

Lucent Technologies
Bell Labs Innovations



**SLC[®] -2000 Multi-Services
Distant Terminal Feature**

User/Service and Ordering
Manual

363-205-004
Issue 6
August 1998

Copyright © 1997 Lucent Technologies. All Rights Reserved.

This material is protected by the copyright and trade secret laws of the United States and other countries. It may not be reproduced, distributed or altered in any fashion by any entity, including other Lucent Technologies Business Units or Divisions, without the expressed written consent of the Lucent Technologies Customer Training and Information Products Organization.

For permission to reproduce or distribute please contact:

Product Development Manager 1 917-386-2883

Notice

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.

Trademarks

4TEL and RMU are registered trademarks of Teledyne, Inc.

5ESS, BDJ, CSL Lightsplice, Flexterm, LGX, Lineage, QuickSnap, SLC, SPOTS, SPQ, and ST are registered trademarks of Lucent Technologies.

ANSI is a registered trademark of American National Standards Institute, Inc.

CLASS is a service mark of Bell Communications Research, Inc.

Ekstrom is a registered trademark of Ekstrom Industries, Inc.

FIBRLOK is a registered trademark of Minnesota Mining and Manufacturing Company.

Flextips is a trademark of Chemtronics, Inc.

FrameMaker is a registered trademark of Frame Technology Corporation.

Hoffman is a registered trademark of Federal Cartridge Corporation.

Kimwipes is a registered trademark of Kimberly-Clark Corp.

Lorain is a registered trademark of Reliance Comm/TEC Corporation.

MCU is a trademark of Tollgrade Communications, Inc.

National Electrical Code is a registered trademark of National Fire Protection Association, Inc.

NO-OX-ID is a registered trademark of Sanchem, Inc.

TRON is a registered trademark of Cooper Industries, Inc.

UL is a registered trademark of Underwriters Laboratories, Inc.

Velcro is a registered trademark of Velcro Industries B.V.

VerSuS is a registered trademark of Versus Technology, Inc.

Documentation Ordering Information

The ordering number for this document is 363-205-004. To order this document, call 1-888-LUCENT8. RBOC/BOC customers should process document orders or standing order requests through their Company Documentation Coordinator. For more ordering information, refer to "How to Order Documents" in the section "About This Manual".

Customer Assistance and Technical Support

Follow local procedures for obtaining technical assistance. Lucent Technologies also provides in-hours or emergency out-of-hours help for the SLC[®]-2000 Multi-Services Distant Terminal Feature. Call the Lucent Technologies Regional Technical Assistance Center (RTAC) at 1-800-225-RTAC.

Developed by Lucent Technologies Network Systems Customer Training and Information Products.

How Are We Doing?

Title: SLC®-2000 Multi-Services User/Service and Ordering Manual

Identification No.: 363-205-004 Issue No.: 6 Date: August 1998

Lucent Technologies welcomes your feedback on this Customer Information Product (CIP). Your comments can be of great value in helping us improve our CIPs.

1. Please rate the effectiveness of this CIP in the following areas:

	Excellent	Good	Fair	Poor	Not Applicable
Ease of Use					////////////////
Clarity					////////////////
Completeness					////////////////
Accuracy					////////////////
Organization					////////////////
Appearance					////////////////
Examples					
Illustrations					
Overall Satisfaction					////////////////

2. Please check the ways you feel we could improve this CIP.

☐ Improve the overview/introduction	☐ Make it more concise/brief
☐ Improve the table of contents	☐ Add more step-by-step procedures/tutorials
☐ Improve the organization	☐ Add more troubleshooting information
☐ Include more figures	☐ Make it less technical
☐ Add more examples	☐ Add more/better quick reference aids
☐ Add more detail	☐ Improve the index

Please provide details for the suggested improvement. _____

3. What did you like most about this CIP?

4. Feel free to write any comments below or on an attached sheet.

If we may contact you concerning your comments, please complete the following:

Name: _____ Telephone Number: _____

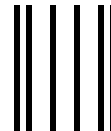
Company/Organization: _____ Date: _____

Address: _____

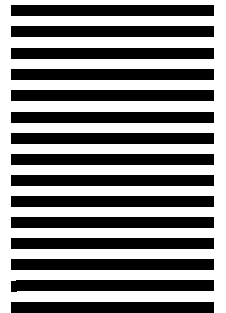
When you have completed this form, please fold, tape and return to address on back
or Fax to: 910 727-3043.

----- Do Not Cut — Fold Here And Tape -----

Lucent Technologies
Bell Labs Innovations



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1999 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

DOCUMENTATION SERVICES
2400 Reynolda Road
Winston-Salem, NC 27199-2029



How Are We Doing?

Title: SLC®-2000 Multi-Services User/Service and Ordering Manual

Identification No.: 363-205-004 Issue No.: 6 Date: August 1998

Lucent Technologies welcomes your feedback on this Customer Information Product (CIP). Your comments can be of great value in helping us improve our CIPs.

1. Please rate the effectiveness of this CIP in the following areas:

	Excellent	Good	Fair	Poor	Not Applicable
Ease of Use					////////////////
Clarity					////////////////
Completeness					////////////////
Accuracy					////////////////
Organization					////////////////
Appearance					////////////////
Examples					
Illustrations					
Overall Satisfaction					////////////////

2. Please check the ways you feel we could improve this CIP.

☐ Improve the overview/introduction	☐ Make it more concise/brief
☐ Improve the table of contents	☐ Add more step-by-step procedures/tutorials
☐ Improve the organization	☐ Add more troubleshooting information
☐ Include more figures	☐ Make it less technical
☐ Add more examples	☐ Add more/better quick reference aids
☐ Add more detail	☐ Improve the index

Please provide details for the suggested improvement. _____

3. What did you like most about this CIP?

4. Feel free to write any comments below or on an attached sheet.

If we may contact you concerning your comments, please complete the following:

Name: _____ Telephone Number: _____

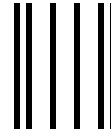
Company/Organization: _____ Date: _____

Address: _____

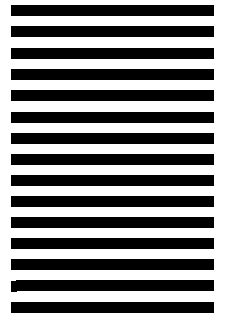
When you have completed this form, please fold, tape and return to address on back
or Fax to: 910 727-3043.

----- Do Not Cut — Fold Here And Tape -----

Lucent Technologies
Bell Labs Innovations



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1999 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

DOCUMENTATION SERVICES
2400 Reynolda Road
Winston-Salem, NC 27199-2029



Contents

About This Manual	xxv
■ Purpose	xxv
■ Intended Audience	xxv
■ Reason for Reissue	xxvi
■ How to Use This Document	xxvi
■ Conventions Used	xxvii
■ Product Safety Labels	xxviii
■ Lightwave Safety	xxviii
■ Electrostatic Discharge (ESD) Considerations	xxix
■ Customer Assistance and Technical Support	xxx
■ Related Documentation/Training	xxxi
■ How to Order Documents	xxxvi
■ How to Comment on This Document	xxxvi

1	Overview	1-1
	■ What Is the <i>SLC</i> [®] -2000 Access System MSDT Feature	1-1
	■ MSDT With Optical Feeder — Fiber in the Loop (FITL)	1-2
	■ MSDT With Metallic Feeder	1-4
	■ MSDT Fed Through a Fiber Services Module (FSM)	1-5

2	Application Considerations	2-1
	■ Introduction	2-1
	■ HDT Site Options	2-1
	■ MSDT Site Options	2-5
	■ HDT to MSDT Facilities	2-10
	■ MSDT Sharing	2-15
	■ Bandwidth Management	2-17
	■ MSDT Powering	2-20

Contents

■ Rural Applications	2-30

3	Physical and Functional Description	3-1
■	Introduction	3-1
■	Central Office Terminal/Switch	3-1
■	Host Digital Terminal (HDT) — SLC®-2000 Access System	3-1
■	Host Digital Terminal — SLC Series 5 Carrier System	3-32
■	Special HDT Application Considerations	3-46
■	HDT Central Powering Equipment	3-58
■	Multi-Services Distant Terminal	3-60
■	Installation and Maintenance Equipment	3-91

4	Administration and Maintenance	4-1
■	Introduction	4-1
■	Administration	4-1
■	Maintenance	4-10
■	Testing With Other Than MLT Equipment	4-81

5	Powering	5-1
■	Introduction	5-1
■	120 V AC Local Powering	5-1
■	-48 V DC Local Powering	5-2
■	-130 V DC Central Powering	5-6
■	±130 V DC Central Powering	5-10
■	-130 or ±130 V DC Peak Leveling Central Powering	5-14
■	60 V AC Central Powering	5-14

Contents

6	Technical Specifications	6-1
	■ General Specifications	6-1
	■ Physical and Environmental Specifications	6-25

7	Construction and Installation	7-1
	■ Introduction	7-1
	■ SLC [®] Series 5 HDT Installation	7-1
	■ SLC-2000 HDT Installation	7-23
	■ Multi-Services Distant Terminal Installation	7-38
	■ Distribution Fiber	7-80
	■ SLC-2000 MSDT Upgrade From Dual Mode to Quad Mode Operation	7-81

8	Operations and Maintenance — TOP	8-1
	■ Introduction	8-1
	■ How To Use This Document	8-2
	■ Safety Labels	8-3
	■ Equipment and Craft Personnel Considerations	8-4
	■ Turn-Up Summary	8-4
	■ Numerical List of TOP Procedures	8-5

A	Circuit Pack Data Sheets	A-1
	■ Introduction	A-1

Contents

B	Fiber Service Module (FSM)	B-1
	■ Introduction	B-1
	■ Functional Description	B-1
	■ Physical Description	B-4
	■ FSM Installation Procedures	B-19
	■ FSM Cable Acceptance Tests	B-29
	■ FSM End-to-End Acceptance Procedures	B-38
	■ Glossary	B-54

C	Ordering	C-1
	■ Introduction	C-1
	■ Remote Terminal Location	C-4
	■ SLC-2000 MSDT Equipment	C-19
	■ Powering Equipment	C-25
	■ Maintenance Equipment	C-28
	■ Documentation	C-29
	■ MSDT Service Configurations	C-32
	■ Ordering Examples	C-36

Figures

About This Manual

1

Overview

1-1	Generic Fiber-in-the-Loop Architecture	1-2
1-2	<i>SLC</i> [®] -2000 MSDT System Architecture	1-3
1-3	<i>SLC</i> [®] -2000 MSDT With Metallic Interface	1-4
1-4	<i>SLC</i> [®] -2000 Fiber Services Module — Typical Configurations	1-5

2

Application Considerations

2-1	<i>SLC</i> [®] -2000 MSDT System in Long-Loop and Short-Loop Configurations	2-3
2-2	Typical <i>SLC</i> [®] -2000 MSDT Pedestal Enclosure	2-6
2-3	Typical <i>SLC</i> [®] -2000 MSDT Strand-Mounted (Aerial) Enclosure	2-7
2-4	Typical <i>SLC</i> [®] -2000 MSDT Rack-Mounted Configuration	2-8
2-5	HDT to MSDT — Optical Facility	2-11
2-6	HDT to MSDT — T1 Metallic Facility	2-12
2-7	<i>SLC</i> [®] -2000 MSDT With HDSL Facility	2-13
2-8	Four MSDTs Served From a 6-Mb/s Multiplexer	2-14
2-9	DS0 and DS1 Service Using 6-Mb/s Multiplexer	2-15
2-10	Increased Sharing of MSDTs Using Subtending Copper Terminal Pedestals	2-16
2-11	FITL Local Powering	2-21
2-12	FITL Central Powering	2-23
2-13	Central Powering Over Coax	2-27
2-14	Hardware Elements for Central Powering Over Coax	2-28
2-15	Multiple MSDTs Powered From Coax Bus — Configuration Example	2-29

Figures

2-16	Generic Five-Branch Route — Copper and Fiber Alternatives	2-32
2-17	<i>SLC</i> [®] -2000 MSDT with Metallic Interface	2-34

3 Physical and Functional Description

3-1	<i>SLC</i> [®] -2000 Host Digital Terminal (HDT) Bay Layout for FITL	3-2
3-2	<i>SLC</i> [®] -2000 HDT 80A-HX Cabinet Layout for FITL	3-3
3-3	<i>SLC</i> [®] -2000 HDT 80D-HX Cabinet Layout for FITL	3-4
3-4	VFDE Feature	3-13
3-5	Basic HDT/MSDT Interfaces	3-15
3-6	Server Pairs in an MDS Assembly — Prior to Release 4.5	3-17
3-7	Server Pairs in an MDS Assembly — Release 4.5 or later in Noncabinet Equipment	3-19
3-8	MSDT Servers	3-22
3-9	High Density Optics Shelf (HDOS) Assembly [J1C265AC-1, L3 (<i>SLC</i> [®] -2000)]	3-24
3-10	<i>SLC</i> [®] -2000 HDT MSDT Server and HDOS OU Placement	3-26
3-11	<i>LGX</i> [®] Lightguide Distribution Frame	3-30
3-12	<i>LGX</i> [®] Fiber Optic Distribution Frame Termination Shelf	3-31
3-13	<i>SLC</i> [®] Series 5 HDT Bay Layout for FITL	3-33
3-14	Typical <i>SLC</i> [®] Series 5 HDT 80A-BP Cabinet Layout for FITL	3-34
3-15	Typical <i>SLC</i> [®] Series 5 HDT 80E-BP Cabinet Layout for FITL With Central Powering Equipment	3-35
3-16	AUA406 and AUA408 MSDT Server Channel Units	3-37
3-17	<i>SLC</i> [®] Series 5 HDT CU Bandwidth Management	3-38
3-18	High Density Optics Shelf (HDOS) Assembly (J1C265AC-1, L2) (<i>SLC</i> [®] Series 5 Systems)	3-45
3-19	MSDT DSX-1 Connections	3-56
3-20	-130 Volt Central Powering System Architecture	3-59

Figures

3-21	<i>SLC</i> [®] -2000 MSDT Physical Arrangement (Fiber)	3-61
3-22	<i>SLC</i> [®] -2000 MSDT Physical Arrangement (Metallic)	3-62
3-23	MSDT Card Cage	3-63
3-24	MC97780A1 or MC97789A1, MC97793A1, and MC97794A1 Backplane Interface Unit	3-65
3-25	BYB1B, BYB1C, BYB5 Optical Unit and BYB2 Line Interface Unit	3-67
3-26	AUA411/AUA411B Channel and Drop Test Unit	3-68
3-27	AUA412 and AUA417 Power Converter Units	3-70
3-28	AUA422 and AUA427 Power Converter Units	3-71
3-29	AUA413 and AUA423 Ringing Generator Units	3-72
3-30	AUA414, AUA415(DA), AUA416, AUA424, AUA426, AUA434, and AUA436 Power Interface Units	3-75
3-31	Field Wiring Box for 120 V AC Local Powering Options (ED-7C712-30, Groups 20 and 24)	3-79
3-32	Field Wiring Box for -48 V DC Local Powering Option (ED-7C712-30, Group 21)	3-80
3-33	Field Wiring Box for ±130 V DC Central Powering Option	3-81
3-34	Field Wiring Box for -130 V DC Central Powering Options (ED-7C712-30, Group 23) (Older Version)	3-82
3-35	Field Wiring Box for -130 V DC Central Powering Options (ED-7C712-30, Group 23) (Newer Version)	3-83
3-36	Field Wiring Box for 60 V AC Central Powering Options (ED-7C712-30, Group 24)	3-84
3-37	Typical <i>SLC</i> [®] -2000 Strand Mount MSDT Physical Arrangement	3-87
3-38	Typical <i>SLC</i> [®] -2000 Rack-Mounted MSDT Physical Arrangement	3-88
3-39	902A Underground MSDT	3-90
3-40	902A Underground MSDT Handhold Enclosure	3-90
3-41	J99409OB-1, L1 OBMK (Cover Removed)	3-92

Figures

4	Administration and Maintenance	
4-1	Provisioning Flowchart	4-3
4-2	Derived Feeder Record	4-5
4-3	MLT-2/PGTC DC Test Pair Test Paths for MSDT Testing Capability (<i>SLC</i> ® Series 5 Systems)	4-14
4-4	MLT-2/PGTC DC Test Pair Test Paths for MSDT Testing Capability (<i>SLC</i> ®-2000 Systems)	4-15
4-5	Integrated <i>SLC</i> ®-2000 Access System Testing	4-18
4-6	SAM Mask for Test Signature #1	4-22
4-7	TV Mask for Test Signature #1	4-23
4-8	SAM Mask for Test Signature #2	4-24
4-9	TV Mask for Test Signature #2	4-25
4-10	SAM Mask for Test Signature #3	4-26
4-11	TV Mask for Test Signature #3	4-27
4-12	SAM Mask for Test Signature #4	4-28
4-13	TV Mask for Test Signature #4	4-29
4-14	SAM Mask for Test Signature #5	4-30
4-15	TV Mask for Test Signature #5	4-31
4-16	SAM Mask for Test Signature #6	4-32
4-17	TV Mask for Test Signature #6	4-33
4-18	SAM Mask for Test Signature #7	4-34
4-19	TV Mask for Test Signature #7	4-35
4-20	SAM Mask for Test Signature #8	4-36
4-21	TV Mask for Test Signature #8	4-37
4-22	SAM Mask for Test Signature #9	4-38
4-23	TV Mask for Test Signature #9	4-39
4-24	SAM Mask for Test Signature #9 (Alternate)	4-40
4-25	TV Mask for Test Signature #9 (Alternate)	4-41
4-26	SAM Mask for Test Signature #10	4-42
4-27	TV Mask for Test Signature #10	4-43
4-28	SAM Mask for Test Signature #11	4-44
4-29	TV Mask for Test Signature #11	4-45
4-30	SAM Mask for Test Signature #12	4-46
4-31	TV Mask for Test Signature #12	4-47

Figures

4-32	SAM Mask for Test Signature #13	4-48
4-33	TV Mask for Test Signature #13	4-49
4-34	SAM Mask for Test Signature #14	4-50
4-35	TV Mask for Test Signature #14	4-51
4-36	Typical SAM Mask for Test Signature #50	4-52
4-37	Typical TV Mask for Test Signature #50	4-53
4-38	Typical SAM Mask for Test Signature #51	4-54
4-39	Typical TV Mask for Test Signature #51	4-55
4-40	Typical SAM Mask for Test Signature #52	4-56
4-41	Typical TV Mask for Test Signature #52	4-57
4-42	Typical SAM Mask for Test Signature #53	4-58
4-43	Typical TV Mask for Test Signature #53	4-59
4-44	Typical SAM Mask for Test Signature #54	4-60
4-45	Typical TV Mask for Test Signature #54	4-61
4-46	Typical SAM Mask for Test Signature #55	4-62
4-47	Typical TV Mask for Test Signature #55	4-63
4-48	Typical SAM Mask for Test Signature #56	4-64
4-49	Typical TV Mask for Test Signature #56	4-65
4-50	Typical SAM Mask for Test Signature #57	4-66
4-51	Typical TV Mask for Test Signature #57	4-67
4-52	Typical SAM Mask for Test Signature #58	4-68
4-53	Typical TV Mask for Test Signature #58	4-69
4-54	Typical SAM Mask for Test Signature #59	4-70
4-55	Typical TV Mask for Test Signature #59	4-71
4-56	Typical SAM Mask for Test Signature #60	4-72
4-57	Typical TV Mask for Test Signature #60	4-73
4-58	Typical SAM Mask for Test Signature #61	4-74
4-59	Typical TV Mask for Test Signature #61	4-75
4-60	Typical SAM Mask for Test Signature #62	4-76
4-61	Typical TV Mask for Test Signature #62	4-77

Figures

5

Powering

5-1	DC Backpowering Power Source	5-3
5-2	Power Source Enclosures	5-4
5-3	Typical -130 V DC CPS Equipment Arrangement in a 51A Cabinet	5-7
5-4	Typical -130 V DC CPS Equipment Arrangement in an 80A Cabinet	5-8
5-5	SLC [®] Series 5 Transmission and -130 V DC CPS Equipment in an 80E-BP Cabinet (Typical)	5-9
5-6	Typical +130 V DC CPS Equipment Arrangement in a 51A Cabinet	5-11
5-7	Typical +130 V DC CPS Equipment Arrangement in an 80A Cabinet	5-12
5-8	SLC [®] Series 5 Transmission and +130 V DC CPS Equipment in an 80E-BP Cabinet (Typical)	5-13
5-9	60 V AC Central Powering	5-15

6

Technical Specifications

6-1	SLC [®] Series 5 HDT Bay Layout	6-26
6-2	SLC [®] -2000 FITL HDT Bay Layout	6-28
6-3	SLC [®] -2000 80A-HX Cabinet FITL Layout	6-29
6-4	SLC [®] -2000 80D-HX Cabinet FITL Layout	6-30

7

Construction and Installation

7-1	SLC [®] Series 5 FITL HDT Bay Layout	7-3
7-2	HDOS Assembly (J1C265AC-1, L2)	7-5
7-3	SLC [®] Series 5 HDT Frame Interconnections	7-7
7-4	SLC [®] Series 5 HDOS Shelf Connections	7-9

Figures

7-5	<i>SLC</i> ® Series 5 External HDT Frame Connections—Digital Line and Miscellaneous	7-15
7-6	<i>SLC</i> ® Series 5 External HDT Frame Connections—Power and Alarm	7-16
7-7	Fiber Connection to the HDOS Assembly	7-18
7-8	Typical Detail of Shelf Optical Cabling Showing 12A1 Cable Clamps	7-19
7-9	Direct Termination of OSP Cables	7-21
7-10	<i>SLC</i> ®-2000 FITL HDT Bay Layout	7-25
7-11	High Density Optics Shelf (HDOS) Assembly (J1C265AC-1, L3)	7-27
7-12	<i>SLC</i> ®-2000 FITL HDT Frame Interconnections (Release 4.5 and Later)	7-31
7-13	<i>SLC</i> ®-2000 FITL HDT Frame DSX-1 Panel Cabling (Release 4.5 and Later)	7-32
7-14	Pole-Mounted MSDT Enclosure	7-40
7-15	Pad-Mounted MSDT Enclosure	7-42
7-16	Direct-Mounted MSDT Base—Cable Placements	7-44
7-17	Direct-Mounted MSDT Base	7-45
7-18	120 V AC Local Powering Connections to MSDT FWB	7-48
7-19	-48 V DC Local Powering MSDT FWB Connections	7-50
7-20	-48 V DC Local Powering MSDT FWB (Cover Open)	7-51
7-21	±130 V DC Central Powering MSDT FWB	7-53
7-22	-130 V DC Central Powering MSDT FWB (Older Version)	7-55
7-23	-130 V DC Central Powering MSDT FWB (Older Version) (Cover Open)	7-56
7-24	-130 V DC Central Powering MSDT FWB (Newer Version)	7-57
7-25	60 V AC Local Powering Connections to MSDT FWB	7-59
7-26	Fiber Drop Cable Routing and Connections	7-61
7-27	Looped Distribution Fiber Cable Routing and Connections	7-66
7-28	T1 Feeder Connection to MSDT	7-68
7-29	Copper Drop Cable Clamping Arrangement	7-69

Figures

7-30	Strand-Mounted MSDT (Rear View)	7-73
7-31	Underground MSDT Handhold Enclosure	7-76
7-32	Underground MSDT	7-77
7-33	Underground MSDT BMT Terminal	7-79

8 Operations and Maintenance — TOP

8-1	SLC [®] -2000 MSDT Enclosure	8-2

A Circuit Pack Data Sheets

B Fiber Service Module (FSM)

B-1	Block Diagram of the Fiber Service Module (FSM) in a Typical HDT-to-MSDT Arrangement	B-3
B-2	FSM With Circuit Packs	B-5
B-3	Recommended FSM Arrangement in the HDT	B-7
B-4	FSM DSX-1 Wiring Diagram at HDT	B-8
B-5	FSM Wiring Diagram at HDT	B-9
B-6	FSM Equipment in the 841 MSDT Cabinet	B-11
B-7	FSM Protectors, Wiring Blocks, and Feeder/Distribution Panel in the 841 Cabinet	B-12
B-8	841/MSDT/FSM Cabinet Wiring Diagram	B-13
B-9	841/MSDT/FSM Repeater Shelf Assembly Wiring Diagram	B-14
B-10	Connections Between the DST Circuit Pack and the 108 Connector (or Equivalent)	B-15
B-11	FSM PWR Circuit Pack Installation	B-20
B-12	MUX Jumper Straps and Option Switches	B-22
B-13	FSM MUX Circuit Pack Installation	B-24
B-14	DSX Option Switches	B-25
B-15	FSM DSX Circuit Pack Installation	B-27

Figures

B-16	FSM OU Circuit Pack Installation	B-28
B-17	Measuring Return Loss at the HDT Site	B-30
B-18	Measuring Return Loss at the MSDT Site	B-31
B-19	Measuring Total Loss of the Optic Fiber Cable	B-32
B-20	Measuring Power Output of the Optic Fiber Cable at the MSDT Site	B-34
B-21	Measuring Power Output of the Optic Fiber Cable at the HDT Site	B-36
B-22	Option Settings on the MSDT Server	B-41
B-23	Connecting the Fiber to Each FSM OU	B-42
B-24	DST Option Switch Locations	B-44
B-25	DST Location in the MSDT	B-45

C

Ordering

C-1	Typical Layout for <i>SLC</i> ® Series 5 HDT Carrier Bay	C-5
C-2	Typical Layout for <i>SLC</i> ®-2000 Bay	C-8
C-3	Typical Layout for <i>LGX</i> ® Lightguide Distribution Frame	C-10
C-4	MSDT Fully Equipped Card Cage	C-20

Tables

About This Manual

1 Overview

2 Application Considerations

2-1	80-Type Cabinet Channel Capacity	2-5

3 Physical and Functional Description

3-1	<i>SLC</i> [®] -2000 HDT Software Release 4 Required Circuit Packs for Specific MSDT Features	3-6
3-2	Alarm Enhancements (Note)	3-9
3-3	Possible Line Combination Settings for MSDT Server Pairs — Prior to Release 4.5 (see Note)	3-16
3-4	Possible Line Combination Settings for MSDT Server Pairs — Release 4.5 and Later (see Note)	3-19
3-5	Choosing the Correct MSDT Server or DT Server	3-21
3-6	<i>SLC</i> [®] -2000 MDS to HDOS Circuit Configuration (R4.4 or earlier)	3-27
3-7	<i>SLC</i> [®] Series 5 to HDOS Circuit Configuration	3-40
3-8	<i>SLC</i> [®] Series 5 RT FITL Channel Service Arrangements in TR-08 Configuration	3-42
3-9	AUA90 T-BRITE in <i>SLC</i> [®] -2000 MSDT Service Restrictions and Time Slot Allocation (Note 1)	3-47
3-10	AUA90 T-BRITE in <i>SLC</i> [®] -2000 MSDT — ISDN Services and Related Physical Drop AIDs Used for Cross-Connections to INA Digroups	3-48
3-11	AUA93 BRITE II in <i>SLC</i> [®] -2000 MSDT, Provisioning and Time Slot Allocation (Notes 1 and 3)	3-50

Tables

3-12	AUA93 BRITE II in <i>SLC</i> [®] -2000 MSDT — ISDN Services and Related Physical Drop AIDs Used for Cross-Connections to INA Digroups	3-52
3-13	ISDN BRI 2B+D AUA94 Channel Unit Locations for the MSDT	3-54
3-14	HDT to DSX-1 Connections	3-57
3-15	<i>SLC</i> [®] -2000 MSDT Powering Interface	3-74
3-16	<i>SLC</i> [®] -2000 MSDT Battery Requirements	3-76

4 Administration and Maintenance

4-1	Counter Maximum Values and Thresholds	4-11
4-2	<i>SLC</i> [®] -2000 MSDT Feature DC Signatures for Drop Tests	4-16
4-3	<i>SLC</i> [®] -2000 MSDT Feature PGTC Channel Test Results	4-17
4-4	DC Signatures (Numbers 1 through 14)	4-78
4-5	DC Signatures (Numbers 50 through 62)	4-80

5 Powering

6 Technical Specifications

6-1	Series 5 Channel Units Supported in the <i>SLC</i> [®] -2000 MSDT	6-2
6-2	<i>SLC</i> [®] -2000 Channel Units Supported in the <i>SLC</i> [®] -2000 MSDT (Note)	6-6
6-3	Transmission Specifications — VF Channel Units with Fixed Settings	6-9
6-4	Transmission Specifications—Multiparty and FSR Channel Units	6-11
6-5	Transmission Specifications — AUA45 Dual Ringing Repeater Channel Unit	6-13

Tables

6-6	Transmission Specifications—VF Channel Units With Adjustable Settings	6-15
6-7	<i>SPQ</i> [®] 400 Electrical and Transmission Specifications	6-17
6-8	<i>SPQ</i> [®] 400 Environmental Specifications	6-19
6-9	<i>SPQ</i> [®] 440 Electrical and Transmission Specifications	6-19
6-10	<i>SPQ</i> [®] 440 Environmental Specifications	6-21
6-11	<i>SPQ</i> [®] 909 Electrical and Transmission Specifications	6-22
6-12	<i>SPQ</i> [®] 909 Environmental Specifications	6-24

7 Construction and Installation

7-1	HDOS System 1 Blue	7-10
7-2	HDOS System 1 White	7-11
7-3	HDOS System 2 Blue	7-12
7-4	HDOS System 2 White	7-13
7-5	DSX-1 Interface Cable Lengths Available	7-29
7-6	SLC [®] -2000 MDS Server Circuit Pack Slot Association With DSX-1 Panel Cabling (Release 4.5 or Later Noncabinet Equipment)	7-33
7-7	HDOS/DSX-1 Circuit Pack Slot Association (Release 4.5 or Later in Noncabinet Equipment)	7-35

8 Operations and Maintenance — TOP

8-1	Numerical List of TOP Procedures	8-6

Tables

A Circuit Pack Data Sheets

B Fiber Service Module (FSM)

B-1	CLEI Codes for FSM Applications	B-16
B-2	MUX Circuit Pack LBO Switch Settings (Switch S1)	B-21
B-3	MUX Circuit Pack Option Switches (Switch S1)	B-21
B-4	DSX Circuit Pack LBO Switch Settings	B-26
B-5	DSX Circuit Pack Individual Option Switch Function	B-26
B-6	LBO Switch Settings (MSDT Server)	B-40
B-7	LBO Switch Settings (DST Circuit Pack)	B-43
B-8	DSX-1 Cable Connection Testing Sequence	B-52

C Ordering

C-1	Figures and Tables for Typical Bay Layouts	C-11
C-2	SLC [®] Series 5 Carrier HDT Bay Equipment Unique to the MSDT Application	C-13
C-3	SLC [®] -2000 HDT Bay Equipment Unique to the MSDT Application	C-14
C-4	SLC [®] -2000 Access System Cabling Requirements for HDT Frames (Release 4.5 or Later)	C-16
C-5	LGX [®] Lightguide Distribution Frame	C-18
C-6	SLC [®] -2000 RT 80A Cabinet	C-18
C-7	SLC [®] -2000 RT 80D Bulk Power Cabinet	C-18
C-8	SLC [®] Series 5 Carrier System HDT in an 80E Bulk Power Cabinet	C-18
C-9	SLC [®] -2000 MSDT Enclosure	C-21
C-10	SLC [®] -2000 MSDT Plug-In Units	C-23
C-11	-48 V DC Local Powering Equipment	C-26
C-12	-130 V DC Central Powering Equipment	C-27
C-13	± 130 V DC Central Powering Equipment	C-27

Tables

C-14	<i>SLC</i> [®] -2000 MSDT Feature Maintenance Equipment	C-28
C-15	<i>SLC</i> [®] -2000 MSDT Feature Documentation	C-30
C-16	The Host Digital Terminal (HDT) Equipment	C-32
C-17	The MSDT Equipment	C-33
C-18	Pedestal-Mounted, 24 Service Lines, 120 V AC Locally Powered MSDT Interfacing to Series 5 HDT, Optical Loss < 9.8 dB	C-37
C-19	Pole-Mounted, 12 Service Lines, -130 V DC Centrally Powered MSDT Interfacing to Series 5 HDT, 9.8 dB < Optical Loss < 13.3 dB	C-38
C-20	Pad-Mounted, 192 Service Lines, 24 DS0s/MSDT, Urban, Eight 120 V AC Powered MSDTs Interfacing to <i>SLC</i> [®] -2000 HDT	C-38
C-21	Code NG — MSDT Rack Applications	C-40
C-22	Code NH or M1— MSDT Cabinet Applications	C-41
C-23	RGU and BIU Loop Application	C-41
C-24	Optical Units or Line Interface Units	C-42
C-25	Equipment for Specific Powering Options	C-42
C-26	Tip and Ring Pair Protectors	C-42
C-27	MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-43
C-28	MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement Protection with Binding Post	C-44
C-29	MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable	C-45
C-30	MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable	C-46
C-31	MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-47
C-32	MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post	C-48
C-33	MSDT -48VDC Rack Mount Application	C-49
C-34	MSDT ±130VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post	C-50
C-35	MSDT ±130VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-51

Tables

C-36	MSDT $\pm 130\text{VDC}$ Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable	C-52
C-37	MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-53
C-38	MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post	C-54
C-39	MSDT 60VAC Cabinet Wall/Aerial Mount with 25 Foot Stub Cable	C-55
C-40	MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement Protection with Binding Post	C-56
C-41	MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-57
C-42	MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement Protection with Binding Post	C-58

About This Manual

Purpose

This user/service and ordering manual provides the following information about the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) feature of the *SLC*-2000 Access System:

- Detailed descriptive information to the circuit pack level
- Technical specifications
- Installation procedures
- Operations and maintenance (O&M) task-oriented practices (TOP) supporting acceptance, operation, circuit order, and trouble-clearing tasks
- Ordering information.

The MSDT is designed to serve as a feature of both the *SLC*-2000 Access System and the *SLC* Series 5 Carrier System.

Intended Audience

This user/service manual is primarily intended for end users responsible for installing, operating, and maintaining a *SLC*-2000 MSDT feature. It may be used by anyone desiring specific operation and maintenance information.

This document is written for individuals with a background in telephony and an understanding of basic digital transmission principles. Knowledge of both the *SLC*-2000 Access System and the *SLC* Series 5 digital loop carrier system is helpful.

Reason for Reissue

This user/service and ordering manual is reissued to correct errors in the previous issue. Specifically, the headings on the Task Oriented Practices (TOP) did not match the table of contents.

How to Use This Document

This document is organized as follows:

- "About This Manual"
This section defines the purpose and intended audience for this document. It also includes support information on topics such as product safety labels, lightwave safety, and electrostatic discharge. Also included are references for customer assistance and technical support, along with references for related documentation and training.
- Chapter 1 — "Overview"
This chapter provides an overview of the *SLC-2000* MSDT feature. It also includes when the *SLC* Series 5 hosts the MSDT.
- Chapter 2 — "Application Considerations"
This chapter provides information on each application of the *SLC-2000* MSDT feature.
- Chapter 3 — "Physical and Functional Description"
This chapter gives a physical and functional description of the equipment associated with the *SLC-2000* MSDT feature including the host digital terminal (both *SLC* Series 5 system and *SLC-2000* system), the multi-services distant terminal, and the installation and maintenance equipment.
- Chapter 4 — "Administration and Maintenance"
This chapter describes the administration, maintenance, and testing for the *SLC-2000* MSDT feature.

- Chapter 5 — "Powering"

This chapter describes the different powering conventions for the equipment used with the *SLC-2000* MSDT feature.

- Chapter 6 — "Technical Specifications"

This chapter provides the technical specifications of the equipment associated with the *SLC-2000* MSDT feature, including the physical and environmental specifications.

- Chapter 7 — "Construction and Installation"

This chapter provides construction and installation procedures for equipment, apparatus, fiber cable, and copper cable located at the host digital terminal (HDT) and *SLC-2000* MSDT locations of a *SLC* Series 5 Carrier System or *SLC-2000* Access System equipped with the *SLC-2000* MSDT feature.

- Chapter 8 — "Operations and Maintenance (TOP)"

This chapter provides TOP procedures to accept, equip and turn up, and clear troubles on the equipment associated with the *SLC-2000* MSDT feature.

- Appendix A — "Circuit Pack Data Sheets"

Appendix A provides a place for the circuit pack data sheets for the equipment associated with the *SLC-2000* MSDT feature.

- Appendix B — "Fiber Service Module (FSM)"

Appendix B provides a description of the FSM. It also includes installation and turn-up procedures along with ordering information.

- Appendix C — "Ordering"

Appendix C provides the user with the information needed to order the MSDT and its associated equipment.

- Glossary

This section provides a list of abbreviations and acronyms with their meaning spelled out.

- Index

Conventions Used

Panel stamping on the equipment is highlighted in text by using all uppercase letters. Document titles referenced in text are printed in an *italic* typeface. However, italic typeface may also be used for highlighting an important word or phrase. Special symbols may be used with safety labels and notes.

Product Safety Labels

This user/service manual contains safety labels in the form of **DANGERS**, **WARNINGS**, and **CAUTIONS**. These safety labels, listed in order of priority, have the following definitions:

- **Danger** shows the presence of a hazard that *will* cause death or severe personal injury if the hazard is not avoided.
- **Warning** shows the presence of a hazard that *can* cause death or severe personal injury if the hazard is not avoided.
- **Caution** shows the presence of a hazard that *will* or can cause minor personal injury or property damage if the hazard is not avoided. Caution is also used for property-damage-only accidents. This includes equipment damage, loss of software, or service interruption.

Lightwave Safety

A Lucent Technologies lightwave digital transmission system and associated optical test sets use semiconductor laser transmitters. The lasers emit lightwaves, at or near infrared wavelengths, into fiber optic cables. This light is at the red end of the visible spectrum.

Although, at present, the transmitter power levels are below those known to cause injury to the eye (for example, from a direct inadvertent exposure to the end of an energized fiber), direct exposure at close distances should be avoided.



WARNING:

Never view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE optical viewer. Viewing optics tends to collimate the energy from an optical connector and, hence, increases the potential risk for injury.

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.

Observe the following precautions 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.
- When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or heel strap, with a minimum resistance of 250K ohms, and stand on a grounded, static-dissipating floor mat. Before using the wrist or heel strap, check it for opens, shorts, and minimum resistance value. If the strap does not pass these checks, it should not be used.
- 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.
- 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 enclosure, immediately put circuit packs into static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.

To reduce the possibility of ESD damage, the *SLC-2000* MSDT is equipped with grounding jacks to enable personnel to ground themselves, using wrist straps, while handling circuit packs or working on an assembly(ies). When grounding jacks are not provided, an alligator clip adapter enables connection to frame ground.

Customer Assistance and Technical Support

Lucent Technologies will provide customer assistance on the Series 5 and *SLC-2000* systems including, but not limited to, troubleshooting assistance, technical consultation, operational problem consultation, procedural advice, and emergency recovery assistance from a qualified system support professional from the Regional Technical Assistance Center (RTAC).

Service is provided from the RTAC at 1-800-225-RTAC. This telephone number is monitored 24 hours a day, 7 days a week. During regular business hours, your call will be answered by your local regional RTAC. Outside of normal business hours, all calls will be answered at a centralized technical assistance center where service-affecting problems will be dispatched immediately to your local RTAC. All other problems will be referred to your local RTAC on the next regular business day.

Related Documentation/Training

The following documents provide additional information about the SLC-2000 MSDT feature:

- Number: 363-005-101 through -3xx
Title: *SLC Series 5 Carrier System Data Sheets and SLC-2000 MSDT Data Sheets*
Audience: End-user personnel
Content: Physical and functional description of SLC-2000, SLC Series 5, and SLC-2000 MSDT units.
- Number: 363-205-000
Title: *SLC Series 5 System, Ordering Guide*
Audience: System planners
Content: Ordering information.
- Number: 363-205-010
Title: *SLC Series 5 System, Applications and Planning Guide*
Audience: System planners and engineers
Content: Features, applications, general description, and system planning/engineering information.
- Number: 363-205-400
Title: *SLC Series 5 System, COT Acceptance and Turn-Up*
Audience: End-user acceptance personnel
Content: Task-oriented practice (TOP) procedures for accepting and turning up a Series 5 central office terminal (COT).
- Number: 363-205-401
Title: *SLC Series 5 System, RT Acceptance and Turn-Up*
Audience: End-user acceptance personnel
Content: Task-oriented practice (TOP) procedures for accepting and turning up a Series 5 remote terminal (RT).
- Number: 363-205-406
Title: *SLC Series 5 System, End-to-End Tests*
Audience: End-user maintenance personnel
Content: Task-oriented practice (TOP) procedures for verifying that the system works properly end-to-end.

- Number: 363-205-500
Title: *SLC Series 5 System, Maintenance and Trouble Clearing*
Audience: End-user maintenance personnel
Content: Task-oriented practice (TOP) procedures for clearing system alarms, trouble isolation on the digital facility, and clearing channel failure.
- Number: 363-208-000
Title: *SLC-2000 Access System, Applications, Planning, and Ordering Guide*
Audience: System planners and engineers
Content: Features, applications, general description, and system planning/engineering.
- Number: 363-208-001
Title: *SLC-2000 Access System, User/Service Manual*
Audience: Maintenance personnel
Content: Detailed procedural description, detailed functional descriptions of all shelves, and operations and maintenance procedures.
- Number: 363-208-003
Title: *SLC-2000 Access System, Commands and Messages*
Audience: Technicians, engineers, and troubleshooters
Content: Detailed information about the software commands and messages for the *SLC-2000 Access System*
- Number: 365-200-100
Title: *T1 Digital Line General Design*
Audience: System planners and engineers
Content: Features, general description, and system planning/engineering information.
- Number: 365-200-410
Title: *T1OS Line and System Maintenance*
Audience: End-user maintenance personnel
Content: Procedures for verifying that the system works properly end-to-end.
- Number: 365-800-002
Title: *T1 Line Acceptance and Maintenance Tasks*
Audience: End-user maintenance personnel
Content: Task-oriented practice (TOP) procedures for verifying that the system works properly end-to-end.
- Number: 636-299-115-1
Title: *High Density Fiber Interconnect System, Installation Instructions*
Audience: End-user installation personnel
Content: Installation procedures for installing high density fiber interconnect (HDIC) framework, apparatus mountings, shelves, doors, and fiber optic interconnect cables.

- Number: 855-351-101
Title: *T1 Digital Line Transmission and Outside Plant Design*
Audience: System planners and engineers
Content: System planning, engineering, and design information.
- Number: 915-710-115
Title: *Series 5 System, Engineering*
Audience: Engineers
Content: System engineering and application procedures.
- Number: FPD 801-450-107-1
Title: *SLC Series 5 Bay, Fiber-to-the-Home Feature, 7' 0" Frame, Two Dual Channel Banks*
Audience: System planners and engineers
Content: Floor plan data sheet drawings and specifications.

No product offering is complete without a formal training package. The National Product Training Center in Dublin, Ohio, provides management courses for system planning, engineering, and ordering, as well as training for telecommunications technicians in installation, operations, and maintenance. Suitcasing of these courses is also available. Consult your local Account Executive for more information or reservations.

The following courses are provided by the Lucent Technologies Customer Training and Information Products organization:

- Number: LE2000
Title: *SLC-2000 Management Overview*
Audience: Telecommunication managers responsible for the planning, implementation, and maintenance of the *SLC-2000 Access System*
Length: 2 days
Content: Applications, planning considerations, features and benefits, functional description, testing, basic maintenance, and ordering procedures
Media: Instructor-led format with visual media and class discussion. End-of-unit review exercises are used to reinforce the lecture. Each student will be provided with 363-208-000, the *SLC-2000 Access System, Applications, Planning, and Ordering Guide*.
Prerequisite: Previous knowledge of the DDM-2000 as provided in course LW2212 — DDM-2000 OC-3 and OC-12 Multiplexers Applications and Architecture.

- Number: LE2010,
Title: *SLC-2000 Overview*
Audience : This course is designed for anyone who would like an overview of the *SLC-2000 Access System*.
Length: 4 hours
Content: This interactive multimedia course is intended to provide students with an overview of the *SLC-2000 Access System*. Many topics are covered in an overview fashion that will help the student better understand the purpose of the *SLC-2000 Access System* and how it fits into the telephony network.
Media: CD-ROM based self-paced course. Students who wish to take this training must have an MPCII compatible computer. All software needed to view the training is included on the CD-ROM.
Prerequisite : Students need to be familiar with basic transmission concepts as provided by TR0510, *Transmission Principles*.
- Number: TR4610
Title: *SLC-2000 Access System Turn-Up and Testing*
Audience: Telecommunication personnel responsible for installing and maintaining the system.
Length: 5 days
Content: A comprehensive study of the *SLC-2000 Access System*, including a physical description, functional description, testing, and basic maintenance.
Media: A combination of instructor lectures and class discussion. The information will be reinforced with end-of-unit review exercises and hands-on exercises on operational systems that are typical of those in the field.
Prerequisite: Students *must* be familiar with the DDM-2000 as provided in courses LW2603X — DDM-2000 Multiplexer OC-3 or LW2612 — DDM-2000 Multiplexer OC-12.
- Number: TR4601
Title: *SLC Series 5 Carrier System Turn-Up and Test*
Audience: Central office technicians, outside plant, and maintenance personnel
Content: Identification of central office terminal (COT) and remote terminal (RT) functions, system configurations, modes of operation, and procedures for isolating and correcting system troubles.
- Number: TR4602
Title: *SLC Series 5 Carrier System Fiber-to-the-Home Feature*
Audience: Outside plant engineers and maintenance personnel
Content: Operation and installation of the Fiber-to-the-Home feature of the *SLC Series 5 Carrier System*.

- Number: TR4621
Title: *SLC Series 5 Carrier System Fiber-to-the-Home Feature Seminar*
Audience: Outside plant engineers and maintenance personnel
Content: Operation and installation of the Fiber-to-the-Home feature of the Series 5 Carrier System.
- Number: LE1010
Title: *SLC Series 5 Carrier System Management Overview*
Audience: Telecommunications planners
Content: Series 5 system architecture, features, operations, service capabilities, applications, and economics.

For information on this and other training courses available, on schedules, fees, and registration, call your company's training coordinator. If your company does not have an assigned training coordinator, call this toll-free number to order a product training catalog, get more information on a course, find out about new courses, or register for a class:

1-888-LUCENT8 (582-3688) In Canada, 1-800-221-1647

When you call 1-888-LUCENT8, select Option 2 (press 2 on a touch-tone phone) for Lucent Technologies product training.

You may also use a computer and modem to log into the on-line catalog, COMCATS (Computerized Catalog System):

DIAL: 1-800-662-0662 or 614-764-5566

login: comcats

password: lucent1

Set your terminal options for 300/1200/2400 baud rate, full duplex, space parity, 7 data bits, and 1 stop bit. If you have trouble accessing COMCATS, call 1-800-TRAINER and ask to speak with the COMCATS Administrator.

For internet users, you can request a catalog from the following internet site:

<http://www.lucent.product-training.com/catalog>

How to Order Documents

To order additional copies of this document and/or to request placement on the standing order list, send or call in an order as follows:

Customer	Mail Order	Telephone Order (Monday thru Friday)
Commercial Customers*	Lucent Technologies Customer Information Center Attention: Order Entry Center 2855 N. Franklin Road P.O. Box 19901 Indianapolis, IN 46219	Within USA: 1-800-LUCENT8 <i>7:30 a.m. to 6:30 p.m. EST</i> FAX from USA and Canada: 1-800-566-9568 FAX Worldwide: 1-317-322-6699
RBOC/BOC	Process through your Company Documentation Coordinator.	

* For commercial customers, a check, money order, purchase order number, or charge card number is required with all orders. Make checks payable to Lucent Technologies. Lucent Technologies entities should use Form IND 1-80.80 FA, available through the Customer Information Center.

One-time orders include a binder (if applicable) and the document contents for the current issue in effect at the time of order. Also, you may request placement on the standing order list for all later reissues of any document. The standing order list for each document provides automatic distribution for all reissues of the document. RBOC/BOC customers should process document orders or standing order requests through their Company Documentation Coordinator.

How to Comment on This Document

Feedback forms are located immediately after the title page of this document. If the feedback forms are missing, please send your comments and suggestions to:

Documentation Services
2400 Reynolda Road
Winston-Salem, NC 27106

Overview

1

Contents

What Is the <i>SLC</i>[®]-2000 Access System MSDT Feature	1-3
MSDT With Optical Feeder — Fiber in the Loop (FITL)	1-4
MSDT With Metallic Feeder	1-6
MSDT Fed Through a Fiber Services Module (FSM)	1-7

**What Is the *SLC*[®]-2000 Access System
MSDT Feature**

The *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) feature enables the cost-efficient delivery of telephony and data services to subscribers over a wide range of applications. The *SLC*-2000 MSDT is a flexible distribution terminal that is designed to support fiber-in-the-loop (FITL) applications. Beyond its applicability for conventional FITL, the *SLC*-2000 MSDT may also be deployed as a small digital loop carrier system. In this arrangement, the connection between the *SLC*-2000 MSDT and the host digital terminal (HDT) may be one bidirectional optical fiber, two single direction optical fibers, a DSX-1 transport system, or a T1 Facility.

The MSDT "extends" the backplane of either the *SLC* Series 5 Carrier System or the *SLC*-2000 Access System closer to the customer, allowing for more efficient use of outside plant facilities. It is fed by either a metallic facility (such as a T1 facility) or an optical facility and can provide up to 24 DS0 rate signals. It supports the full range of narrowband services including plain old telephone service (POTS), coin, 2- and 4-wire specials, 64-kb/s data, and Integrated Services Digital Network (ISDN).

MSDT With Optical Feeder — Fiber in the Loop (FITL)

Bellcore has defined the elements of a FITL system in TR-909 (Figure 1-1). Optical network units (ONUs) are generally located to serve multiple subscribers; for example, at curbside in residential applications. These ONUs connect a host digital terminal (HDT) over a fiber optic link. The HDT then interfaces to the switch. For short loop applications, the HDT may be located in a central office building; for long loops, the HDT may be remotely located in a cabinet, hut, or controlled environment vault (CEV).

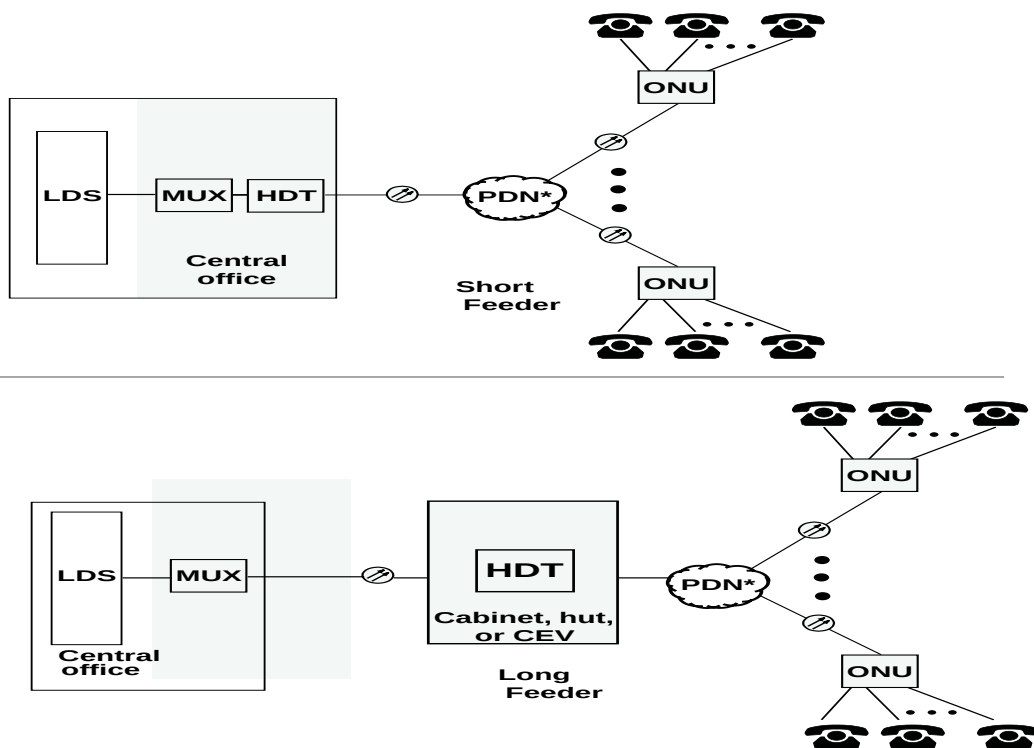
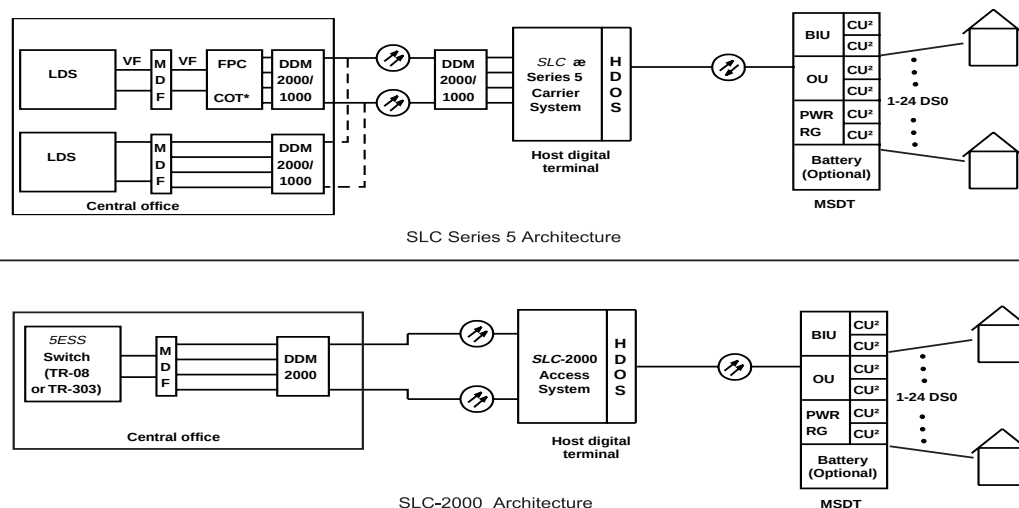


Figure 1-1. Generic Fiber-in-the-Loop Architecture

The *SLC-2000* Multi-Services Distant Terminal (MSDT) is one of Lucent Technologies ONU products. The HDT may be either a *SLC* Series 5 or a *SLC-2000* remote terminal. The Passive Distribution Network (PDN) refers to the optical network that connects ONUs to the HDT. The *SLC-2000* MSDT feature uses one singlemode fiber along with 1310-nm optical components to provide a bidirectional transmission link between each *SLC-2000* MSDT and the HDT. Figure 1-2 depicts the *SLC-2000* MSDT FITL architecture. Telephone and data distribution to the customer from the *SLC-2000* MSDT to the subscriber is done with standard twisted pair metallic drops. Both the *SLC* Series 5 and *SLC-2000* remote terminals may be directly integrated into a digital switch using the Bellcore TR-08 interface. In addition, the *SLC-2000* HDT can be directly integrated into a digital switch using the Bellcore TR-303 interface. For *SLC* Series 5 universal applications, a Feature Package C (FPC) or a Central Office Terminal (COT) compatible with the TR-08 interface is used in the central office. For *SLC-2000* universal applications, a *SLC-2000* COT is used in the central office.



* Or COT compatible with the TR-08 interface.

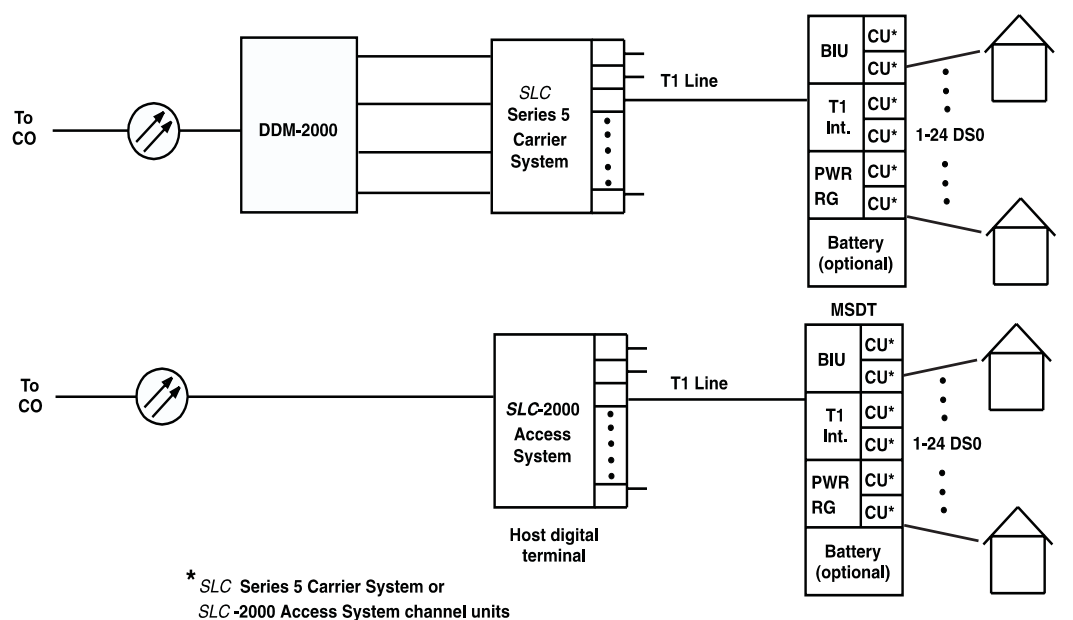
* *SLC* Series 5 Carrier System or *SLC-2000* Access System channel units.

msdt.arch.ps

Figure 1-2. *SLC*[®]-2000 MSDT System Architecture

MSDT With Metallic Feeder

Beyond its applicability for conventional FITL, you may also feed the MSDT using a DSX-1 transport system or a T1 line (Figure 1-3). This facility flexibility enables the installation of *SLC-2000* MSDTs over existing copper plant and allows a simple future upgrade to fiber when replacement of the copper is warranted. The copper distribution loops can extend to 1500 ohms.



msdt.mi.ps

Figure 1-3. SLC[®]-2000 MSDT With Metallic Interface

The *SLC-2000* MSDT feature is an extremely effective vehicle for increasing the service capability of the loop network.

MSDT Fed Through a Fiber Services Module (FSM)

The fiber services module (FSM) provides the *SLC-2000* Access System with fiber-in-the-loop expanded distribution capability for MSDTs and DSX-1 transmission extensions. Located in the *SLC-2000* system cabinet and in the MSDT, the FSM multiplexes up to 12 DSX-1s into a 51.84-Mb/s digital bit stream for single optical fiber transport. Figure 1-4 shows typical FSM configurations. See Appendix B for a detailed description of the FSM.

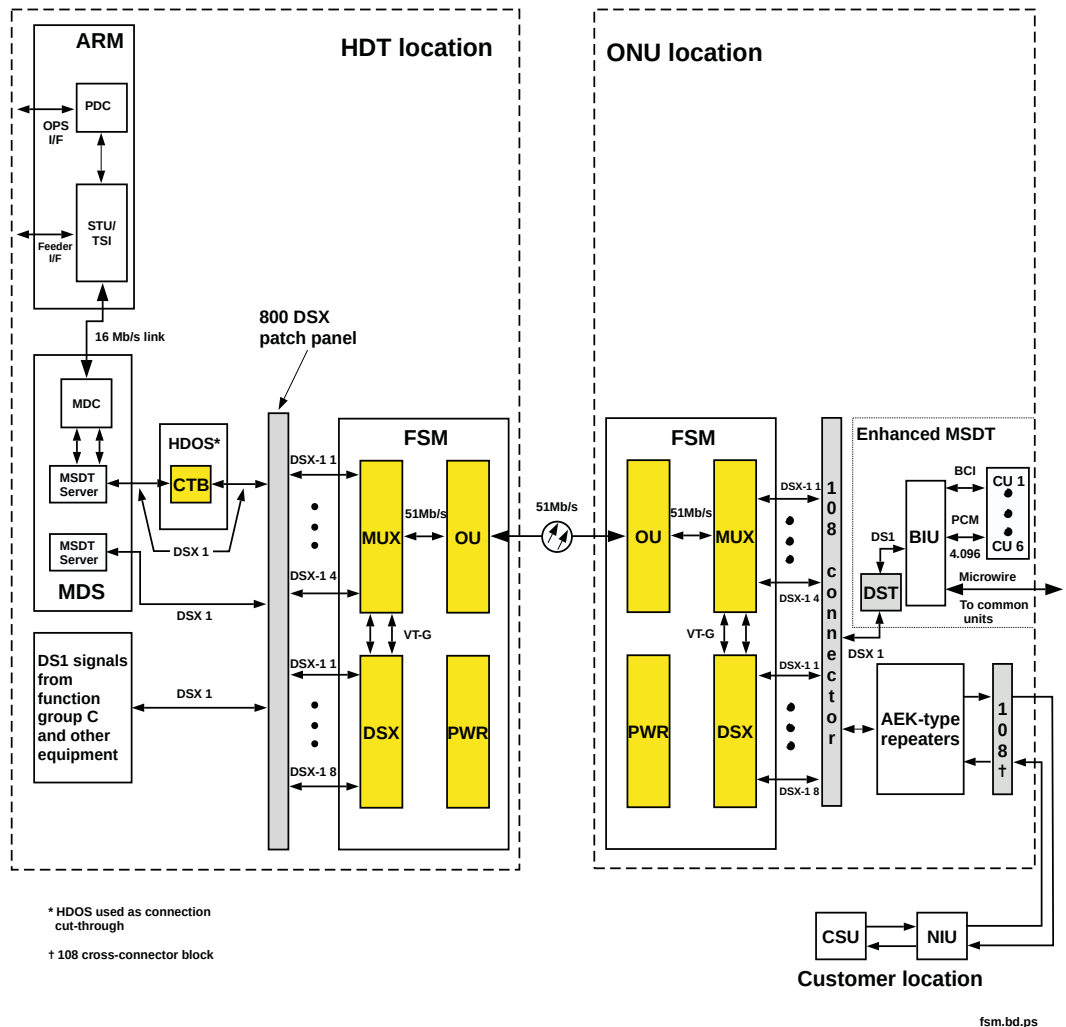


Figure 1-4. *SLC*®-2000 Fiber Services Module — Typical Configurations

Contents

Introduction	2-3
HDT Site Options	2-3
■ SLC® Series 5 and SLC-2000 Access System	2-3
■ Long-Loop and Short-Loop Applications	2-4
■ Remote HDT Enclosures	2-6
MSDT Site Options	2-7
■ Pedestal Enclosure Configuration	2-8
■ Pole-Mounted Configuration	2-9
■ Strand-Mounted Configuration	2-9
■ Rack-Mounted Configuration	2-10
HDT to MSDT Facilities	2-12
■ Conventional Optical Facility (FITL)	2-12
■ Conventional Metallic Facility	2-14
■ High Bit-Rate Digital Subscriber Line (HDSL) Modem Facility	2-15
■ Optical Multiplexer Facility	2-16
MSDT Sharing	2-17
■ Service Drop Distance	2-18
■ Rural Considerations	2-19
Bandwidth Management	2-19
■ HDT to MSDT Optical Link	2-20
■ MSDT Bandwidth Management From SLC Series 5 HDT	2-20
■ MSDT Bandwidth Management From SLC-2000 HDT	2-21
MSDT Powering	2-22

Contents

■ Local Powering	2-22
120 V AC Local Powering	2-22
-48 V DC Local Powering	2-24
■ Central Powering	2-25
-130 V DC Central Powering	2-26
± 130 V DC Central Powering	2-27
60 V AC Central Powering	2-28
Rural Applications	2-32
■ Rural Modernization	2-32
■ Alternative Solutions	2-33
■ Economics	2-33
■ Rural Features	2-35

Introduction

The *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) feature provides the cost-efficient delivery of telephony and data services to subscribers over a wide range of applications. The *SLC*-2000 MSDT is a flexible distribution terminal that is designed to support both fiber-in-the-loop (FITL) and small line size digital loop carrier (DLC) configurations. This chapter discusses the factors that should be considered for successful deployment of the MSDT in the distribution plant.

HDT Site Options

SLC[®] Series 5 and *SLC*-2000 Access System

The *SLC*-2000 MSDT is designed to operate with either a *SLC* Series 5 or a *SLC*-2000 Access System as its host digital terminal (HDT). Introduced initially with the *SLC* Series 5 HDT, this configuration requires that Feature Package F be installed in the common equipment slots and an AUA406 or AUA408 channel unit be used as the MSDT Server. The *SLC* Series 5 configuration remains a cost-effective alternative for rural and other applications which require smaller line capacity at the HDT. Additionally, existing *SLC* Series 5 systems can be equipped for FITL distribution through the addition of a high density optics shelf (HDOS) along with the Feature Package F bank controller and the MSDT Server mentioned earlier.

The *SLC* Series 5 HDT can be directly integrated to the digital switch through a TR-08 interface. In this configuration, an AUA408 must be used as the MSDT Server. Universal configurations are also supported through the use of a *SLC* Series 5 Feature Package C central office terminal (COT) or a COT compatible with the TR-08 interface. In the universal configuration, either an AUA406 or an AUA408 can be used. The *SLC* Series 5 system can not be directly integrated in a TR-303 mode.

The MSDT can be used with the *SLC*-2000 Access System as its host digital terminal. When used as an HDT, a Release 2.0 or higher version of *SLC*-2000

software is required along with an *SPQ*[®]808, or *SPQ*809, *SPQ*810*, or *SPQ*811* Server for the MSDT. The switch interface can be an integrated TR-08 or TR-303 configuration or a universal configuration using a companion *SLC*-2000 COT.*

The *SLC*-2000 HDT provides a number of operational benefits which derive from its next generation DLC design. With its fully integrated multiplexer, the *SLC*-2000 HDT supports full synchronous optical network (SONET) networking with DDM-2000 and other *SLC*-2000 systems. The *SLC*-2000 HDT has doubled the line density of its *SLC* Series 5 predecessor with the introduction of quad-circuit channel units. A single system is capable of delivering 768 DS0s (1152 DS0s Release 4.5 or later for FITL applications) along with 28 DS1s, available from the embedded multiplexer.

The *SLC*-2000 HDT supports a time slot interchange (TSI) capability which offers several important advantages in MSDT applications. First, it enables the mapping of any distribution DS0 to any feeder DS0, greatly improving the utilization of switch and feeder resources. Second, it provides an important bandwidth management function for MSDTs, ensuring efficient use of HDT capacity.

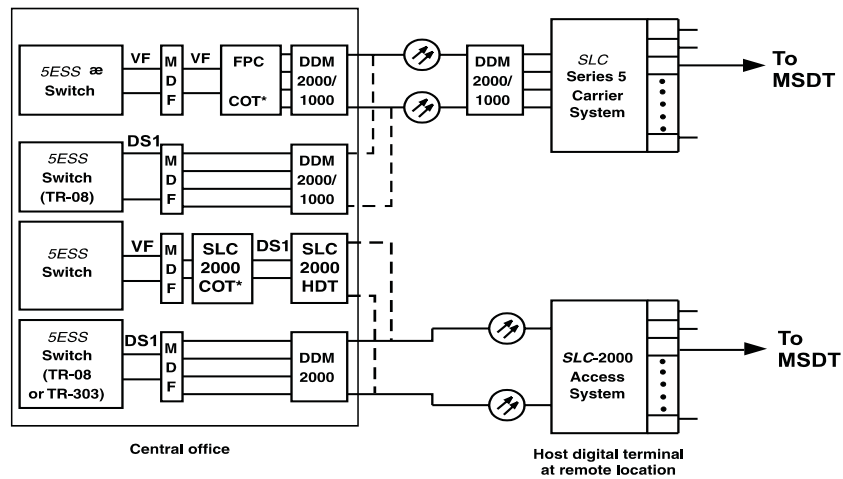
The *SLC*-2000 HDT offers continued enhancements to the operation of FITL systems. For example, detailed alarm messages identifying which particular MSDT and common circuit board have initiated the condition are available at the HDT's user interface pane (UIP). This information is remotely accessible from the central office or any other maintenance location. TL1 messaging provides interfaces to Bellcore and other operations support (OS) systems. The *SPQ*809 or later MSDT Server and the enhanced backplane interface unit (BIU) allow a user to download MSDT software from the HDT.

An *SLC*-2000 bay can support up to 64 MSDTs in Release 4.4 or less, 96 MSDTs in Release 4.5 and greater (not in a cabinet).

Long-Loop and Short-Loop Applications

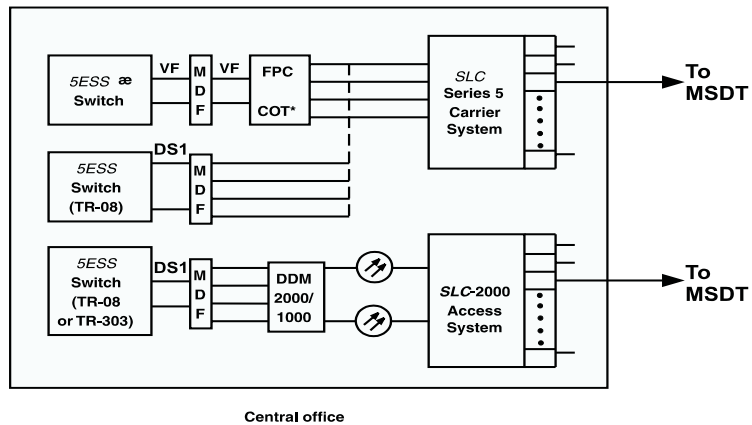
The MSDT feature can be configured for both long-loop and short-loop applications using either the *SLC* Series 5 or *SLC*-2000 HDT (Figure 2-1). In long-loop applications, the HDT is located in the outside plant, at a remote terminal site similar to standard digital loop carrier installations. Long-loop applications are typified by customers being located sufficiently far from the central office to warrant the use of a multiplexer to reduce fiber count back to the central office. This is a rather straightforward comparison of increased fiber cost versus the cost of the multiplexer and HDT enclosure. For FITL applications, an additional consideration may be the cost benefits/penalties of placing network powering hubs at the HDT.

* You can only use the *SPQ*810 or *SPQ*811 MSDT Server in a *SLC*-2000 HDT containing Software Release 4.4 or later.



* Or COT compatible with the TR-08 Interface or SLC Series 5 FPC.

A. Long-Loop Configuration



* Or COT compatible with the TR-08 interface.

B. Short-Loop Configuration

msdtloop. ps

Figure 2-1. SLC[®]-2000 MSDT System in Long-Loop and Short-Loop Configurations

The HDT will interface back to the central office through a COT for universal configurations or directly to the switch for integrated configurations.

Short-loop applications are often found in more densely populated urban areas where home-run fibers, from the MSDTs to an HDT located in the central office, are clearly more economical than a remote HDT. This is particularly true in larger cities where right-of-ways for the placement of HDT enclosures are extremely difficult and expensive to obtain. Some customers have selected short-loop configurations simply to avoid the placement of additional electronics in the outside plant. This arrangement is also popular with competitive access providers (CAPs) who are looking to concentrate lines at an economical place, the central office.

In universal short-loop applications, the HDT and COT are connected back-to-back in the central office. For integrated arrangements, the HDT provides a TR-08 or TR-303 interface to the switch.

Remote HDT Enclosures

Both the *SLC* Series 5 and *SLC*-2000 HDTs, when located remotely from the central office, are designed to be housed in huts, controlled-environment vaults (CEVs), and a variety of 80-type and other cabinets.

Among the standard *SLC*-2000 cabinet configurations are an 80A which supports up to 768 DS0s and 64 MSDTs and an 80D which supports up to 1536 DS0s and 128 MSDTs.

The *SLC*-2000 and *SLC* Series 5 HDT is available in an 80A cabinet that supports up to 384 DS0s and 32 MSDTs, in an 80D cabinet that supports up to 768 DS0s and 64 MSDTs. An 80E cabinet (*SLC* Series 5) supports up to 1344 DS0s and 112 MSDTs. Both the *SLC*-2000 and *SLC* Series 5 HDT can also be provided in customized cabinet configurations, which house a variety of cross-connect, multiplexer, protection, and powering equipment in addition to the HDT.

For centrally powered MSDT applications, many customers elect to collocate the powering equipment with the HDT. This configuration allows the copper powering conductors to be routed and placed along with the fibers serving individual MSDTs. All of the HDT housing options include a configuration that contains the central power equipment as well. In 80-type cabinets, this may reduce the number of subscribers that can be served from the HDT due to the additional space utilized for the batteries and other power equipment. The cabinet capacities are summarized in Table 2-1.

Table 2-1. 80-Type Cabinet Channel Capacity

System	Channel Capacity					
	80A-HX With Central Power	80A-HX Without Central Power	80D-HX With Central Power	80D-HX Without Central Power	80E-BP With Central Power	80E-BP Without Central Power
<i>SLC</i> [®] -2000	192	768	960	1536	Not Avail.	Not Avail.
Series 5	192	384	576	768	1152	1344

MSDT Site Options

The selection of an MSDT location and enclosure type is dependent on a variety of factors which include the following:

- Living unit density of the area to be served
- Availability of right-of-ways for equipment placement
- Accessibility to power sources
- Maximum number of living units to be served from an MSDT
- Outside plant versus in-building application
- Buried versus aerial outside plant
- Local code considerations on above-ground enclosures.

To accommodate the wide variation in application parameters, a family of MSDT enclosure configurations has been developed.

Pedestal Enclosure Configuration

New suburban developments are typified by buried outside plant and subscriber densities which dictate 12- or 24-line Optical Network Unit (ONU) capacity (depending on the use of dual or quad channel units). For these applications, the MSDT pedestal is an ideal solution (Figure 2-2). The unit can be pad-mounted or stake-mounted. In cases where 48 lines are required at one location, a standard configuration supports the placement of a second MSDT on the same plastic mounting pad. The pedestals themselves are offered with a variety of mounting bases which afford an opportunity to raise the height of the MSDT in areas where snow accumulation or flooding is a particular concern. The pedestal configuration supports all local and centralized powering arrangements. For locally powered applications, the determination of the MSDT site should include consideration of accessibility to the power source. See Chapter 5 for additional information.

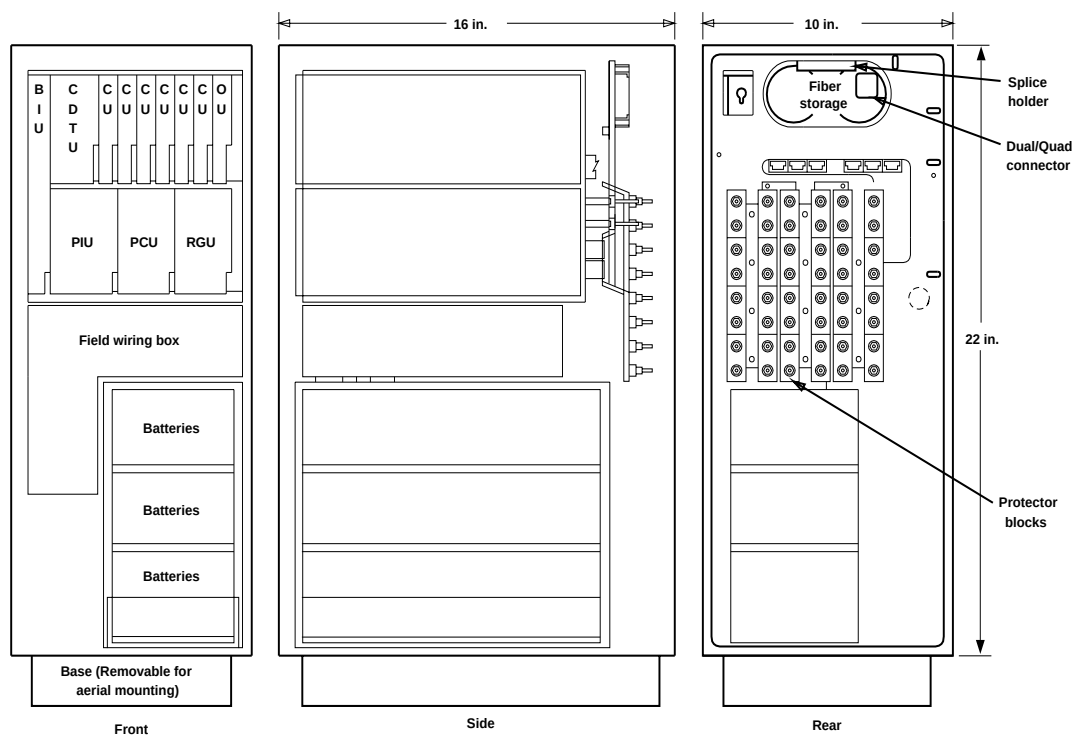


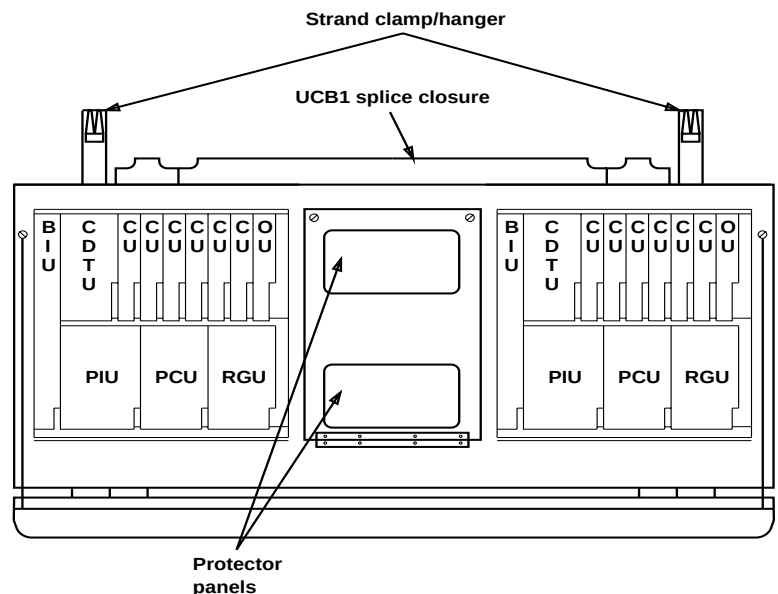
Figure 2-2. Typical SLC®-2000 MSDT Pedestal Enclosure

Pole-Mounted Configuration

Many older areas, particularly those in urban or rural applications, are typified by aerial outside plant. To support upgrade rehabilitation of those applications with FITL, the basic MSDT is available in a pole-mounted configuration, which conveniently accommodates aerial drop cables to subscribers. The pole-mounted MSDT supports all local and centralized powering options.

Strand-Mounted Configuration

Urban applications are further characterized by increased subscriber density, difficulty in obtaining right-of-way for placement of pedestals, and increasing concern over equipment vandalism. A strand-mounted MSDT enclosure has been designed to address these unique requirements. The strand-mounted MSDT (Figure 2-3) can be configured for 24- or 48-line capacity. The enclosure is designed to be mounted on the strand, at some distance from the pole, to discourage any tampering with the equipment or housing. The copper distribution is routed from the MSDT to a standard termination box on the pole, from which the subscriber drops are run exactly as they are in conventional copper applications. The strand-mounted MSDT is currently arranged for centralized powering, with no batteries in the enclosure.

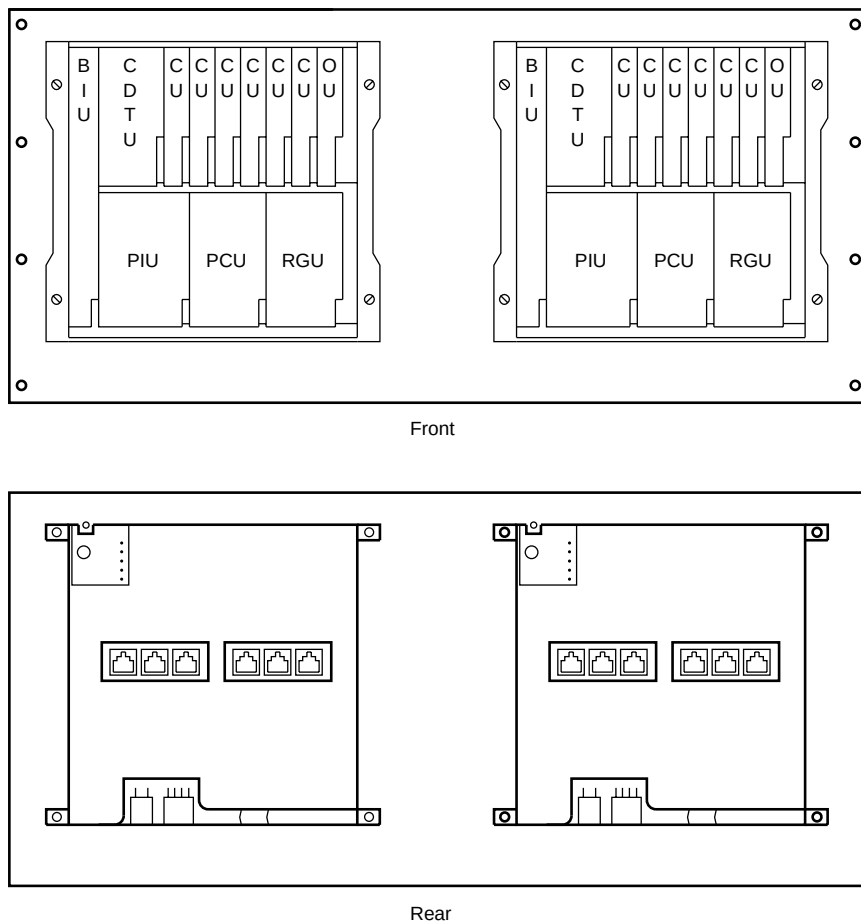


tpa 820608/01

Figure 2-3. Typical SLC®-2000 MSDT Strand-Mounted (Aerial) Enclosure

Rack-Mounted Configuration

The MSDT has been designed for rack-mounting to support the needs of both in-building applications and sites requiring up to 48 lines in a single enclosure. As Figure 2-4 shows, two 24-line MSDTs are housed side-by-side in a standard 23-inch rack-mounting arrangement.



tpa 813293/01

Figure 2-4. Typical SLC®-2000 MSDT Rack-Mounted Configuration

Installations requiring 72- or 96-line capacity are served by two 23-inch mountings that are equipped with three or four 24-line MSDT electronic assemblies. For in-building applications, the relay rack can be mounted in a telephone closet or equipment room, or it can be housed in a cabinet for wall or floor mounting. The rack-mounted system is often powered from a 48-volt DC supply which is available at the installation site.

