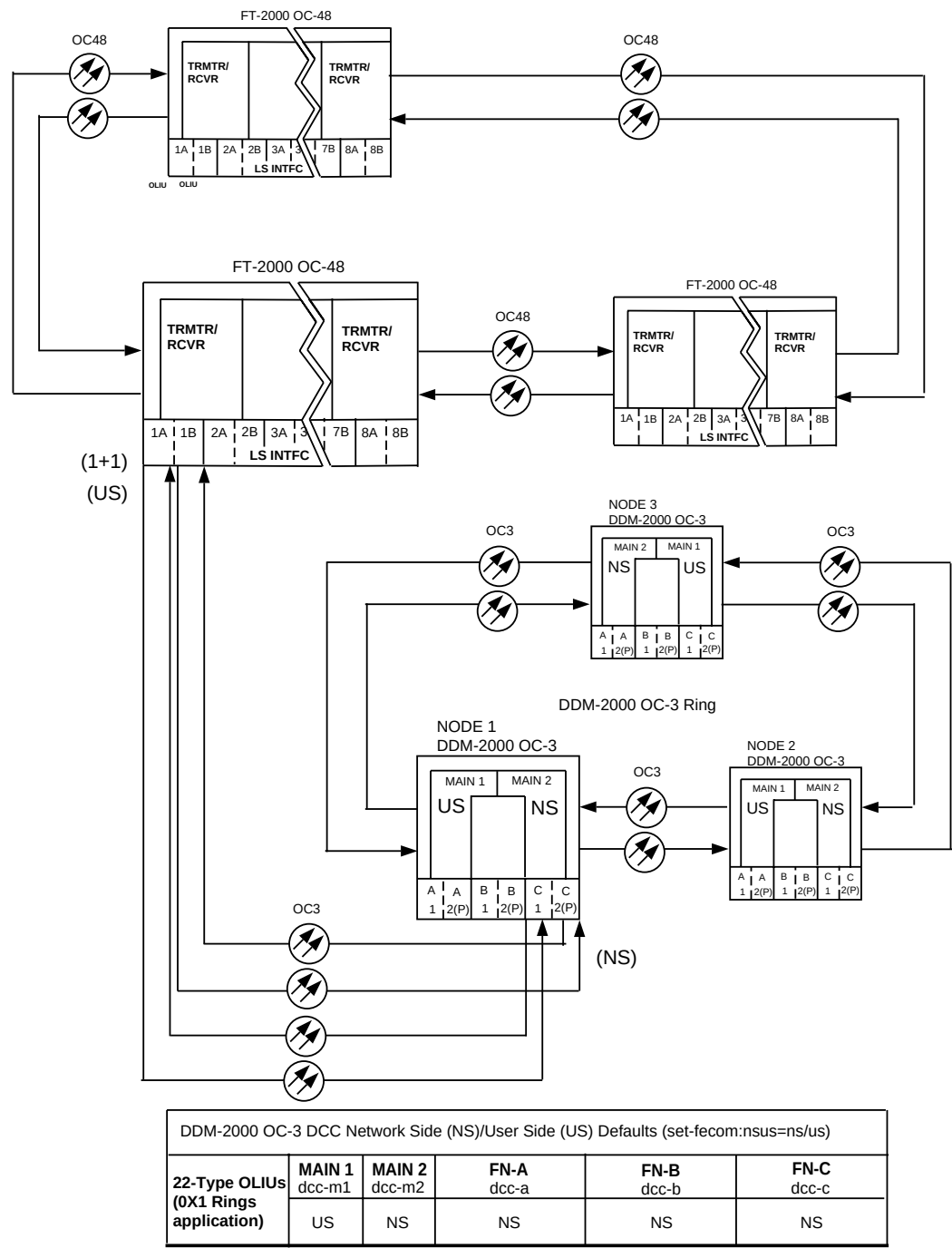


Figure 4. Sample OC-3 Linear Extension Network Schematic

3. Verify system configuration is same as specified on work order or circuit order.
4.  **NOTE:**
Cross-connections consist of drop and pass-through connections. For example in Figure 5, drop connections are made at OC-3 Nodes 1 and 3. Pass-through cross-connections are made at Node 2 in the network. Also, cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and the FT-2000 OC-48 rings, as required. See **ent-crs-()** command in the "Commands and Reports" section of Volume 1 of this manual.

From work order or circuit order, determine the terminating (drop) nodes for the service being established.

5. From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.
6. From work order or circuit order, determine the host OC-48 node(s) that connects to the OC-3 ring(s) or extensions.
7. Use the **rtrv-eqpt:** command at each node in the network to verify that each shelf is properly equipped for the service being established. Ensure that **OLI** circuit packs are installed in the correct slots in the host OC-48 nodes.
8.  **NOTE 1:**
Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections in DDM-2000 OC-3. Only STS-1 cross-connections are allowed in FT-2000 OC-48. In an OC-3 shelf, use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at an OC-3 shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group [see **ent-crs-sts1** command].

⇒ **NOTE 2:**

The following commands may be used to delete, enter, and retrieve cross-connections: **dlt-crs-vt1** (OC-3 only), **dlt-crs-sts1**, **ent-crs-vt1** (OC-3 only), **ent-crs-sts1**, **rtrv-crs-vt1** (OC-3 only), and **rtrv-crs-sts1**. See the "Commands and Reports" section of each system manual for a description of commands.

⇒ **NOTE 3:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All terminating drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order or circuit order, determine the cross-connections [STS-1 or VT1.5] to be made at each node [pass-through, terminating (drop), and host OC-48 node(s)] associated with the kind of service being established.

9. Starting at one of the terminating nodes for the DS1/STS-1 circuit being established, use the **rtrv-crs-()**: command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #1 low speed port in the **DS1** circuit pack in slot #2 of **LOW SPEED GROUP B** (b-2-1) is to be connected to timeslot m-1-2-1 and the **rtrv-crs-vt1** command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure. If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the **dlt-crs-()** commands.
10. **⇒ NOTE:**
Channel state provisioning provides IS, AUTO, and NMON states for VT/STS1 channels similar to the port states for DS1 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

At all nonterminating pass-through nodes in the network, use the **ent-crs-vt1**: or **ent-crs-sts1**:) command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-2-1 in other OC-3 shelves, use the **ent-crs-vt1:m-1-2-1,m-1-2-1:cct=twoway** command.]

11. At both terminating (drop) nodes of the circuit being established, use the **ent-crs-()**: command to make the terminating cross-connections at OC-3 nodes (for example at the OC-3 Node 3 in Figure 5, **ent-crs-vt1:m-1-2-1,b-2-1:cct=twoway**)

12. At the host FT-2000 OC-48 ring node sites, make proper cross-connections.
13. Use the **rtrv-crs-vt1:** or **rtrv-crs-sts1:** command to verify that the proper connections have been made. If an improper cross-connection is made, use the **dlt-crs-vt1:** or **dlt-crs-sts1:** command to delete the improper cross-connection and reenter the cross-connection.
14. At OC-3 terminating nodes equipped with **BBG4B DS3** circuit packs, use the **set-trace-sts1** command to verify the proper cross-connect path of a STS-1 cross-connected STS-1 signal.
15. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.
16. If DS3 cross-connections have been established and the terminating nodes are equipped with **BBG4B DS3** circuit packs, use **set-trace-sts1** command to check integrity of cross-connect path.

Reference: **DLP-563**

17. If "ne-acty", "inc. VT AIS", "inc. STS1 AIS", "inc. VT unequipped", or "inc. STS1 unequipped" alarms are present, look for missing or improperly made cross-connections. Use **TAP-120** to locate missing cross-connections, if required.