For outside plant applications requiring 72- or 96-line capacity, the rack-mounted electronics can be housed in a 51A cabinet. The cabinet can be equipped with the necessary local powering equipment (including batteries) or it can be configured for centralized powering. The 51A cabinet also allows the consolidation of fiber and copper cross-connect hardware, protectors, multiplexers, or any other equipment required to support the particular installation.

Local code considerations in areas subjected to high incidence of earthquakes often restrict the placement of above-ground terminals. In some residential developments, concern over the aesthetics or the vulnerability of curbside enclosures suggests that "out-of-sight" solutions may be appropriate. For all of these cases, the MSDT is offered in an enclosure for below-ground installation.

HDT to MSDT Facilities

The MSDT is designed to operate over either a fiber or metallic link to the HDT. You should choose the facility that is most economical for your configuration while keeping in mind future growth.

Conventional Optical Facility (FITL)

Figure 2-5 shows a conventional FITL application using an optical facility. The MSDT interfaces with the MSDT Server through an optical unit (OU) in the HDOS assembly. At the MSDT, the optical fiber connects to an OU in the MSDT card cage.

For conventional FITL applications, the MSDT operates bidirectionally over a single fiber from the HDT. This reduces the total amount of fiber required for a typical system. A typical optical link using this configuration is 1.5 Mb/s transmitted at 1310 nm. The single-fiber link supports an outside plant loss budget of 9.8 dB, which converts to an allowable distance of approximately 15 miles between the HDT and the MSDT. Using an enhanced system with the fiber services module (FSM), you can increase the speed of the optics to 51 Mb/s. The enhanced system will support the 9.8-dB loss budget as well.

While 15 miles is a considerable range between the HDT and MSDT, there are some rural and other applications which involve even further distances. To support these cases, an extended range optical unit [AYB5 (HDOS)/BYB5 (MSDT)] that also operates bidirectionally over a singlemode fiber is available. In this configuration, the outside plant loss budget increases to 13.3 dB, which is approximately a 21-mile range between the HDT and the MSDT.

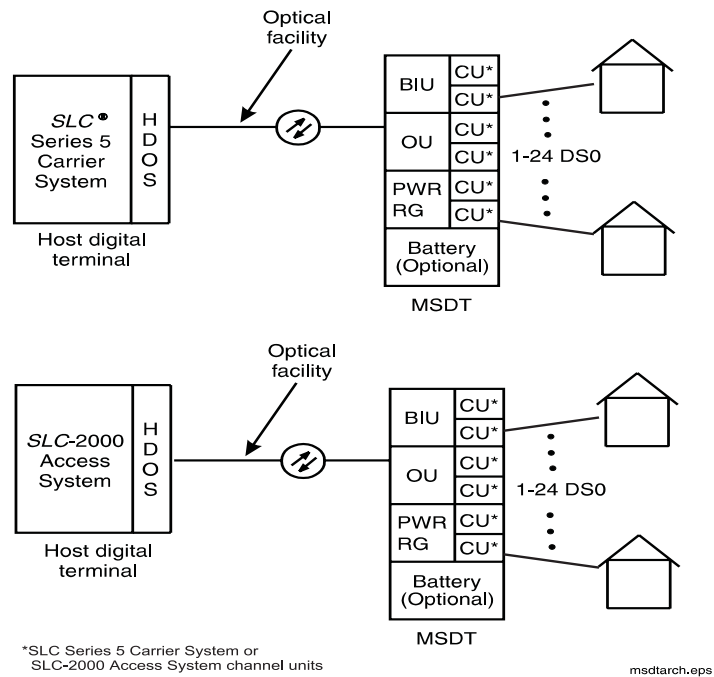
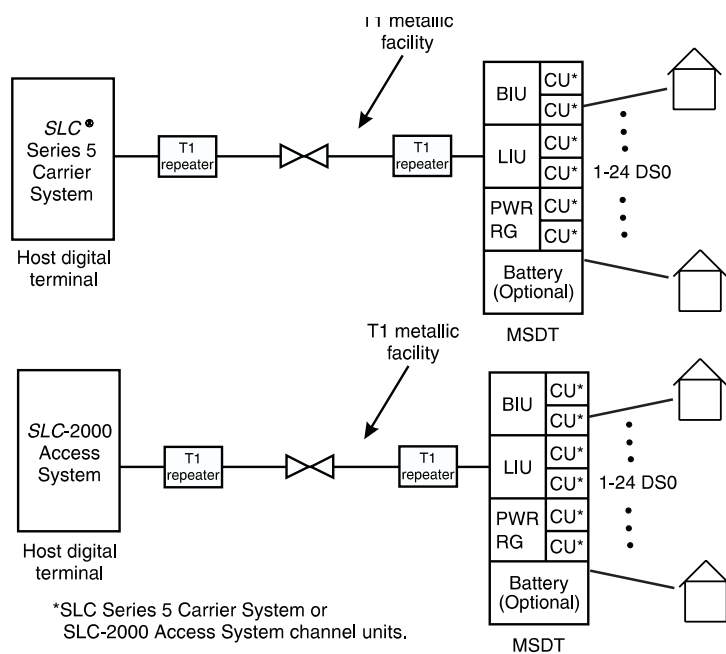


Figure 2-5. HDT to MSDT — Optical Facility

Conventional Metallic Facility

The MSDT is a very effective vehicle for increasing the service capacity of a rural network. Used as a small digital loop carrier (DLC) system, the MSDT delivers a full range of services not previously available in most of these applications. A characteristic of these rural networks is often the availability of a metallic T1 feeder that is not ready for replacement, despite the need to rehabilitate the distribution portion of the route. Figure 2-6 shows a typical metallic facility application. To support such applications, an interface has been developed that enables the MSDT to be connected to the HDT over a copper wire-pair interface. An MSDT Server (in DSX-1 output mode) is located at the HDT and connected to a T1 line repeater. At the MSDT, a BYB2 line interface unit (LIU) replaces the optical unit. This feature enables the reuse of existing copper facilities and a simple plug-in upgrade to a fiber interface when circumstances warrant.



facmet.eps

Figure 2-6. HDT to MSDT — T1 Metallic Facility

High Bit-Rate Digital Subscriber Line (HDSL) Modem Facility

The 1.5-Mb/s link between the units can also be a simple copper pair up to 12 kft long, using standard DSX-1 interfaces available at both the HDT (MSDT Servers) and the MSDT (BYB2), augmented by high bit-rate digital subscriber line (HDSL) modems at each end (Figure 2-7). This option permits the rapid deployment of an MSDT to meet particular customer service requirements. This is an effective interim strategy until a permanent T1 line or fiber can be placed.

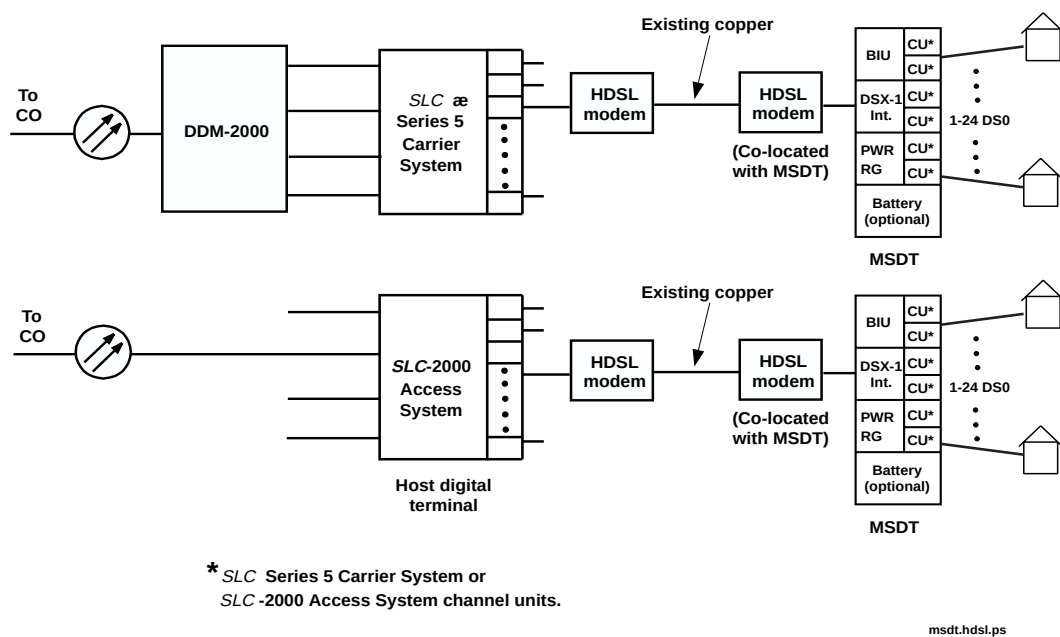


Figure 2-7. SLC®-2000 MSDT With HDSL Facility

Optical Multiplexer Facility

The DSX-1 interface also allows the use of a higher rate optical multiplexer to serve as the link between the HDT and the MSDTs. An example shown in Figure 2-8 depicts a 6-Mb/s multiplexer used to serve a 51A cabinet equipped with four rack-mounted MSDTs. Alternatively, the same 6-Mb/s multiplexer can be used to serve an MSDT and provide three DS1 extensions, as illustrated in Figure 2-9.

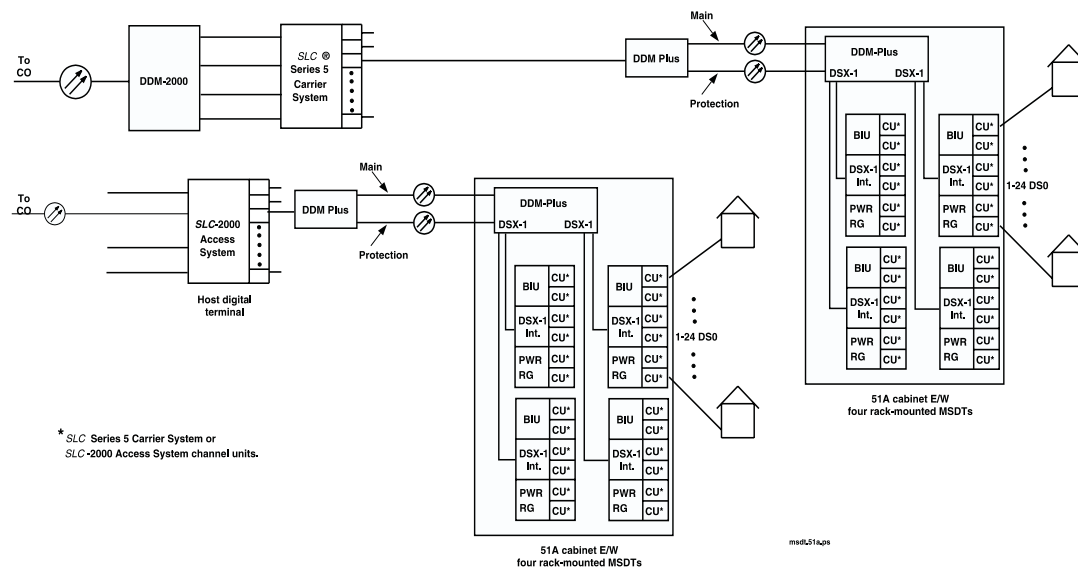


Figure 2-8. Four MSDTs Served From a 6-Mb/s Multiplexer

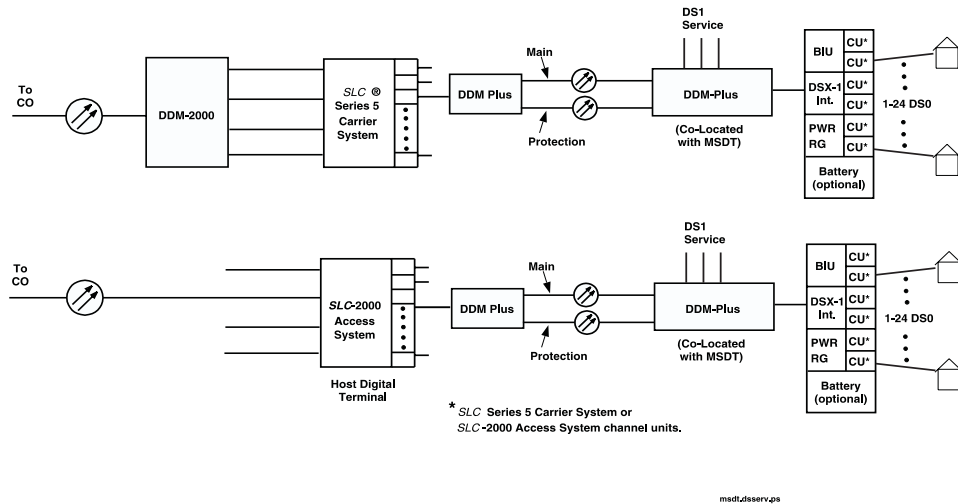


Figure 2-9. DS0 and DS1 Service Using 6-Mb/s Multiplexer

MSDT Sharing

A major consideration in the early deployment of FITL is the ability to achieve cost parity with the more traditional copper networks. A most important factor toward that end is the sharing of MSDT capacity across a larger number of living units to distribute the costs of electronics, media, and powering.

The initial fiber-to-the-curb (FTTC) standards suggested that an ONU serve four living units. In practice, most customers have elected to increase that sharing level to eight or even beyond. The decision on ONU sharing is based on any growth expected in the neighborhood, the number of lines allocated for each living unit, and the maximum drop length allowed. The 24-line MSDT supports this increased sharing, and some new outside plant planning and engineering tactics are emerging in response to this trend.

Service Drop Distance

Deployment of longer copper drops from an MSDT to the living units allows for increased sharing. In the more conventional FTTC configurations usually found in suburban and urban applications, the maximum drop length from the MSDT is limited by a 132-ohm loop resistance. This loop resistance is the sum of the resistance of the drop cable and the resistance of the customer premises wiring.

An option that may facilitate longer drops is the placement of subtending copper terminal pedestals. In this arrangement, 25-pair cable may be used to wire between the MSDT and each of the terminal pedestals. Drop pairs would then be run from these terminal pedestals to individual living units according to local practices. This arrangement would fit well into current operations, administration, and provisioning systems. This concept is illustrated in Figure 2-10.

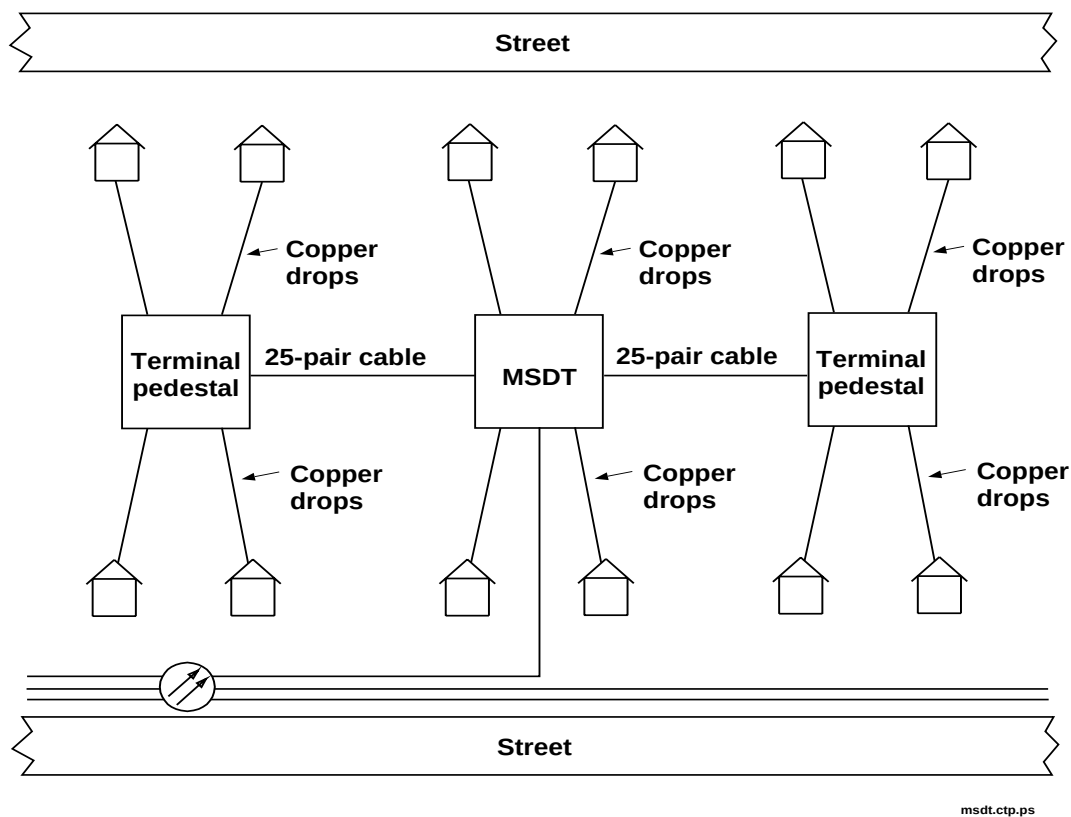


Figure 2-10. Increased Sharing of MSDTs Using Subtending Copper Terminal Pedestals

A consideration in determining the maximum drop length and the MSDT sharing levels is the plan that might exist for providing broadband services at the location. A variety of architectures exists for incorporating video transport capability into a FITL system and most can be engineered to accommodate the 8- to 12-living-unit-per-MSDT models.

Another limiting consideration might be video drop distance if video is associated with the MSDT/ONU configuration.

Rural Considerations

Long, sparsely populated rural routes can deploy the MSDT as a small digital loop carrier system. In these applications, 900-ohm or even 1500-ohm loop resistance designs are typical. As in the conventional FTTC case, local exchange carrier (LEC) increased sharing of MSDT electronics across a maximum number of living units is desirable. To achieve this, some have adopted a *rural serving area* concept in which lengths as great as 18 kft are permitted between the MSDTs and the subscribers. Others are designing rural networks that will allow the possible use of emerging technologies such as HDSL or ADSL to provide broadband and other new services. This approach may limit the drop distances to 12 kft, 6 kft, or some other range that is projected for these technologies. The selection of drop distance is a trade-off between first cost and the future capabilities anticipated for the network.

Bandwidth Management

The number and types of telephony services that can be provided by an MSDT are determined by the following:

- The maximum bandwidth capacity of the HDT to MSDT optical link
- The type and provisioning of the MSDT Server channel unit installed at the HDT
- The type of service channel units installed in the MSDT.

The engineering of the FITL system (that is, the sizing and distribution of its load bandwidth) is similar to the engineering of transmission trunks and switching systems in that the statistical factors and anticipated growth must be considered. Some of the aspects of managing MSDT bandwidth are discussed in this section.

HDT to MSDT Optical Link

The fiber distribution link between the HDT and the MSDT operates at the DS1 rate of 1.544 Mb/s when the HDOS is used. This provides a maximum capacity of 24 DS0 channels at the MSDT. The actual payload will be established by bandwidth provisioning at the HDT and channel unit selection at the MSDT.

By using the fiber service module (FSM), you can increase the speed of the optical link between the HDT and the MSDT to 51 Mb/s. This will allow the delivery of higher speed digital signals at the MSDT in addition to the 24 DS0s currently available. See Appendix B for details of the FSM.

MSDT Bandwidth Management From SLC Series 5 HDT

The MSDT Server channel unit installed at the HDT provides a digital interface between the backplane of the HDT and the optical unit which terminates the fiber link to that MSDT. Each MSDT requires its own dedicated server channel unit. For the *SLC Series 5 HDT*, there are two types of MSDT Server channel units — the AUA406 and the AUA408. The AUA408 is the more recent version of the unit. While the AUA406 interfaces only to a fiber facility, the AUA408 offers options for both fiber and metallic interfaces. Additionally, the AUA408 supports both universal and TR-08 integrated applications where the AUA406 is limited to universal only with a Feature Package C COT or a COT compatible with a TR-08 interface.

Both MSDT Servers are equipped with a slot allocation switch whose setting determines how many DS0 time slots on the HDT backplane are accessed by the server channel unit. This establishes the bandwidth capacity of the HDT which is allocated to a particular MSDT. The switch allows an MSDT capacity which ranges from a minimum of six DS0s to a maximum of 24 DS0s with increments of two DS0s available.

The ability to engineer the bandwidth of each MSDT allows better utilization of HDT capacity. While setting the bandwidth of each MSDT to 24 DS0s would allow for maximum sharing and growth potential, it results in stranded HDT capacity if those time slots are never required. With the bandwidth selection feature, the digroup time slots not accessed by an MSDT Server channel unit can be assigned to a second server located in the same digroup. For example, if the first MSDT in a digroup is engineered for 12 DS0 capacity, a second MSDT of 12 DS0 capacity can be served from the same digroup.

Consideration must be given to future growth requirements at the various MSDTs since a line capacity exhaust may necessitate some rearrangement of MSDT Server channel units at the HDT.

MSDT Bandwidth Management From SLC-2000 HDT

With *SLC-2000* as the FITL HDT, MSDTs are set up for either 12-line or 24-line capacity by provisioning the MSDT Server channel unit from a craft interface terminal at the HDT or a remote location. The server channel unit for the *SLC-2000* HDT is installed in a metallic distribution shelf (MDS) assembly. Prior to Release 4.5, the 48 DS0 time slots available in an MDS Assembly quadrant can be assigned as two 24-line MSDTs, four 12-line MSDTs, or one 24-line and two 12-line MSDTs. Release 4.5 allows 72 DS0 time slots to be available in an MDS quadrant. They can be assigned as three 24-line MSDTs, or four 12-line MSDTs and one 24-line MSDT, or two 12-line MSDTs and two 24-line MSDTs, or six 12-line MSDTs.

The *SLC-2000* system supports full checkerboarding of Integrated Network Access (INA), TR-08, and TR-303 services in shelves configured for FITL operation. The MSDT follows the same cross-connect rules that apply to the rest of the *SLC-2000* RT. For example, TR-303 POTS and ISDN services can be cross-connected into a 12- or 24-line MSDT that is already supporting TR-08 and INA services.



CAUTION:

Release 4.5 contains some checkerboard limitations. See 363-208-000 (SLC-2000 Access System Applications, Planning, and Ordering Guide).

The MSDT supports the AUA94 Dual ISDN Basic Rate Interface (BRI) (4:1 Time Division Multiplex (TDM)) 2B+D channel unit in specific locations. See Chapter 3 for details. *SLC-2000* quad ISDN channel units (SPQ494) are not compatible with MSDT.

MSDT Powering

A major consideration in the application of FITL systems is the method chosen for powering the ONUs. The MSDT allows a variety of powering options. By using the proper combination of power interface unit (PIU) and power conversion unit (PCU), the MSDT can be powered from the following:

- 120 V AC local powering (AUA414 PIU and AUA412 PCU)
- –48 V DC local powering (AUA414 PIU and AUA412 PCU)
- –130 V DC central powering (AUA416 PIU and AUA417 PCU)
- ±130 V DC central powering (AUA416 PIU and AUA427 PCU)
- ±130 V DC central powering peak loading (AUA426 PIU and AUA427 PCU)
- 60 V AC central powering (AUA424/AUA434 PIU and AUA422 PCU).

The choice of powering options involves trade-offs in initial costs, operating costs, maintenance costs, and other noneconomic factors.

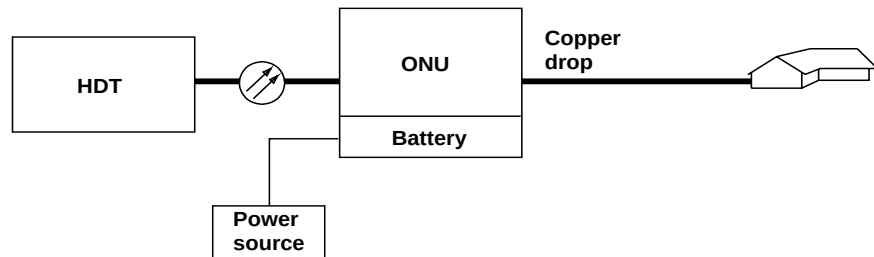
Local Powering

Local powering refers to the use of the commercial power utility to provide basic system operation. Backup during an outage of the primary power is provided by a small rechargeable battery installed in each MSDT enclosure. Reserve time meets the Bellcore TR-909 requirement of 10 hours.

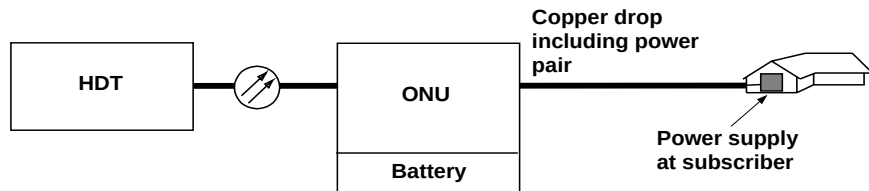
The use of local power represents some departure from traditional telephony practice. It is often the most simple and first-cost-effective powering method. But local powering introduces the rather significant issue of batteries in the distribution plant; along with the accompanying concerns over maintenance, replacement, and extended outages.

120 V AC Local Powering

Commercial 120 V AC power, obtained from the power utility (with or without a power meter), can be directly connected to the MSDT (Figure 2-11A). This has several advantages. First, the design is quite simple. Often, in new developments, arrangements can be made with the power utility for the powering of MSDTs from a transformer point. In many cases, the transformers and MSDTs are placed adjacent to one another, setting up small utility centers which can be landscaped or located to optimize the aesthetics. Operating energy costs are minimized in this configuration which involves very few power conversions and, therefore, provides high efficiency.



A. Power From Power Utility



B. Power From the Subscriber (Backpower)

power.lc.ps

Figure 2-11. FITL Local Powering

Perhaps the biggest benefit of the 120 V AC local powering arrangement is the significant first-cost advantage it offers over architectures which require copper cables to be run to each MSDT from centrally located power sources.

There are a number of factors which must also be weighed in the decision to use local 120 V AC power. This arrangement necessitates coordination with the electric utility, not only during the initial installation but also in the resolution of service problems which may result from failures in the power network. This makes the LEC somewhat more dependent on the electric utility than has been the case in the local loop. Installation of the 120 V AC service into the MSDT may also require the services of a licensed electrician in those cases where the LEC work force has not been certified to perform that function.

The most significant concern with the 120 V AC local powering option is the need to provide batteries. Wide-scale FITL deployment will result in large quantities of

MSDTs throughout the distribution network, each of which would require its own utility connections and batteries. Identifying and replacing batteries which reach their end-of-life is a major maintenance effort and expense item. Some LECs are also concerned that even 10 hours of battery reserve time is insufficient to handle the major disasters which occasionally occur throughout the country. The use of portable generators to extend that emergency reserve time is impractical during a wide-scale outage, since each MSDT would require its own generator.

The 120 V AC local powering option has been successfully deployed in numerous FITL applications around the United States. Its appropriateness is determined by an assessment of first-cost, life-cycle cost, susceptibility to long-term power outages, relationship with the local electric utility, and other factors which may be unique to the particular application.

–48 V DC Local Powering

A variation of the 120 V AC local powering arrangement is –48 V DC local powering (Figure 2-11B). The –48 V DC used in powering the MSDT is derived from the 120 V AC at the customer premises where a small power source provides conversion to –48 V DC. From there, the –48 V DC is routed to the MSDT by means of copper wire pairs that parallel the drop pairs. Several power sources from different customer premises may be paralleled to provide redundancy.

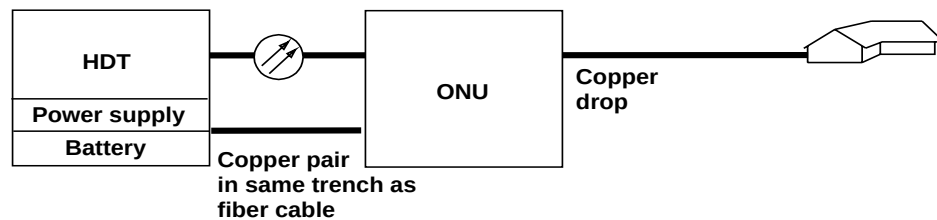
This arrangement offers two advantages over the more conventional local powering arrangement described earlier. First, the operating cost is transferred to the subscriber. In reality, however, this may result in some reimbursement from the LEC since one subscriber may be paying the electric bill for others served from the same MSDT. The other advantage of the –48 V DC local powering method is a lower voltage level, which provides greater safety and allows the LEC craft personnel to perform the installation.

As a local powering arrangement, all of the battery needs discussed earlier still remain. The –48 V DC local powering option also involves an additional power conversion and transmission loss, which decreases the operating efficiency of the system as compared to the 120 V AC option. With the need for redundant power sources to the MSDT, this version of local powering is generally higher on a first-cost basis than the 120 V AC arrangement.

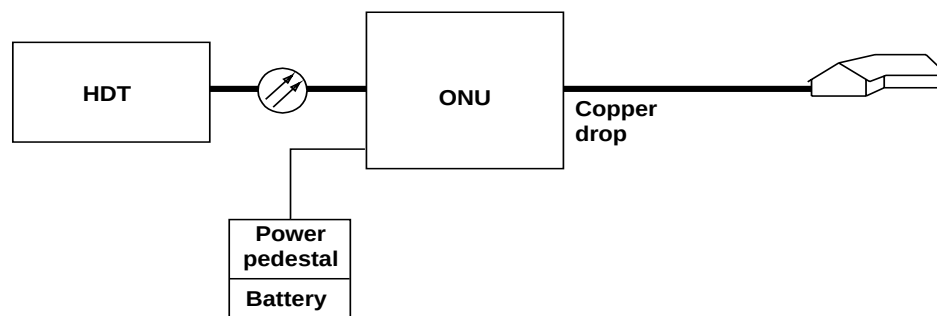
Central Powering

Although it generally involves a first-cost disadvantage compared with local powering, centralized powering is becoming a widely deployed architecture for FITL applications. This increasing acceptance is primarily due to the advantages it offers with respect to battery maintenance and extended reserve time.

The central powering approach uses one or more power hubs, each of which serves a number of MSDTs over metallic powering conductors. The power hub can be established at the HDT location (Figure 2-12A), or it can be an independent enclosure(s) located to optimize the power distribution network (Figure 2-12B).



A. Power Hub at HDT Location



B. Independent Power Hub

power.ct.ps

Figure 2-12. FITL Central Powering

Centralization of the power source offers several important advantages. First, it allows the consolidation of batteries into a few, or perhaps even one, location. This makes the task of battery maintenance and replacement much less complicated and costly. Additionally, the batteries deployed in these larger sites are generally longer-life products than the smaller units available for use in the MSDT. If the power hub is a Controlled Environment Vault (CEV), hut, or other controlled-environment location, the battery life is dramatically improved. Finally, the establishment of a power hub allows a single point for a generator connection during extended power outages.

These benefits must be weighed against several disadvantages associated with central powering. Of course, an obvious penalty is the need for a copper network to distribute the power into the outside plant. The power distribution network typically parallels the fiber distribution and resembles the metallic network that is replaced by fiber. It also presents similar maintenance requirements.

Additional power conversions and the energy dissipated during transport to the MSDTs result in lower overall energy efficiency. This, in turn, means higher energy costs and a requirement for larger power plants and more batteries.

In general, centralized powering involves higher initial costs for engineering, materials, and installation. The costs include the power plant, copper cabling, current-limiting hardware, splices, and terminations. When -48 V DC power plants of sufficient capacity exist at power hub locations, only the -130 V converters and downstream equipment are required. However, the power hubs are typically new locations, and the cost of the -48 V DC system must be considered.

Engineering effort for the power plant and the distribution network is needed. The design differs somewhat from that for telephony plants. See Chapter 5, "Powering", for further details on the centralized power plant and distribution network.

-130 V DC Central Powering

The Bellcore recommended centralized powering option supplies -130 V DC over standard, twisted-pair copper cables to operate MSDTs. This voltage is recommended by Bellcore TA-1468 and is selected to accommodate the large voltage drops associated with centralized powering runs, adhere to existing safety standards, and avoid any concern over corrosion effects on copper cables exposed to positive voltages.

The –130 V DC system uses a standard –48 V DC battery plant to supply a number of –130 V DC converters which are connected in parallel. The individual –130 V DC distribution circuits are equipped with 100 VA current limiting devices.

All of the HDT enclosure configurations offer an option for installing the central power equipment at that site as well. This arrangement uses the –48 V DC battery plant which supplies the *SLC-2000* or *SLC Series 5* HDT as the source to the –130 V DC converters. The powering conductors are run along with the fibers from the HDT to the MSDTs.

A variety of stand-alone powering hubs is also available. These hubs can be placed among the MSDTs to optimize the lengths of the power distribution cables. Among the standard powering hubs are a 51A cabinet which typically serves up to 27 twelve-line MSDTs and a larger 80A cabinet which can serve 84 twelve-line MSDTs.

±130 V DC Central Powering

Some FITL applications, particularly those in sparsely populated rural areas, involve long distances between the HDT and MSDTs. For these applications, the use of –130 V DC centralized power is rather limited by the large amount of copper required to power the MSDTs over these long runs. To support this application segment, a ±130 V DC central powering option has been developed.

The use of ±130 V DC extends, by a factor of four, the distance over which a particular size copper conductor can power an MSDT. As an example, a 22-gauge copper pair can typically power a 12-line MSDT over a distance of 4.5 kilofeet using –130 V DC. That range is increased by a factor of four to 18 kilofeet using a ±130 V DC converter card.

As in the –130 volt central powering option described earlier, a –48 V DC battery plant supplies the ±130 V DC converters. An individual ±130 V DC converter card is dedicated to each distribution circuit. The circuit is current-limited to 100 VA for safety considerations.

Recent studies indicate that positive voltages are not a significant corrosion concern for today's jelly-filled cables. However, local policy with respect to this corrosion issue may impact the selection of the FITL powering option.

60 V AC Central Powering

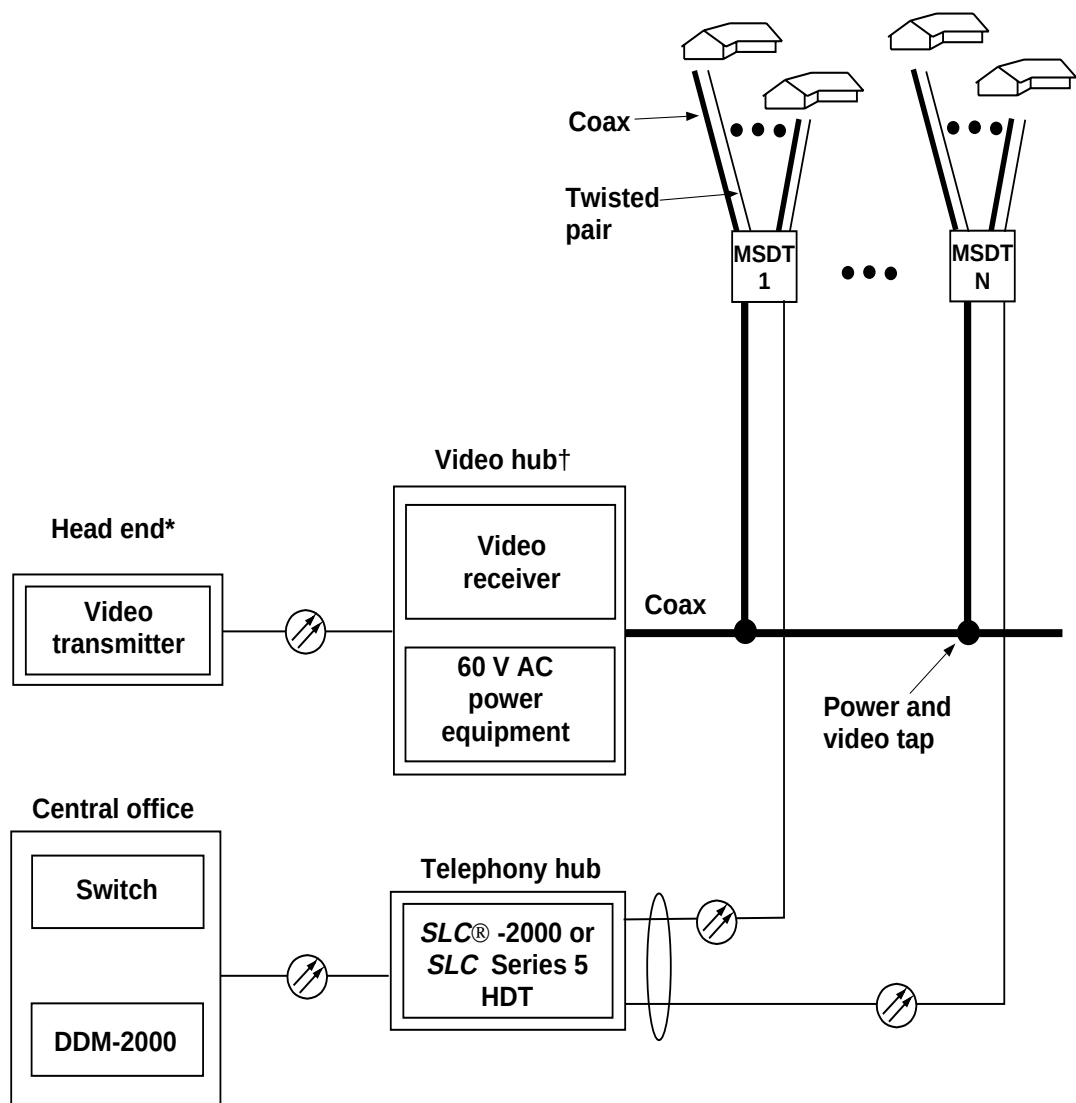
An increasing number of FITL applications also include a companion video network. In many of these cases, quality analog video signals are transported over fiber to a particular serving area. This configuration is depicted in Figure 2-13.

The community antenna television (CATV) industry has used this type of distribution architecture for some time. A standard method of powering the active electronics on this video network is by inserting 60 V AC power between the center conductor and the shield of the coax cable. A new central powering option has been developed to allow MSDTs to also be powered from the 60 V AC on the coax cable running past the MSDTs. This is also illustrated in Figure 2-13.

This 60 V AC central powering option offers several advantages. First, it eliminates the need for separate copper powering pairs between the power hub and each MSDT. Assuming that the coax cable is to be provided for video transport, its additional use as the power cable improves the overall economics of the installation.

In addition, the bus architecture further improves the cost efficiency by allowing a less conservative power design. For example, when individual power conductors are run to each MSDT from a powering hub, the copper must be designed to support some *worst-case* traffic level which could occur at that MSDT (perhaps 18 CCS or even 36 CCS). This increases the amount of copper required just to support a case which seldom, if ever, materializes. However, the power bus approach enables one to take advantage of traffic statistics across a number of MSDTs. While any one MSDT may experience a worst-case, 18- or 36-CCS condition, it is very unlikely that the entire bus of multiple MSDTs will see such traffic levels simultaneously. Therefore, a bus design which supports an overall 6-CCS level, for example, may be more than adequate.

A third benefit is the availability of standard hardware and practices to support a 60 V AC coax powering approach. While the concept is new to the telephone industry, it has been widely deployed for years in the CATV industry. As a result, standard equipment is available, including the 60 V AC power supplies, power inserters, video taps, directional couplers, etc. An example of a typical hardware layout is shown in Figure 2-14.

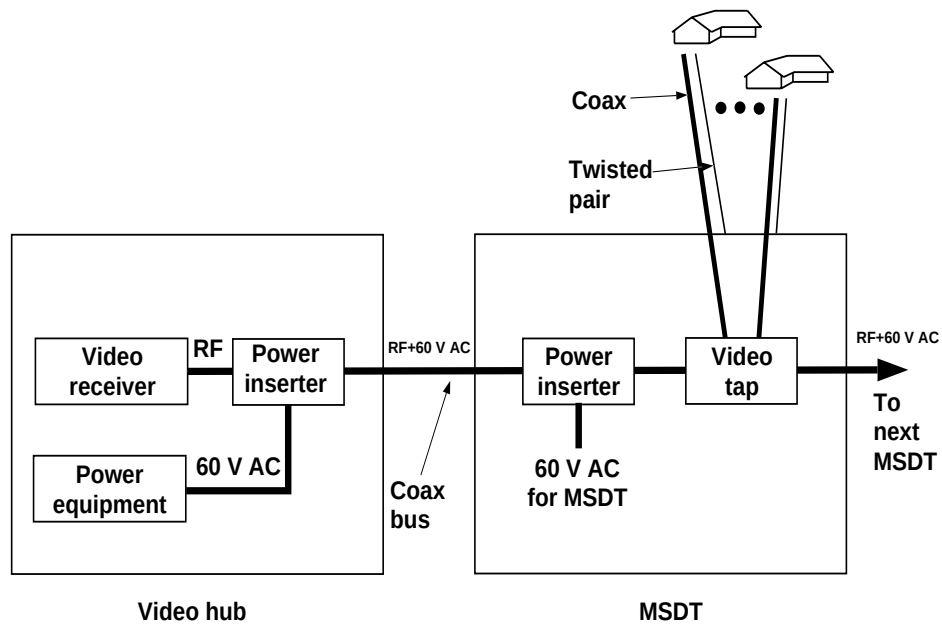


* Video head end could be at central office.

† Video hub and telephony hub may be combined into single enclosure.

video.hub.ps

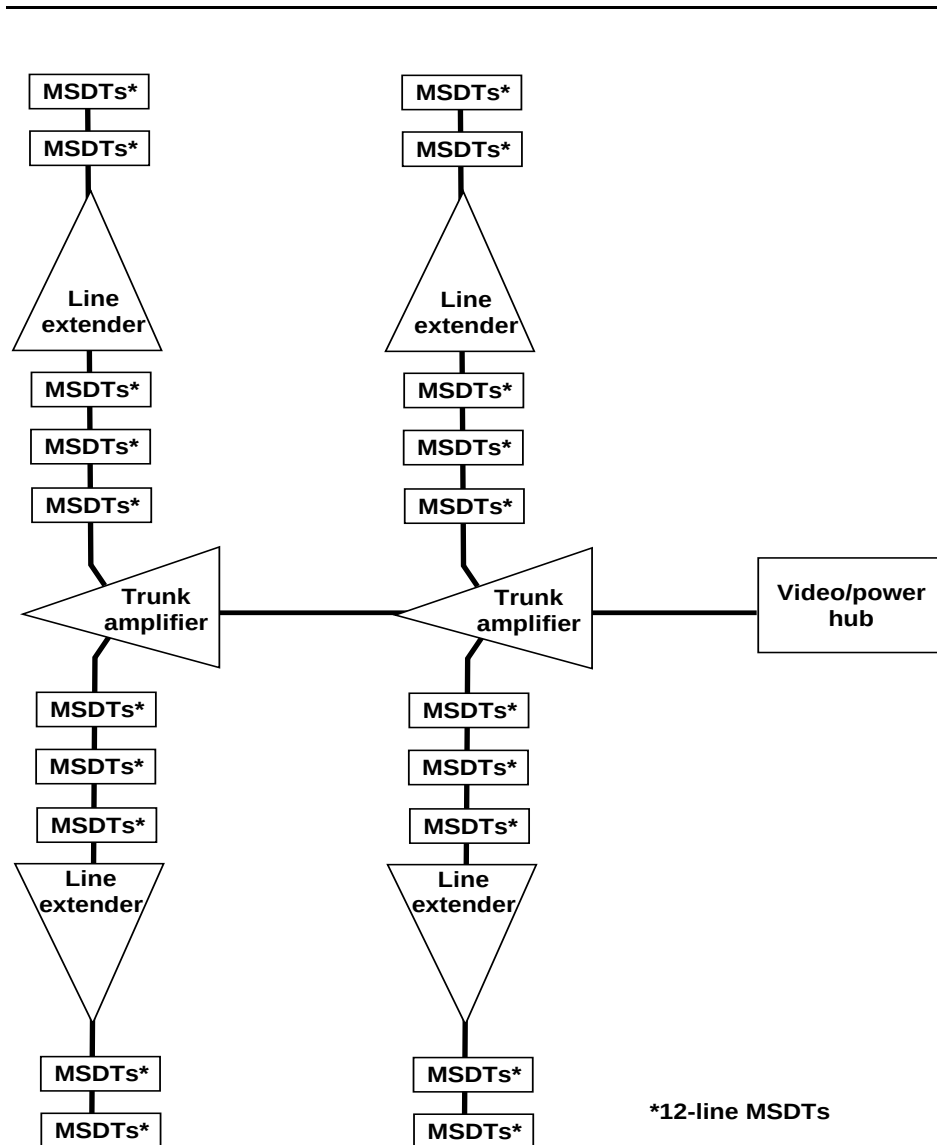
Figure 2-13. Central Powering Over Coax



power.cx.ps

Figure 2-14. Hardware Elements for Central Powering Over Coax

The extremely low resistance value of coax cable provides another cost benefit. Whereas a –130 V DC centralized power network on twisted pairs is generally limited by voltage drops, this is not the case with 60 V AC over coax. Here, current capacity and not voltage drop is typically the limiting factor. As a result, a 60 V AC, 15 amp power supply can power a large number of MSDTs, in addition to the video electronics, on the coax bus. The example in Figure 2-15 demonstrates multiple 12-line MSDTs being fed from such a bus. The actual number is dependent on factors such as living unit density, quantity and power requirements of amplifiers and line extenders in the network, and telephony traffic design.



msdt.cb.ps

Figure 2-15. Multiple MSDTs Powered From Coax Bus — Configuration Example

While the advantages of 60 V AC powering over coax are attractive, there are other factors which should be considered as well. First and foremost is the issue of safety regulations. While the CATV industry has successfully utilized this powering practice for years, the telephone industry has historically adhered to the National Electric Code® position that communications circuits be current-limited to 100 VA. The 60 V AC central powering method violates that model. This issue

must certainly be addressed by an LEC and its work force if the option is to be considered.

While the bus architecture provides powering cost benefits, it also introduces the element of significantly higher failure groups. If the power bus is lost, many more subscribers are affected. Redundancy of power supplies mitigates this risk, but it is nonetheless an area for consideration.

Assuming that the safety and failure group issues are satisfactorily resolved, there remains the issue of training the telephone industry to implement an unfamiliar technique. LEC engineering and installation practices must be established and personnel educated.

The apparent advantages of this central powering network are significant, as are the issues to be addressed. For applications where this 60 V AC power method is selected, the MSDT supports the option by using standard powering hardware available in the CATV industry.

Rural Applications

Rural Modernization

Nearly all telephone companies are faced with the challenge of providing high-quality service to their rural subscribers. Rural routes are typified by long distances and low subscriber density. Finding a cost-effective means to serve this special customer segment has been a difficult task.

In the early 1970s, rural modernization programs were undertaken to upgrade the multiparty open wire lines which generally served these areas. Buried air-core cable was placed and one-, two-, and four-party service was provided. The addition of VF amplifiers raised service to levels never before known in rural areas. The enhancement continued in the 1980s as the introduction of analog station carrier systems provided a rural network of single-party service, with customer lengths averaging under one mile.

As we progress through the 1990s, the modernization goes on. Many rural routes are served from digital switches and fiber has been placed for interoffice facilities. But much of the loop plant of the 1970s is still in place and much of it is wearing out. Service is deteriorating due to corrosion and water seepage, and it is now time to replace the cable. Telephone companies are now faced with finding a cost-effective solution which meets today's rural needs and those of the future. Rural customers require a full range of services, as farms have evolved to high-tech, agri-businesses with multiple lines, fax machines, and high-speed modems. And it is the rural segment that may benefit most from the emerging services such as distance learning and medical imaging.

Alternative Solutions

Placing new copper voice-frequency (VF) plant for single-party service is extremely expensive, and carrier-based solutions are preferred by most telephone companies. But the analog carrier systems which enabled earlier enhancements are severely lacking in today's environment. The grade of service provided is well below the standards described in Bellcore TR-57 and other documents. The carrier level signals are very susceptible to cross talk, particularly from digital signals in a common cable sheath. In general, analog carrier has become obsolete as digital techniques become the mainstay of the telecommunications industry.

Digital Loop Carrier (DLC) has proven to be a very effective solution in the outside plant. DLC systems offer robust transmission, high functionality, and attractive first-cost. And with continued technology advances, DLC systems are becoming smaller, less expensive, more reliable, and offer more comprehensive operation, administration, maintenance, and provisioning (OAM&P) capabilities. A small DLC system that can deliver these advantages to rural applications is an excellent modernization option. A system which can operate over an existing T1 line or a single fiber is even more attractive.

Economics

Recognizing this need in the rural areas, the MSDT has been designed with a number of features targeted specifically at this application.

The economic benefit of fiber for long routes is a consequence of the fact that the installed cost of copper cable is more than the installed cost of a fiber cable with equivalent bandwidth. For long rural routes, large gauge copper cables (typically 19 gauge) are needed to maintain signaling and transmission performance, and with the extremely lengthy runs required, the savings accrued from the fiber placement more than pay for the electronic multiplexing equipment associated with the DLC system.

Figure 2-16 is an illustration of a generic five-branch route that is scaled to allow comparisons between copper and fiber alternatives for routes of varying length. Over the numerous studies conducted, it has been found that 24-channel fiber-fed terminals are the economic choice for routes of 40 kft or more to the furthest subscriber. Also, routes containing densities from one-half to ten living units per mile are especially good candidates. A tremendous number of routes throughout North America possess these characteristics.

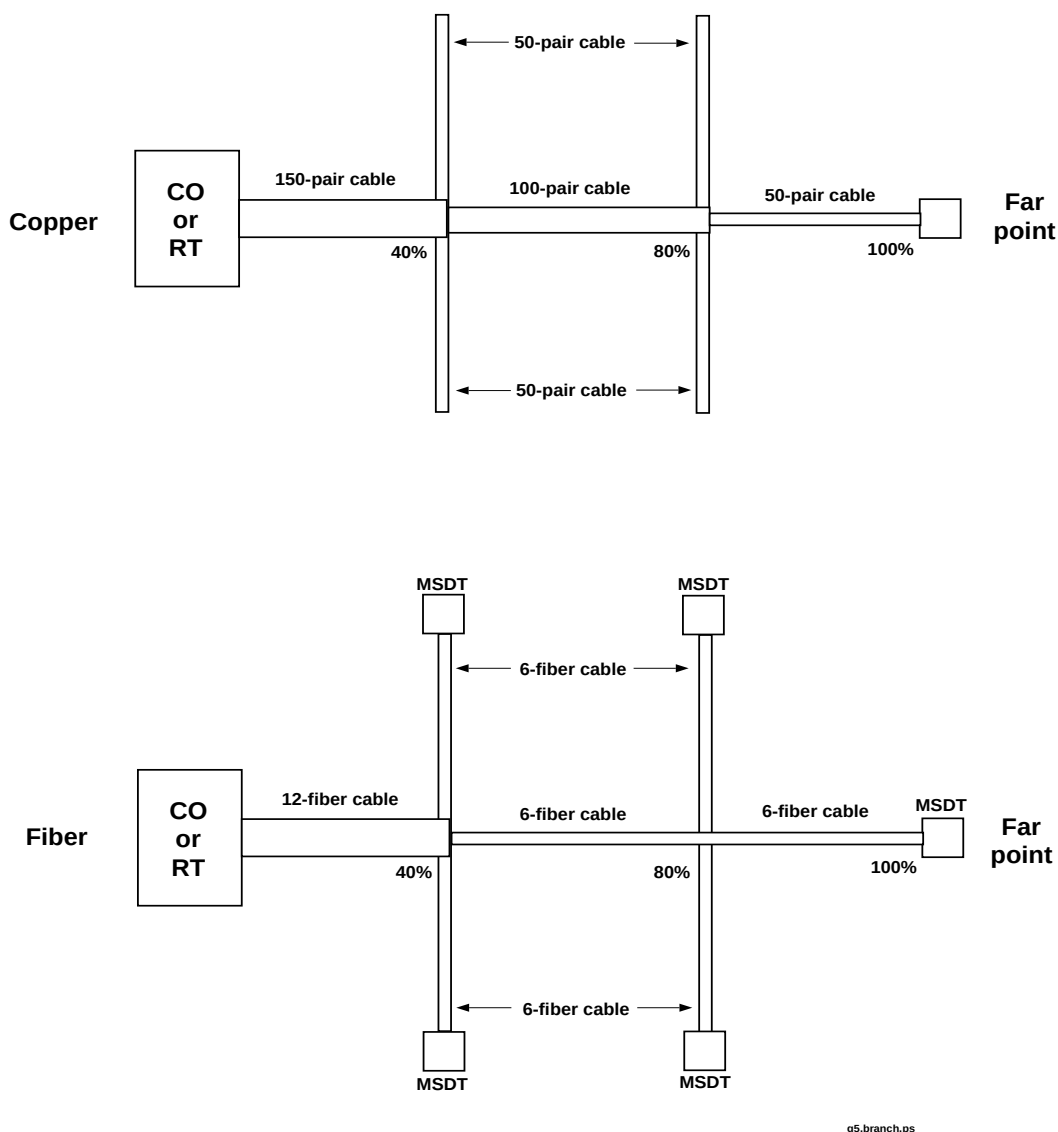


Figure 2-16. Generic Five-Branch Route — Copper and Fiber Alternatives

Rural Features

What makes the MSDT cost-effective in rural applications is its serving range. An MSDT can be hosted from an HDT up to 15 miles away over a single fiber. An extended range option is also available that increases that distance to 21 miles. The extended range option implements the AYB5/BYB5 optical cards at the HDOS/MSDT. Equally important is the full array of 900-ohm channel units that permit telephone companies to establish 18-kft serving areas around each MSDT without the need for loading coils. Many customers prefer 12-kft serving areas to be prepared for ISDN services and for possible use of HDSL technology. This 12-kft range can also be economically accomplished with the MSDT. For the occasional extra-long loop, a 1500-ohm channel unit is available as well.

An extended-range ringing generator (AUA423) is available as an MSDT option to support the long copper drop distances not found in conventional FITL applications. The AUA423 ringing generator is required for loops longer than 132 ohms.

The reality of the outside plant does not always permit the total replacement of a copper facility with fiber. Often there are T1 lines with several years of remaining life serving distribution that need immediate rehabilitation. For those cases, the MSDT can be equipped to operate from a T1 line while still delivering the complete range of services and benefits (Figure 2-17). When the T1 line is ready for upgrade to fiber in the future, the MSDT is converted through a simple plug-in change of its facility interface board. The facility side of the MSDT can also interconnect at the DSX-1 level. This permits its use with a larger lightwave multiplexer or with HDSL modems.

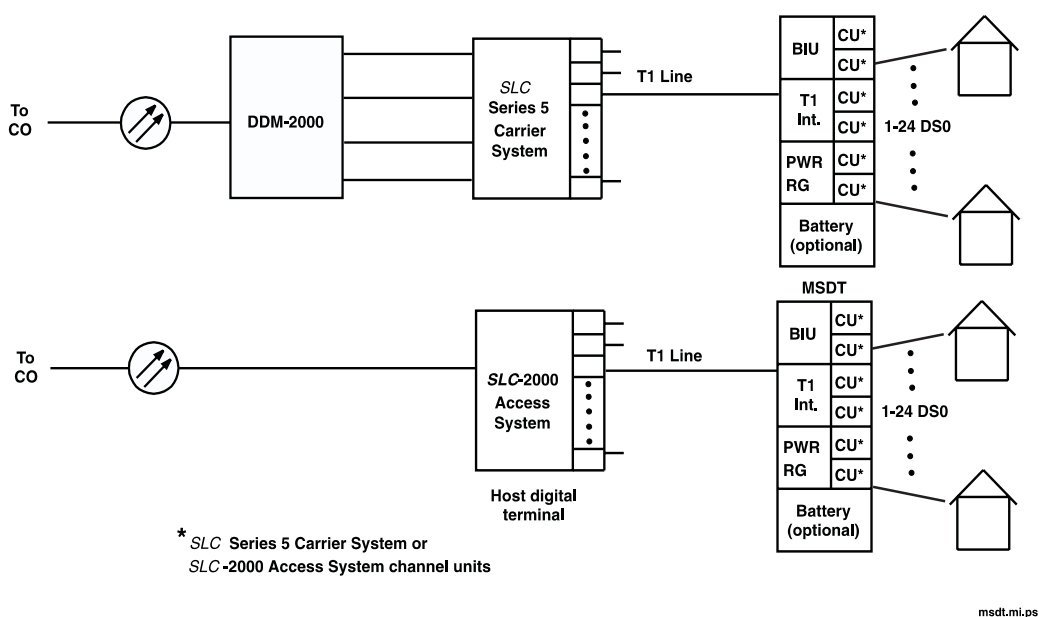


Figure 2-17. SLC®-2000 MSDT with Metallic Interface

This facility flexibility allows the MSDT to be economically placed in virtually all rural applications now. It also guarantees simple upgrade to a fiber-based network where fiber cannot be deployed initially.

The 120 V AC local powering option is often the choice for rural routes as customers place MSDTs in locations convenient to an AC power source. Central powering is also used in many applications. This reduces the number of batteries distributed throughout the outside plant and enables operation during extended power outages through the use of an auxiliary generator at the powering hub. To support central powering in rural cases, a ± 130 V DC option has been developed that greatly increases the distances over which MSDTs can be powered from remote locations.

Physical and Functional Description

3

Contents

Introduction	3-1
Central Office Terminal/Switch	3-1
Host Digital Terminal (HDT) — SLC[®]-2000 Access System	3-1
■ HDT Housing Options	3-1
■ HDT Equipment Additions to Support an MSDT	3-4
■ MSDT Features and Required Equipment for SLC-2000 HDT Software Release 4.0 or Later	3-6
TR-303 Basic Services	3-7
BIU Downloading	3-7
TR-303 ISDN BRI 2B+D	3-8
Enhanced Alarms for Fiber Distribution Systems	3-9
TR-303 Metallic Circuit Testing	3-9
TR-303 ISDN Metallic Circuit Testing	3-10
MSDT Inventory Retrieval	3-10
MSDT Server/MSDT Link Performance Monitoring	3-10
Voice Frequency Data Enhancement (VFDE) Feature (Release R4.6 or Later)	3-11
■ HDT/MSDT System Operating Description	3-14
MSDT Servers	3-16
General Operation — Prior to Release 4.5	3-16
General Operation — Release 4.5 and Later Equipment not in a Cabinet	3-18
SPQ[®] 808, SPQ809, SPQ810, and SPQ811 MSDT Server Channel Unit	3-20
High Density Optics Shelf (HDOS) Assembly	3-22
Fiber Optic Distribution Shelves	3-29

Contents

Metallic Distribution From the HDT	3-32
Host Digital Terminal — SLC Series 5 Carrier System	3-32
■ AUA406 and AUA408 MSDT Server CUs	3-37
■ SLC Series 5 HDT Bandwidth and Bandwidth Shedding	3-38
■ High Density Optics Shelf Assembly	3-44
■ Fiber Optic Distribution Shelves	3-45
Special HDT Application Considerations	3-46
■ Basic Rate Interface Transmission Extension (BRITE) and ISDN	3-46
T-BRITE (AUA90 Channel Unit)	3-46
BRITE II (AUA93 Channel Unit)	3-48
■ SLC-2000 ISDN BRI Services (SLC-2000 Software Release 4.0 and Later) (AUA94 Channel Unit)	3-53
■ Mode 2	3-55
■ T1 MSDT	3-55
HDT Central Powering Equipment	3-58
Multi-Services Distant Terminal	3-60
■ Card Cage and Backplane	3-62
Backplane Interface Units (BIUs)	3-63
Optical Units (OUs) or Line Interface Units (LIUs)	3-66
Channel and Drop Test Unit (CDTU)	3-67
Power Converter Units (PCUs)	3-68
Ringing Generator Units (RGUs)	3-72
Power Interface Units (PIUs)	3-73
Channel Units	3-75
■ Battery Backup	3-76
■ Field Wiring Box	3-77
120 V AC Local Powering Option — ED-7C712-30, Group 20	3-78
-48 V DC Local Powering Option — ED-7C712-30, Group 21	3-79
±130 V DC Central Powering Option — ED-7C712-30, Group 22	3-80
-130 V DC Central Powering Option — ED-7C712-30, Group 23	3-81
60 V AC Central Powering Option — ED-7C712-30, Group 24	3-83

Contents

■ Fan Unit	3-85
■ Fiber Storage Unit	3-85
■ Tip and Ring Pair Protectors	3-85
■ Pedestal-Type MSDT Enclosure Description	3-85
■ Strand-Mounted MSDT Enclosure Description	3-86
■ Rack-Mounted MSDT Description	3-87
■ Underground MSDT (U-MSDT) Description	3-89
Installation and Maintenance Equipment	3-91
■ Optical Backplane Maintenance Kit	3-91
■ WP91067, L6 Test Cord	3-94
■ 300A ST [®] Fiber Optic Cable Connector Microscope	3-94

Physical and Functional Description

3

Introduction

This chapter provides a physical and functional description of the equipment and apparatus required at the central office terminal (COT), host digital terminal (HDT), and *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) locations to support the *SLC*-2000 MSDT feature.

Central Office Terminal/Switch

In a universal or integrated configuration, there will be no changes to the equipment at the COT or switch location, respectively, due to the addition of the *SLC*-2000 MSDT feature.

Host Digital Terminal (HDT) — *SLC*[®]-2000 Access System

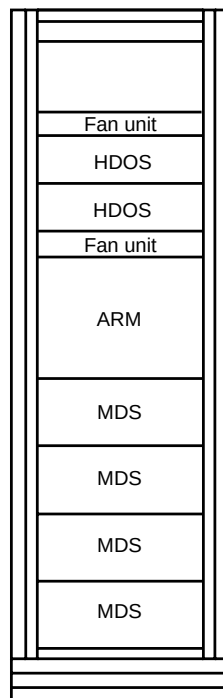
This section describes the *SLC*-2000 Access System host digital terminal (HDT) equipment housing options along with the equipment that must be added to support the *SLC*-2000 MSDT. It also includes a high-level operating description of the HDT/MSDT system and its parts. A detailed description of the *SLC*-2000 HDT can be found in 363-208-000, *SLC-2000 Application, Planning, and Ordering Guide*.

This section also includes the MSDT features along with the required circuit packs when the HDT uses *SLC*-2000 Software Release 4 or later.

HDT Housing Options

For long-loop applications, the *SLC*-2000 Access System HDT equipment and associated *SLC*-2000 MSDT feature equipment are designed to be installed in a hut, controlled environment vault (CEV), an 80A cabinet, or an 80D cabinet.

When located in a CEV or hut, the equipment required to support the *SLC*-2000 MSDT feature is installed in a 7-foot high bay and arranged according to Figure 3-1. For short-loop applications, the *SLC*-2000 Access System HDT is installed in the central office.



tpa 832473/02

Figure 3-1. *SLC*[®]-2000 Host Digital Terminal (HDT) Bay Layout for FITL

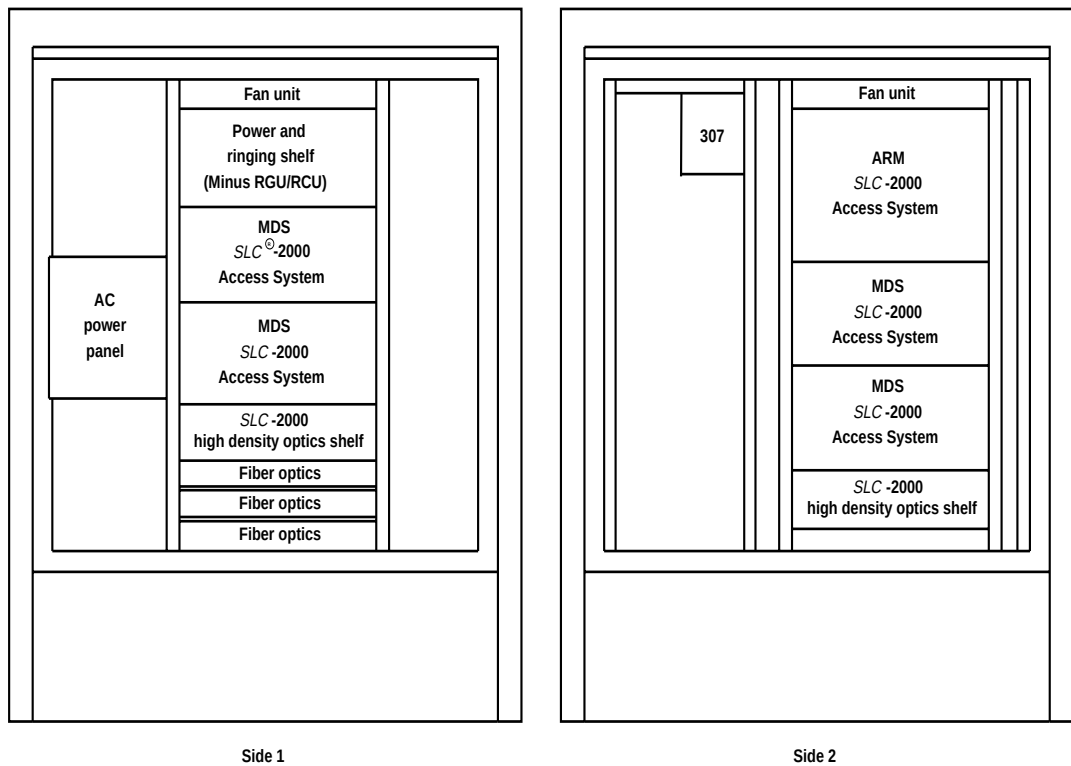
A typical 80A-HX cabinet arrangement (Figure 3-2) consists of the following:

■ **Side 1:**

- Two metallic distribution shelf (MDS) assemblies
- A high density optics shelf (HDOS) assembly
- Three fiber optic interconnect panels
- A power and ringing shelf
- An AC power panel.

■ **Side 2:**

- One access resource manager (ARM) assembly
- Two MDS assemblies
- One HDOS assembly.



tpa 832450/01

Figure 3-2. SLC®-2000 HDT 80A-HX Cabinet Layout for FITL

A typical 80D-HX cabinet arrangement (Figure 3-3) may include up to two ARM shelf assemblies, eight MDS assemblies, and four HDOS assemblies. The typical 80-type cabinet arrangement may be customized by omitting MDS assemblies to add central powering equipment, DDM-plus extension shelves, or fiber splicing shelves.

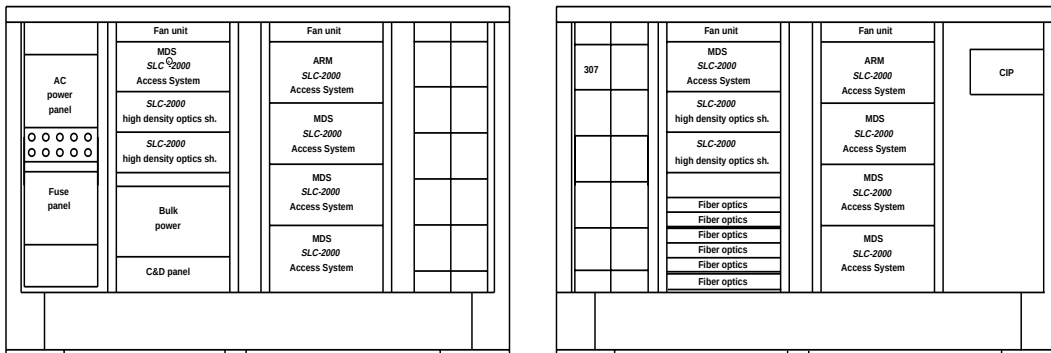


Figure 3-3. SLC®-2000 HDT 80D-HX Cabinet Layout for FITL

HDT Equipment Additions to Support an MSDT

The SLC-2000 Access System contains some additional equipment when it serves as the HDT for the SLC-2000 MSDT feature. The equipment that has been added at the HDT includes the following shown in Figure 3-1, Figure 3-2, and Figure 3-3:

- MSDT Servers
- J1C265AC-1, L3 HDOS assembly
- Fiber optic distribution shelves
- Central power source equipment with associated protection panel(s) (optional — depends on selected power arrangement). This equipment will be described later in this chapter.

On a *SLC-2000* metallic distribution shelf provisioned for FITL (upper or lower shelf of an MDS assembly), the plug-in units that can be inserted into the channel unit (CU) slots to support the *SLC-2000* MSDT feature are restricted to MSDT Servers. In general, metallic channel units cannot be used with MSDT Servers on the same metallic distribution shelf (although they are allowed in the same MDS assembly) except for the following circuit packs (which replace the MSDT Servers):

- AUA57 FSR
- AUA232 RS-232 channel unit (available in *SLC-2000* Software Release 3.2 and later)
- DC pair emulator (MC5405).

You can install these channel units in an MSDT-serving shelf where the RT site is entirely dedicated to FITL service. They terminate CO/RT circuits associated with maintenance. You can only install these channel units in the following valid MSDT Server slots on an MDS assembly shelf depending on the software release:

- **Release 4.4 or Earlier:** slots 1, 5, 13, and 17
- **Release 4.5 or Later:** slots 1, 5, 9, 13, 17, and 21.

Cross-connections for the AUA232 and AUA57 should be made as if the channel units were installed in the first slot in the MSDT instead of the MDS assembly (for example, **ENT-CRS-T0: :v3dp-1-1,dtdp-1-1-1-1**).

MSDT Features and Required Equipment for SLC-2000 HDT Software Release 4.0 or Later

Customers may take advantage of several new MSDT features available in *SLC-2000* Software Release 4 or later. Table 3-1 describes the MSDT circuit packs that support these features. The circuit packs designated with an "X" support the features in the first supported release and later releases. All newer circuit packs are backward compatible with previous *SLC-2000* release features.

Table 3-1. SLC[®]-2000 HDT Software Release 4 Required Circuit Packs for Specific MSDT Features

Features	First Supported in Release	MSDT Server			BIU		CDTU (Note)	
		SPQ [®] 808 Server	SPQ809 or SPQ810* Server	SPQ811* Server	MC97780A1 MC97789A1 MC97794A1	MC97793A1	AUA 411	AUA 411B
TR-303 Basic Service	4.00.01	X	X	X	X	X	n/a	n/a
BIU Downloading	3.02.01		X	X		X	n/a	n/a
TR-303 ISDN BRI 2B+D	4.00.01		X	X		X	n/a	n/a
Enhanced MSDT System Alarms	4.00.01		X	X		X	n/a	n/a
TR-303 Metallic Circuit Testing	4.00.01		X	X		X		X
TR-303 ISDN Metallic Circuit Testing	4.00.02		X	X		X		X
MSDT Inventory Retrieval	4.00.02		X	X		X	n/a	n/a
Server/MSDT Link Performance Monitoring	4.00.02		X	X		X	n/a	n/a
VFDE	4.06			X		X	n/a	n/a

Note: n/a — circuit pack is not applicable to the feature.

* The SPQ810 or SPQ811 Server can only host an MSDT if the HDT software is R4.5 or later. The VFDE feature is supported with the SPQ811 Server only.

TR-303 Basic Services

The MSDT supports basic TR-303 services such as POTS, frequency selective ringing (FSR), coin, multiparty, direct inward dial (DID), manual ringdown and private line auto ring (PLAR), etc. This is done using any of the basic channel units shown in Table 6-1 of Chapter 6. The MSDT then acts as an *extension* of the HDT that is connected to the TR-303 switch.

BIU Downloading

SLC-2000 Software Release 4 or later supports BIU software downloading from the HDT to the BIU at the MSDT. If the BIU at the MSDT contains a version of software that needs to be updated, the SLC-2000 HDT will download the current version of its software into the BIU circuit pack at the MSDT. This download will also proceed if a new version of software is installed on the HDT's SMU (for example, a conversion from 3.02.01 to 4.00.01).

For BIU software downloading to take place, the system must contain the following circuit packs:

- **At the HDT**, the SPQ[®]809, SPQ810*, or SPQ811* MSDT Server
- **At the MSDT**, an MC97793A1 BIU.

* You can only use the SPQ810 or SPQ811 MSDT Server in a SLC-2000 HDT containing Software Release 4.4 or later.

TR-303 ISDN BRI 2B+D

The SLC-2000 HDT/MSDT FITL system, when equipped as shown in Table 3-1, supports TR-303 ISDN basic rate interface (BRI) 2B+D, B1+D, B2+D, and D-only service homing on the local digital switch using the AUA94() dual ISDN channel unit. Each AUA94() U-DSL channel unit provides two ISDN BRI services. Each of these services can provide up to two 64-kb/s B-channels for voice and/or data in addition to one 16-kb/s quarter DS0 D-channel for message signaling and packet switched data.

ISDN BRI services provide for the following capabilities in addition to the digital 144-kb/s 2B+D voice, data, and packet switched data capability:

- ISDN segmented DSL digital testing
 - Analog loopbacks at the channel unit (2B+D only)
 - Digital loopbacks at the channel unit (B1+D, B2+D, B1+B2, B1, B2, or D)
 - Digital loopbacks at the NT (2B+D, B1, or B2)
 - Force corrupt CRC
- DSL performance monitoring (PM), upstream and downstream, current and previous intervals
 - Coding violations (CV) (also known as block errors or CRC)
 - Errored seconds (ES)
 - Severely errored seconds (SES)
 - ES and SES threshold levels
 - Corrupt count indications
- ISDN port status
 - Service state changes
 - PM threshold crossing alert notification for alerting craft personnel to service degradation situations
 - Loss of signal (LOS) reporting for notification of loss/restoration of communication between the channel unit and the NT1
 - Change of overhead bits for NT1/TE customer premises equipment (CPE).

The MSDT supports 4:1 time division multiplexing (TDM) of four D-channels into a single DS0 as required by the AUA94 channel unit and TR-303. D-channel 4:1 TDM for TR-303 requires that the ISDN AUA94 channel unit adhere to placement restrictions when equipped at the MSDT. These placement restrictions are identified later in this chapter.

Enhanced Alarms for Fiber Distribution Systems

SLC-2000 Software Release 4 or later provides enhanced fault sectionalization capability within the MSDT system. The enhancements provide operating personnel the ability to identify individual channel unit failures in the MSDT. Table 3-2 shows additional alarm enhancements. All alarms are reported to operating personnel using one of the following methods:

- User interface panel (UIP) (at the HDT)
- Craft interface terminal (CIT)
- **With TR-303 systems**, over the embedded operations channel (EOC) to the local digital switch.

Table 3-2. Alarm Enhancements (Note)

Basic Alarm	Corresponding Enhanced Alarm
Channel unit failure at MSDT	• Channel unit failure with MSDT CU slot number
MSDT on batteries alarm	• MSDT on remote battery • MSDT on local battery
Power alarm	• MSDT battery charger alarm • Power source failure • Blown PIU fuse

Note: Enhanced alarms will only be reported if all the components of a fiber distribution system (such as the SLC[®]-2000 HDT, MSDT Server, and MSDT BIU) support this feature (see Table 3-1).

TR-303 Metallic Circuit Testing

The MSDT supports TR-303 metallic drop testing of locally switched non-provisionable CUs using the pair gain test controller (PGTC). The CDTU performs tests on the metallic drop at the MSDT and passes the results to the MSDT Server where they are translated into a specific DC signature. Chapter 4 contains these translations and detailed information on MSDT circuit testing procedures.



NOTE:

For TR-303 metallic circuit testing, the MSDT must contain the AUA411B CDTU.

TR-303 ISDN Metallic Circuit Testing

The MSDT can test the metallic drop between the AUA94 channel unit and the NT1-U. Test results are passed and translated into DC signatures at the MSDT Server in the same manner as non-ISDN channel units. Chapter 4 provides additional information on the ISDN metallic drop testing feature.

MSDT Inventory Retrieval

In *SLC-2000* Software Release 4 or later, the **rtrv-eqpt** command includes inventory retrieval of MSDT circuit packs and MSDT Servers. The following list shows the MSDT related circuit packs included in the command's response:

- BIU (with its associated software version)
- PIU
- PCU
- RGU
- MSDT Server.

MSDT Server/MSDT Link Performance Monitoring

The MSDT DS1 performance monitoring (PM) feature provides operating personnel with the ability to determine the quality of the DS1 link between the *SLC-2000* HDT and the remote MSDT. The HDT and the MSDT independently monitor the quality of their respective ends of the DS1 signal. The system does this by counting the number of seconds it detects excessive errors. The HDT periodically accumulates this data, which operating personnel can retrieve on-demand using the HDT CIT interface. When the errors exceed predetermined thresholds, the system sends a report to an operations system (OS) using the TL1 interface. See Chapter 4 for more information on performance monitoring.

Voice Frequency Data Enhancement (VFDE) Feature (Release R4.6 or Later)

SLC-2000 Software Release R4.6 or later allows the HDT and MSDT to support the VFDE feature. This feature is designed to improve the connect rate, or *throughput*, of analog modems served by switched single-party loop-start and ground-start lines. These lines must connect to the TR-303 interface of a local digital switch (LDS) supporting the VFDE software. If the LDS does not contain the appropriate VFDE software, then the feature is not usable with the *SLC-2000* HDT or MSDT.

The VFDE feature increases the possibility that analog modems will connect closer to their rated speed. For example, if you are using a modem rated at 28.8 kb/s, but normally connect to your internet server or other computer equipment at 21.6 kb/s, this feature could improve the connect rate.



NOTE:

Many factors combine to decrease the connect rate of a modem. These include line noise, poor physical connections, modem quality, etc. The DS1s interfacing with the *SLC-2000* HDT and MSDT are only one of many factors. The VFDE feature eliminates the DS1s interfacing with *SLC-2000* equipment as one of the factors decreasing the connect rate.

The *SLC-2000* HDT and MSDT uses a hybrid signaling scheme specified in TR-303. The hybrid signaling scheme requires the use of *robbed-bit signaling*. The VFDE feature allows the system to suspend robbed-bit signaling and convert to a *clear channel* mode. Figure 3-4 compares robbed-bit signaling and clear channel as follows:

- **Robbed-bit Signaling:** This is the standard TR-303 signaling mode used on each DS0 within the DS1 feeder between the LDS and the *SLC-2000* ARM shelf. The system also uses this method between the DT Server in the MDS assembly and the MSDT. Each DS0 has a bandwidth of 64 kb/s. A small portion of this bandwidth is used for signaling. However, this limits the usable bandwidth for analog modem connections and reduces the connect rate.
- **Clear Channel Mode:** This is an enhancement to the *SLC-2000* system and makes the entire 64 kb/s bandwidth available for an analog modem connection and is similar to the "B" channel of an ISDN line.

Figure 3-4A shows the VFDE feature with switched POTS and special service lines connected through an MSDT configuration where the channel units are installed in an MSDT. The feature is enabled by not only installing Software Release R4.6 or later on your system, but by also installing the following hardware at the HDT and MSDT:

- *SPQ811* or later DT Server in the MDS assembly at the HDT
- *SPQ401B* or *SPQ440D* channel unit — depending on type of service — in the MSDT channel unit slots desiring clear channel service.

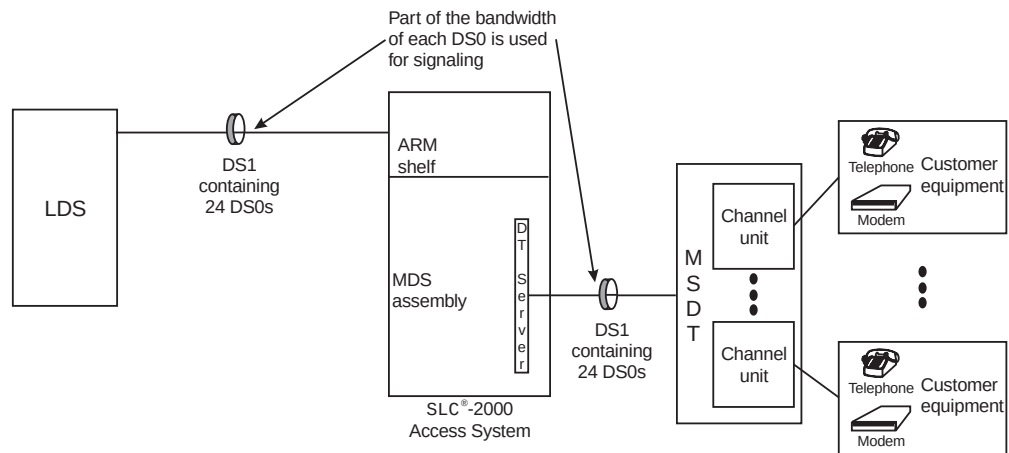


NOTE:

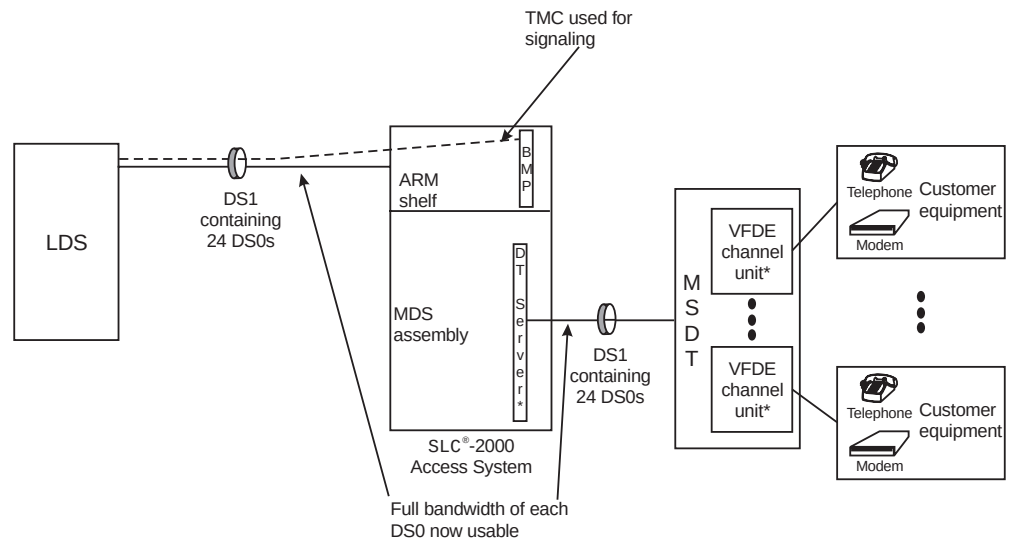
The *SPQ401B* or *SPQ440D* are required at the MSDT for VFDE operation in a FITL configuration. Both channel units can be used in a metallic configuration in the MDS assembly, but they are not required for VFDE operation in a metallic distribution configuration. VFDE operation in a metallic configuration requires only the correct software loads in the *SLC-2000* system and the LDS.

With the correct software release and hardware installed, the system stays in the robbed-bit signaling mode while a customer's equipment goes off-hook to place an outgoing call or answer an incoming call. After the connection has been made with the far end, the system immediately converts the connection to the clear channel mode as shown in Figure 3-4B. The connection stays in the clear channel mode until the MDC in the HDT detects a release or until it detects a *flash* from the customer equipment and passes it to the LDS over the TMC terminating on the BMP circuit pack in the HDT. The system then reverts back to robbed-bit signaling until the next connection is attempted. If the correct FITL hardware is *not* installed, you will still realize some throughput improvement because of the clear channel operation between the *SLC-2000* ARM shelf and the LDS.

As stated earlier, once in the clear channel mode, the system will keep the connection in clear channel until the MDC in the HDT detects an on-hook (disconnection) or a switch-hook flash from the customer equipment. It then reverts back to — and stays in — the robbed-bit signaling mode. When a switch-hook flash is detected, the system assumes that the connection is a voice call — with the customer trying to use a voice feature such as 3-way calling or other *5ESS*[®]-type feature initiated by a flash — not requiring clear channel operation.



A. Robbed-Bit Signaling



*For clear channel operation, the following equipment must be installed:

- DT Server: SPQ *811 Server
- VFDE Channel Unit: SPQ 401B or SPQ 440D

If the above equipment is not installed, some throughput improvement will be realized on the link between the LDS and the HDT.

B. Clear Channel

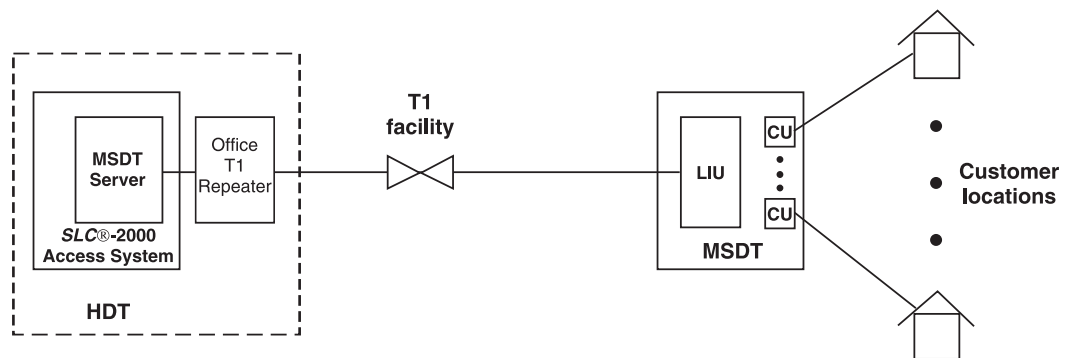
vfdemsdt.eps

Figure 3-4. VFDE Feature

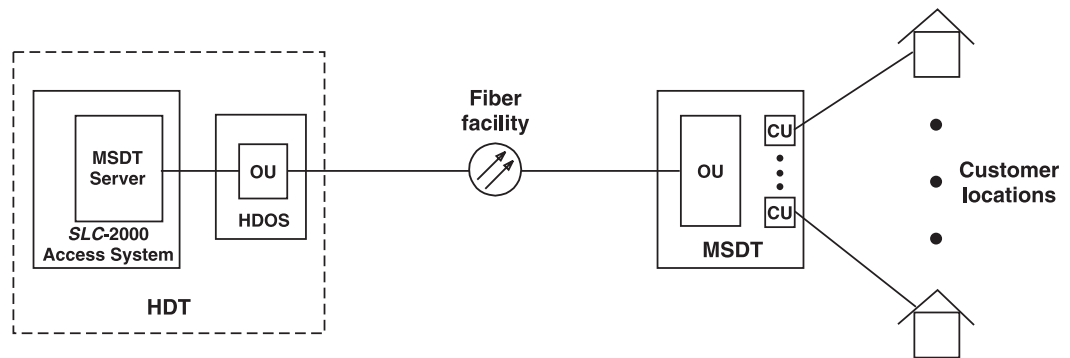
HDT/MSDT System Operating Description

Figure 3-5 shows the two basic methods used by the HDT to interface the MSDT:

- ***Metallic Interface.*** This interface consists of a T1 facility that carries a DSX-1 signal between the MSDT Server at the HDT and the line interface unit (LIU) at the MSDT.
- ***Fiber Optic Interface.*** This interface consists of a fiber facility that carries an optical signal between the HDOS and the optical unit (OU) in the MSDT.



Metallic Interface



Fiber Optic Interface

hdtdmsdt.int.ps

Figure 3-5. Basic HDT/MSDT Interfaces

MSDT Servers

General Operation — Prior to Release 4.5

The MSDT Servers are located in the MDS assembly of the HDT. Figure 3-6 shows an MDS assembly with shelf 2 provisioned for FITL. The Servers are located in slots 1, 3, 5, 7, 13, 15, 17, and 19. Each shelf of the MDS assembly has a capacity of 96 drops. When the shelf is provisioned for FITL, the 96 drops associated with the shelf are divided into four server pairs. Each pair has a capacity of 24 lines. You can provision the first server in the pair to shed 12 of its lines to the next server in the pair. This allows the customer to match the payload between the HDT and the MSDT to the channel units equipped in the MSDT.

When an MDS assembly shelf is in a fiber distribution mode, only the channel unit slots that support MSDT Servers can be used.

You can set the MSDT Server to either 0, 12, or 24 lines using the **ed-dt** command from the CIT. The following restrictions apply to these line settings:

- The settings of the two MSDT Servers in the pair combined cannot be greater than 24 lines.
- The second MSDT Server in the pair cannot be set to 24 lines.
- When first server of a pair is set for 24 lines, the second server of the pair is not equipped.

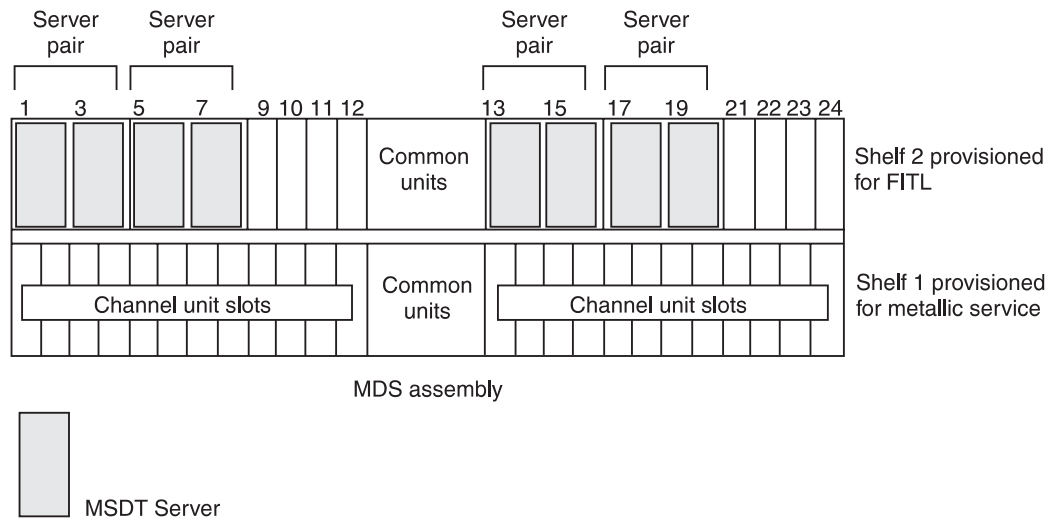
Table 3-3 shows the possible line combination settings of the MSDT Server pairs.

Table 3-3. Possible Line Combination Settings for MSDT Server Pairs — Prior to Release 4.5 (see Note)

Lines for First MSDT Server of Pair	Lines for Second MSDT Server of Pair	Total Lines
24 lines*	0 lines	24 lines
12 lines	12 lines	24 lines
0 lines	12 lines	12 lines
12 lines	0 lines	12 lines
0 lines	0 lines	0 lines

Note: Channel unit slots 1 and 3, 5 and 7, 13 and 15, 17 and 19 are used for the MSDT Server pairs.

* This is the default standard setting for a shelf configured for FITL distribution.



Note: Figure shows 8 servers, each serving 12 lines.
 If MSDTs with 24 lines are used, only slots 1, 5, 13, and 17
 would be equipped with servers.

svrpairs.eps

Figure 3-6. Server Pairs in an MDS Assembly — Prior to Release 4.5

General Operation — Release 4.5 and Later Equipment not in a Cabinet

The MSDT Servers are located in the MDS assembly of the HDT. Figure 3-7 shows an MDS assembly with shelf 2 provisioned for FITL. The Servers are located in slots 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21 and 23. Each shelf of the MDS assembly has a capacity of 144 drops. When the shelf is provisioned for FITL, the 144 drops associated with the shelf are divided into six server pairs. Each pair has a capacity of 24 lines. In Release R4.5, you can provision the first server in the pair to shed 12 of its lines to the next server in the pair except slots 11 and 23. Release R4.6 or later includes support for slots 11 and 23 with using the *SPQ811* or later Server. This allows the customer to match the payload between the HDT and the MSDT to the channel units equipped in the MSDT.

When an MDS assembly shelf is in a fiber distribution mode, only the channel unit slots that support MSDT Servers can be used.

You can set the MSDT Server to either 0, 12, or 24 lines using the **ed-dt** command from the CIT. The following restrictions apply to these line settings:

- The settings of the two MSDT Servers in the pair combined cannot be greater than 24 lines.
- The second MSDT Server in the pair cannot be set to 24 lines.
- If the HDT contains Software Release 4.5, a server cannot be used in channel slots 11 or 23. If the HDT contains Software Release R4.6 or later **and** you are using an *SPQ811* or later server, the slot 11 or 23 can contain 12 line servers.

Table 3-4 shows the possible line combination settings of the MSDT Server pairs.

Table 3-4. Possible Line Combination Settings for MSDT Server Pairs — Release 4.5 and Later (see Note)

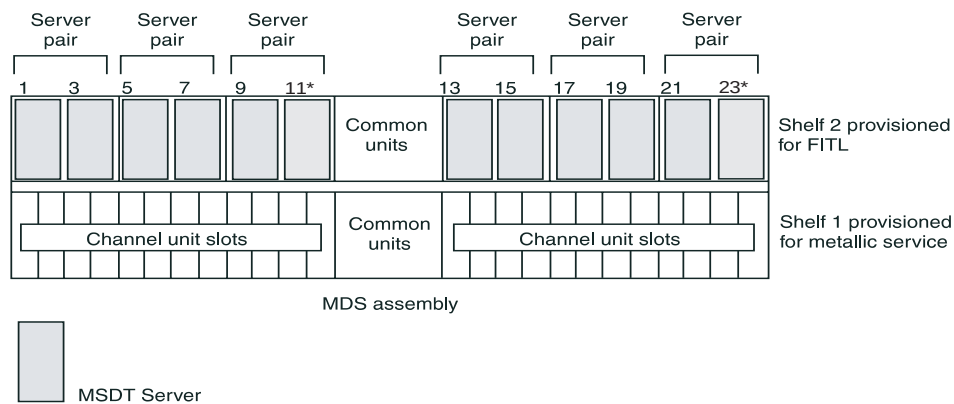
Lines for First MSDT Server of Pair	Lines for Second MSDT Server of Pair [†]	Total Lines
24 lines*	0 lines	24 lines
12 lines	12 lines	24 lines
0 lines	12 lines	12 lines
12 lines	0 lines	12 lines
0 lines	0 lines	0 lines

Note: Observe the following server pair slot restrictions:

- **Release R4.5:** Channel unit slots 1 and 3, 5 and 7, 13 and 15, 17 and 19 are used for the MSDT Server pairs. Channel slots 9 and 21 may be used alone for 24 lines (paired slots 11 and 23 cannot support a server).
- **Release R4.6 or Later and SPQ811 Server:** Channel unit slots 1 and 3, 5 and 7, 9 and 11, 13 and 15, 17 and 19, 21 and 23 are used for the MSDT Server pairs.

* This is the default standard setting for a shelf configured for FITL distribution.

[†] In Release R4.5, slots 11 and 23 cannot support a server.



*Servers in these slots are only supported when the HDT contains Software Release R4.6 or later and an SPQ 811 Server.

svrpairs4.5.cdr

Figure 3-7. Server Pairs in an MDS Assembly — Release 4.5 or later in Noncabinet Equipment

SPQ[®]808, SPQ809, SPQ810, and SPQ811 MSDT Server Channel Unit

The MSDT Server (Figure 3-8) provides the primary interface between the *SLC-2000* HDT and the MSDT, terminates the DS1 rate transmission link to the HDT, and terminates the extended superframe (ESF) format data link between the HDT and the MSDT. The MSDT Server provides the DS0 rate services and transfers the respective time slots between the HDT backplane bus and the MSDT over the DS1 rate optical or T1 link.

The MSDT Server is configured at the HDT to serve 0, 12, or 24 lines from the MSDT. (The zero setting is used to remove an MSDT from service.) In TR-08 Mode 1, the *SLC-2000* access resource manager (ARM) shelf capacity allows up to 56 twelve-line MSDTs. In TR-08 Mode II, the *SLC-2000* ARM shelf capacity allows up to 64 twelve-line MSDTs.

The MSDT Server consists of a single printed wiring board attached to a faceplate that covers two physical CU slots on the HDT and occupies two physical channel unit slots in a *SLC-2000* metallic distribution shelf. One MSDT Server is required for each MSDT.

When used to host an MSDT, these Servers perform all the above tasks of the *SPQ808* Server. The *SPQ810* and *SPQ811* Server is only used in an HDT with *SLC-2000* Software Release 4.5 or later. See Table 3-5 to determine which server to use with a specific *SLC-2000* software release and feature set. Figure 3-8 shows the faceplate of the four MSDT Servers. See Table 3-1 for specific applications of the MSDT Servers.



NOTE:

The *SPQ809*, *SPQ810*, and *SPQ811* Server can also host the DDM-2000 FiberReach Narrowband Shelf (NBS) as an ONU. The *SPQ809* Server can host an NBS with its feeder DS1 signals operating in the quad mode. You must use the *SPQ810* or *SPQ811* Server when hosting an NBS with its feeders operating in the octet mode. When using the *SPQ810* or *SPQ811* Server to host an MSDT, you must ensure that the *SLC-2000* HDT software release is R4.5 or later before installing the server. When hosting an MSDT, the *SPQ810* or *SPQ811* Server characteristics are the same as the *SPQ809* Server.

Table 3-5. Choosing the Correct MSDT Server or DT Server

Software Release	Features	MSDT Server or DT Server			
		SPQ®808	SPQ809	SPQ810	SPQ811
R2.0	All	X	X		
R3.1	All	X	X		
R3.2	No Automatic Software Download*	X	X		
R3.3	Automatic Software Download		X		
R4.0 R4.1 R4.2 R4.3 R4.4	Basic TR-08 and Basic TR-303	X	X		
R4.0 R4.1 R4.2 R4.3 R4.4	Enhanced Features†		X		
R4.5	Basic TR-08†† and Basic TR-303	X	X	X	X
	Enhanced Features†		X	X	X
R4.6	Basic TR-08†† and Basic TR-303	X	X	X	X
	Enhanced Features†		X	X	X
	VFDE Feature				X

* No automatic software download from the HDT to the BIU in the MSDT.

† Enhanced features include automatic software download and Enhanced TR-303 features shown in Table 3-1 (except VFDE).

†† There are cross-connections (checkerboarding) restrictions when using TR-08 with enhanced FITL in Release 4.5 or later. See 363-208-000 (SLC-2000 Access System Applications, Planning, and Ordering Guide).

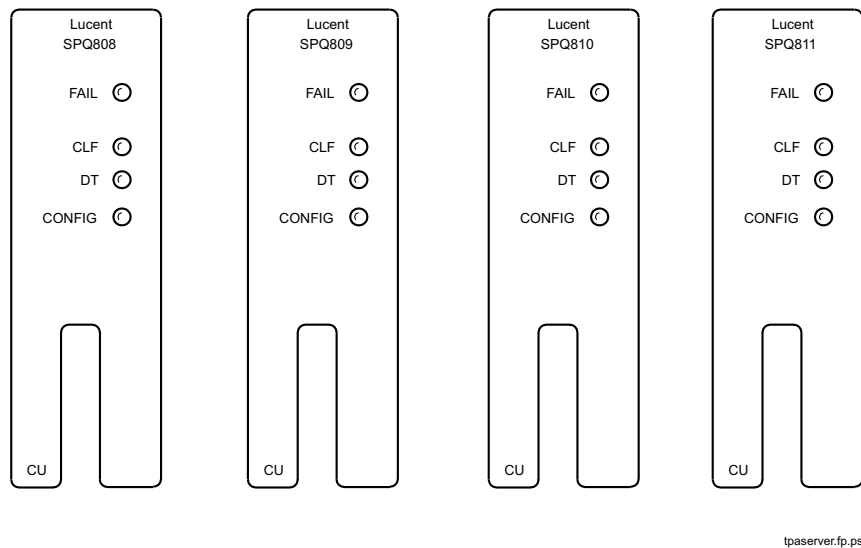


Figure 3-8. MSDT Servers

High Density Optics Shelf (HDOS) Assembly

The J1C265AC-1, L3 HDOS assembly (Figure 3-9) allows the *SLC-2000* Access System to serve as an HDT in a FITL distribution system. A fully loaded HDOS assembly houses 32 OUs and 8 AYB2 PCUs that are described later. The HDOS interfaces with up to two MDS assemblies fully configured to provide service to a specified number of MSDTs (from sixteen 24-line MSDTs to thirty-two 12-line MSDTs or any combination in between).

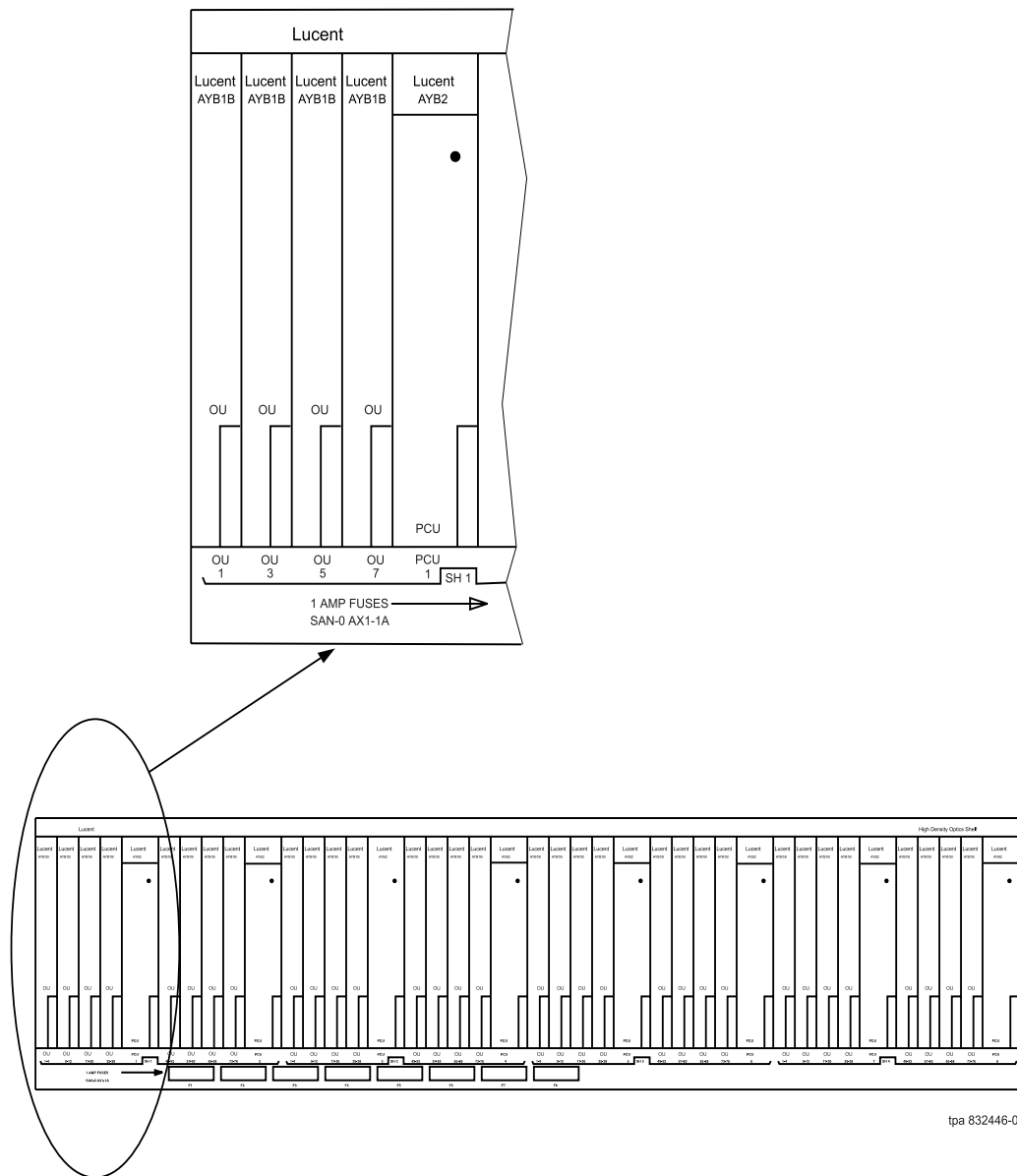
In Release 4.4 and earlier, each OU slot is connected through bay cabling to one channel unit (CU) slot in the MDS assembly, to the T-R and T1-R1 pairs of the MDS CU connector. For ease of reference, OU slots in the HDOS are numbered using the corresponding MDS CU slot numbers (see the section on HDT bandwidth in Chapter 2). The designation strip interchanges for *SLC* Series 5 operation.

In Release 4.5 and later, each OU slot and CU slot is cabled to a DSX-1 Interface where they are cross-connected as desired.

The AYB1B OU has an optical termination for one singlemode fiber on the backplane. The same fiber is used for both the transmit and receive optical

signals through a standard connector (ST[®] type) on the backplane. In a typical installation, the OU optical termination is connected to a fiber optic distribution shelf through singlemode fiber jumpers or fiber optic interconnect cables.

The AYB3 OU is an optical unit that is compatible with all functions of the BYB3 OU. The AYB5 is an optical unit used for extended range applications.



tpa 832446-01

Figure 3-9. High Density Optics Shelf (HDOS) Assembly [J1C265AC-1, L3 (SLC®-2000)]

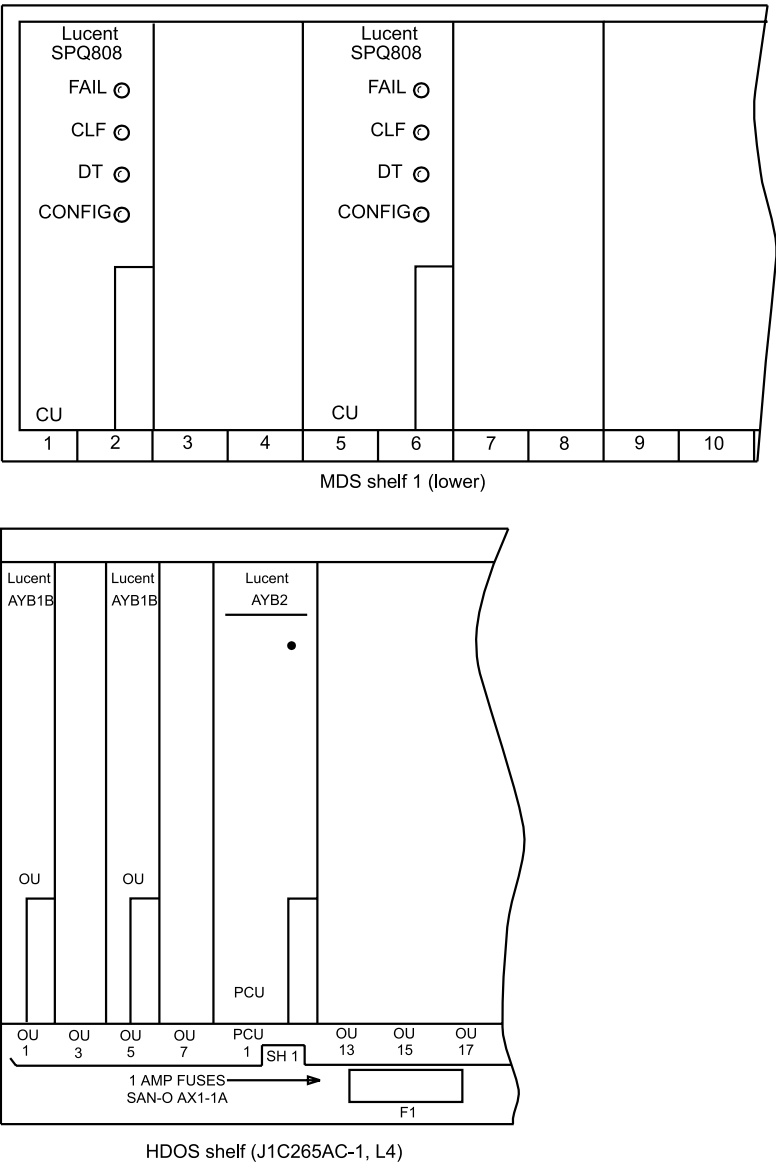
The OU is located at the HDT in the HDOS assembly to provide electrical-to-optical and optical-to-electrical conversions at the end of the optical line. The OU receives an electrical 1.544-Mb/s signal (optioned to be an RS 422 electrical signal) from the MSDT Server. It converts the electrical signal to an optical signal and transmits it over one singlemode fiber, operating in a bidirectional transmission mode at 1310 nm, to the OU at the MSDT. The OU uses a Class I, singlemode laser diode in the transmitter circuit to convert the electrical signal into pulses of light. It also uses a positive-intrinsic-negative (PIN) diode detector in the receiver circuit to convert the pulses of light into electrical pulses. There are no options or settings that need to be selected on this unit.

The AYB2 power converter unit (PCU) is located at the HDT in the HDOS assembly to provide power for a group of four adjacent OU slots. The AYB2 PCU converts an individually fused –48 V DC battery supply to +5 and –5 V DC. A FAIL indicator is provided on the AYB2 PCU faceplate to indicate a failure within the PCU. The distribution fiber from the MSDT terminates in an optical unit (OU) that connects to the MSDT Server. As shown in Figure 3-10, the corresponding OU must be installed in the HDOS assembly slot that has the same channel designation numbers as the left-most HDT channel unit slot occupied by the MSDT Server. To use the MSDT server for fiber distribution through the HDOS, you must set a switch on the MSDT Server circuit board to **OU** before installing the Server in the MDS assembly.



NOTE:

The optical unit circuit pack code may be an AYB1B, an AYB3, or an AYB5.



tpa 832571/01

Figure 3-10. SLC®-2000 HDT MSDT Server and HDOS OU Placement

As shown in Table 3-6, one or two MSDT Servers (covering two or four specific CU slots, respectively) installed in the metallic distribution shelf can serve all 24 DS0 time slots in a digroup. Intrabay cabling between MDS shelves and HDOS shelves provide this connection.

Table 3-6. SLC[®]-2000 MDS to HDOS Circuit Configuration (R4.4 or earlier)

MDS, Shelf (Second HDOS) (Second AID)	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGXQ[®] Frame
MDS 1, shelf 1	CU 1	dt-1-1	1, F1	OU 1	SH-1-1
(MDS 3, shelf 5)	CU 3 *	dt-1-3	1, F1	OU 3 *	SH-1-3
(dt-5-#)	CU 5	dt-1-5	1, F1	OU 5	SH-1-5
	CU 7 *	dt-1-7	1, F1	OU 7 *	SH-1-7
	CU 13	dt-1-13	2, F2	OU 13	SH-1-13
	CU 15 *	dt-1-15	2, F2	OU 15 *	SH-1-15
	CU 17	dt-1-17	2, F2	OU 17	SH-1-17
	CU 19 *	dt-1-19	2, F2	OU 19 *	SH-1-19
MDS 1, shelf 2	CU 1	dt-2-1	3, F3	OU 1	SH-2-1
(MDS 3, shelf 6)	CU 3 *	dt-2-3	3, F3	OU 3 *	SH-2-3
(dt-6-#)	CU 5	dt-2-5	3, F3	OU 5	SH-2-5
	CU 7 *	dt-2-7	3, F3	OU 7 *	SH-2-7
	CU 13	dt-2-13	4, F4	OU 13	SH-2-13
	CU 15 *	dt-2-15	4, F4	OU 15 *	SH-2-15
	CU 17	dt-2-17	4, F4	OU 17	SH-2-17
	CU 19 *	dt-2-19	4, F4	OU 19 *	SH-2-19
MDS 2, shelf 3	CU 1	dt-3-1	5, F5	OU 1	SH-3-1
(MDS 4, shelf 7)	CU 3 *	dt-3-3	5, F5	OU 3 *	SH-3-3
(dt-7-#)	CU 5	dt-3-5	5, F5	OU 5	SH-3-5
	CU 7 *	dt-3-7	5, F5	OU 7 *	SH-3-7
	CU 13	dt-3-13	6, F6	OU 13	SH-3-13
	CU 15 *	dt-3-15	6, F6	OU 15 *	SH-3-15
	CU 17	dt-3-17	6, F6	OU 17	SH-3-17
	CU 19 *	dt-3-19	6, F6	OU 19 *	SH-3-19

Continued on next page

See notes and footnotes at end of table.

Table 3-6. SLC[®]-2000 MDS to HDOS Circuit Configuration (R4.4 or earlier)—Continued

MDS, Shelf (Second HDOS) (Second AID)	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGXQ[®] Frame
MDS 2, shelf 4	CU 1	dt-4-1	7, F7	OU 1	SH-4-1
(MDS 4, shelf 8)	CU 3 *	dt-4-3	7, F7	OU 3 *	SH-4-3
(dt-8-#)	CU 5	dt-4-5	7, F7	OU 5	SH-4-5
	CU 7 *	dt-4-7	7, F7	OU 7 *	SH-4-7
	CU 13	dt-4-13	8, F8	OU 13	SH-4-13
	CU 15 *	dt-4-15	8, F8	OU 15 *	SH-4-15
	CU 17	dt-4-17	8, F8	OU 17	SH-4-17
	CU 19 *	dt-4-19	8, F8	OU 19 *	SH-4-19

Notes:

1. The MSDT Servers must be installed in the slots listed. The circuits served do not necessarily correspond with the slot label where the MSDT Server is installed.
2. The access identifier (AID) has the syntax of: **dt-shelf#-physical slot # in HDT**
where:
shelf# is the digital loop carrier (DLC) system or shelf number {1-8}
physical slot # in HDT is the slot for the MSDT server {1,3,5,7,13,15,17,19}.
3. The PCU powers four optical units to the left.
4. For a second HDOS, the shelf labels **SH-1** through **SH-4** refer to Virtual Remote Terminal (VRT) shelves 5 through 8.

* These slots can only be used when the MSDT Servers are provisioned for 12 channels.

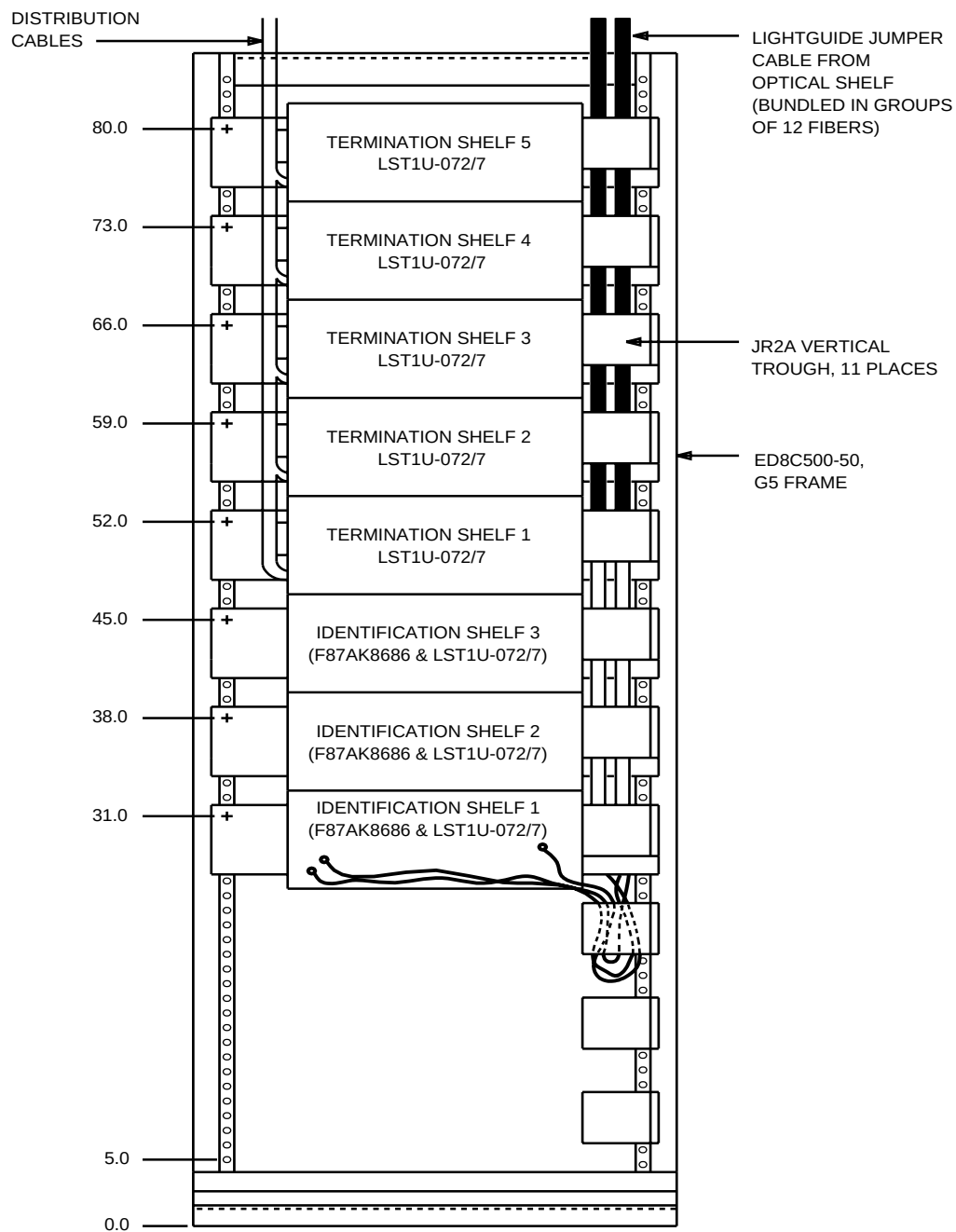
For Release 4.5 and later in bay applications, the MSDT Servers and HDOS must be cabled to a DSX-1 Interface or crossconnect panel where they will be cross-connected as desired (Figure 3-10 and Table 3-6 does not apply).

Fiber Optic Distribution Shelves

The fiber optic distribution shelves may be mounted in the *LGX*[®] Lightguide Distribution Frame or, for cabinet applications, are mounted in the same cabinet as the *SLC-2000* Access System. The outside plant (OSP) fibers are either field terminated in *ST* connectors or are spliced to preterminated *ST* fiber pigtails. The *ST* connectorized fibers are installed in 1000 *ST* fiber connector panels located in a fiber optic termination shelf (or combination termination/splicing shelf). Single fiber jumpers with *ST* fiber connectors are cabled from the HDOS assembly to the 1000 *ST* panels in the fiber termination shelf.

For cabinet systems, a range of fiber optic distribution shelves is available for termination only and for termination and splicing. If fiber splice shelves are not equipped in the cabinet, the OSP fibers may either be directly terminated with *ST* connectors or may be spliced to pigtails in an external hand hole.

In 7-foot frame-mounted systems, the *LGX* fiber optic distribution frame (Figure 3-11) may be used. The *LGX* fiber optic distribution frame is comprised of five termination shelves and three identification shelves mounted in an ED-8C500-50, Group 5 bay frame. The bay frame is a 23-inch unequal-flange type that accommodates termination and identification shelves as required to match the fiber count requirements. A maximum of 360 customer fibers can be terminated at the *LGX* frame.



tpa 777102/01

Figure 3-11. LGX® Lightguide Distribution Frame

The LST1U-072/7 termination shelf (Figure 3-12) is typically used for direct termination of OSP cables. The shelf is 7 inches high, 17 inches wide, and 11 inches deep. Clamp brackets supplied with the termination shelf are used to mount two 12A1 cable clamps (not provided with the shelf) to secure a total of two OSP cables. The shelf also has provisions for slack storage of the buffered fibers while maintaining a minimum bend radius of 1.5 inches. The standard bulk head panel supplied with the shelf can mount up to twelve 1000 *ST* fiber optic connector panels (six C3000A-2 singlemode *ST* fiber optic cable connector couplings per panel) for a termination capacity of 72 fibers. The fiber optic connector panels (not provided with the shelf) are mounted on the front facing panel of the termination shelf with snap-in fasteners. Fiber jumpers are routed in a trough that is equipped with rings for strain relief. The shelf provides a blank label for identifying fiber terminations.

Each individual singlemode OSP fiber is attached to a coupling on the connector panels by a P3020AC-125 singlemode *ST* fiber optic cable connector.

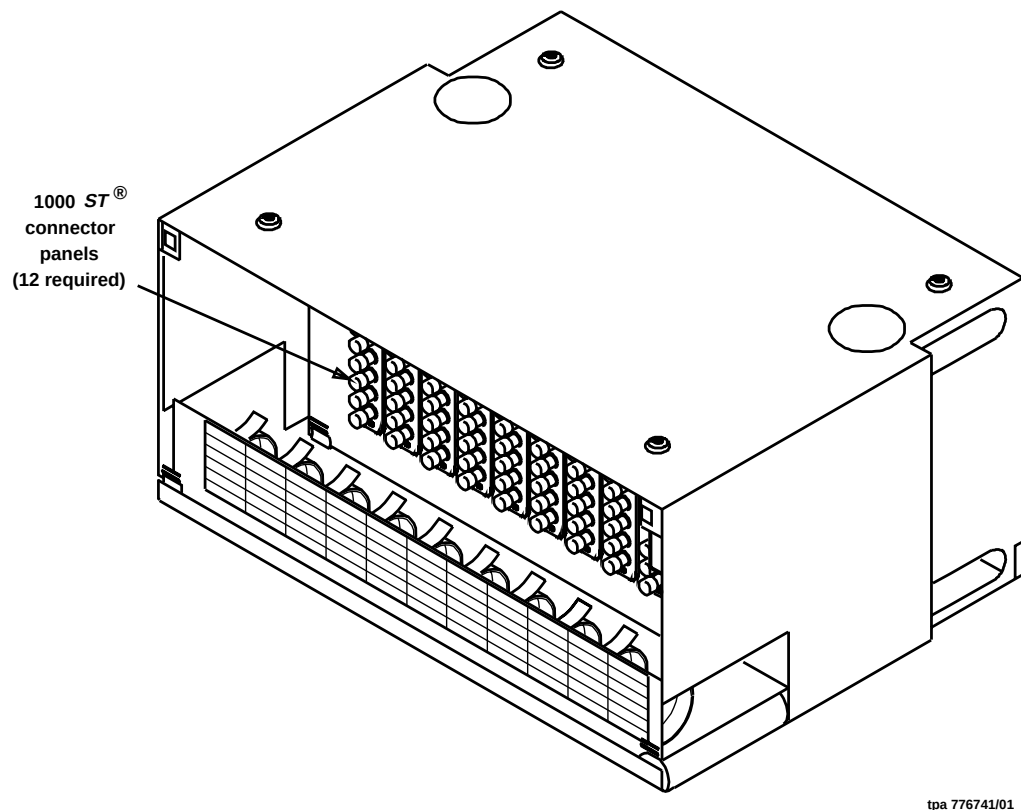


Figure 3-12. LGX® Fiber Optic Distribution Frame Termination Shelf

The *ST* fiber optic cable connector is available in a package containing the *ST* fiber optic cable connector, a dust cap, and a strain relief boot. The *ST* fiber optic cable connector is designed for direct termination onto the OSP fiber using the 1032B-tool kit.

The 12A1 cable clamp contains all the material necessary for clamping and grounding one OSP cable. The cable clamp is attached to the side of the termination shelf with a bracket designed to maintain the proper radius for the cable as it enters the shelf. An OSP cable is secured between the clamp halves using the V-groove insert to grip the cable. Grounding hardware is also provided to connect metallic strength members to an approved ground terminal. One 12A1 clamp is ordered for each OSP cable, and each shelf can handle two 12A1 clamps.

The JR2A retainer is a set of two jumper retainers (Figure 3-11) for mounting on the front flange of each termination shelf in 7-foot bay applications. Each retainer is 4 inches high, 4 inches wide, and 4 inches deep. A total of ten 32 retainers, five sets, are needed to route the fibers to the lower shelves. The JR2A retainers also come with two labels and necessary mounting hardware. These jumper retainers are not provided with the shelf and must be ordered separately.

In 7-foot bay applications, equipment jumpers that are not interconnected are stored and identified on identification shelves located in the *LGX* fiber optic distribution frame. An identification shelf is comprised of an LST1U-072/7 fiber optic termination shelf combined with an F87AK8686 jumper storage panel (the storage panel is not provided with the shelf). The shelf is 7 inches high, 17 inches wide, and 11 inches deep. The panel is 6 inches high, 17 inches wide, and has 96 couplings and 192 dust caps installed from the factory. Each panel has factory labeling and locations for field labeling for easy identification of the equipment jumpers. In cabinet applications, all equipped fiber jumpers are connected to a fiber optic termination shelf.

Metallic Distribution From the HDT

The MSDT can also be connected to the HDT through a metallic facility such as a T1 line. This metallic facility carries a DSX-1 signal between the MSDT Server at the HDT and the LIU at the MSDT. To use the MSDT Server for metallic distribution, you must set a switch on the MSDT Server circuit board to **DSX** before installing the server in the MDS assembly.

Host Digital Terminal — *SLC* Series 5 Carrier System

This section describes the equipment that must be added at the HDT site to a *SLC* Series 5 Carrier System HDT with the FITL feature to support the *SLC*-2000 MSDT. For long-loop application, the *SLC* Series 5 Carrier System HDT dual bank assembly and associated *SLC*-2000 MSDT feature equipment are

designed to be installed in either a minihut, CEV, or an 80A-HX, 80D-HX, or 80E-BP cabinet. When located in a CEV or hut, the equipment required to support the *SLC-2000* MSDT feature is installed in a 7-foot high bay and arranged according to Figure 3-13. Since it is not feasible to show all possible Series 5, 80-type HDT cabinet arrangements, a typical 80A-BP arrangement and 80E-BP arrangement with central powering are shown in Figure 3-14 and Figure 3-15, respectively.

For short-loop application, the *SLC* Series 5 HDT is installed in the central office.

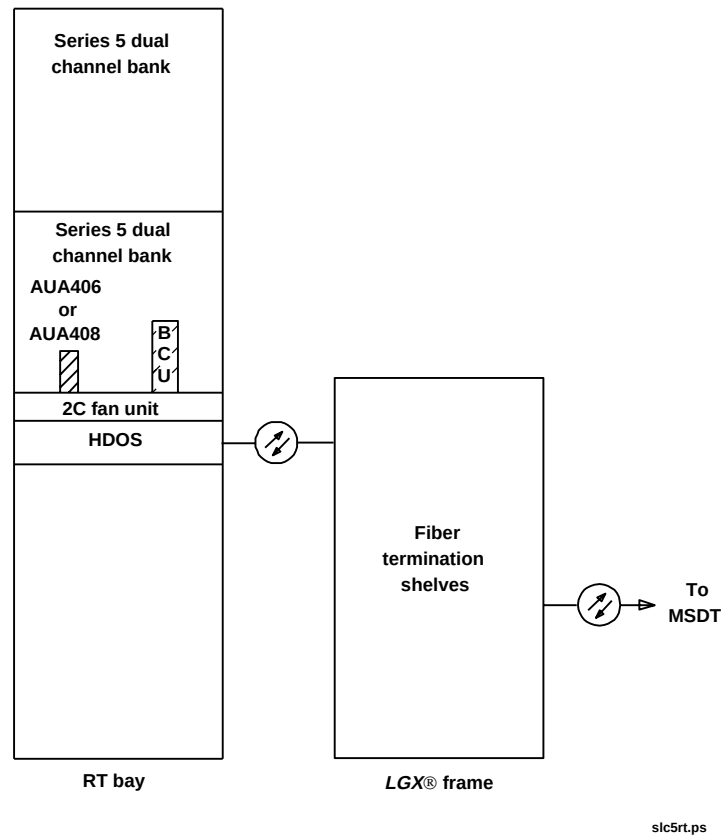
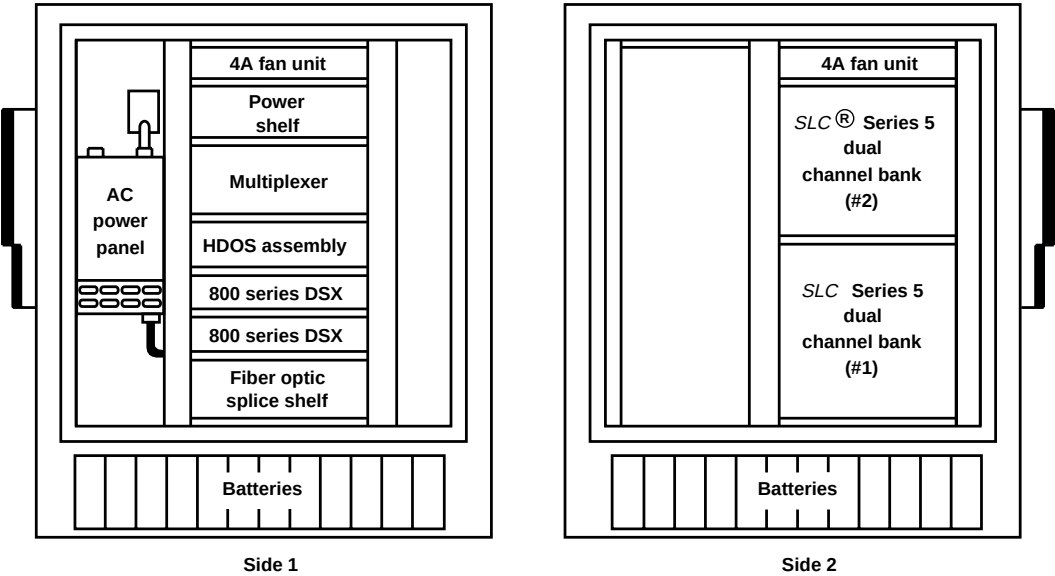


Figure 3-13. SLC[®] Series 5 HDT Bay Layout for FITL



tpa 832572/01

Figure 3-14. Typical SLC® Series 5 HDT 80A-BP Cabinet Layout for FITL

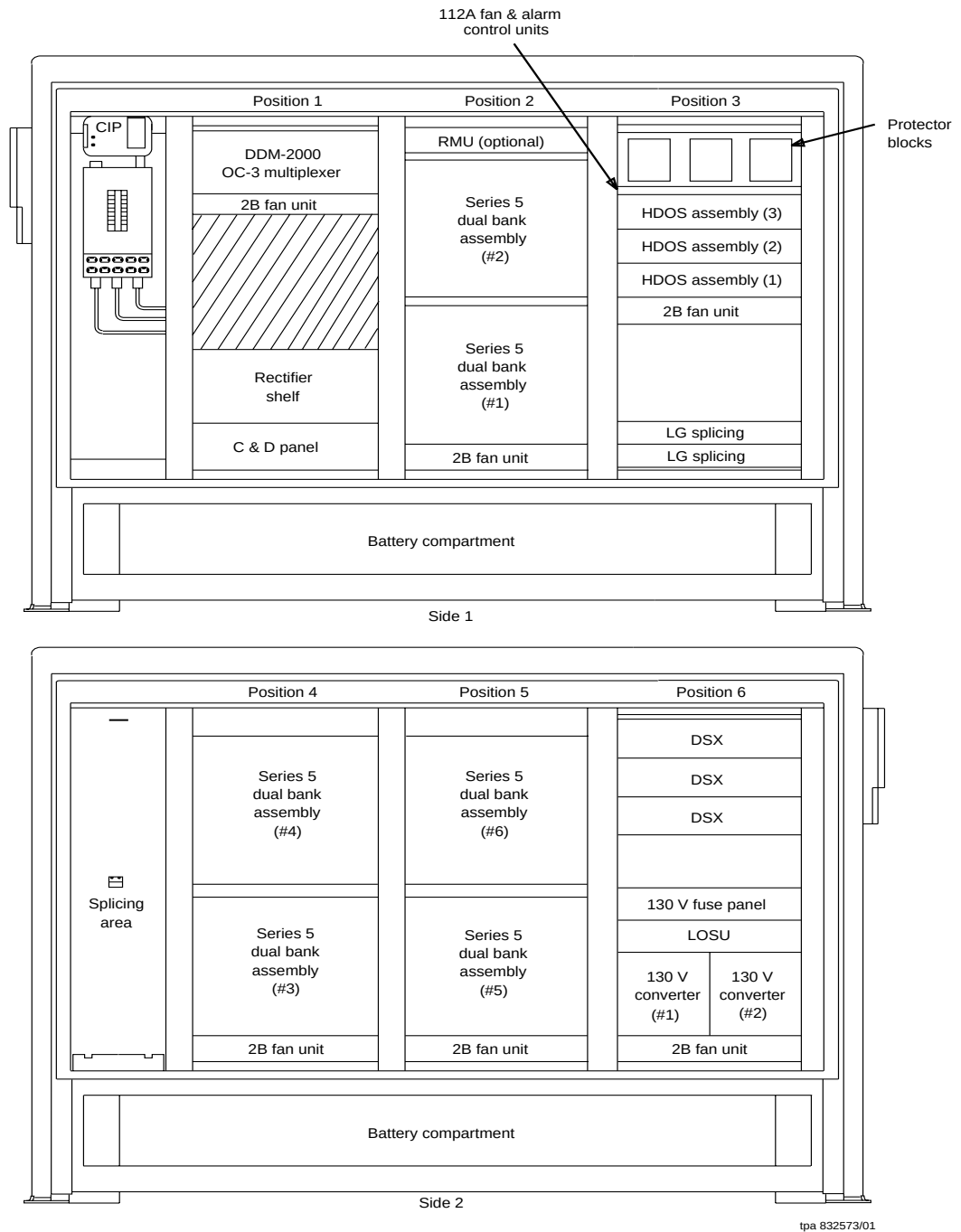


Figure 3-15. Typical SLC® Series 5 HDT 80E-BP Cabinet Layout for FITL With Central Powering Equipment

Although the Series 5 HDT dual bank assembly used in the *SLC-2000* MSDT feature configuration has not been changed, equipment has been added at the HDT location to support the *SLC-2000* MSDT feature. The equipment that has been added at the HDT includes the following:

- AUA406 or AUA408 MSDT Server
- J1C265AC-1, L2 HDOS assembly
- Fiber optic distribution shelves
- Central power source shelves with associated protection panel(s). This equipment will be described later in the chapter.

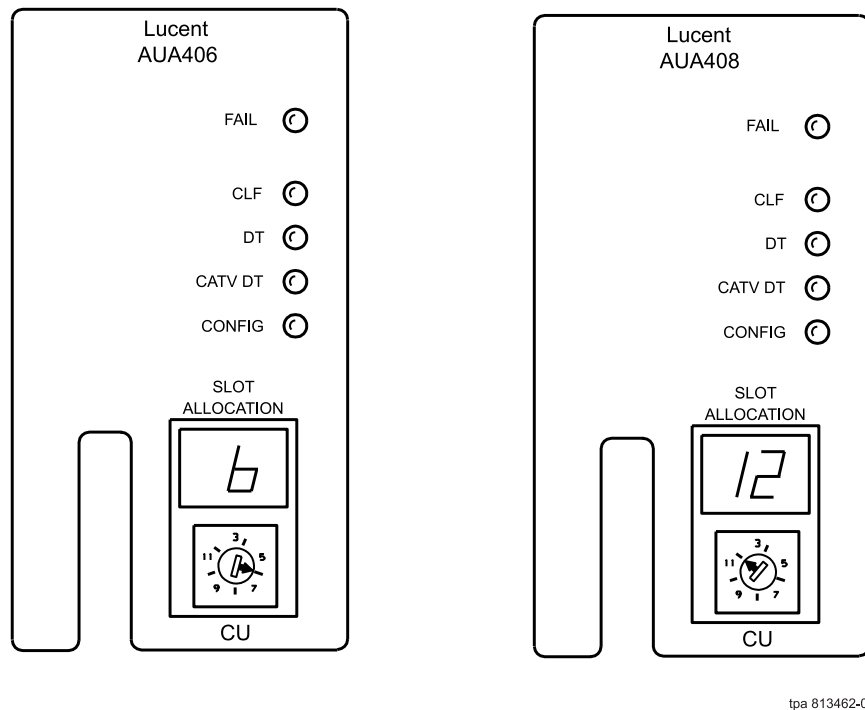


NOTE:

Metallic channel units and MSDT Servers must not be mixed in a *SLC* Series 5 HDT dual bank assembly.

AUA406 and AUA408 MSDT Server CUs

The AUA406 and AUA408 MSDT Servers (Figure 3-16) provide the interface between the *SLC Series 5* HDT backplane and the optics shelf. Either MSDT Server occupies three physical slots in an HDT digroup shelf and is capable of accessing from 6 to 24 of the DS0 time slots in the associated DS1 digroup signal for a Series 5 system. The number of time slots accessed by each server is determined by a switch setting on the server faceplate. The DS0 time slots accessible by the servers include the time slots associated with the three physical slots they span plus any even number of DS0 time slots associated with the physical slots to the right of the server as depicted by the slot allocation on the AUA406/408 channel unit. The AUA406 MSDT Server is designed for universal configurations only (a *SLC Series 5* FPC COT or a COT compatible with a TR-08 interface), and the AUA408 MSDT Server is designed for integrated and universal configurations. The MSDT Server consists of a single printed wiring board attached to a faceplate that covers three physical channel unit slots on the HDT shelf. One MSDT Server is required for each MSDT.

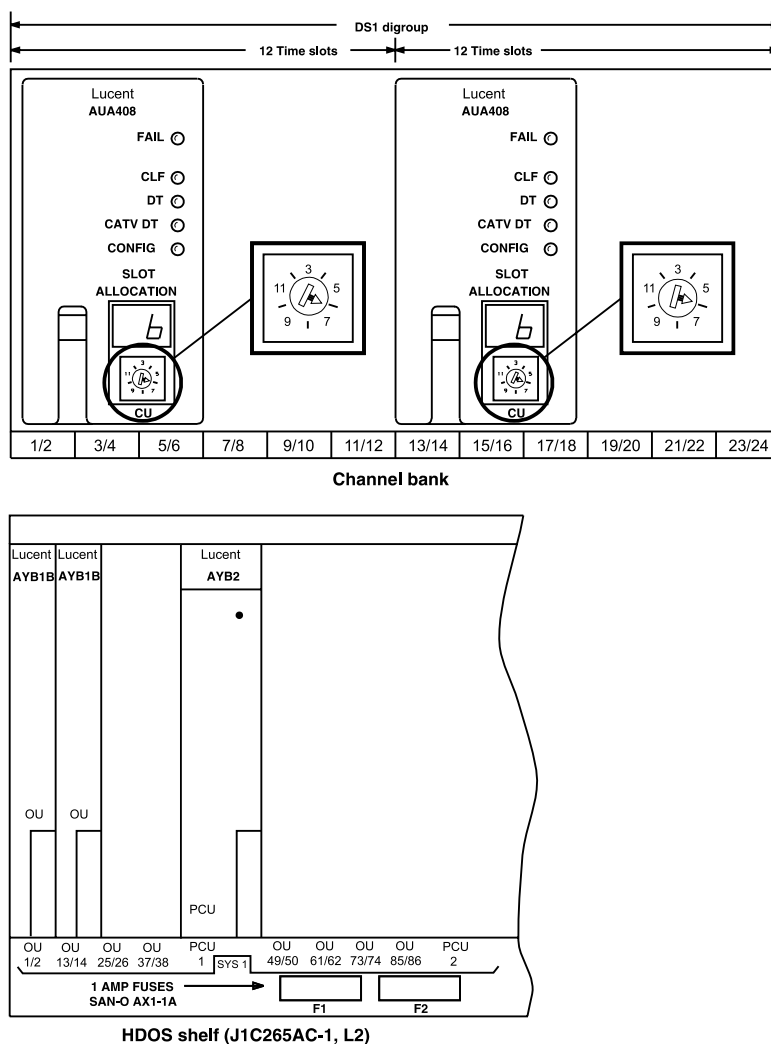


tpa 813462-01

Figure 3-16. AUA406 and AUA408 MSDT Server Channel Units

SLC Series 5 HDT Bandwidth and Bandwidth Shedding

The distribution fiber from the MSDT terminates in an AYB1B optical unit (OU) on the HDOS which interfaces the MSDT Server. As shown in Figure 3-17, the corresponding AYB1B OU must be installed in the HDOS assembly slot that has the same channel designation numbers as the left-most HDT CU slot occupied by the MSDT Server.



Ipa 813332/01

Figure 3-17. SLC® Series 5 HDT CU Bandwidth Management

The setting of the **SLOT ALLOCATION** switch on the AUA406 and AUA408 MSDT Server faceplates determines the number of physical CU slots accessed by these MSDT Servers. During normal operation, this setting is visible at the display on the AUA406 and AUA408 MSDT Servers (Figure 3-17).

The number of physical CU slots accessed by an AUA406 or AUA408 MSDT Server in a *SLC* Series 5 HDT may range from the three slots covered by the faceplate of the AUA406 or AUA408 up to the 12 physical CU slots in a digroup (a group of 12 physical slots served by the same CO/RT DS1 signal). Since each physical CU slot corresponds to two DS0 time slots, the bandwidth accessed by an AUA406 or AUA408 ranges from 6 to 24 DS0 time slots. Table 3-7 shows the circuit relationships between the HDT, HDOS, and *LGX* frame. Table 3-8 shows the TR-08 channel time slots served by the MSDT channel unit slots.

Table 3-7. SLC® Series 5 to HDOS Circuit Configuration

SLC Carrier System	MSDT Server Slot	High Density PCU Slot and Fuse	Optics Shelf Optical Unit Slot	FiberLabel at LGX® Frame
Lower	1/2	1,F1	1/2	SH-1-1
Assembly 1	13/14 *	1,F1	13/14 *	SH-1-13
Blue	25/26	1,F1	25/26	SH-1-25
System	37/38 *	1,F1	37/38 *	SH-1-37
	49/50	2,F2	49/50	SH-1-49
	61/62 *	2,F2	61/62 *	SH-1-61
	73/74	2,F2	73/74	SH-1-73
	85/86 *	2,F2	85/86 *	SH-1-85
Lower	1/2	3,F3	1/2	SH-2-1
Assembly 1	13/14 *	3,F3	13/14 *	SH-2-13
White	25/26	3,F3	25/26	SH-2-25
System	37/38 *	3,F3	37/38 *	SH-2-37
	49/50	4,F4	49/50	SH-2-49
	61/62 *	4,F4	61/62 *	SH-2-61
	73/74	4,F4	73/74	SH-2-73
	85/86 *	4,F4	85/86 *	SH-2-85
Upper	1/2	5,F5	1/2	SH-3-1
Assembly 2	13/14 *	5,F5	13/14 *	SH-3-13
Blue	25/26	5,F5	25/26	SH-3-25
System	37/38 *	5,F5	37/38 *	SH-3-37
	49/50	6,F6	49/50	SH-3-49
	61/62 *	6,F6	61/62 *	SH-3-61
	73/74	6,F6	73/74	SH-3-73
	85/86 *	6,F6	85/86 *	SH-3-85
Upper	1/2	7,F7	1/2	SH-4-1
Assembly 2	13/14 *	7,F7	13/14 *	SH-4-13
White	25/26	7,F7	25/26	SH-4-25
System	37/38 *	7,F7	37/38 *	SH-4-37
	49/50	8,F8	49/50	SH-4-49

Continued on next page

See footnote at end of table.

Table 3-7. SLC[®] Series 5 to HDOS Circuit Configuration—Continued

SLC Carrier System	MSDT Server Slot	High Density PCU Slot and Fuse	Optics Shelf Optical Unit Slot	FiberLabel at LGX[®] Frame
	61/62 *	8,F8	61/62 *	SH-4-61
	73/74	8,F8	73/74	SH-4-73
	85/86 *	8,F8	85/86 *	SH-4-85

* These slots can only be used when the MSDT Servers are provisioned for 12 channels.

Table 3-8. SLC® Series 5 RT FITL Channel Service Arrangements in TR-08 Configuration

MSDT Server	MSDT RT Quad Mode Channel Unit Slots and Channel Time Slots Served (Note)					
Slot (lines/DT)	1	2	3	4	5	6
1/2 (24 lines)	1-4	5-8	9-12	13-16	17-20	21-24
25/26	25-28	29-32	33-36	37-40	41-44	45-48
49/50	49-52	53-56	57-60	61-64	65-68	69-72
73/74	73-76	77-80	81-84	85-88	89-92	93-96
1/2 (12 lines)	1-4	5-8	9-12	—	—	—
13/14	13-16	17-20	21-24	—	—	—
25/26	25-28	29-32	33-36	—	—	—
37/38	37-40	41-44	45-48	—	—	—
49/50	49-52	53-56	57-60	—	—	—
61/62	61-64	65-68	69-72	—	—	—
73/74	73-76	77-80	81-84	—	—	—
85/86	85-88	89-92	93-96	—	—	—
MSDT drop protector	1-4	5-8	9-12	13-16	17-20	21-24
MSDT Server	MSDT RT Dual Mode Channel Unit Slots and Channel Time Slots Served (Note)					
Slot (lines/DT)	1	2	3	4	5	6
1/2 Dual (12)	1/2	3/4	5/6	7/8	9/10	11/12
13/14	13/14	15/16	17/18	19/20	21/22	23/24
25/26	25/26	27/28	29/30	31/32	33/34	35/36
37/38	37/38	39/40	41/42	43/44	45/46	47/48
49/50	49/50	51/52	53/54	55/56	57/58	59/60
61/62	61/62	63/64	65/66	67/68	69/70	71/72
73/74	73/74	75/76	77/78	79/80	81/82	83/84
85/86	85/86	87/88	89/90	91/92	93/94	95/96

Table 3-8. SLC® Series 5 RT FITL Channel Service Arrangements in TR-08 Configuration

MSDT Server	MSDT RT Quad Mode Channel Unit Slots and Channel Time Slots Served (Note)					
	1/2	3/4	5/6	7/8	9/10	11/12
MSDT drop protector						
Note: The "channel time slot" number is used by the craft interface unit (CIU) to provision special service channel units.						

The maximum number of physical CU slots available to an AUA406 or AUA408 MSDT Server is equal to the sum of the three slots occupied by the MSDT Server plus the number of physical CU slots between the MSDT Server and the next plug-in installed to the right of the MSDT Server, with a maximum of 12 slots.

If an AUA406 or AUA408 MSDT Server **SLOT ALLOCATION** switch is set for more physical CU slots than this restriction allows, the HDT bank control unit (BCU) will grant the AUA406 or AUA408 access only to the number of slots allowed by the restriction. A configuration error will also be reported by means of the compatibility (**CMP**) indicator on the HDT alarm display unit (ADU) and the **CONFIG** indicator and **SLOT ALLOCATION** display on the AUA406 or AUA408 MSDT Server.

High Density Optics Shelf Assembly

The J1C265AC-1, L2 HDOS assembly (Figure 3-18) allows the *SLC* Series 5 Carrier System to serve as an HDT in a FITL distribution system. A fully loaded HDOS assembly houses 32 AYB1B OUs and 8 AYB2 PCUs that are described later. The HDOS interfaces with up to four Series 5 dual channel bank assemblies fully configured to provide service to a specified number of MSDTs (from sixteen 24-line MSDTs to thirty-two 12-line MSDTs or any combination in between). Each OU slot is connected through bay cabling to one CU slot in the dual channel bank assembly, to the T-R and T1-R1 pairs of the channel bank CU connector. For ease of reference, OU slots in the HDOS are numbered using the corresponding channel bank CU slot numbers. The AYB1B OU has an optical termination for one singlemode fiber on the backplane. The same fiber is used for both the transmit and receive optical signals through a standard connector (*ST* type) on the backplane. In a typical installation, the OU optical termination is connected to fiber optic distribution shelves through singlemode fiber jumpers or fiber optic interconnect cables.

The AYB1B OU is located at the HDT in the HDOS assembly to provide electrical-to-optical and optical-to-electrical conversions at the end of the optical line. The AYB1B OU receives an electrical 1.544-Mb/s signal from the MSDT Server. It converts the electrical signal to an optical signal and transmits it over one singlemode fiber, operating in a bidirectional transmission mode at 1310 nm, to the BYB1B OU at the MSDT. The AYB1B OU uses a Class I, singlemode laser diode in the transmitter circuit to convert the electrical signal into pulses of light. It also uses a PIN diode detector in the receiver circuit to convert the pulses of light into electrical pulses. There are no options or settings that need to be selected on this unit.

The AYB1C OU is a new optical unit that is compatible with all functions of the AYB1B OU. The AYB5 OU is used for extended range applications.

The AYB2 PCU is located at the HDT in the HDOS assembly to provide power for a group of four adjacent OU slots. The AYB2 PCU converts an individually fused 48 V DC battery supply to +5 and -5 V DC. A FAIL indicator is provided on the AYB2 PCU faceplate to indicate a failure within the PCU.

Fiber Optic Distribution Shelves

Refer to “Fiber Optic Distribution Shelves” under the “HDT—SLC-2000 Access System” section earlier in this chapter for a discussion of the fiber optic distribution shelves.

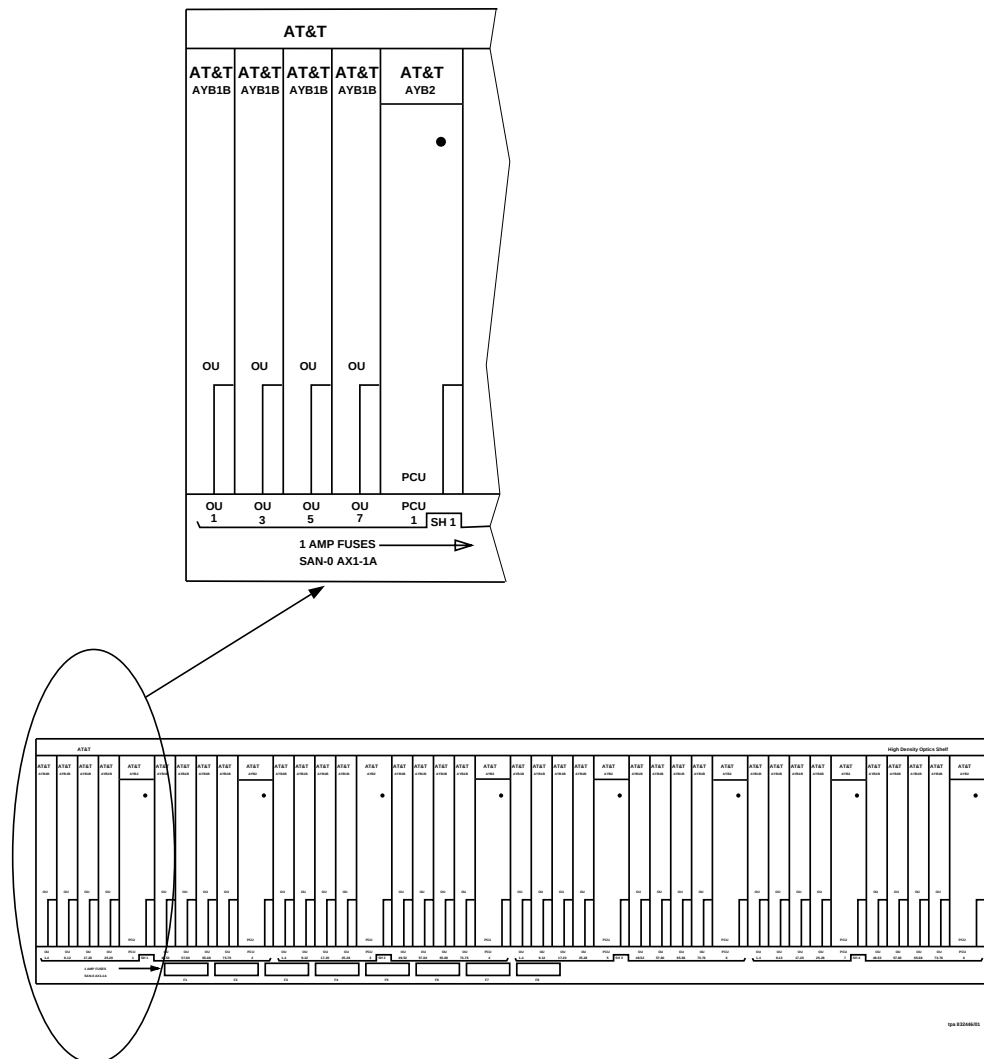


Figure 3-18. High Density Optics Shelf (HDOS) Assembly (J1C265AC-1, L2) (SLC® Series 5 Systems)

Special HDT Application Considerations

Basic Rate Interface Transmission Extension (BRITE) and ISDN

T-BRITE (AUA90 Channel Unit)

The AUA90 T-BRITE channel unit provides basic rate ISDN service directly to terminal equipment over a 4-wire T interface from the RT channel bank. It eliminates the need for a network termination (NT1) unit. The AUA90 supplies ISDN 2B+D service requiring three DS0 channels (two B channels and one D channel). It supports point-to-point and point-to-multipoint (switch dependent) transmission applications.

The AUA90 is automatically programmed for operation at the HDT by the Metallic Distribution Controller (MDC) circuit pack. It is always configured for 2B+D service and requires no option switch settings or provisioning through the *SLC-2000* CIT.

The AUA90 channel unit is only supported in TR-08 Mode 1 when used in the MSDT. When used with a *SLC 96* COT in a universal configuration, Table 3-9 lists the time slot allocations and restrictions.

Table 3-10 shows ISDN services and related physical drop AIDs used for cross-connections to INA digroups. See the following example of how to use the table:

Example of How to Use Table 3-10. To access the channel unit in shelf 1, server 1, MSDT channel unit slot 3, for the purpose of making the cross-connections to INA logical DS0s, the physical AIDs would be *dt dp-1-1-3-2*, *dt dp-1-1-3-3*, and *dt dp-1-1-3-4*. The INA logical AID format is *in ads0-feeder#(1-28)-ds0#(1-24)*. The INA logical DS0 is determined by the placement and provisioning of the ISDN card in the D4 bank.

Applications for the AUA90 are described in 363-205-106, *SLC Series 5 Carrier System, AUA90 T-BRITE Channel Unit for ISDN, Installation and Maintenance*.

Table 3-9. AUA90 T-BRITE in SLC[®]-2000 MSDT Service Restrictions and Time Slot Allocation (Note 1)

Physical Slot in MSDT (Note 2)	Service	Universal Configuration AHG13 in SLC 96 COT		Integrated Configuration Hairpin Time Slot(s)/Digroups
		Physical Slot/Digroup	Mode Switches	
1	2B+D	1	CC	1 (B1),3(D),5(B2)
2	Not supported			
3	2B+D	5	OO	19 (B1),21(D),23(B2)
4	2B+D	7	CC	2(B1),4(D),6(B2)
5	Not supported			
6	2B+D	11	OO	20(B1),22(D),24(B2)

Notes:

1. T-BRITE channel units are supported in TR-08 Mode 1 or INA only.
2. The first pair associated with the physical slot is the transmit pair (toward the carrier). The second pair associated with the physical slot is the receive pair.

Table 3-10. AUA90 T-BRITE in SLC®-2000 MSDT — ISDN Services and Related Physical Drop AIDs Used for Cross-Connections to INA Digroups

SLC-2000 MSDT Slot Number (Note 1)	Channels Used for ISDN Service	2B+D Service Aids (Channels) (x=shelf # 1-8)(y=server #) (Note 2)
1	1	dtdp-x-y-1-1 (B1)
	2	dtdp-x-y-1-2 (D)
	3	dtdp-x-y-1-3 (B2)
2	Not supported	
3*	10	dtdp-x-y-3-2 (B1)
	11	dtdp-x-y-3-3 (D)
	12	dtdp-x-y-3-4 (B2)
4	13	dtdp-x-y-4-1 (B1)
	14	dtdp-x-y-4-2 (D)
	15	dtdp-x-y-4-3 (B2)
5	Not supported	
6*	22	dtdp-x-y-6-2 (B1)
	23	dtdp-x-y-6-3 (D)
	24	dtdp-x-y-6-4 (B2)

Notes:

1. The first pair associated with the physical slot is the transmit pair (toward the carrier). The second pair associated with the physical slot is the receive pair (from the carrier).
2. The physical line AID is formatted as follows:
dtdp-shelf#(1-8)server#[1,3,5,7,13,15,17,19 (also 9 and 21 R4.5)]-slot#(1-6)-channel#(1-4).

*This slot uses the second, third, and fourth drop AIDs to provide 2B+D service. All other slots use the first, second, and third drop AIDs for 2B+D service.

BRITE II (AUA93 Channel Unit)

The AUA93 channel unit provides second generation basic rate ISDN service using *ANSI** standard LT-mode U-interface for full duplex transmission. The U-interface 2 binary 1 quaternary (2B1Q) signal provides a 4-level line coding format at a data rate of 160 kb/s (80 k/ baud). Each AUA93 occupies one physical slot in

* *ANSI* is a registered trademark of American National Standards Institute, Inc.

an MSDT and uses up to three DS0 time slots depending on service selection (2B+D, B1+D, B2+D, or D only). When used in the MSDT, you can provision service selection depending on the software releases of the *SLC-2000* HDT hosting the MSDT:

- **Release 4.1 or earlier.** Provision the service selection using the physical option switches.
- **Release 4.2 or later.** Provision the service selection using the ent-t0 command from the CIT. Ignore the AUA93 physical option switches.

In the MSDT, the AUA93 BRITE II is supported in TR-08 Mode 1 or INA. However, time slot allocation and restrictions are shown in Table 3-11.

Table 3-12 shows ISDN services and related physical drop AIDs used for cross-connections to INA digroups. See the following example of how to use the table:

Example of How to Use Table 3-12. To access the channel unit in shelf 1, server 1, MSDT channel unit slot 3, for the purpose of making the cross-connections to INA logical DS0s, the physical AIDs would be *dt dp-1-1-3-1*. The INA logical AID format is *inads0-feeder#(1-28)-ds0#(1-24)*. The INA logical DS0 is determined by the placement and provisioning of the ISDN card in the D4 bank.

Applications and provisioning for the AUA93 are described in 363-205-107, *SLC Series 5 Carrier System, AUA93 BRITE II Channel Unit for ISDN, Installation and Maintenance*.

Table 3-11. AUA93 BRITE II in SLC®-2000 MSDT, Provisioning and Time Slot Allocation (Notes 1 and 3)

		Universal Configuration (AHG13 in SLC96 COT)		
Physical Slot in MSDT (Note 2)	Service (Note 3)	Physical Slot/ Digroup	Switches S1, 1-4	Time Slots per TR-08 Digroup on the DS1 Feeder
1	D-Only	1	OC CC	1 (D)
	B1+D		OC CO	1 (B1), 3 (D)
	B2+D		OC OC	1 (B2), 3 (D)
	2B+D		OC OO	1 (B1), 3 (D), 5 (B2)
2	D-Only	3	OC CC	9 (D)
	B1+D		OC CO	9 (B1), 11 (D)
	B2+D		OC OC	9 (B2), 11 (D)
	2B+D		Not supported	
3	D-Only	5	OC CC	17 (D)
	B1+D		OC CO	17 (B1), 19 (D)
	B2+D		OC OC	17 (B2), 19 (D)
	2B+D		OC OO	19 (B1), 21 (D), 23 (B2)
4	D-Only	7	OC CC	2 (D)
	B1+D		OC CO	2 (B1), 4 (D)
	B2+D		OC OC	2 (B2), 4 (D)
	2B+D		OC OO	2 (B1), 4 (D), 6 (B2)
5	D-Only	9	OC CC	10 (D)
	B1+D		OC CO	10 (B1), 12 (D)
	B2+D		OC OC	10 (B2), 12 (D)
	2B+D		Not supported	
6	D-Only	11	OC CC	18 (D)
	B1+D		OC CO	18 (B1), 20 (D)

Continued on next page

See notes at end of table.

Table 3-11. AUA93 BRITE II in SLC®-2000 MSDT, Provisioning and Time Slot Allocation (Notes 1 and 3) —Continued

		Universal Configuration (AHG13 in SLC96 COT)		
Physical Slot in MSDT (Note 2)	Service (Note 3)	Physical Slot/ Digroup	Switches S1, 1-4	Time Slots per TR-08 Digroup on the DS1 Feeder
6	B2+D	11	OC OC	18 (B2), 20 (D)
	2B+D		OC OO	20 (B1), 22 (D), 24 (B2)

Notes:

1. BRITE II channel units are supported in TR-08 Mode 1 and INA only.
2. The 24-line MSDT is shown. For a 12-line MSDT, use slots 1, 2, and 3.
3. Provision the channel unit as follows depending on the SLC-2000 HDT software release:
 - **Release 4.1 or earlier.** Provision the service selection using the physical option switches.
 - **Release 4.2 or later.** Provision the service selection using the **ent - t0** command from the CIT. Ignore the AUA93 physical option switches.

Table 3-12. AUA93 BRITE II in SLC®-2000 MSDT — ISDN Services and Related Physical Drop AIDs Used for Cross-Connections to INA Digroups

SLC-2000 MSDT Slot Number (Note 1)	Channels Used for ISDN Service	2B+D Service AIDs (Channels) x=shelf # 1-8 (y=shelf #) (Note 2)	Bn+d Service AIDs (Channels) (n = 1 or 2) (x=shelf # 1-8) (y=shelf #) (Note 2)	D-Only Service AIDs (Channels) (x=shelf # 1-8) (y=shelf #) (Note 2)
1	1	dtdp-x-y-1-1 (B1)	dtdp-x-y-1-1 (Bn)	dtdp-x-y-1-1 (D)
	2	dtdp-x-y-1-2 (D)	dtdp-x-y-1-2 (D)	
	3	dtdp-x-y-1-3 (B2)		
2	5	Not supported	dtdp-x-y-2-1 (Bn)	dtdp-x-y-2-1 (D)
	6		dtdp-x-y-2-2 (D)	
3*	10		dtdp-x-y-3-1 (Bn)	dtdp-x-y-3-1 (D)
	11	dtdp-x-y-3-2 (B1)	dtdp-x-y-3-2 (D)	
	12	dtdp-x-y-3-3 (D)		
		dtdp-x-y-3-4 (B2)		
4	13	dtdp-x-y-4-1 (B1)	dtdp-x-y-4-1 (Bn)	dtdp-x-y-4-1 (D)
	14	dtdp-x-y-4-2 (D)	dtdp-x-y-4-2 (D)	
	15	dtdp-x-y-4-3 (B2)		
5	17	Not supported	dtdp-x-y-5-1 (Bn)	dtdp-x-y-5-1 (D)
	18		dtdp-x-y-5-2 (D)	

Continued on next page

See notes and footnote at end of table.

Table 3-12. AUA93 BRITE II in SLC®-2000 MSDT — ISDN Services and Related Physical Drop AIDs Used for Cross-Connections to INA Digroups—Continued

SLC-2000 MSDT Slot Number (Note 1)	Channels Used for ISDN Service	2B+D Service AIDs (Channels) x=shelf # 1-8) (y=shelf #) (Note 2)	Bn+d Service AIDs (Channels) (n = 1 or 2) (x=shelf # 1-8) (y=shelf #) (Note 2)	D-Only Service AIDs (Channels) (x=shelf # 1-8) (y=shelf #) (Note 2)
6*	21		dtdp-x-y-6-1 (B1)	dtdp-x-y-6-1 (D)
	22	dtdp-x-y-6-2 (B1)	dtdp-x-y-6-2 (D)	
	23	dtdp-x-y-6-3 (D)		
	24	dtdp-x-y-6-4 (B2)		

Notes:

1. The first pair associated with the physical slot in the transmit pair (toward the carrier). The second pair associated with the physical slot is the receive pair (from the carrier).
2. The physical line AID is formatted as follows:
dtdp-shelf#(1-8)server#[1,3,5,7,13,15,17,19(also 9 and 21 R4.5)]-slot#(1-6)-channel#(1-4).

*This slot uses the second, third, and fourth drop AIDs to provide 2B+D service. All other slots use the first, second, and third drop AIDs for 2B+D service.

SLC-2000 ISDN BRI Services (SLC-2000 Software Release 4.0 and Later) (AUA94 Channel Unit)

The AUA94 Dual U ISDN channel unit provides two circuits of second generation basic rate ISDN service using the *ANSI* standard LT-mode U-interface for full duplex transmission. The U-interface 2 binary 1 quaternary (2B1Q) signal provides a four-level line coding format at a data rate of 160 kb/s (80 k/ baud). Each AUA94 channel unit occupies one physical slot in an MSDT and provides full 2B+D service for two customer circuits. Table 3-13 lists the slot locations and restrictions when using the AUA94 in the MSDT.

The AUA94 is supported only with SLC-2000 Software Release 4.0 and later when supporting a TR-303 VRT. When the AUA94 is installed, the D-channels (16 kb/s) of the 2B+D circuits must be nailed up to the host switch in 1/4 time slots using the Embedded Operations Channel (EOC) assignments. Four D-channels may occupy a single feeder DS0. The B-channels from an AUA94 are typically assigned to feeder DS0 slots dynamically using time slot management channel

(TMC) assignments. The B-channels from an AUA94 may be optionally assigned to feeder DS0 slots on a semipermanent basis, using EOC assignments.

Applications and provisioning for the AUA94 are described in 363-205-113, *SLC Series 5 Carrier System, AUA94 U-DSL ISDN Channel Unit, Installation and Maintenance*.



NOTE:

This channel unit is compatible in an MSDT hosted by a SLC-2000 TR-303 HDT. It is not supported when the HDT is a SLC-Series 5 system.

Table 3-13. ISDN BRI 2B+D AUA94 Channel Unit Locations for the MSDT

MSDT Line Size Configuration	MSDT Channel Unit Slot Number (Note)					
	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6
12-line MSDT	P	P	I/P	n/a	n/a	n/a
24-line MSDT	I/P	I/P	I/P	I/P	P	P*

Note: The following list shows the meaning of the symbols in the body of the table:

P — This slot supports up to four POTS lines with a quad channel unit. You can also use single or dual POTS-type channel units in this slot.

I — This slot supports the AUA94 dual ISDN BRI 2B+D channel unit. The *SPQ*[®]494 quad ISDN channel unit is not allowed in the MSDT.

n/a — This slot is not available when the MSDT Server is optioned for lines = 12.

* **Slot 6.** This slot supports up to four POTS lines unless the ISDN feature is being used. If the ISDN feature is being used, observe the following restrictions when using Slot 6 in the MSDT:

If any ISDN BRI service is provided in the MSDT, this slot provides POTS lines to the first two channels (or lines) of the slot. This will allow this slot to contain either a single or dual channel unit. The second two channels of this slot are unavailable since the system uses these channels to support ISDN D channels. Therefore, quad channel units are not allowed in Slot 6.