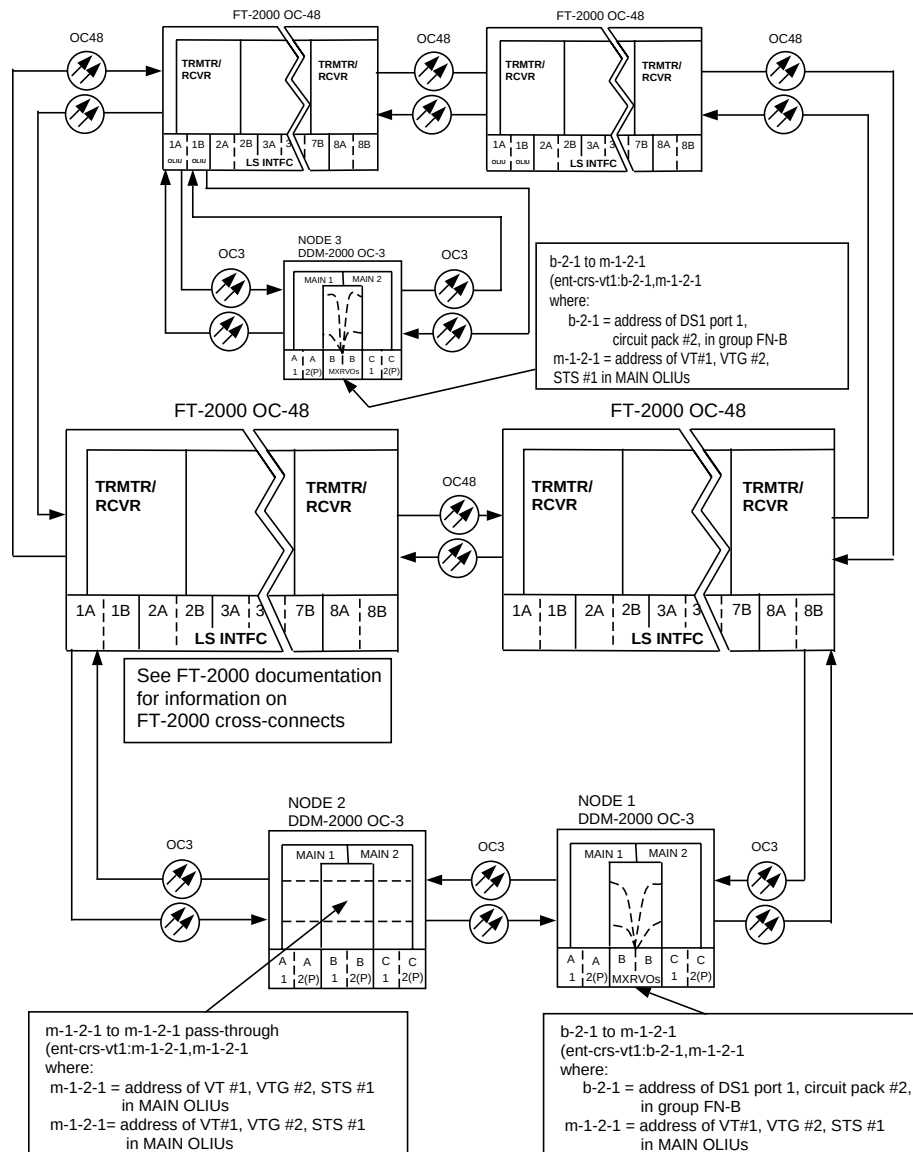


Figure 5. Example of Single/Dual Homing OC-48/OC-3 Cross-connections

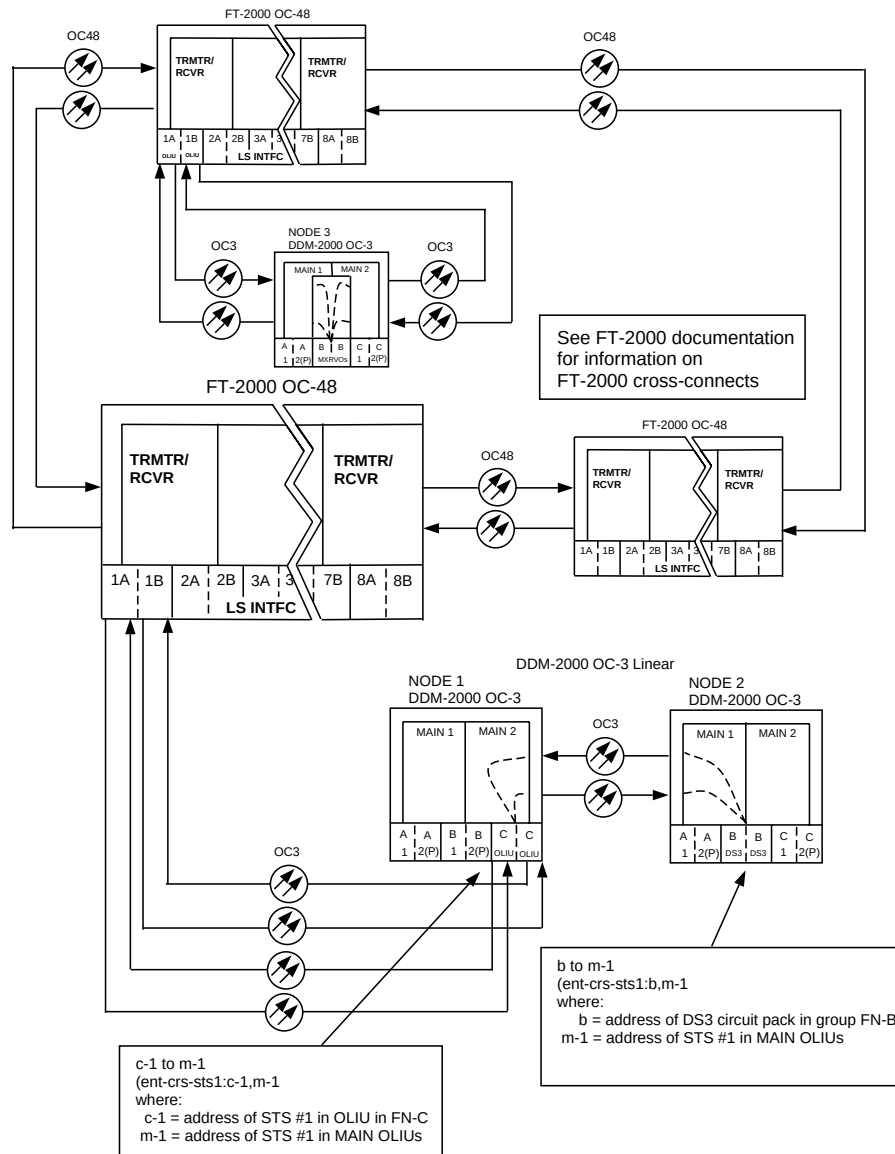


Figure 6. Example of FT-2000 with OC-3 Extensions Cross-connections

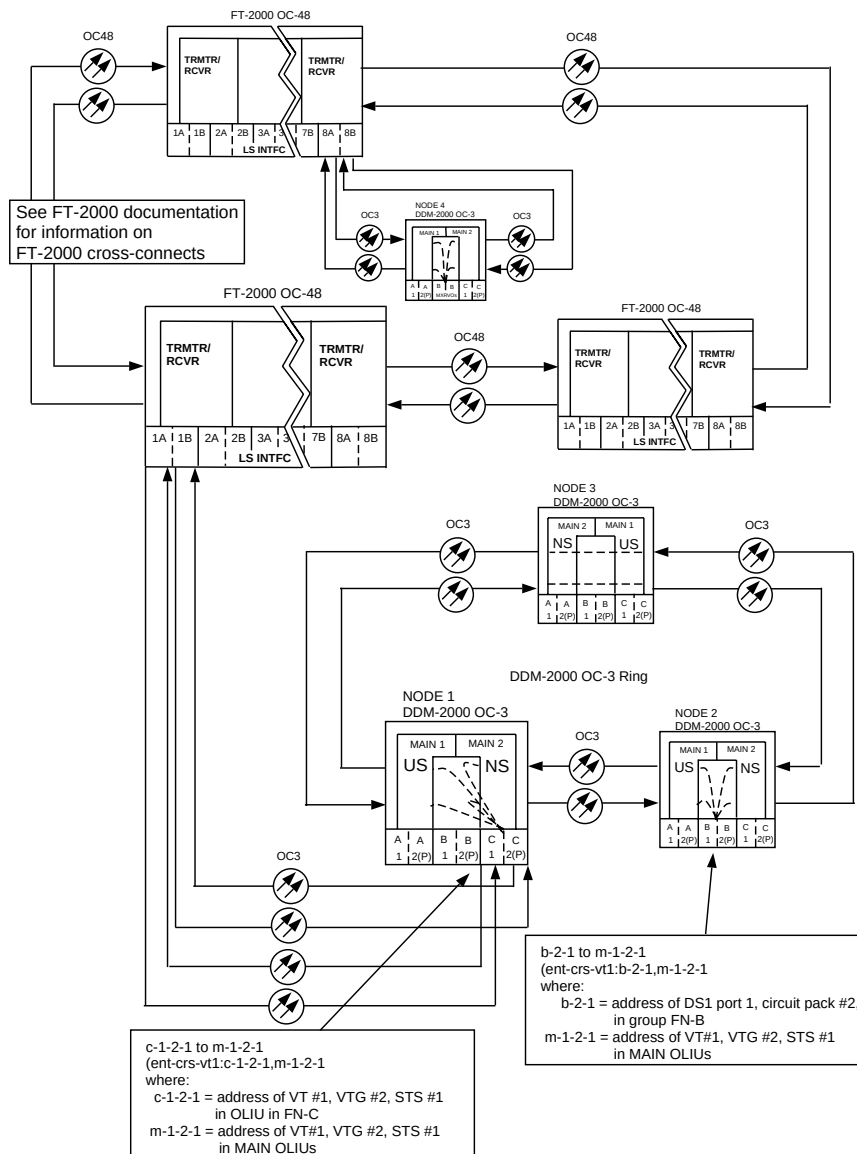


Figure 7. Example of FT-2000 with OC-3 Extensions Cross-connections

Make Cross-Connections Using CIT Single/Dual Homing OC-12/OC-3 Ring Configuration

1. **⇒ NOTE 1:**

If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section and read the description of the following commands in the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I* and 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I*: "**ent-crs-sts1**", "**ent-crs-vt1**" (OC-3 only), "**rtrv-crs-sts1**", "**rtrv-crs-vt1**" (OC-3 only), "**dlt-crs-sts1**", and "**dlt-crs-vt1**" (OC-3 only).

⇒ NOTE 2:

You will have to login to more than one node in each ring to get a complete map of the network using the "**rtrv-map-network**" and "**rtrv-map-neighbor**" command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections.

Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figures 1 and 2 show examples of simple schematics.