If the MSDT provides ISDN service in slots 1 through 4, quad channel units, T-BRITE (AUA90) channel units, BRITE II (AUA93) channel units, and dual OCU dataport (*SPQ*452) channel units are not allowed in Slot 6.

If there is a quad channel unit, T-BRITE (AUA90) channel unit, BRITE II (AUA93) channel unit, or dual OCU dataport (SPQ452) channel unit in Slot 6, ISDN channel units are not allowed in any slot of the MSDT.

Mode 2

The MSDT also supports Mode 2. It has the same slot restrictions for special services as on a *SLC Series 5* Mode 2 system. The special service channel units are restricted to the last four slots in any digroup.

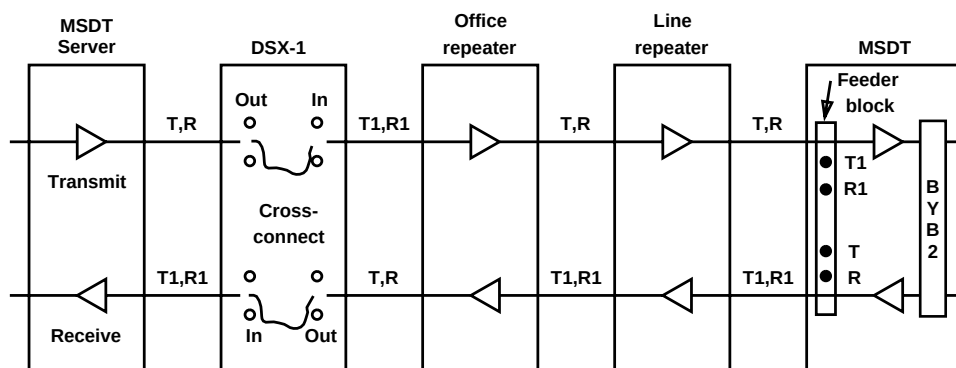
T1 MSDT

MSDT Servers can operate over standard T1 facilities when the OU/DSX switch (board-mounted switch) is set in the DSX position. In this configuration, the MSDT Server is supplying a DSX-1 signal that requires a T1 repeater shelf and repeater to interface to the outside plant. In addition, the B8ZS/ZCS switch (board-mounted switch) has to be set for the proper line coding, and the equalization switch (board-mounted switch) has to be set for the appropriate distance between the RT bank and the DSX-1 cross-connector. Refer to the appropriate MSDT Server data sheet listed in Appendix A.

The MSDT Server uses the VF channel bank pairs as outputs to the DSX or T1 facility. The tip and ring copper pairs in the connector cables are used for the transmit (T, R) and receive (T1, R1) direction for the T1 facility. These T, R, T1, R1 pairs should be connected to a DSX-1 cross-connector where they are wired to an office or line powering repeater (Figure 3-19). The T1 repeater is wired to the OSP copper facilities where all the standard T1 design and testing rules apply.

Specific designated leads in the connector cables are wired to one side of a DSX-1 frame, while the other side has the T1 repeaters wired to it. A cross-connection is then run between the CU position and the T1 repeater position on the DSX-1 frame to complete the circuit.

Refer to SD-7C118-01, *SLC Series 5 Carrier System Remote Terminal (RT) Application and Bay Wiring Schematic* for detailed information on voice-frequency (VF) cables for DSX-1. Refer to the SD-7C174-01 *SLC-2000 Remote Terminal Application Schematic*, for detailed information on VF cables for DSX-1.



tpa 832612/01

Figure 3-19. MSDT DSX-1 Connections

The following cabling arrangement is used for wiring both the 12- and 24-line MSDTs. The physical channel unit positions 1, 13, 25, 37, 49, 61, 73, and 85 are used for the 12-line MSDT. The physical channel unit positions 1, 25, 49, and 73 are used for the 24-line MSDT. Refer to Table 3-14 for the slot, VF connector, and pin numbers for both the 12- and 24-line MSDTs. For the blue *SLC* Series 5 channel bank, the cables will be J101 through J104BL. For the white bank, the cables will be J101 through J104W.

Table 3-14. HDT to DSX-1 Connections

AUA408 Slot		VF Connector				
Digroup	Slot	J (Note)	Pin	Designation	DS0 Channel Designation	DSX Designation
A	1/2	101	1	T-1	12/24	In-1T
			2	R-1		In-1R
			3	T1-1		Out-1T
			4	R1-1		Out-1R
	13/14	101	25	T-7	12	In-()T
			26	R-7		In-()R
			27	T1-7		Out-()T
			28	R1-7		Out-()R
B	25/26	101	49	T-13	12/24	In-()T
			50	R-13		In-()R
		102	1	T1-13		Out-()T
			2	R1-13		Out-()R
	37/38	102	23	T-19	12	In-()T
			24	R-19		In-()R
			25	T1-19		Out-()T
			26	R1-19		Out-()R

Continued on next page

See notes at end of table

Table 3-14. HDT to DSX-1 Connections - Continued

AUA408 Slot		VF Connector			DS0 Channel Designation	DSX Designation
Digroup	Slot	J (Note)	Pin	Designation		
C	49/50	102	47	T-25	12/24	In-()T
			48	R-25		In-()R
			49	T1-25		Out-()T
			50	R1-25		Out-()R
	61/62	103	21	T-31	12	In-()T
			22	R-31		In-()R
			23	T1-31		Out-()T
			24	R1-31		Out-()R
D	73/74		45	T-37	12/24	In-()T
			46	R-37		In-()R
			47	T1-37		Out-()T
			48	R1-37		Out-()R
	85/86	104	19	T-43	12	In-()T
			20	R-43		In-()R
			21	T1-43		Out-()T
			22	R1-43		Out-()R

Note: There are two designated cables; one for the white bank and one for the blue bank. Each one is labeled J101W or J101BL.

At the DSX-1 frame, the VF T/R should be wired to the T1/R1 for the repeater that will be associated with a T1 facility. The T1/R1 should then be wired to the T/R of the repeater.

HDT Central Powering Equipment

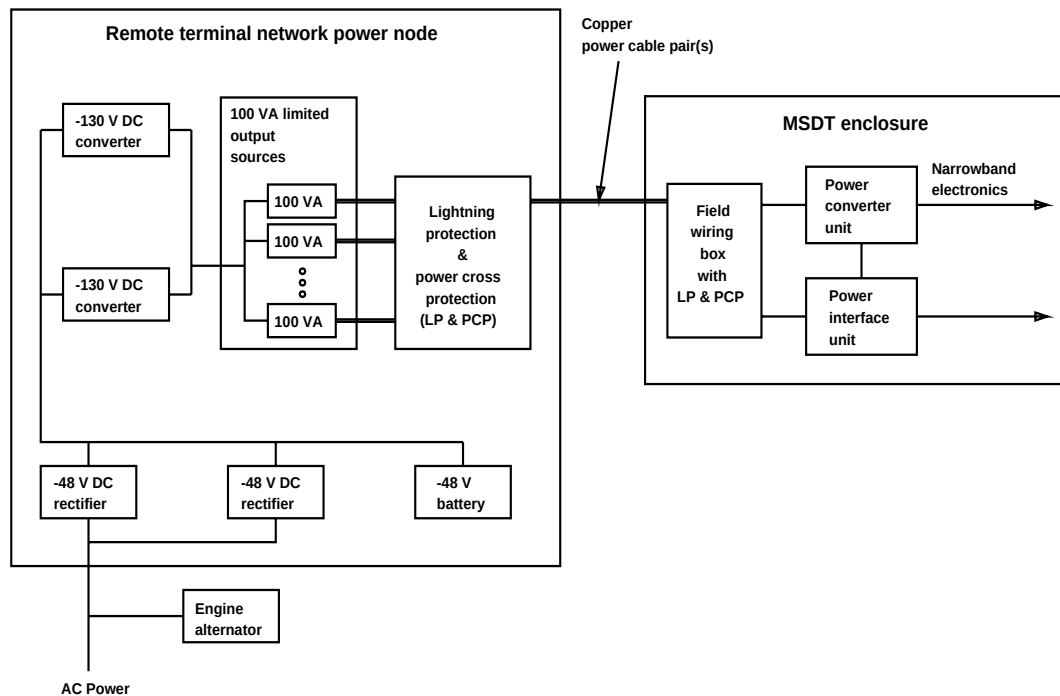
The HDT site may also be equipped with a central powering system (CPS) if it has to provide central power to outlying MSDTs. When the HDT equipment is located in a hut or CEV, the CPS can be located separately from the HDT narrowband optoelectronics bays. Figure 3-20 depicts a typical system. If the HDT equipment is housed in an 80-type cabinet, the CPS can also be housed in the same cabinet as shown in Figure 3-15. Regardless of the CPS location, it must be custom engineered for each application according to Chapter 5.

The CPS is powered from a -48 V DC power plant. The -48 V DC power plant converts and rectifies commercial AC power to obtain the -48 V DC required by the central powering converter plant. The existing -48 V DC power may be used to provide power if it has sufficient excess capacity. Otherwise, a new power plant or additional capacity will have to be installed at the HDT site.

The central powering converter plant operates from the -48 V DC supplied by the power plant and sends -130 V DC to the limited output source units (LOSUs — AUA418) in the limited output source shelf. Each LOSU supplies 100 VA limited outputs to the MSDTs. One limited output source shelf fully equipped with 24 LOSU cards can power forty-eight 24-line MSDTs.

A fully equipped -130 V DC converter plant bay contains the following:

- One -130 V DC output fuse panel as required
- One limited output source shelf as required
- Converter shelves with each one containing up to two -48 to -130 V DC converters as required.



tpa 789699/01

Figure 3-20. -130 Volt Central Powering System Architecture

A lightning/power cross protection panel is also required for use with the converter bay, but it is located separate from the converter bay.

To ensure the safety of craft personnel handling components and wiring associated with the CPS, the CPS outputs are limited to 130 V DC and 100 VA. The CPS outputs conform to the TR-57* interface specification.

Some centrally powered applications will use separate powering hubs that are not co-located with the HDT. These hubs typically include the following equipment:

- 48-volt rectifier and battery strings
- Central power converter
- Limited output sources
- Protection panel.

Chapter 5 contains examples of such power hubs.

Multi-Services Distant Terminal

The SLC-2000 MSDT consists of a card cage and backplane mounted in a pedestal, strand (aerial), or underground enclosure or in framework suitable for rack mounting. The MSDT may be equipped with some or all of the following items:

- Batteries
- Field wiring box (FWB)
- Fiber storage unit
- Tip and ring pair protectors
- Tip and ring terminal block
- T1 protection blocks.

Typical examples of a fiber MSDT and a metallic MSDT mounted in a pedestal enclosure are shown in Figure 3-21 and Figure 3-22, respectively.

A description of the items that comprise a SLC-2000 MSDT is contained in the following sections along with a description of each MSDT enclosure.

* Bellcore Technical Reference TR-TSY-000057 Issue 1, April 1987, *Functional Criteria for Digital Loop Carrier Systems*.



Figure 3-21. SLC®-2000 MSDT Physical Arrangement (Fiber)

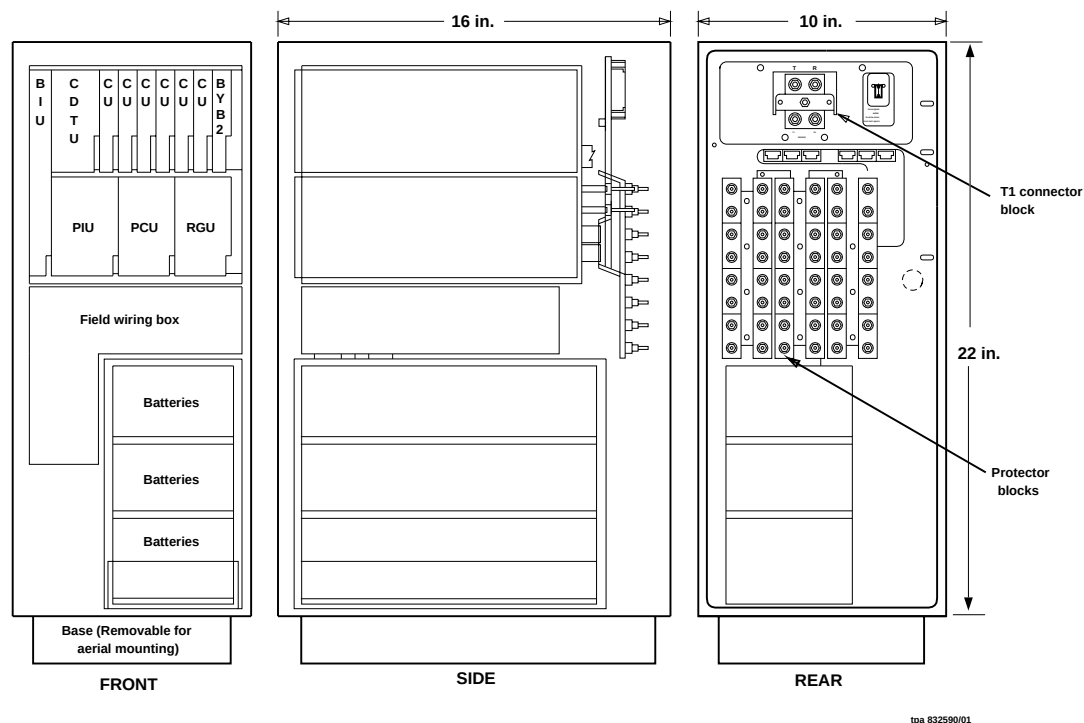


Figure 3-22. SLC®-2000 MSDT Physical Arrangement (Metallic)

Card Cage and Backplane

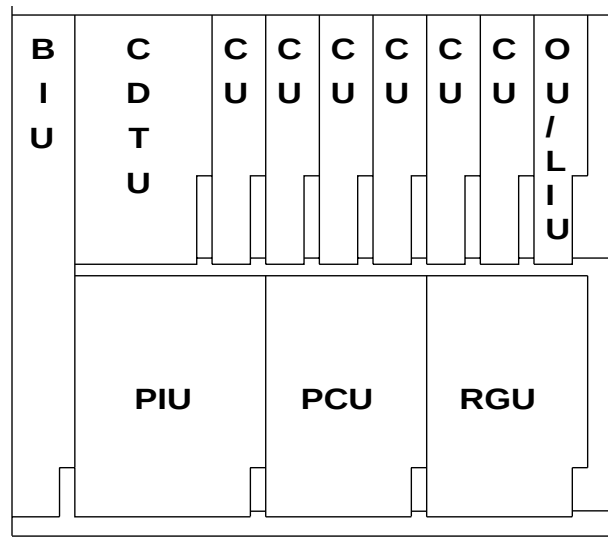
The card cage and backplane in the SLC-2000 MSDT ED-7C712-30 enclosure is similar to the backplane of the SLC-2000 Access System or SLC Series 5 system and provides housing for the following plug-in units:

- **Backplane Interface Units (BIUs).** MC97780A1, MC97789A1, MC97793A1, or MC97794A1 backplane interface unit (BIU)
- **Optical Units (OUs) or Line Interface Unit (LIU).** BYB1B/BYB1C/BYB3/BYB5 OU or BYB2/BYB2B T1/DSX-1 line interface unit (LIU)
- **Channel and Drop Test Unit (CDTU).** AUA411/AUA411B channel and drop test unit (CDTU)
- **Power Converter Units (PCUs).** AUA412, AUA417, AUA422, or AUA427 power converter unit (PCU)
- **Ringin Generator Units (RGUs).** AUA413 or AUA423 ringin generator unit (RGU)
- **Power Interface Units (PIUs).** AUA414, AUA416, AUA424, AUA426, AUA434, or AUA436 power interface unit (PIU)

- **Channel Units (CUs).** Six Series 5 or *SLC-2000* CUs.

Figure 3-23 shows the location of each plug-in unit in the card cage.

The following sections provide a description of each of these plug-in units.



cardcg.msdt.ps

Figure 3-23. MSDT Card Cage

Backplane Interface Units (BIUs)

The BIU provides the interface between the MSDT and the HDT MSDT Server. It performs functions similar to a combination of the Series 5 LIU, transmit/receive unit (TRU), bank control unit (BCU), and alarm display unit (ADU).

The BIU faceplate (Figure 3-24) contains five LED indicators (**FAIL**, **NE**, **CLF**, **FE**, and **CONFIG**), a momentary contact push button switch (**LED TEST**), and a seven-segment LED display (**SLOTS AVAILABLE**).

The following BIUs are compatible with the MSDT:

- **MC97780A1 BIU.** This BIU is used for short loops (132 ohms) and requires an AUA413 RGU (XAUA413 for 25-Hz ringing frequency).
- **MC97789A1 BIU.** This BIU is used for either short or long loops (up to 1500 ohms) and requires an AUA423 RGU.

- **MC97793A1 BIU.** This BIU performs the same basic functions as the MC97780A1 with the additional capability of allowing a software download from the HDT. It requires an AUA413 RGU.
- **MC97794A1 BIU.** This BIU performs the same basic functions as the MC97780A1 with the additional capability of supporting DC alarm channel units (*MCU*^{*}5205). It requires an AUA413 RGU.

Refer to Table 3-1 to determine which BIU to use with which feature and *SLC-2000 software release*.

* Trademark of Tollgrade Communications, Inc.

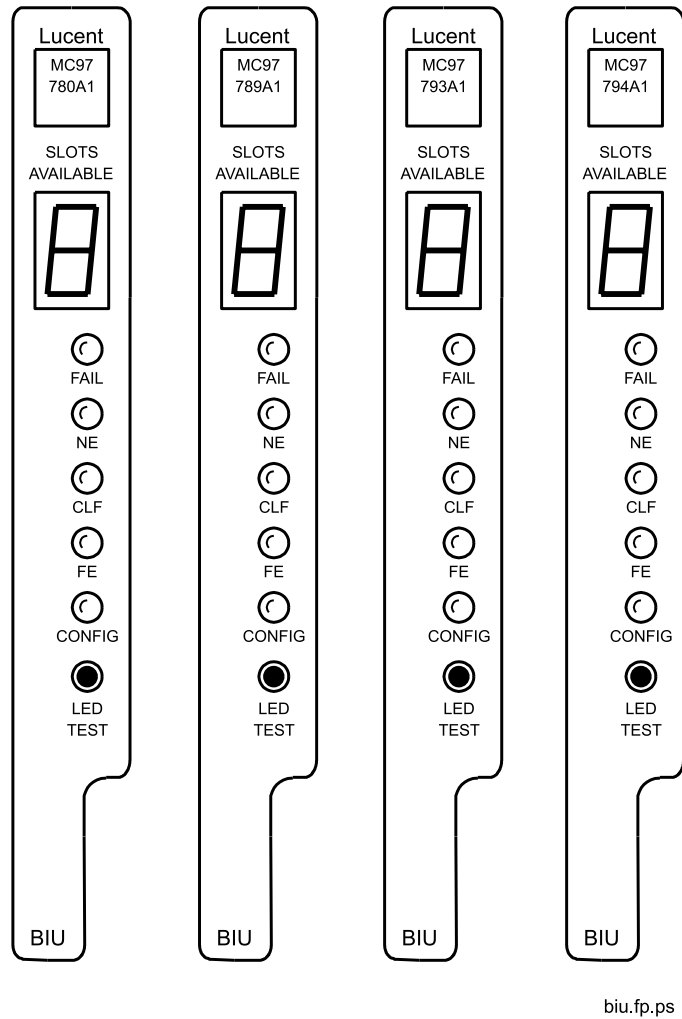


Figure 3-24. MC97780A1 or MC97789A1, MC97793A1, and MC97794A1 Backplane Interface Unit

Optical Units (OUs) or Line Interface Units (LIUs)

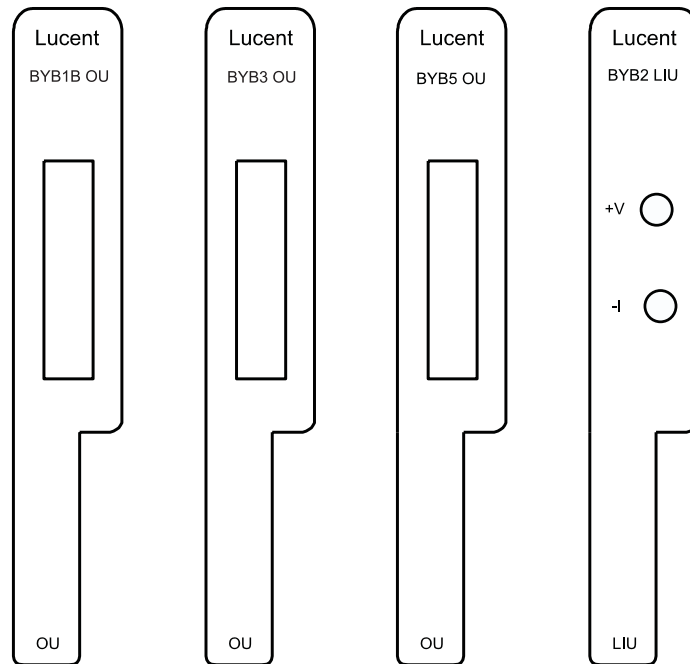
The MSDT can contain one of the following OUs or LIUs:

- **BYB1B/BYB3/BYB5 OUs.** These OUs (Figure 3-25) receive electrical 1.544-Mb/s signals from the MSDT CUs and convert them to an optical 1.544-Mb/s signal using a singlemode laser diode. The optical signal is then transmitted over one singlemode fiber, using simultaneous bidirectional transmission at 1310 nm, to the optical unit at the HDT site. In the other direction, upon reception of the optical 1.544-Mb/s signal from the HDT, the OU converts it to an electrical 1.544-Mb/s signal using a positive-intrinsic-negative (PIN) diode detector and feeds it to the MSDT CUs. The BYB3 OU is an optical unit that is compatible with all the functions of the BYB1C or BYB1B OU. The BYB5 OU is used for extended range applications.
- **BYB2/BYB2B T1/DSX-1 LIU.** The BYB2 T1/DSX-1 LIU (Figure 3-25) is used in the SLC-2000 MSDT when the MSDT interfaces a DSX or T1 signal. When used in the T1 mode of operation for shorter T1 facilities, the BYB2 provides a power looping function for the T1 facility. For longer T1 facilities, the BYB2 can be optioned to provide a DSX-1 interface. This DSX-1 interface is designed to be used with a separate, telco provided, office repeater (DSX-1 to T1 interface) with power feed for the T1 facility. The BYB2 faceplate is equipped with two jacks (+V and -I) for measuring T1 loop voltage and current.



WARNING:

Under no circumstances should the signal lines be run to outside plant cables or equipment when the BYB2 is optioned for the DSX mode. The DSX mode of operation is intended for inside plant applications only.



tpa789745-01

Figure 3-25. BYB1B, BYB1C, BYB5 Optical Unit and BYB2 Line Interface Unit

Channel and Drop Test Unit (CDTU)

The AUA411/AUA411B CDTU (Figure 3-26) provides the remote end terminations and detectors required to support end-to-end channel testing of 2-wire locally-switched services. The CDTU also contains a drop test circuit to determine the health of the metallic drop beyond the MSDT to support loop testing with mechanized loop testing 2 (MLT-2). The CDTU faceplate is equipped with two LED indicators (**FAIL** and **BUSY**). The AUA411B has all the capabilities of the AUA411 CDTU plus ISDN drop testing capabilities and TR303 loop testing.

**NOTE:**

The CDTU meets the TR-909 requirements with 500 feet of cable. For example, when using 22-gauge wire at approximately 20 ohms/kft, the loop resistance is approximately 20 ohms.

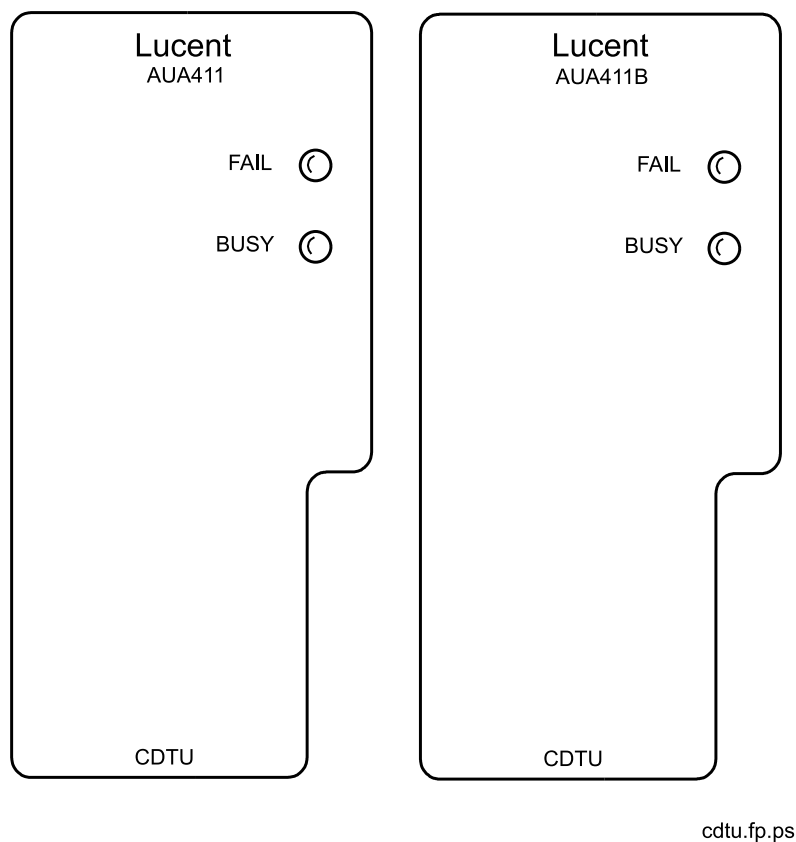


Figure 3-26. AUA411/AUA411B Channel and Drop Test Unit

Power Converter Units (PCUs)

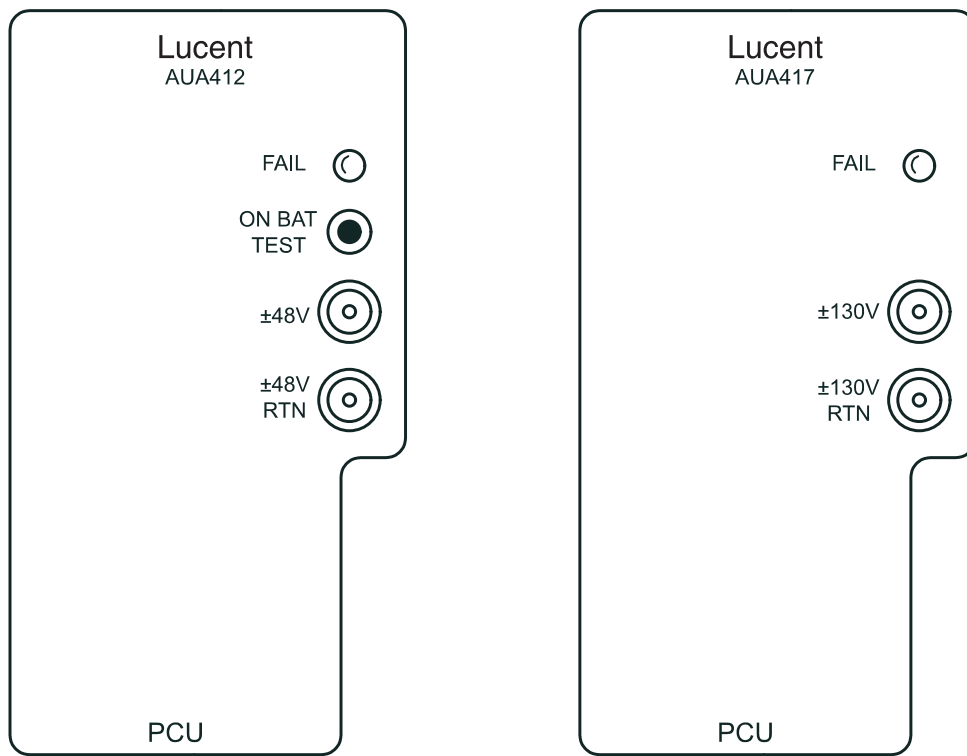
The MSDT can contain one of the following PCUs, depending on the type of powering used:

- **AUA412 PCU.** The AUA412 (Figure 3-27) is used at the MSDT to support the local 120 V AC and –48 V DC backpowering applications. The AUA412 PCU accepts input voltage from either an AUA414 or AUA415 power interface unit (PIU) and converts it to the specified voltage levels required by the electronics in the MSDT. The total output power capability of the AUA412 is 65 watts. The faceplate of the AUA412 PCU contains the following indicators, switches, and test points:
 - **FAIL** LED indicator
 - **ON BAT TEST**, a momentary contact push button switch
 - **–48 V** and **–48 V RTN** test points.

- **AUA417 PCU.** The AUA417 PCU (Figure 3-27) is used at the MSDT to support the –130 V DC central powering application. The AUA417 PCU accepts input voltage from the powering pairs and converts it to the specified voltage levels required by the electronics in the MSDT. The output capability of the AUA417 is 58 watts. The faceplate of the AUA417 PCU contains the following LED indicator and test points:
 - **FAIL** LED indicator
 - **–130 V** and **–130 V RTN** test points.

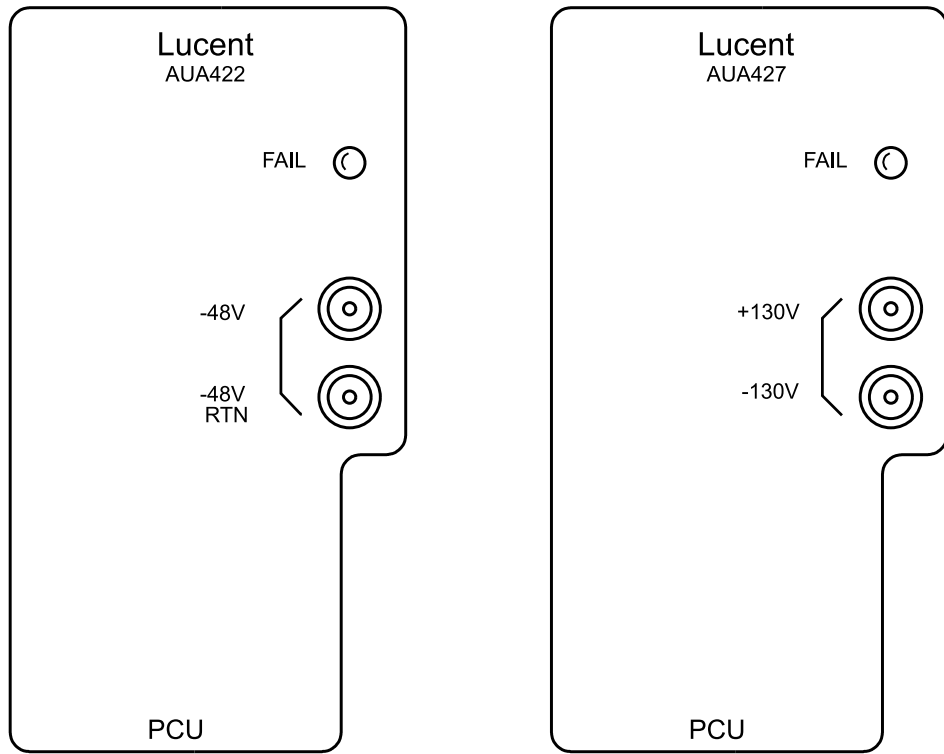
- **AUA422 PCU.** The AUA422 PCU (Figure 3-28) is used at the MSDT to support the 60 V AC central powering arrangement. The AUA422 PCU accepts input voltage from the AUA424/AUA434 PIU and converts it to the specified voltage levels required by the electronics in the MSDT. The output capability of the AUA422 is 58 watts. The AUA422 PCU contains the following LED indicator and test points:
 - **FAIL** LED indicator
 - **–48 V** and **–48 V RTN** test points.

- **AUA427 PCU.** The AUA427 PCU (Figure 3-28) is used at the MSDT to support the ± 130 V DC central powering application. The AUA427 PCU accepts input voltage from the powering pairs and converts it to the specified voltage levels required by the electronics in the MSDT. The output capability of the AUA427 is 58 watts. The AUA427 PCU contains the following LED indicator and test points:
 - **FAIL** LED indicator
 - **–130 V** and **+130 V** test points.



tpa 813518/01

Figure 3-27. AUA412 and AUA417 Power Converter Units

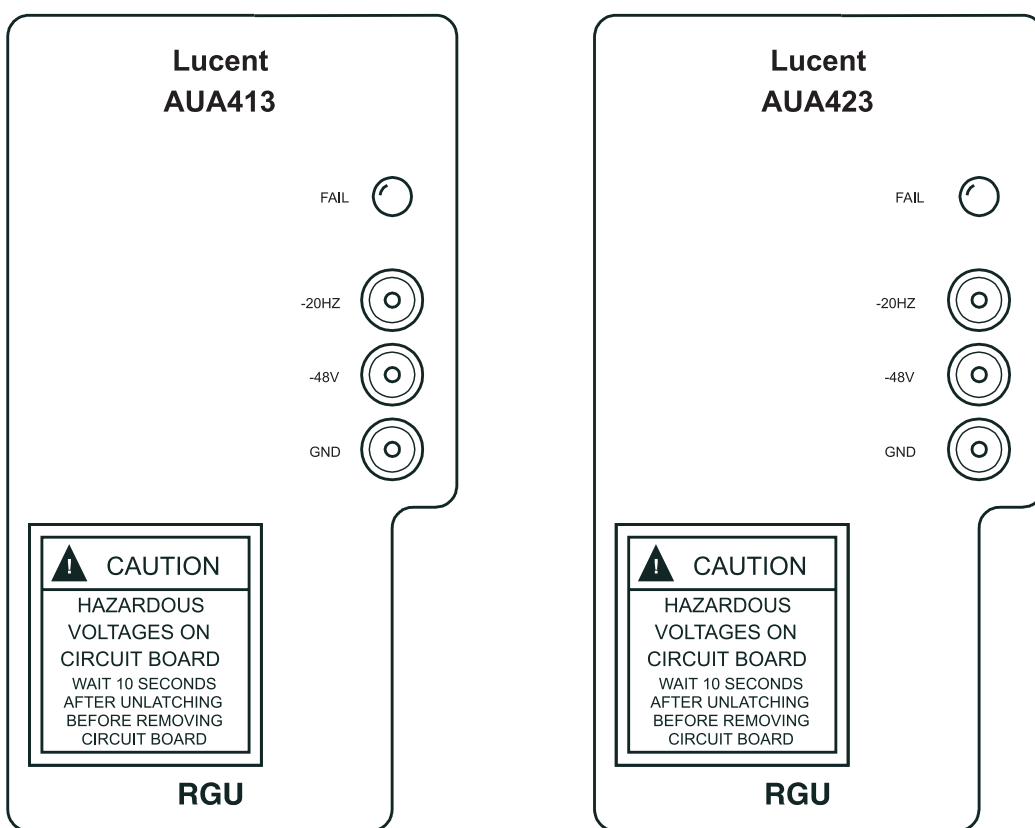


aua422-427.fp.ps

Figure 3-28. AUA422 and AUA427 Power Converter Units

Ringling Generator Units (RGUs)

The AUA413 and AUA423 RGUs (Figure 3-29) provide 20-Hz negative-superimposed ringing current to satisfy the ringing requirements of the MSDT. The AUA413 and AUA423 RGUs receive an input voltage in the -42 to -60 V DC range from the PCU and supply a ringing voltage of 20 Hz, 80 or 100 V rms sine wave, respectively, superimposed on the negative input voltage. Both can ring up to three lines simultaneously. The AUA423 RGU satisfies the ringing requirements of the MSDT for longer loop applications where the loop impedance exceeds 130 ohms. Each of the faceplates contains an LED indicator (**FAIL**) and three test points (**-20 HZ**, **-48 V**, and **GND**).



tpa 789773/01

Figure 3-29. AUA413 and AUA423 Ringing Generator Units

Power Interface Units (PIUs)

The PIUs (Figure 3-30) are used in conjunction with the PCUs to provide a variety of MSDT input powering options. Refer to Table 3-15 for the proper PIU/PCU combination for the desired powering application. The faceplate on each unit contains the following:

- **AUA414 PIU.** The faceplate of the AUA414 PIU contains two LED indicators (**CHGR FAIL** and **ON BAT**), four test points (**34 V AC**, **34 V AC RTN**, **BAT**, and **GND**), and two fuses (**–48 V — MSDT 5A** and **–48 V — CATV 2A**).
- **AUA415 PIU.** This unit has been DA'd and is replaced by the AUA414 PIU.
- **AUA416 PIU.** The faceplate of the AUA416 PIU contains two LED indicators (**FAIL** and **NET BAT**) and two test points (**–130 V** and **–130 V RTN**).
- **AUA424 PIU.** The faceplate of the AUA424 PIU contains two test points (**48 V AC** and **48 V AC RTN**) and two fuses (**–48 V SPARE FUSE** and **MSDT 5A**).
- **AUA426 PIU.** The faceplate of the AUA426 PIU contains two LED indicators (**CHGR FAIL** and **ON BAT**) and two test points (**BAT** and **GND**).

**NOTE:**

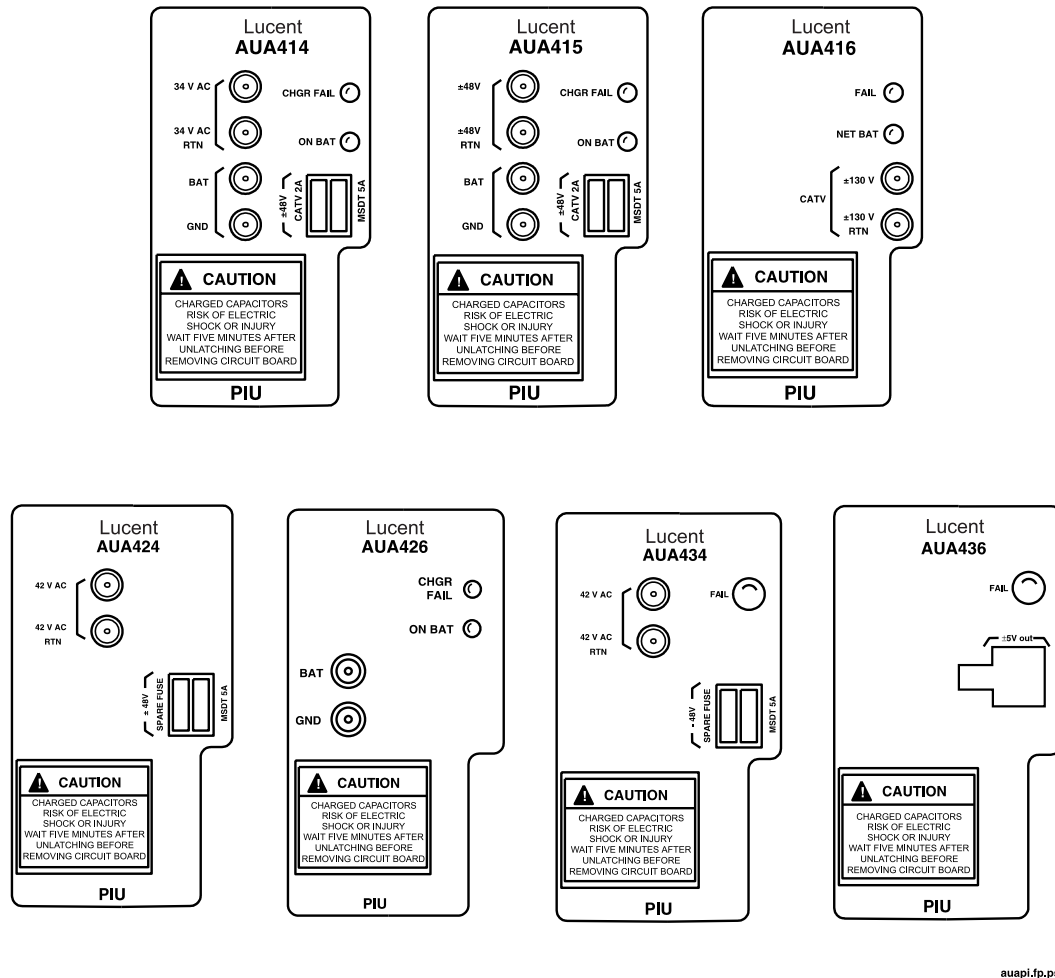
The AUA426 PIU is used to provide peak leveling with the –130 or ± 130 V DC central powering options. Peak leveling is a technique that allows for a less conservative design of the copper powering pairs between the MSDT and the central power point. The copper is engineered for a less than worst-case condition (for example, 18-CCS). A small battery is placed at the MSDT to handle the infrequent occasions when traffic exceeds that 18-CCS level. When peak leveling is not desired, the AUA416 PIU is used with the –130 or ± 130 V DC central powering option.

- **AUA434 PIU.** The faceplate of the AUA434 PIU contains an LED indicator (**FAIL**), two test points (**42 V AC** and **42 V AC RTN**), and two fuses (**–48 V SPARE FUSE** and **MSDT 5A**).
- **AUA436 PIU.** The faceplate of the AUA436 PIU contains an LED indicator (**FAIL**) and a connector jack to provide ± 5 volts to associated power equipment.

Table 3-15. SLC[®]-2000 MSDT Powering Interface

Power Source	PIU Required	PCU Required
120 V AC	AUA414	AUA412
–48 V DC	AUA415 (DA) or AUA414	AUA412
–130 V DC without peak leveling	AUA436	AUA417
–130 V DC	AUA436*	AUA417
–130 V DC with peak leveling	AUA436	AUA417
±130 V DC without peak leveling	AUA416	AUA427
±130 V DC with peak leveling	AUA426	AUA427
60 V AC	AUA434	AUA422
60 V AC	AUA434*	AUA422

* Required if the low power option feature of the SPQ[®]909 CU is used.



auapi.fp.ps

Figure 3-30. AUA414, AUA415(DA), AUA416, AUA424, AUA426, AUA434, and AUA436 Power Interface Units

Channel Units

The *SLC-2000* MSDT accepts a maximum of six Series 5 dual or *SLC-2000* quad POTS or *SPOTS*[®] CUs that will provide a maximum of 12 or 24 channels, respectively. A variety of services can be provided by using the appropriate CUs in the MSDT. These services include POTS, coin, digital data system (DDS), integrated services digital network (ISDN), a number of switched, nonlocally switched, and nonswitched voice-frequency (VF) special services. The *SLC-2000 SPQ400* quad POTS and *SPQ440* quad *SPOTS* CUs provide the same services

as the AUA158D and AUA150C CUs, respectively, while also providing automatic loss compensation (ALC). The Series 5 and *SLC*-2000 CUs supported in the MSDT are presented in Chapter 6, "Technical Specifications."

Battery Backup

Optional batteries are available for installation in the MSDT enclosure to provide backup power or peak leveling. For MSDTs powered locally, the enclosure is equipped with a battery storage compartment that houses up to three KS-21906, L20 battery packs. These batteries are used to provide backup power to avoid service interruption during periods of power loss. The number of battery packs required in these MSDT enclosures can be determined using Table 3-16.

Table 3-16. *SLC*®-2000 MSDT Battery Requirements

Number of Lines Equipped	Number of Battery Packs
1 — 4	1
5 — 8	2
9 — 24	3

For MSDTs powered from -130 V DC central power or ± 130 V DC central power and utilizing the peak leveling technique, the enclosure may be equipped with a battery storage compartment that houses up to two KS-21906, L20 battery packs. These batteries help maintain the required voltage level during peak load periods that exceed the traffic design capacity of the copper powering pairs. It is recommended that two battery packs be used in MSDT enclosures that are located in areas where cold weather temperature extremes are common. Otherwise, only one battery pack is needed. Peak leveling batteries are optional for all MSDT central powering arrangements except in aerial and underground applications.

The battery packs provide from 8 to 20 hours of backup power depending on the number of lines off hook. Each battery pack is rated at 48 volts, 2.5 Ah at an ambient temperature of 77°F. A 27 watt thermostatically controlled battery heater is also attached to the side of the battery storage compartment in all locally powered MSDT enclosures. The battery heater turns on at 33 degrees going down, and turns off at 45 degrees going up.

Centrally powered MSDTs that do not utilize the peak leveling technique do not require batteries at the MSDT.

Field Wiring Box

The MSDT field wiring box (FWB) provides termination connections for incoming power wiring when the MSDT is housed in a pedestal or underground enclosure. Five different FWBs are available for installation in these MSDT enclosures. The following powering options that are used for the MSDT determine the appropriate FWB that will be installed in the enclosure:

- **120 V AC Local Powering Option:** ED-7C712-30, Group 20
- **-48 V DC Local Powering Option:** ED-7C712-30, Group 25
- **± 130 V DC Central Powering Option:** ED-7C712-30, Group 22
- **-130 V DC Central Powering Option:** ED-7C712-30, Group 23
- **60 V AC Central Powering Option:** ED-7C712-30, Group 24.

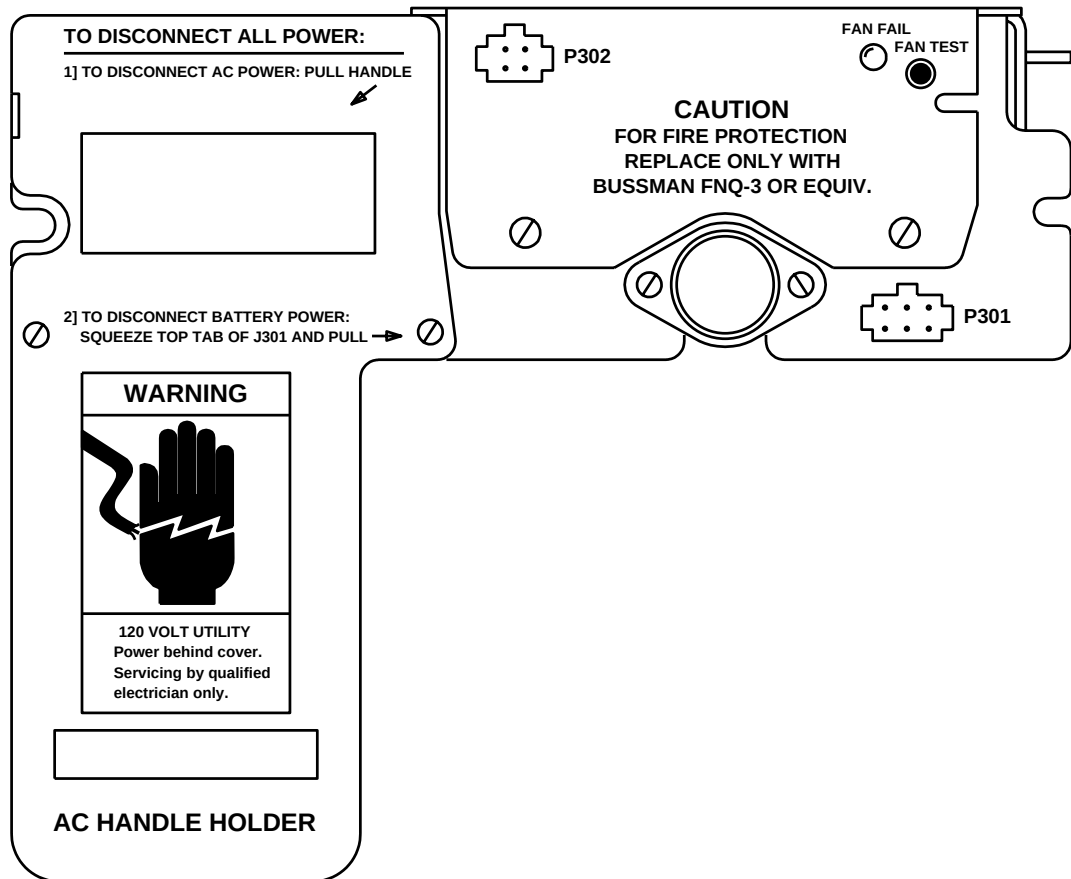
The following sections briefly describe the different FWBs available.

120 V AC Local Powering Option — ED-7C712-30, Group 20

This FWB (Figure 3-31) is used in conjunction with the 120 V AC local powering option and is equipped with the following:

- An AC power disconnection that connects power to or removes power from the MSDT circuitry
- A 3-amp *TRON*^{*} fuse (FNQ-3) that protects the circuitry in the MSDT
- Two connectors, P301 (six-pin) and P302 (four-pin), that mate with the battery connector (J301) and fan connector (J302), respectively
- A transformer that converts the 120 V AC input voltage to 34 V AC for use by the MSDT circuitry
- Three power connection terminals, located behind the FWB front panel, that accept the incoming power wiring
- A power disconnect handle storage slot that houses the power disconnect handle after it is removed from the power connector
- A fan slot that houses a fan described later in this chapter.

* Registered trademark of Cooper Industries, Inc.



tpa 813506/01

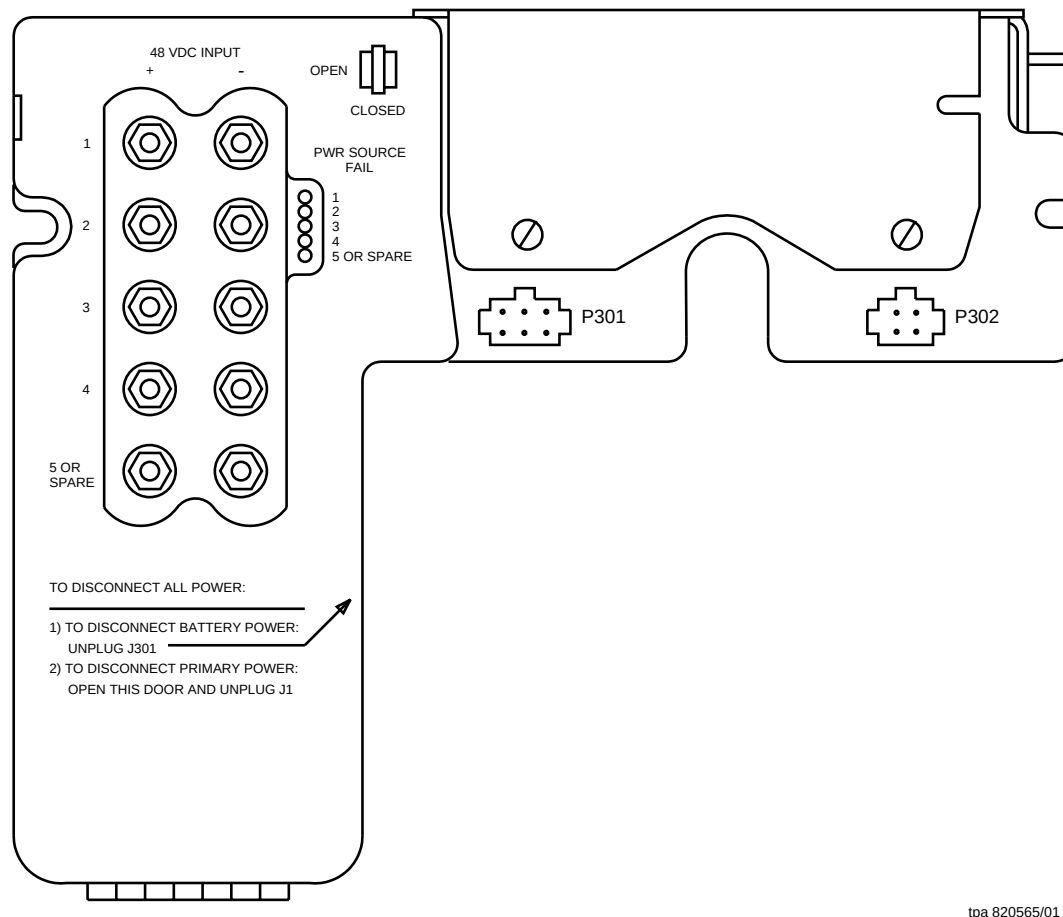
Figure 3-31. Field Wiring Box for 120 V AC Local Powering Options (ED-7C712-30, Groups 20 and 24)

**—48 V DC Local Powering Option —
ED-7C712-30, Group 21**

These FWBs are used in conjunction with the –48 V DC local powering option. The Group 21 FWB (Figure 3-32) supports up to five powering sources. Each FWB is equipped with the following:

- Lightning and power cross protection
- Two connectors, P301 (6-pin) and P302 (four-pin), that mate with the battery connector (J301) and fan connector (J302), respectively
- A terminal strip, attached to the FWB front panel, that accepts the incoming power wiring

- A printed wiring board located behind the FWB front panel that allows the selection of the number of subscribers providing power to the MSDT.



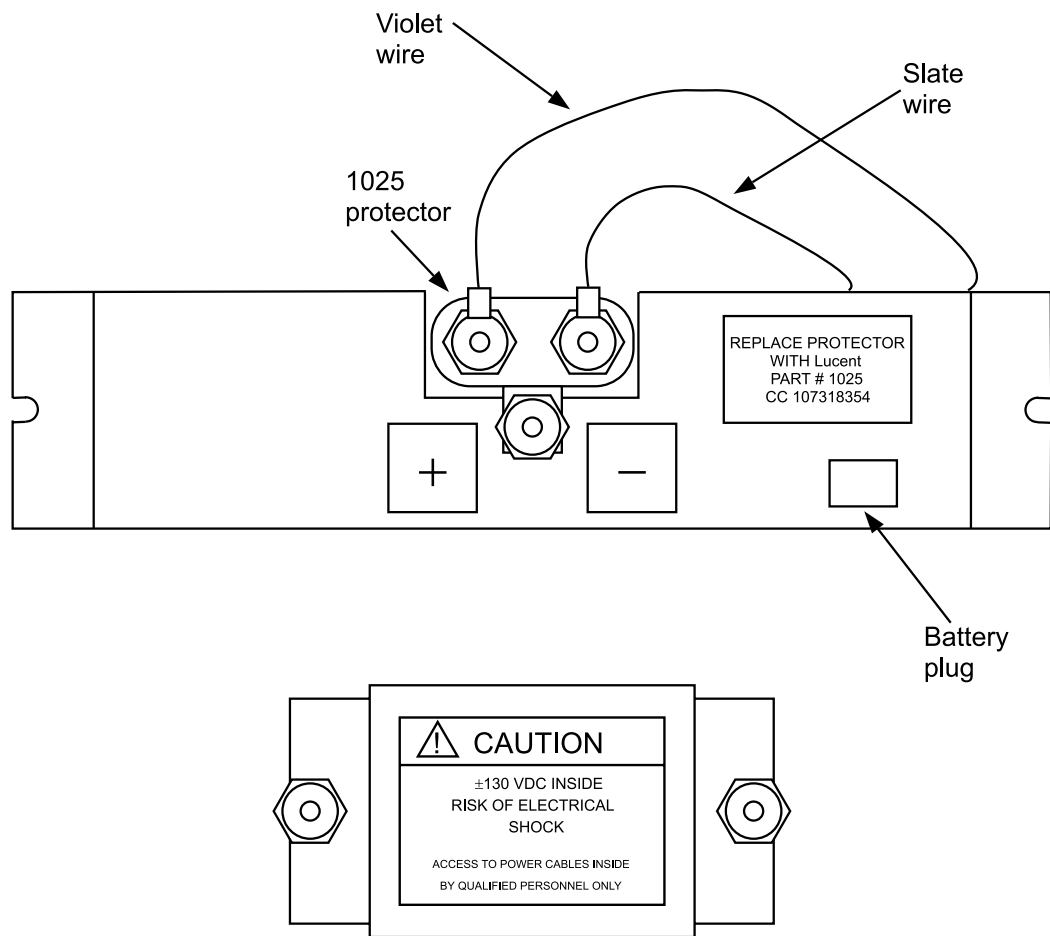
tpa 820565/01

Figure 3-32. Field Wiring Box for -48 V DC Local Powering Option (ED-7C712-30, Group 21)

±130 V DC Central Powering Option — ED-7C712-30, Group 22

This FWB (Figure 3-33) is used in conjunction with the ±130 V DC central powering option and is equipped with the following:

- Lightning protectors
- One connector, P301 (six-pin), that mates with the battery connector (J301).



130fwb.ps

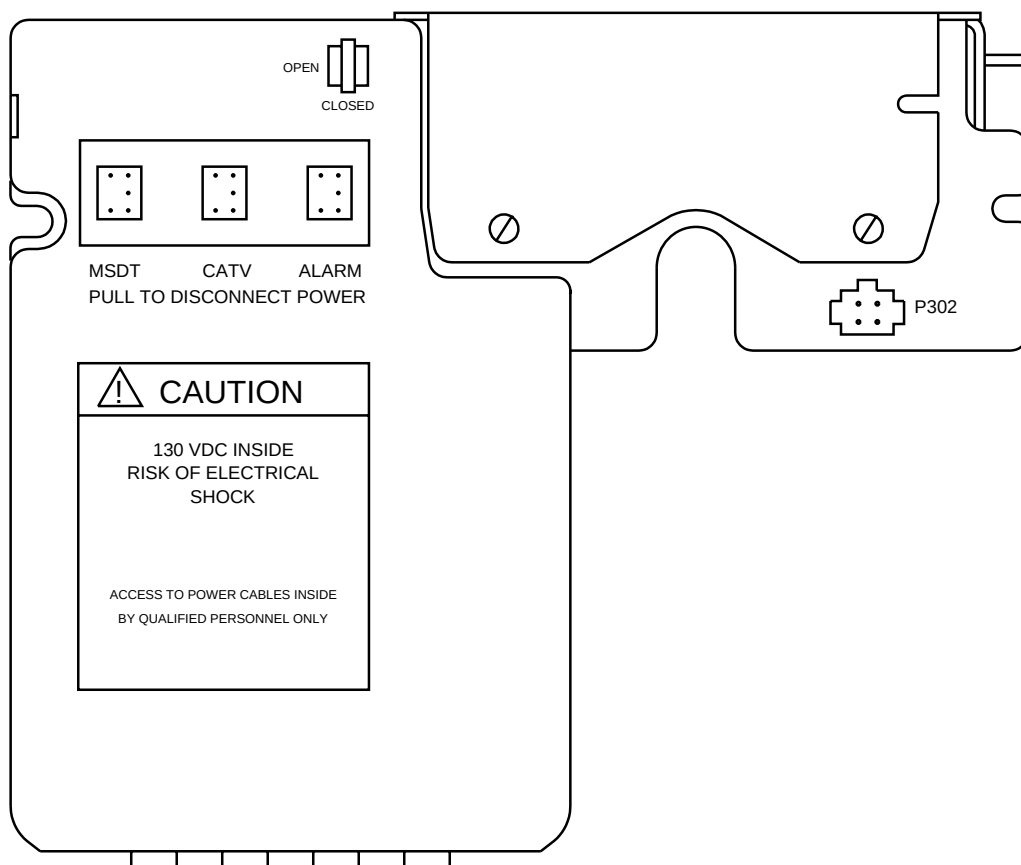
Figure 3-33. Field Wiring Box for ±130 V DC Central Powering Option

**–130 V DC Central Powering Option —
ED-7C712-30, Group 23**

This FWB (Figure 3-34) is an older version and is used in conjunction with the –130 V DC central powering option and is equipped with the following:

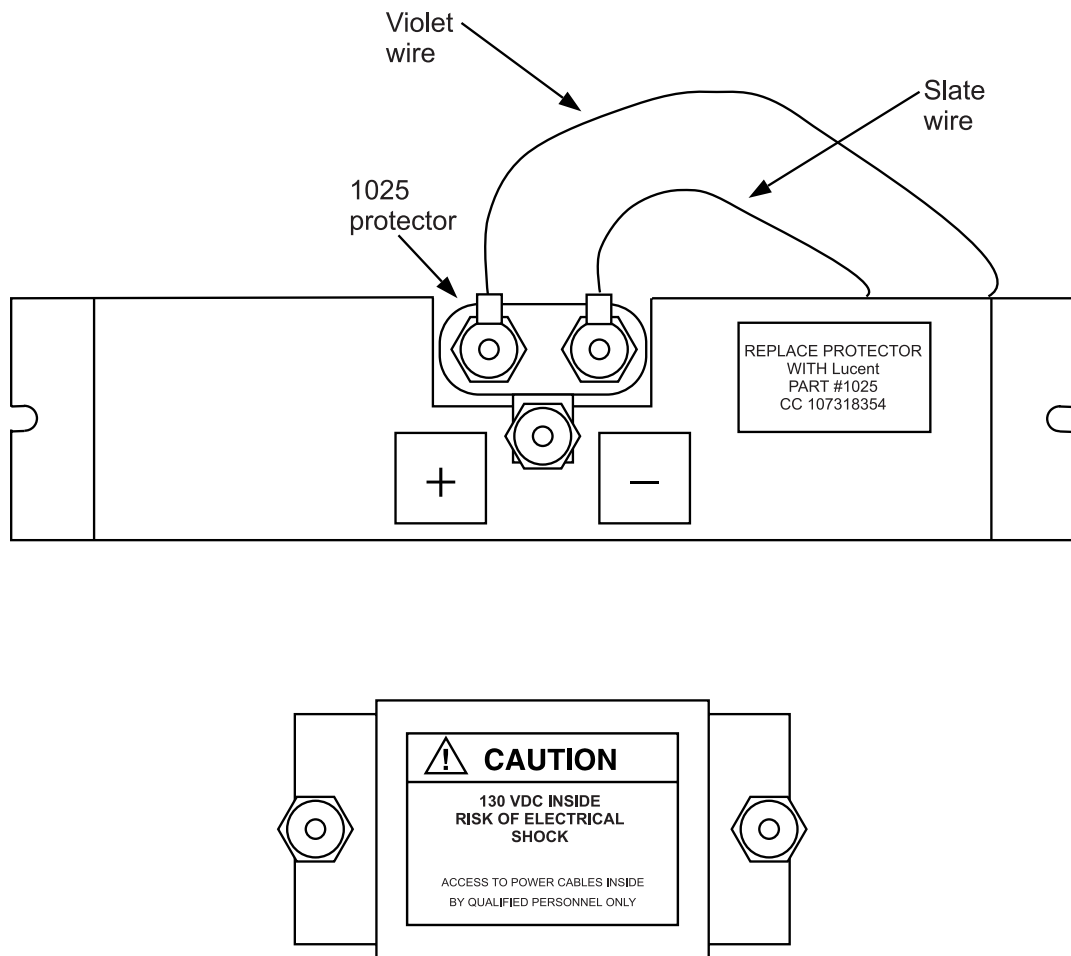
- Lightning protectors
- A five-position terminal strip, located behind the FWB front panel, that accepts the incoming power wiring.

A newer version to be used with the –130 V DC powering option is shown in Figure 3-35.



tpa 820567/01

Figure 3-34. Field Wiring Box for -130 V DC Central Powering Options (ED-7C712-30, Group 23) (Older Version)



grp23fwb02.ps

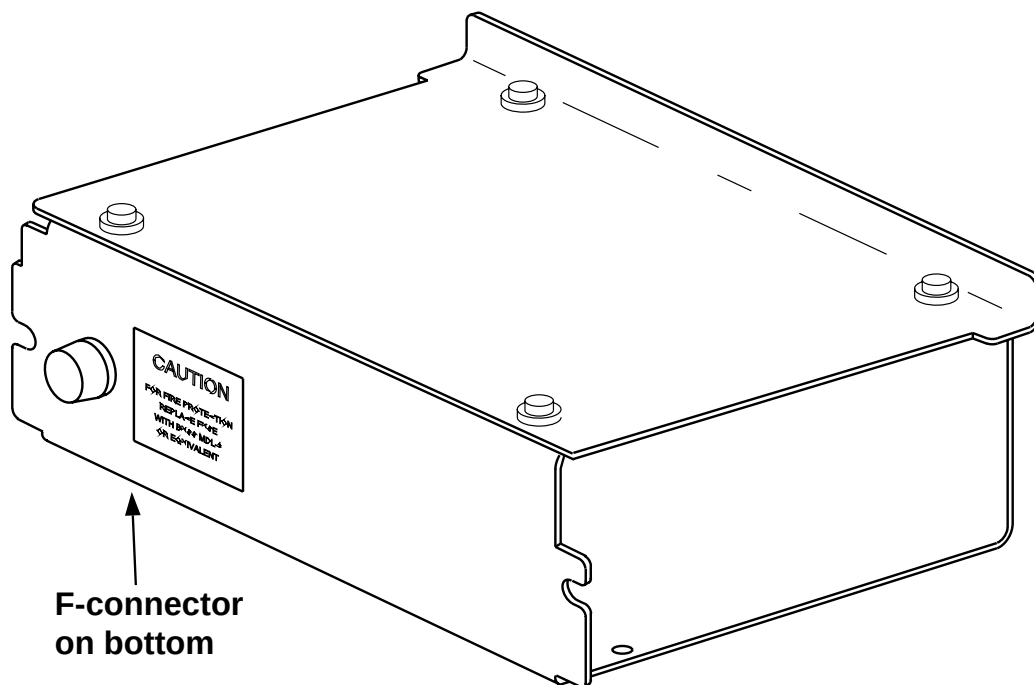
Figure 3-35. Field Wiring Box for -130 V DC Central Powering Options (ED-7C712-30, Group 23) (Newer Version)

60 V AC Central Powering Option — ED-7C712-30, Group 24

This FWB (Figure 3-36) is used in conjunction with the 60 V AC central powering option and is equipped with the following:

- A 3-amp BUSS fuse (MDL-3) that protects the circuitry in the MSDT

- A transformer that converts the 60 V AC input voltage to 34 V AC for use by the MSDT circuitry
- An F connector located on the bottom left-hand side for bringing in 60 V AC power for the MSDT.



acfwb.ps

**Figure 3-36. Field Wiring Box for 60 V AC Central Powering Options
(ED-7C712-30, Group 24)**

Fan Unit

The fan unit is used in MSDTs that are powered by local AC power to circulate air through the MSDT plug-in units so that an even temperature distribution can be maintained within the MSDT. When used in AC powered MSDTs, a 5C fan unit is installed in a slot provided in the FWB. If a rack-mounted MSDT is located in an uncontrolled environment, a fan unit (for example, the 4A fan unit) must be mounted adjacent to it to provide adequate cooling for the MSDT electronics. Refer to Chapter 6, "Technical Specifications," for temperature operating limits of the MSDT. The fan unit is thermostatically controlled and is equipped with the following:

- A single 4-inch fan
- A control circuit board
- A **FAN FAIL** LED indicator
- A **FAN TEST** push button switch.

A thermostat on the control circuit board applies power to the fan when the temperature within the cabinet reaches approximately 85°F and removes power when the temperature drops to approximately 70°F. The **FAN FAIL** indicator and **FAN TEST** switch are used to check the fan unit for proper operation.

Fiber Storage Unit

The fiber storage unit is located at the rear of the pedestal type MSDT enclosure and is used to store excess fiber cable. The fiber storage unit also includes a fiber splice holder that contains enough room for two splices.

Tip and Ring Pair Protectors

The MSDT enclosures are equipped with provisions for lightning protectors for electrical protection of the MSDT channel bank. The MSDT can be ordered with 125-type protection with binding port termination or a panel for use with five pin plug-in protectors with insulation displacement terminal block.

Pedestal-Type MSDT Enclosure Description

The pedestal-type ED-7C712-30 enclosure (Figure 3-21) measures 22 inches high, 10 inches wide, 16 inches deep, and holds one MSDT card cage. This enclosure can be ground, pole, or wall mounted. If the enclosure is ground mounted, it can be mounted with a base that is directly buried or the MSDT can be placed on a concrete or fiberglass pad. Attached to the front and rear of the MSDT pedestal enclosure are hinged access doors. The front door provides access to the electronics in the enclosure and is locked and unlocked by a special allen-type key (COMCODE 840841324). The rear door provides access to the fiber storage

and connection area and to the drop connection field. The rear door is locked and unlocked by a 216C tool.

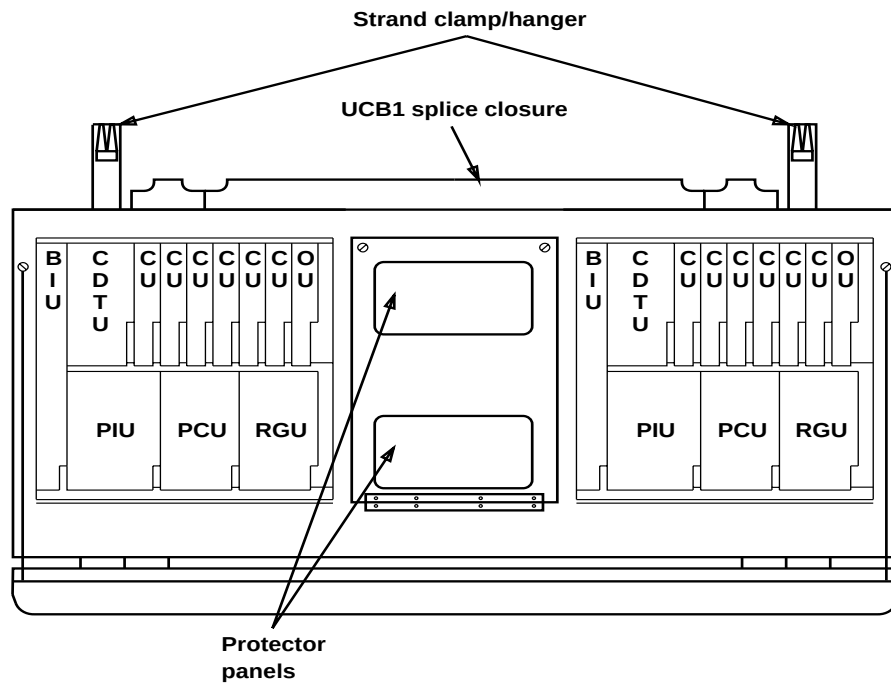
The fully loaded pedestal MSDT enclosure weighs approximately 45 pounds (without batteries).

Strand-Mounted MSDT Enclosure Description

This item has been DA'd.

The strand-mounted MSDT enclosure (Figure 3-37) measures 12 inches high (without mounting features), 26 inches wide, and 15 inches deep. This metal enclosure houses two ED-7C712-30, Group 10 or Group 11 card cages and two protector panels. Attached to the front of the MSDT strand-mounted enclosure is a hinged access door that provides access to the MSDT electronics and the protector panels. This access door is locked and unlocked by a special allen-type key (COMCODE 840841324). Located at the top of the enclosure is a UCB1 splice closure that provides a fiber and power cable storage and connection area. Drop cable entry into the enclosure is provided by watertight grips located on the sides of the enclosure. The rear of the enclosure contains a rear access panel that provides access to the drop cable connection area.

A fully loaded strand-mounted MSDT enclosure weighs approximately 81 pounds.

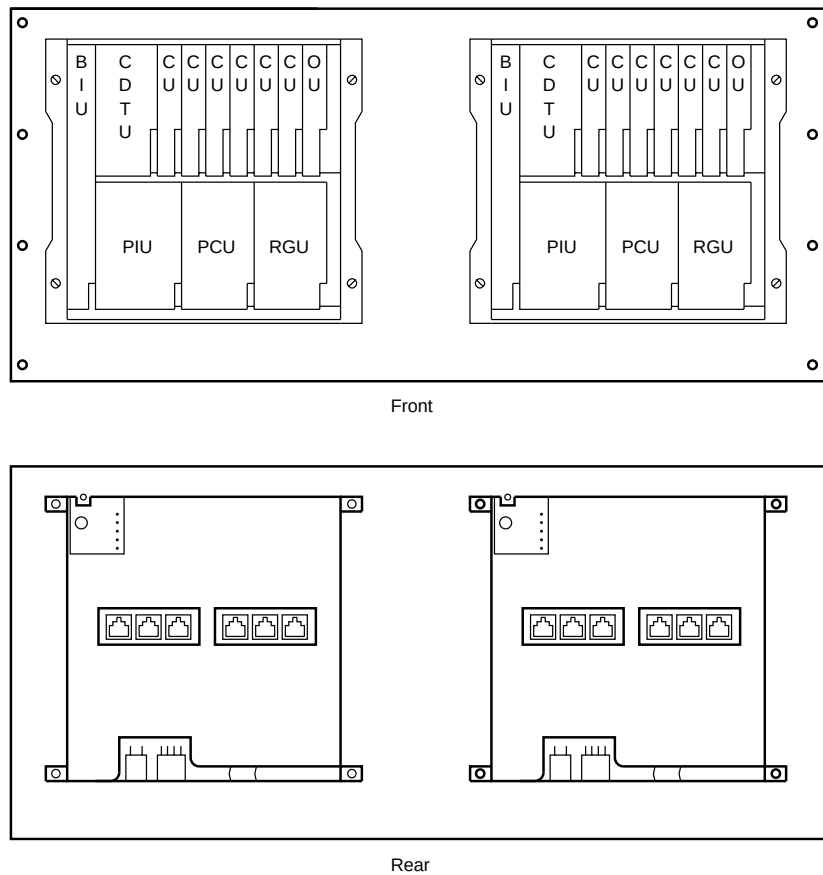


tpa 820608/01

Figure 3-37. Typical SLC®-2000 Strand Mount MSDT Physical Arrangement

Rack-Mounted MSDT Description

The MSDT rack-mounted arrangement (Figure 3-38) measures 10 inches high, 23 inches wide, and 14 inches deep. This arrangement consists of one or two ED-7C712-30, Group 10 or Group 11 card cages attached to a metal framework. The metal framework is installed in a 23-inch relay rack and secured by four screws in each side flange.



tpa 813293/01

Figure 3-38. Typical SLC®-2000 Rack-Mounted MSDT Physical Arrangement

Fiber or T1 line connections to the MSDT are available on the rear of the arrangement through an *ST* connector or a four-position terminal block, respectively. The power cable connection to the rack-mounted arrangement is made at the FWB connector located on the lower rear of the arrangement. Drop cable connections are also made at the rear of the arrangement by six RJ-11 jacks.



NOTE:

When a rack-mounted MSDT is located in an uncontrolled environment, a 4A fan unit, or equivalent, may be required above it to provide adequate ventilation to the electronics in the MSDT.

A fully loaded MSDT rack-mounted arrangement weighs approximately 25 pounds.

Underground MSDT (U-MSDT) Description

The 902A MSDT (COMCODE 107320525 DA) (Figure 3-39) is a sealed enclosure containing the MSDT circuit packs for below ground mounting arrangements. It uses the -130 volts DC network powering arrangement and mounts in a handhold (COMCODE 407223940) with an integral swing arm lift out assembly. The handhold (Figure 3-40) measures 30 inches wide by 48 inches long and 31 inches deep with an open bottom.

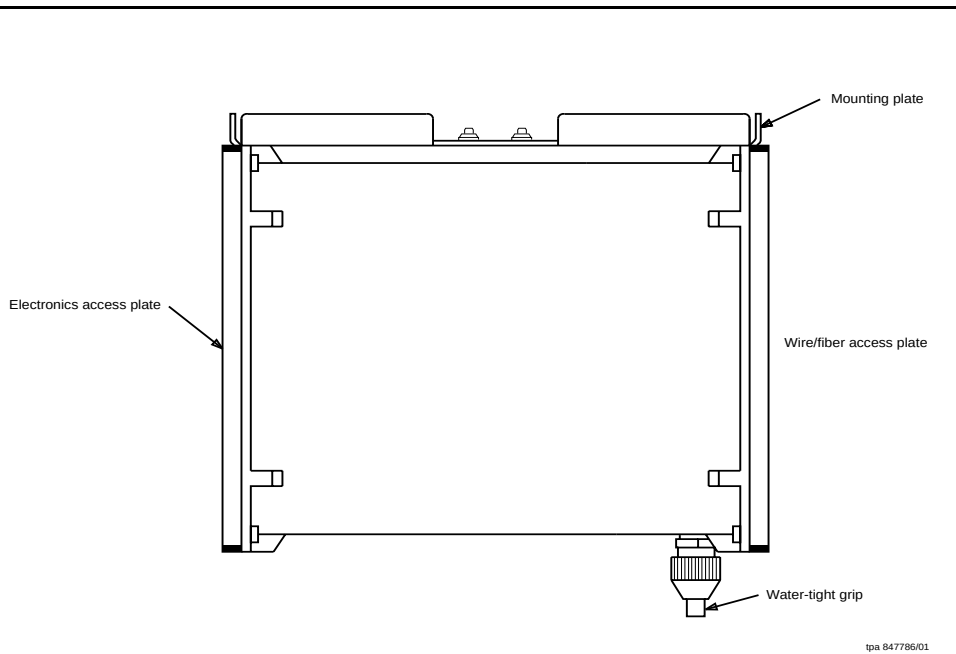


Figure 3-39. 902A Underground MSDT

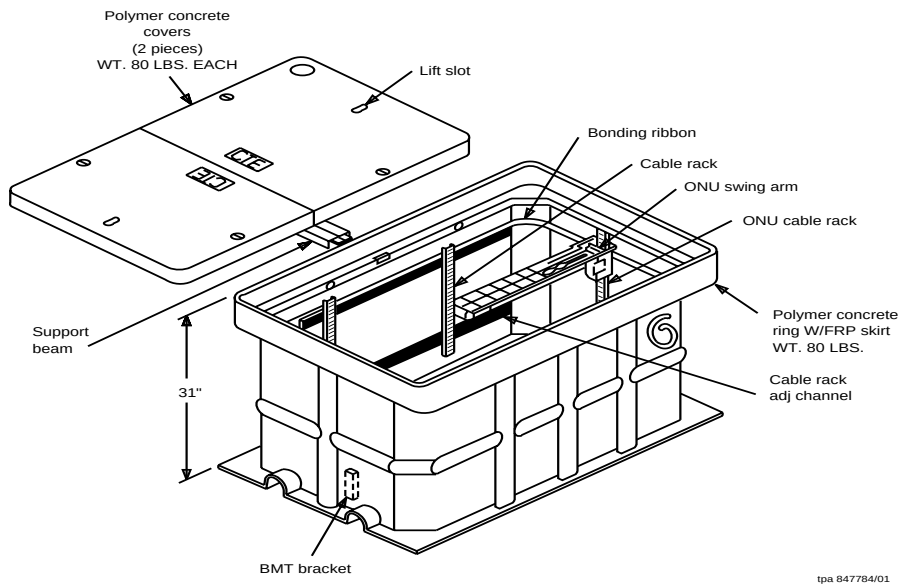


Figure 3-40. 902A Underground MSDT Handhold Enclosure

Installation and Maintenance Equipment

Optical Backplane Maintenance Kit

This item has been DA'd (discontinued availability).

The J99409OB-1, L1 optical backplane maintenance kit (OBMK) (COMCODE 601300742) is used to clean the optical backplane couplings on optics shelves of any dust particles that may be present on the optical sleeves. The sleeve is located inside the coupling and maintains the alignment of the two fiber optic ferrule plugs. The OBMK also serves to insert and remove the protective plugs located on the front (circuit pack side) of the backplane couplings during initial customer turn-up or customer service termination. The protective plug prevents the accumulation of dust particles on the sleeve of the optical backplane coupling which could lead to premature failure of the coupling.

The OBMK (Figure 3-41) consists of the following items:

- **Alignment card:** A modified AYB1B OU bare board equipped with a guide tube that is positioned in line with the backplane coupling when the card is inserted into an equipment slot.
- **Handle:** An aluminum rod approximately 6 inches long with a knurled knob on one end and a chuck on the other end. The handle attaches to the plug insertion tube and plug removal rod and accepts a swab used in cleaning an optical coupling.
- **Swabs:** An individual swab is attached to the end of the handle and, after being moistened with alcohol, is used to clean a backplane optical coupling.
- **Air tube:** An aluminum tube approximately 9 inches long that installs on the nozzle of the compressed air can.
- **Protective plugs:** Install on backplane optical couplings to protect couplings from dust.
- **Plug insertion tube:** Aluminum tube approximately 3-3/4 inches long that attaches to the end of the handle. It is used to install protective plugs on backplane optical couplings.
- **Plug removal rod:** Aluminum rod approximately 3-1/2 inches long that attaches to the end of the handle. It is used to remove protective plugs from backplane optical couplings.

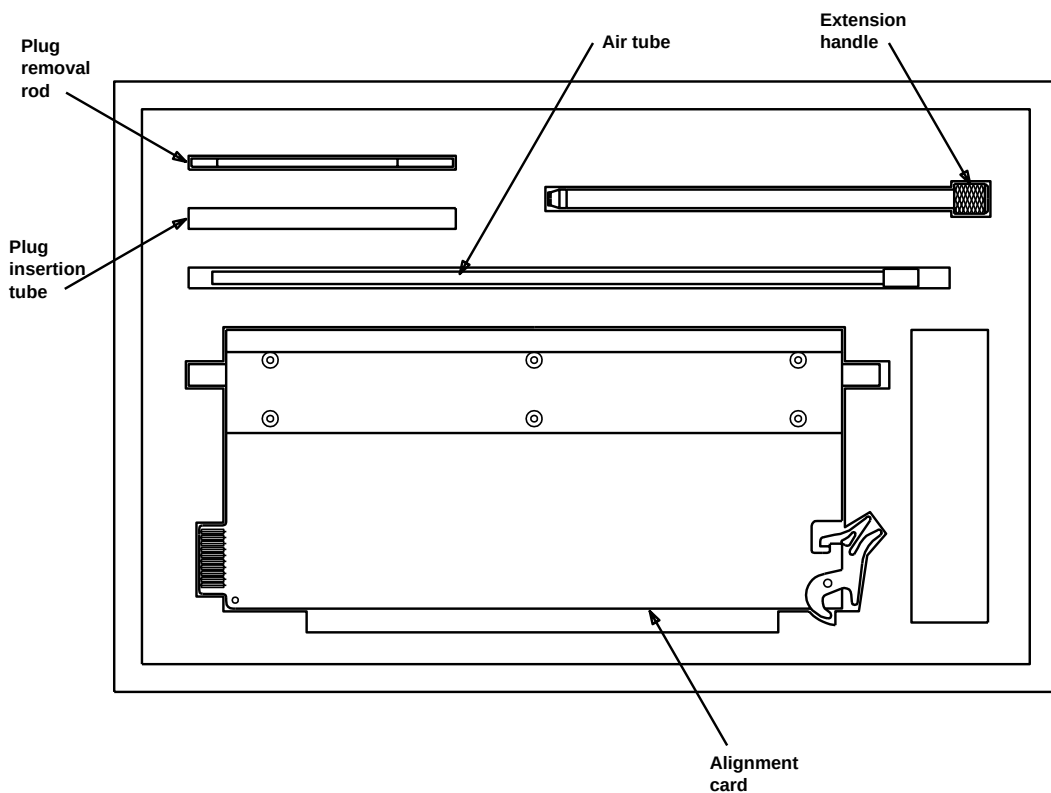


Figure 3-41. J99409OB-1, L1 OBMK (Cover Removed)

All the components of the optical backplane maintenance kit are packaged in a rigid plastic carrying case along with instructions.

An optics shelf backplane coupling can be cleaned with the optical backplane maintenance kit per the following procedure:

1. Insert a swab into the chuck of the handle and tighten the chuck into the handle.
2. Insert the handle, with the swab, into the guide tube of the alignment card.
3. Moisten the tip of the swab by dipping it into alcohol (isopropyl reagent).
4. Remove excess alcohol with an alcohol moistened *Kimwipes*^{*} tissue or equivalent.

* Registered trademark of Kimberly-Clark Corp.

5. Insert the alignment card into the slot of the optics shelf while keeping the handle inside the guide tube. Latch the alignment card into place.
6. Push the handle into the guide tube until the knob of the handle contacts the guide tube.
7. Rotate the knob of the handle three turns clockwise, then three turns counterclockwise.
8. Remove the handle with the swab from the guide tube.
9. Discard the swab and store the handle in the J99409OB case.
10. Assemble the air tube over the nozzle on the can of compressed air.
11. Insert the air tube with the can of compressed air into the guide tube of the alignment card until the tube stops forward progress.
12. Using the can of compressed air, blow three short blasts of air into the coupling.
13. Remove the air tube with the can of compressed air from the guide tube. Disassemble and store the air tube in the J99409OB case.
14. Remove the alignment card and store it in the J99409OB case.

The following steps should be followed when using the optical backplane maintenance kit to install a protective plug on the backplane coupling of the optics shelf:

1. Load the protective plug into the connector end (end opposite the latch) of the guide tube on the alignment card. Verify that the nipple of the protective plug faces the coupling.
2. Insert the alignment card into the slot of the optics shelf and latch it into place.
3. Slide the plug insertion tube over the chuck of the handle.
4. Insert the handle/plug insertion tube assembly into the guide tube of the alignment card. Apply light pressure on the knob of the handle until forward progress stops.
5. Unlatch the alignment card.
6. Remove the handle/plug insertion tube assembly from the guide tube.
7. Remove the plug insertion tube from the handle and store it in the J99409OB case.
8. Remove the alignment card from the optics shelf slot and store it in the J99409OB case.

The following steps should be followed when using the optical backplane maintenance kit to remove a protective plug from the backplane coupling of the optics shelf:

1. Insert the alignment card into the slot of the optics shelf and latch it into place.
2. Insert the plug removal rod into the chuck of the handle. Tighten the chuck into the handle.
3. Insert the handle/plug removal rod assembly into the guide tube on the alignment card until the knob stops forward progress.



NOTE:

An attempt should not be made to withdraw the handle/plug removal rod from the guide tube while the alignment card is latched in place. The protective plug being removed will not fit through the guide tube.

4. Simultaneously remove the alignment card and the handle/plug removal rod assembly.
5. Remove the protective plug from the connector end of the alignment card and store it in the J99409OB case.
6. Remove the handle/plug removal rod assembly from the alignment card.
7. Remove the plug removal rod from the handle and store it in the J99409OB case.
8. Store the alignment card in the J99409OB case.

WP91067, L6 Test Cord

The WP91067, L6 test cord (COMCODE 405755208) provides access to the test points on the faceplate of the AUA403 test CU and all channel units.

300A ST® Fiber Optic Cable Connector Microscope

The 300A microscope (COMCODE 405755208) is used to check the condition of the end of the fiber optic fiber installed in an *ST* connector.

Contents

Introduction	4-1
Administration	4-1
■ Provisioning	4-2
■ Rearrangement	4-7
■ Growth	4-7
■ Assignment	4-8
Maintenance	4-10
■ DS1 Performance Monitoring	4-10
■ Proactive Maintenance	4-11
■ Alarms and Fault Sectionalization	4-12
■ Channel and Drop Testing	4-12
■ TR-909 Compatibility	4-13
■ MLT Testing	4-13
■ Integrated SLC-2000 Access System Testing	4-17
■ MLT Setup	4-18
■ Integral Test Head (ITH) Testing	4-20
■ Fault Isolation Procedure	4-20
■ Testing With Systems Other Than MLT	4-21
Testing With Other Than MLT Equipment	4-81

Introduction

This chapter contains information about the administration and maintenance of *SLC*[®] Carrier Systems employing the *SLC-2000* Multi-Services Distant Terminal (MSDT) feature.

Administration

The fiber-in-the-loop (FITL) system is a double-star configuration and necessitates changes in facilities administration.

The facilities may be divided in one of two ways consistent with facility assignment control system (FACS) assignment.

1. Option 1:

- F1 - Fiber channels between the central office (CO) and the *SLC-2000* MSDT (Host Digital Terminal (HDT) is collocated with the CO)
- F2 - Copper between the MSDT and the end-user premises.

2. Option 2:

- F1 - Fiber channels between the CO and the host digital terminal (HDT)
- F2 - Fiber channels between the HDT and the MSDT
- F3 - Copper between the MSDT and the customer premises.

Provisioning

The major work operations required to provide the FITL feature are basically the same as those for the digital loop carrier (DLC) in a copper environment with some additions and modifications. Figure 4-1 is a general flowchart outlining these operations.

The following is a discussion of the differences between fiber and copper distribution cable as applied to work operations numbered 1 through 8 on the flowchart. Work operations numbered 9 through 14 concerning assignment are discussed later in the section entitled "Assignment."

- a. OPERATION 1: Prepare outside plant engineering job order for distribution fiber cable and remote terminal (RT) structure.

In addition to the details normally required for DLC installations employing copper cable (refer to 916-100-102), the following items are required for DLC installations equipped with the *SLC-2000* MSDT feature:

- Additional RT structure [80A cabinet, 80D cabinet, 80E cabinet, controlled environment vault (CEV), or hut] mounting details for *LGX*® lightguide distribution shelf and high density optics shelf (HDOS) assembly equipment.
- Dedication of individual fibers to each location served.
- Placement and splicing of fiber drop to each location.
- Rearrangement of any existing *LGX* lightguide distribution shelf connections required.
- Connection of fiber from HDOS cable to distribution fiber at the *LGX* lightguide distribution shelf.
- Remote terminal record for optical units, similar to plug-in records for DLC.
- Cable designation for fiber cable to allow identification as a fiber facility [for example, DF311 would be a distribution (D) fiber (F) cable number 311].

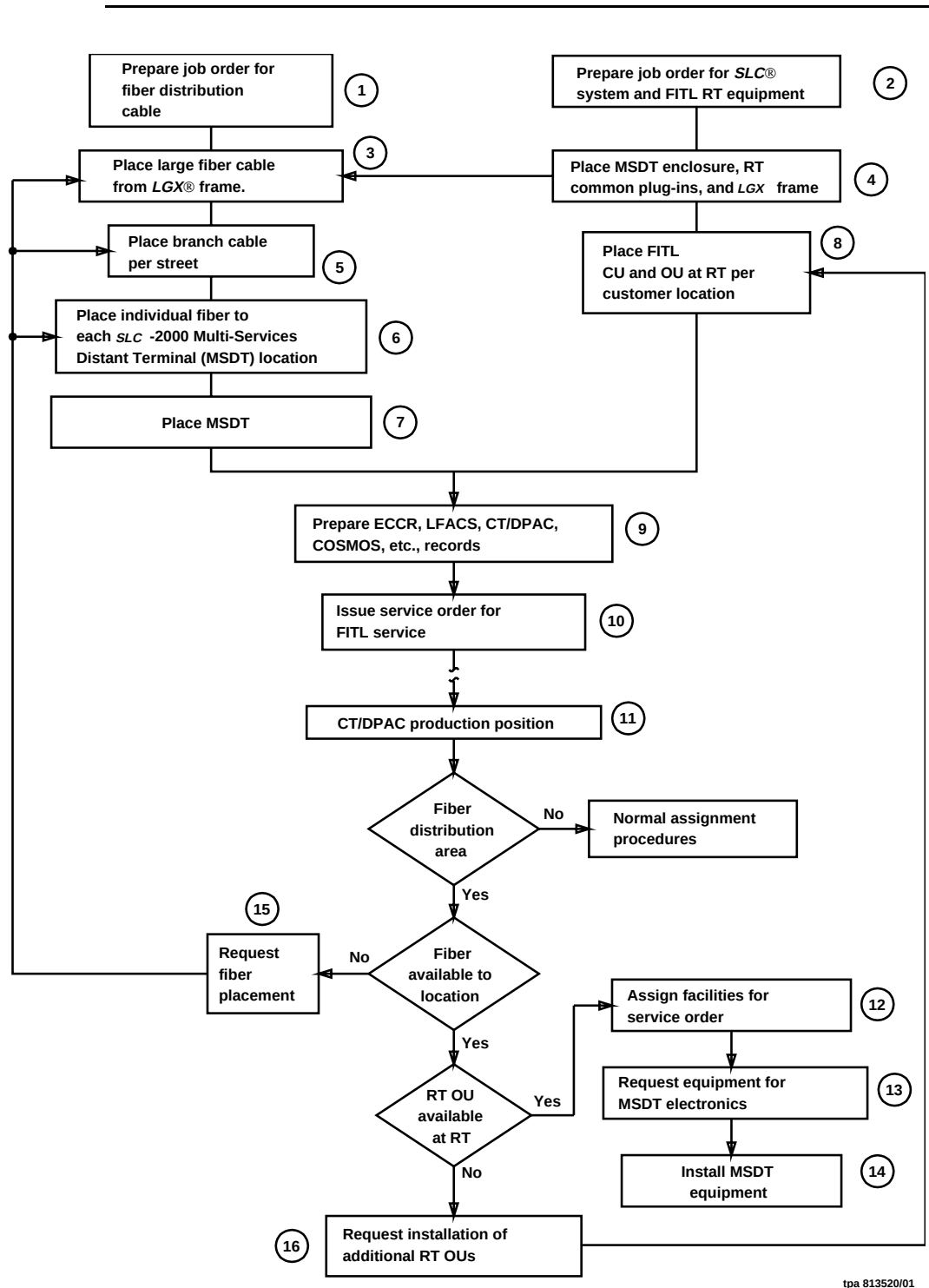


Figure 4-1. Provisioning Flowchart

- Since multiple lines will be served by a single fiber, a pseudo cable pair numbering scheme must be used that will allow records to be handled as they are presently. A pseudo cable pair will consist of a maximum 4-digit identification number (refer to Figure 4-2). The first three digits represent the fiber number and the last digit represents the channel number (for example, pseudo cable pair 231 represents fiber 23 and channel 1). Refer to the section in this chapter entitled "Assignment" for additional information concerning the numbering scheme. Refer to Chapter 7, "Construction and Installation," for additional information concerning fiber placing and splicing requirements.
- b. OPERATION 2: Prepare equipment engineering job order for *SLC* and FITL RT equipment.
 - Requires modified floor plan layout if RT structure is CEV/hut.
 - Requires mounting and cabling details for FITL equipment.
 - Refer to Appendix C, "Ordering", for ordering information.
- c. OPERATION 3: Place main distribution cable from *LGX* lightguide distribution shelf facility.

At the RT location, the main distribution cable will be terminated in an *ST*® fiber optic cable connector at the *LGX* lightguide distribution shelf.

- d. OPERATION 4: Place MSDT enclosure, HDT common plug-ins, and *LGX* lightguide distribution shelf.

Requires the same operations as a standard DLC installation with the following exceptions:

- The fiber cable assembly from the HDOS assembly to the *LGX* lightguide distribution shelf is shipped separately and must be field installed. (There are two fiber cable assemblies per *SLC* Series 5 dual bank or *SLC*-2000 HDOS assembly.)
 - Fiber from the optical unit (OU) is dedicated and connected to the main distribution fiber at the *LGX* lightguide distribution shelf.
- e. OPERATION 5: Place branch distribution cable.

Refer to OPERATION 7.
 - f. OPERATION 6: Place fiber or T1 copper drop and MSDT enclosure.

Refer to OPERATION 7.

Figure 4-2. Derived Feeder Record

[illegible]

tpa 813522/01

g. OPERATION 7: Place MSDT and individual customer metallic drops.

Refer to Chapter 7, "Construction and Installation," for information concerning the placement of the branch distribution cable, fiber drop, and MSDT.

- Operations 5, 6, and 7 are interdependent and are capable of being placed in any one of the following four sequences for installations where the MSDT is located on the side of the living unit:
 1. Place branch cable, place and splice drop to branch cable, place MSDT, and place *ST*[®] connector on drop on the same authority. This can only be accomplished when all site and external building work is completed.
 2. Splice drop to branch cable and store when branch cable is placed. Return and place drop, *ST* connector, and MSDT at location when all site and building work is completed.
 3. Place branch cable. Return and place drop, splice drop to cable, place MSDT, and place *ST* connector when site and building work are completed.
 4. Place branch cable, place drop to location, and splice drop to cable. Return and place MSDT and *ST* connector when building work is completed.
- If the MSDT is being pole or pedestal mounted, operations 5, 6, and 7 are capable of being placed in any one of the following three sequences:
 1. Place branch cable, place and splice fiber drop to branch cable, place individual customer metallic drops, place MSDT enclosure, place MSDT, and place *ST* connector on fiber drop at pedestal on the same authority. This can only be accomplished when all site and external building work is completed.
 2. Splice fiber drop to branch cable, place MSDT enclosure, place individual customer metallic drops and store when branch cable is placed. Return and place *ST* connector and MSDT when all site and building work is completed.
 3. Place branch cable. Return and place fiber drop, splice fiber drop to cable, place individual customer metallic drops, place MSDT enclosure, place MSDT, and place *ST* connector when site and building work are completed.

h. OPERATION 8: Place channel units and optical units at RT.

The channel units and optical units for the *SLC-2000* MSDT feature should be placed to satisfy the near term forecasted demand. A minimum quantity of spare

units should be provided for growth. These units should be provided on an engineering work authority according to OPERATIONS 1 and 2.

Rearrangement

In terms of rearrangement, one of the major differences encountered in providing FITL as opposed to providing copper occurs when a new (unplanned) line is requested. This is due to the bandwidth shedding capability and the 24-line capacity of the MSDT.

The addition of a new line may exceed the planned capacity of the MSDT and still be within the 24-line capacity of the MSDT. This can occur when the MSDT Server is serving less than 24 lines and the remaining lines in the digroup are served by another Channel Unit (CU). Under these circumstances, rearrangement is necessary. The most comprehensive rearrangement procedure involves the following steps:

- a. Move the HDT CU (MSDT Server) to a new location with sufficient capacity (slots).
- b. Move the HDT OU accordingly.
- c. Move the RT optical jumper accordingly (adding or using a new jumper as opposed to moving the existing jumper should be easier).
- d. Move the outside plant (OSP) fiber accordingly.
- e. Move the CO connections or change the assignment on a digital switch.

The simplest rearrangement procedure is described as follows:

- a. Move the OSP fiber to a termination already equipped with the necessary circuit packs and capacity.
- b. Move the CO connections.

If the new line causes the 24-line capacity of the MSDT to be exceeded, a line may be available from another MSDT nearby or a new MSDT may be needed.

Growth

Installed fibers can be activated very easily. After a fiber is terminated at an MSDT, it will also have an appearance on the *LGX* lightguide distribution shelf. This appearance must be added to the terminal assignment cards (TACs) along with the corresponding street address of the living unit or the MSDT location. The remaining assignment is made at the time a customer requests service.

If a new (additional) requested line is within the planned capacity of the MSDT and drop plant, an additional channel unit may be added as needed at the MSDT. Verify that the HDT CU or MSDT Server is configured for the planned capacity to ensure time slot availability.

Assignment

With the bandwidth of fiber optic cable being very wide, it is anticipated that in the future many services (channels) will be provided to an individual location by a single fiber. To allow fiber cable to be administered in the assignment records in the same manner as copper cables, the records for fiber distribution cables should be set up as pseudo pairs in complements of ten channels per fiber.

The distribution cable identification could be set up to identify the cable as a fiber facility; that is, DF311 would identify a fiber distribution cable numbered 311 (refer to "Provisioning," (a) OPERATION 1). What would normally be considered as pairs 230 through 239, for example, would actually represent fiber number 23 channels 0 through 9. Channel 0 (pair 230) would be reserved for future wideband usage; channels 1, 2, 3, and 4 (pairs 231 through 234) would be used to provide paths for the voice-frequency (VF) signals.

Using this method of identification will set up the *SLC-2000* MSDT feature in a normal pair gain configuration and allow it to be administered as it is today [for example, four FITL systems installed and set up as pair gain cable 5: 1-400 with channels 45 and 46 of the first system (PG 5 pairs 45, 46) connected to fiber 23 channels 1, 2 (DF311 pairs 231, 232) and shown as primary facilities for the location being served].

The MSDT can be ordered for dual mode or quad mode 64-kb voice channels. The 24-channel configuration requires quad channel units to access the 24 channels. The MSDT must be ordered for quad mode for the *SLC-2000* Access System.

Since the single distribution fiber to each MSDT will serve multiple lines, it will be necessary to modify other existing assignment records to reflect this condition. The derived feeder record (DFR), which is used to record and administer the *SLC* Series 5 Carrier System and *SLC-2000* Access System CU positions at the central office terminal (COT) and RT, will require minor modification. The LINE STATUS CU entry for the COT will remain the same; however, the RT entry could be either EFD (dual channel unit) or EFQ (quad channel unit) as shown on the DFR in Figure 4-2.

The connect-through/dedicated plant assignment card (CT/DPAC) could be modified by utilizing NFT (fiber through) to show that the MSDT and fiber have been placed, and FT (in lieu of CT) to show that the CU, RT optical unit (OU), fiber, distant terminal (DT) OU, and voice-frequency interface (VFI) have been placed in those locations served by fiber distribution facilities. Refer to Figure 4-2 for CT/DPAC example layouts.

In a non-COSMOS loop assignment center (LAC), the first stop in the service order flow will be at the CT/DPAC production center. The service order address will be matched to the CT/DPAC address. If the address is in a fiber distribution area with an NFT available but no FT (refer to Figure 4-2), the service order will be assigned an F2 facility designation indicating the need for a DT OU and a VFI in

position 1 at the customer location. The service order (SO) entry would be similar to this:

IF2 /CA DF512/PR211
/TEA MSDT/ I DT OU I VFI/P1

If a distant terminal (DT) OU is present at the customer location but a VFI is needed for line 2, the SO entry would be similar to this:

IF2 /CA DF512/PR241
/TEA MSDT/ E DT OU I VFI/P2

If a DT OU is present and a VFI is available for the line (FT), the SO entry would be similar to this:

IF2 /CA DF512/PR221
/TEA MSDT/ E DT OU E VFI/P1

If neither an FT nor an NFT is available at the RT, or no fiber is shown available at this location, the SO should be routed to the exchange customer cable record (ECCR) production position.

If, however, the necessary equipment and fiber are available, the ECCR production position will assign the order and advise the CT/DPAC position to update its records. The SO entry would be similar to this:

IOE 012 01 19/CUC E ES
IF1 /CA PG5/PR1/P1
/TEA F 512 LAMAR;PLJ
/PGS SLC5 05/CUR E EFD/LT1
IF2 /CA DF512/PR201/J20
/TEA MSDT/ I DT OU I VFI/P1

In this example, the MSDT following /TEA of the F2 facility indicates that the fiber and an MSDT are in place at the customer location.

If a CU or HDT OU is needed at the RT or fiber is not available to the location, a request should be sent to the outside plant engineering (OSPE) forces for additional facilities.

The use of the proposed facility identifiers (FIDs) [EFD for the RT dual (two lines) channel unit and EFQ for the RT quad (four lines) channel unit], the proposed fiber

distribution cable designations, and pseudo pair layout will allow the FITL system to be assigned and administered in the same manner as existing copper facilities with the following exception: all fiber connections and fiber placements should be authorized by an engineering work order.

Maintenance

DS1 Performance Monitoring

The MSDT DS1 performance monitoring (PM) feature provides operating personnel with the ability to determine the quality of the DS1 link between the *SLC-2000* HDT and the remote MSDT. Performance monitoring feature is only compatible when hosted by a *SLC-2000* HDT. The HDT and the MSDT independently monitor the quality of their respective ends of the DS1 signal, and count the number of seconds that excessive errors are detected. This feature requires the use of the *SPQ*®809 (or later) MSDT Server in the HDT, and an MC97793A1 (or later) BIU card in the MSDT. Older versions of the MSDT Server and BIU cards are not capable of providing this feature. Refer to 363-208-003, *SLC-2000 Access System Commands and Messages*, for information on the appropriate commands (**RTRV-PM-T1**) to use this feature.

The specific data accumulated by the HDT and MSDT are:

- **Coding Violations (CV).** A CRC-6 violation on the DS1 link.
- **Severely Errored Framing Seconds (SEFS).** Number of seconds that an out-of-frame (OOF) or a change of frame alignment (COFA) occurred.
- **Errored Seconds (ES).** Number of seconds that any CV, OOF or COFA occurred.
- **Severely Errored Seconds (SES).** Number of seconds that 320 or more CVs or any OOF or COFA occurred.
- **Unavailable Seconds (UAS).** Number of seconds in which no signal was detected or when 10 consecutive seconds of SES errors occurred.
- **Degraded Minute (DM).** A minute in which 93 or more CVs occurred, that are not reflected in the SES or UAS counts.

At 15-minute intervals, on the hour and at 15, 30, and 45 minutes past the hour, the metallic distribution controller (MDC) in the HDT will accumulate the DS1 PM data from each MSDT Server and its associated MSDT. The MDC maintains 8 hours worth of PM data, represented as 32 sets of values. The data gathered through midnight is also maintained as a total for the previous day. All of this historical data, including the values for the current 15-minute period, can be retrieved by operating personnel on-demand using the CIT interface command **RTRV-PM-T1**. This command allows retrieval of the data from the HDT end by specifying a *cu* address, or retrieval of the data from the MSDT by specifying a *biu*

address. This history data is maintained for all of the counters defined above, with the exception of the coding violation (CV) counts.

The other MSDT PM command available at the CIT interface is the **INIT-REG-T1** command. With this command, operating personnel can cause the current counts at either the HDT or MSDT end to be cleared to zero. The command allows for clearing either the 15-minute or day counters. This command has no effect on the history data kept by the MDC.

While accumulating data, the server and BIU cards also compare the data for the current 15-minute interval and current day against a set of predefined thresholds. If any count exceeds its threshold, the system generates an event report on the TL1 interface, indicating which counter exceeded its threshold. No threshold detection is provided for the coding violation (CV) counts, since this count is used to drive other counts having thresholds. See Table 4-1 for predefined thresholds and maximum values for each counter.

Table 4-1. Counter Maximum Values and Thresholds

Counter	Maximum Value (Minute/Day)	15-Minute Threshold	Day Threshold
CV	1,200,000 / 28,800,000	None	None
ES	3,600 / 86,400	65	648
SES	3,600 / 86,400	10	100
SEFS	3,600 / 86,400	2	17
UAS	3,600 / 86,400	3	10
DM	60 / 1,440	4	4

Proactive Maintenance

Fiber-in-the-loop systems substantially increase the digital portion of the outside plant, having analog signals only on a very short subscriber drop. Digital transmission provides continuous on-line monitoring of signal quality making it possible to receive status information about a failure or malfunction before subscriber complaints are received.

In addition to the DS1 alarms raised by the CO/RT digital facility which may be equipped with protection switching, the FITL system will alert the maintenance center to MSDT Server, HDT/MSDT link, or MSDT common component failures.

Alarms and Fault Sectionalization

The *SLC-2000* MSDT and the HDT Server can report status to the *SLC* Series 5 HDT bank control unit (BCU) or *SLC-2000* HDT user interface panel (UIP) where they are mapped into the system alarms. In conjunction with indicators on the HDT UIP or BCU and alarm display unit (ADU), the MSDT Server, and the MSDT, these alarms will assist in fault detection and sectionalization. For more information on alarm and fault sectionalization, see Chapter 8, "Operations and Maintenance."

Channel and Drop Testing



NOTE:

TR-303 channel and metallic drop testing requires an AUA411B channel and drop testing unit (CDTU).

The *SLC-2000* MSDT supports testing of locally switched nonprovisionable CUs using the pair gain test controller (PGTC) or similar procedures. The architecture allows for testing the end-to-end channel and the metallic drop beyond the MSDT.

End-to-end channel testing is performed by the PGTC and supported by the channel and drop test unit (CDTU) at the MSDT. This test checks the transmission and signaling capabilities of the channel up to the metallic tip/ring appearance at the MSDT CU.

During the end-to-end channel test setup, the CDTU makes a series of tests on the metallic drop beyond the MSDT. The PASS/FAIL results of these tests are passed to the HDT CU to be reported to the loop testing system [mechanized loop testing (MLT) or equivalent] by the programmable DC signature feature. One of the following messages will be reported:

- HDT/MSDT link down



NOTE:

This test will not function during a major alarm.

- HDT/MSDT link up and MSDT common equipment failure
- HDT/MSDT link up and drop test OK
- HDT/MSDT link up and drop open
- HDT/MSDT link up and foreign electromotive force (FEMF) on drop
- HDT/MSDT link up and receiver off-hook (ROH)
- HDT/MSDT link up and hazardous potentials on drop
- HDT/MSDT link up and resistive fault on drop.

TR-909 Compatibility

The DC signatures used and the threshold for faults are defined in Bellcore TR-909 specification. The MSDT is generally compliant with this specification.

MLT Testing

Remote testing of the *SLC-2000* MSDT feature in universal *SLC-2000* or *SLC Series 5* systems is accomplished using MLT (or equivalent) and the PGTC. If the system is equipped with an extended test controller (XTC) in a universal configuration, the XTC must have a PGTC expansion shelf and the PGTC cable (P109) must be installed between the XTC and the central office terminal (COT) (Figure 4-3 for *SLC Series 5* systems, Figure 4-4 for *SLC-2000* systems). For integrated *SLC* systems, the XTC and PGTC are connected to a test bus control unit (TBCU) in the switch. The XTC uses only the PGTC capabilities during the testing; therefore, only the PGTC is mentioned in the following description. The MSDT must be equipped with a CDTU.

Two tests are performed by MLT-2 to sectionalize trouble on a system equipped with the *SLC-2000* MSDT feature. The test paths taken by these two tests are described as follows:

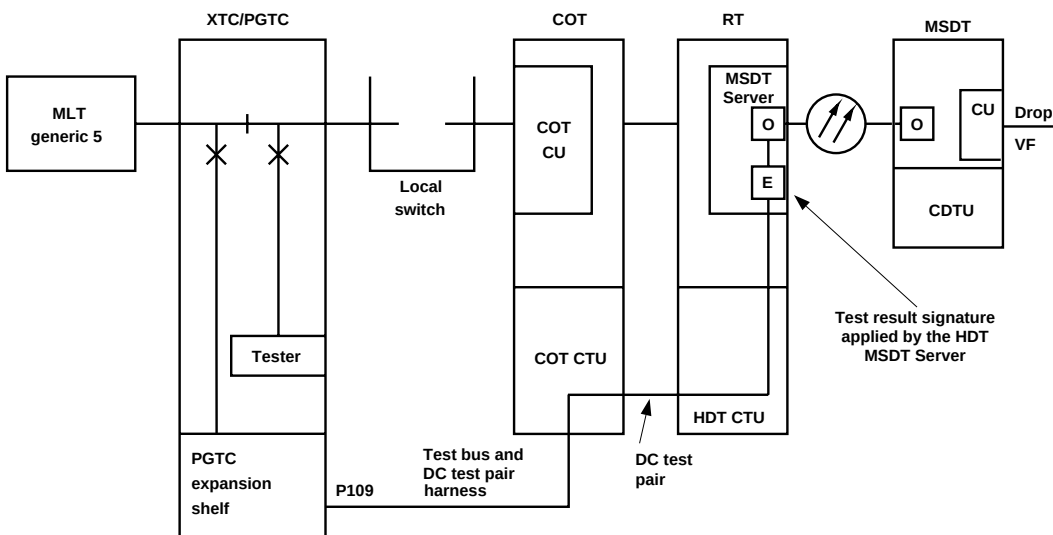
- **End-to-end channel test:** This test is performed by the PGTC to check the quality of the derived subscriber loop. The channel test covers the COT CU, the COT-to-RT link, the HDT CU, the HDT-to-MSDT optical link, and the MSDT CU. A pass/fail test result indication is reported by the PGTC to MLT-2.
- **Drop Tests:** The metallic (copper) segment of the subscriber loop, from the MSDT to the subscriber's station (telephone set), is tested by the channel and drop test unit (CDTU)*. The results of the drop test are transmitted by the MSDT backplane interface unit (BIU) and CDTU to the MSDT Server, which converts them to one of the TR-909 *DC signatures*. The MLT-2 measures the *DC signature* parameters using either the DC test pair (a metallic loop connecting the MLT to the RT), remote measurement unit (RMU), or an integral test head (ITH) for a *SLC-2000* system. A single RMU can serve approximately 3,000 lines and should be used if the RT is out of range of an MLT test vehicle or if the COT-to-RT link is all fiber. The signatures are measured when the MLT performs a drop test. To identify the loop as being served by FITL, the DC signature always has 90.9K-ohm resistors from tip-to-ground and from ring-to-ground; the tip-to-ring resistor is varied to indicate the testing results. Table 4-2 shows the breakdown of the *SLC-2000* MSDT feature system signatures.

* An MSDT not equipped with a CDTU will get an MSDT channel and drop test not available or common equipment failure from MLT.

When a customer trouble report is received, a repair service administrator (RSA) initiates an MLT test of the customer loop. Since the loop is fiber and not copper, one of the DC signatures is generated for MLT by the HDT CU. The signature is measured by MLT and *trapped*. During this time, the *SLC* Carrier System channel test is also being performed. When the results are returned, the usual display is masked by the trapping of the DC signature presented by the HDT CU, and a user programmed narrative is displayed. One of the new programmable VER codes will be generated by MLT and displayed to the RSA indicating a system equipped with the *SLC*-2000 MSDT feature.

At this point, the trouble report is passed through a screening process based on the new VER code to a maintenance administrator (MA) for dispatch or further testing.

Depending on the signature value detected previously and the CU test results, the craftsman is dispatched to the most probable trouble location as shown in Table 4-2 and Table 4-3. Other test systems may not have programmable DC signatures available; but if their test system is capable of measuring the DC resistances of the T-R-G delta equivalent circuit, they can also use Table 4-2 for craft personnel dispatch.



tpa 813346/01

Figure 4-3. MLT-2/PGTC DC Test Pair Test Paths for MSDT Testing Capability (SLC® Series 5 Systems)

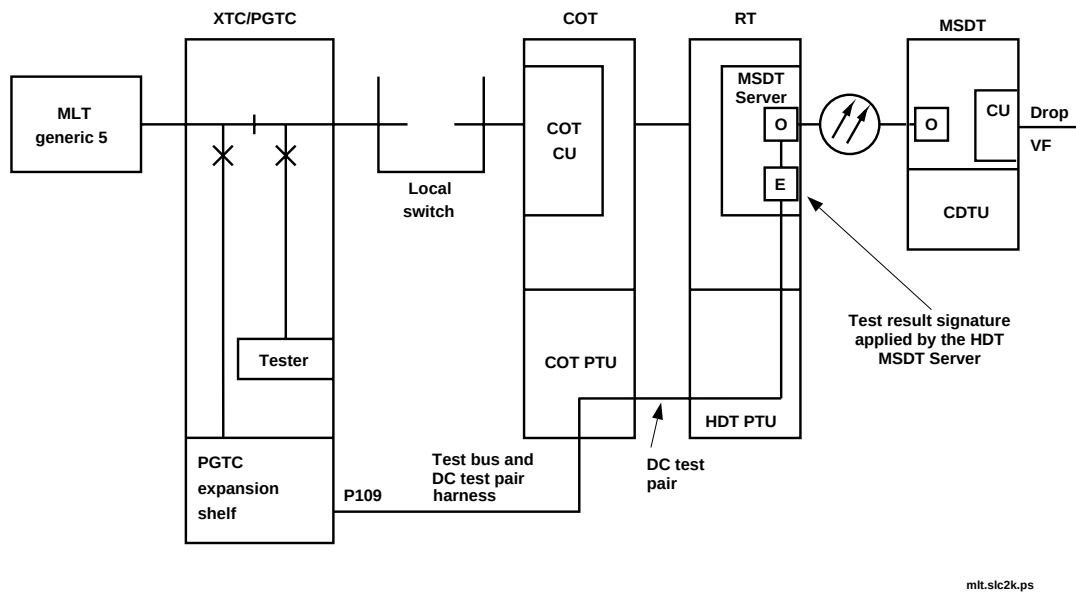


Figure 4-4. MLT-2/PGTC DC Test Pair Test Paths for MSDT Testing Capability (SLC®-2000 Systems)

Table 4-2. SLC®-2000 MSDT Feature DC Signatures for Drop Tests

DC Signature (Resistance T-R) Ohms	Indication	Dispatch To
15K-24K	HDT/MSDT link up and MSDT common equipment failure or MSDT not equipped for testing	MSDT
24K-34K	HDT/MSDT link up and FEMF on drop	MSDT
34K-44K	HDT/MSDT link up and drop test OK	As indicated channel test
44K-54K	HDT/MSDT link up and drop open	MSDT
54K-64K	HDT/MSDT link up and resistive fault	MSDT
64K-74K	HDT/MSDT link up and receiver off hook (ROH)	MSDT or customer premises
74K-86K	HDT/MSDT link up and hazardous potentials on drop	MSDT
>1000K	HDT/MSDT link down*	HDT

* This test will not function during a major alarm.

Table 4-3. SLC®-2000 MSDT Feature PGTC Channel Test Results

VER Code: Returned	DC Signature (Resistance T-R Ohms)	Channel Test Indication	Dispatch To
VER 25 or 95	24K-86K	Pass, channel good from COT to MSDT	As indicated by drop test*
VER 99 †	24K-86K	Fail, fiber link good to MSDT, channel test fails, DC signature may indicatedrop test failure	MSDT or as indicated by drop test
—	15K-24K	Fiber link good HDT to MSDT, no channel test	MSDT
—	>1000K	Fiber link bad (OOF) HDT to MSDT, no channel test‡	HDT

* If drop and channel tests are ok, make a test call to subscriber location.

† The VER 99 code may also appear for problems other than the ones listed here.

‡ This test will not function during a major alarm.

With these maintenance capabilities, even if a *test ok* is indicated to the Maintenance Administrator (MA), the customer could still have a failure. When this situation occurs, standard test procedures should be followed to check the subscriber's equipment.

As a reminder, the MLT system must be *programmed* to correctly interpret the DC signatures, which will be presented by the HDT CU, before a system equipped with the SLC-2000 MSDT feature may be tested.

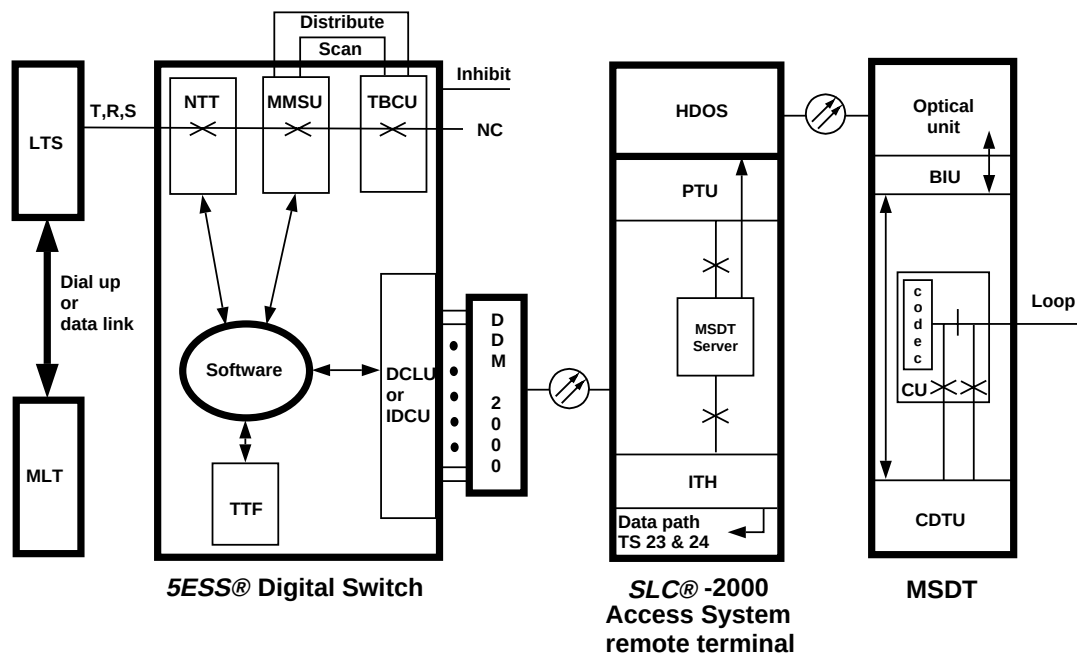
This programming is performed using a system administration and maintenance (SAM) mask to accomplish the following:

- Identify to MLT the values of the DC signatures and VER codes to be trapped during the loop test.
- Provide new VER codes to allow for the proper screening of SLC-2000 MSDT trouble reports.

Integrated SLC-2000 Access System Testing

When testing an integrated SLC-2000 Access System using the integral test head (ITH) with MLT, a dial link or X.25 data link accesses the local test system (LTS) from a computer interface loop maintenance operations system (LMOS) or a repair desk terminal. The local digital switch (LDS) sets up access to the ITH and

does PGTC testing via channels 23 and 24 on shelf 1 of the HDT MDS with Software Release 2.0 (Figure 4-5). Software Release 3.1 and later can use any channel on shelf 1.



intg.test.ps

Figure 4-5. Integrated SLC®-2000 Access System Testing

MLT Setup

The SLC-2000 MSDT uses the programmable DC signatures feature of MLT to report the results of testing since MLT cannot directly test the drop beyond the MSDT. This feature must be programmed in advance by the MLT facilities manager.

The Series 5 or SLC-2000 system with the SLC-2000 MSDT feature exhibits one of the DC signatures found in Table 4-2 to the MLT, or an equivalent test system, during its drop test. The signature reflects the state of the metallic drop from the MSDT to the subscriber's equipment and the state of the HDT-to-MSDT fiber link. The PGTC delivers pass or fail channel test results, which MLT converts to VER codes, that show the condition of the pair gain channel from the CO to the MSDT CU.

**NOTE:**

When new service is just turned up and line records have not yet been built, the test system operator must use an appropriate override; for example, C40 for a *SLC* 96 Carrier System, C41 for a *SLC* Series 5 Carrier System, etc. In this temporary case, the test results will depend on the CO equipment being used, the state of the test system, etc., and not on the loop. Unless the proper override is used, the test results returned are not predictable. (When testing with the RMU/ITH, the override will only provide channel status, not loop status beyond the MSDT.)

A total of 14 masks, covering all possible equipment configurations, test failures, and missing line records, are available. The number of programmable masks needed can be reduced to nine if channel test failures are always cleared before drop test failures. The drop test results can also be interpreted from Table 4-2 directly.

Each signature is composed of a set of three resistance values. Detection of one of these unique *DC signatures* is an indication that the test results received are from a *SLC*-2000 MSDT feature circuit. The Tip-to-Ground (T-G) and Ring-to-Ground (R-G) resistance values [R(T-G) and R(R-G)] of 90.9K ohms identify the circuit under test as a *SLC*-2000 MSDT feature circuit. The Tip-to-Ring (T-R) resistance value [R(T-R)] is set by the RT CU to reflect the results of the drop test or the failed state of the HDT-to-MSDT fiber link. Table 4-2 shows the resistance values associated with the possible drop test results.

In order for the MLT-2 measurements and signatures to be accurate, the DC test pair to the FITL HDT must meet the following parameters:

1. Series loop resistance: 2500 ohms maximum
2. Leakage resistances: >2500K ohms T-R, T-G, and R-G.

If the DC test pair does not meet these parameters, the MLT-2 measurements can have sufficient error to cause the wrong TV mask to appear (that is, the next higher or lower signature value TV mask may appear).

Figure 4-6 through Figure 4-35 show the suggested MLT-2 SAM masks for the *SLC*-2000 MSDT feature with the enhanced test capability. Each SAM mask is associated with a TV mask typical for the condition. A graphic interpretation of the test results is also shown. An alternate SAM and TV mask for signature No. 9 is shown in Figure 4-24 and Figure 4-25, respectively. The purpose of this alternate is to save on the number of SAM and TV masks. This test signature No. 9 (alternate) should be used if the MLT administrator wants to limit the number of programmable signatures to ten. It is a suggested replacement for signatures No. 9 through No. 14. If a customer reaches the limit of programmable signatures and is looking to increase the number of signatures, this alternate can be used as a solution.

Figure 4-36 through Figure 4-61 show typical SAM mask test signatures and their associated TV mask signatures.

Table 4-4 shows the TR-909 requirements for the mask test signatures 1 through 14. Table 4-5 shows the TR-909 requirements for the mask test signatures 50 through 62.

Integral Test Head (ITH) Testing

The *SLC-2000 Access System* HDT supports an integral test head (ITH) capability that eliminates the need for an external RMU and DC test pair. The ITH supports POTS testing using the mechanized loop testing (MLT) system and local technician test access from a craft interface terminal (CIT). The MSDT is isolated from the HDT and does not support ITH services. Refer to 363-208-000, *SLC-2000 Access System Applications, Planning, and Ordering Guide*, and 363-208-001, *SLC-2000 Access System User/Service Manual*, for functional and physical descriptions of the ITH.

Fault Isolation Procedure

The normal maintenance test flow follows:

1. When trouble exists, the customer calls the repair service bureau (RSB) number and is connected to an RSA.
2. The RSA enters the telephone number of the *SLC-2000* MSDT feature line into the LMOS terminal and requests a FULLX test. Then the following tests are performed automatically:
 - a. Central office line circuit and dial tone tests.
 - b. Drop tests (MSDT-to-subscriber's set) performed on the metallic drop by the CDTU.
 - c. End-to-end channel tests (central office-to-MSDT) of the *SLC* Series 5 Carrier System or *SLC-2000 Access System*.
3. After the channel tests are completed, the MLT-2 will trap a system VER code to signal the pass or fail status of the pair gain channel. It will also trap the signature it measured, which is associated with a FITL system. Instead of displaying this information, the TV mask narrative associated with the programmed VER code and signature combination will appear on the LMOS terminal.
4. The first line of the MLT-2 TV mask narrative identifies the line as being part of a *SLC-2000* MSDT feature by displaying the following: FIBER IN THE LOOP SYSTEM INDICATED. (The exact wording may vary according to local preference.) This shows that the MLT-2 system has successfully accessed the HDT using the PGTC, and in response to the test request, it has received one of the *SLC-2000* MSDT feature signatures.
5. The second line of the TV mask text will indicate the state of the pair gain channel with one of the following responses: COT-TO-DT CHANNEL TEST OK or PAIR GAIN CHANNEL TEST FAILURE. Both messages are an

indication that the HDT-to-MSDT fiber link is in frame and functioning. The pair gain channel test failure message indicates an out-of-limit condition for one or more of the following tests:

- On-hook state
- Off-hook state
- Permanent ring ground
- Echo return loss
- Transmission channel loss
- Idle channel noise
- Ability to provide ringing voltage.



NOTE:

While a channel test failure message always means service degradation, it does not always mean an out-of-service condition. It is reasonable, therefore, to clear any drop test failures first, to re-establish service, and then to clear the channel faults.



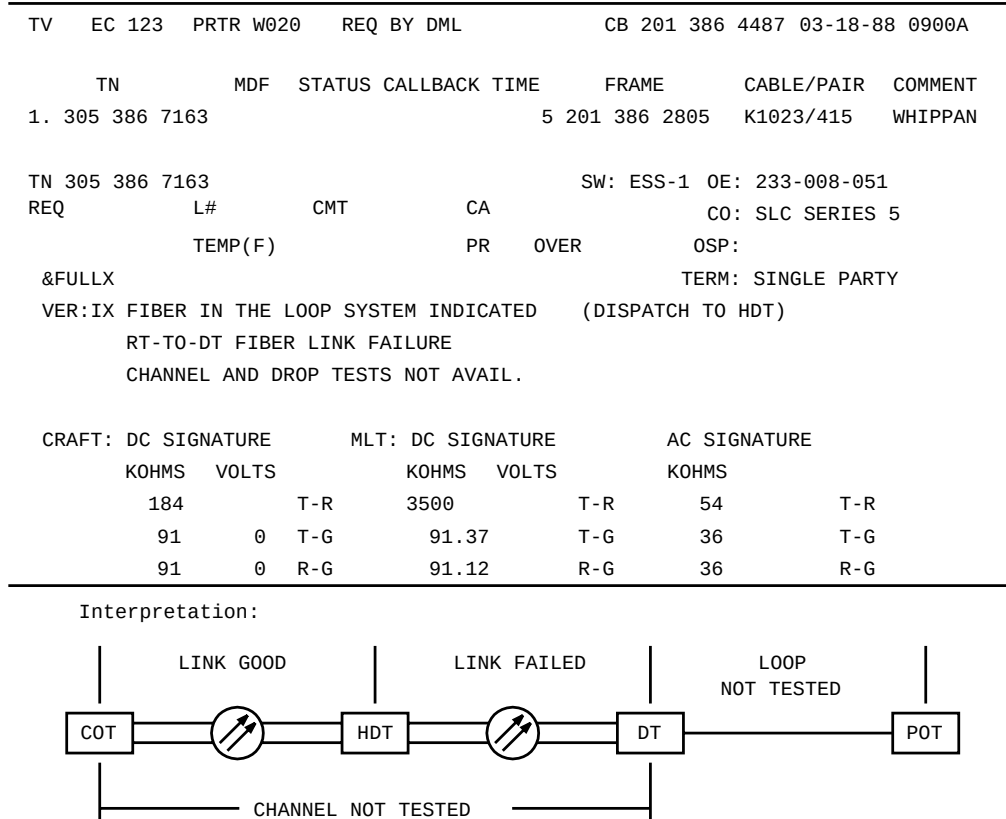
NOTE:

Other test failures (such as CO faults) may occasionally cause the PAIR GAIN CHANNEL TEST FAILURE message to be displayed. Repeat testing with LOOPX test to eliminate these failures.

6. The RT-TO-DT FIBER LINK BAD - OOF message means a complete failure of the link. The fault can be in one or more of the following elements: HDT CU, HDT OU, HDIC, the fiber, MSDT OU, or the MSDT CU. Trouble clearing should begin at the RT. (This test will not function during a major alarm.)

Testing With Systems Other Than MLT

Systems other than MLT are capable of testing FITL systems and responding to Bellcore TR-909 specification DC signatures in a manner similar to MLT. It may be necessary to consult with the testing system supplier to determine the compatibility with FITL and Bellcore TR-909 specification testing.



tpa 785397/01

Figure 4-7. TV Mask for Test Signature #1

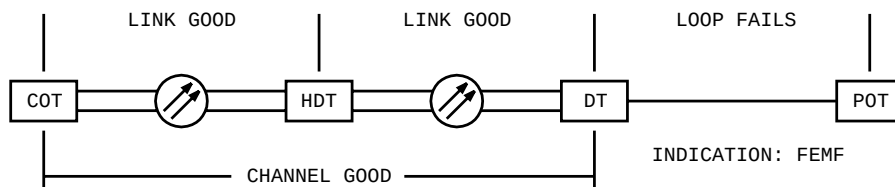
SAM	SYSTEM:	m2	PRTR:	BY:	
REQ:	DVER -N 2		NPANNX:	EXK:	
NEXT	(Y/N):		STATUS:		
INPUT:					
	VER: 25	MLT:	DC SIGNATURE		
		KOHMS	VOLTS		DECISION RULE (Y)
	MIN	MAX	MIN	MAX	
	24.00	34.00			T-R () VER
	84.00	96.00	-4.00	+4.00	T-G () SIGNATURE
	84.00	96.00	-4.00	+4.00	R-G () VER OR SIGNATURE
					(Y) VER AND SIGNATURE
OUTPUT:					
VER:3X	* FIBER IN THE LOOP SYSTEM INDICATED				*
	* COT-TO-DT CHANNEL TEST OK				*
	* DROP TEST FAILS - FEMF				*
	* (DISPATCH TO DT)				*
	*				*
	*				*

tpa 785398/01

Figure 4-8. SAM Mask for Test Signature #2

TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A
TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR COMMENT
1. 305 386 7163			5 201 386 2805		K1023/415 WHIPPAN
TN 305 386 7163				SW: ESS-1	OE: 233-008-051
REQ	L#	CMT	CA	CO: SLC SERIES 5	
	TEMP(F)		PR	OVER	OSP:
&FULLX			TERM: SINGLE PARTY		
VER:3X FIBER IN THE LOOP SYSTEM INDICATED				(DISPATCH TO DT)	
COT-TO-DT CHANNEL TEST OK					
DROP TEST FAILS - FEMF					
CRAFT: DC SIGNATURE		MLT: DC SIGNATURE		AC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS	KOHMS	
26	T-R	30.67	T-R	21	T-R
52	T-G	91.58	T-G	35	T-G
52	R-G	91.54	R-G	36	R-G

Interpretation:



tpa 785399/01

Figure 4-9. TV Mask for Test Signature #2

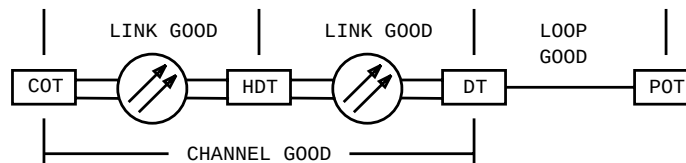
SAM	SYSTEM:	m2	PRTR:	BY:	
REQ:	DVER -N 3		NPANNX:	EXK:	
NEXT	(Y/N):		STATUS:		
INPUT:					
	VER: 25	MLT:	DC SIGNATURE		
		KOHMS	VOLTS		DECISION RULE (Y)
	MIN	MAX	MIN	MAX	
	34.00	44.00			T-R () VER
	84.00	96.00	-4.00	+4.00	T-G () SIGNATURE
	84.00	96.00	-4.00	+4.00	R-G () VER OR SIGNATURE
					(Y) VER AND SIGNATURE
OUTPUT:					
VER:4X	* FIBER IN THE LOOP SYSTEM INDICATED				*
	* COT-TO-DT CHANNEL TEST OK				*
	* DROP TEST OK				*
	*				*
	*				*
	*				*

tpa 785400/01

Figure 4-10. SAM Mask for Test Signature #3

TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A
	TN	MDF	STATUS CALLBACK TIME	FRAME	CABLE/PAIR COMMENT
1.	305 386 7163		5 201 386 2805	K1023/415	WHIPPAN
TN 305 386 7163 SW: ESS-1 OE: 233-008-051					
REQ L# CMT CA CO: SLC SERIES 5					
TEMP(F) PR OVER OSP:					
&FULLX TERM: SINGLE PARTY					
VER:4X FIBER IN THE LOOP SYSTEM INDICATED					
COT-T0-DT CHANNEL TEST OK					
DROP TEST OK					
CRAFT: DC SIGNATURE MLT: DC SIGNATURE AC SIGNATURE					
KOHMS VOLTS KOHMS VOLTS KOHMS					
34 T-R 41.42 T-R 25 T-R					
54 T-G 91.40 T-G 35 T-G					
54 R-G 91.42 R-G 35 R-G					

Interpretation:



tpa 785401/01

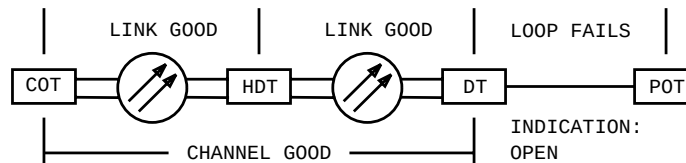
Figure 4-11. TV Mask for Test Signature #3

tpa 785402/01

Figure 4-12. SAM Mask for Test Signature #4

TV	EC 123	PRTR W020	REQ BY DML	CB 201	386 4487	03-18-88 0900A
	TN	MDF STATUS	CALLBACK TIME	FRAME	CABLE/PAIR	COMMENT
1.	305 386 7163		5 201 386 2805		K1023/415	WHIPPAN
TN 305 386 7163						
REQ	L#	CMT	CA	SW: ESS-1	OE:233-008-051	
	TEMP(F)	PR	OVER	OSP:	C0: SLC SERIES 5	
&FULLX				TERM: SINGLE PARTY		
VER:5X FIBER IN THE LOOP SYSTEM INDICATED				(DISPATCH TO DT)		
COT-TO-DT CHANNEL TEST OK						
DROP TEST FAILS - NO TERMINATION						
CRAFT: DC SIGNATURE						
KOHMS		VOLTS		MLT: DC SIGNATURE		AC SIGNATURE
				KOHMS		VOLTS
40		T-R		51.51		T-R
56	0	T-G		91.35	0	T-G
56	0	R-G		91.41	0	R-G
				28		T-R
				36		T-G
				36		R-G

Interpretation:



tpa 785403/01

Figure 4-13. TV Mask for Test Signature #4

SAM	SYSTEM:	m2	PRTR:	BY:
REQ:	DVER -N 5		NPANNX:	EXK:
NEXT	(Y/N):		STATUS:	
INPUT:				
VER:	95	MLT:	DC SIGNATURE	
		KOHMS	VOLTS	DECISION RULE (Y)
		MIN	MAX	
	54.00	64.00		T-R () VER
	84.00	96.00	-4.00 +4.00	T-G () SIGNATURE
	84.00	96.00	-4.00 +4.00	R-G () VER OR SIGNATURE
				(Y) VER AND SIGNATURE
OUTPUT:				
VER:6X	* FIBER IN THE LOOP SYSTEM INDICATED			
	* COT-TO-DT CHANNEL TEST OK			
	* DROP TEST FAILS - RESISTIVE FAULT			
	* (DISPATCH TO DT)			
	*			
	*			

tpa 785227/01

Figure 4-14. SAM Mask for Test Signature #5

tpa 785228/01

```
SAM      SYSTEM:  m2      PRTR:      BY:
REQ:    DVER -N 6      NPANNX:      EXK:
NEXT    (Y/N):      STATUS:
INPUT:
      VER:  95      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              64.00    74.00      -4.00    +4.00
              84.00    96.00      -4.00    +4.00
              84.00    96.00      -4.00    +4.00
              T-R      ( ) VER
              T-G      ( ) SIGNATURE
              R-G      ( ) VER OR SIGNATURE
              (Y) VER AND SIGNATURE

OUTPUT:
VER:7X * FIBER IN THE LOOP SYSTEM INDICATED      *
      * COT-TO-DT CHANNEL TEST OK                  *
      * DROP TEST FAILS - RECEIVER OFF HOOK          *
      * (DISPATCH TO DT)                          *
      *                                              *
      *
```

tpa 785404/01

Figure 4-16. SAM Mask for Test Signature #6

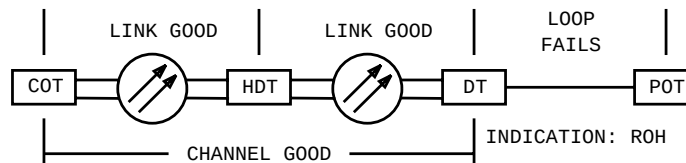
TV EC 123 PRTR W020 REQ BY DML CB 201 386 4487 03-18-88 0900A

TN MDF STATUS CALLBACK TIME FRAME CABLE/PAIR COMMENT
1. 305 386 7163 5 201 386 2805 K1023/415 WHIPPAN

TN 305 386 7163 SW: ESS-1 OE: 233-008-051
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
&FULLX TERM: SINGLE PARTY
VER:7X FIBER IN THE LOOP SYSTEM INDICATED
COT-TO-DT CHANNEL TEST OK (DISPATCH TO DT)
DROP TEST FAILS - RECEIVER OFF HOOK

CRAFT: DC SIGNATURE MLT: DC SIGNATURE AC SIGNATURE
KOHMS VOLTS KOHMS VOLTS KOHMS
51 T-R 71.61 T-R 32 T-R
59 0 T-G 91.38 0 T-G 35 T-G
58 0 R-G 91.18 0 R-G 36 R-G

Interpretation:



tpa 785405/01

Figure 4-17. TV Mask for Test Signature #6

```
SAM      SYSTEM:  m2      PRTR:      BY:
REQ:    DVER -N 7      NPANNX:      EXK:
NEXT    (Y/N):      STATUS:
INPUT:
      VER: 95      MLT:      DC SIGNATURE
                KOHMS      VOLTS
                MIN      MAX      MIN      MAX
                74.00    86.00      -4.00    +4.00    T-R    ( ) VER
                84.00    96.00      -4.00    +4.00    T-G    ( ) SIGNATURE
                84.00    96.00      -4.00    +4.00    R-G    ( ) VER OR SIGNATURE
                                (Y) VER AND SIGNATURE

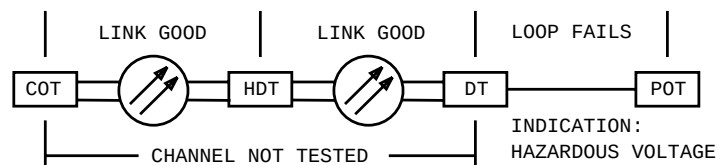
OUTPUT:
      VER:8X * FIBER IN THE LOOP SYSTEM INDICATED      *
            * COT-TO-DT CHANNEL TEST OK                *
            * DROP TEST FAILS - HAZARDOUS VOLTAGE!      *
            * WARNING!! TAKE PROPER PRECAUTIONS!!       *
            * (DISPATCH TO DT)                          *
            *                                             *
```

tpa 813594/01

Figure 4-18. SAM Mask for Test Signature #7

TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A
TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR COMMENT
1. 305 386 7163			5 201 386 2805	K1023/415	WHIPPAN
TN 305 386 7163	SW: ESS-1 OE: 233-008-051				
REQ	L#	CMT	CA	CO: SLC SERIES 5	
	TEMP(F)	PR	OVER	OSP:	
&FULLX	TERM:				
VER:8X FIBER IN THE LOOP SYSTEM INDICATED				WARNING!! TAKE PROPER PRECAUTIONS!!	
COT-TO-DT CHANNEL TEST OK				(DISPATCH TO DT)	
DROP TEST FAILS - HAZARDOUS VOLTAGE!					
CRAFT: DC SIGNATURE		MLT: DC SIGNATURE		AC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS	KOHMS	
56	T-R	81.40	T-R	34	T-R
60	0 T-G	91.40	0 T-G	35	T-G
60	0 R-G	91.42	0 R-G	36	R-G

Interpretation:



tpa 813595/01

Figure 4-19. TV Mask for Test Signature #7

```
SAM      SYSTEM:  m2          PRTR:      BY:
REQ:    DVER -N 8           NPANNX:      EXK:
NEXT    (Y/N):              STATUS:
INPUT:
  VER:      MLT:      DC SIGNATURE
           KOHMS      VOLTS
           MIN      MAX      MIN      MAX      T-R
           15.00    24.00    -4.00    +4.00    T-R
           84.00    96.00    -4.00    +4.00    T-G
           84.00    96.00    -4.00    +4.00    R-G
           -----
           ( ) VER
           (Y) SIGNATURE
           ( ) VER OR SIGNATURE
           ( ) VER AND SIGNATURE

OUTPUT:
  VER:9X * FIBER IN THE LOOP SYSTEM INDICATED      *
        * RT-TO-DT FIBER LINK GOOD                  *
        * DT COMMON EQUIPMENT FAILURE -OR-          *
        * DT NOT EQUIPPED FOR TESTING                *
        * CHANNEL AND DROP TESTS NOT AVAIL.         *
        * (DISPATCH TO DT)                          *
```

tpa 785406/01

Figure 4-20. SAM Mask for Test Signature #8

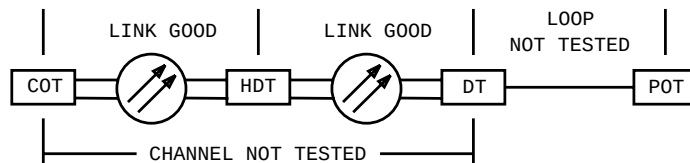
TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A

TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR	COMMENT
1. 305 386 7163			5 201 386 2805		K1023/415	WHIPPAN

TN 305 386 7163	SW: ESS-1	OE: 233-008-051		
REQ	L#	CMT	CA	C0: SLC SERIES 5
	TEMP(F)	PR	OVER	OSP:
&FULLX				TERM:
VER:9X FIBER IN THE LOOP SYSTEM INDICATED				DT NOT EQUIPPED FOR TESTING
RT-T0-DT FIBER LINK GOOD				CHANNEL AND DROP TESTS NOT AVAIL.
DT COMMON EQUIPMENT FAILURE -OR-				(DISPATCH TO DT)

CRAFT: DC SIGNATURE	MLT: DC SIGNATURE	AC SIGNATURE
KOHMS VOLTS	KOHMS VOLTS	KOHMS
18 T-R	20.45 T-R	16 T-R
50 0 T-G	91.26 0 T-G	35 T-G
50 0 R-G	91.30 0 R-G	36 R-G

Interpretation:



tpa 785407/01

Figure 4-21. TV Mask for Test Signature #8

```
SAM      SYSTEM:  m2      PRTR:      BY:
REQ:    DVER -N 9      NPANNX:      EXK:
NEXT    (Y/N):      STATUS:
INPUT:
      VER:    99  MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              24.00    34.00      -4.00    +4.00    T-R    ( ) VER
              84.00    96.00      -4.00    +4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00    +4.00    R-G    ( ) VER OR SIGNATURE
                                (Y) VER AND SIGNATURE

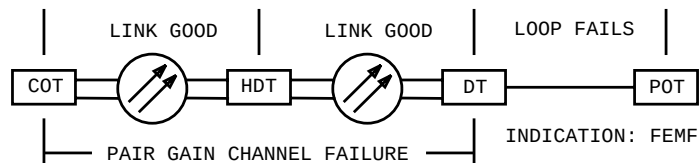
OUTPUT:
      VER:3C * FIBER IN THE LOOP SYSTEM INDICATED      *
              * COT-TO-DT CHANNEL TEST FAILURE          *
              * DROP TEST FAILS - FEMF                  *
              * (DISPATCH TO DT)                        *
              *                                           *
              *                                           *
```

tpa 785410/01

Figure 4-22. SAM Mask for Test Signature #9

TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A
	TN	MDF	STATUS CALLBACK TIME	FRAME	CABLE/PAIR COMMENT
1.	305 386 7163		5 201 386 2805	K1023/415	WHIPPAN
TN 305 386 7163 SW: ESS-1 OE: 233-008-051					
REQ L# CMT CA CO: SLC SERIES 5					
TEMP(F) PR OVER OSP:					
&FULLX TERM: SINGLE PARTY					
VER:3C FIBER IN THE LOOP SYSTEM INDICATED (DISPATCH TO DT)					
COT-TO-DT CHANNEL TEST FAILURE					
DROP TEST FAILS - FEMF					
CRAFT: DC SIGNATURE MLT: DC SIGNATURE AC SIGNATURE					
KOHMS VOLTS KOHMS VOLTS KOHMS					
26 T-R 30.68 T-R 21 T-R					
52 0 T-G 91.46 0 T-G 36 T-G					
52 0 R-G 91.42 0 R-G 37 R-G					

Interpretation:



tpa 785411/01

Figure 4-23. TV Mask for Test Signature #9

```
SAM      SYSTEM:  m2      PRTR:      BY:
REQ:    DVER -N 9      NPANNX:      EXK:
NEXT    (Y/N):      STATUS:
INPUT:
      VER: 99      MLT:      DC SIGNATURE
              KOHMS      VOLTS      DECISION RULE (Y)
              MIN      MAX      MIN      MAX
              15.00    86.00      -4.00    +4.00    T-R    ( ) VER
              84.00    96.00      -4.00    +4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00    +4.00    R-G    ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER: 4C      * FIBER IN THE LOOP SYSTEM INDICATED      *
                  * COT-TO-DT CHANNEL TEST FAILS            *
                  * RT-TO-DT FIBER LINK GOOD                  *
                  * DROP TEST NOT INTERPRETED                  *
                  * (DISPATCH TO DT)                          *
                  *                                            *
```

tpa 785420/01

Figure 4-24. SAM Mask for Test Signature #9 (Alternate)

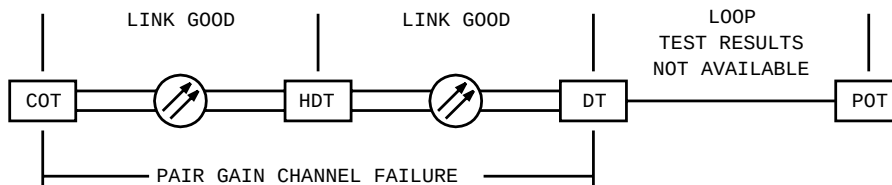
TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A

TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR	COMMENT
1. 305 386 7163			5 201 386 2805		K1023/415	WHIPPAN

TN 305 386 7163	SW: ESS-1	OE: 233-008-051		
REQ	L#	CMT	CA	CO: SLC SERIES 5
	TEMP(F)	PR	OVER	OSP:
&FULLX				TERM: SINGLE PARTY
VER:4C	FIBER IN THE LOOP SYSTEM INDICATED		DROP TEST NOT INTERPRETED	
	COT-TO-DT CHANNEL TEST FAILURE		(DISPATCH TO DT)	
	RT-TO-DT FIBER LINK GOOD			

CRAFT: DC SIGNATURE	MLT: DC SIGNATURE	AC SIGNATURE
KOHMS VOLTS	KOHMS VOLTS	KOHMS
34 T-R	41.42 T-R	25 T-R
54 0 T-G	91.40 0 T-G	35 T-G
54 0 R-G	91.42 0 R-G	36 R-G

Interpretation:



tpa 785421/01

Figure 4-25. TV Mask for Test Signature #9 (Alternate)

```
SAM      SYSTEM:  m2      PRTR:      BY:
REQ:    DVER -N 10      NPANNX:      EXK:
NEXT    (Y/N):      STATUS:
INPUT:
      VER:    99  MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN    MAX      MIN    MAX
              34.00   44.00   -4.00   +4.00   T-R  ( ) VER
              84.00   96.00   -4.00   +4.00   T-G  ( ) SIGNATURE
              84.00   96.00   -4.00   +4.00   R-G  ( ) VER OR SIGNATURE
                                (Y) VER AND SIGNATURE

OUTPUT:
      VER:4C * FIBER IN THE LOOP SYSTEM INDICATED      *
              * COT-TO-DT CHANNEL TEST FAILURE          *
              * DROP TEST OK                             *
              * (DISPATCH TO DT)                         *
              *                                           *
              *                                           *
```

tpa 785412/01

Figure 4-26. SAM Mask for Test Signature #10

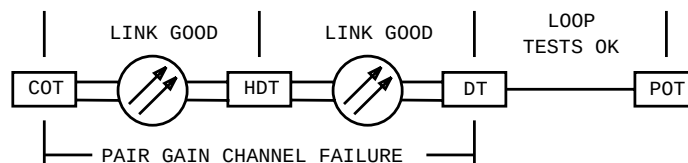
TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A

TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR	COMMENT
1. 305 386 7163			5 201 386 2805		K1023/415	WHIPPAN

TN 305 386 7163	SW: ESS-1	OE: 233-008-051
REQ	L#	CMT
	TEMP(F)	CA
	PR	OVER
		OSP:
&FULLX		TERM: SINGLE PARTY
VER:4C FIBER IN THE LOOP SYSTEM INDICATED	(DISPATCH TO DT)	
COT-TO-DT CHANNEL TEST FAILURE		
DROP TEST OK		

CRAFT: DC SIGNATURE	MLT: DC SIGNATURE	AC SIGNATURE
KOHMS VOLTS	KOHMS VOLTS	KOHMS
34 T-R	41.39 T-R	25 T-R
54 0 T-G	91.16 0 T-G	36 T-G
54 0 R-G	91.24 0 R-G	36 R-G

Interpretation:



tpa 785413/01

Figure 4-27. TV Mask for Test Signature #10

```
SAM      SYSTEM:  m2      PRTR:      BY:
REQ:  DVER -N 11      NPANNX:      EXK:
NEXT  (Y/N):      STATUS:
INPUT:
      VER:  99  MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
      44.00    54.00      -4.00    +4.00    T-R  ( ) VER
      84.00    96.00      -4.00    +4.00    T-G  ( ) SIGNATURE
      84.00    96.00      -4.00    +4.00    R-G  ( ) VER OR SIGNATURE
                                   (Y) VER AND SIGNATURE

OUTPUT:
      VER:5C * FIBER IN THE LOOP SYSTEM INDICATED      *
              * COT-TO-DT CHANNEL TEST FAILURE          *
              * DROP TEST FAILS - NO TERMINATION         *
              * (DISPATCH TO DT)                        *
              *                                           *
              *                                           *
```

tpa 785414/01

Figure 4-28. SAM Mask for Test Signature #11

TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A

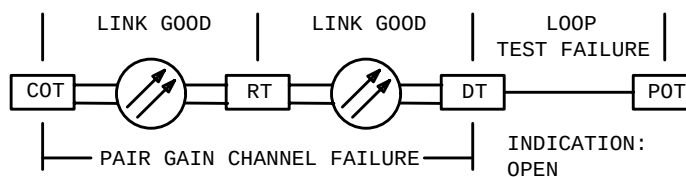
TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR	COMMENT
1. 305 386 7163			5 201 386 2805		K1023/415	WHIPPAN

TN 305 386 7163	SW: ESS-1	OE: 233-008-051		
REQ	L#	CMT	CA	CO: SLC SERIES 5
	TEMP(F)	PR	OVER	OSP:
&FULLX				TERM: SINGLE PARTY

VER:5C FIBER-IN-THE-LOOP SYSTEM INDICATED
COT-TO-DT CHANNEL TEST FAILURE (DISPATCH TO DT)
DROP TEST FAILS - NO TERMINATION

CRAFT: DC SIGNATURE	MLT: DC SIGNATURE	AC SIGNATURE
KOHMS VOLTS	KOHMS VOLTS	KOHMS
40 T-R	51.55 T-R	28 T-R
56 0 T-G	91.46 0 T-G	35 T-G
56 0 R-G	91.48 0 R-G	36 R-G

Interpretation:



tpa 785415/01

Figure 4-29. TV Mask for Test Signature #11

```
SAM      SYSTEM:    m2      PRTR:      BY:
REQ:    DVER -N 12      NPANNX:      EXK:
NEXT    (Y/N):      STATUS:
INPUT:

      VER: 99      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
      54.00      64.00      -4.00      +4.00      T-R      ( ) VER
      84.00      96.00      -4.00      +4.00      T-G      ( ) SIGNATURE
      84.00      96.00      -4.00      +4.00      R-G      ( ) VER OR SIGNATURE
                                      ( Y ) VER AND SIGNATURE

OUTPUT:
VER:6C * FIBER IN THE LOOP SYSTEM INDICATED      *
      * COT-TO-DT CHANNEL TEST FAILURE            *
      * DROP TEST FAILS - RESISTIVE FAULT          *
      * (DISPATCH TO DT)                          *
      *                                             *
      *                                             *
```

tpa 785416/01

Figure 4-30. SAM Mask for Test Signature #12

TV EC 123 PRTR W020 REQ BY DML CB 201 386 4487 03-18-88 0900A

TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR	COMMENT
1. 305 386 7163			5 201 386 2805		K1023/415	WHIPPAN

TN 305 386 7163 SW: ESS-1 OE: 233-008-051

REQ L# CMT CA CO: SLC SERIES 5

TEMP(F) PR OVER OSP:

&FULLX TERM: SINGLE PARTY

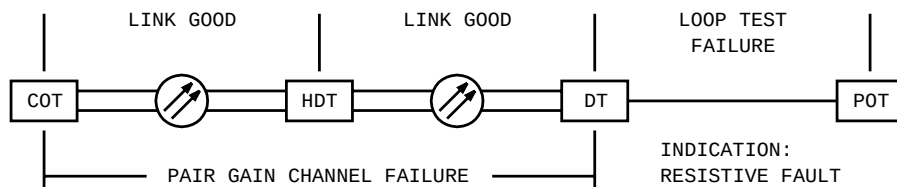
VER:6C FIBER IN THE LOOP INDICATED

COT-T0-DT CHANNEL TEST FAILURE (DISPATCH TO DT)

DROP TEST FAILS - RESISTIVE FAULT

CRAFT: DC SIGNATURE	MLT: DC SIGNATURE	AC SIGNATURE
KOHMS VOLTS	KOHMS VOLTS	KOHMS
46 T-R	61.44 T-R	30 T-R
57 0 T-G	91.57 0 T-G	35 T-G
57 0 R-G	91.31 0 R-G	36 R-G

Interpretation:



tpa 785417/01

Figure 4-31. TV Mask for Test Signature #12

SAM	SYSTEM:	m2	PRTR:	BY:
REQ:	DVER -N 13		NPANNX:	EXK:
NEXT	(Y/N):		STATUS:	
INPUT:				
VER: 99	MLT:	DC SIGNATURE		
	KOHMS	VOLTS		DECISION RULE (Y)
	MIN	MAX	MIN	MAX
	64.00	74.00		T-R () VER
	84.00	96.00	-4.00	+4.00 T-G () SIGNATURE
	84.00	96.00	-4.00	+4.00 R-G () VER OR SIGNATURE
				(Y) VER AND SIGNATURE
OUTPUT:				
VER:7C	* FIBER IN THE LOOP SYSTEM INDICATED			*
	* COT-TO-DT CHANNEL TEST FAILURE			*
	* DROP TEST FAILS - RECEIVER OFF HOOK			*
	* (DISPATCH TO DT)			*
	*			*
	*			*

tpa 785418/01

Figure 4-32. SAM Mask for Test Signature #13

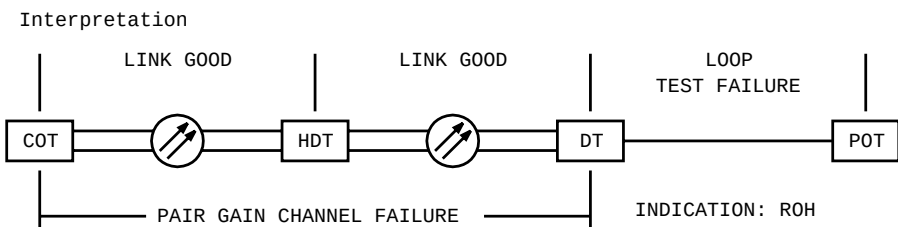
TV	EC 123	PRTR W020	REQ BY DML	CB 201 386 4487	03-18-88 0900A

TN	MDF	STATUS	CALLBACK TIME	FRAME	CABLE/PAIR	COMMENT
1. 305 386 7163			5 201 386 2805		K1023/415	WHIPPAN

TN 305 386 7163	SW: ESS-1	OE: 233-008-051		
REQ	L#	CMT	CA	CO: SLC SERIES 5
	TEMP(F)	PR	OVER	OSP:
&FULLX				TERM: SINGLE PARTY

VER:7C FIBER IN THE LOOP SYSTEM INDICATED
COT-TO-DT CHANNEL TEST FAILURE (DISPATCH TO DT)
DROP TEST FAILS - RECEIVER OFF HOOK

CRAFT: DC SIGNATURE	MLT: DC SIGNATURE	AC SIGNATURE
KOHMS VOLTS	KOHMS VOLTS	KOHMS
51 T-R	71.73 T-R	32 T-R
59 0 T-G	91.30 0 T-G	35 T-G
59 0 R-G	91.24 0 R-G	36 R-G



tpa 785419/01

Figure 4-33. TV Mask for Test Signature #13

```
SAM      SYSTEM:  m2      PRTR:      BY:
REQ:    DVER -N 14      NPANNX:      EXK:
NEXT    (Y/N):      STATUS:
INPUT:
      VER: 99      MLT:      DC SIGNATURE
              KOHMS      VOLTS      DECISION RULE (Y)
              MIN      MAX      MIN      MAX
              74.00    86.00      -4.00  +4.00    T-R    ( ) VER
              84.00    96.00      -4.00  +4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00  +4.00    R-G    ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER: 8C      * FIBER IN THE LOOP SYSTEM INDICATED      *
                   * COT-TO-DT CHANNEL TEST FAILURE          *
                   * DROP TEST FAILS - HAZARDOUS VOLTAGE!     *
                   * WARNING!! TAKE PROPER PRECAUTIONS!!      *
                   * (DISPATCH TO DT)                         *
                   *                                           *
```

tpa 813596/01

Figure 4-34. SAM Mask for Test Signature #14

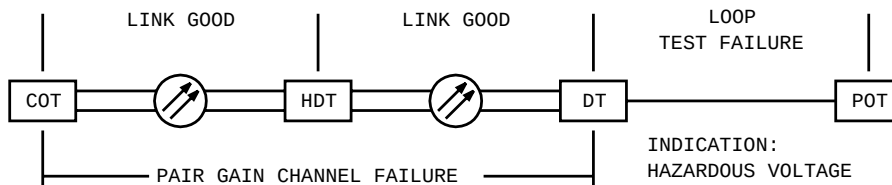
TV EC 123 PRTR W020 REQ BY DML CB 201 386 4487 03-18-88 0900A

TN MDF STATUS CALLBACK TIME FRAME CABLE/PAIR COMMENT
1. 305 386 7163 5 201 386 2805 K1023/415 WHIPPAN

TN 305 386 7163 SW: ESS-1 OE: 233-008-051
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
&FULLX TERM: SINGLE PARTY
VER:8C FIBER IN THE LOOP SYSTEM INDICATED WARNING!! TAKE PROPER PRECAUTIONS!!
COT-TO-DT CHANNEL TEST FAILURE (DISPATCH TO DT)
DROP TEST FAILS-HAZARDOUS VOLTAGE!