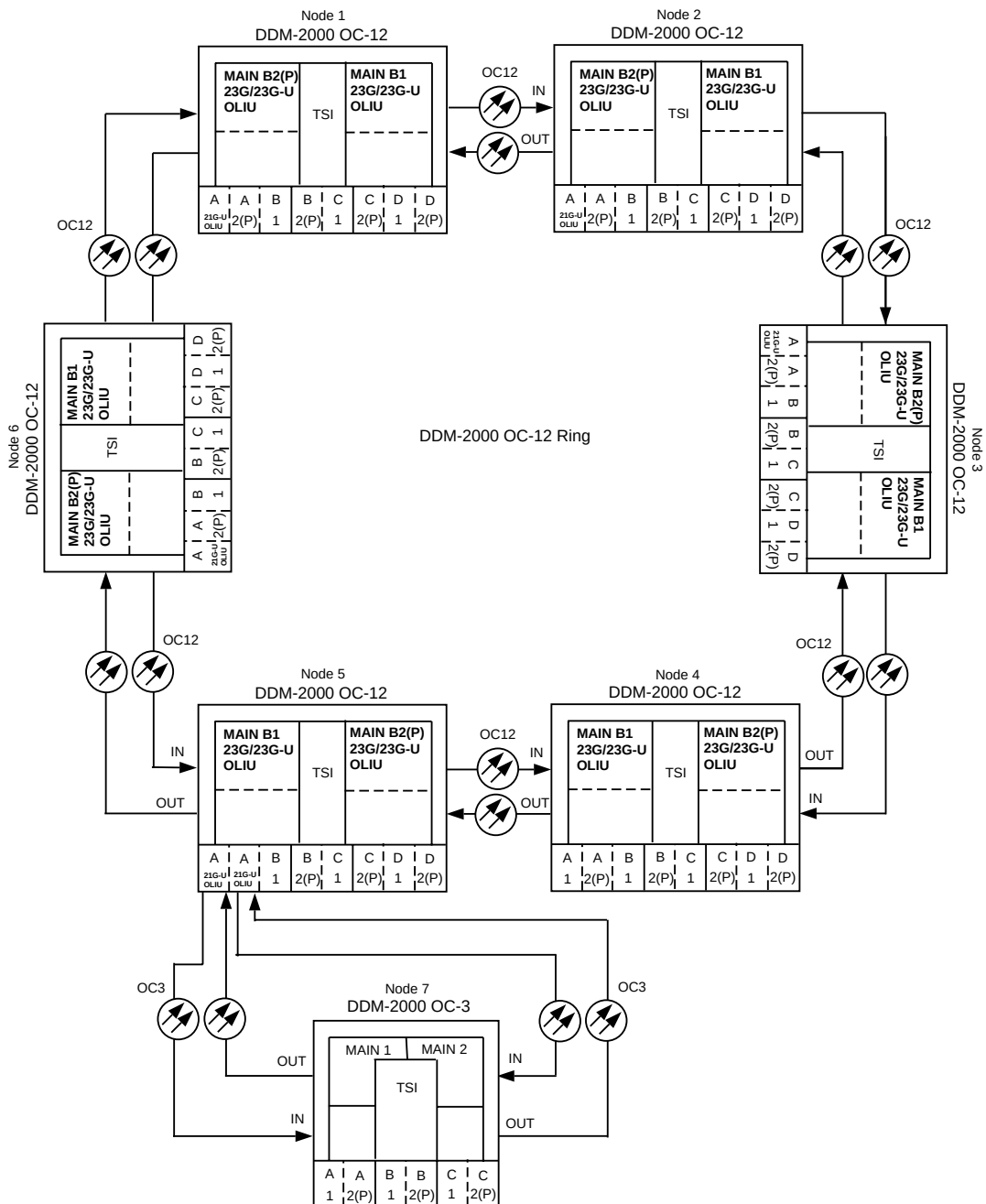


Figure 1. Sample Single Homed Network Schematic

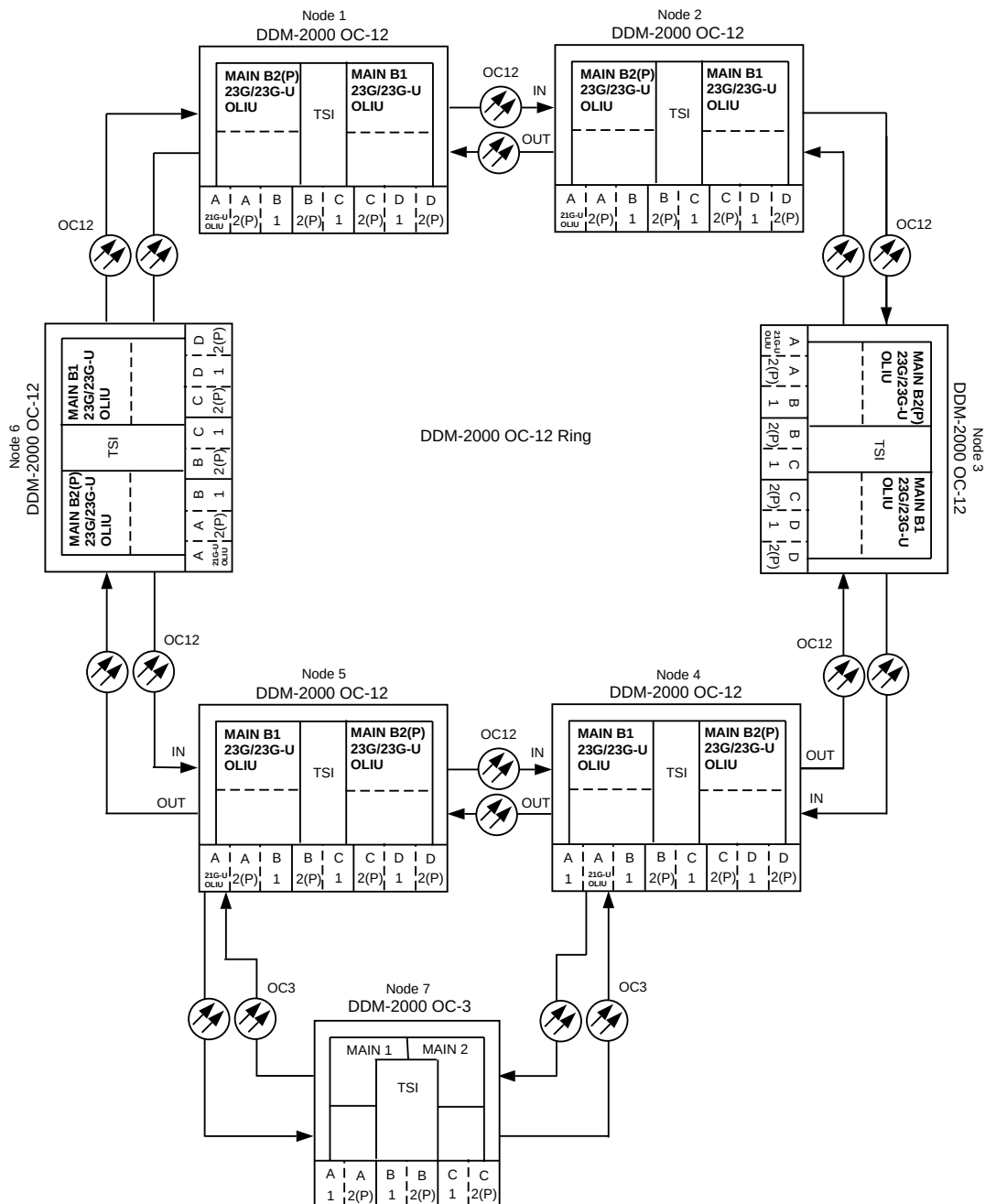


Figure 2. Sample Dual Homed Network Schematic

Log in to any node in each ring in the network and use the "**rtrv-map-network**" and/or "**rtrv-map-neighbor**" command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
Node5 98-05-27 13:09:53 DDM-2000 OC-12, R5.1.1
M  rtrv-map-network: COMPLD
/* Network Map for Node5
```

System Name (TID)	Comm. Status	Product Type	NE Type	Alarm Group
Node5		DDM-2000 OC-12	DSNE	3
Node4		DDM-2000 OC-12		3
Node3		DDM-2000 OC-12		3
Node2		DDM-2000 OC-12		3
Node1		DDM-2000 OC-12		3
Node6		DDM-2000 OC-12		3
Node7		DDM-2000 OC-3		3

```
*/
```

Figure 3. Sample Report From rtrv-map-network Command

```
Node7 98-05-27 13:09:53 DDM-2000 OC-3, R11.1.1
M  rtrv-map-neighbor: COMPLD
/* Neighbor Map for Node7
```

System Name (TID)	Connected Through	Link Comm. Status	Product Type
Node7			DDM-2000 OC-3
Node5	main-1		DDM-2000 OC-12
Node4	main-2		DDM-2000 OC-12