CRAFT: DC SIGNATURE MLT: DC SIGNATURE AC SIGNATURE
KOHMS VOLTS KOHMS VOLTS KOHMS
56 T-R 81.40 T-R 34 T-R
60 0 T-G 91.40 0 T-G 35 T-G
60 0 R-G 91.42 0 R-G 36 R-G

Interpretation:



tpa 813597/01

Figure 4-35. TV Mask for Test Signature #14

SAM SYSTEM: m2 PRTR: B851 BY: JL

REQ: DVER -N 50 NPANNX: EXK:

NEXT (Y/N): STATUS: ENABLED

INPUT:

VER:	MLT: KOHMS		DC SIGNATURE VOLTS			DECISION RULE (Y)
	MIN	MAX	MIN	MAX		
	15.00	24.00			T-R	() VER
	84.00	96.00	-4.00	4.00	T-G	(Y) SIGNATURE
	84.00	96.00	-4.00	4.00	R-G	() VER OR SIGNATURE
						() VER AND SIGNATURE

OUTPUT:

VER: 2X	*	PROBABLE FIBER-IN-THE-LOOP FOUND -	*
	*	FIBER LINK IS GOOD FROM COT TO DT -	*
	*	(DISPATCH TO ONU)	*
	*	NO CHANNEL OR LOOP TESTS AVAILABLE	*
	*	ONU COMMON EQUIPMENT FAILURE	*
	*		*

sam50.ps

Figure 4-36. Typical SAM Mask for Test Signature #50

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 1X: PROBABLE FIBER-IN-THE-LOOP FOUND - NO CHANNEL OR LOOP TESTS AVAILABLE
FIBER LINK IS GOOD FROM COT TO DT - ONU COMMON EQUIPMENT FAILURE
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
16	T-R	17.86	T-R
49	0 T-G	90.40	0 T-G
49	0 R-G	91.04	0 R-G

tv50.ps

Figure 4-37. Typical TV Mask for Test Signature #50

```
SAM      SYSTEM:  m2      PRTR: B851      BY: JL
REQ:  DVER -N 51      NPANNX:      EXK:
NEXT  (Y/N):      STATUS: ENABLED
INPUT:
      VER:  25      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              24.00    34.00      -4.00    +4.00    T-R    ( ) VER
              84.00    96.00      -4.00    +4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00    +4.00    R-G    ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER:  2X      *  PROBABLE FIBER-IN-THE-LOOP FOUND-      *
                   *  LOOP TESTS INDICATE - FEMF GREATER      *
                   *  (DISPATCH TO ONU)                      *
                   *  CHANNEL-SINGLE PARTY SERVICE            *
                   *  THAN 10 VOLTS                          *
                   *                                           *
```

sam51.ps

Figure 4-38. Typical SAM Mask for Test Signature #51

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER:2X PROBABLE FIBER-IN-THE-LOOP FOUND - CHANNEL-SINGLE PARTY SERVICE
LOOP TESTS INDICATE - FEMF GREATER THAN 10 VOLTS
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
24	T-R	27.82	T-R
51	0 T-G	90.45	0 T-G
51	0 R-G	91.00	0 R-G

tv51.ps

Figure 4-39. Typical TV Mask for Test Signature #51

SAM SYSTEM: m2 PRTR: B851 BY: JL

REQ: DVER -N 52 NPANNX: EXK:

NEXT (Y/N): STATUS: ENABLED

INPUT:

VER: 99	MLT:		DC SIGNATURE			DECISION RULE (Y)
	KOHMS		VOLTS			
	MIN	MAX	MIN	MAX		
	24.00	34.00			T-R	() VER
	84.00	96.00	-4.00	4.00	T-G	() SIGNATURE
	84.00	96.00	-4.00	4.00	R-G	() VER OR SIGNATURE
						(Y) VER AND SIGNATURE

OUTPUT:

VER: 2C	*	PROBABLE FIBER-IN-THE-LOOP FOUND -	*
	*	LOOP TESTS INDICATE - FEMF GREATER	*
	*	(DISPATCH TO ONU)	*
	*	PAIR GAIN CHANNEL FAILURE	*
	*	THAN 10 VOLTS	*
	*		*

sam52.ps

Figure 4-40. Typical SAM Mask for Test Signature #52

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 2C: PROBABLE FIBER-IN-THE-LOOP FOUND - PAIR GAIN CHANNEL FAILURE
LOOP TESTS INDICATE - FEMF GREATER THAN 10 VOLTS
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
24	T-R	27.82	T-R
51	0 T-G	90.45	0 T-G
51	0 R-G	91.00	0 R-G

tv52.ps

Figure 4-41. Typical TV Mask for Test Signature #52

```
SAM      SYSTEM:  m2      PRTR: B851      BY: JL
REQ:  DVER -N 53      NPANNX:      EXK:
NEXT  (Y/N):      STATUS: ENABLED
INPUT:
      VER:  25      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              34.00    44.00      -4.00    4.00    T-R    ( ) VER
              84.00    96.00      -4.00    4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00    4.00    R-G    ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER:  3X      *  PROBABLE FIBER-IN-THE-LOOP FOUND -      *
                   *  LOOP TESTS INDICATE - TEST OK          *
                   *                                          *
                   *  CHANNEL-SINGLE PARTY SERVICE            *
                   *                                          *
                   *                                          *
```

sam53.ps

Figure 4-42. Typical SAM Mask for Test Signature #53

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 3X: PROBABLE FIBER-IN-THE-LOOP FOUND - CHANNEL-SINGLE PARTY SERVICE
LOOP TESTS INDICATE - TEST OK

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
32	T-R	38.36	T-R
53	0 T-G	90.40	0 T-G
53	0 R-G	91.05	0 R-G

tv53.ps

Figure 4-43. Typical TV Mask for Test Signature #53

```
SAM      SYSTEM:  m2      PRTR: B851      BY: JL
REQ:  DVER -N 54      NPANNX:      EXK:
NEXT  (Y/N):      STATUS: ENABLED
INPUT:
      VER:  99      MLT:      DC SIGNATURE
              KOHMS      VOLTS      DECISION RULE (Y)
              MIN      MAX      MIN      MAX
              34.00    44.00      -4.00    4.00    T-R    ( ) VER
              84.00    96.00      -4.00    4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00    4.00    R-G    ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER:  3C      *  PROBABLE FIBER-IN-THE-LOOP FOUND -      *
                    *  LOOP TESTS INDICATE - TEST OK          *
                    *                                          *
                    *  PAIR GAIN CHANNEL FAILURE              *
                    *                                          *
                    *                                          *
```

sam54.ps

Figure 4-44. Typical SAM Mask for Test Signature #54

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 3C: PROBABLE FIBER-IN-THE-LOOP FOUND - PAIR GAIN CHANNEL FAILURE
LOOP TESTS INDICATE - TEST OK

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
32	T-R	38.36	T-R
53	0 T-G	90.41	0 T-G
53	0 R-G	91.04	0 R-G

tv54.ps

Figure 4-45. Typical TV Mask for Test Signature #54

```
SAM      SYSTEM:  m2      PRTR: B851      BY: JL
REQ:    DVER -N 55      NPANNX:      EXK:
NEXT  (Y/N):      STATUS: ENABLED
INPUT:
      VER:  25      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              44.00    54.00      -4.00    4.00    T-R    ( ) VER
              84.00    96.00      -4.00    4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00    4.00    R-G    ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER:  4X      *  PROBABLE FIBER-IN-THE-LOOP FOUND -      *
                   *  LOOP TESTS INDICATE - NO RINGERS      *
                   *  (DISPATCH TO ONU)                    *
                   *  CHANNEL-SINGLE PARTY SERVICE          *
                   *                                         *
                   *                                         *
```

sam53.ps

Figure 4-46. Typical SAM Mask for Test Signature #55

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 4X: PROBABLE FIBER-IN-THE-LOOP FOUND - CHANNEL-SINGLE PARTY SERVICE
LOOP TESTS INDICATE - NO RINGERS
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
38	T-R	48.31	T-R
55	0 T-G	90.42	0 T-G
55	0 R-G	91.07	0 R-G

tv55.ps

Figure 4-47. Typical TV Mask for Test Signature #55

SAM SYSTEM: m2 PRTR: B851 BY: JL

REQ: DVER -N 56 NPANNX: EXK:

NEXT (Y/N): STATUS: ENABLED

INPUT:

VER: 99	MLT: KOHMS		DC SIGNATURE VOLTS			DECISION RULE (Y)
	MIN	MAX	MIN	MAX		
	44.00	54.00			T-R	() VER
	84.00	96.00	-4.00	4.00	T-G	() SIGNATURE
	84.00	96.00	-4.00	4.00	R-G	() VER OR SIGNATURE
						(Y) VER AND SIGNATURE

OUTPUT:

VER: 4C	*	PROBABLE FIBER-IN-THE-LOOP FOUND -	*
	*	LOOP TESTS INDICATE - NO RINGERS	*
	*	(DISPATCH TO ONU)	*
	*	PAIR GAIN CHANNEL FAILURE	*
	*		*
	*		*

sam56.ps

Figure 4-48. Typical SAM Mask for Test Signature #56

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 4C: PROBABLE FIBER-IN-THE-LOOP FOUND - PAIR GAIN CHANNEL FAILURE
LOOP TESTS INDICATE - NO RINGERS
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
38	T-R	48.30	T-R
55	0 T-G	90.42	0 T-G
55	0 R-G	91.07	0 R-G

tv56.ps

Figure 4-49. Typical TV Mask for Test Signature #56

SAM SYSTEM: m2 PRTR: B851 BY: JL

REQ: DVER -N 57 NPANNX: EXK:

NEXT (Y/N): STATUS: ENABLED

INPUT:

VER:	25	MLT:		DC SIGNATURE			DECISION RULE (Y)
		KOHMS		VOLTS			
		MIN	MAX	MIN	MAX		
		54.00	64.00			T-R	() VER
		84.00	96.00	-4.00	4.00	T-G	() SIGNATURE
		84.00	96.00	-4.00	4.00	R-G	() VER OR SIGNATURE
							(Y) VER AND SIGNATURE

OUTPUT:

VER: 5X	*	PROBABLE FIBER-IN-THE-LOOP FOUND -	*
	*	LOOP TESTS INDICATE - RESISTANCE	*
	*	(DISPATCH TO ONU)	*
	*	CHANNEL-SINGLE PARTY SERVICE	*
	*	FAULT LESS THAN 150 KOHMS	*
	*		*

sam57.ps

Figure 4-50. Typical SAM Mask for Test Signature #57

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
 REQ L# CMT CA CO: SLC SERIES 5
 TEMP(F) PR OVER OSP:
 LOOPX TERM: SINGLE PARTY
 VER 5X: PROBABLE FIBER-IN-THE-LOOP FOUND - CHANNEL - SINGLE PARTY SERVICE
 LOOP TESTS INDICATE -- RESISTANCE FAULT LESS THAN 150 KOHMS
 (DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
44	T-R	57.93	T-R
56	0 T-G	90.39	0 T-G
56	0 R-G	91.08	0 R-G

tv57.ps

Figure 4-51. Typical TV Mask for Test Signature #57

SAM SYSTEM: m2 PRTR: B851 BY: JL

REQ: DVER -N 58 NPANNX: EXK:

NEXT (Y/N): STATUS: ENABLED

INPUT:

VER: 99	MLT: KOHMS		DC SIGNATURE VOLTS			DECISION RULE (Y)
	MIN	MAX	MIN	MAX		
	54.00	64.00			T-R	() VER
	84.00	96.00	-4.00	4.00	T-G	() SIGNATURE
	84.00	96.00	-4.00	4.00	R-G	() VER OR SIGNATURE
						(Y) VER AND SIGNATURE

OUTPUT:

VER: 5X	*	PROBABLE FIBER-IN-THE-LOOP FOUND -	*
	*	LOOP TESTS INDICATE - RESISTANCE	*
	*	(DISPATCH TO ONU)	*
	*	PAIR GAIN CHANNEL FAILURE	*
	*	LESS THAN 150 KOHMS	*
	*		*

sam58.ps

Figure 4-52. Typical SAM Mask for Test Signature #58

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 5C: PROBABLE FIBER-IN-THE-LOOP FOUND - PAIR GAIN CHANNEL FAULURE
LOOP TESTS INDICATE -- RESISTANCE FAULT LESS THAN 150 KOHMS
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
44	T-R	57.93	T-R
56	0 T-G	90.39	0 T-G
56	0 R-G	91.08	0 R-G

tv58.ps

Figure 4-53. Typical TV Mask for Test Signature #58

```
SAM      SYSTEM:  m2      PRTR: B851      BY: JL
REQ:  DVER -N 59      NPANNX:      EXK:
NEXT  (Y/N):      STATUS: ENABLED
INPUT:
      VER:  25      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              64.00    74.00      -4.00    4.00      T-R      ( ) VER
              84.00    96.00      -4.00    4.00      T-G      ( ) SIGNATURE
              84.00    96.00      -4.00    4.00      R-G      ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER:  6X      *  PROBABLE FIBER-IN-THE-LOOP FOUND -      *
                   *  LOOP TESTS INDICATE - ROH              *
                   *  (DISPATCH TO ONU)                      *
                   *  CHANNEL-SINGLE PARTY SERVICE            *
                   *                                           *
                   *                                           *
```

sam59.ps

Figure 4-54. Typical SAM Mask for Test Signature #59

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 6X: PROBABLE FIBER-IN-THE-LOOP FOUND - CHANNEL-SINGLE PARTY SERVICE
LOOP TESTS INDICATE -- ROH
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
49	T-R	67.89	T-R
58	0 T-G	90.43	0 T-G
58	0 R-G	91.08	0 R-G

tv59.ps

Figure 4-55. Typical TV Mask for Test Signature #59

```
SAM      SYSTEM:  m2          PRTR: B851      BY: JL
REQ:    DVER -N 60          NPANNX:          EXK:
NEXT  (Y/N):              STATUS: ENABLED
INPUT:
      VER: 99      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              64.00    74.00      -4.00    4.00    T-R    ( ) VER
              84.00    96.00      -4.00    4.00    T-G    ( ) SIGNATURE
              84.00    96.00      -4.00    4.00    R-G    ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER: 6C      * PROBABLE FIBER-IN-THE-LOOP FOUND -      *
                  * LOOP TESTS INDICATE - ROH                *
                  * (DISPATCH TO ONU)                        *
                  * PAIR GAIN CHANNEL FAILURE                  *
                  *                                           *
                  *                                           *
```

sam60.ps

Figure 4-56. Typical SAM Mask for Test Signature #60

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 6C: PROBABLE FIBER-IN-THE-LOOP FOUND - PAIR GAIN CHANNEL FAILURE
LOOP TESTS INDICATE -- ROH
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
49	T-R	67.89	T-R
58	0 T-G	90.43	0 T-G
58	0 R-G	91.08	0 R-G

tv60.ps

Figure 4-57. Typical TV Mask for Test Signature #60

```
SAM      SYSTEM:  m2      PRTR: D903      BY: JL
REQ:  DVER -N 61      NPANNX:      EXK:
NEXT  (Y/N):      STATUS: ENABLED
INPUT:
      VER:  25      MLT:      DC SIGNATURE
              KOHMS      VOLTS
              MIN      MAX      MIN      MAX
              74.00    86.00      -4.00    4.00      T-R      ( ) VER
              84.00    96.00      -4.00    4.00      T-G      ( ) SIGNATURE
              84.00    96.00      -4.00    4.00      R-G      ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER:  7X      *  PROBABLE FIBER-IN-THE-LOOP FOUND -      *
                   *  LOOP TESTS INDICATE -- !!HAZARDOUS      *
                   *  (DISPATCH TO ONU)                      *
                   *  CHANNEL-SINGLE PARTY SERVICE             *
                   *  VOLTAGE!! TAKE PROPER PRECAUTIONS       *
                   *                                           *
```

sam61.ps

Figure 4-58. Typical SAM Mask for Test Signature #61

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 7C: PROBABLE FIBER-IN-THE-LOOP FOUND - CHANNEL-SINGLE PARTY SERVICE
LOOP TESTS INDICATE -- !!HAZARDOUS VOLTAGE!! TAKE PROPER PRECAUTIONS
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
52	T-R	77.89	T-R
59	0 T-G	90.43	0 T-G
59	0 R-G	91.08	0 R-G

tv61.ps

Figure 4-59. Typical TV Mask for Test Signature #61

```
SAM      SYSTEM:  m2      PRTR: B851      BY: JL
REQ:  DVER -N 62      NPANNX:      EXK:
NEXT  (Y/N):      STATUS: ENABLED
INPUT:
      VER:  99      MLT:      DC SIGNATURE
              KOHMS      VOLTS      DECISION RULE (Y)
              MIN      MAX      MIN      MAX
              74.00      86.00      -4.00      4.00      T-R      ( ) VER
              84.00      96.00      -4.00      4.00      T-G      ( ) SIGNATURE
              84.00      96.00      -4.00      4.00      R-G      ( ) VER OR SIGNATURE
                                ( Y ) VER AND SIGNATURE

OUTPUT:
      VER:  7C      *  PROBABLE FIBER-IN-THE-LOOP FOUND -      *
                    *  LOOP TESTS INDICATE -- !!HAZARDOUS      *
                    *  (DISPATCH TO ONU)                      *
                    *  PAIR GAIN CHANNEL FAILURE              *
                    *  VOLTAGE!! TAKE PROPER PRECAUTIONS      *
                    *                                           *
```

sam62.ps

Figure 4-60. Typical SAM Mask for Test Signature #62

TV EC 914 PRTR D903 REQ BY MS CB 02-20-95 1120A

TN 214 231 0491 SW: ESS-1 OE: 002-327-007
REQ L# CMT CA CO: SLC SERIES 5
TEMP(F) PR OVER OSP:
LOOPX TERM: SINGLE PARTY
VER 7C: PROBABLE FIBER-IN-THE-LOOP FOUND - PAIR GAIN CHANNEL FAILURE
LOOP TESTS INDICATE -- !!HAZARDOUS VOLTAGE!! TAKE PROPER PRECAUTIONS
(DISPATCH TO ONU)

CRAFT: DC SIGNATURE		MLT: DC SIGNATURE	
KOHMS	VOLTS	KOHMS	VOLTS
52	T-R	77.89	T-R
59	0 T-G	90.43	0 T-G
59	0 R-G	91.08	0 R-G

tv62.ps

Figure 4-61. Typical TV Mask for Test Signature #62

Table 4-4. DC Signatures (Numbers 1 through 14)

Indication	MLT DC Signature Ranges		TR-909 Requirements		Uncat Term	Single Party Chan OK	Single Party Chan FAIL
	T-R (k-ohms)	T-G, R-G (k-ohms)	T-R (k-ohms)	T-G, R-G (k-ohms)	Ver 25	Ver 95	Ver 99
ONU Equipment Failure	15-24	84-96	17.8	90.9	1	1	1
FEMF	24-34	84-96	27.8	90.9	2		11
Test Okay	34-44	84-96	38.3	90.9	3		12
Termination Test Failed	44-54	84-96	48.3	90.9	4		13
Resistive Fault	54-64	84-96	58.0	90.9		5	14
Receiver Off Hook	64-74	84-96	68.0	90.9		6	
Hazardous Potential	74-86	84-96	78.5	90.9		7	
HDT-to-ONU							
Failure	715-3500	84-96	≥1000	90.9	8	8	8
HDT Optical Line							
Unit Failure	15-24	102-116	17.8	110	9	9	9
Customer Premises							
Trouble (MTU)	24-34	102-116	27.8	110	10		
Reserved for Future Use	34-44	102-116	38.3	110			
Reserved for Future Use	44-54	102-116	48.3	110			
Reserved for Future Use	54-64	102-116	58.0	110			

Continued on next page.

Table 4-4. DC Signatures (Numbers 1 through 14)—Continued

Indication	MLT DC Signature Ranges		TR-909 Requirements		Uncat Term	Single Party Chan OK	Single Party Chan FAIL
	T-R (k-ohms)	T-G, R-G (k-ohms)	T-R (k-ohms)	T-G, R-G (k-ohms)	Ver 25	Ver 95	Ver 99
ONU Equipment Failure	15-24	84-96	17.8	90.9	1	1	1
Reserved for Future Use	64-74	102-116	68.0	110			
Reserved for Future Use	74-86	102-116	78.5	110			
Reserved for Future Use	715-3500	102-116	≥1000	110			

Table 4-5. DC Signatures (Numbers 50 through 62)

Indication	MLT DC Signature Ranges		TR-909 Requirements		Single Party Chan OK	Single Party Chan FAIL
	T-R (k-ohms)	T-G, R-G (k-ohms)	T-R (k-ohms)	T-G, R-G (k-ohms)	Ver 95	Ver 99
ONU Equipment Failure	15-24	84-96	17.8	90.9	50-1X	50-1X
FEMF	24-34	84-96	27.8	90.9	51-2X	52-2C
Test Okay	34-44	84-96	38.3	90.9	53-3X	54-3C
Termination Test Failed	44-54	84-96	48.3	90.9	55-4X	56-4C
Resistive Fault	54-64	84-96	58.0	90.9	57-5X	58-5C
Receiver Off Hook	64-74	84-96	68.0	90.9	59-6X	60-6C
Hazardous Potential	74-86	84-96	78.5	90.9	61-7X	62-7C
HDT-to-ONU					<i>SLC</i> [®] -2000 or <i>SLC</i> Series 5 MSDT Not Available	
Facility Failure	715-3500	84-96	≥1000	90.9		
HDT Optical Line						
Unit Failure	15-24	102-116	17.8	110		
Customer Premises						
Trouble (MTU)	24-34	102-116	27.8	110		
Reserved for Future Use	34-44	102-116	38.3	110		
Reserved for Future Use	44-54	102-116	48.3	110		
Reserved for Future Use	54-64	102-116	58.0	110		
Reserved for Future Use	64-74	102-116	68.0	110		
Reserved for Future Use	74-86	102-116	78.5	110		
Reserved for Future Use	715-3500	102-116	≥1000	110		

Testing With Other Than MLT Equipment

If necessary, the *SLC-2000* MSDT can be tested using equipment other than MLT, including the *SLC-2000* Access System integral test head (ITH) or the *4TEL*^{*} Computer-Controlled Diagnostic System *RMU*[†] telephone line test measurement apparatus. When the local exchange carrier (LEC) uses a test system other than MLT, it may be possible to use that system to measure the DC signatures that show the status of the *SLC-2000* MSDT feature. The degree to which that testing system could be automated depends on the specific test system. This document provides adequate information to allow the LEC to use DC signatures with another test system.

* *4TEL* is a registered trademarks of Teledyne, Inc.

† *RMU* is a registered trademarks of Teledyne, Inc.

Contents

Introduction	5-1
120 V AC Local Powering	5-1
■ Wall-Mounted MSDT	5-2
■ Pole-Mounted MSDT	5-2
■ Pad-Mounted MSDT	5-2
-48 V DC Local Powering	5-2
-130 V DC Central Powering	5-6
±130 V DC Central Powering	5-10
-130 or ±130 V DC Peak Leveling Central Powering	5-14
60 V AC Central Powering	5-14

Introduction

This chapter describes the various options available for providing power to the electronics in the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) feature.

The *SLC*-2000 MSDT allows a variety of powering options. By using the proper combination of power interface unit (PIU) and power converter unit (PCU), the MSDT can be powered from the following:

- 120 V AC local powering (AUA414 PIU and AUA412 PCU)
- –48 V DC local powering (AUA415 PIU and AUA412 PCU)
- –130 V DC central powering without peak leveling (AUA416 PIU and AUA417 PCU)
- –130 V DC central powering with peak leveling (AUA426 PIU and AUA417 PCU)
- ±130 V DC central powering without peak leveling (AUA416 PIU and AUA427 PCU)
- ±130 V DC central powering with peak leveling (AUA426 PIU and AUA427 PCU)
- 60 V AC central powering (AUA424/AUA434 PIU and AUA422 PCU).



NOTE:

See Chapter 3 for Field Wiring Box ED numbers unless otherwise specified.

120 V AC Local Powering

The use of local 120 V AC power represents some departure from traditional telephony practice. Local AC powering is often the most simple but requires

batteries at the SLC-2000 MSDT to provide at least 10 hours of service during primary power failures. Depending on MSDT location, commercial 120 V AC power can be obtained directly from the power utility, with or without a power meter, or from the customer premises.

This section describes some of the suggested arrangements that can be used to provide customer supplied 120 V AC power to a wall-mounted MSDT enclosure. This description does not include all possible powering arrangements and does not suggest that other arrangements cannot be used. Verify that local building and electrical codes are strictly adhered to regardless of the powering arrangement used.

Wall-Mounted MSDT

One arrangement for providing AC power to an MSDT uses a weatherproof electrical box located on the outside wall of the living unit. This box is installed by an electrician and connected to a single circuit breaker located in the customer's circuit breaker panel. If the MSDT field wiring box (FWB) is to be fitted with a power cord terminated with a molded plug, then the electrical box must be equipped with an AC outlet (for example, a *Hoffman*^{*} A-6R44 3R unit). Otherwise, the MSDT FWB must be hard wired to the electrical box.

Pole-Mounted MSDT

A pole-mounted MSDT obtains AC power directly from the power company pole mounted transformer. The power from the transformer to the MSDT FWB should be under the control of a switch or circuit breaker for protection. Whether or not a power meter must be used on the AC power line to the MSDT depends on the billing arrangements that can be worked out with the power company.

Pad-Mounted MSDT

Commercial 120 V AC power is fed to a pad-mounted MSDT by underground power lines enclosed in a conduit.

–48 V DC Local Powering

The –48 V DC local powering system consists of a DC backpowering power source enclosure, which is mounted on each living unit connected to the MSDT enclosure, and the FWB located in the MSDT enclosure. The DC backpowering power source enclosure provides environmental protection for a –48 V DC backpowering power source (COMCODE 406177006) and, in some instances, a

* Registered trademark of Federal Cartridge Corporation.

120 V AC outlet. The power source is a *UL*^{*} Listed power supply enclosed in a metal case (Figure 5-1). It converts customer supplied 120 V AC to low current –48 V DC (Class II under National Electric Code Standards) power which is supplied by copper wire drop cable to the MSDT FWB. Powering for the MSDT is shared among several of the living units served from the MSDT as long as each living unit has an operating DC back powering power source. The maximum number of DC backpowering sources that can supply power to a single MSDT is determined by the type of FWB located in the MSDT. The ED-7C712-30, Group 21 and 22 FWB can accept power from a maximum of five and eight DC backpowering sources, respectively. However, in situations where only one or two living units are supplying power to an MSDT, the maximum number of lines of narrowband service that can be provided without degradation is 12 or 24, respectively.

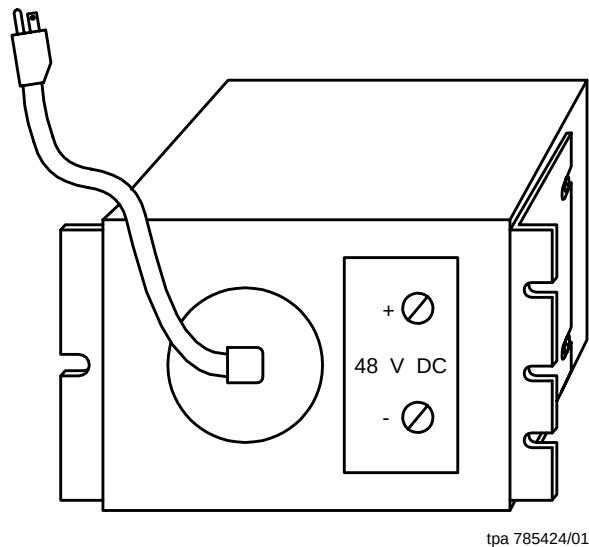
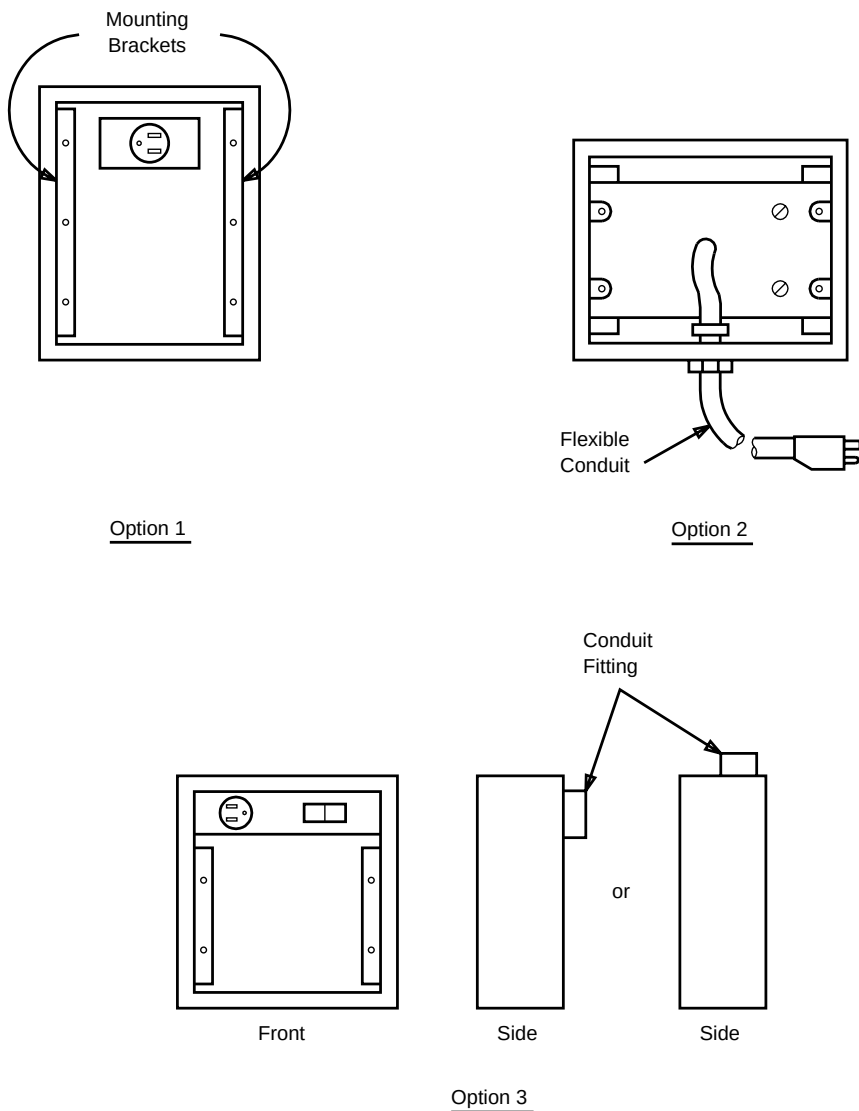


Figure 5-1. DC Backpowering Power Source

* Registered trademark of Underwriters Laboratories, Inc.

The type of enclosure used to house the DC power source is left to the discretion of each individual telephone company. However, some examples of approved enclosures that are available are described in the following paragraphs and shown in Figure 5-2. The option number below each enclosure in Figure 5-2 corresponds to the option number in the description that follows.



tpa 785209/01

Figure 5-2. Power Source Enclosures

OPTION 1

A J806HPL *UL* Listed, oiltight, dust free, fiberglass outdoor enclosure measuring 8 inches high, 6 inches wide, and 4-3/8 inches deep. The enclosure has silicone gaskets, integral mounting feet, and a fiberglass door with stainless steel piano-type hinges, a latch, and padlock hasp. The enclosure can be purchased from Robroy Industries, Belding, Michigan. In addition to the DC power source, the enclosure must be equipped with the following:

- *SF1* Myers Hub or Thomas & Betts 370 Hub mounted through the box wall to act as an entrance hole for AC power line connection
- Surface mount utility box measuring 4 inches long and 2-1/8 inches wide
- Single position 120 V AC outlet
- Single position outlet coverplate
- –48 V DC entrance grommet (COMCODE 803764208 or Part Number WP 92128, L3) mounted through the bottom of the box to act as an entrance hole for the DC metallic drop cable
- Right and left backpowering power source mounting brackets (COMCODE 846513893 and 846513885, respectively). Also orderable with the –48 V DC entrance grommet through Part Number WP 92128, L3.

- OPTION 2** A J606HPL outdoor enclosure (COMCODE 406177014 or Part Number 92128, L2), measuring 6 inches high, 6 inches wide, and 4-3/8 inches deep, is equipped with the DC backpowering power source and a flexible conduit power cord. This enclosure must be used with a lockable enclosure such as a *Hoffman* A-6R44 3R unit or an Ekstrom^{*} enclosure/power ring in order to receive AC power ring. The enclosure/power ring can be purchased from Ekstrom Industries, Inc., Farmington Hills, Michigan. Due to the various types of power meter pans/sockets used by the power companies, coordination between the telephone company, the power company, and *Ekstrom* Industries is required in order to ensure that the power ring adapters are compatible with the meter pans/sockets. Before installing this enclosure, verify that it is equipped with an 8-amp circuit breaker.
- OPTION 3** A J606HPL outdoor metal enclosure measuring 6 inches high, 6 inches wide, and 4-3/8 inches deep. This enclosure is equipped with a 120 V AC outlet, circuit breaker, and power source mounting brackets. Two models of this enclosure are available: model 1000-SP2493 is equipped with a 1/2-inch conduit hub on the back, and model 1000-SP2484 is equipped with a 1/2-inch conduit hub on the top. This enclosure can be purchased from Ekstrom Industries, Inc., Farmington Hills, Michigan.

* Registered trademark of Ekstrom Industries, Inc.

–130 V DC Central Powering

The –130 V DC central powering option permits the use of a single –130 V DC central powering system (CPS), or several smaller –130 V DC CPSs to provide powering for SLC-2000 MSDTs from a remote powering point (PP) or remote terminal (RT) site. When located at a remote powering point, the CPS equipment can be housed in a 51A or 80A cabinet. The typical CPS equipment arrangement in a 51A and 80A cabinet is shown in Figure 5-3 and Figure 5-4, respectively. At an host digital terminal (HDT) site, the CPS equipment can be housed in bays within a controlled environment vault (CEV) or hut or combined with the SLC Series 5 or SLC-2000 HDT in an 80-type cabinet. One possible arrangement with a SLC Series 5 HDT in an 80E-BP cabinet is shown in Figure 5-5.

The CPS accepts commercial 120, 208, or 240 V AC power, converts it to –130 V DC (Class III under National Electric Code Standards), and supplies it to the MSDT electronics over copper pairs into the FWB of the MSDT. The MSDT FWB provides protection from lightning and power cross on the power lines. The battery string in the CPS also provides 8 hours of backup power during AC input failures. Accommodations can be made for an engine alternator for extended AC outages.

The CPS equipment at the powering point consists of the following:

- Rectifiers
- Battery strings
- –130 V DC converters
- 100 VA limiters
- Lightning protection
- Interconnection to the outside plant and alarms.

The AC input is fed to a standard –48 V DC battery plant. The output of this plant is fed to the converters to produce –130 V DC that is placed through current limiters and protectors on a panel for connection to the outside plant.

The CPS is typically connected to the MSDT FWB using 19- and 22-gauge copper wire pairs. The number of pairs required for any given MSDT depends on the distance between the CPS and the MSDT and the number of lines provided by the MSDT.

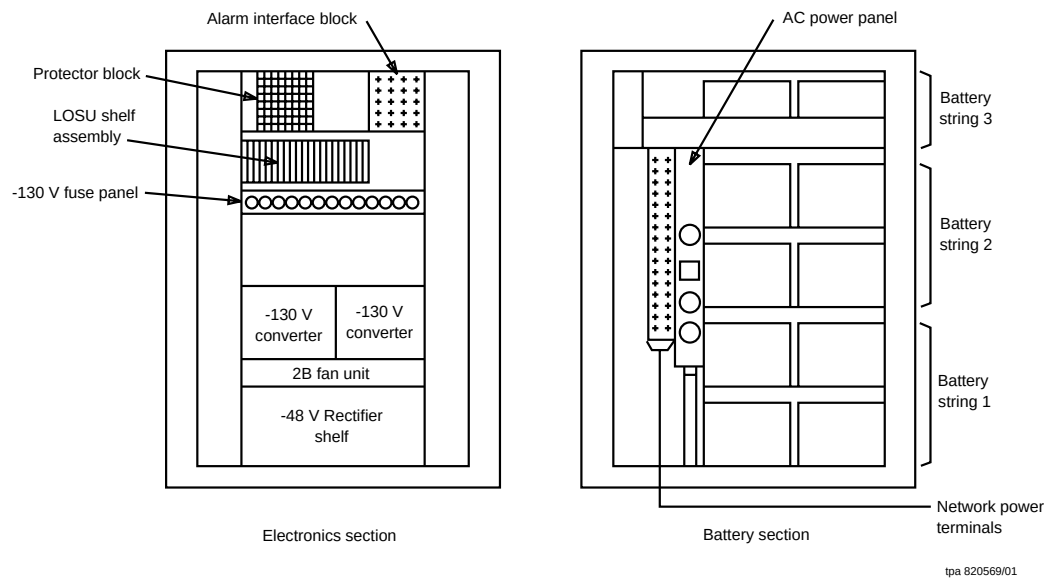
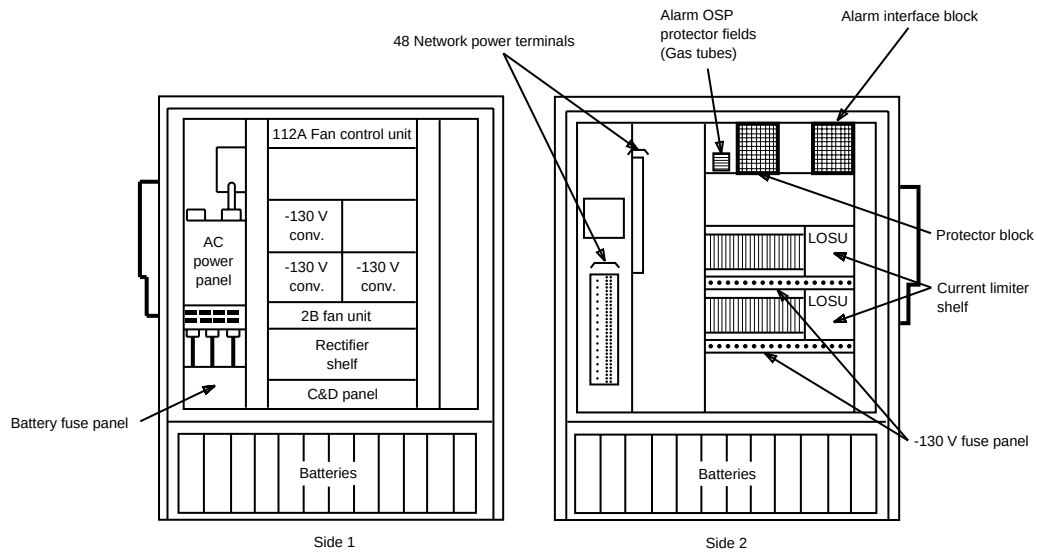


Figure 5-3. Typical –130 V DC CPS Equipment Arrangement in a 51A Cabinet



tpa 820570/01

Figure 5-4. Typical -130 V DC CPS Equipment Arrangement in an 80A Cabinet

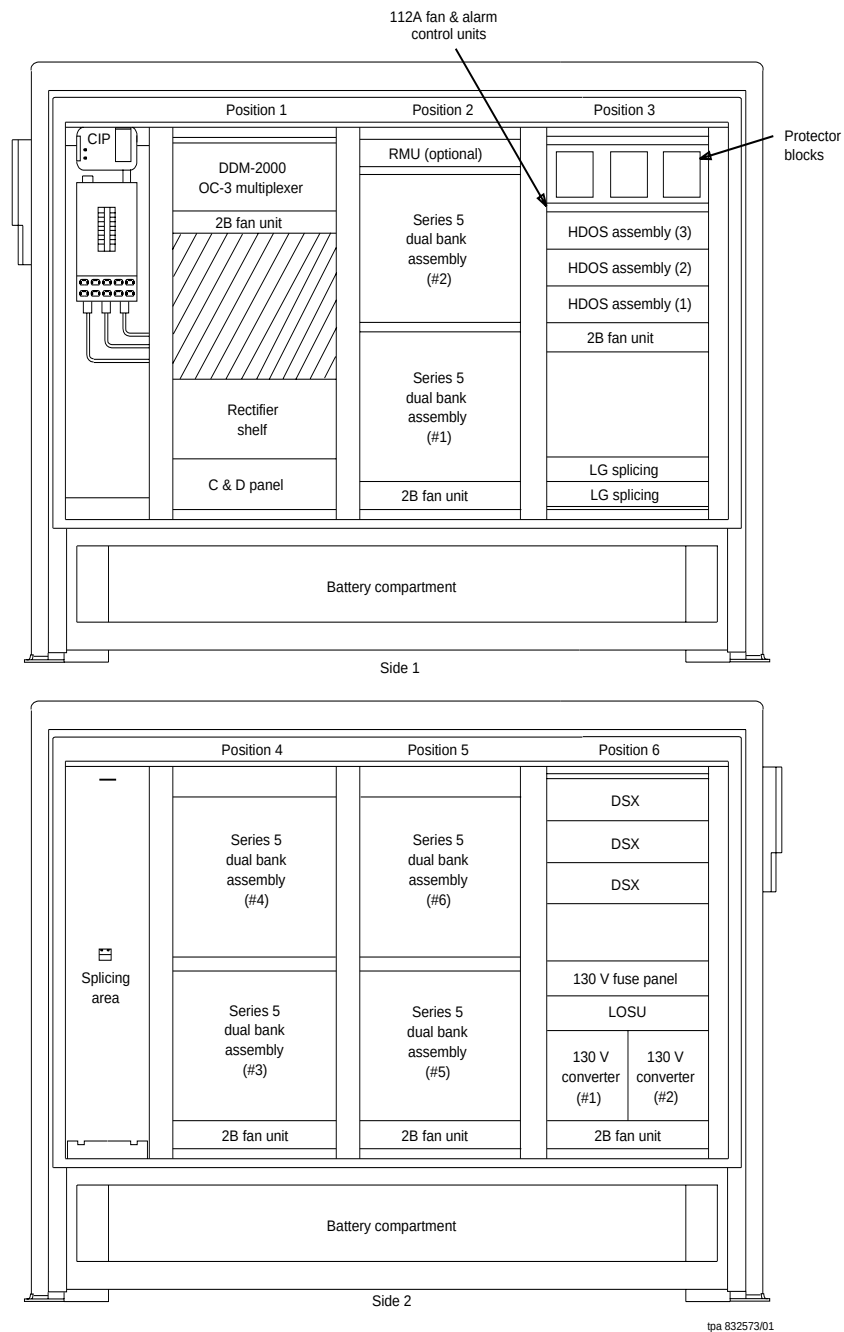


Figure 5-5. SLC® Series 5 Transmission and -130 V DC CPS Equipment in an 80E-BP Cabinet (Typical)

±130 V DC Central Powering

The ±130 V DC central powering option offers extended range powering to the *SLC-2000* MSDT. It is particularly useful in rural applications where the power point must be located an extraordinary distance (sometimes several miles) from the MSDT. This powering option is a modification of the –130 V DC central powering option, but it allows the distance between the power point and an MSDT to increase by a factor of four without an increase in the amount of copper needed.

The ±130 V DC central powering option also permits the use of a single ±130 V DC CPS or several smaller ±130 V DC CPSs to provide powering for *SLC-2000* MSDTs from a remote power point or HDT site. When located at a remote powering point, the CPS equipment can be housed in a 51A cabinet (Figure 5-6) or 80A cabinet (Figure 5-7). At an HDT site, the CPS equipment can be housed in bays within a CEV or hut or combined with *SLC* transmission equipment in an 80A, 80D, or 80E cabinet. One possible arrangement with a *SLC* Series 5 HDT in an 80E-BP cabinet is shown in Figure 5-8.

The CPS accepts –48 V DC power, converts it to ±130 V DC (Class III under National Electric Code Standards), and supplies it to the MSDT electronics over copper pairs into the FWB of the MSDT. The MSDT FWB provides protection from lightning and power cross on the power lines. The current limiter shelf in the CPS is equipped with new power units (AUA428) that perform voltage conversion and power limiting on one plug-in unit. Each AUA428 PU is designed to serve one MSDT. The CPS equipment at the power point consists of the following equipment:

- Power converter units
- Current limiters
- Lightning protectors
- Interconnection to the outside plant and alarms.

The CPS is typically connected to the MSDT FWB using 19- and 22-gauge copper wire pairs. The number of pairs required for any given MSDT depends on the distance between the CPS and the MSDT and the number of lines provided by the MSDT.

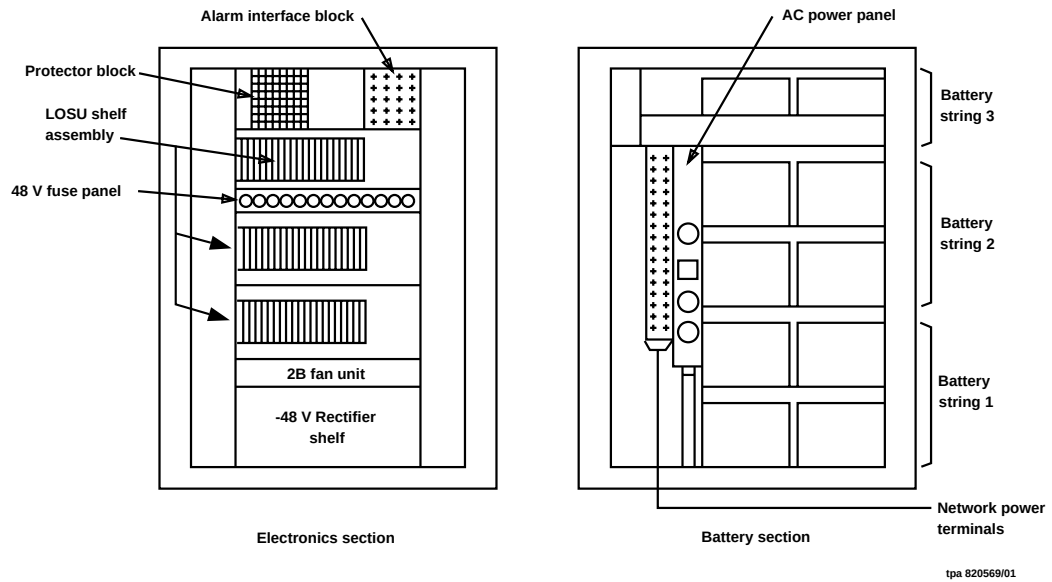
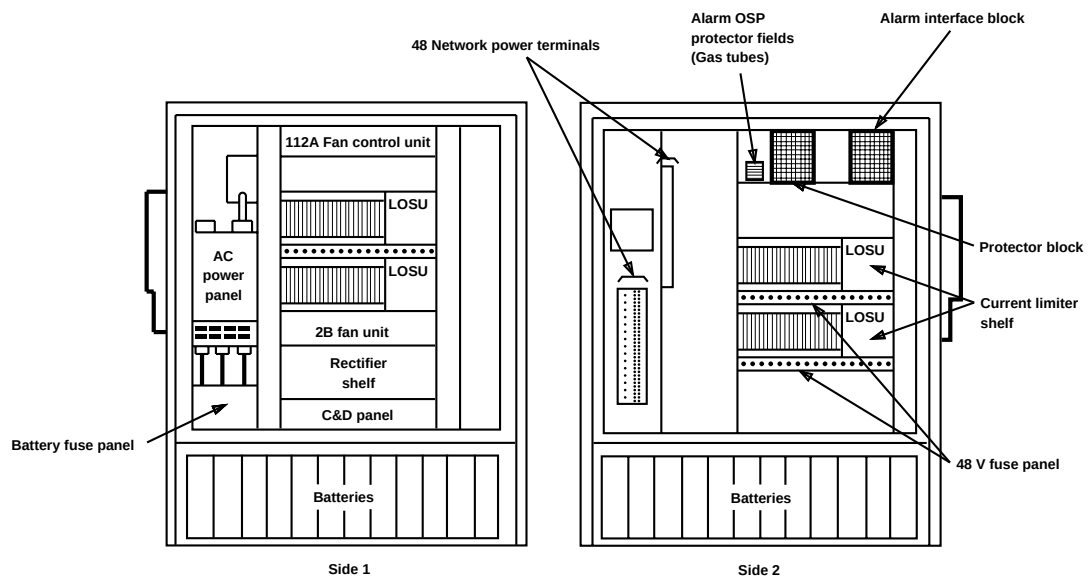


Figure 5-6. Typical +130 V DC CPS Equipment Arrangement in a 51A Cabinet



130.80a.ps

Figure 5-7. Typical +130 V DC CPS Equipment Arrangement in an 80A Cabinet

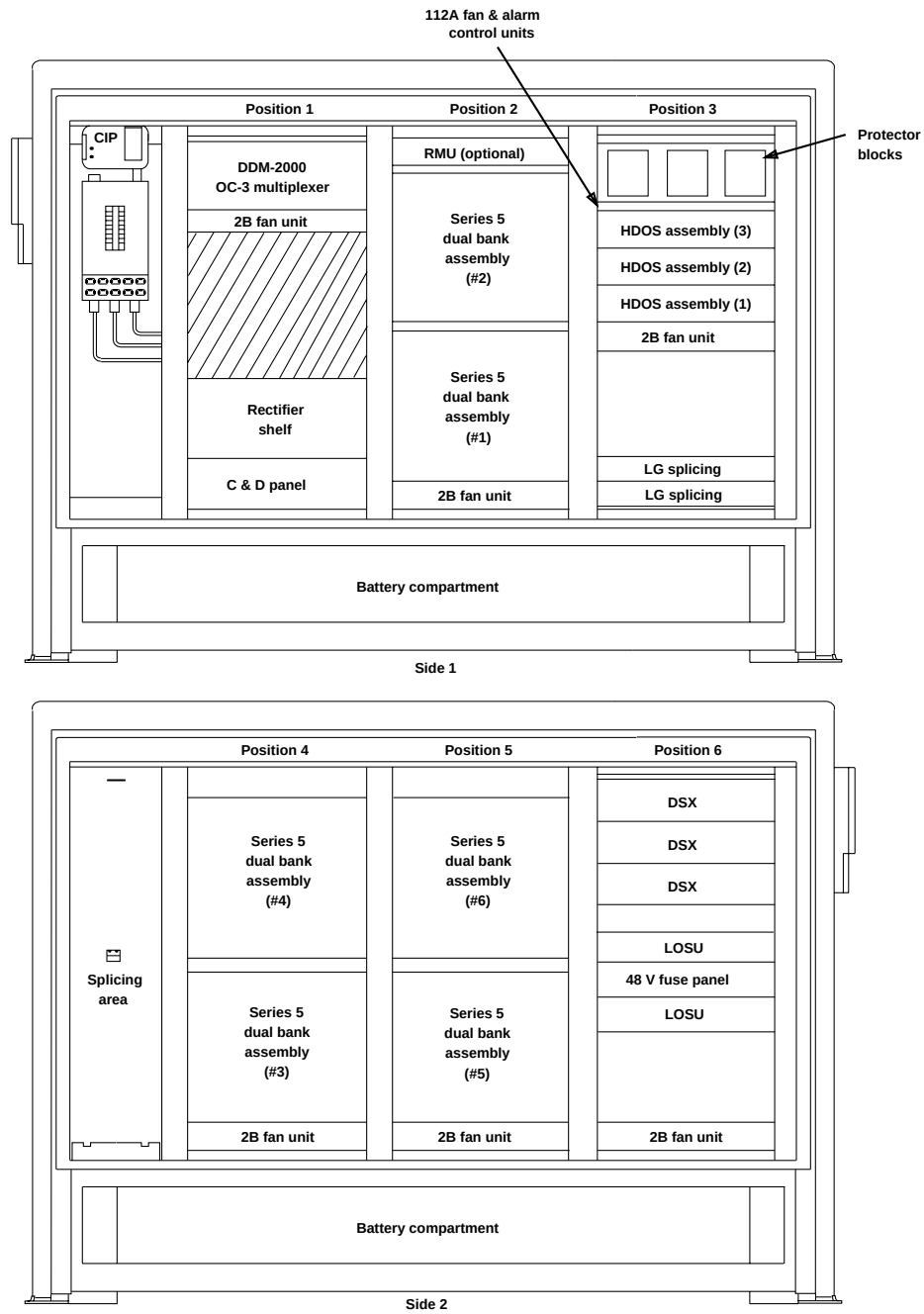


Figure 5-8. SLC® Series 5 Transmission and +130 V DC CPS Equipment in an 80E-BP Cabinet (Typical)

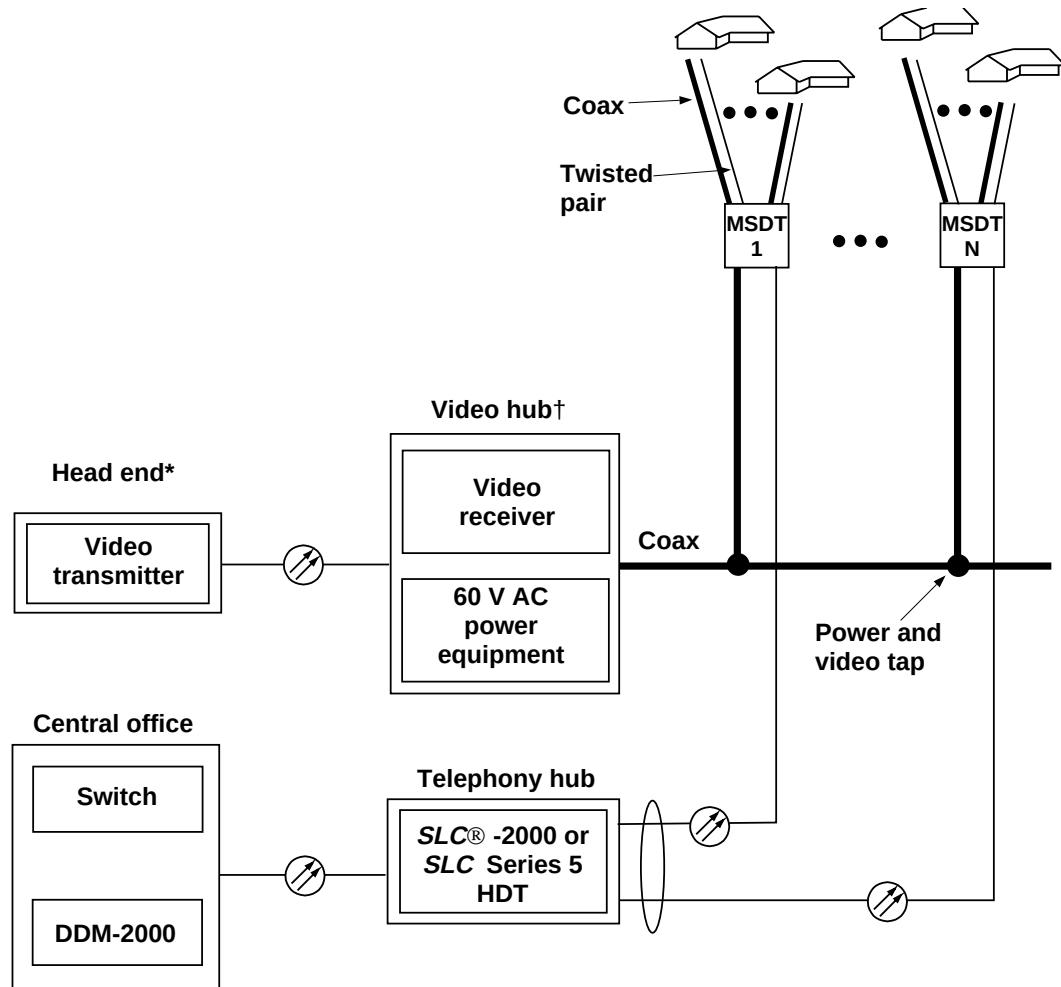
–130 or ± 130 V DC Peak Leveling Central Powering

The –130 or ± 130 V DC peak leveling central powering option is identical to the central powering option described earlier, except for the batteries used in the MSDT to provide additional power during periods of increased power consumption. In the infrequent cases when the traffic and power demands exceed the available power from the CPS, the remainder of the required power is obtained from the MSDT batteries. The effective range of the CPS is increased when batteries are used in the MSDT to provide peak leveling. This allows the copper pairs between the CPS and the MSDT to be engineered for lower traffic levels.

60 V AC Central Powering

The 60 V AC central powering option is applicable when a combination of telephony and coax video services are being provided. The 60 V AC powering equipment eliminates the need for separate powering pairs.

Applications that require telephony and video services could collocate the video receiver, the HDT, and the powering equipment as shown in Figure 5-9. Coaxial cable is used from this hub to the MSDTs and carries the video signals and power for operating amplifiers and the connected MSDTs. At the MSDT, a power inserter is used to separate the video signals from the power. The MSDT then uses this power to operate its internal circuitry. An RF tap can be used at the MSDT to provide individual video feeds to each customer feed from the MSDT. This application requires the use of the AUA424 or AUA434 power interface unit (PIU) and the AUA422 power converter unit (PCU). These two power conditioning boards allow the MSDT to operate from 60 V AC.



* Video head end could be at central office.

† Video hub and telephony hub may be combined into single enclosure.

video.hub.ps

Figure 5-9. 60 V AC Central Powering

Contents

General Specifications	6-1
■ Channel Units	6-1
■ Optical Units	6-7
AYB1B/AYB1C/AYB3 and BYB1B/BYB1C*/BYB3 OU	6-7
AYB5 and BYB5 OU	6-7
■ High Density Optics Shelf (HDOS) Alarm Output	6-8
■ Ringing Generator	6-8
■ Terminal-to-Terminal Voice-Frequency Transmission	6-8
■ Signaling Mode	6-24
■ Optical Fiber Link	6-24
■ Circuit Maintenance	6-24
■ Digital Data Performance	6-25
Physical and Environmental Specifications	6-25
■ SLC® Series 5 HDT	6-25
■ SLC-2000 HDT	6-28
■ SLC-2000 MSDT	6-31

General Specifications

The specifications for the channel banks, channel units (CUs), digital lines, and enclosures used to house the *SLC*[®] Series 5 Carrier System and *SLC*-2000 Access System host digital terminal (HDT) and *SLC*-2000 Multi-Services Distant Terminal (MSDT) equipment are given in this chapter.

Channel Units

The following tables list the channel units that can be installed in the MSDT:

- Table 6-1. *SLC* Series 5 Channel Units
- Table 6-2. *SLC*-2000 Channel Units.

Table 6-1. Series 5 Channel Units Supported in the SLC[®]-2000 MSDT

CU Code	CU Type	Services and Functions Provided
AUA25B*†	POTS/M SPOTS [®]	POTS, Centrex line, FX Trunk, FX Line, WATS Trunk, WATS Line, PBX-CO Trunk, Off-Premises Extension, Secretarial Line, Off-Premises Station (OPS) (station end)
AUA27	POTS + VerSuS‡ Alarms	POTS, VerSuS Alarms
AUA31†§	POTS CS	OPS (PBX end)
AUA32†	POTS/SPOTS CS	Same as AUA31
AUA38†§	POTS CS + OHT	Same as AUA31
AUA39†	POTS/SPOTS CS + OHT	Same as AUA31
AUA45B¶	Ringdown Repeater	Private Line Ringdown
AUA51*†	POTS/SPOTS	Same as AUA25B
AUA53()	Coin	Coin. AUA53B adds inventory
AUA55()**	Multiparty	Multiparty
AUA56()	DID	PBX-CO DID Trunk
AUA57	FSR	Frequency Selective Ringing
AUA58B*†	POTS + OHT	POTS, Telemetry, FX Line, Off-Premises Extension, WATS Line, Secretarial Line, OPS (station end), Centrex Line
AUA59*†	POTS/SPOTS	Same as AUA25B
AUA75¶	Private Line Automatic Ringdown	Private Line Ringdown
AUA150†	POTS/SPOTS + OHT	Same AUA25B, Telemetry
AUA150C††	POTS/SPOTS + OHT	Same AUA150, plus ALC and inventory

Continued on next page

See footnotes at end of table.

Table 6-1. Series 5 Channel Units Supported in the SLC®-2000 MSDT —
Continued

CU Code	CU Type	Services and Functions Provided
AUA151††	POTS/ <i>SPOTS</i> CF w/o OSIP+OHT/ <i>CLASS</i> *	POTS/ <i>SPOTS</i> CU
AUA158(B,C)†	ALC POTS + OHT	Same as AUA58B
AUA159(B,C)†	ALC POTS/ <i>SPOTS</i> + OHT	Same as AUA150
AUA178††	ALC C-POTS CF OHT/ <i>CLASS</i>	ALC C-POTS CU
AUA179††	ALC C-POTS/ <i>SPOTS</i> CU OHT/ <i>CLASS</i> ALIC5	ALC C-POTS/ <i>SPOTS</i> CU
AUA200††	2-wire Switched 56-kb/s DPX	Switched 56 CU
AUA232††	RS-232 DSU Dataport	RS-232 Dataport
<i>MCU</i> †-5205††	Metallic Channel Unit	CU for alarm and telemetry services
AUA41()	4W VF CF	DX4: PBX tie trunk, DX signaling normal or reverse polarity; FXS: foreign exchange line or trunk, no toll diversion, loop or ground-start, normal or reverse polarity; FXT: foreign exchange trunk, toll diversion, loop or ground-start, normal or reverse polarity; TO: Transmission only.
AUA42()	E <i>SPOTS</i> CS	FXO: OPS (PBX end); TO: Transmission only.
AUA43()	E <i>SPOTS</i> CF	FXS: foreign exchange line or trunk with toll diversion; OPS line (station end); TO: Transmission only.
AUA44()	4W VF CS	FXO: OPS (PBX end), loop- or ground-start, normal or reverse polarity
AUA52¶	Dataport	DDS/BDS (2.4, 4.8, 9.6, and 56 kb/s)

See footnotes at end of table.

Continued on next page

Table 6-1. Series 5 Channel Units Supported in the SLC®-2000 MSDT —
Continued

CU Code	CU Type	Services and Functions Provided
AUA52B¶	All-Rate Dataport	DDS/BDS (2.4, 4.8, 9.6, 19.2, 56, and 64 kb/s)
AUA54()§‡‡	4W VF E&M	EM4: PBX tie trunk, E&M signaling, Type I or II; PLR: PBX tie trunk, inverted-polarity E&M signaling
AUA252††	OCU Dataport	Dataport
AUA90§§	T-BRITE	ISDN 2B+D
See footnotes at end of table.		<i>Continued on next page</i>

Table 6-1. Series 5 Channel Units Supported in the SLC®-2000 MSDT — Continued

AUA93§§	BRITE II	ISDN B1+D, B2+D, or D
AUA94	ISDN BRI	ISDN BRI 2B+D (This circuit pack is only compatible with a SLC-2000 HDT containing software release 4.0 or later.)

* When these units are matched with an AUA39 CU in the central office terminal (COT) and used in a loop start (LS) application employing a 5ESS® switch, or any digital switch that leaves the Tip-Ground open (floating), the line will be dead for up to 4 seconds after going off-hook with a ringing telephone at the MSDT.

† To reduce costs, LECs should consider using POTS or POTS/SPOTS CUs at the MSDT for nonlocally switched and nonswitched special services. See the detailed specifications of these CUs to determine if these CUs are compatible with local practices for these services.

‡ Registered trademark of Versus Technology, Inc.

§ An MSDT housing one or more AUA31, AUA38, and AUA54 CUs must be used only in end-user premises applications because protection against outside-plant electrical hazards is not incorporated in these CUs.

¶ The AUA45B, AUA75, AUA52, and AUA52B CUs are intended for business applications and will only be supported with 12 physical CU slots allocated to the AUA406 or AUA408 (only supported in SLC Series 5 Carrier Systems).

** On multiparty circuits provided by the AUA55, the MSDT supports two-party, fully selective ringing and does not support four-party, fully selective ringing. The ringing generator unit (RGU) provides only negative-superimposed ringing; both negative- and positive-superimposed ringing are required to provide four-party, fully selective ringing.

†† You can use this channel unit only when the MSDT is hosted by a SLC-2000 HDT containing Software Release 4.2 or later.

‡‡ An MSDT tip/ring cabling arrangement without protectors is provided for the support of E&M CUs (refer to 363-205-003). Tip/ring wiring assignments for E&M CUs will be included with MSDT engineering drawings. Due to LEC administrative issues and because the E&M CU provides a single circuit, the E&M CU will only be supported in a dual-mode MSDT. Also, due to LEC administrative issues, SLC-2000 quad-circuit CUs will not be supported in an MSDT equipped with E&M CUs.

§§ When these units are used in a universal configuration or in a TR-08 integrated configuration, they can only be placed in physical slots 1 and 4. The other physical slots (slots 2, 3, 5, and 6) can be used to support other channel units. These channel units are not supported in any mode 2 configuration. There are no slot restrictions when working into an integrated digital carrier unit (IDCU) in a 5ESS® switch.

* Service mark of Bell Communications Research, Inc.

† Trademark of Tollgrade Communications, Inc.

Table 6-2. SLC[®]-2000 Channel Units Supported in the SLC[®]-2000 MSDT (Note)

CU Code	CU Type	Services and Functions Provided
SPQ [®] 400	Quad POTS ALC	POTS
SPQ401B	Quad POTS ALC and VFDE	POTS and VFDE
SPQ419	Quad Coin	Quad DTF Coin
SPQ429	Quad EBS	Quad EBS (P-Phone)
SPQ440	Quad POTS/SPOTS [®] ALC	POTS, Centrex line, FX Trunk, FX Line, WATS Trunk, WATS Line, PBX-CO Trunk, Off-Premises Extension, Secretarial Line, Off-Premises Station (OPS) (station end)
SPQ440C*	Quad POTS/SPOTS +Extended Range	Same as SPQ440 plus extended range
SPQ440D*	Quad POTS/SPOTS +Extended Range and VFDE	Same as SPQ440 plus extended range and VFDE
SPQ442*	E SPOTS CU CS	E SPOTS CU
SPQ443*	E SPOTS CU CF	E SPOTS CU
SPQ450	Quad ALIC	ALIC unit (450)
SPQ452*	Dual OCU Dataport (all rate)	DDS (2.4, 4.8, 9.6, 19.2, 56, and 64 kb/s), Switched 56 and quality monitoring
SPQ453*	Dual coin	Dual DTF/CF Coin
SPQ456*	Quad DID, DPT	Quad DID, DPT end
SPQ909()	LP-POTS	POTS service on short loops

Note: All SLC-2000 channel units used in the MSDT contain enhanced inventory.

*You can use this channel unit only when the MSDT is hosted by a SLC-2000 HDT containing Software Release 4.2 or later.

Optical Units



NOTE:

Lucent Technologies recommends the use of physical contact fiber connectors to meet the following requirements.

AYB1B/AYB1C^{*}/AYB3 and BYB1B/BYB1C^{*}/BYB3 OU

The AYB1B, AYB1C^{*}, and AYB3 optical units (OUs) are used in the HDOS at the HDT, and the BYB1B, BYB1C^{*}, and BYB3 OUs are used at the MSDT. These OUs operate within the following parameters:

■ **Receiver.**

- **Minimum sensitivity:** -40 dBm worst case, end of life (EOL), over temperature, devices and circuitry for a 1310-nm laser transmitter at 10⁻⁹ bit error rate (BER).
- **Dynamic range:** 25 dB without automatic gain control (AGC).

■ **Transmitter.**

Average power output (printed circuit board output): -23.7
±2.5 dBm worst case, EOL.

- **Reflection:** -27 dB.
- **Laser safety factor:** Class I.

AYB5 and BYB5 OU

The AYB5 optical unit (OU) is used in the HDOS at the HDT, and the BYB5 OU is used at the MSDT. These OUs operate within the following parameters:

■ **Receiver.**

- **Minimum sensitivity:** -40 dBm worst case, end of life (EOL), over temperature, devices and circuitry for a 1310-nm laser transmitter at 10⁻⁹ bit error rate (BER).
- **Dynamic range:** 25 dB without automatic gain control (AGC).

■ **Transmitter.**

- **Average power output (printed circuit board output):** -20.2
±2.5 dBm worst case, EOL.
- **Reflection:** -30 dB.
- **Laser safety factor:** Class I.

*

Discontinued Availability (DA) of the AYB1B, AYB1C, BYB1B, and BYB1C OUs. They are replaced by the AYB3 and BYB3 respectively.

High Density Optics Shelf (HDOS) Alarm Output

ALM1 and ALM2 on the power converter unit (PCU) (AYB2B) are rated at 30 VA.

Ringling Generator

The *SLC-2000* MSDT can service a drop with a maximum of 132 ohms using an AUA413 RGU which is equivalent to 1300 feet, 26-gauge loop cable, and a drop with a maximum of 1500 ohms for an AUA423 RGU.

Terminal-to-Terminal Voice-Frequency Transmission

The CUs used in the central office terminal (COT) and MSDT determine the voice-frequency (VF) transmission characteristics. The specifications for POTS, *SPOTS*[®], and coin CUs are given in Table 6-3. Table 6-4 lists the specifications for multiparty and frequency selective ringing (FSR) CUs. Specifications for the dual ringing repeater channel unit are listed in Table 6-5. Table 6-6 lists the specifications for 2- and 4-wire special services. Table 6-7, Table 6-8, Table 6-9, and Table 6-10 list the specifications for quad POTS/*SPOTS* CUs. Table 6-11 and Table 6-12 list the specifications for the *SPQ909* LP-POTS channel units.

Table 6-3. Transmission Specifications — VF Channel Units with Fixed Settings

	Value (Measured at 25°C)		
Parameter	POTS	SPOTS® Unit	Coin
Loop Resistance (Beyond the HDT excluding the set)	0-1500 Ω	CSA Loops	0-1500 Ω
Loop Current	> 20 mA	> 23 mA	
1000-Hz Loss (±0.5 dB typical, ±1.0 dB max)	1 dB (R _{EXT} ≤ 1,100 ±100) * 0 dB (R _{EXT} ≥ 1,100 ±100) *	0 dB †	
Bandwidth (Relative to the 1000-Hz loss)	0 to −3.0 dB at 300 Hz and 3000 Hz 0 to −1.5 dB at 400 Hz and 2800 Hz		
Return Loss at the COT ‡	ERL ≥ 18 dB, SRL ≥ 12 dB		
Return Loss at the HDT §	ERL ≥ 18 dB, SRL ≥ 15 dB		
Idle Channel Noise (at the HDT)	20 dBrnC Maximum		
Signal-to-Distortion Ratio (at −10 dBm)	> 33 dB		
Dial Pulse Distortion [Peak to Average Ratio (PAR)]	> 90		
Gain Tracking (1004 Hz) −37 dBm0 to +3 dBm0 −50 dBm0 to −37 dBm0	±0.5 dB Maximum (±0.25 dB Average) ±1.0 dB Maximum (±0.5 dB Average)		
See footnotes at end of table.		Continued on next page	

Table 6-3. Transmission Specifications — VF Channel Units with Fixed Settings — *Continued*

Parameter	Value (Measured at 25°C)		
	POTS	SPOTS® Unit	Coin
Intermodulation Distortion (−13 dBm0 Input)	A-B (R2) Product: > 43 dB 2A-B (R3) Product: > 44 dB		
Single Frequency Distortion (0-12 kHz 0 dBm0)	< −28 dBm0		
Impulse Noise ¶	≤ 15 Counts in 15 Minutes		
Overload at COT and HDT	≥ + 3 dBm0		
Longitudinal Balance at the HDT ** (Minimum)	200 Hz, 500 Hz, 1,000 Hz: ≥ 58 dB 3000 Hz: ≥ 53 dB		

* Measured as insertion loss between 900-ohm terminations. R_{EXT} includes both the loop resistance and the station set resistance. Actual threshold value for R_{EXT} is 1100 ohms ±100 ohms.

† Measured as the ICL with the HDT terminated in 600 ohms and with the COT terminated in 900 ohms.

‡ Measured with respect to 900 ohms and 2.16 µF with the 4-wire path broken or with the other end terminated in 1100 ohms in parallel with 0.03 µF.

§ Measured with respect to 600 ohms and 2.16 µF with the 4-wire path broken or with the other end terminated in 900 ohms and 2.16 µF.

¶ Measured with a holding tone of −13 dBm0 and a threshold of 59 dBm0.

** Measured by Institute of Electrical and Electronics Engineers (IEEE) method 455-1976.

Table 6-4. Transmission Specifications—Multiparty and FSR Channel Units

Parameter	Value (Measured at 25°C)	
	Multiparty**	FSR
Loop Resistance (Beyond the HDT excluding the set)	0-1500 Ω	0-900 Ω
1004 Hz On-Hook Loss	≤ 5 dB over 1004 Hz	On-hook transmission not supported
Loop Current	> 20 mA	
1000 Hz Loss (± 0.5 dB typical, ± 1.0 dB max)	1 dB	
Bandwidth (Relative to the 1004 Hz loss) *	-0.5 to +1.0 dB at 400 Hz and 2800 Hz	
Return Loss at the COT †	ERL ≥ 18 dB, SRL ≥ 10 dB	
Return Loss at the HDT ‡	ERL ≥ 18 dB, SRL ≥ 10 dB	
Idle Channel Noise (at the HDT)	20 dBrnC Maximum	
Signal-to-Distortion Ratio (at -10 dBm)	> 33 dB	
Dial Pulse Distortion [Peak to Average Ratio (PAR)]	> 90	
Gain Tracking (1004 Hz) -37 dBm0 to +3 dBm0 -50 dBm0 to -37 dBm0	± 0.5 dB Maximum (± 0.25 dB Average) ± 1.0 dB Maximum (± 0.5 dB Average)	
Intermodulation Distortion (-13 dBm0 Input)	A-B (R2) Product: > 43 dB 2A-B (R3) Product: > 44 dB	
Single Frequency Distortion (0-12 kHz 0 dBm0)	< -28 dBm0	
Impulse Noise §	≤ 15 Counts in 15 Minutes	
See footnotes at end of table.	Continued on next page	

Table 6-4. Transmission Specifications—Multiparty and FSR Channel Units—Continued

Parameter	Value (Measured at 25°C)	
	Multiparty**	FSR
Overload at COT and HDT	$\geq +3$ dBm0	
Longitudinal Balance at the HDT (Minimum)¶	200 Hz, 500 Hz, 1000 Hz: ≥ 58 dB 3000 Hz: ≥ 53 dB	

* Measured with a signal level of 0 dBm0, + means more loss, – means less loss.

† Measured with respect to 900 ohms and 2.16 μ F and with 900 ohms in series with 2.16 μ F in parallel with a hold coil at the HDT.

‡ Measured with respect to 900 ohms in series with 2.16 μ F with a hold coil at the HDT and with –48 V battery feed terminated with 900 ohms in series with 2.16 μ F at the COT.

§ Measured with a holding tone of –13 dBm0 at a threshold of 59 dBnC0.

¶ Measured by IEEE Method 455-1976.

** MSDT does not support positive ringing.

Table 6-5. Transmission Specifications — AUA45 Dual Ringing Repeater Channel Unit

Parameter	Value (Measured at 25°C)
Loop Design	The AUA45 channel unit is not limited to CSA design rules. Maximum cable loss should not exceed 9 dB, split in any proportion between the two end cable links. Total combined loop resistance (not including the terminating equipment) should not exceed 1500 ohms.
Structural Impedance	900 ohms +2.16 μ F
Balance Impedance	900 ohms +2.16 μ F
1,000-Hz Loss * ($\pm$ 0.5 dB typical, $\pm$ 1.0 dB max)	0 dB or 3 dB (switch selectable)
Bandwidth (Relative to the 1000-Hz loss)	+1 to -0.5 dB at 400 Hz and 2800 Hz
Return Loss† (end-to-end)	ERL $\geq$ 26 dB, SRL $\geq$ 20 dB
Idle Channel Noise ‡	20 dBrnC Maximum
Signal-to-Distortion Ratio (at -10 dBm)	> 33 dB
Peak to Average Ratio (PAR) (dial pulse distortion) at -13 dBm	> 90
Gain Tracking (1004 Hz) -37 dBm0 to +3 dBm0 -50 dBm0 to -37 dBm0	$\pm$ 0.5 dB Maximum $\pm$ 1.0 dB Maximum
Intermodulation Distortion (-13 dBm0 Input)	A-B (R2) Product: > 43 dB 2A-B (R3) Product: > 44 dB
Single Frequency Distortion (0-12 kHz 0 dBm0)	< -28 dBm0
Impulse Noise at 47 dBrnC0	$\leq$ 15 Counts in 15 Minutes
Overload at COT and HDT	at + 3 dBm0 is $\leq$ 0.5 dB compression
See footnotes at end of table.	Continued on next page

Table 6-5. Transmission Specifications — AUA45 Dual Ringing Repeater Channel Unit—*Continued*

Parameter	Value (Measured at 25°C)
Longitudinal Balance at the HDT (Minimum)¶	200 Hz, 500 Hz, 1000 Hz: ≥ 58 dB 3000 Hz: ≥ 53 dB
Equal-Level Cross talk	Better than -65 dB (200 Hz to 3400 Hz)

* Measured as insertion loss between 900-ohm terminations.

† Measured with respect to 900 ohms and 2.16 μ F with the opposite end terminated in 900 ohms in series with 2.16 μ F.

‡ Measured with 900-ohm terminations on both ends.

¶ Measured with IEEE method 455-1976.

Table 6-6. Transmission Specifications—VF Channel Units With Adjustable Settings

Parameter	2-Wire E SPOTS® CUs(AUA42, AUA43)	4-Wire CUs (AUA41, AUA44, AUA54)
Loop Resistance (beyond HDT, excluding telset)	CSA loops	0-2800 ohms (loop start, ground-start) 0-5000 ohms (DX)
Gain Range (Granularity)		
Metallic Interface to digital line	–1.0 dB to 6.75 dB (in 0.25-dB steps)	Range depends on function code
Digital line to metallic interface	–8.0 dB to 1.5 dB (in 0.25-dB steps)	Granularity = 0.1 dB
Gain Tracking		
Input –37 to +3 dBm	± 0.25 dB	± 0.25 dB
Input –50 to –37 dBm	± 0.50 dB	± 0.50 dB
Equalization	(Slope type) Equalized CSA cable roll-off at 0.4 kHz varies from 0.0 dB to 1.1 dB; at 2.8 kHz, roll-off varies from 0.3 dB to 1.75 dB	Post-equalization of cable less than 15 dB (H88) or 18 kft (NL) is comparable to D4 4FXS CU (J98726SB). Pre-equalization and post-equalization available by emulating 150-ohm mismatch.
Structural Impedance	600 ohms + 2.16 µF or 900 ohms + 2.16 µF	600 ohms or 1200 ohms
ERL/SRL (2-wire return loss with 4-wire path broken)	28/20 dB	
RL (any Hz) / RL (1 kHz)		23/28 dB
Balance Capability, CSA loops	ERL better than 12 dB at digital line interface of channel unit facing loop	—
Longitudinal Balance (IEEE method)		
	AUA42	AUA43
200 Hz	63 dB	58 dB
500 Hz	63 dB	58 dB
1000 Hz	63 dB	58 dB
3000 Hz	58 dB	58 dB

Continued on next page

Table 6-6. Transmission Specifications—VF Channel Units With Adjustable Settings—Continued

Parameter	2-Wire E SPOTS® CUs(AUA42, AUA43)	4-Wire CUs (AUA41, AUA44, AUA54)
Equal-Level Cross talk, C-message weighted between 0.2 and 3.4 kHz	–65 dB	–65 dB (channel unit) –65 dB (interunit cross talk)
Idle-Channel Noise	23 dBrnc0 for AUA42/ AUA43 pair	20 dBrnc0 per channel unit, each direction
Impulse Noise, no more than 15 counts in 15 minutes at	59 dBrnc0	59 dBrnc0
Signal Distortion (at –10 dBm)	> 33 dB	> 33 dB
Single-Frequency distortion 0 dBm0 input tone at any frequency from 0 to 12 kHz	–28 dBm0 for AUA42/ AUA43 pair	–28 dBm0 per channel unit
Intermodulation Distortion (IM) , –13 dBm0 input (IM products)	A-B (R2) < –43 dB 2A-B (R3) < –44 dB	R2 < –49 dB R3 < –51 dB
Pulse Distortion [Peak to Average Ratio (PAR)]	not less than 90	not less than 94

Table 6-7. SPQ[®]400 Electrical and Transmission Specifications

Parameter	Value
Loop Resistance (excluding telset)	0 Ω to 900 Ω
Loop Current	20 mA (900 Ω loop) to 30 mA (0 Ω loop)
VF loss, off-hook, between CO and network interface (NIF) at customer location	4 to 8 dB
Nominal 1000-Hz loss, <i>SPQ400</i> only: 0 Ω tip-to-ring 900 Ω loop resistance	6.0 dB 1.4 dB
VF loss, on-hook, between CO and NIF at customer location	9 dB to 13 dB
Return loss at COT (reference Z of 900 Ω + 2.16 μ F, terminated with 900 Ω + 2.16 μ F)	ERL > 18 dB SRL > 10 dB
Return loss at RT (reference Z of 900 Ω + 2.16 μ F, CO terminated with 900 Ω + 2.16 μ F)	ERL > 18 dB SRL > 10 dB
Structural impedance	900 Ω + 2.16 μ F
Minimum longitudinal balance (measured by IEEE Method 455-1976)	200 Hz to 1,000 Hz: $\geq$ 58 dB 3000 Hz: $\geq$ 53 dB
Idle channel noise, end-to-end	$\leq$ 20 dBnC
Frequency response (loss relative to 1004 Hz) End-to-end <i>SPQ400</i> only (1/2 channel)	400 Hz to 2800 Hz: -0.5 dB to +1 dB 3200 Hz: -0.5 dB to +1.5 dB 300 Hz and 3400 Hz: -0 dB to +3 dB 400 Hz to 2800 Hz: -0.25 dB to +0.5 dB 3200 Hz: -0.25 dB to +0.75 dB 300 Hz and 3400 Hz: -0 dB to +1.5 dB
	<i>Continued on next page</i>

Table 6-7. SPQ®400 Electrical and Transmission Specifications — *Continued*

Parameter	Value
60-Hz Rejection	> 20 dB
Cross talk (0-dBm0 input, 200 Hz to 3400 Hz)	≤ -65 dBm0
Impulse noise at a threshold of 47 dBmCO for 15 minutes	≤ 15 counts
Data pulse distortion (PAR)	
End-to-end	> 90
SPQ400 only (1/2 channel)	≥ 94
Single frequency distortion with input of:	
0 Hz to 12 kHz, 0 dBm0	< -28 dBm0 at 0 Hz to 12 kHz
1004 Hz to 1020 kHz, 0 dBm0	< -40 dBm0 at 0 Hz to 4000 Hz
Signal-to-distortion with input of:	
0 dBm0 to -30 dBm0	> 33 dB
-30 dBm0 to -40 dBm0	> 27 dB
-40 dBm0 to -45 dBm0	> 22 dB
System generated tones 0 Hz < f < 16 kHz	< -50 dBm0
Gain tracking at 1004 Hz, relative to 0 dBm0	
-37 dBm0 to +3 dBm0	±0.5 dB maximum (±0.25 dB average)
-50 dBm0 to -37 dBm0	±1.5 dB maximum (±0.5 dB average)

Table 6-8. SPQ[®]400 Environmental Specifications

Temperature Range (Ambient)	
Operating	–40° to 85°C (–40° to 185°F)
Storage	–40° to 85°C (–40° to 185°F)
Relative Humidity, Noncondensing	
5% to 95%	

Table 6-9. SPQ[®]440 Electrical and Transmission Specifications

Parameter	Value	
	POTS	Special Services
Loop resistance (excluding telset)	0 to 900 Ω	CSA
Loop current	20 mA to 30 mA	25 mA to 30 mA
VF loss, off-hook, between CO and network interface (NIF) at customer location	4 to 8 dB	2 to 5 dB
Nominal 1000 Hz loss, <i>SPQ440</i> only: 0 Ω tip-to-ring Maximum loop resistance	6.0 dB 1.4 dB	3.4 dB 0 dB
VF loss, on-hook, between CO and NIF at customer location	9 dB to 13 dB	7 dB to 12 dB
Return loss at COT (reference Z of 900 Ω + 2.16 μ F, terminated with 900 Ω + 2.16 μ F for POTS or TR-57 CSA test loops for special services)	ERL > 18 dB SRL > 10 dB	ERL > 10 dB SRL > 5 dB
Return loss at RT (reference Z of 600 Ω + 2.16 μ F, CO terminated with 900 Ω + 2.16 μ F)	ERL > 22 dB SRL > 14 dB	ERL > 22 dB SRL > 14 dB

Continued on next page

Table 6-9. SPQ®440 Electrical and Transmission Specifications — Continued

Parameter	Value
POTS and Special Services	
Structural Impedance	600 ohms + 2.16 μ F
Minimum longitudinal balance (measured by IEEE Method 455-1976)	200 Hz to 1,000 Hz: ≥ 58 dB 3000 Hz: ≥ 53 db
Idle channel noise, end-to-end	≥ 20 dBrnC
Frequency Response (Loss Relative to 1004 Hz)	
End-to-end	400 Hz to 2800 Hz: -0.5 dB to $+1$ dB
	3200 Hz: -0.5 dB to $+1.5$ dB
	300 Hz and 3400 Hz: -0 dB to $+3$ dB
SPQ440 only (1/2 channel)	400 Hz to 2800 Hz: -0.25 dB to $+0.5$ dB
	3200 Hz: -0.25 dB to $+0.75$ dB
	300 Hz and 3400 Hz: -0 dB to $+1.5$ dB
60 Hz Rejection	> 20 dB
Cross talk (0 dBm0 input, 200 Hz to 3400 Hz)	≤ -65 dBm0
Impulse noise at a threshold of 47 dBrnC for 15 minutes	≤ 15 counts
Data pulse distortion (PAR)	
End-to-end	> 90
SPQ440 only (1/2 channel)	≥ 94
Single frequency distortion with input of:	
0 Hz to 12 kHz, 0 dBm0	< -28 dBm0 at 0 Hz to 12 kHz
1,004 Hz to 1020 kHz, 0 dBm0	< -40 dBm0 at 0 Hz to 4000 Hz
<i>Continued on next page</i>	

Table 6-9. SPQ[®]440 Electrical and Transmission Specifications — *Continued*

Parameter	Value
Signal-to-distortion with input of:	
0 dBm0 to –30 dBm0	> 33 dB
–30 dBm0 to –40 dBm0	> 27 dB
–40 dBm0 to –45 dBm0	> 22 dB
System generated tones 0 Hz < f < 16 kHz	< –50 dBm0
Gain tracking at 1004 Hz, relative to 0 dBm0:	
–37 dBm0 to +3 dBm0	±0.5 dB maximum (±0.25 dB average)
–50 dBm0 to –37 dBm0	±1.5 dB maximum (±0.5 dB average)

Table 6-10. SPQ[®]440 Environmental Specifications

Temperature Range (Ambient)	
Operating	–40° to 85°C (–40° to 185°F)
Storage	–40° to 85°C (–40° to 185°F)
Relative Humidity, Noncondensing	
5% to 95%	

Table 6-11. SPQ®909 Electrical and Transmission Specifications

Parameter	Value
DC Supervisory Range (including telset)	450 Ω
Loop Resistance (up to 500 ft. of AWG 22)	0 Ω to 20 Ω
Loop Current	20 mA to 25 mA
Nominal 1000 Hz VF loss off-hook between CO and RT CUs	4 dB
SPQ909 alone	4 dB
Nominal 1000 Hz VF loss off-hook between RT CUs and CO	2 dB
SPQ909 alone	2 dB
Nominal 1000 Hz VF loss on-hook between CO and RT CUs	5.5 dB
SPQ909 alone	4 dB
Nominal 1000 Hz VF loss on-hook between RT CUs and CO	3.5 dB
SPQ909 alone	2 dB
Return loss at COT (reference Z of 900 Ω + 2.16 μ F, RT terminated with 600 Ω)	ERL > 18 dB SRL > 10 dB
Return loss at RT (reference Z of 600 Ω , CO terminated with 900 Ω + 2.16 μ F)	ERL > 26 dB SRL > 21 dB
Hybrid Balance of SPQ909 (RT terminated with 600 Ω)	ERL > 26 dB SRL > 21 dB
Output impedance (structural impedance, hybrid impedance)	600 Ω
Minimum longitudinal balance (measured by IEEE Method 455-1985)	200 Hz to 1000 Hz: $\geq$ 45 dB 3000 Hz: $\geq$ 40 dB
Idle channel noise, end-to-end	$\leq$ 20 dBrnC
Frequency response (loss relative to 1004 Hz)	

Continued on next page

Table 6-11. SPQ®909 Electrical and Transmission Specifications —Continued

Parameter	Value
End-to-end	300 Hz to 3,000 Hz: –0.5 dB to +1 dB 3200 Hz: –0.5 dB to +1.5 dB
SPQ909 alone	300 Hz to 3000 Hz: –0.25 dB to +0.5 dB 3200 Hz: –0.25 dB to +0.75 dB
60-Hz Rejection (loss relative to 1004 Hz)	> 20 dB
Cross talk (0 dBm0 input, 200 Hz to 3400 Hz)	–65 dBm0
Impulse noise at a threshold of 47 dBrnC0 for 15 minutes	≤ 15 counts
Data pulse distortion (PAR)	
End-to-end	> 90
SPQ909 alone	≥ 94
Single frequency distortion with input of:	
0 Hz to 12 kHz, 0 dBm0	< –28 dBm0 at 0 Hz to 12 kHz
1004 Hz to 1020 kHz, 0 dBm0	< –40 dBm0 at 0 Hz to 4000 Hz
Signal-to-distortion with input of:	
0 dBm0 to –30 dBm0	> 33 dB
–30 dBm0 to –40 dBm0	> 27 dB
–40 dBm0 to –45 dBm0	> 22 dB
System generated tones 0 Hz < f < 16 kHz	< –50 dBm0
Gain tracking at 1004 Hz, relative to 0 dBm0:	
–37 dBm0 to +3 dBm0	±0.5 dB maximum (±0.25 dB average)
–50 dBm0 to –37 dBm0	±1.5 dB maximum (±0.5 dB average)
–55 dBm0 to –50 dBm0	±3.0 dB maximum (±1.5 dB average)

Table 6-12. SPQ®909 Environmental Specifications

Temperature Range (Ambient)	
Operating	–40° to 85°C (–40° to 185°F)
Storage	–40° to 85°C (–40° to 185°F)
Relative Humidity, Noncondensing	
5% to 95%	

Signaling Mode

Loop-start signaling with fast forward disconnect is provided with the channel units used in the *SLC* Series 5 and *SLC*-2000 systems with the *SLC*-2000 MSDT feature.

Optical Fiber Link

Operating specifications for the fiber link between the host digital terminal (HDT) and the MSDT locations include the following:

- Transmission: Simultaneous bidirectional
- Data rate: 1.544 ±130 ppm Mb/s optical line rate
- Coding: Scrambled nonreturn to zero (NRZ)
- Center wavelength: 1300 ±50 nm over the full temperature range
- Bit error rate: 10⁻⁹
- Start-up environment (humidity): A relative humidity of 5 to 95 percent.

Circuit Maintenance

Circuit maintenance features that are available in addition to features presently provided for *SLC* Series 5 and *SLC*-2000 systems include the following:

- Channel unit (CU) testing performed by the maintenance center [using mechanized loop testing system version 2 (MLT-2), local test desk (LTD), or local test center (LTC)] by means of the pair gain test controller (PGTC) or extended test controller (XTC).
- The HDT optics power shelf assembly and fan shelf alarms and MSDT alarms will appear at the HDT and COT.



NOTE:

SLC Series 5 or *SLC*-2000 systems equipped with the *SLC*-2000 MSDT feature are not compatible with the maintenance terminal unit.

Digital Data Performance

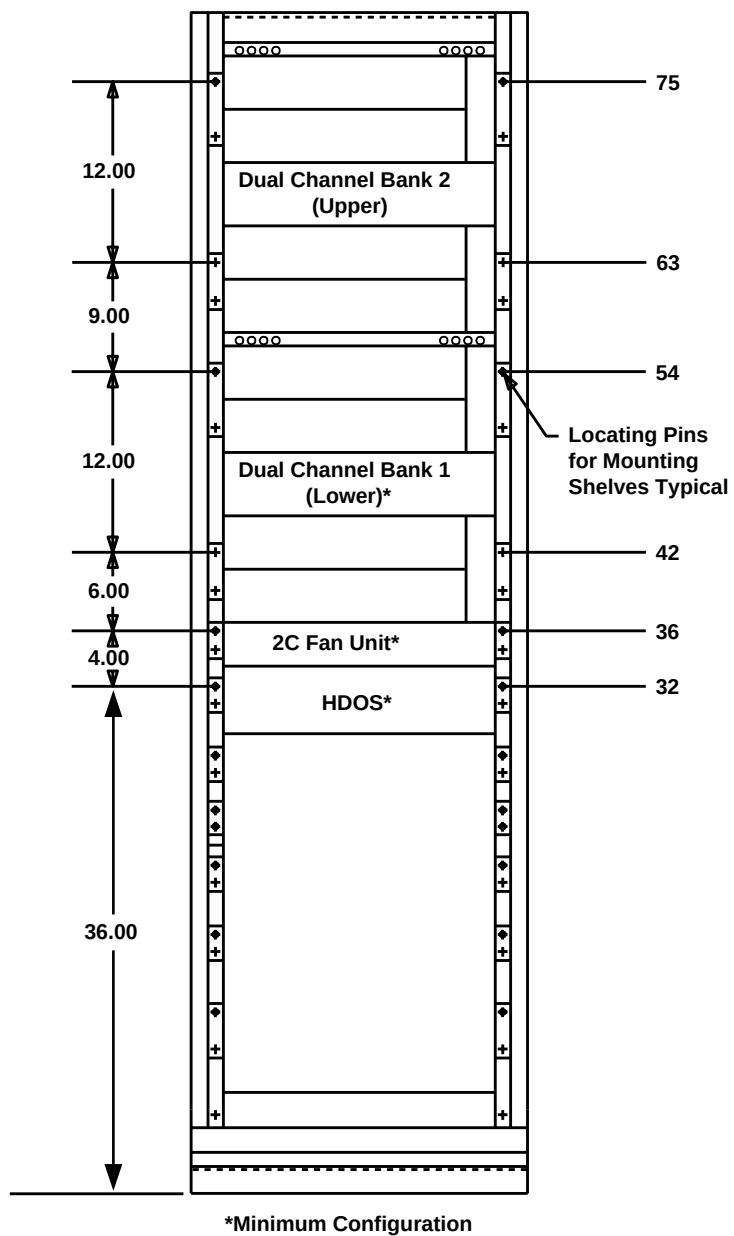
The AUA52B OCU (office channel unit) dataport is designed to provide end links in DDS. These end links have certain features as follows:

- One 4-wire circuit per plug-in pair.
- Data rate — 2.4, 4.8, 9.6, 19.2, 56, or 64 kb/s.
- Error correction. A digital line bit error rate of 10^{-3} is improved to 10^{-8} for any data rate without reducing the channel capacity of the bank.
- Zero Code Allowed option. Allows an all-zero byte to be transmitted toward the digital line (which must be optioned for B8ZS zero code suppression).
- Secondary channel. An option which permits a feature of DDS that provides the customer with a low-speed telemetry channel supplementing the primary data channel at any data rate. (See RL83-01-163.)

Physical and Environmental Specifications

***SLC*[®] Series 5 HDT**

The *SLC* Series 5 Carrier System dual bank assembly and associated fiber-in-the-loop (FITL) equipment are designed to be installed in either a controlled environment vault (CEV), hut, or an 80-type bulk powered (BP) cabinet. When located in a CEV or hut, the FITL equipment is installed in a 7-foot high bay and arranged according to Figure 6-1.



sl5bayrt.ps

Figure 6-1. SLC® Series 5 HDT Bay Layout

The FITL equipment can be installed in an 80-type BP cabinet, with or without central powering equipment, in various arrangements. The following is a description of each of these arrangements:

- a. **80A-HX Cabinet:** HDT structure that houses and protects electronic equipment related to system operation with the *SLC-2000* MSDT feature.
 - Physical size: 66 inches high, 52 inches wide, and 36 inches deep
 - Input power: 30-amp, 120/240 V AC, 60 Hz
 - Operating temperature range: –40°F to +115°F (outside)
 - Operating relative humidity range: 5 to 95 percent (outside)
 - Has primary lightning protection
 - Meets or exceeds Bellcore specification TR-487*.
- b. **80D-HX Cabinet:** HDT structure that houses and protects electronic equipment related to system operation with the *SLC-2000* MSDT feature.
 - Physical size: 69 inches high, 90 inches wide, and 39 inches deep
 - Input power: 120/240 V AC, 60 Hz
 - Operating temperature range: –40°F to +115°F (outside)
 - Operating relative humidity range: 5 to 95 percent (outside)
 - Has primary lightning protection
 - Meets or exceeds Bellcore specification TR-487.
- c. **80E-BP Cabinet:** HDT structure that houses and protects electronic equipment related to system operation with the *SLC-2000* MSDT feature.
 - Physical size: 75 inches high, 106 inches wide, and 33 inches deep
 - Input power: 120/240 V AC, 60 Hz
 - Operating temperature range: –40°F to +115°F (outside)
 - Operating relative humidity range: 5 to 95 percent (outside)
 - Has primary lightning protection.
- d. **Bulk Powered 7-Foot Frame:** For use in concrete huts, CEVs, electronic equipment enclosures (EEEs), or other buildings.
 - Houses four 96-line Series 5 systems (two dual channel banks), a power shelf, and a fan shelf
 - Physical size: 84 inches high, 26 inches wide, and 12 inches deep
 - Input power: –48 V DC (–54.5 V DC maximum, –42 V DC minimum)
 - Power dissipation (fully loaded and operational): 588.4 watts
 - Battery reserve: 8 hours recommended
 - Operating temperature range: +40°F to +100°F. Short term temperature range of +35°F to +120°F maximum

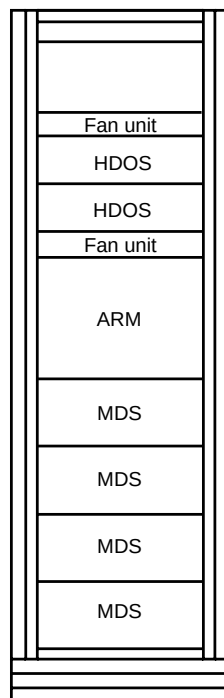
*

Bellcore Technical Reference TR-TSY-000487, Issue 1, 1989, *Generic Requirements for Electronic Equipment Cabinets*.

- Line interface units (LIUs) and CUs include secondary lightning protection and power cross protection
- HDOS assembly
- LGX[®] lightguide distribution shelf.

SLC-2000 HDT

The *SLC-2000* Access System and associated FITL equipment are designed to be installed in either a controlled environment vault (CEV), hut, an 80A-HX cabinet, or an 80D-HX cabinet. When located in a CEV or hut, the FITL equipment is installed in a 7-foot high bay and arranged according to Figure 6-2.

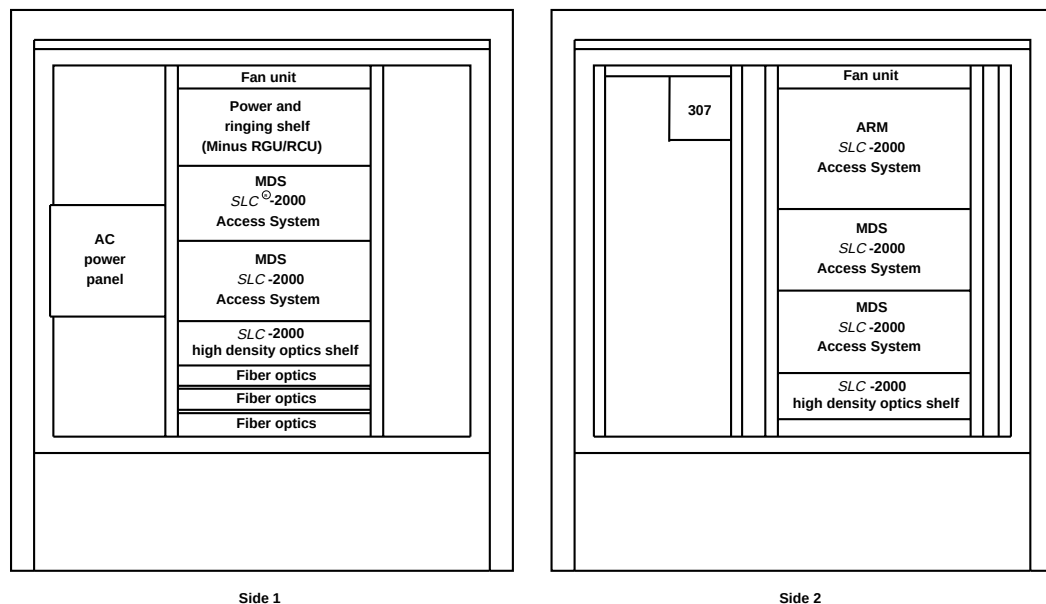


tpa 832473/02

Figure 6-2. *SLC*[®]-2000 FITL HDT Bay Layout

The following is a description of each of these arrangements:

- a. **80A-HX Cabinet:** HDT structure that houses and protects electronic equipment related to system operation with the *SLC-2000* MSDT feature.
 - The 80A-HX cabinet (Figure 6-3) houses up to two metallic distribution shelf (MDS) assemblies, a high density optics shelf (HDOS) assembly, three fiber optic shelves, a power and ringing shelf, and an AC power panel on side 1 and one access resource manager (ARM) shelf assembly, two MDS assemblies, and one HDOS assembly on side 2.
 - Physical size: 66 inches high, 52 inches wide, and 36 inches deep.
 - Input power: 30-amp, 120/240 V AC, 60 Hz.
 - Operating temperature range: -40°F to +115°F (outside).
 - Operating relative humidity range: 5 to 95 percent (outside).
 - Has primary lightning protection.
 - Meets or exceeds Bellcore specification TR-487.



tpa 832450/01

Figure 6-3. SLC[®]-2000 80A-HX Cabinet FITL Layout

- b. **80D-HX Cabinet:** HDT structure that houses and protects electronic equipment related to system operation with the *SLC-2000* MSDT feature.
- The 80D-HX cabinet (Figure 6-4) houses up to one ARM shelf assembly, four MDS assemblies, two HDOS assemblies, one bulk power assembly, and one fuse panel on side 1. On side 2, the 80D-HX cabinet houses up to one ARM shelf assembly, four MDS assemblies, two HDOS assemblies, and six fiber optic panels
 - Physical size: 69 inches high, 90 inches wide, and 39 inches deep
 - Input power: 120/240 V AC, 60 Hz
 - Operating temperature range: -40°F to $+115^{\circ}\text{F}$ (outside)
 - Operating relative humidity range: 5 to 95 percent (outside)
 - Has primary lightning protection
 - Meets or exceeds Bellcore specification TR-487.

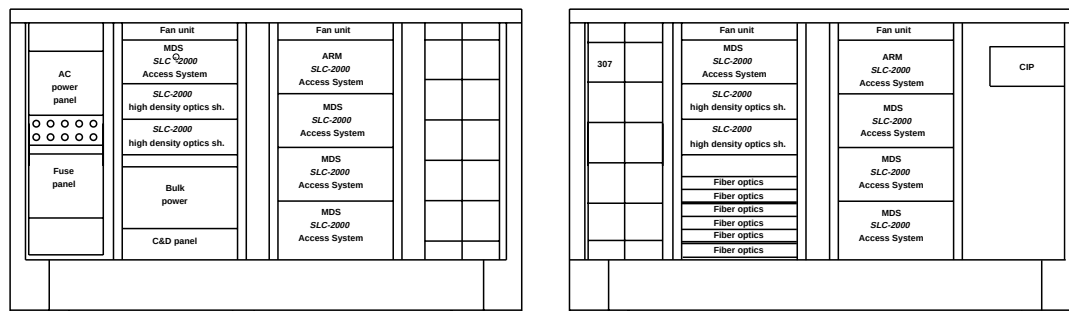


Figure 6-4. SLC[®]-2000 80D-HX Cabinet FITL Layout

- c. **Bulk Powered 7-Foot Frame:** For use in concrete huts, CEVs, electronic equipment enclosures (EEEs), or other buildings.
- Houses one ARM shelf assembly, four MDS assemblies, two HDOS assemblies, and two fan shelves
 - Physical size: 84 inches high, 26 inches wide, and 12 inches deep
 - Input power: -48 V DC (-54.5 V DC maximum, -42 V DC minimum)
 - Maximum power dissipation (fully loaded and operational): 715 watts
 - Battery reserve: 8 hours recommended
 - Operating temperature range: $+40^{\circ}\text{F}$ to $+100^{\circ}\text{F}$. Short term temperature range of $+35^{\circ}\text{F}$ to $+120^{\circ}\text{F}$ maximum

- CUs include secondary lightning protection and power cross protection
- LGX lightguide distribution shelf.

SLC-2000 MSDT

The *SLC-2000 MSDT* is designed to be mounted in a pedestal, strand, or underground enclosure in framework suitable for rack mounting. The following is a description of each of these arrangements:

- a. **Pedestal MSDT Enclosure:** Metal structure that can be wall, pole, or ground mounted.
 - Contains electronic equipment to provide service for 24 DS0 channels
 - Physical size: 22 inches high, 10 inches wide, and 16 inches deep
 - Weight: 50 pounds (fully loaded without battery)
 - Various codes of field wiring boxes (FWBs) allow input voltages of 120 V AC, 48 V DC, –130 V DC, ± 130 V DC, or 60 V AC
 - Power dissipation: 25 watts nominal
 - Battery reserve: 8 to 20 hours with three KS-21906, L20 battery packs (120 V AC and –48 V DC powering only)
 - Contains a 27 watt thermostatically controlled battery heater which turns on at 33 degrees going down and turns off at 45 degrees going up.
 - Operating temperature range: –40°F to +115°F
 - Operating relative humidity range: 5 to 95 percent (outside).
- b. **Strand-Mounted MSDT Enclosure:** Metal structure that houses two MSDT systems and is used for aerial installations.
 - Contains electronic equipment to provide service for 48 DS0 channels
 - Physical size: 12 inches high, 26 inches wide, and 15 inches deep
 - Weight: 81 pounds (fully loaded)
 - Input power: –130 V DC
 - Power dissipation: 50 watts nominal

- Operating temperature range: –40°F to +115°F
- Operating relative humidity range: 5 to 95 percent (outside).
- c. **Rack-Mounted MSDT:** Metal framework houses two MSDT systems for mounting on 23-inch relay racks.
 - Contains electronic equipment to provide service for 48 DS0 channels
 - Physical size: 10 inches high, 23 inches wide, and 14 inches deep
 - Weight: 20 pounds (fully loaded)
 - Input power: –48 V DC
 - Power dissipation: 50 watts nominal
 - Operating temperature range: –40°F to +115°F
 - Operating relative humidity range: 5 to 95 percent (outside).
- d. **Underground Enclosure:**
 - Sealed enclosure containing the MSDT circuit packs for below ground mounting arrangements
 - Physical size: 30 inches wide, 48 inches long, 31 inches deep with an open bottom
 - Power: –130 V DC.

Contents

Introduction	7-1
SLC[®] Series 5 HDT Installation	7-1
■ SLC Series 5 FITL HDT Frame	7-2
HDT Dual Bank Assembly	7-2
Installation of First HDT Dual Bank Assembly (Lower)	7-2
Installation of Second HDT Dual Bank Assembly (Upper)	7-4
Installation of Two HDT Dual Bank Assemblies	7-4
High Density Optics Shelf (HDOS) Assembly for SLC Series 5 Carrier System	7-4
2() Fan Unit	7-6
Electrical Connections	7-6
Optical Fiber Connections	7-17
Fiber Optic Distributing Shelf	7-18
Installation	7-18
Fiber Optic Distributing Shelves Cabling	7-19
Outside Plant Cables	7-20
Equipment Fibers (7-Foot Bay Applications Only)	7-22
MSDT Connect	7-22
MSDT Disconnect	7-23
SLC-2000 HDT Installation	7-23
■ SLC-2000 Access System FITL HDT Frame	7-24
Access Resource Manager Shelf	7-24
MDS Assembly	7-24
HDOS Assembly for the SLC-2000 Access System	7-26
4() Fan Unit	7-28
Electrical Connections (Release 4.5 and Later in	

Contents

Noncabinet Equipment)	7-28
Optical Fiber Connections	7-37
■ LGX [®] Fiber Optic Distributing Frame	7-37
Installation	7-37
Multi-Services Distant Terminal Installation	7-38
■ General	7-38
■ SLC [®] -2000 MSDT Wall-, Pole-, and Ground-Mounted Installation	7-38
Pole-Mounted MSDT Installation	7-39
Pad-Mounted MSDT Installation	7-41
Direct Ground Mounting of MSDT With No Pad (ED-7C712-30, Group 61)	7-43
Wall-Mounted MSDT Installation	7-45
Power Connections	7-46
120 V AC Local Powering Connections (ED-7C712-30, Group 20)	7-46
-48 V DC Local Powering Connections (ED-7C712-30, Group 21)	7-49
±130 V DC Central Powering Connections (ED-7C712-30, Group 22)	7-52
-130 V DC Central Powering Connections (ED-7C712-30, Group 23)	7-54
60 V AC Central Powering Connections (ED-7C712-30, Group 24)—Figure 7-25	7-58
Fiber/T1 Distribution Cable Connections	7-59
Initial Fiber Drop Cable Installation	7-59
Unterminated Fiber Drop Cable Splicing and Storage	7-62
Preterminated Fiber Drop Cable Splicing and Storage	7-63
Looped Distribution Cable Installation	7-64
T1 Metallic Distribution Cable Installation	7-67
Copper Drop Cable and Ground Connections	7-69
Copper Drop Cable Connections	7-69
Ground Connection	7-70
■ SLC-2000 Strand-Mounted MSDT Installation	7-70
Site Preparation	7-71
MSDT Enclosure Placement	7-71

Contents

Power Connections	7-71
Fiber Cable Connections	7-72
Copper Drop Cable Connections	7-73
■ SLC-2000 Rack-Mounted MSDT Installation	7-74
Power Connections	7-75
Fiber/T1 Distribution Cable Connections	7-75
Copper Drop Cable Connections	7-75
■ SLC-2000 Underground-Mounted MSDT (U-MSDT) Installation	7-75
Distribution Fiber	7-80
■ Cable Placement	7-80
■ Fiber Splicing	7-80
■ Connectorization	7-80
■ Completion Testing	7-81
SLC-2000 MSDT Upgrade From Dual Mode to Quad Mode Operation	7-81
■ Installing ED-7C712-30, Group 80 Upgrade Kit	7-82
■ Installing ED-7C712-30, Group 82 Upgrade Kit	7-82

Construction and Installation

7

Introduction

This chapter provides construction and installation procedures for equipment, apparatus, fiber cable, and copper cable located at the host digital terminal (HDT) and *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) locations of a *SLC* Series 5 Carrier System or *SLC*-2000 Access System equipped with the *SLC*-2000 MSDT feature.

SLC[®] Series 5 HDT Installation

The *SLC* Series 5 HDT equipment associated with the *SLC*-2000 MSDT feature can be installed in either a controlled environment vault (CEV), hut, or an 80-type cabinet structure. Since all HDT equipment and interconnect cabling in an 80-type cabinet, except the fiber optic interconnection cables and outside plant (OSP) cables, are installed and connected prior to placing the cabinet, installation and connection procedures for the 80-type cabinet are limited to the lightguide interconnection cables (LICs) and Outside Plant (OSP) cables.

SLC Series 5 FITL HDT Frame

Assuming that the HDT frame has been installed, this part contains the procedures necessary to install all of the equipment in an HDT frame (Figure 7-1), which includes the following:

- Series 5 HDT dual bank assemblies
- Optics shelves
- 2C fan units.

HDT Dual Bank Assembly

Equipment required to install an HDT dual bank assembly includes the following:

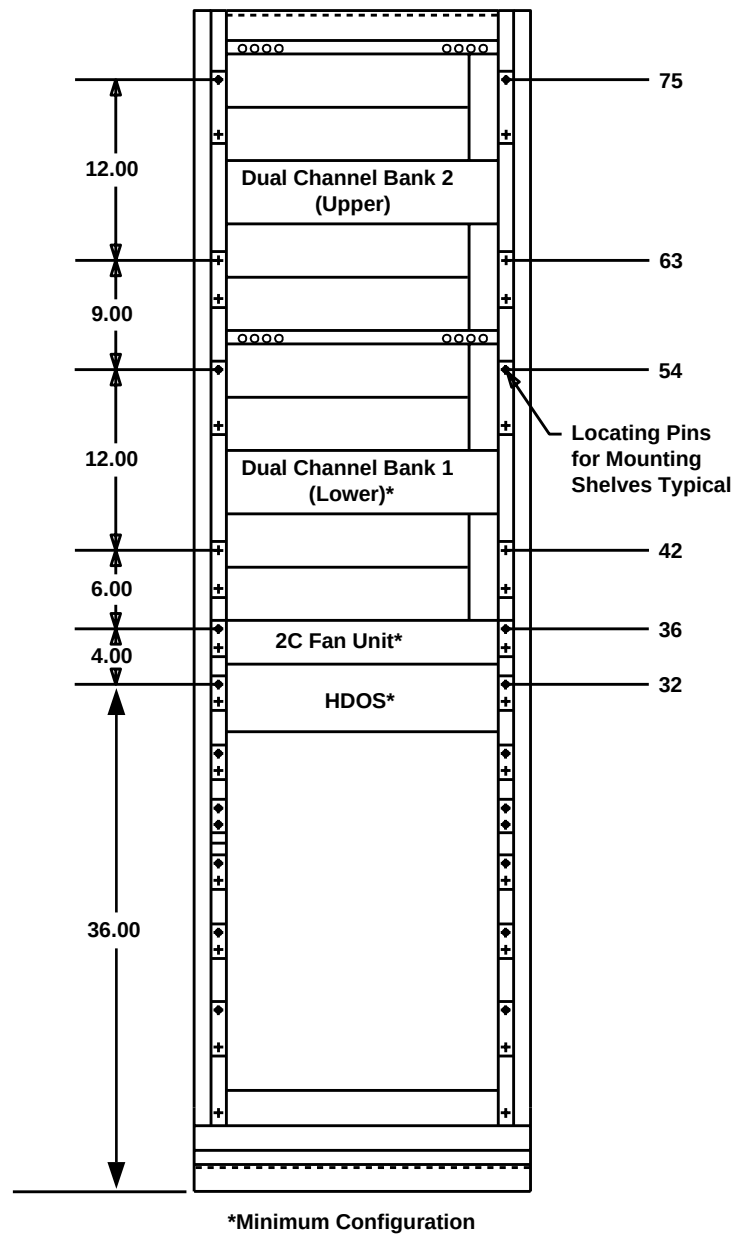
- Two alignment pins (provided)
- Eight No. 12-24 mounting screws (provided)
- KS-22605, L1 access shelf (optional).

An HDT frame can accommodate up to two HDT dual banks for the *SLC-2000* MSDT feature applications. Since both assemblies do not have to be installed at the same time, the procedures for installing either one or both assemblies are included.

Installation of First HDT Dual Bank Assembly (Lower)

If only one dual bank assembly is to be installed, it must be located in the lower position and installed as follows:

1. Install the access shelf in the appropriate position to mount the lower dual bank assembly (No. 1) and secure it with four No. 12-24 screws.
2. Locate the structure cables for the lower dual bank assembly and dress them to the front.
3. Dress the cables for the upper dual bank assembly (if present) into the duct work since they will not be used at this time.
4. Place the lower dual bank assembly on the access shelf.
5. Free all bank assembly dangling cables and connectors and secure the dual bank assembly with the eight No. 12-24 mounting screws.
6. Remove the access shelf.



sl5bayrt.ps

Figure 7-1. SLC® Series 5 FITL HDT Bay Layout

Installation of Second HDT Dual Bank Assembly (Upper)

Installation of a second dual bank assembly in an HDT frame should be performed as follows:

1. Install the access shelf in the appropriate position to mount the upper dual bank assembly (No. 2) and secure it with four No. 12-24 screws.
2. Locate the structure cables for the upper dual bank assembly and dress them to the front.
3. Place the upper dual bank assembly on the access shelf.
4. Free all bank assembly dangling cables and connectors and secure the dual bank assembly with the eight No. 12-24 mounting screws.
5. Remove the access shelf.

Installation of Two HDT Dual Bank Assemblies

If two dual bank assemblies are to be installed, start at the top position and install them as follows:

1. Install the access shelf in the appropriate position to install the upper dual bank assembly and secure it with four No. 12-24 screws.
2. Locate the structure cables for the upper dual bank assembly and dress them to the front.
3. Dress the cables for the lower dual bank assembly to the rear inside the unequal flange duct space. This will ensure later accessibility.
4. Place the upper dual bank assembly on the access shelf.
5. Free all bank assembly dangling cables and connectors and secure the dual bank assembly with the eight No. 12-24 mounting screws.
6. Remove the access shelf.
7. Install the access shelf in the appropriate position to install the lower dual bank assembly and secure it with four No. 12-24 screws.
8. Place the lower dual bank assembly on the access shelf.
9. Free all bank assembly dangling cables and connectors and secure the dual bank assembly with the eight No. 12-24 mounting screws.
10. Remove the access shelf.

High Density Optics Shelf (HDOS) Assembly for SLC Series 5 Carrier System

All equipment required to install each HDOS assembly (Figure 7-2) is furnished with the shelf as follows:

- Two alignment pins
- Four No. 12-24 mounting screws

- Backplane cover.

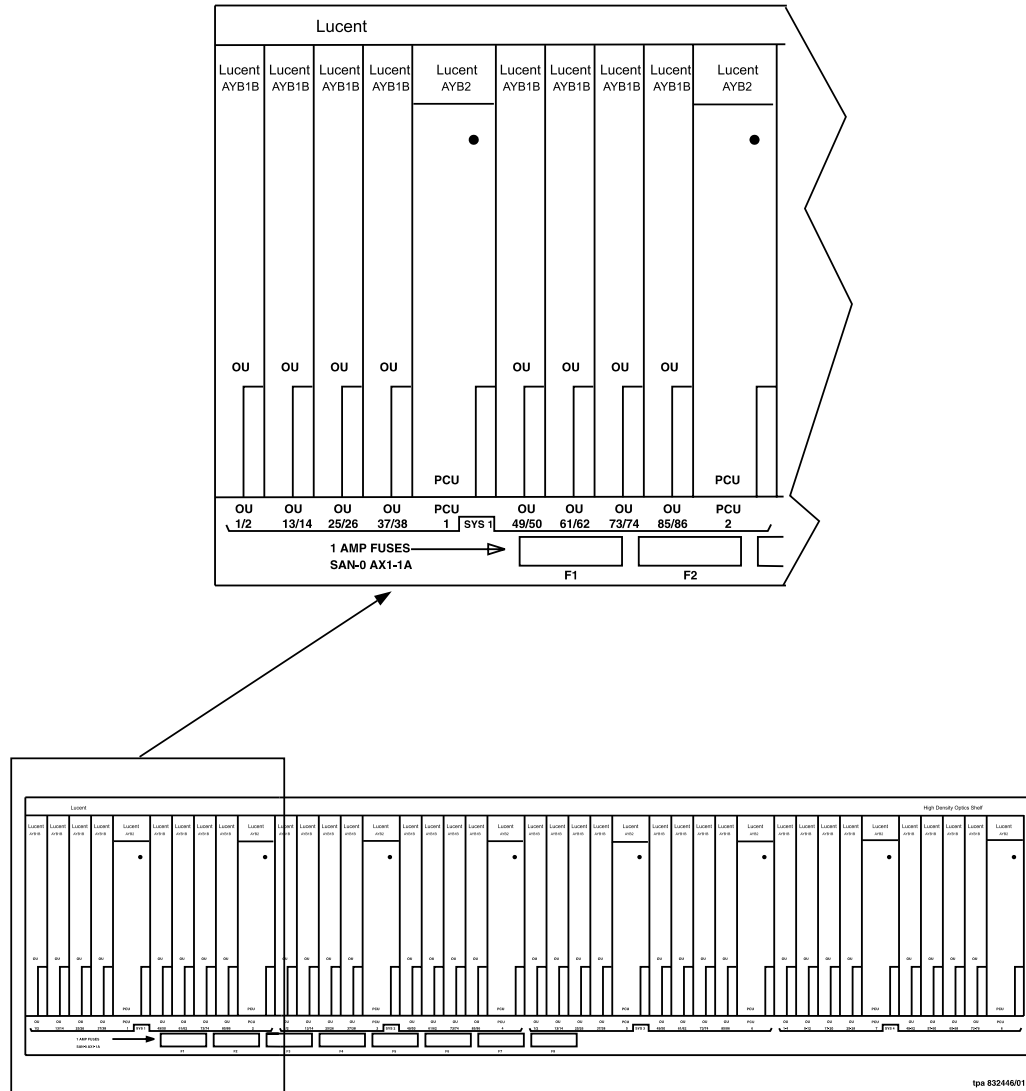


Figure 7-2. HDOS Assembly (J1C265AC-1, L2)

Install each HDOS assembly as follows:

1. If the LICs are not being installed on the HDOS assembly at this time, install the backplane cover.
2. Locate the holes in the HDT frame to receive the mounting screws.
3. Install the two alignment pins into the two upper screw holes in the frame that align with the mounting holes in the HDOS assembly.
4. Mount the HDOS assembly in the frame while verifying that the alignment pins are inserted through the upper mounting holes in the HDOS assembly.
5. Secure the bottom of the HDOS assembly using two No. 12-24 screws in the two bottom mounting holes.
6. Replace the alignment pins with the two remaining No. 12-24 screws.

2() Fan Unit

All equipment required to install each fan unit includes the following:

- Two alignment pins
- Four No. 12-24 mounting screws.

Install each fan unit as follows:

1. Refer to Figure 7-1 and locate the holes in the HDT frame to receive the mounting screws.
2. Install the two alignment pins into the two lower screw holes in the frame that align with the mounting holes in the fan unit.
3. Mount the fan unit in the frame while verifying that the alignment pins are inserted through the lower mounting holes in the fan unit.
4. Secure the top of the fan unit using two No. 12-24 screws in the two top mounting holes.
5. Replace the alignment pins with the two remaining No. 12-24 screws.

Electrical Connections

The next steps specify how to make the electrical connections between the *SLC* Series 5 HDT dual bank assemblies, HDOS assembly, and 2C fan units (see Figure 7-3).

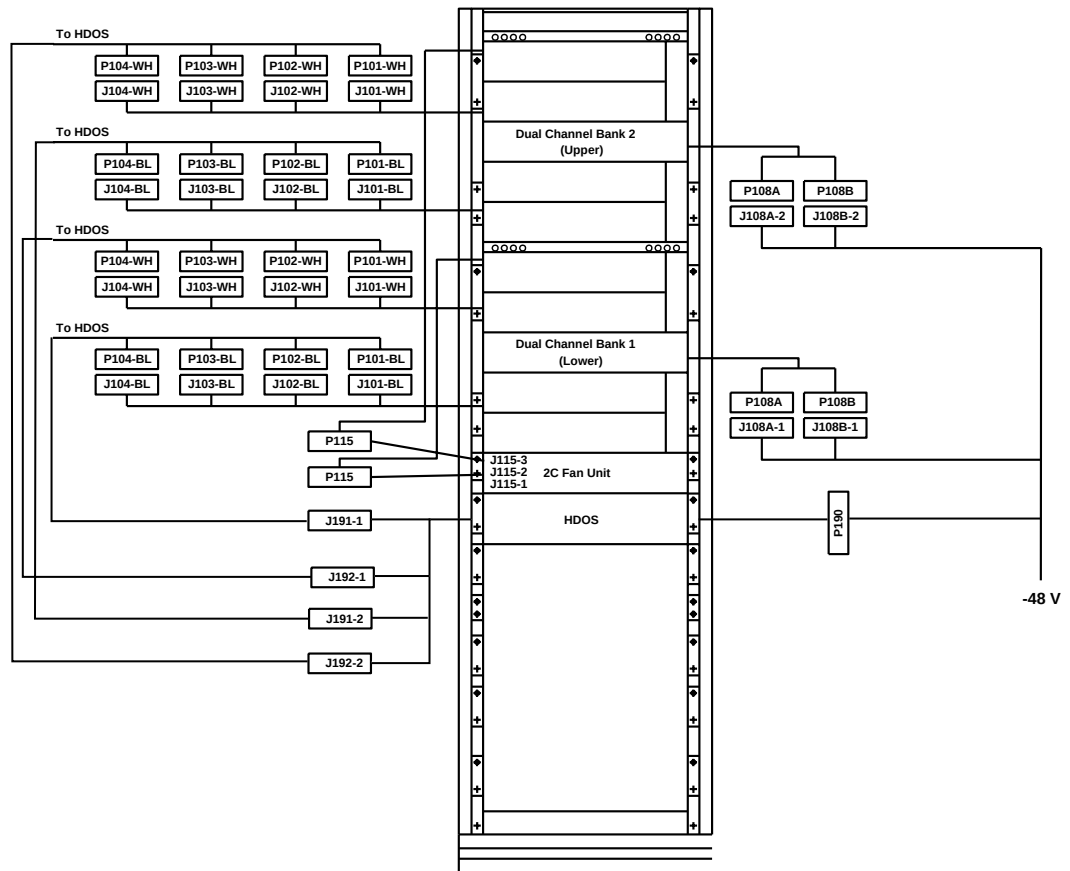
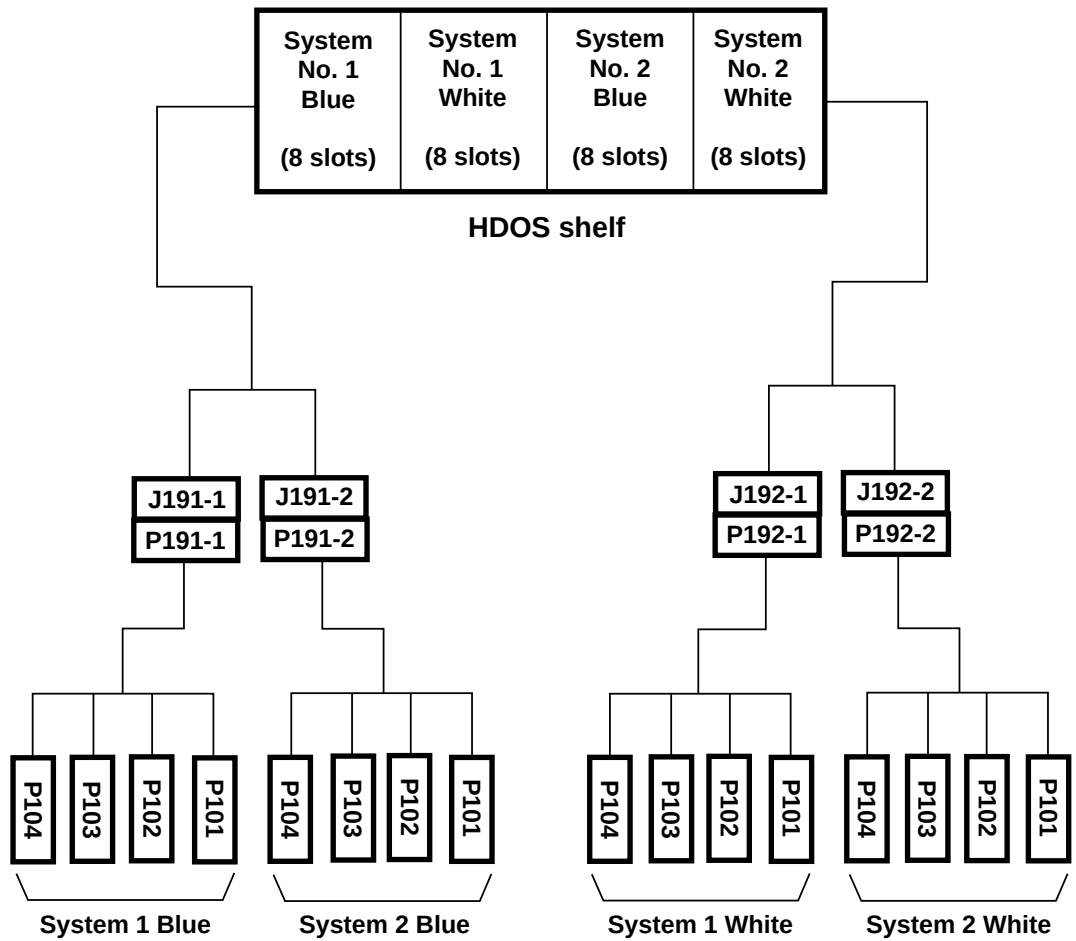


Figure 7-3. SLC® Series 5 HDT Frame Interconnections

1. Interconnect HDOS assembly connector J191-1* to the lower dual bank assembly connectors J101B, J102B, J103B, and J104B, respectively. Interconnect HDOS assembly connector J192-1* to the lower dual bank assembly connectors J101W, J102W, J103W, and J104W, respectively. Use interconnect cable F930HO162 (COMCODE 106999808). (See Figure 7-4 and Table 7-1 and Table 7-2.)
2. Interconnect HDOS assembly connector J191-2* to the upper dual bank assembly connectors J101B, J102B, J103B, and J104B, respectively. Interconnect HDOS assembly connector J192-2* to the upper dual bank assembly connectors J101W, J102W, J103W, and J104W, respectively. Use interconnect cable F930HO162 (COMCODE 106999808). (See Figure 7-4 and Table 7-3 and Table 7-4.) *
3. Make a loop with the frame ground lead from the HDOS assembly and connect it to a suitable mounting hole on the frame.
4. Connect HDOS assembly power connector P190 to input power.
5. If the bay is equipped with two HDT banks, connect upper bank assembly connector P115 to J115 of the patch cable.
6. If the bay is equipped with two HDT banks, connect patch cable connector P115 to 2C fan unit No. 2 connector J115-3.

Make all required external frame connections (digital lines, miscellaneous pair panel, DC test pair, telemetry alarms, and grounding) per Figure 7-5 and Figure 7-6.

* The J19()-() is a 50-pin dual inline connector that mates with a KS-21998L2 connector (COMCODE 403939713).



hdos.shconn.ps

Figure 7-4. SLC[®] Series 5 HDOS Shelf Connections

Table 7-1. HDOS System 1 Blue

HDOSJ1 91-1	Digroup	OU or AUA408SI ot	SLC® Series 5 J10() T/R Pairs	SLC Series 5 Connection
T-26	A	1/2	T-1 — 1	J101 BL
R-1			R-1 —	
T1-27			T1-1 — 2	
R1-2			R1-1 —	
T-28	A	13/14*	T-13 — 13	
R-3			R-13 —	
T1-29			T1-13 — 14	
R1-4			R1-13 —	
T-30	B	25/26	T-25 — 25	J102 BL
R-5			R-25 —	
T1-31			T1-25 — 1	
R1-6			R1-25 —	
T-32	B	37/38*	T-37 — 12	
R-7			R-37 —	
T1-33			T1-37 — 13	
R1-8			R1-37 —	
T-34	C	49/50	T-49 — 24	
R-9			R-49 —	
T1-35			T1-49 — 25	
R1-10			R1-49 —	
T-36	C	61/62*	T-61 — 11	J103 BL
R-11			R-61 —	
T1-37			T1-61 — 12	
R1-12			R1-61 —	
T-38	D	73/74	T-73 — 23	
R-13			R-73 —	
T1-39			T1-73 — 24	
R1-14			R1-73 —	
See footnote at end of table.			Continued on next page.	

Table 7-1. HDOS System 1 Blue —*Continued*

HDOSJ1 91-1	Digroup	OU or AUA408SI ot	SLC® Series 5 J10() T/R Pairs	SLC Series 5 Connection
T-40	D	85/86*	T-85 — 10	J104 BL
R-15			R-85 —	
T1-41			T1-85 — 11	
R1-16			R1-85 —	

* Slot used when AUA408 provisioned for 12 channels.

Table 7-2. HDOS System 1 White

HDOS J192-1	Digroup	OU or AUA408 Slot	SLC® Series 5 J10() T/R Pairs	SLC Series 5 Connection
T-26	A	1/2	T-1 — 1	J101 WH
R-1			R-1 —	
T1-27			T1-1 — 2	
R1-2			R1-1 —	
T-28	A	13/14*	T-13 — 13	
R-3			R-13 —	
T1-29			T1-13 — 14	
R1-4			R1-13 —	
T-30	B	25/26	T-25 — 25	
R-5			R-25 —	
T1-31			T1-25 — 1	J102 WH
R1-6			R1-25 —	
T-32	B	37/38*	T-37 — 12	
R-7			R-37 —	
T1-33			T1-37 — 13	
R1-8			R1-37 —	
T-34	C	49/50	T-49 — 24	
R-9			R-49 —	
T1-35			T1-49 — 25	
R1-10			R1-49 —	

See footnote at end of table.

Continued on next page

Table 7-2. HDOS System 1 White —*Continued*

HDOS J192-1	Digroup	OU or AUA408 Slot	SLC® Series 5 J10() T/R Pairs	SLC Series 5 Connection
T-36 R-11 T1-37 R1-12	C	61/62*	T-61 — 11 R-61 — T1-61 — 12 R1-61 —	J103 WH
T-38 R-13 T1-39 R1-14	D	73/74	T-73 — 23 R-73 — T1-73 — 24 R1-73 —	
T-40 R-15 T1-41 R1-16	D	85/86*	T-85 — 10 R-85 — T1-85 — 11 R1-85 —	

* Slot used when AUA408 provisioned for 12 channels.

Table 7-3. HDOS System 2 Blue

HDOS J191-2	Digroup	OU or AUA408 Slot	SLC® Series 5J10() T/R Pairs	SLC Series 5 Connection
T-26 R-1 T1-27 R1-2	A	1/2	T-1 — 1 R-1 — T1-1 — 2 R1-1 —	J101 BL
T-28 R-3 T1-29 R1-4	A	13/14*	T-13 — 13 R-13 — T1-13 — 14 R1-13 —	
T-30 R-5 T1-31 R1-6	B	25/26	T-25 — 25 R-25 — T1-25 — 1 R1-25 —	

See footnote at end of table.

Continued on next page

Table 7-3. HDOS System 2 Blue —*Continued*

HDOS J191-2	Digroup	OU or AUA408 Slot	SLC® Series 5J10() T/R Pairs	SLC Series 5 Connection
T-32 R-7 T1-33 R1-8	B	37/38*	T-37 — 12 R-37 — T1-37 — 13 R1-37 —	
T-34 R-9 T1-35 R1-10	C	49/50	T-49 — 24 R-49 — T1-49 — 25 R1-49 —	
T-36 R-11 T1-37 R1-12	C	61/62*	T-61 — 11 R-61 — T1-61 — 12 R1-61 —	
T-38 R-13 T1-39 R1-14	D	73/74	T-73 — 23 R-73 — T1-73 — 24 R1-73 —	
T-40 R-15 T1-41 R1-16	D	85/86*	T-85 — 10 R-85 — T1-85 — 11 R1-85 —	J104 BL

* Slot used when AUA408 provisioned for 12 channels.

Table 7-4. HDOS System 2 White

HDOS J192-2	Digroup	OU or AUA408 Slot	SLC® Series 5 J10() T/R Pairs	SLC Series 5 Connection
T-26 R-1 T1-27 R1-2	A	1/2	T-1 — 1 R-1 — T1-1 — 2 R1-1 —	J101 WH

See footnote at end of table. *Continued on next page*

Table 7-4. HDOS System 2 White—Continued

HDOS J192-2	Digroup	OU or AUA408 Slot	SLC® Series 5 J10() T/R Pairs	SLC Series 5 Connection
T-28 R-3 T1-29 R1-4	A	13/14*	T-13 — 13 R-13 — T1-13 — 14 R1-13 —	J102 WH
T-30 R-5 T1-31 R1-6	B	25/26	T-25 — 25 R-25 — T1-25 — 1 R1-25 —	
T-32 R-7 T1-33 R1-8	B	37/38*	T-37 — 12 R-37 — T1-37 — 13 R1-37 —	
T-34 R-9 T1-35 R1-10	C	49/50	T-49 — 24 R-49 — T1-49 — 25 R1-49 —	
T-36 R-11 T1-37 R1-12	C	61/62*	T-61 — 11 R-61 — T1-61 — 12 R1-61 —	J103 WH
T-38 R-13 T1-39 R1-14	D	73/74	T-73 — 23 R-73 — T1-73 — 24 R1-73 —	
T-40 R-15 T1-41 R1-16	D	85/86*	T-85 — 10 R-85 — T1-85 — 11 R1-85 —	J104 WH

* Slot used when AUA408 provisioned for 12 channels.



Figure 7-5. SLC® Series 5 External HDT Frame Connections—Digital Line and Miscellaneous

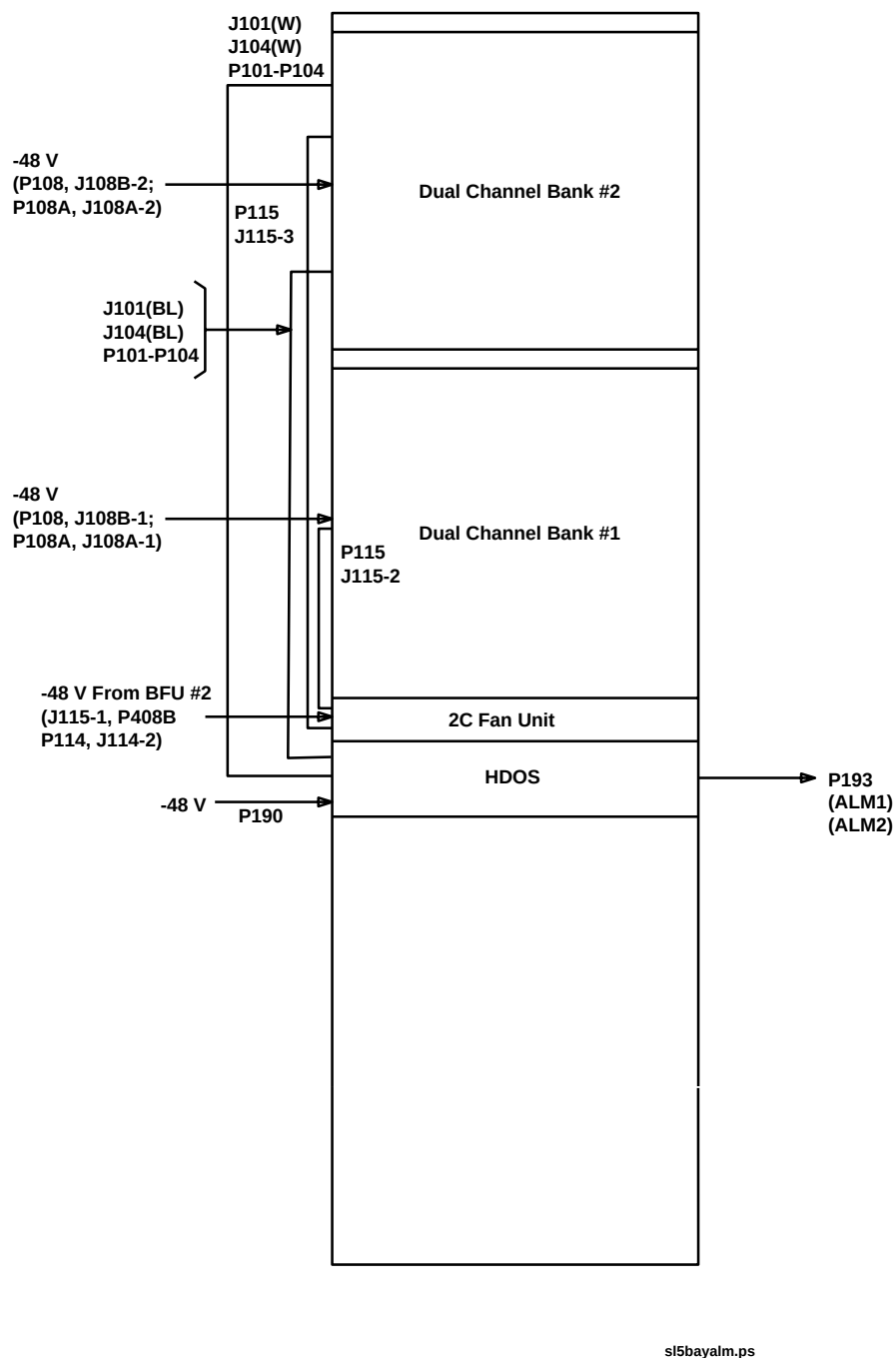


Figure 7-6. SLC® Series 5 External HDT Frame Connections—Power and Alarm

Optical Fiber Connections

The items required to install LICs on the HDOS assembly include the following:

- 300A *ST*[®] fiber optic cable connector microscope (COMCODE 104055025)
- *Kimwipes*^{*} tissues (Lint Guard Poly Shield, Stock No. 34155) or equivalent
- Alcohol (isopropyl reagent)
- 1/4-inch nut driver
- Can of compressed air
- Five 1/4-inch cable ties or equivalent.



NOTE:

Before connecting the LICs to the HDOS assembly, verify that all metallic connections have been made.

The following is the procedure for connecting the fiber optic interconnection cables from the fiber optic distributing shelf to the rear of the HDOS assembly (Figure 7-7):

1. ***For cable application***, go to Step 6.
2. Verify that the LIC is properly stored in the overhead rack slack storage shelves.
3. Remove the last 9 feet of the four 12-fiber LIC groups from the overhead rack slack storage shelves and dress them in the cable trough.
4. Tie the LIC group to the frame at approximately 1 foot from the top of the bay using a large cable tie (preferably 1/4-inch tie).
5. If the LIC cable is enclosed in spiral wrap, remove the spiral wrap.
6. Remove the dust cap from each *ST* fiber optic cable connector on the rear of the HDOS assembly and inspect the end of the connector with an *ST* fiber optic cable connector microscope or equivalent (one connector at a time). If any dust particle is visible, clean the connector using *Kimwipes* tissues or equivalent dipped in alcohol. Blow air on the end of the *ST* fiber optic cable connector using a can of compressed air held 4 to 6 inches from the tip of the fiber then reinspect the connector with the *ST* fiber optic cable connector microscope.
7. Attach the fiber to its corresponding coupling (for example, P01 to CP1, P10 to CP10, etc.).
8. Repeat the two previous steps for each *ST* fiber optic cable connector.

*

Registered trademark of Kimberly-Clark Corp.

9. Dress the metallic cables in the cable trough first, then place the fiber cables carefully in front of the metallic cables.
-

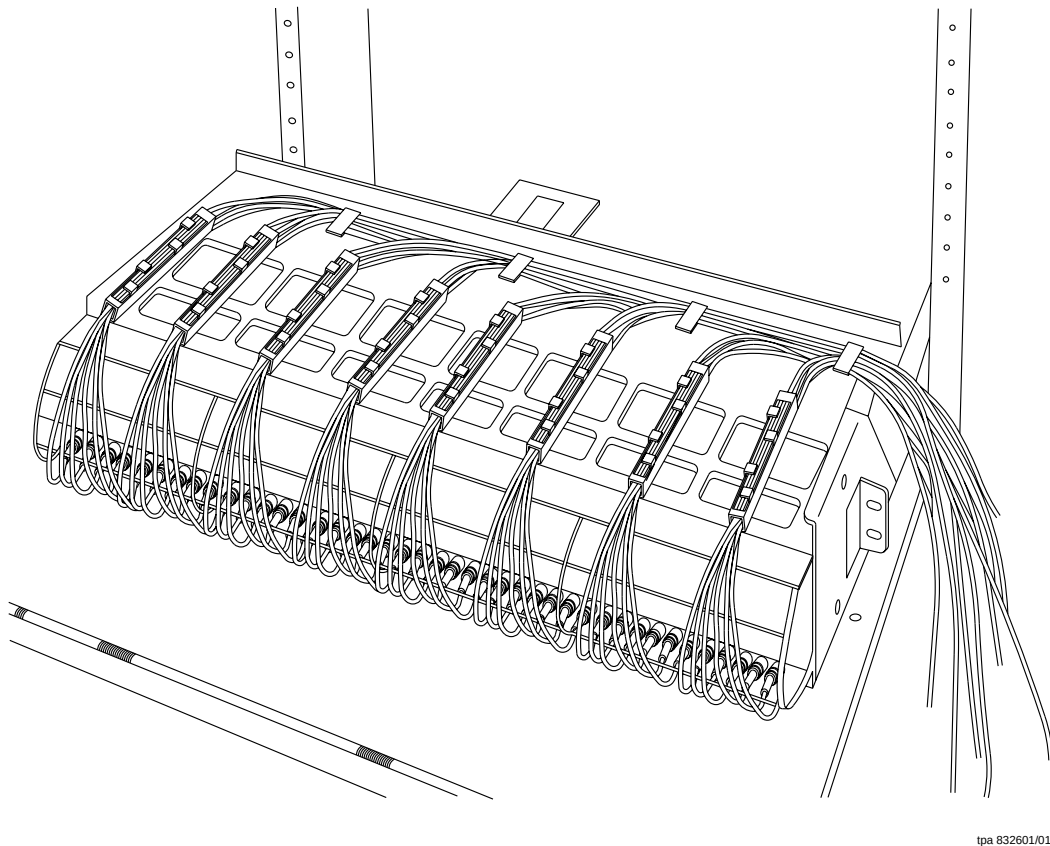


Figure 7-7. Fiber Connection to the HDOS Assembly

Fiber Optic Distributing Shelf

Installation

Each fiber optic distributing shelf is supplied with an installation instruction sheet for mounting the shelves to the frame. The instruction sheet also covers the installation of the other loose hardware shipped with each shelf and describes in detail the methods for shelf cabling.

Fiber optic shelf assemblies are easily installed by fastening the flanges together on the front of the frame. In 7-foot bay applications, the jumper retainers on the front of the frame may need to be removed temporarily while the shelves are

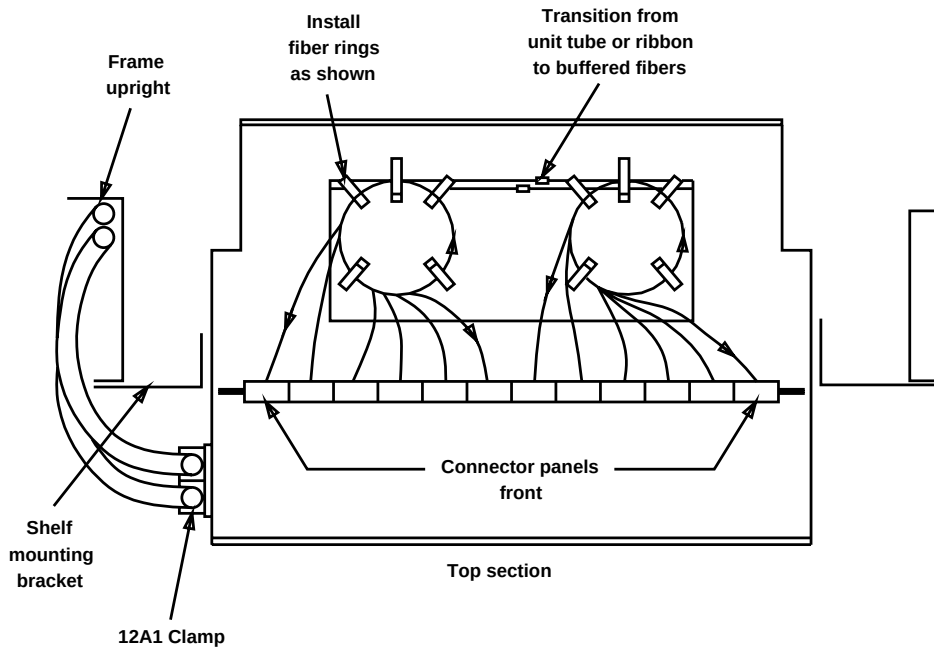
being installed. The height of the front-mounted jumper retainers may also need to be adjusted when the shelf assembly is installed.

Fiber Optic Distributing Shelves Cabling

The fiber optic distributing shelves are designed to handle a wide variety of fiber cables. All Lucent Technologies fiber optic cable types, including multimode and singlemode may be spliced and/or terminated on the shelves.

The OSP cables are secured and grounded on the cable clamp bracket attached to the side of the shelf. Instructions for clamping, blocking, and grounding OSP cable sheaths can be found in 636-299-110. The procedures for buffering the individual fibers in preparation for field mounting connectors can also be found in this practice. Additional information concerning procedures on cable clamping can be found in 636-299-110-1.

Pigtails or connectorized OSP fiber are typically terminated as shown in Figure 7-8. Fiber slack may be coiled and stored in the rear of the shelf.



tpa 776740/01

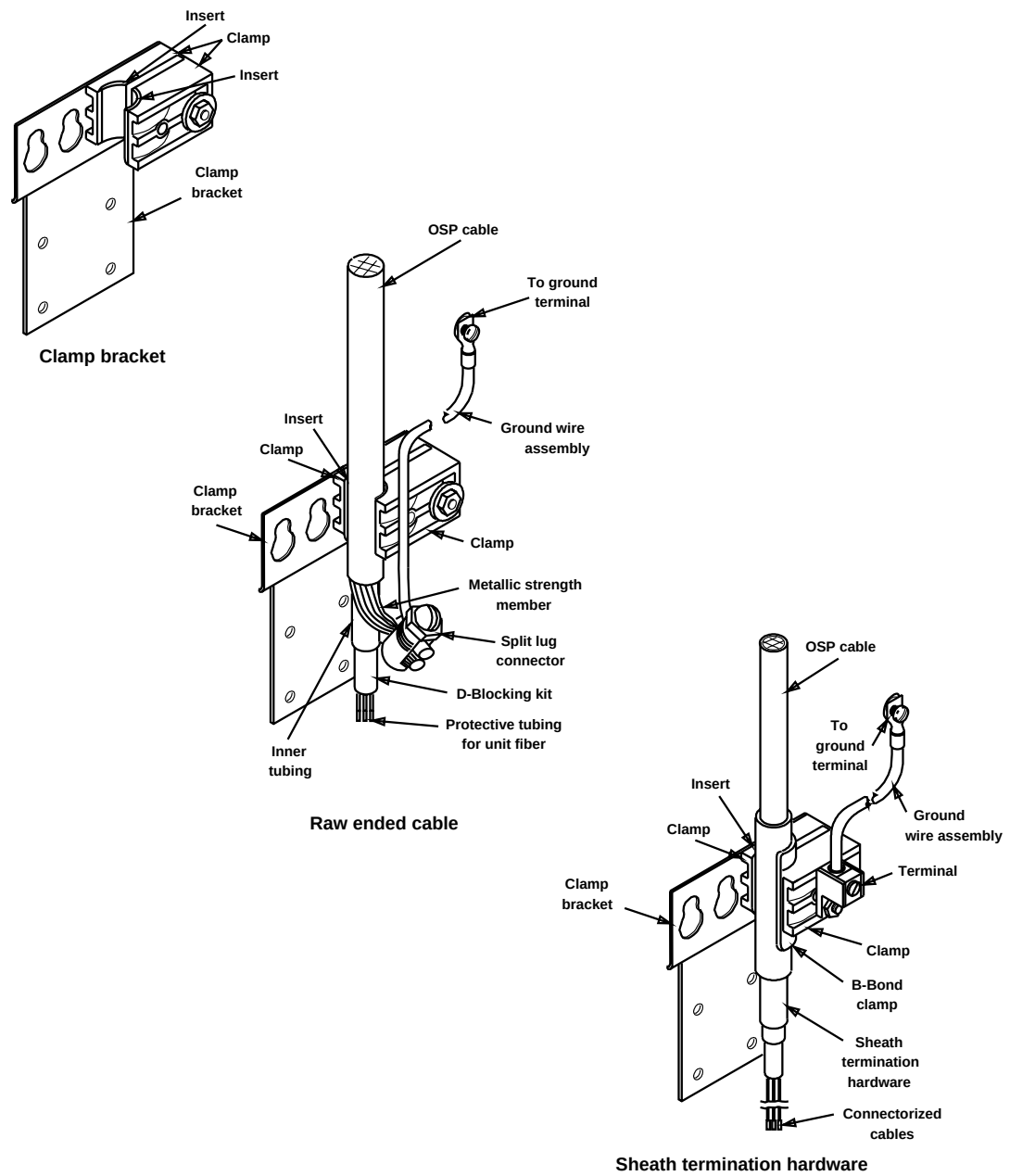
Figure 7-8. Typical Detail of Shelf Optical Cabling Showing 12A1 Cable Clamps

Outside Plant Cables

The OSP cables from the *SLC-2000* MSDTs are terminated or spliced on fiber optic distributing shelves. These cables may have metallic strength members and may be exposed to electrical hazards and therefore require grounding. Each of the two 12A1 cable clamps mounted on each shelf (Figure 7-9) will ground one OSP cable.

The OSP cables should be terminated or spliced in the following manner:

1. Prepare the OSP cables per 636-299-110.
2. Mount the prepared cables onto the 12A1 clamps per 636-299-110-1 provided with each clamp. Route the fibers into the shelf according to the instruction sheet provided with each shelf.
3. Install field mountable singlemode *ST* fiber optic cable connectors on each fiber or splice each OSP fiber to an *ST* pigtail.
4. Install singlemode couplings onto the 1000*ST* panels as required.
5. Install the 1000*ST* panels (from Step 4) onto the panel of the fiber optic termination shelves.
6. Connect the field installed *ST* connectors or *ST* pigtails (Step 3) to the back of the couplings (Step 5) inside the shelves.
7. Identify the individual OSP fibers/pigtails on the provided label of the shelf.
8. Store the slack fiber of the OSP cable or pigtails inside the shelf and close the shelf (per instructions in the shelf).



tpa 776739/01

Figure 7-9. Direct Termination of OSP Cables

Equipment Fibers (7-Foot Bay Applications Only)

For every 96 equipment fibers, one identification shelf is required. This shelf is composed of one LST1U-072/7 shelf and one F87AK8686 panel. An assembly instruction sheet is included with the panel. Each panel has factory labeling and locations for field labeling for easy identification of the equipment jumpers.



NOTE:

This procedure allows permanent identification of equipment fibers.

Store and identify equipment fibers as follows:

1. Route the fiber bundles through the right vertical retainers from the top of the bay to the appropriate identification shelf.
2. Store the slack bundles on the overhead rack, allowing only 18 inches of bundle wraps into the vertical retainer. The transition point between the bundle wrap and the stranded fibers should be 65 to 68 inches above the floor. Do not use cable ties for tie-off purposes; the wrapping of the slack bundle should be strong enough.
3. Attach the connector of each fiber to the coupling with the same ID number. Write the SYSTEM number of the bundle wrap on the panel.
4. Dress the slack fibers in the horizontal trough and secure them into the rings.
5. Store the remainder of the slack fiber in the vertical trough.
6. Store the red dust caps for future use.

MSDT Connect

1. Find the equipment fiber that will serve the MSDT.
2. Remove the fiber in the horizontal trough of the identification shelf from the rings and disconnect the *ST* fiber optic cable connector of the equipment fiber from the coupling on the identification shelf.
3. Install a red dust cap over the coupling uncovered in the previous step.
4. Inspect the end of the *ST* fiber optic cable connector with an *ST* fiber optic cable connector microscope or equivalent. If any dust particle is visible, clean the connector using *Kimwipes* tissues (Lint Guard Poly Shield, Stock No. 34155) or equivalent, dipped in isopropyl reagent alcohol. Blow air on the end of the *ST* fiber optic cable connector using a can of compressed air, then reinspect the connector with the *ST* fiber optic cable connector microscope.
5. Remove the dust cap from the coupling on the termination shelf associated with the MSDT to be connected.
6. Use compressed air to clean the coupling.

7. Attach the *ST* fiber optic cable connector on the equipment fiber removed previously to the coupling in the termination shelf.
8. Store the red dust cap for future use.
9. Dress the slack fiber in the vertical and horizontal troughs.

MSDT Disconnect

1. At the termination shelf, locate the fiber and coupling associated with the MSDT to be disconnected.
2. Remove the fiber in the horizontal trough of the termination shelf from the rings.
3. Disconnect the *ST* fiber optic cable connector of the equipment fiber from the coupling identified previously.
4. Trace the equipment fiber to the bundle wrap from which it originates and read the SYSTEM number.
5. Find the same SYSTEM number on one of the identification shelves.
6. Remove the red dust cap from the appropriate coupling on the identification shelf.
7. Attach the *ST* fiber optic cable connector of the equipment fiber removed previously to the coupling on the identification shelf.
8. Dress the slack fibers in the horizontal trough and secure them into the fiber rings.
9. Dress the remainder of the slack fiber in the vertical trough.
10. Install a red dust cap over the coupling in the termination shelf uncovered previously.

***SLC-2000* HDT Installation**

The *SLC-2000* HDT equipment associated with the *SLC-2000* MSDT feature can be installed in either a controlled environment vault (CEV), hut, an 80A cabinet, or an 80D cabinet structure. Since all HDT equipment and interconnect cabling in an 80A and 80D cabinet, except the fiber optic interconnection cables (LICs) and outside plant (OSP) cables, are installed and connected prior to placing the cabinet, installation and connection procedures for these cabinets are limited to the LICs and OSP cables.

SLC-2000 Access System FITL HDT Frame

Assuming that the HDT frame has been installed, this part contains the procedures necessary to install all of the equipment in an HDT frame (Figure 7-10) which includes the following:

- Access resource manager (ARM) shelf
- Metallic distribution shelf (MDS)
- High density optics shelf (HDOS)
- Fan shelf.

Access Resource Manager Shelf

Equipment required to install an ARM shelf includes the following:

- Two alignment pins (provided)
- Eight No. 12-24 mounting screws (provided)
- KS-22605, L1 access shelf (optional).

Install the ARM shelf in the HDT frame as follows:

1. Install the access shelf in the appropriate position to mount the ARM shelf and secure it with four No. 12-24 screws.
2. Place the ARM shelf on the access shelf.
3. Free all ARM shelf dangling cables and connectors and secure the ARM shelf to the frame with the eight No. 12-24 mounting screws.
4. Remove the access shelf.

MDS Assembly

All equipment required to install the MDS assembly comes furnished with the shelf including the following:

- Two alignment pins
- Four No. 12-24 mounting screws.

Install each HDT MDS assembly as follows:

1. Refer to Figure 7-10 and locate the holes in the HDT frame to receive the mounting screws.
2. Install the two alignment pins into the two lower screw holes in the frame that align with the mounting holes in the MDS assembly.
3. Mount the MDS assembly in the frame while verifying that the alignment pins are inserted through the lower mounting holes in the shelf.

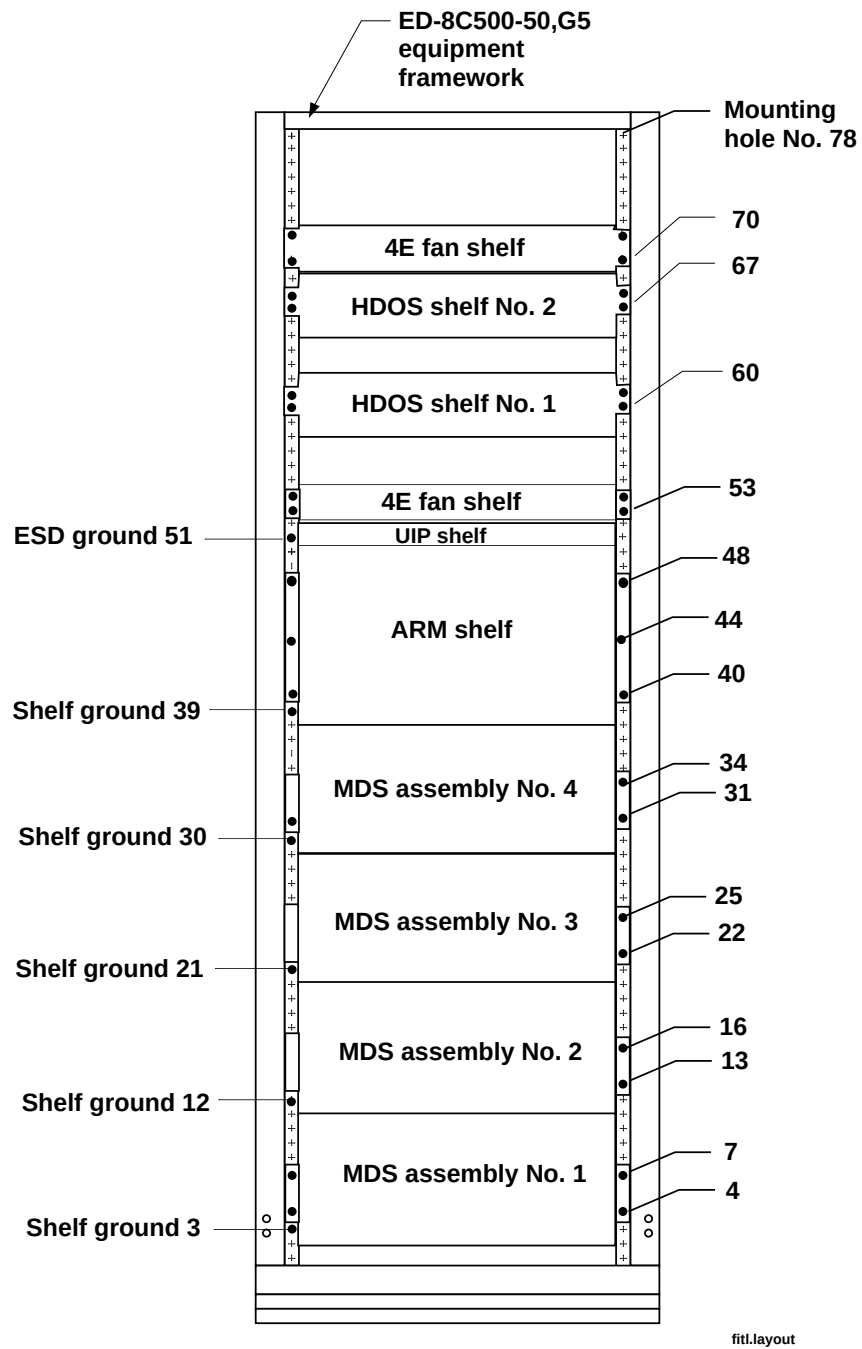


Figure 7-10. SLC®-2000 FITL HDT Bay Layout

4. Secure the top of the MDS using two No. 12-24 screws in the two top mounting holes.
5. Replace the alignment pins with the two remaining No. 12-24 screws.

HDOS Assembly for the SLC-2000 Access System

All equipment required to install each HDOS assembly (Figure 7-11) comes furnished with the shelf and includes the following:

- Two alignment pins
- Four No. 12-24 mounting screws
- Backplane cover.

Install each HDOS assembly as follows:

1. If the LICs are not being installed on the HDOS assembly at this time, install the backplane cover.
2. Locate the holes in the HDT frame to receive the mounting screws.
3. Install the two alignment pins into the two upper screw holes in the frame that align with the mounting holes in the HDOS assembly.
4. Mount the HDOS assembly in the frame while verifying that the alignment pins are inserted through the upper mounting holes in the HDOS assembly.
5. Secure the bottom of the HDOS assembly using two No. 12-24 screws in the two bottom mounting holes.
6. Replace the alignment pins with the two remaining No. 12-24 screws.

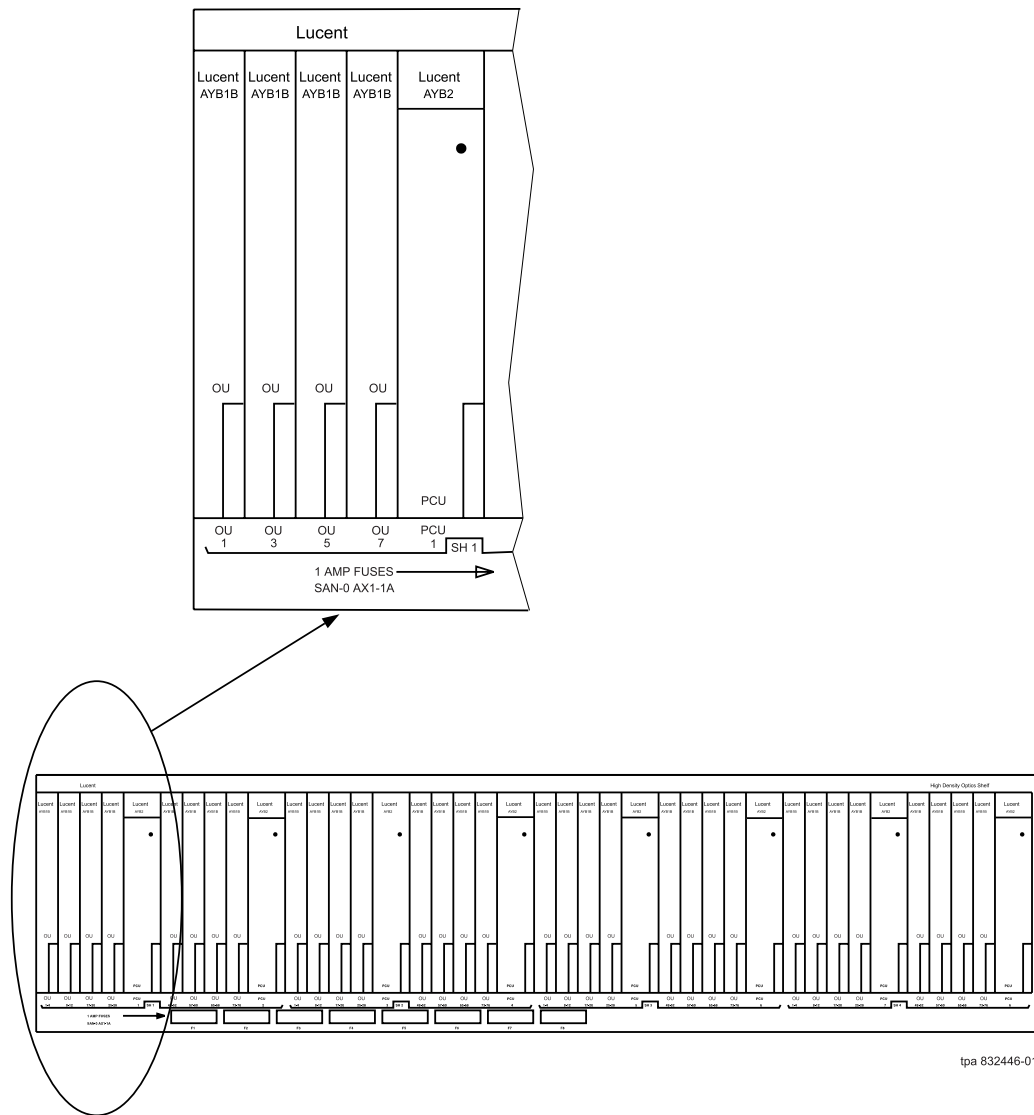


Figure 7-11. High Density Optics Shelf (HDOS) Assembly (J1C265AC-1, L3)

4() Fan Unit

All equipment required to install each 4() fan unit includes the following:

- Two alignment pins
- Four No. 12-24 mounting screws.

Install each fan unit as follows:

1. Refer to Figure 7-10 and locate the holes in the HDT frame to receive the mounting screws.
2. Install the two alignment pins into the two lower screw holes in the frame that align with the mounting holes in the fan unit.
3. Mount the fan unit in the frame while verifying that the alignment pins are inserted through the lower mounting holes in the fan unit.
4. Secure the top of the fan unit using two No. 12-24 screws in the two top mounting holes.
5. Replace the alignment pins with the two remaining No. 12-24 screws.

Electrical Connections (Release 4.5 and Later in Noncabinet Equipment)



NOTE:

For detailed information see 363-208-010 (*SLC-2000 Assembly Manual*)

The following steps connect cables between one shelf of an MDS assembly (odd or even) and the DSX-1 Interface (Figure 7-12).

1. Install the MDS/DSX-1 transmission cable assembly ED-7C723-35, Group 17 (601831043) by connecting the cable to the MDS dangles [J101-104 (odd) or J201-204 (even)] associated with the shelf to be cabled.
2. Mate a pair of DSX-1 interface cable [ED-7C723-35, G19-22 (see Table 7-5 below), for example] for each transmit (OUT) and receive (IN) arm of the group 17 cable's P191/P192 connectors. Stamp each connector with a designation which agrees with its mating connector (that is, J191-OUT mating to P191/P192-OUT). Identify the butt cut end of the cable with a similar stamp or label.

Table 7-5. DSX-1 Interface Cable Lengths Available

Length (ft.)	Description	Comcode
30.0	ED-7C723-35, G19	601845472
50.0	ED-7C723-35, G20	601845480
100.0	ED-7C723-35, G21	601845498
200.0	ED-7C723-35, G22	601845506

3. Find a convenient place on the RT frame to mount the drain wire lug. Scrape the frame and attach the lug from the drain wire to the frame with a 12-24 panel mounting screw (COMCODE 801486341).
4. Repeat Steps **2** and **3** for the second DSX-1 interface cable that mates with the P191/P192-IN connector.
5. Terminate the transmit pairs at the DSX and label the leads in accordance with Figure 7-12 and Table 7-6.
6. Terminate the receive pairs at the DSX and label the leads in accordance with Figure 7-12 and Table 7-6.

**NOTE:**

Transmit (T,R-out) and Receive (T1,R1-IN) pair run in separate cables to the DSX. The cable shields must be grounded at the RT frame and the Transmit and Receive shall not be mixed on the same cross-connect block. The DSX end of the cable is not grounded.

7. Repeat Steps **1** through **6** above for each shelf.

The following steps cable the HDOS shelf to the DSX-1 Panel. The HDOS must be located within 25 cable running feet of the DSX-1 panel, either in the same frame or an adjacent frame.

1. Label the connectorized end of the first cable P191-1. See Table 7-7 for HDOS circuit pack association.
2. Connect the first ED-7C723-35, Group 18 cable to P191-1 on the HDOS shelf.
3. Terminate the pairs at the DSX and label the leads in accordance with Figure 7-13 and Table 7-7.