```
*/
```

Figure 4. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order. For example, see Figures 5, 6, and 7.
3.  **NOTE:**
Cross-connections consist of drop and pass-through connections. For example in Figure 5, drop connections are made at Nodes 1, 4, and 5. Pass-through cross-connections are made at other nodes in the network (Figure 2). Also, cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and FT-2000 OC-48 rings, as required. See "**ent-crs- ()**" command in the "Commands and Reports" section of Volume 1 of this manual.

From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.
5. From work order or circuit order, determine the host OC-12 node(s) that connects to the OC-3 ring(s).
6.  **NOTE:**
In dual homing configurations (Figures 5 and 6), **OLIU** circuit packs must be installed in the correct slots in the host OC-12 nodes to support the direction of traffic required. For example in Figure 5, for traffic to be routed between Node 1 (See Figure 2) and the OC-3 system, the **21-Type OLIU** must be installed in **FUNCTION UNITS** group **A, B, C, or D**, slot **1** of Node 5 and **FUNCTION UNITS** group **A, B, C, or D**, slot **2(P)** of Node 4. This is required because traffic entering Node 5, slot **FUNCTION UNITS A 1** from the OC-3 shelf is automatically connected to the **MAIN B 1 OLIU** when cross-connections are made. Traffic entering slot **FUNCTION UNITS A 2(P)** is automatically connected to the **MAIN B 2(P) OLIU**.

In single homing configurations (Figure 7), the **21-Type OLIU** in **FUNCTION UNITS** group **A, B, C, or D**, slot **1** of the OC-12 shelf must be connected to the **MAIN 1 OLIU** in the OC-3 shelf. The **21-Type OLIU** in **FUNCTION UNITS** group **A, B, C, or D**, slot **2(P)** of the OC-12 shelf must be connected to the **MAIN 2(P) OLIU** in the OC-3 shelf.

Use the "**rtrv-eqpt**:" command at each node in the network to verify that each shelf is properly equipped for the service being established. Ensure that **OLIU** circuit packs are installed in the correct slots in the host OC-12 nodes.

7.  **NOTE 1:**
Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections in DDM-2000 OC-3. Only STS-1 cross-connections are allowed in DDM-2000 OC-12. In an OC-3 shelf, use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at an OC-3 shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group [see "**ent-crs-sts1**" command].

-  **NOTE 2:**
The following commands may be used to delete, enter, and retrieve cross-connections: "**dlt-crs-vt1**" (OC-3 only), "**dlt-crs-sts1**", "**ent-crs-vt1**" (OC-3 only), "**ent-crs-sts1**", "**rtrv-crs-vt1**" (OC-3 only), and "**rtrv-crs-sts1**". See the "Commands and Reports" section of each system manual for a description of commands.

⇒ **NOTE 3:**

In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All terminating drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.
2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.
3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order or circuit order, determine the cross-connections [STS-1 or VT1.5] to be made at each node [pass-through, terminating (drop), and host OC-12 node(s)] associated with the kind of service being established.

8. Starting at one of the terminating nodes for the DS1/STS1 circuit being established, use the "**rtrv-crs-()**:" command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #1 low speed port in the **DS1** circuit pack in slot #2 of **LOW SPEED GROUP B** (b-2-1) is to be connected to timeslot m-1-2-1 and the "**rtrv-crs-vt1**" command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the **"dlt-crs-()"** commands.

9.  **NOTE:**
Channel state provisioning provides IS, AUTO, and NMON states for VT/STS1 channels similar to the port states for DS1 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

At all nonterminating pass-through nodes in the network, use the **"ent-crs-vt1:"** or **"ent-crs-sts1:"** command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-2-1 in other OC-3 shelves, use the **"ent-crs-vt1:m-1-2-1,m-1-2-1:cct=twoway"** command. To make pass-through cross-connections for STS-1 #1 in an OC-12 shelf, use the **"ent-crs-sts1:m-1,m-1:cct=twoway"** command.]

10. At both terminating (drop) nodes of the circuit being established, use the **"ent-crs-():"** command to make the terminating cross-connections (for example at the OC-3 node in Figure 5, **"ent-crs-vt1:m-1-2-1,b-2-1:cct=twoway"**)
11. At the host OC-12 ring node sites, make proper cross-connections. For example, in Figure 5 at Node 5, if STS-1 channel #1 from the OC-3 **MAIN 1 OLIU** is to be cross-connected to STS#1 in the OC-12 **MAIN B 1 OLIU** then the command **"ent-crs-sts1:mb-1,a-1:cct=twoway"** would be used to make the cross-connection.

12. Use the "**rtrv-crs-vt1:**" or "**rtrv-crs-sts1:**" command to verify that the proper connections have been made. If an improper cross-connection is made, use the "**dlt-crs-vt1:**" or "**dlt-crs-sts1:**" command to delete the improper cross-connection and reenter the cross-connection.
13. At terminating nodes equipped with **BBG4B DS3/BBG11B 3DS3** circuit packs, use the "**set-trace-sts1**" command to verify the proper cross-connect path of a STS-1 cross-connected STS-1 signal.
14. After all cross-connections are made, use the "**rtrv-alm:**" command to verify no alarms are present.
15. If DS3 cross-connections have been established and the terminating nodes are equipped with **BBG4B DS3/BBG11B 3DS3** circuit packs, use "**set-trace-sts1**" command to check integrity of cross-connect path.

Reference: **DLP-563**

16. If "ne-acty", "inc. VT AIS", "inc. STS1 AIS", "inc. VT unequipped", or "inc. STS1 unequipped" alarms are present, look for missing or improperly made cross-connections. Use **TAP-120** to locate missing cross-connections, if required.

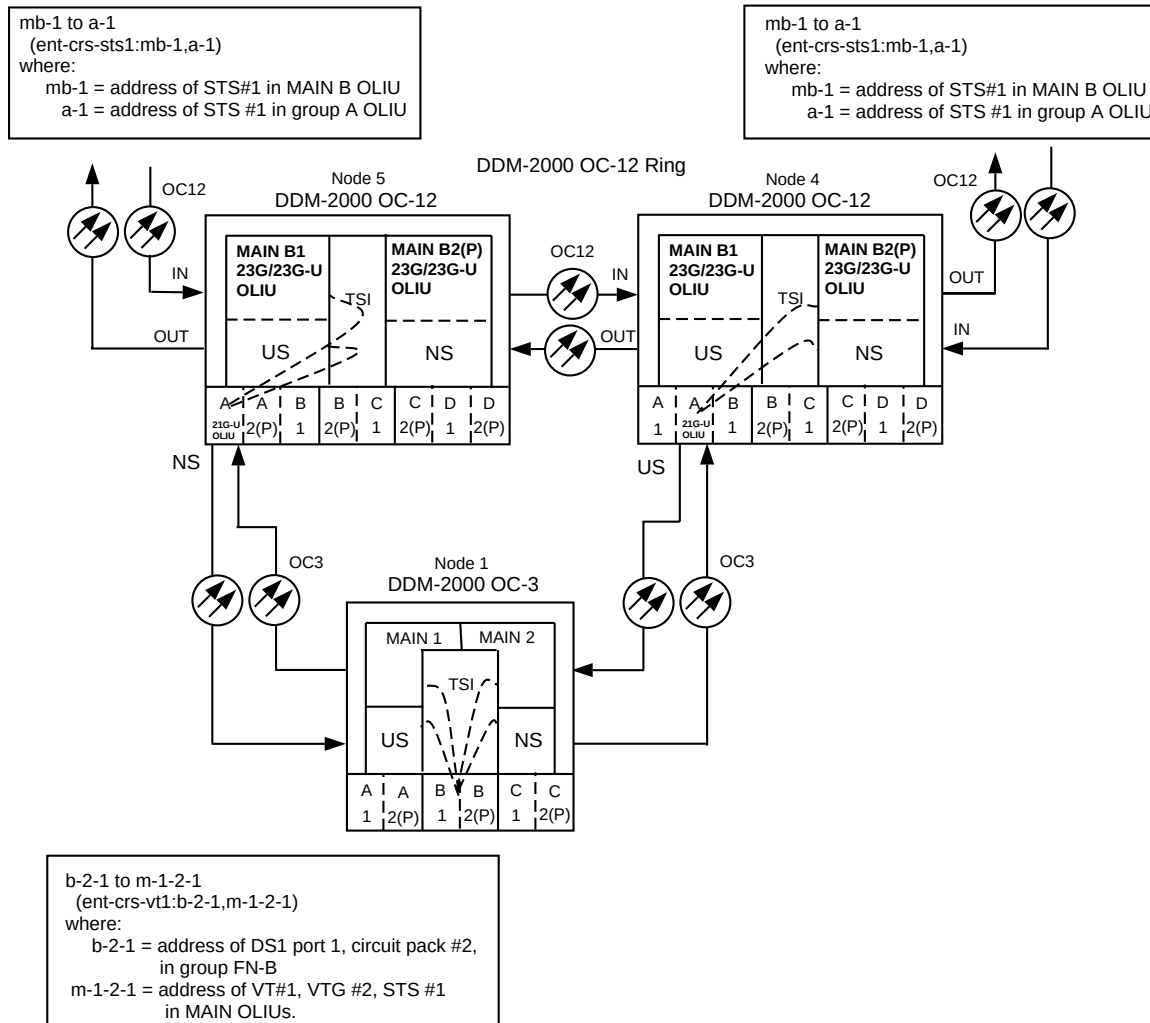


Figure 5. Example of Dual Homing OC-12/OC-3 Cross-connections

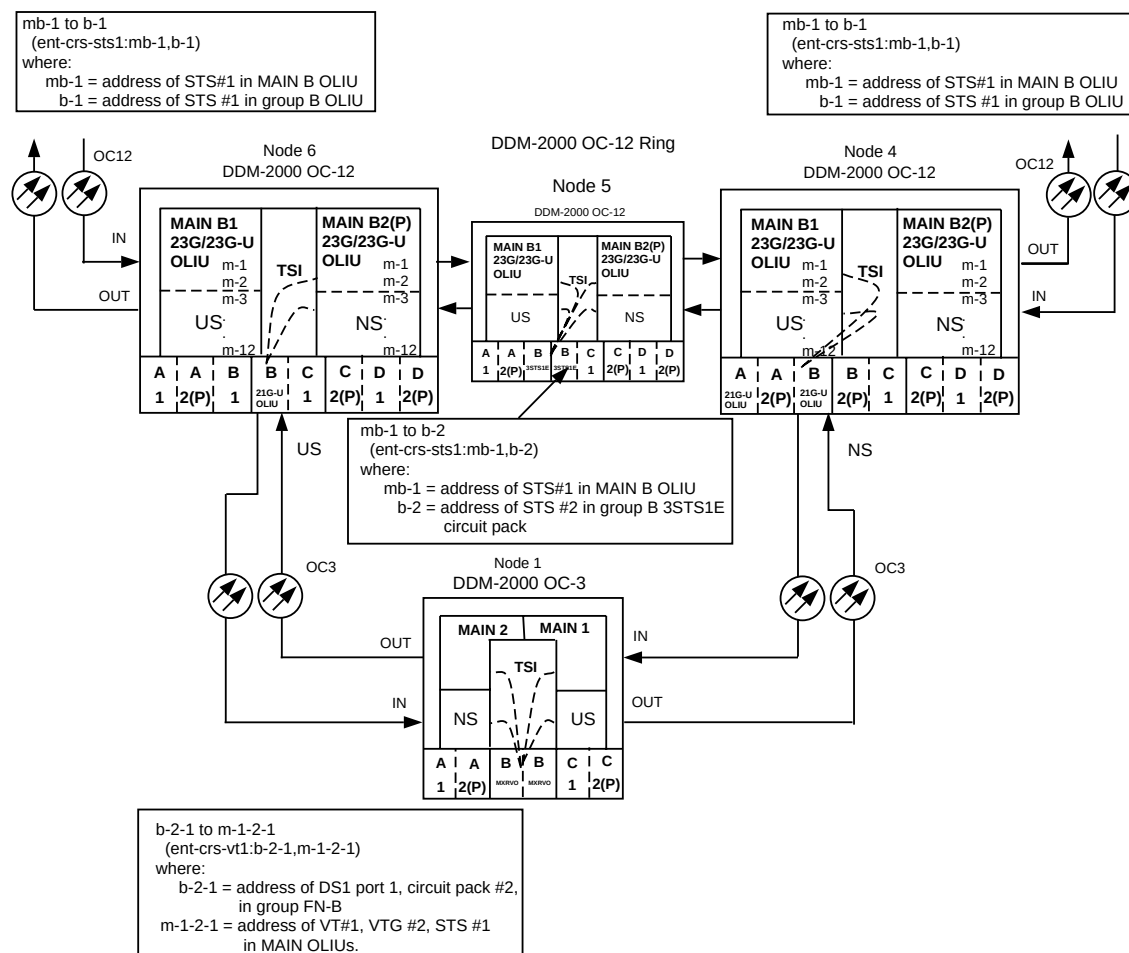


Figure 6. Example of Dual Homing OC-12/OC-3 Cross-connections

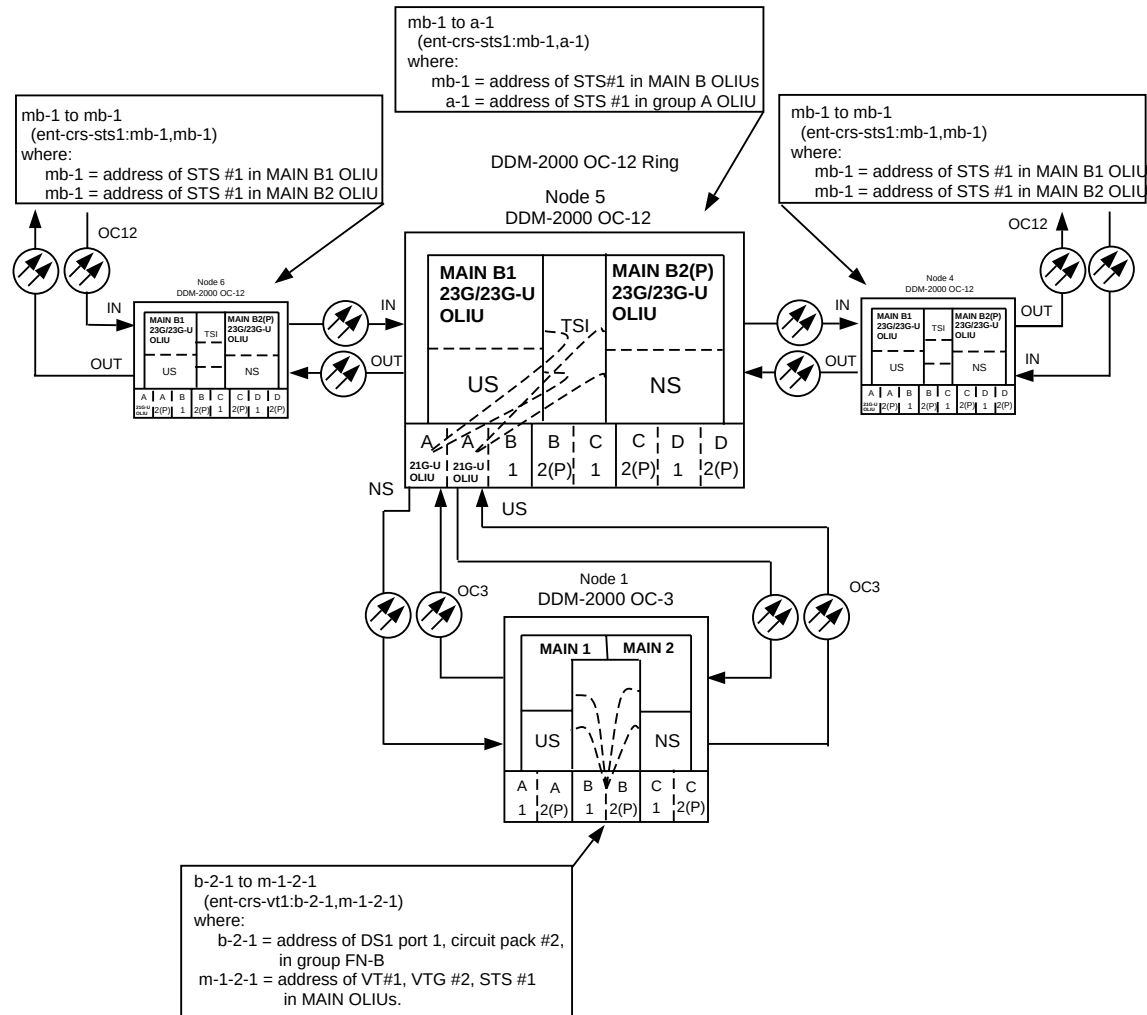


Figure 7. Example of Single Homing OC-12/OC-3 Cross-connections

Install Software Generic Program - New Shelf Installation Only BBG8/BBG8B SYSCTL and BBG9 OHCTL Installed

1.  **NOTE 1:**
This procedure is used to install a software program in a new DDM-2000 OC-3 shelf equipped only with the **BBG8/BBG8B SYSCTL** and **BBG9 OHCTL** controller circuit packs. The circuit packs may be new from the factory or circuit packs used previously that may be loaded with software. For procedures to download software locally to a fully equipped in-service shelf, see **DLP-532**. For procedures to download software remotely to a fully equipped in-service shelf, see **DLP-562**.

 **NOTE 2:**
It is assumed that the **BBG9 OHCTL** and **BBG8/BBG8B SYSCTL** circuit packs have been installed per **DLP-500** and **DLP-549**.

 **NOTE 3:**
If you are using a PC operating in a *Windows*^{*} environment, you must **exit Windows** and restart your PC in *MS-DOS*^{*} mode before performing these download procedures. For example, if your PC is running *Windows 95* you must exit *Windows* by clicking on the **Start** button, then **Shut Down**, then **Restart the computer in MS-DOS mode**.

Obtain equipment, check software, and connect PC for download.

Reference: **DLP-566**

* Registered trademark of Microsoft Corporation.

2. Observe one of the following indications on the **FE ID** display. Note the indication and follow the suggested procedure.

A. **Letter "P" in FE ID Display**

Indicates no software installed in **SYSCTL**. Software must be downloaded locally using these procedures.

Continue with **Step 3**.

B. **Letter "P." in FE ID Display**

Letter "**P**" followed by a period (**P.**) indicates a previous download attempt has failed. New software must be downloaded locally using these procedures.

Proceed to **Step 6**.

C. **FE ID Display Blank:**

Indicates compatible software is installed in **OHCTL** and **SYSCTL**. This procedure assumes the installed software version is not the correct version. (Version is displayed on the **FE ID** display when the **ACO** button is depressed for longer than 2 seconds.)

Proceed to **Step 6**.

D. **Letter "d" in FE ID Display:**

Indicates **OHCTL** has no software or that software in **OHCTL** and **SYSCTL** is incompatible.

Proceed to **Step 6**.

E. Letter "U" in FE ID Display:

Indicates **SYCTL** Switch **S1** is not set properly for type of shelf being equipped.

Remove **SYCTL**. Repeat procedures of **DLP-549** to correct switch settings and to install **SYCTL**.

F. Letter "E" in FE ID Display:

Indicates **SYCTL** must be replaced.

Get replacement **SYCTL** and repeat procedures of **DLP-549**.

G. Letter "F" in FE ID Display:

Indicates **SYCTL** faceplate latch is not fully latched.

Unplug **SYCTL** and repeat procedures of **DLP-549**. Ensure you properly latch the faceplate when installing **SYCTL**.

H. Flashing Letter "L" in FE ID Display:

Indicates a low voltage condition (brownout) on the shelf.

Clear trouble using **Trouble Clearing: TAP-121**.

Letter "P" in FE ID Display

3. Ensure PC is connected to the front CIT (CIT-1) connector of shelf receiving software. If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

4. **NOTE:**

After the terminal emulator (**term**) is started, the software download automatically begins. The download may take up to 45 minutes.

Enter **term** or **term COMn** command, where $n = 1$ or 2 . If **term** is entered without the **COMn** option, then **COM1** will be selected by default. Disregard message "Can't find script <init>" if you see it after starting the terminal emulator.

Response: Two brief messages are printed and you are instructed to Press any key to continue . . . after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows within 2 minutes:
Interface ready. (Type Alt-h for help.)
Communications established.

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress

The dots continue to print until program installation is complete. If using floppies, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog: TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

5. Was response correct?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then proceed to **Step 10**.

Letter "d" or "P." in FE ID Display or Display Blank

6. Ensure PC is connected to the front CIT (CIT-1) connector of shelf receiving software. If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.
7. Enter **term** or **term COM n** command, where $n = 1$ or 2 . If **term** is entered without the **COM n** option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "Can't find script <init>", disregard it.

Response: Two brief messages are printed and you are instructed to Press any key to continue . . . after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows:
Interface ready. (Type Alt-h for help.)
Communications established.

8. Unplug and reseal the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display (approximately 15 seconds). Software download may take up to 45 minutes.

Response: PC starts download and prints the following message:

```
Searching for optimal transfer rate.  
Handshake established at <baudrate> baud.
```

```
In progress . . . .
```

The dots continue to print until program installation is complete. If using the floppy disks, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog: TID COMPLD  
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system. After approximately three minutes, you can log into the system.

9. Was response correct?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then continue with **Step 10.**

10. Did the download start as indicated by the In progress message and rows of dots?

If **NO**, then continue with **Step 11**.

If **YES**, then proceed to **Step 18**.

11. Check that the DDM-2000 is connected to the PC through the **COM** port. If it is not, reconnect the PC to DDM-2000 using the **COM** port and repeat the procedure.

If the download still does not start, as indicated by the In progress message and rows of dots, within 2 minutes after the **P** appears in the **FE ID** display, change the CTRM baud rate as follows and repeat this procedure: if the baud rate is currently set to 9600, change it to 4800 or if the baud rate is currently set to 4800, change it to 9600. The baud rate is changed by:

1. Momentarily depress the "Alt C" keys.
 2. Use the RETURN key to move to the "Speed" field.
 3. Press the "Space" bar until the desired rate appears.
 4. Momentarily depress the "Escape/Esc" key to activate the new baud rate.
12. Ensure first (number 1) disk of program being installed is inserted, if using floppies.
 13. Ensure diskette is inserted in correct drive.
 14. Ensure the proper command was used to go to the drive with the diskette or to the proper directory containing the software.
 15. Check for invalid COM port. Exit TERM (Alt-F2), then restart TERM using **term COM1** or **term COM2**.
 16. If the download still does not start, refer to **Trouble Clearing: TAP-116**.
 17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. If the download *starts and fails* during its progress, exit TERM (Alt-F2), unplug and reseat the **SYCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display (approximately 15 seconds). Repeat this procedure from **Step 3**.

If the download still does not complete, refer to
Trouble Clearing: TAP-116.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install New Software Generic Program In-Service System Remote Shelf Download

1. Before beginning the software installation, refer to the "Software Installation and Upgrade Procedure" section of the Software Release Description. This section contains a description of any special considerations required when installing this version of software.

2.  **NOTE 1:**

This procedure uses the "**cpy-prog**", "**ins-prog**", or "**apply**" command to install a new executing or dormant software program in a remote in-service DDM-2000 OC-3 shelf. It is assumed that the local shelf has already been upgraded and the software is executing normally or has been installed as a dormant copy. For procedures to download software in a new shelf (initial installation), see **DLP-561**. For procedures to download software to a local in-service shelf, see **DLP-532**.

Verify that no DCC failures or transmission failures (OC-3 LOS, flashing **OLIUFault** LEDs, etc.) are present on the network element or system receiving the program.

3. Use "**rtrv-fecom/set-fecom**" command to verify/enable far-end communications (fecom).
4.  **CAUTION:**
***TIMING** slot 2 should always be equipped with a **TGS** circuit pack and be active prior to software download. To clear a "**C**" condition from the **SYSCTL FE ID** display, procedures will require removal of the **TGS** circuit pack from **TIMING** slot 1 to force the system to run the new software. See Table A.*

Table A. DDM-2000 OC-3 In-Service Upgrade Compatibility

Current Release in Shelf (OLD)	Software Release To Be Installed (NEW)						
	Linear		Ring				
	8.0	8.1.n	7.2.n	9.0.n	9.1.n	11.0.n	11.1.n
7.1.n or earlier	NA	NA	C	C	C	C	C
7.2.n (Ring)	NA	NA	X	C	C	C	C
8.0.n (Linear)	X	X	C	C	C	C	C
8.1.n (Linear)	NA	X	NA	C	C	C	C
9.0.n (Ring)	NA	NA	NA	X	X	X	X
9.1.n (Ring)	NA	NA	NA	NA	X	X	X
11.0.n (Ring)	NA	NA	NA	NA	NA	X	X
11.1.n (Ring)	NA	NA	NA	NA	NA	NA	X

C - Indicates software incompatibility. Upon completion of the software download, a "C" will be displayed in the **SYSCTL FE ID** display. This is a caution indicating that the newly installed software has major changes from the previous release. Transmission will not be affected but shelf access, protection switching, alarm reporting, and control functions will be disabled while the "C" is displayed. You must verify that the correct software version has been downloaded and that a "C" was expected as a result of the download (See Table above). After verifying that the correct software download occurred, the system may be forced to run the new software by following the steps provided in this procedure.

NA - Not Applicable. If an NA conversion is required, contact your local technical support organization.

X - Indicates software compatibility. Download procedures will not require the system to be forced to run the software installed. No "C" should appear in the **SYSCTL FE ID** display. Other equipment/fiber changes and/or software/equipment provisioning may be required before and/or after the upgrade. See **System Turnup: IXL-001** for particular upgrade procedures and the Software Release Description for the software release being installed.

⇒ NOTE 1:

If a linear shelf is in the STS3c mode (**concat** mode enabled by the "**set-oc3**" command) and a different software generic that does not have the STS3c feature is loaded, the **OLIUs** will stay in the **concat** mode until they are removed and reseated.

⇒ NOTE 2:

When the "**ins-prog**" or "**cpy-prog**" command is used for software upgrades from Release 9.1 to Release 11, or later, the software is loaded as a dormant copy in the **SYSC** receiving the software. At the end of the download, the "**rtrv-alm**" report will show a status message of "*dormant/exec code mismatch*". The "**apply**" command must be used to overwrite the original executing copy of software with the new dormant software version. See the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the "**apply**" command.

Before performing this procedure, ensure that both **TGS** circuit packs are installed in the shelf receiving the program, then use the "**switch-sync:s=circuitpack,pri>manual**" command to switch to the protection **TGS** circuit pack in **TIMING** slot 2, if not already **ACTIVE**. Use "**rtrv-sync:**" command to verify that the **TGS** circuit pack in **TIMING** slot 2 is **ACTIVE**.

5. ⇒ NOTE 1:

If you want to load new software to a remote shelf (if allowed) directly **from a PC**, use the "**ins-prog:tid**" command where the TID entered is that of the remote shelf where you want to install the new software. For OC-3 Release 9.0 and earlier, only one "**ins-prog:**" per **term** session is permitted. After using the "**ins-prog:tid**" command to download software to one shelf, you must exit **term** (Alt F2) and re-execute **term** before starting a second "**ins-prog:**" command. If **term** is not exited, it will stop running if a second "**ins-prog:**" is started within the same **term** session. The PC will not respond or return any message and the "**ins-prog:**" will not progress.

⇒ **NOTE 2:**

If remote software downloading is allowed and you want to load new software to a remote site via the DCC **from a local shelf** which already contains the new software, log in (either locally or remotely) to the shelf containing the new software, and then enter the "**cpy-prog:tid**" command (where *tid* = the tid of the shelf in which you want to install the software). [The tid is the name given to a shelf (network element) using the "**set-ne:**" command.] The "**cpy-prog:tid**" command will only copy software from a local controller to a remote controller; it is not used to download software from a PC.

⇒ **NOTE 3:**

The download time will be longer (even without excessive DCC traffic) when there are additional spans between the source and target network elements. To minimize the download time and reduce DCC traffic, it is recommended that multi-span software downloading be avoided by remotely logging into the nearest shelf of the same type and remotely downloading the new program from that shelf.

⇒ **NOTE 4:**

When upgrading from releases without synchronization messaging to releases with this feature, it is suggested to upgrade first the shelves which are provisioned for "external timed" or "external mult" timed. This is to prevent timing "holdover" conditions at nodes that derive timing from the OC-3 line.

Are you using "**cpy-prog**", "**ins-prog**", or "**apply**" command to download software to far-end shelf?

If **CPY-PROG**, then continue with **Step 6**.

If **INS-PROG**, then proceed to **Step 13**.

If **APPLY**, then proceed to **Step 34**.

6.  **CAUTION:**
*Only one "**cpy-prog**" procedure at a time should be performed in the same maintenance subnetwork. Simultaneous "**cpy-prog**" procedures in the same network may fail.*

Connect and establish session with local shelf being used as a source for the new remote program download.

Reference: **DLP-521**

7. Enter the command "**cpy-prog: tid**"
Where tid = the target identifier (shelf name) for the remote DDM-2000 shelf receiving the new program.

Response: /* Testing For Program Installation... */

After several seconds, the PC prints a Caution!
message followed by the prompt:

Execute? y/n =.

8. Was response correct?
If **YES**, then continue with **Step 9**.
If **NO**, then do **Trouble Clearing: TAP-116**.

9. Enter a *y* or *yes* and a carriage return to execute the program. Software download may take up to 20 minutes.

Response: **ABN** LED lights on User Panel. A "**P.**" is displayed in **SYSCTL FE ID** display in the far-end shelf receiving the program (for uncompressed executing copy download, not if dormant copy is being loaded). At DDM-2000 shelves connected directly to the shelf receiving the program, **MJ** and **NE ACTY** LEDs light on User Panel and **FAULT** LED flashes on **OHCTL**. At other shelves in the same control system, **MJ** and **FE ACTY** LEDs light on User Panel. Download begins and the following message is displayed:

In progress

The dots continue to print until program installation is complete. After installation is completed, the PC prints the following completion message:

```
ins-prog: TID COMPLD
/* Generic a.b.c is installed */
```

The LEDs go off on the User Panel and **SYSCTL**.

10. Was response correct?
If **YES**, then proceed to **Step 27**.
If **NO**, then continue with **Step 11**.
11. Wait approximately 10 minutes for network to stabilize then repeat this procedure from Step 7. If the second attempt to download software fails, then do **Trouble Clearing: TAP-116**. You may have to go to the remote site.
12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13.  **NOTE:**
If you are using a PC operating in a *Windows*^{*} environment, you must **exit** *Windows* and restart your PC in *MS-DOS*^{*} mode before performing these download procedures. For example, if your PC is running *Windows 95* you must exit *Windows* by clicking on the **Start** button, then **Shut Down**, then **Restart the computer in MS-DOS mode**.

Obtain equipment, check software, and connect PC for download.

Reference: **DLP-566**

14.  **NOTE:**
The **FE ID** display on the remote **SYSCTL** must show one of the following preceding software installation. Other conditions represent failure conditions or conditions that will not allow a remote software download.
- A. The letter (**P.**) displayed in the **FE ID** display indicates that a previous software download has failed and you may be able to download software from another shelf, or locally. Try again to download software from same shelf. If there is no period after the (**P**), the software can only be downloaded locally using the procedures of **DLP-532**.
 - B. Nothing displayed in the **FE ID** display indicates that compatible software is installed in the **OHCTL** and **SYSCTL** and you may download software remotely if remote software downloading is permitted for this release.

Ensure PC is connected to the front CIT (CIT-1). If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

* Registered trademark of Microsoft Corporation.

15. Enter **term** or **term COM n** command, where $n = 1$ or 2 . If **term** is entered without the **COM n** option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "Can't find script <init>", disregard it.

Response: Two brief messages are printed and you are instructed to Press any key to continue . . . after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows:
Interface ready. (Type Alt-h for help.)
Communications established.

16. **⇒ NOTE:**

The default shelf is the shelf physically connected to the PC. To set baud rate automatically, enter two carriage returns (<cr>), two lower case "a"s (**aa**), or two upper case "A"s (**AA**). All other characters are ignored.

Enter two carriage returns.

Response: PC prompts with:
/* Enter a shelf number from 1 to 8 */
shelf [default] =

17. Was response correct?
If **YES**, then proceed to **Step 19**.
If **NO**, then continue with **Step 18**.
18. Check PC to **CIT** port connections. Make sure the cable is connected between the PC **COM()** port and the **CIT** connector on the DDM-2000. If the rear **CIT** connector is being used on the DDM-2000, make sure a null modem is installed on the port. Check term setup and make sure the **com** port selected matches the port (**COM()**) on the PC that is connected to the **CIT** port on the shelf. If CIT bay mult cabling is connected to this shelf verify that it is terminated.

Exit term (Alt-F2) and repeat this procedure from Step 14.

19. Enter the shelf number for the local shelf being used for new program download.

Response: PC responds with:

```
login<
password<

/*****
*
*
*      Lucent Technologies
*      DDM-2000 OC-3 Multiplexer
*
*      Release a.b.c
*
*****/

      .
      .
      .

TID date time
M rtrv-alm: all COMPLD
/* Active Alarms and Status Report
```

20.  **NOTE:**
After the system prompt (<), the system will respond normally to commands entered. The "Commands and Reports" section of this manual gives a description of the commands.

Use "**rtrv-map-network**" command to retrieve the name (*tid*) of the remote shelf having new program installed.

21. Enter the command "**ins-prog: tid**"
Where tid = the target identifier (shelf name) for the far-end DDM-2000 shelf having the new program installed.

Response: /* Testing For Program Installation... */
After several seconds, the PC prints a Caution!
message followed by the prompt:
Execute? y/n =.

22. Was response correct?

If **YES**, then continue with **Step 23**.

If **NO**, then do **Trouble Clearing: TAP-116**.

23. Enter a *y* or *yes* and a carriage return to execute the program. Software download may take up to 45 minutes.

Response: **ABN** LED lights on User Panel. A "**P.**" is displayed in **SYSCTL FE ID** display in the far-end shelf receiving the program (for uncompressed executing copy download, not if dormant copy is being loaded). PC starts download and prints the following message:

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress

The dots continue to print until program installation is complete. If floppy disks are being used, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog: TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets, and the terminal is logged off the system. The LEDs go off on the User Panel and **SYSCTL**.

24. Was response correct?

If **YES**, then proceed to **Step 27**.

If **NO**, then continue with **Step 25**.

25. Wait approximately 10 minutes for the network to stabilize, exit **term**, then repeat this procedure from **Step 14**. If the second attempt to download software fails, do **Trouble Clearing: TAP-116**. You may have to go to the remote site.

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

27. Wait approximately 5 minutes then verify communications can be reestablished with far-end shelf using "**rtrv-map-network**" command. Verify that *Comm. Status* is good (not *FAILED*) as indicated by a blank in the report.
28. Is communication status good between local and remote shelf?
 If **YES**, then proceed to **Step 31**.
 If **NO**, then continue with **Step 29**.
29. Dispatch technician to remote site and perform local software download procedures.

Reference: **DLP-532**

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
31. Use "**rlgn:tid**" command to remotely login to far-end shelf.

Reference: **DLP-522**

32.  **NOTE:**
 If a dormant copy was loaded into the far-end shelf and its release version is different than the currently executing version, a status alarm message of "*dormant/exec code mismatch*" will appear in the "**rtrv-alm**" report.

Use "**rtrv-alm**" command at far-end shelf to check for alarm status message of "*dormant/exec code mismatch*".

33. Does alarm report indicate "*dormant/exec code mismatch*"?
 If **YES**, then continue with **Step 34**.
 If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. **NOTE:**

The software you downloaded to the remote shelf has been loaded as a dormant copy. The original software is still the executing software. The "**apply**" command must be used at the remote shelf to install the dormant copy of software as an executing copy. When the "**apply**" command is executed during an upgrade from Release 9.1, there is a 30-minute delay before the dormant copy installation begins.

When the "**apply**" command is executed during an upgrade from Release 11.0 to later releases, if you do not specify a *time* and *date* parameter, there is a default 15-minute delay before the dormant copy installation begins. Once the installation begins, the dormant copy is installed in approximately 10 minutes.

See the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for a description of the "**apply**" command. The "**apply**" command allows you to coordinate the software download across the network.

Are you going to use the "**apply**" command at this time to load the dormant version of software to replace the current executing software?

If **YES**, then continue with **Step 35**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

35. Use the "**rlgn:tid**" command to login to the remote shelf, then use the "**rtrv-ne:**" command to verify the *Dormant_Version* release.
36. Is the *Dormant_Version* release number listed and correct?
If **YES**, then continue with **Step 37**.
If **NO**, then proceed to **Step 39**.
37. Execute the "**apply**" command.

Response: At the local shelf, a "**P**" appears in the **FE ID** display when the installation begins.
The **SYSCTL** resets after the software is installed.
LEDs and **FE ID** display go off on **SYSCTL** and User Panel.
The remote login session is terminated.
After approximately 10 minutes, you can remote login again to the remote shelf.
38. Was response correct?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then proceed to **Step 40**.
39. If the *Dormant_Version* release number is not listed, the dormant software is missing or corrupted. You will have to load new software.
40. Repeat this procedure to load new software using the "**cpy-prog**" or "**ins-prog**" command. If software installation fails again, you may have to dispatch a technician to the remote site to perform trouble clearing procedures, replace the **SYSCTL**, and/or install software locally using the procedures of **DLP-532**.
41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Provision STS-1 Path Trace

OVERVIEW: This procedure is used to provision the transmit and receive path trace fields of an STS cross-connected STS-1 signal. Path trace is only applicable to STS paths terminating to a **BBG4B DS3** circuit pack because it is an STS-1 terminating device. This procedure can be performed from any network element in a DDM-2000 OC-3 network. See the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for additional information on the **set-trace-sts1** and **rtrv-trace-sts1** commands.

1. If required, condition the CIT and connect it to the local DDM-2000 network element.

Reference: **DLP-521**

2. From office records, determine which DDM-2000 OC-3 network elements are the source and destination terminating network elements for the STS-1 path(s) to be traced.

3.  **NOTE:**

When performing this test, one DDM-2000 terminating shelf will be referred to as the near end and the other terminating shelf as the far end. These designations are arbitrary; either shelf can be the near-end or the far-end shelf.

Establish a login to the near-end terminating shelf.

4. Use the command **rtrv-crs-sts1** to determine the address of the STS-1 drop at each terminating location.

5. **⇒ NOTE 1:**

The path trace string may be up to 62 character long. The transmit (*trc*) and receive (*exptrc*) strings should be different within the same location; however, the *exptrc* from one location must identically match the *trc* at the other location.

⇒ NOTE 2:

Trace strings are case sensitive. Be sure to match capitals and lower case entries in the trace (*trc*) message at the near-end with the expected trace (*exptrc*) message at the far-end.

From office records, determine the path trace character string for each STS-1 path to be traced (path is between the source and destination network elements).

6. Use **set-trace-sts1:**

address:exptrc=ExpectedIncomingPathTrace, trc=OutgoingPathTrace command to provision the near-end Expected Incoming Path Trace (*exptrc*) string and near-end Outgoing Path Trace (*trc*) string.

7. Establish remote login to the far-end STS-1 terminating network element.

Reference: **DLP-522**

8. Use **set-trace-sts1:**

address:exptrc=ExpectedIncomingPathTrace, trc=OutgoingPathTrace command at the far-end to provision the Expected Incoming Path Trace (*exptrc*) string the same as you did for the *trc* string at the near-end terminating element. Provision the Outgoing Path Trace (*trc*) string the same as you did for the *exptrc* string at the near-end terminating element.

9. Use **rtrv-trace-sts1:address** command to retrieve the provisioned transmit and receive path trace strings for the STS-1 channel being tested.

10. Did the STS-1 Path Trace Report indicate Status: GOOD?
If **YES**, then proceed to **Step 14**.
If **NO**, then continue with **Step 11**.
11. Did the STS-1 Path Trace Report indicate Status: MISMATCH?
If **YES**, then proceed to **Step 13**.
If **NO**, then continue with **Step 12**.
12. Indications are that there is no incoming path trace message (Status: UNAVAILABLE). Verify that both terminating nodes are using **BBG4B DS3** circuit packs. Verify cross-connections and terminating addresses at all nodes. Repeat this test from Step 9.
13. Indications are that the Incoming Path Trace string message (INCTRC) does not match the Expected Path Trace string message (EXPTRC) — (Status: MISMATCH). Verify that the path string entered as the Expected Incoming Path Trace (EXPTRC) at this node matches exactly the Outgoing Path Trace string (TRC) entered at the other terminating node. circuit packs. Verify cross-connections and terminating addresses at all nodes. Repeat this test from Step 9.
14. Has the **rtrv-trace-sts1:address** command been performed at both terminating ends?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then continue with **Step 15**.
15. Log out of remote location. Repeat this test from Step 9. for the other terminating end.

Establish New Alarm Group System In-Service

OVERVIEW: This procedure establishes a new alarm group in an in-service system. It requires that a new AGNE be designated and new alarm group numbers be assigned to associated network elements. See the "Commands and Reports" section in 363-206-280, *DDM-2000 OC-3 Multiplexer, Releases 8.0 through 11.1, User/Service Manual—Volume I*, for additional information on the **set -ne** command.

1. If required, condition CIT and connect it to the local DDM-2000 network element.

Reference: **DLP-521**

2. Use the **rtrv-map-network** command to display all network elements that are a part of this network (associated with the same DSNE). Note the various *Alarm Group* numbers associated with each network element.
3. One at a time, log into a shelf in each alarm group that exists now and use the **rtrv-alm** command to verify that no alarms exist in any alarm group. If any alarms exist, they must be cleared before establishing a new alarm group.
4.  **NOTE:**
All network elements in the same alarm group must have the same alarm group number (**almgrp=1** through **255**).

From office records or work order, determine which DDM-2000 network element will be the new AGNE for the new alarm group. Determine new alarm group number (1-255) for the new AGNE and each associated network element.

5. From office records or work order, determine which DDM-2000 network elements will be in the same alarm group (*almgrp*) with the new AGNE.

6. Use **set-ne:tid=tid,agne=yes,almgrp=(1 through 255)** command to designate the new AGNE and its alarm group number.
7.  **NOTE:**
Other network elements of the same alarm group may be provisioned as backup AGNEs if required.

At each network element in the new alarm group, use **set-ne:tid=tid,agne=yes or no,almgrp=(1 through 255)** command to assign the new alarm group number.

8. Wait a few minutes, then verify that alarms are clear. Use the **rtrv-map-network** command to verify that all required network elements have been changed to the new alarm group.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Sync Messaging Change Kbyte to Sbyte

1. **⇒ NOTE:**
This procedure may be used to change Kbyte sync messaging to Sbyte sync messaging.

Use **rtrv-alm** command to verify that there are no alarms or protection switches present on the system.

2. **⇒ NOTE 1:**
To minimize the amount of time that DDM-2000 shelves are in holdover mode when upgrading a ring network from Kbyte to Sbyte messages, it is recommended that you first upgrade the node(s) farthest away from the external timing source, then proceed to nodes closer to the timing source. For example, if all the line timed nodes in the network shown in Figure 1 had their *Sync Source (src)* set to *main1*, the farthest node from the external timing source would be Node D.

⇒ NOTE 2:
Note that in Figure 2, if Node B is changed to Sbyte first, then Node C will go into holdover. Note that in Figure 3, if Node D is changed to Sbyte first, then Node C and Node B, none of the nodes will go into holdover.

Use the **rtrv-sync/set-sync** command at each node in the network to display/set the synchronization source.

3. Use **rtrv-oc3/set-oc3:** command to verify/enable sync messaging (kbyte) at each node.
4. Determine the farthest node from the external timing source.

5. Use **set-oc3:syncmsg=Sbyte** command to enable Sbyte sync messaging at each node, starting from the node furthest from the external timing source.
6. Use the **rtrv-sync** command to display the provisioning and operational information of the synchronization interface.
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

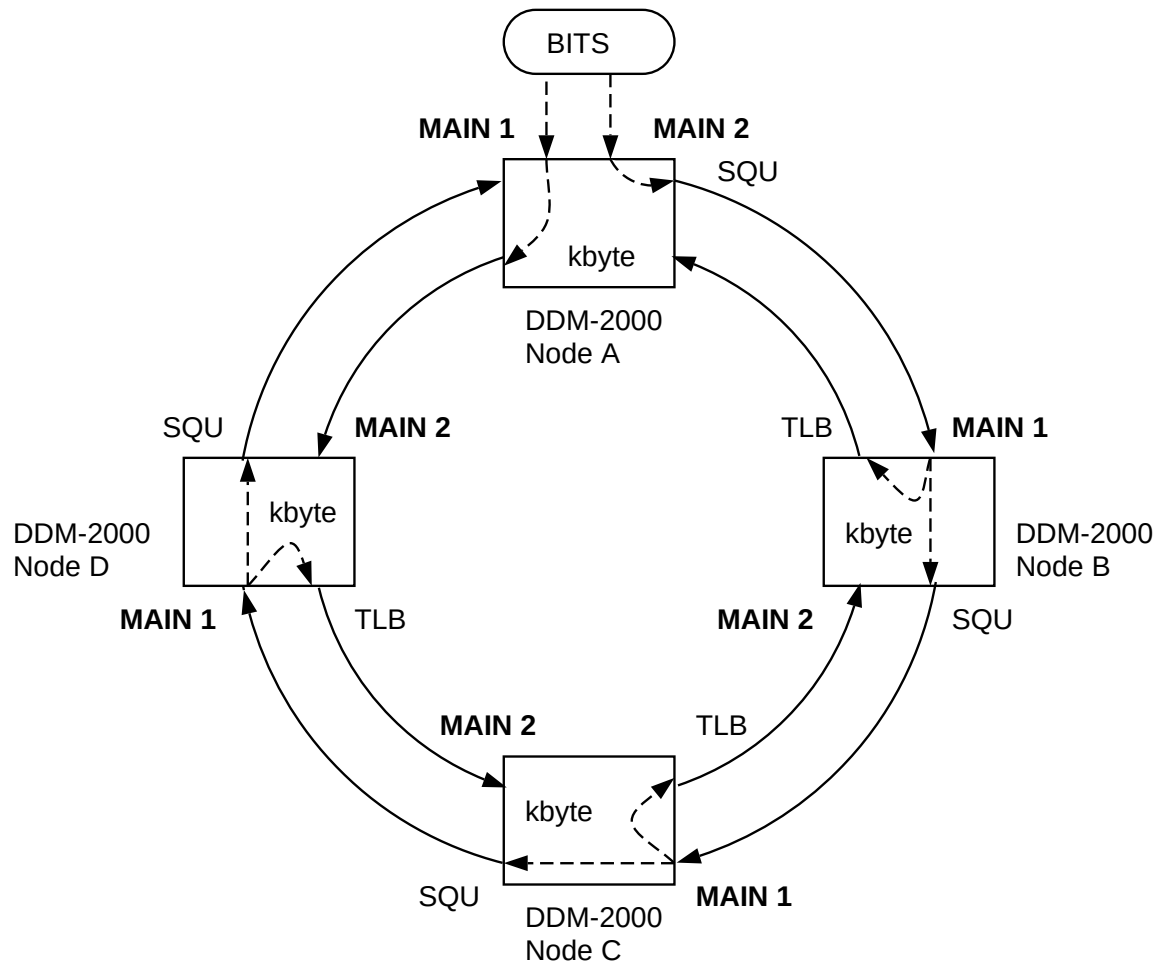


Figure 1. Normal OC-3 Ring Using Kbyte Messaging

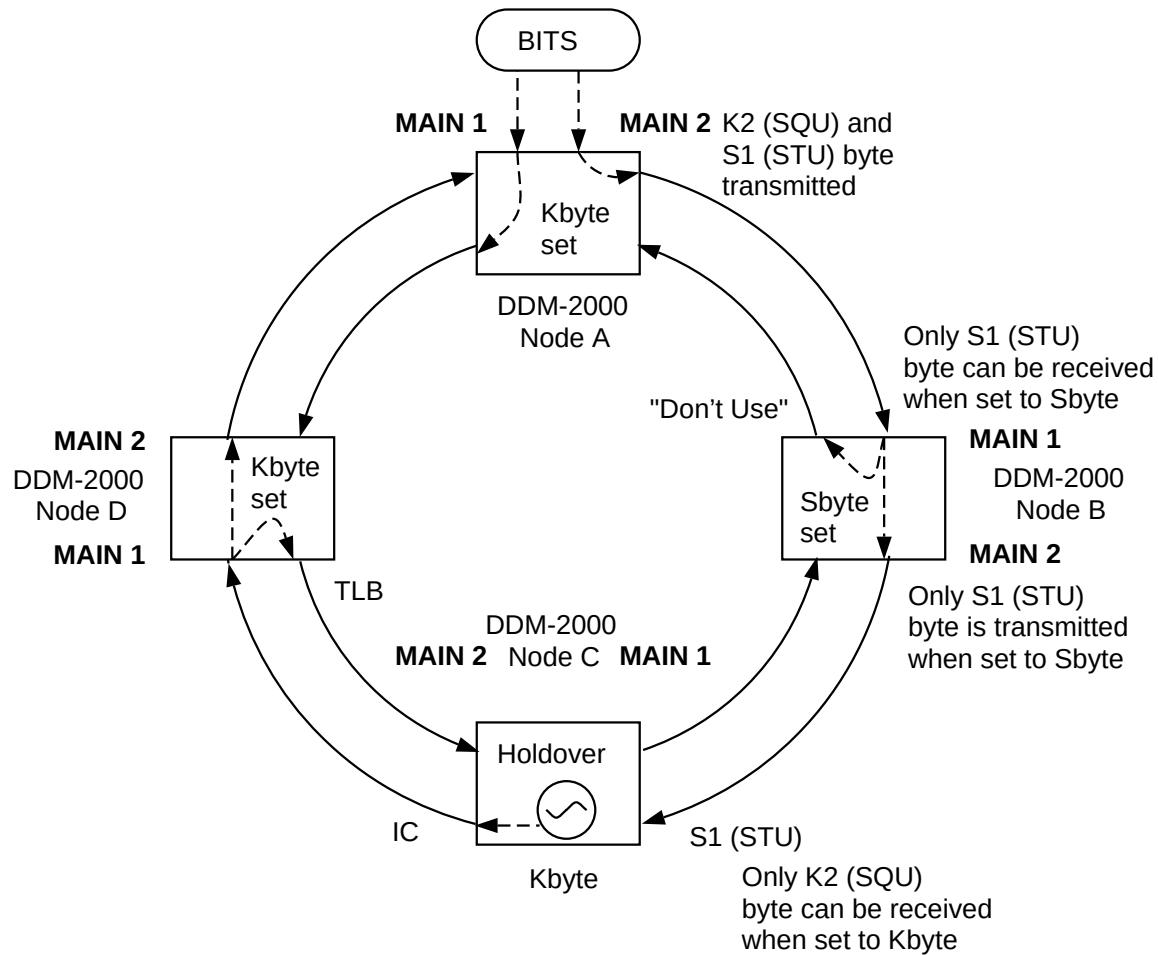


Figure 2. Abnormal Sequence of Changing Kbyte to Sbyte - One Node in Holdover

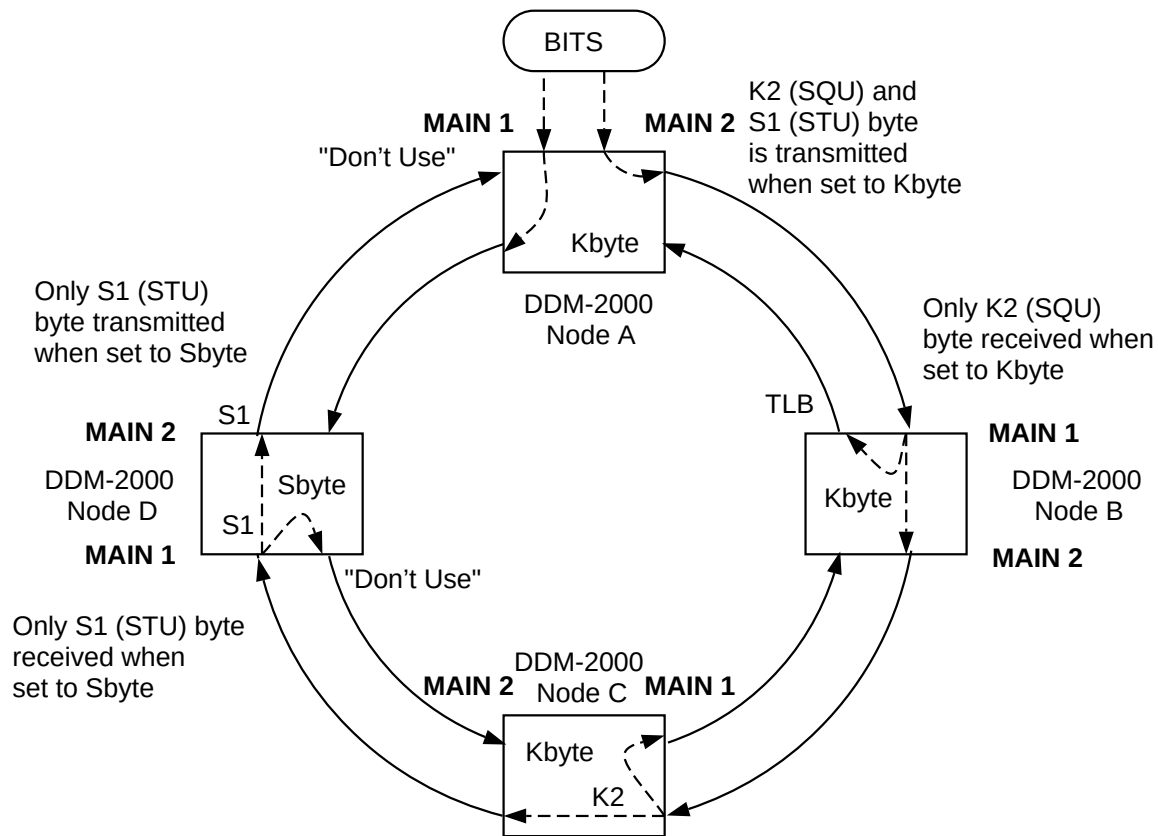


Figure 3. Normal Sequence of Changing Kbyte to Sbyte

Obtain Equipment, Check Software, Prepare and Connect Personal Computer (PC) for Software Download

1. Obtain the following equipment:

- (1) *IBM*^{*} compatible PC running an *MS-DOS*[†] computer program operating system, Release 2.1 or later.
- (2) RS-232 cable to connect PC **COM** port to User panel craft interface terminal (**CIT**) port.

⇒ **NOTE:**

The PC may be connected to either the front or rear CIT port, or remotely through a dial-up modem. If connected to the rear **CIT** port, a null modem is required between the RS-232 cable and the rear **CIT** port.

- (3) Working copies of the new system generic program diskette(s).
- (4) Software Release Description for software being installed.

* Registered trademark of International Business Machines Corporation.

† Registered trademark of Microsoft Corporation.

2. Before beginning the software installation procedure, the following is strongly suggested:
 - a. Become familiar with the characteristics and operating procedures of your PC and the *MS-DOS* operating system.

Reference: **DLP-533**

- b. Operate laptop PCs on AC power during download procedures.
 - c. Follow proper procedures in handling the diskette(s) (floppies).

Reference: **DLP-533**

- d. Make working copies and backup copies of the original new generic program diskettes.

Reference: **DLP-534**

- e. **Read the Software Release Description for software being installed.**
3. Before beginning the software installation, refer to the Software Release Description for the software being installed for a description of any special considerations required when installing this version of the software.
4.  **NOTE:**

If you are using a PC operating in a *Windows*[‡] environment, you must **exit** *Windows* and restart your PC in *MS-DOS* mode before performing these download procedures. For example, if your PC is running *Windows 95* you must exit *Windows* by clicking on the **Start** button, then **Shut Down**, then **Restart the computer in MS-DOS mode**.

Start *MS-DOS* operating system on the PC [**DLP-534**].

Response: PC displays the prompt (for example, C>, C:\DOS>) determined by the PC.

[‡] Registered trademark of Microsoft Corporation.

5. If you are going to use the PC hard disk to load software to the shelf, **copy** all files on the source diskettes(s) (floppies) to a directory on the hard disk (for example, GEN_1111 for generic version 11.1.1).
6. If you are going to load the software from the hard disk, use the **cd** command to change to the appropriate hard drive directory containing the software.

If you are going to load the software from the floppies, use the appropriate *MS-DOS* command (for example, **a:** or **b:**) to go to the drive where the floppy disk will be installed.

Response: PC displays the appropriate prompt (A>, B>, C>, C:\DOS>, etc.) determined by the PC.

Comment: If you are using floppies and get a disk error message, verify the drive latch is locked and that you have the proper diskette installed in the drive.

7.  **NOTE:**
The new generic program may be on many floppy disks. If you are using the floppy disks, the PC will prompt you to insert disks as needed after the first disk is installed.

If you are using the floppy disks, insert the first (number 1) floppy disk into the PC drive.

8. **⇒ NOTE:**

The **checkpgm** command may take up to 25 minutes to complete.

Execute the command **checkpgm** to check the version number of the program you are installing. If using floppy disks, insert each diskette when prompted.

approx. 15 min. if using hard drive approx. 25 min. if using floppy drive

Response: PC has DDM-2000 program version a.b.c

9. **⇒ NOTE 1:**

The shelf rear access CIT port is configured for a modem. A null modem is required to use this port with the PC.

⇒ NOTE 2:

The cable from the **CIT** port on the DDM-2000 must be connected to the **COM (COM1 or COM2)** RS-232 port of the PC. If a "**P**" or "**d**" is displayed in the **FE ID** display, the PC must be connected to the front **CIT** port.

Connect PC to **CIT** port by connecting one end of an RS-232 cable to the **COM()** port of the PC and the other end of the cable to the front or rear DDM-2000 **CIT** port.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install BBF8 HDSL Circuit Packs

1.  **CAUTION:**
*Take care to avoid damaging the light emitting diodes (LEDs) that protrude through the opening in the faceplate of the **BBF8 HDSL** (High Density Digital Subscriber Line) circuit pack.*

 **NOTE:**
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Refer to Figure 1 and Table A and set option switches.

Table A. BBF8 HDSL Control Switch Settings

Control Settings	Switch S1 Settings			
	S1-1	S1-2	S1-3	S1-4
Master	—	OFF	—	OFF
Slave	—	ON	—	ON
Local	OFF	—	OFF	—
Remote	ON	—	ON	—

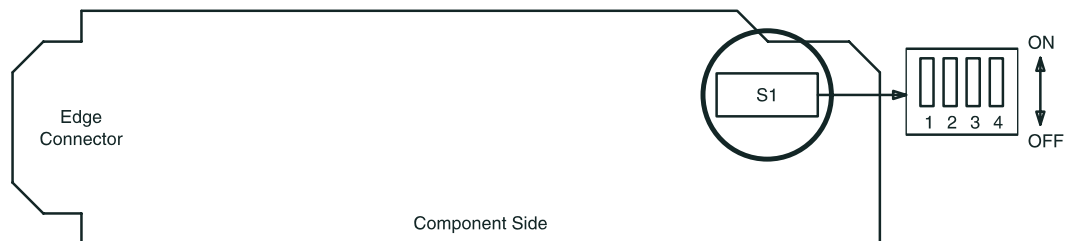


Figure 1. BBF8 HDSL Control Switch

2. **⇒ NOTE:**
A maximum of three **HDSL** circuit packs, including protection, can be installed with current **BBG2 MXRVO** circuit packs installed in the associated **LOW SPEED GROUP**.

Seat **HDSL** circuit pack in required slot of **LOW SPEED GROUP** being equipped.

Response: **FAULT** LED on **HDSL** circuit pack lights and may remain lighted for about 40 seconds and then goes off.

3. Repeat this procedure from Step 1 for each service **HDSL** circuit pack being installed.
4. **⇒ NOTE 1:**
One protection **HDSL** circuit pack may be installed in slot **8(P)** of each **LOW SPEED GROUP** being equipped.

If required, refer to Figure 1 and Table A and set option switches on protection **HDSL** circuit pack.

5. If required, install protection **HDSL** circuit pack into slot **8(P)** of **LOW SPEED GROUP** being equipped.

6. Install **177A** Retainer Cards into all unequipped service DS1 **LOW SPEED GROUP** slots.
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