**NOTE:**

Transmit (T, R) and Receive (T1, R1) pairs are run in the same cables to the DSX. The Transmit (OUT) and Receive (IN) pairs shall not be mixed on the same cross-connect block.

4. Label the connectorized end of the second cable P192-1. See Table 7-7 for HDOS circuit pack slot association.

5. Connect the second ED-7C723-35, Group 18 cable to P192-1 on the HDOS shelf.
6. Terminate the pairs at the DSX and label the leads in accordance with Figure 7-13 and Table 7-7.

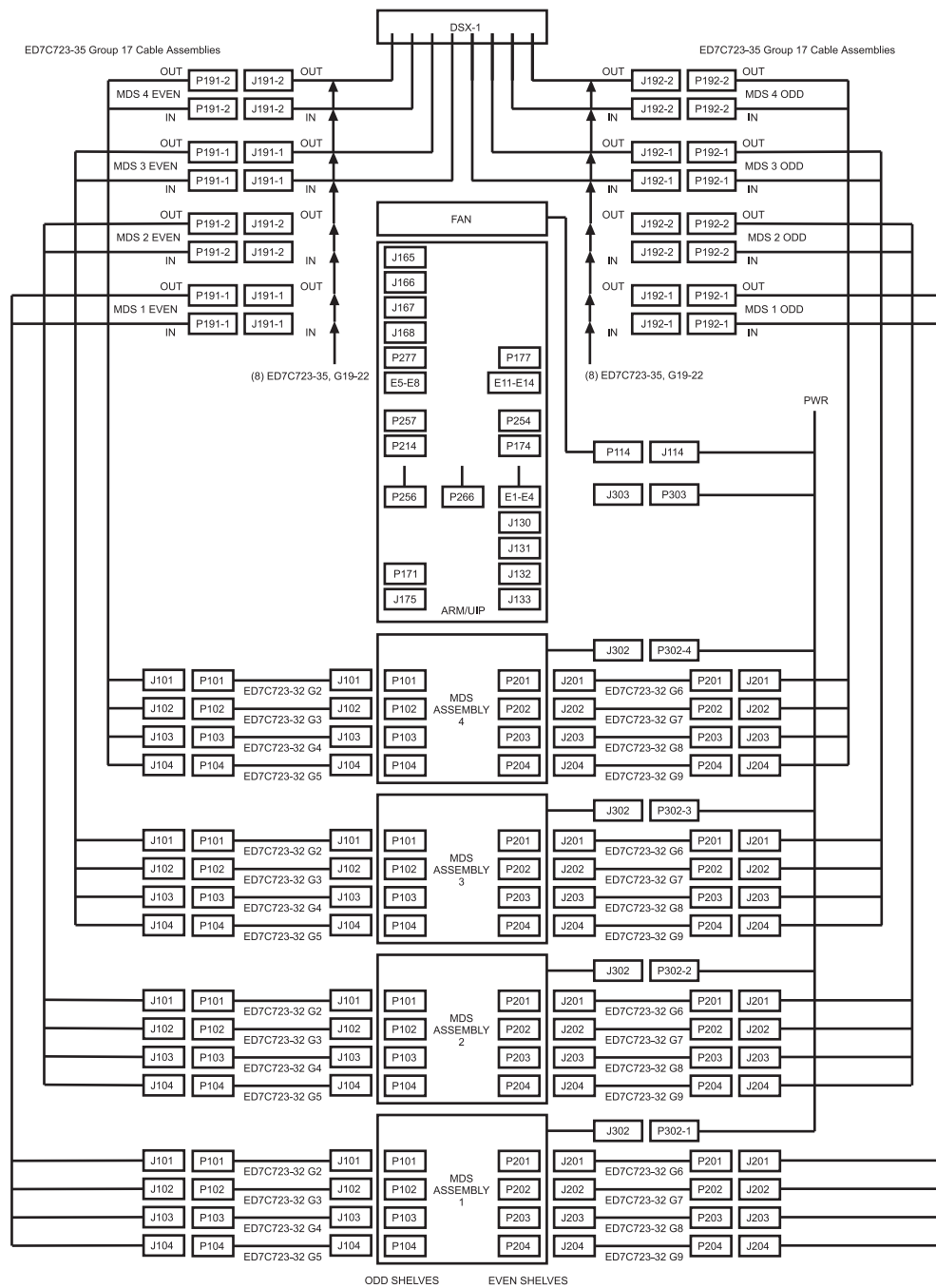


NOTE:

Transmit (T, R) and Receive (T1, R1) pairs are run in the same cables to the DSX. The Transmit (OUT) and Receive (IN) pairs shall not be mixed on the same cross-connect block.

7. Repeat Steps 1 through 6 to connect the third and fourth ED-7C723-35, Group 18 cables to P191-2 and P192-2 as required.

Make all required external frame connections (digital lines, miscellaneous pair panel, DC test pair, telemetry alarms, and grounding) per Figure 7-12.



r45inter

Figure 7-12. SLC®-2000 FITL HDT Frame Interconnections (Release 4.5 and Later)

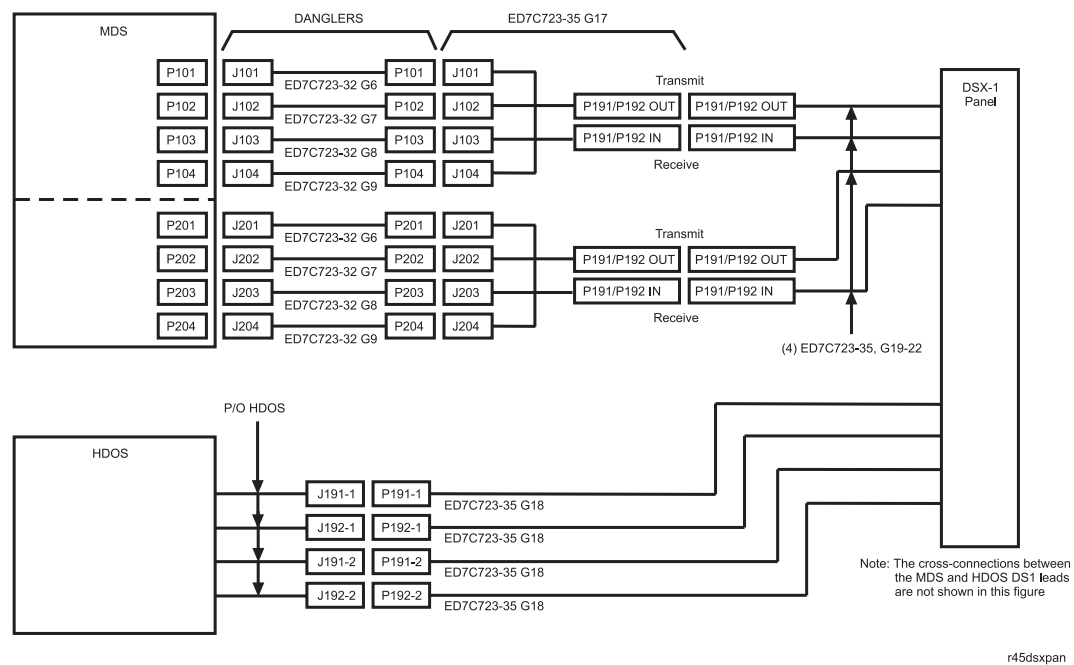


Figure 7-13. SLC®-2000 FITL HDT Frame DSX-1 Panel Cabling (Release 4.5 and Later)

Table 7-6. SLC®-2000 MDS Server Circuit Pack Slot Association With DSX-1 Panel Cabling (Release 4.5 or Later Noncabinet Equipment)

Shelf No.	Shelf Conn	Pins R,T	MDS Slot CU	P191/P192 ED7C723-35, G17		DSX-1 (See Note)
				Connector	Pins R,T	
1 (Odd)	J101	1,26	1	OUT	1,26	BL-W, W-BL
		2,27		IN	1,26	BL-W, W-BL
		9,34	3	OUT	2,27	O-W, W-O
		10,35		IN	2,27	O-W, W-O
		17,42	5	OUT	3,28	G-W, W-G
		18,43		IN	3,28	G-W, W-G
		25,50	7	OUT	4,29	BR-W, W-BR
	J102	1,26		IN	4,29	BR-W, W-BR
		8,33	9	OUT	5,30	S-W, W-S
		9,34		IN	5,30	S-W, W-S
		16,41	11	OUT	6,31	BL-R, R-BL
		17,42		IN	6,31	BL-R, R-BL
		24,49	13	OUT	7,32	O-R, R-O
		25,50		IN	7,32	O-R, R-O
	J103	7,32	15	OUT	8,33	G-R, R-G
		8,33		IN	8,33	G-R, R-G
		15,40	17	OUT	9,34	BR-R, R-BR
		16,41		IN	9,34	BR-R, R-BR
		23,48	19	OUT	10,35	S-R, R-S
		24,49		IN	10,35	S-R, R-S
	J104	6,31	21	OUT	11,36	BL-BK, BK-BL
		7,32		IN	11,36	BL-BK, BK-BL
		14,39	23	OUT	12,37	O-BK, BK-O
		15,40		IN	12,37	O-BK, BK-O

See note at end of table.

Continued on next page

Table 7-6. SLC®-2000 MDS Server Circuit Pack Slot Association With DSX-1 Panel Cabling (Release 4.5 or Later Noncabinet Equipment)—Continued

Shelf No.	Shelf Conn	Pins R,T	MDS Slot CU	P191/P192 ED7C723-35, G17		DSX-1 (See Note)
				Connector	Pins R,T	
2 (Even)	J201	1,26	1	OUT	1,26	BL-W, W-BL
		2,27		IN	1,26	BL-W, W-BL
		9,34	3	OUT	2,27	O-W, W-O
		10,35		IN	2,27	O-W, W-O
		17,42	5	OUT	3,28	G-W, W-G
		18,43		IN	3,28	G-W, W-G
	J202	25,50	7	OUT	4,29	BR-W, W-BR
		1,26		IN	4,29	BR-W, W-BR
		8,33	9	OUT	5,30	S-W, W-S
		9,34		IN	5,30	S-W, W-S
		16,41	11	OUT	6,31	BL-R, R-BL
		17,42		IN	6,31	BL-R, R-BL
		24,49	13	OUT	7,32	O-R, R-O
		25,50		IN	7,32	O-R, R-O
	J203	7,32	15	OUT	8,33	G-R, R-G
		8,33		IN	8,33	G-R, R-G
		15,40	17	OUT	9,34	BR-R, R-BR
		16,41		IN	9,34	BR-R, R-BR
		23,48	19	OUT	10,35	S-R, R-S
		24,49		IN	10,35	S-R, R-S
	J204	6,31	21	OUT	11,36	BL-BK, BK-BL
		7,32		IN	11,36	BL-BK, BK-BL
		14,39	23	OUT	12,37	O-BK, BK-O
		15,40		IN	12,37	O-BK, BK-O

Note: The colors specified in this cable are true only if the transmission cable used utilizes color code 4.

Table 7-7. HDOS/DSX-1 Circuit Pack Slot Association(Release 4.5 or Later in Noncabinet Equipment)

High Density Optical Shelf				ED-7C723-35, G18 to DSX-1	
BP Conn	Pins R, T R1, T1	OU Slot	Shelf Connector	Pins R, T R1, T1	Wire Color (Color Code 4)
J1	9, 18	1	J191-1	1, 26	BL-W, W-BL
	8, 17			2, 27	O-W, W-O
J2	9, 18	3		3, 28	G-W, W-G
	8, 17			4, 29	BR-W, W-BR
J3	9, 18	5		5, 30	S-W, W-S
	8, 17			6, 31	BL-R, R-BL
J4	9, 18	7		7, 32	O-R, R-O
	8, 17			8, 33	G-R, R-G
J6	9, 18	13		9, 34	BR-R, R-BR
	8, 17			10, 35	S-R, R-S
J7	9, 18	15		11, 36	BL-BK, BK-BL
	8, 17			12, 37	O-BK, BK-O
J8	9, 18	17		13, 38	G-BK, BK-G
	8, 17			14 39	BR-BK, BK-BR
J9	9, 18	19		15,40	S-BK, BK-S
	8, 17			16, 41	BL-Y, Y-BL
J11	9, 18	1	J192-1	1,26	BL-W, W-BL
	8, 17			2, 27	O-W, W-O
J12	9, 18	3		3, 28	G-W, W-G
	8, 17			4, 29	BR-W, W-BR
J13	9, 18	5		5, 30	S-W, W-S
	8, 17			6, 31	BL-R, R-BL
J14	9, 18	7		7, 32	O-R, R-O
	8, 17			8, 33	G-R, R-G
J16	9, 18	13		9, 34	BR-R, R-BR
	8, 17			10, 35	S-R, R-S
J17	9, 18	15		11, 36	BL-BK, BK-BL
	8, 17			12, 37	O-BK, BK-O
Continued on next page					

Continued on next page

Table 7-7. HDOS/DSX-1 Circuit Pack Slot Association(Release 4.5 or Later in Noncabinet Equipment)—*Continued*

High Density Optical Shelf				ED-7C723-35, G18 to DSX-1	
BP Conn	Pins R, T R1, T1	OU Slot	Shelf Connector	Pins R, T R1, T1	Wire Color (Color Code 4)
J18	9, 18	17	J192-1	13, 38	G-BK, BK-G
	8, 17			14, 39	BR-BK, BK-BR
J19	9, 18	19		15, 40	S-BK, BK-S
	8, 17			16, 41	BL-Y, Y-BL
J21	9, 18	1	J191-2	1, 26	BL-W, W-BL
	8, 17			2, 27	O-W, W-O
J22	9, 18	3		3, 28	G-W, W-G
	8, 17			4, 29	BR-W, W-BR
J23	9, 18	5		5, 30	S-W, W-S
	8, 17			6, 31	BL-R, R-BL
J24	9, 18	7		7, 32	O-R, R-O
	8, 17			8, 33	G-R, R-G
J26	9, 18	13		9, 34	BR-R, R-BR
	8, 17			10, 35	S-R, R-S
J27	9, 18	15		11, 36	BL-BK, BK-BL
	8, 17			12, 37	O-BK, BK-O
J28	9, 18	17		13, 38	G-BK, BK-G
	8, 17			14 39	BR-BK, BK-BR
J29	9, 18	19		15,40	S-BK, BK-S
	8, 17			16, 41	BL-Y, Y-BL
J31	9, 18	1	J192-2	1,26	BL-W, W-BL
	8, 17			2, 27	O-W, W-O
J32	9, 18	3		3, 28	G-W, W-G
	8, 17			4, 29	BR-W, W-BR
J33	9, 18	5		5, 30	S-W, W-S
	8, 17			6, 31	BL-R, R-BL
J34	9, 18	7		7, 32	O-R, R-O
	8, 17			8, 33	G-R, R-G

Continued on next page

Continued on next page

Table 7-7. HDOS/DSX-1 Circuit Pack Slot Association (Release 4.5 or Later in Noncabinet Equipment)—*Continued*

High Density Optical Shelf				ED-7C723-35, G18 to DSX-1	
BP Conn	Pins R, T R1, T1	OU Slot	Shelf Connector	Pins R, T R1, T1	Wire Color (Color Code 4)
J36	9, 18	13	J192-2	9, 34	BR-R, R-BR
	8, 17			10, 35	S-R, R-S
J37	9, 18	15		11, 36	BL-BK, BK-BL
	8, 17			12, 37	O-BK, BK-O
J38	9, 18	17		13, 38	G-BK, BK-G
	8, 17			14, 39	BR-BK, BK-BR
J39	9, 18	19		15, 40	S-BK, BK-S
	8, 17			16, 41	BL-Y, Y-BL

Optical Fiber Connections

Since the installation of the optical fiber connections in a *SLC-2000* HDT is identical to the installation in a *SLC* Series 5 HDT, install the optical fiber connections as described previously under the Series 5 HDT installation.

***LGX*[®] Fiber Optic Distributing Frame**

Installation

Since the installation of an *LGX* fiber optic distributing frame in a *SLC-2000* HDT is identical to the installation in a *SLC* Series 5 HDT, install the *LGX* fiber optic distributing frame as described previously under the Series 5 HDT installation.

Multi-Services Distant Terminal Installation

General

This section contains procedures for installing and connecting a *SLC-2000* MSDT in each possible mounting arrangement: wall, pole, ground (pad and stake), strand (aerial), rack, and underground.

Due to the various methods of mounting and connecting an MSDT, the installation and connection procedures presented here are divided into four separate activities for each mounting arrangement: MSDT installation, power connections, fiber/T1 distribution cable connections, and drop cable and ground connections.

***SLC*[®]-2000 MSDT Wall-, Pole-, and Ground-Mounted Installation**

The wall-, pole-, and ground- (pad or stake) mounted MSDT consists of a metal enclosure with a card cage and backplane, five common unit circuit boards, one options unit (CDTU), up to six channel unit circuit boards, and a battery pack(s) (optional). These are shipped unassembled and are field assembled by the telephone company craft personnel. Installation of the batteries and all circuit boards in the MSDT is presented in Chapter 8, "Operations and Maintenance — TOP."

In MSDT wall, pole, and ground installations where insect infestations may be a problem, it is recommended that the cable entrances to the MSDT be sealed to keep insects out of the MSDT. There are two methods of sealing the cable entrances; one method uses a baseplate (COMCODE 847060555) mounted underneath the MSDT and the other method uses expanding polyurethane foam sealant. The method used to terminate the fiber distribution cable in the MSDT dictates the method that should be used to seal the cable entrances.

It is recommended that the baseplate be used to seal cable entrances in MSDT installations where the fiber distribution cable is terminated (not looped) inside the MSDT. The baseplate contains nine drop wire grommet openings to seal around cables brought into the MSDT. The baseplate is attached to the bottom of the MSDT using the four bolt holes normally used to attach the base unit. If a base unit is also attached to the bottom of the MSDT, the baseplate mounts between the MSDT and the base unit.

In MSDT installations where the fiber distribution cable is looped through the MSDT or the MSDT has already been installed, it is recommended that all openings around the cables be sealed with expanding polyurethane foam sealant (for example, part number 4411-B from 3M).

Pole-Mounted MSDT Installation

Refer to Figure 7-14 and pole mount the MSDT using the following procedure:

1. Obtain ED-7C712-30, Group 62 pole mounting brackets.
2. Attach the brackets to the side of the MSDT enclosure with the supplied 1/4-20 screws and lockwashers. Position the brackets so that they extend above and below the MSDT enclosure.



CAUTION:

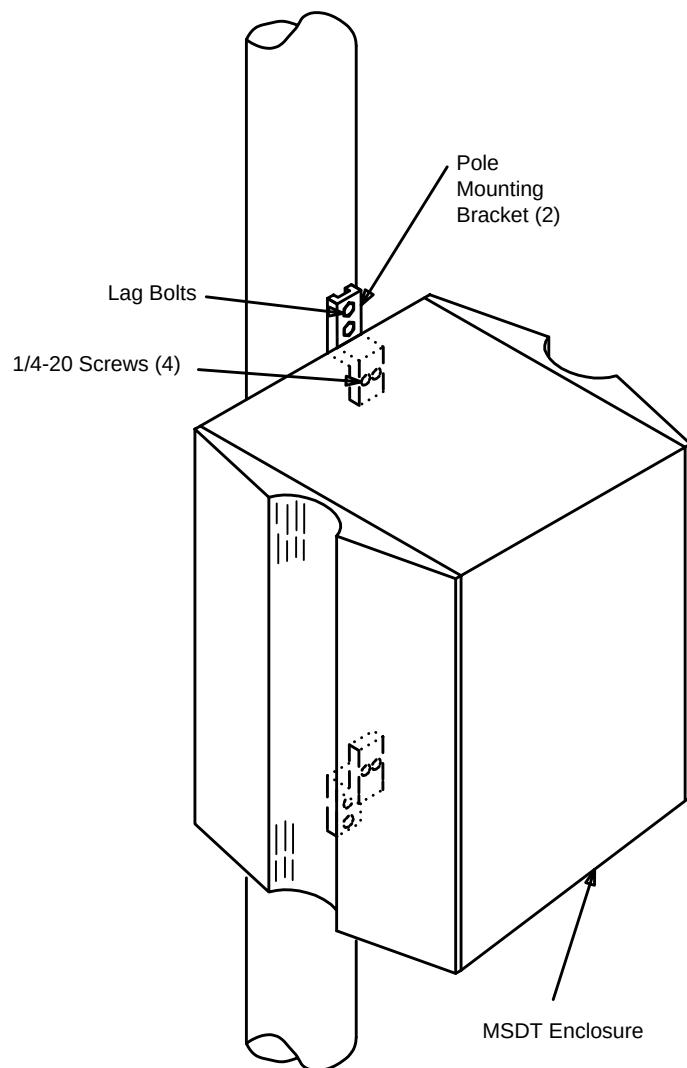
A fully loaded MSDT cabinet weighs approximately 50 pounds; assistance may be required when lifting the cabinet to the correct mounting height.

3. Attach the brackets and MSDT to the pole using lag bolts (not provided).



NOTE:

The enclosure can be mounted so that the doors open toward or away from the pole. It is recommended that the enclosure be mounted so that the doors open toward the pole.



tpa 813670/01

Figure 7-14. Pole-Mounted MSDT Enclosure

Pad-Mounted MSDT Installation

Refer to Figure 7-15 and install the pad mounting base (ED-7C712-30, Group 60 or 64) and MSDT enclosure using the following procedure:



NOTE:

The pad is not supplied. Specifications for a concrete pad are on drawing ED-7C715-01.

1. Confirm that all conduits and cables, including the following, are properly placed:
 - Fiber optic or T1 cable
 - Drop cables to living units
 - Electrical power cable 3/4-inch conduit (ED-7C712-30, Group 20, only)
 - Local powering cabling (ED-7C712-30, Groups 21 and 22, only)
 - Central powering cabling (ED-7C712-30, Group 23, only)
 - Ground wire [No. 10 American wire gauge (AWG)].
2. Place the pad over the cables, guiding the cables through the center opening of the pad. When installing plastic pads, follow the additional instructions supplied by the pad manufacturer.
3. Backfill the pad area so that the top of the pad will be approximately 3 inches above the final grade.
4. When installing concrete pads, fill the center opening of the pad around the cable with No. 56 gravel.
5. Once the pad is installed, position the separate base unit of the MSDT enclosure so that its rubber grommet is directly above the cable opening in the pad. Mount the base unit to the pad using the four bolts supplied with the pad.
6. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324).
7. If the backup battery option is used, disconnect battery connector J301 from connector **P301** on the field wiring box (FWB) (ED-7C712-30, Groups 20, 21, and 22, only).
8. Loosen the two captive screws holding the battery module in place and slide the module out of the enclosure.
9. Mount the MSDT enclosure to the base unit using the four 216-type bolts provided.
10. Reinstall the battery module and secure it with the two captive screws.

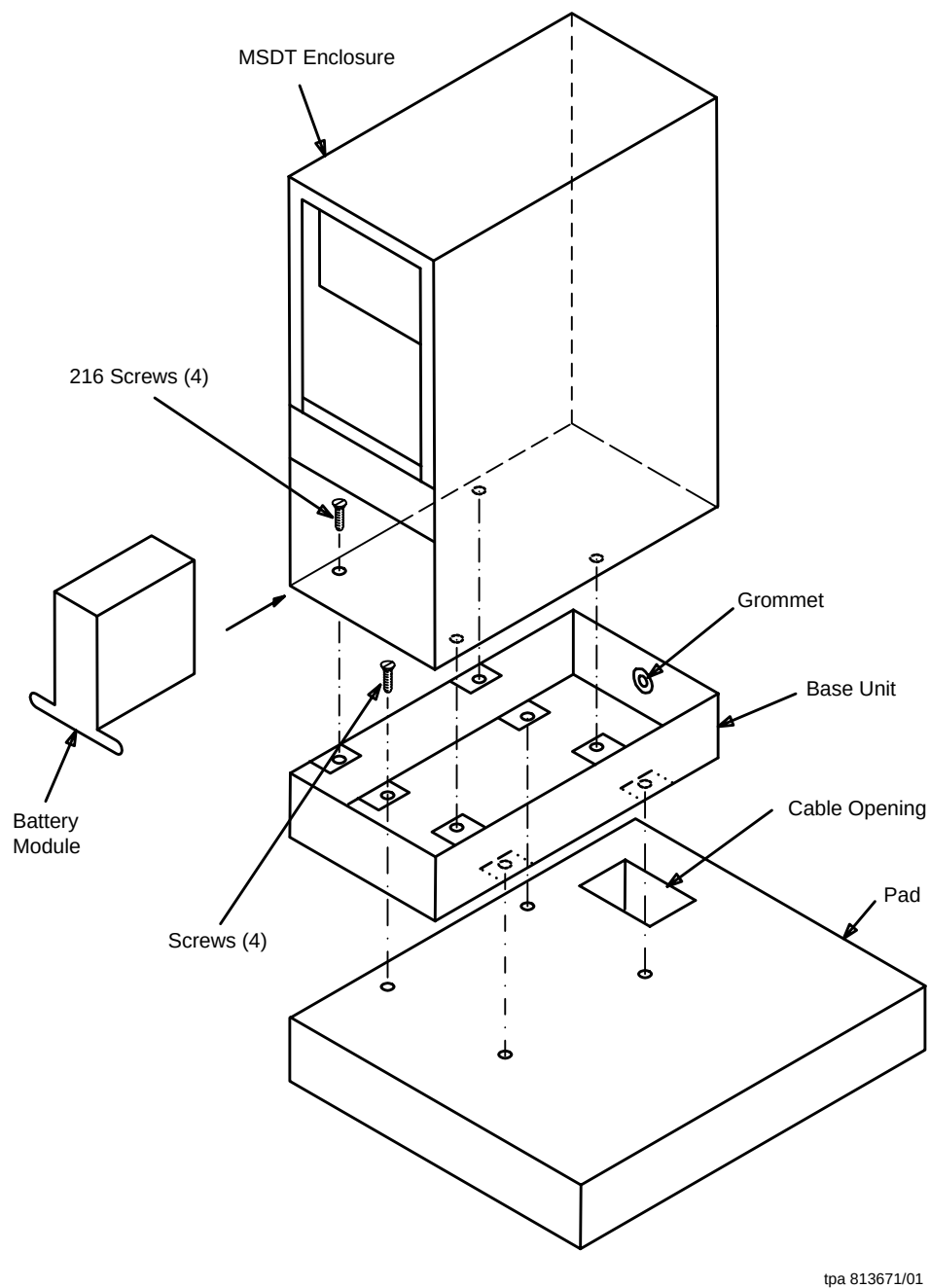


Figure 7-15. Pad-Mounted MSDT Enclosure

11. Reattach battery connector J301 to connector **P301** on the FWB.
12. Close and lock the front door of the enclosure using the special allen-type key.

Direct Ground Mounting of MSDT With No Pad (ED-7C712-30, Group 61)

Refer to Figure 7-16 and Figure 7-17 and direct ground mount the MSDT enclosure using the following procedure:

1. Confirm that all conduits and cables, including the following, are properly placed:
 - Fiber optic or T1 cable
 - Drop cables to living units
 - Electrical power cable 3/4-inch conduit (ED-7C712-30, Group 20, only)
 - Local powering cabling (ED-7C712-30, Groups 21 and 22, only)
 - Central powering cabling (ED-7C712-30, Group 23, only)
 - Ground wire (No. 10 AWG).
2. Set the separate base unit (ED-7C712-30, Group 61) of the MSDT enclosure into the ground so that the ground marks on the base unit are at ground level. The top of the base should be approximately 7 inches above grade level.
3. Backfill around the base to secure it in place.
4. Place approximately 4 inches of gravel on the base.
5. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324).
6. If the backup battery option is used, disconnect battery connector J301 from connector **P301** on the field wiring box (FWB) (ED-7C712-30, Groups 20, 21, and 22, only).
7. Loosen the two captive screws holding the battery module in place and slide the module out of the enclosure.
8. Remove and discard the four plastic plugs protecting the mounting holes in the base of MSDT enclosure.
9. Mount the MSDT enclosure to the base unit using the four 216-type bolts provided.
10. Reinstall the battery module and secure it with the two captive screws.

11. Reattach battery connector J301 to connector **P301** on the FWB.
 12. Close and lock the front door of the enclosure using the special allen-type key.
-

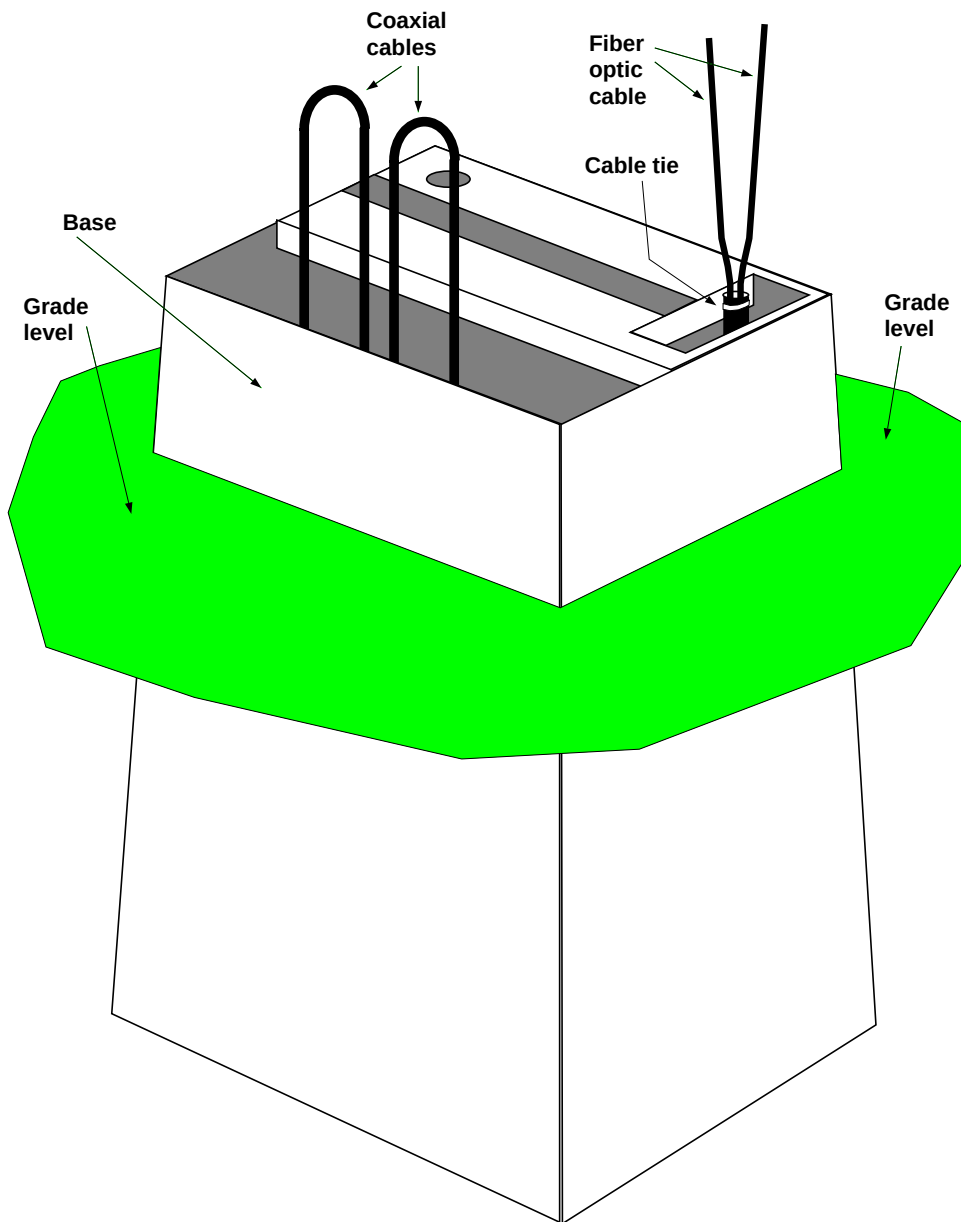


Figure 7-16. Direct-Mounted MSDT Base—Cable Placements

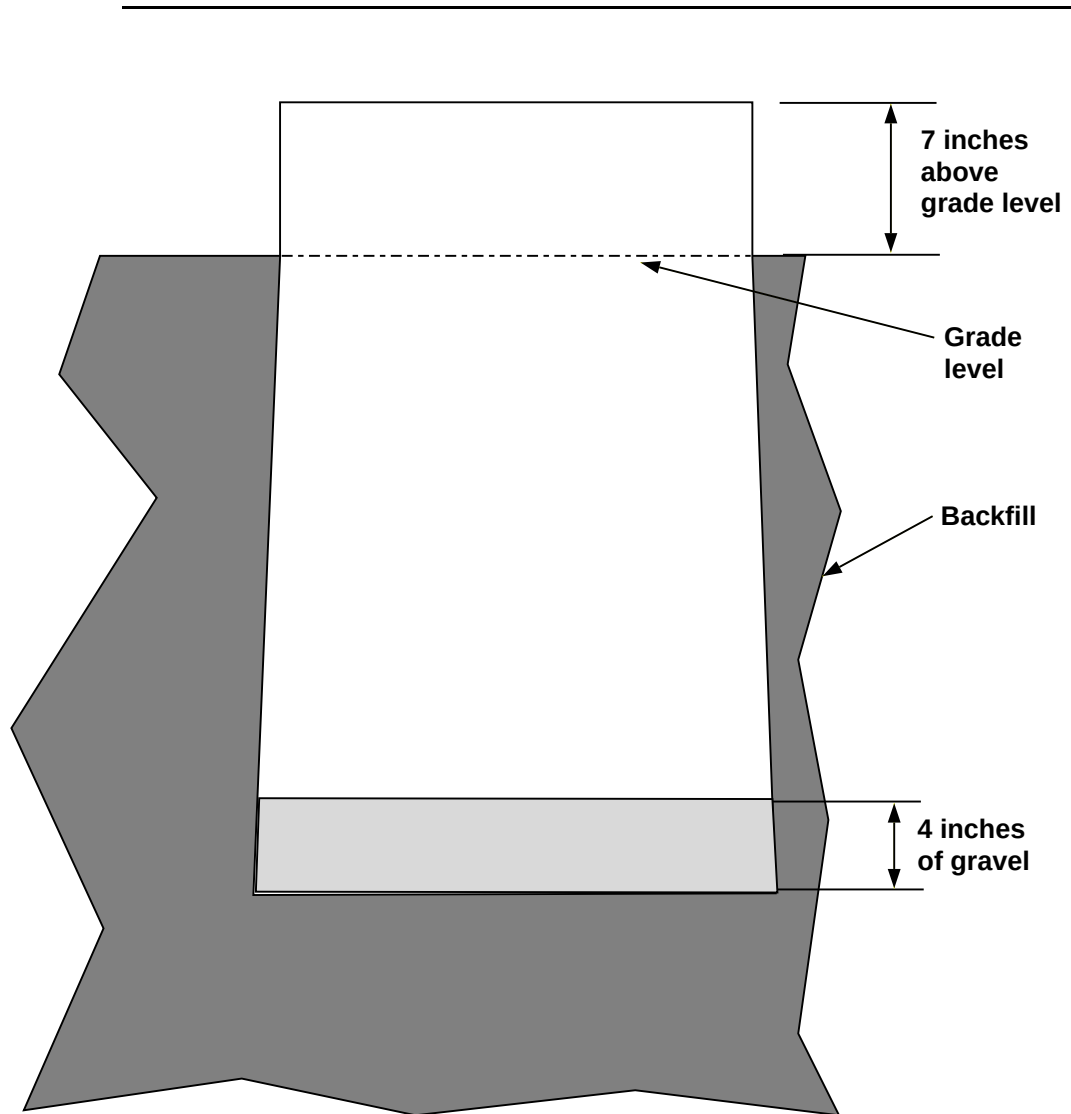


Figure 7-17. Direct-Mounted MSDT Base

Wall-Mounted MSDT Installation

Wall mount the MSDT enclosure using the following procedure:

1. Ensure that a piece of plywood or equivalent, at least 3/4-inch thick, is securely attached to the wall that the enclosure is to be mounted to.
2. Tape the mounting template supplied with the MSDT to the wall making sure that there are no obstructions within the outline shown on the template.

3. Drill four 1/8-inch diameter holes at the locations shown on the template.
4. Screw one of the supplied wood screws with flatwasher into one of the top holes in the plywood until the screw head is approximately 1inch from the plywood surface.
5. Secure the wall mount brackets to the side of the MSDT with the supplied 1/4-20 screws and lockwashers. Position the brackets so that they extend above and below the MSDT.



CAUTION:

A fully loaded MSDT cabinet weighs approximately 50 pounds; assistance may be required when lifting the cabinet to the correct mounting height.

6. Position the MSDT cabinet on the wall by placing the wide keyhole slot in the top mounting bracket over the screw in the wall.
7. Install the three remaining screws in the wall mounting brackets and tighten all four screws.



NOTE:

For wall-mounted applications in or on a building, there will be a UL^{*}-listed version.

Power Connections

This section contains the procedures for routing and connecting the MSDT power cable after the MSDT has been installed.

120 V AC Local Powering Connections (ED-7C712-30, Group 20)



NOTE 1:

These procedures are to be used by a qualified electrician to install all AC power wiring per the National Electrical Code and the local electrical code.



NOTE 2:

MSDT AC powering requires 120 volts AC, 60 Hz, 2-amp service. The FWB is sized to accept power wiring from 14 to 10 AWG.



NOTE 3:

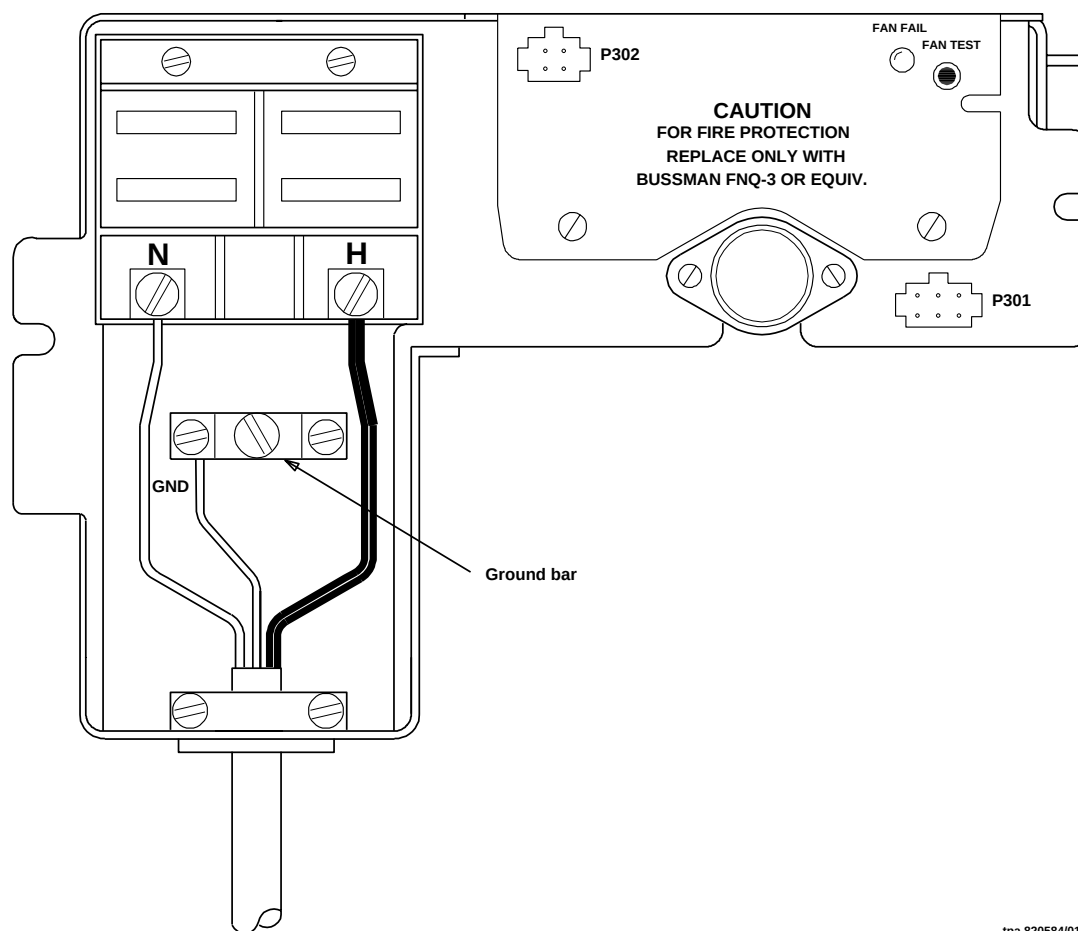
In areas where frost heaving of cabinets may occur, allow slack in the AC cable to allow for movement of the cabinet.

*

UL is a registered trademark of Underwriters Laboratories, Inc.

Make 120 V AC local powering connections according to the following procedure:

1. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324).
2. Remove the pull disconnect by grabbing the handle and firmly pulling straight out on it. Store the disconnect in a safe location.
3. Remove the FWB front panel by removing the two retaining screws.
4. Insert the power cable through the grommet located in the front left bottom of the MSDT enclosure and into the hole in the bottom of the FWB (Figure 7-18). This hole is designed to accept 3/4-inch flexible conduit.
5. Install the proper hardware to relieve the strain on the incoming power cable.
6. Connect the ground conductor to the ground bar.
7. Connect the "hot" and "neutral" conductors to the block positions labeled "**H**" and "**N**", respectively.
8. Replace the FWB front panel.
9. Replace the pull disconnect.
10. Close and lock the front door of the enclosure using the special allen-type key.



tpa 820584/01

Figure 7-18. 120 V AC Local Powering Connections to MSDT FWB

–48 V DC Local Powering Connections (ED-7C712-30, Group 21)

Make –48 V DC local powering connections according to the following procedure:

1. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324).
2. Open the rear door of the MSDT enclosure using a 216-type tool.
3. Insert the local powering pairs into the MSDT through the foam seal in the bottom of the enclosure.
4. If the powering pairs are contained in a separate sheath from the telephone pairs, ground and bond the powering cable sheath according to the instructions contained in the copper drop installation procedure. If the powering pairs are contained in the same sheath as the telephone pairs, ground and bond the common cable sheath according to the instructions contained in the copper drop installation procedure.
5. Route the powering pairs to the terminal block located on the front of the FWB (Figure 7-19).
6. Remove the clear plastic cover protecting the terminal block by gently pulling on the fastener at the top of the cover.
7. Connect each powering pair to a separate pair of binding posts, maintaining the proper polarity.
8. Replace the clear plastic cover over the terminal block and press the fastener at the top of the cover to lock the cover in place.
9. Activate the power source fail alarms as follows:
 - a. Open the FWB cover by turning the latch at the top of the cover 1/4 turn toward the **OPEN** position.
 - b. Slide the protector board out approximately 1 inch.

- c. Locate dual in-line package (DIP) switch S1 on the side of the protector board (Figure 7-20).



NOTE:

The first five rocker switch positions (**1** through **5**) on S1 correspond directly to the terminal block connections on the FWB cover. These switches are used to activate or deactivate the fail alarm LEDs for the five possible power sources. Switches **6** through **8** on S1 are not used.

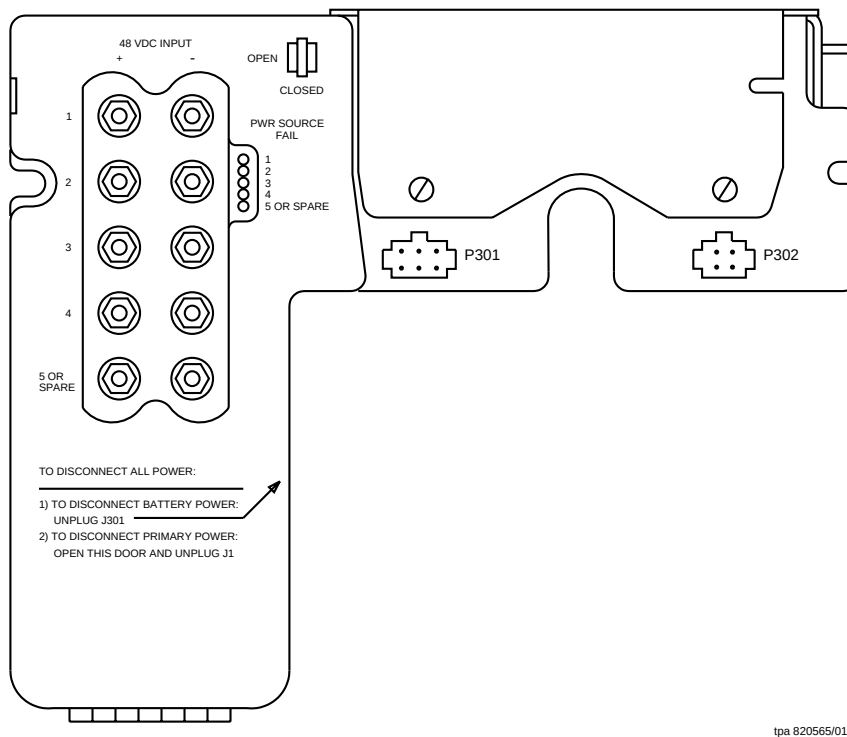
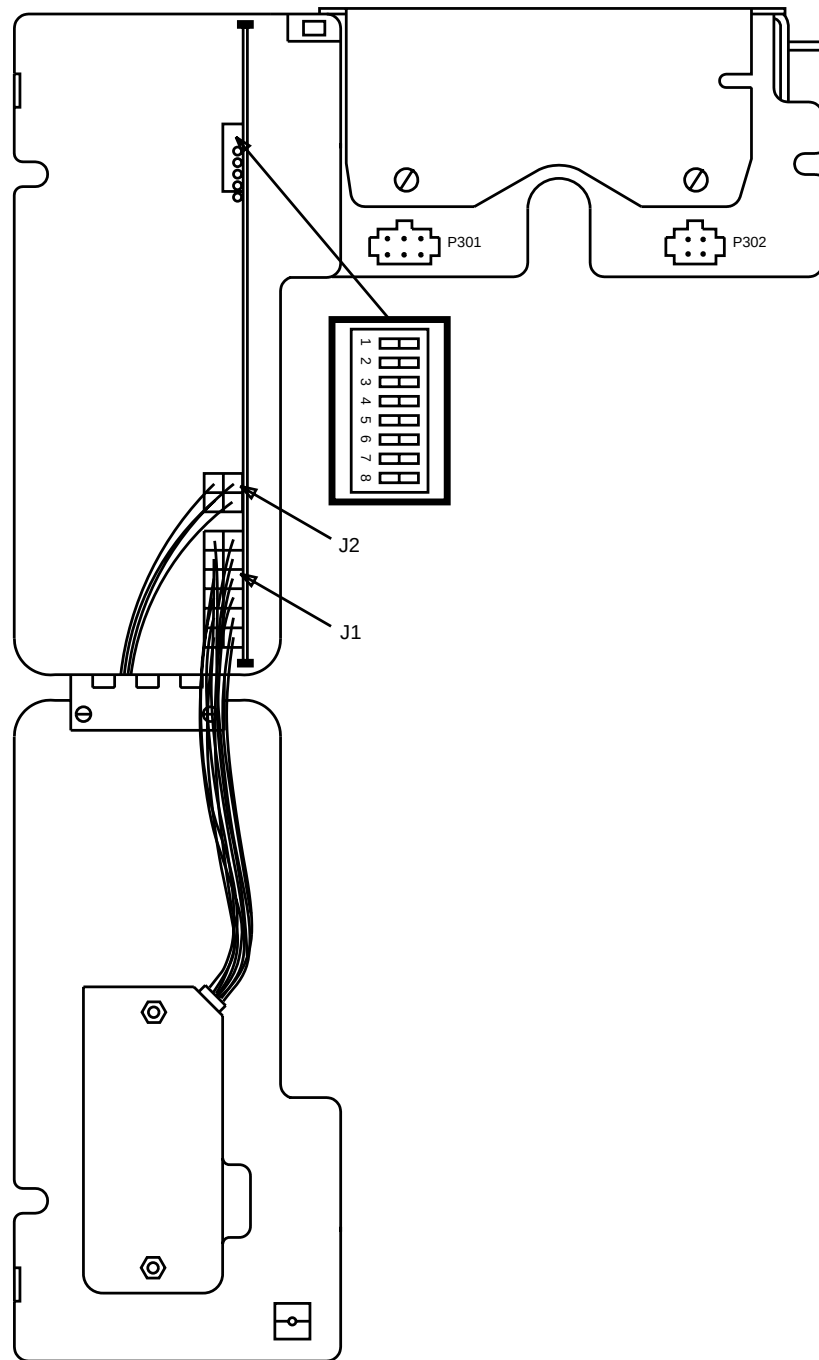


Figure 7-19. -48 V DC Local Powering MSDT FWB Connections



tpa 820566/01

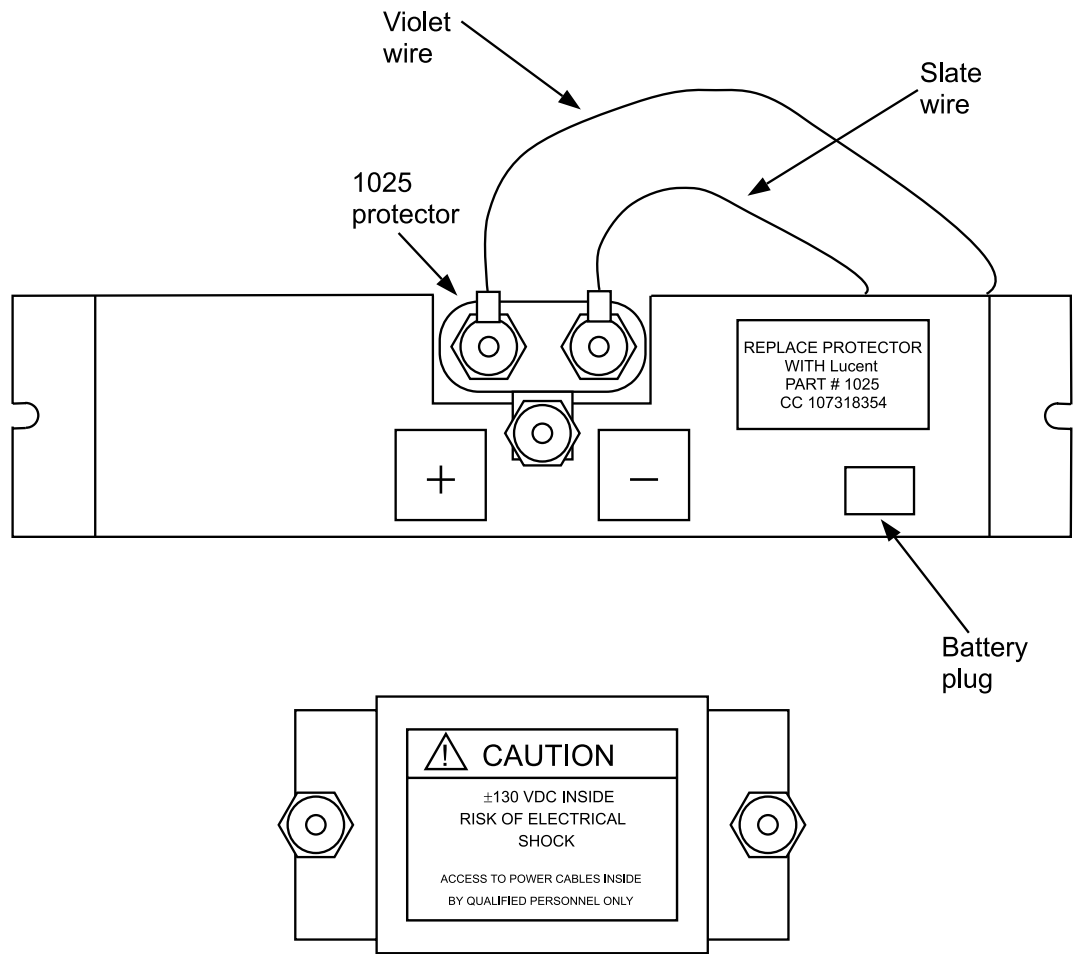
Figure 7-20. -48 V DC Local Powering MSDT FWB (Cover Open)

- d. For only those living units providing a powering source, set the corresponding rocker switches on S1 to the ON (activated) position by pressing the rocker switches on the side near the numbers.
 - e. Slide the protector board into its original position.
 - f. Close the FWB cover and lock it into position by pressing in on the latch and turning it 1/4 turn toward the **CLOSED** position.
10. Close and lock the front and rear doors of the enclosure using the special allen-type key and the 216-type tool, respectively.

±130 V DC Central Powering Connections (ED-7C712-30, Group 22)

Make ±130 V DC central powering connections according to the following procedure:

- 1. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324).
- 2. Open the rear door of the MSDT enclosure using a 216-type tool.
- 3. Insert the central powering sheathed cable into the MSDT through the foam seal in the bottom of the enclosure or through the grommet in the front left bottom of the MSDT.
- 4. Ground and bond the powering cable sheath according to the instructions contained in the copper drop installation procedure.
- 5. Route the powering pairs to the front of the FWB.
- 6. Distribute the central powering pairs between the two sets of binding posts in the FWB (Figure 7-21) maintaining proper polarity.
- 7. Close and lock the front and rear doors of the enclosure using the special allen-type key and the 216-type tool, respectively.



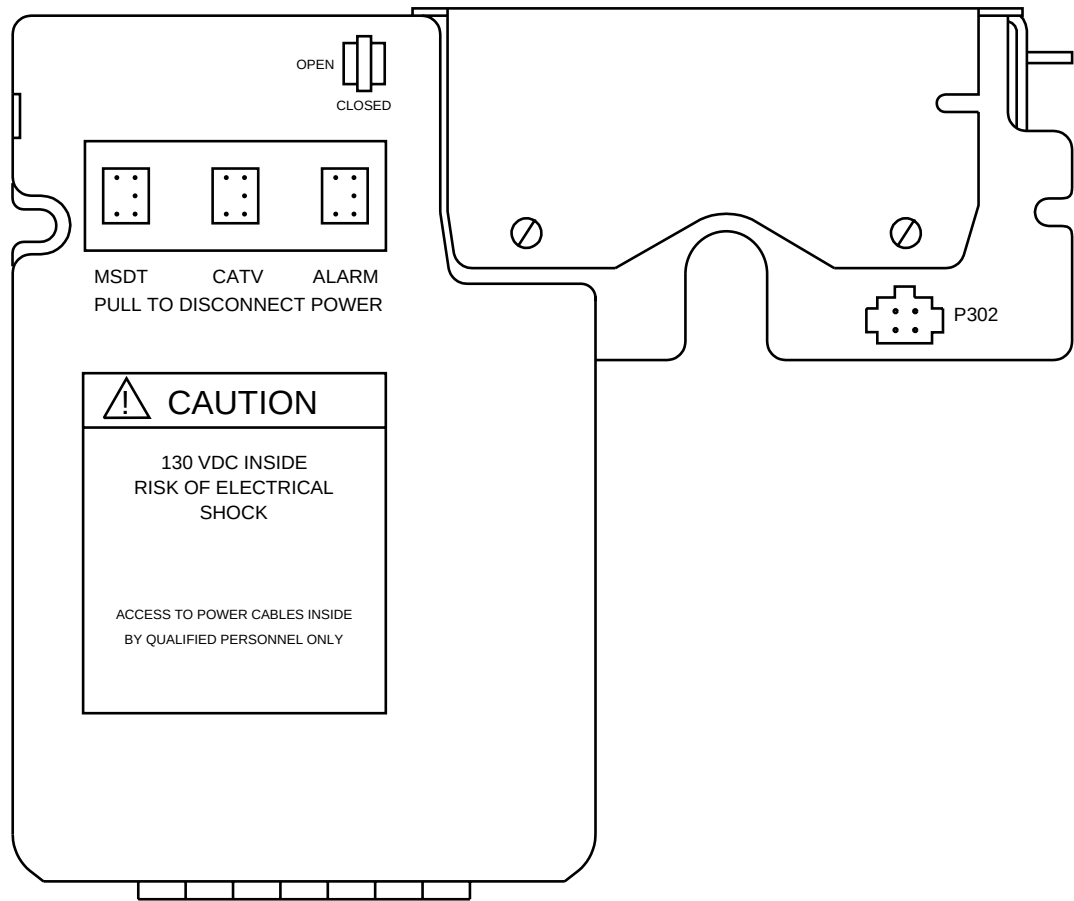
130fwb.ps

Figure 7-21. ±130 V DC Central Powering MSDT FWB

–130 V DC Central Powering Connections (ED-7C712-30, Group 23)

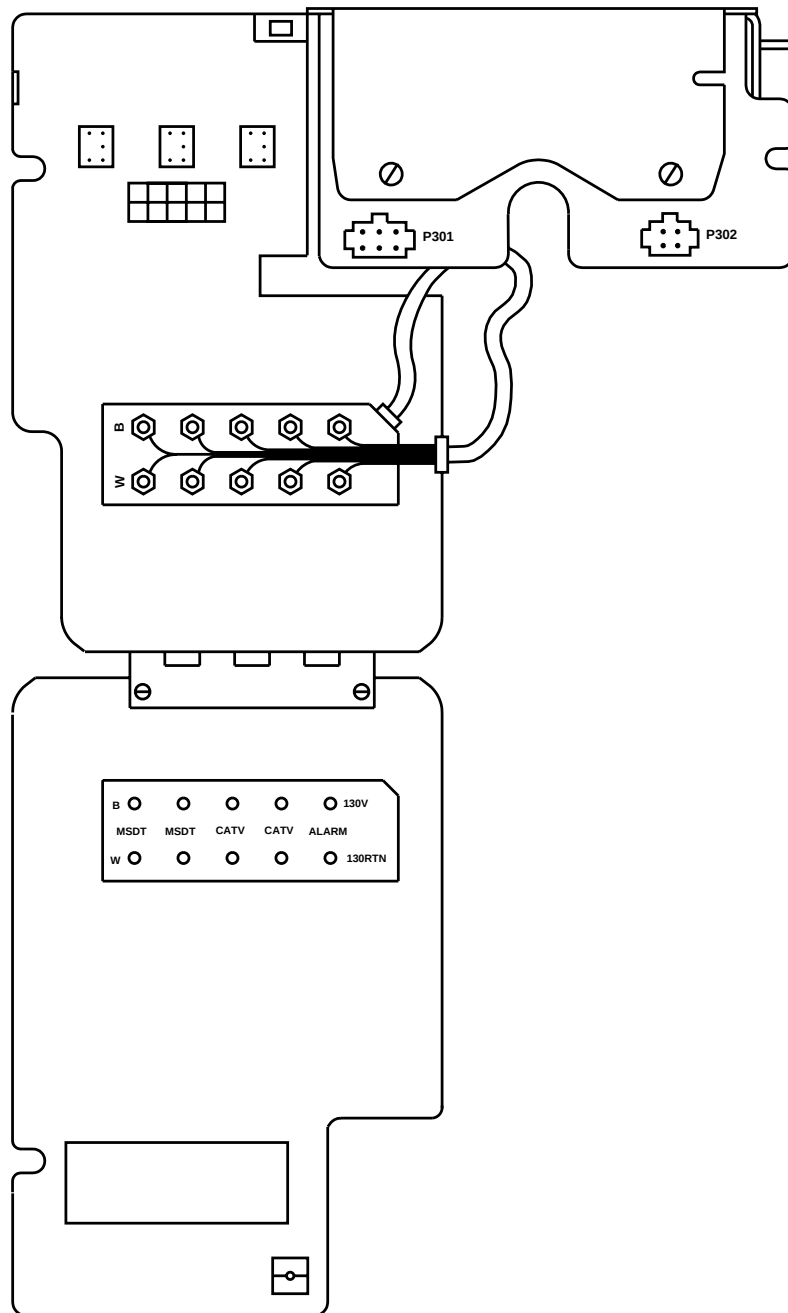
Make –130 V DC central powering connections according to the following procedure:

1. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324).
2. Open the rear door of the MSDT enclosure using a 216-type tool.
3. Insert the central powering sheathed cable into the MSDT through the foam seal in the bottom of the enclosure or through the grommet in the front left bottom of the MSDT.
4. Ground and bond the powering cable sheath according to the instructions contained in the copper drop installation procedure.
5. Route the powering pairs to the front of the FWB.
6. In the older version, open the FWB cover by turning the latch at the top of the cover 1/4 turn toward the **OPEN** position (Figure 7-22).
7. Distribute the central powering pairs between the two sets of binding posts in the FWB (older version — Figure 7-23; newer version — Figure 7-24) maintaining proper polarity.
8. In the older version, close the FWB cover and lock it into position by pressing in on the latch and turning it 1/4 turn toward the **CLOSED** position.
9. Close and lock the front and rear doors of the enclosure using the special allen-type key and the 216-type tool, respectively.



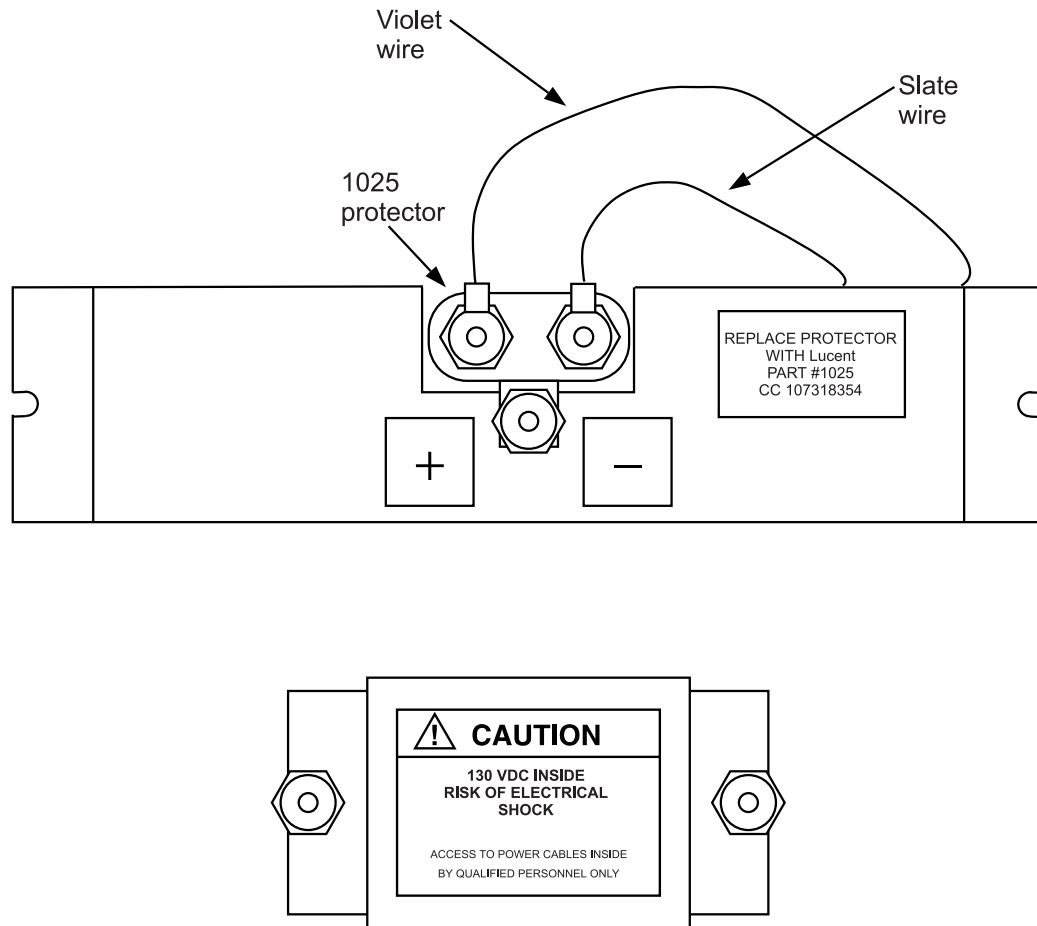
tpa 820567/01

Figure 7-22. -130 V DC Central Powering MSDT FWB (Older Version)



group23fwb.ps

Figure 7-23. -130 V DC Central Powering MSDT FWB (Older Version) (Cover Open)



grp23fwb02.ps

Figure 7-24. -130 V DC Central Powering MSDT FWB (Newer Version)

**60 V AC Central Powering Connections (ED-7C712-30, Group 24)—
Figure 7-25**



NOTE 1:

It is recommended that these procedures be used by a qualified electrician to install all AC power wiring per the National Electrical Code and the local electrical code.



NOTE 2:

MSDT 60 V AC powering requires 60 volts AC, 60 Hz, 60 VA service. The power connection is made through a coaxial F connection.

Make 60 V AC central powering connections according to the following procedure:

1. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324).
2. Insert the coaxial power cable through the plastic plug located in the bottom of the MSDT enclosure by cutting a hole of the appropriate size in the plug.
3. Connect the coaxial drop cable to the F-connector located on the bottom left side of the FWB (see Figure 7-25).
4. Close and lock the front door of the enclosure using the special allen-type key.

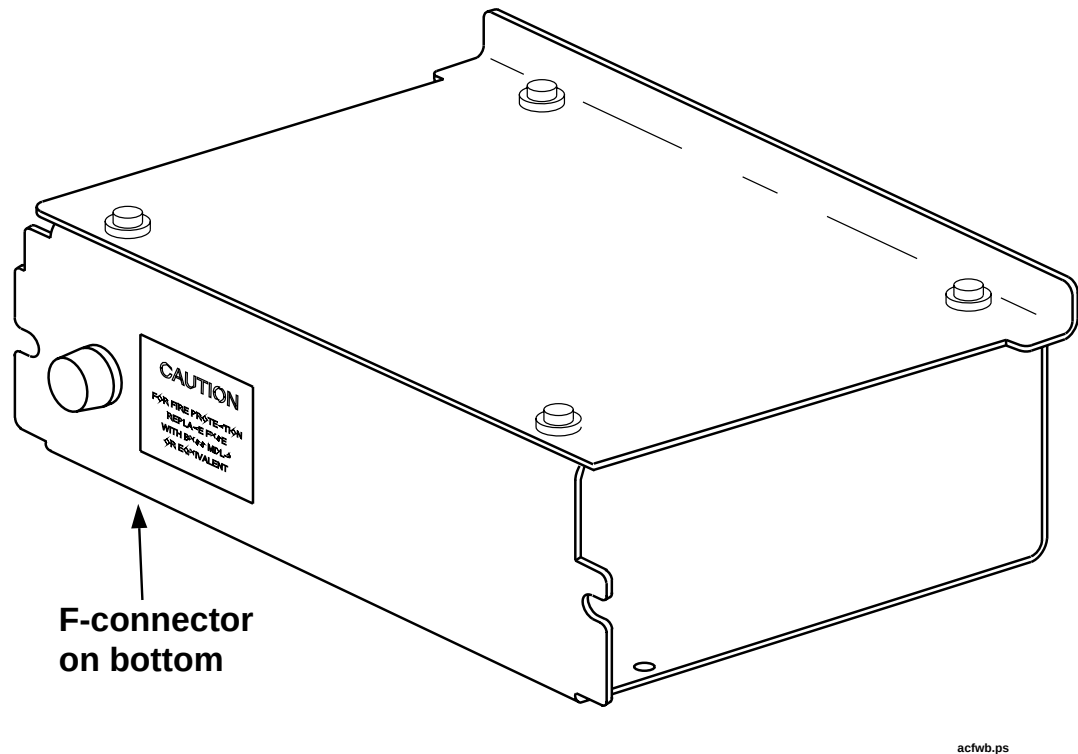


Figure 7-25. 60 V AC Local Powering Connections to MSDT FWB

Fiber/T1 Distribution Cable Connections

This section contains the procedures for installing and connecting fiber drop and looped distribution cables or T1 line distribution cable. The fiber drop cable is available in either a preterminated or unterminated form. The preterminated cable is available in specified lengths and is factory terminated with an *ST* fiber optic cable connector. The unterminated cable is spliced to an *ST* fiber optic cable connector pigtail after the cable is installed in the MSDT enclosure.

Initial Fiber Drop Cable Installation

Perform initial fiber drop cable installation as follows:

1. Open the rear door of the MSDT enclosure using a 216-type tool.
2. Insert the sheathed fiber drop cable through the foam seal in the bottom on the MSDT enclosure.

3. Route the cable up along the right side of the enclosure until the cable extends either 52-1/2 or 57-1/2 inches above the upper tie-down loop for unterminated or preterminated cable, respectively (Figure 7-26).
4. Tie wrap the fiber cable sheath to the upper tie-down loop.
5. Secure the cable at the bottom of the enclosure with appropriate hardware (not provided).
6. Tie wrap the fiber cable sheath to the two remaining tie-down loops.
7. Remove either 52 or 57 inches of sheath and core tube from the fiber cable for unterminated or preterminated cable, respectively.
8. Loosen the two screws holding the clear security cover in place and remove the cover by gently flexing it and pulling it forward.

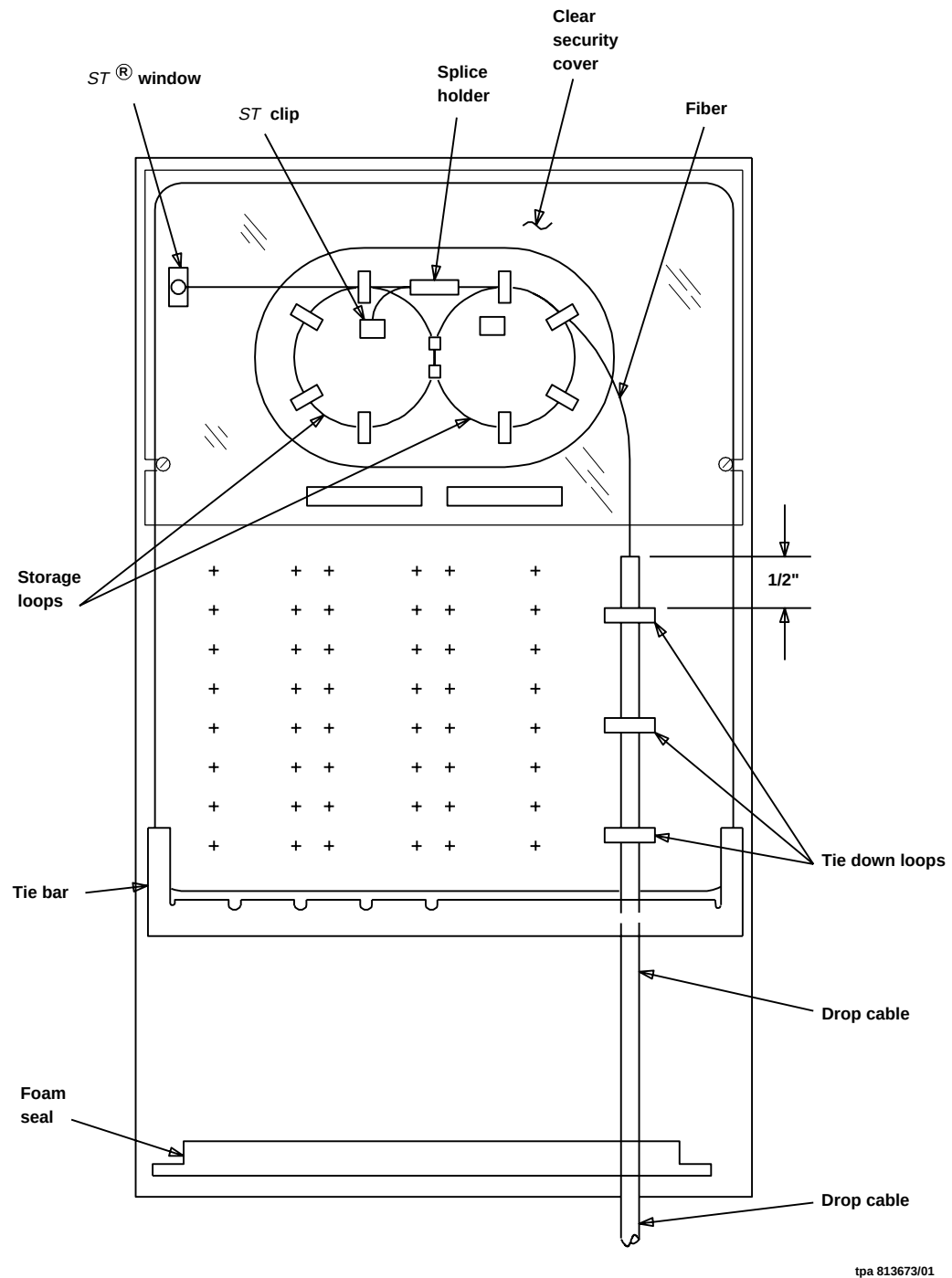


Figure 7-26. Fiber Drop Cable Routing and Connections

Unterminated Fiber Drop Cable Splicing and Storage



NOTE:

If the fiber drop cable contains two fibers, the terms "active" and "dark" fibers will be used in reference to the energized and spare fibers, respectively.

Install, splice, and store the unterminated fiber drop cable in the MSDT enclosure as follows:

1. Cut a single-ended *ST* fiber optic cable connector "pigtail" unit 49 inches long, measured from the tip of the *ST* connector to the end of the buffered fiber.
2. Splice the active fiber of the drop cable to the pigtail fiber using a Lucent Technologies *CSL LightSplice*® fiber optics splicer, Lucent Technologies prealigned rotary splice, *FIBRLOK** optical fiber splicing kit, fusion splice, or equivalent.
3. Store the completed splice in the splice holder at the top of the fiber organizer unit and secure it with the captive *Velcro*† fastener.
4. Open all of the fiber organizer unit retaining clips.
5. On each side of the splice, coil the fiber into four loops and install it into the retaining clips.
6. Connect the pigtail's *ST* fiber optic cable connector to the MSDT coupler located in the upper left **FIBER** window.
7. When splicing an *ST* fiber optic cable connector to a dark fiber, repeat Steps **1** through **3**. Then coil the dark fiber into four loops, install it into the retaining clips on the right side of the fiber organizer unit, and insert the *ST* fiber optic cable connector into the clip holder.
8. Close all fiber organizer unit retaining clips.
9. Dress the loops on each side of the splice to avoid sharp bends.
10. Replace the clear security cover by gently flexing it and guiding the two side slots under the hold down screws. Tighten the two hold down screws.
11. Close and lock the rear door of the enclosure using the 216-type tool.

* FIBRLOK is a registered trademark of Minnesota Mining and Manufacturing Company.

† Velcro is a registered trademark of Velcro Industries B. V.

Preterminated Fiber Drop Cable Splicing and Storage



NOTE:

If the fiber drop cable contains two fibers, the terms "active" and "dark" fibers will be used in reference to the energized and spare fibers, respectively.

Install and store the preterminated fiber drop cable in the MSDT enclosure as follows:

1. Open all of the fiber organizer unit retaining clips.
2. Coil the active fiber into four loops and install it into the retaining clips on the right side of the fiber organizer unit.
3. Remove the dust cover from the *ST* coupler located in the upper left **FIBER** window.
4. Connect the *ST* fiber optic cable connector to the MSDT coupler located in the **FIBER** window.
5. Coil the dark fiber into four loops, install it into the retaining clips on the right side of the fiber organizer unit, and insert the *ST* fiber optic cable connector into the clip holder.
6. Close all fiber organizer unit retaining clips.
7. Dress the loops on each side of the splice to avoid sharp bends.
8. Replace the clear security cover by gently flexing it and guiding the two side slots under the hold down screws. Tighten the two hold down screws.
9. Close and lock the rear door of the enclosure using the 216-type tool.

Looped Distribution Cable Installation

Perform looped distribution fiber cable installation as follows:

1. Place the fiber cable to be looped so that at least 84 inches of sheath can be removed from it.
2. Open the doors of the MSDT using a 216-type tool for the back door and an electronics key for the front door.
3. Locate and remove the foam rubber seal in the bottom of the cabinet (Figure 7-27). Gently remove the seal by compressing the foam to disengage the pins holding the seal in place. Remove the seal and store it in a safe location.
4. Remove and discard the four plastic plugs protecting the mounting holes in the bottom of the MSDT.
5. Set the MSDT on the base by carefully guiding the fiber optic cable through the slot in the base of the MSDT and lowering the MSDT onto the base.
6. Align the MSDT with the base and fasten it in place using the four 1/4-20 screws provided.
7. Obtain an approved ground for the MSDT per local practice.
8. Run an 8 AWG or larger ground wire from the ground through the slot in the bottom of the MSDT and connect the ground wire to the terminal provided on the MSDT.
9. Mark both legs of the fiber optic cable 6 inches above the bottom of the MSDT. Remove the sheath from the fiber optic cable between these two points.
10. Bond and ground the fiber optic cable metallic shield using appropriate hardware. Connect a flexible ground strap from the cable shield to the ground studs located in the bottom of the MSDT.
11. Identify the unused core tubes. These core tubes should be loosely coiled and stored in the space on the right side of the MSDT between the side of the enclosure and electronics card cage.
12. Position the core tube containing the fiber to be spliced along the right side of the backplane cover. Mark the core tube at a position 4 inches above the top-most cable tie-down loop.
13. Open the core tube between the marked points. Select and clean the fiber to be spliced and separate it from the remaining fiber.
14. Lightly tie wrap the core tube opened in the preceding step to the tie-down loops on the right side of the MSDT.
15. Drop down the fiber organizer unit and store the unused fibers behind the tray.
16. Rotate the fiber organizer unit to its home position and secure it.
17. Splice the selected fiber to a single ended pigtail.

18. Store the completed splice in the splice holder at the top of the fiber organizer unit and secure it in place.
19. Unlock all of the retaining clips of the fiber organizer unit. For each side of the splice, coil the slack fiber into the retaining clips.
20. Connect the pigtail's *ST* connector to the MSDT. The MSDT coupler is located in the upper left portion of a window marked *Fiber*.
21. Replace the foam seals removed in **Step 3**.
22. Close and latch the doors on the MSDT.

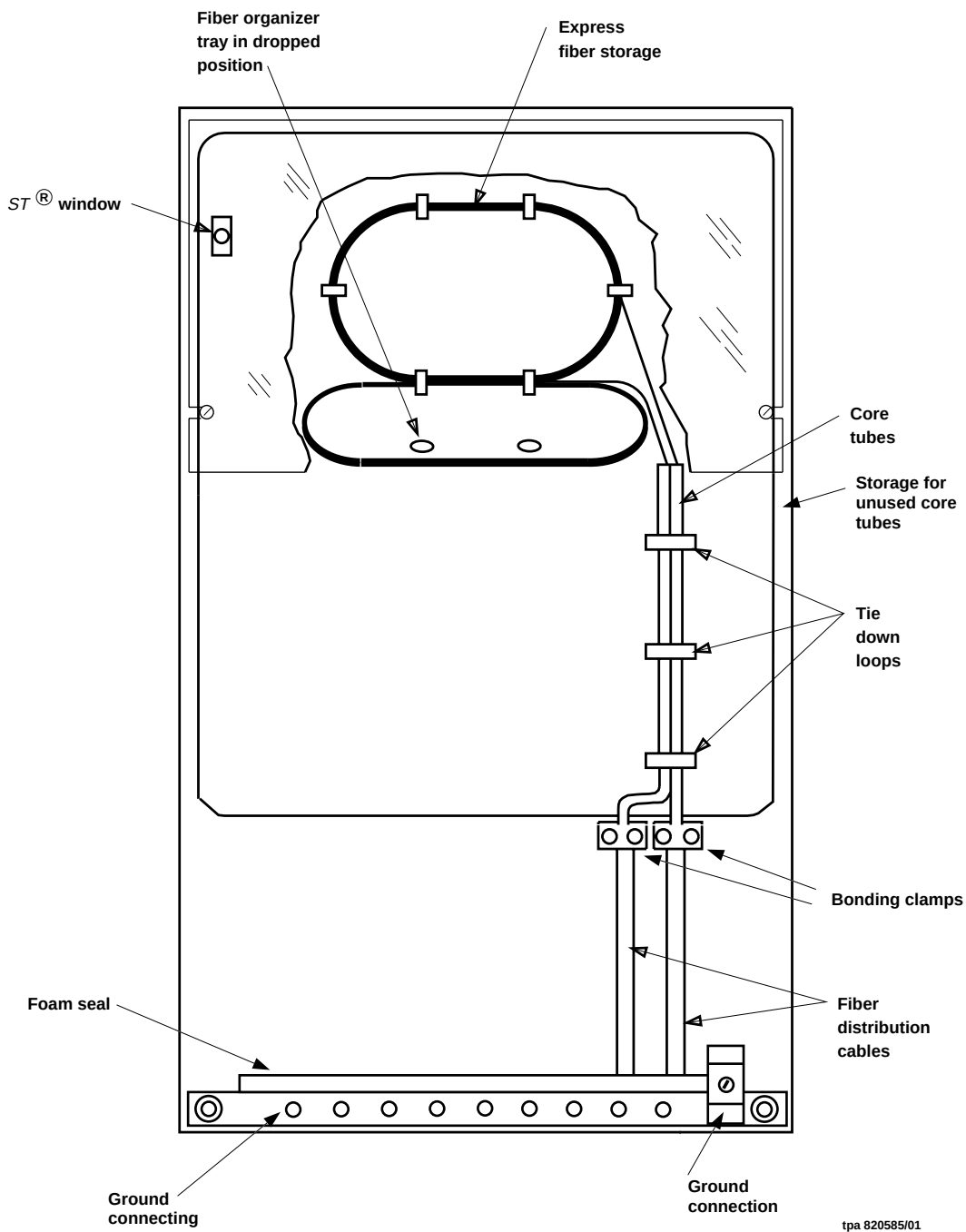


Figure 7-27. Looped Distribution Fiber Cable Routing and Connections

T1 Metallic Distribution Cable Installation

Install the T1 metallic distribution cable in the MSDT as follows (refer to Figure 7-28 while performing this procedure):

1. Open the rear door of the MSDT enclosure using a 216-type tool.
2. Insert the T1 metallic distribution cable through the foam seal in the bottom of the MSDT enclosure.
3. Route the cable up along the right side of the enclosure until the cable extends 12 inches above the upper tie-down loop.
4. Tie wrap the cable to the upper tie-down loop.
5. Secure the cable at the bottom of the enclosure with appropriate hardware (not provided).
6. Tie wrap the cable to the two remaining tie-down loops.
7. Loosen the two screws holding the clear security cover in place and remove the cover by gently flexing it and pulling it forward.
8. Connect the T1 metallic lines to the **T**, **R**, **T1**, and **R1** binding post lugs near the top of the MSDT.
9. Replace the clear security cover by gently flexing it and guiding the two side slots under the hold down screws. Tighten the two hold down screws.
10. Close and lock the rear door of the enclosure using the 216-type tool.

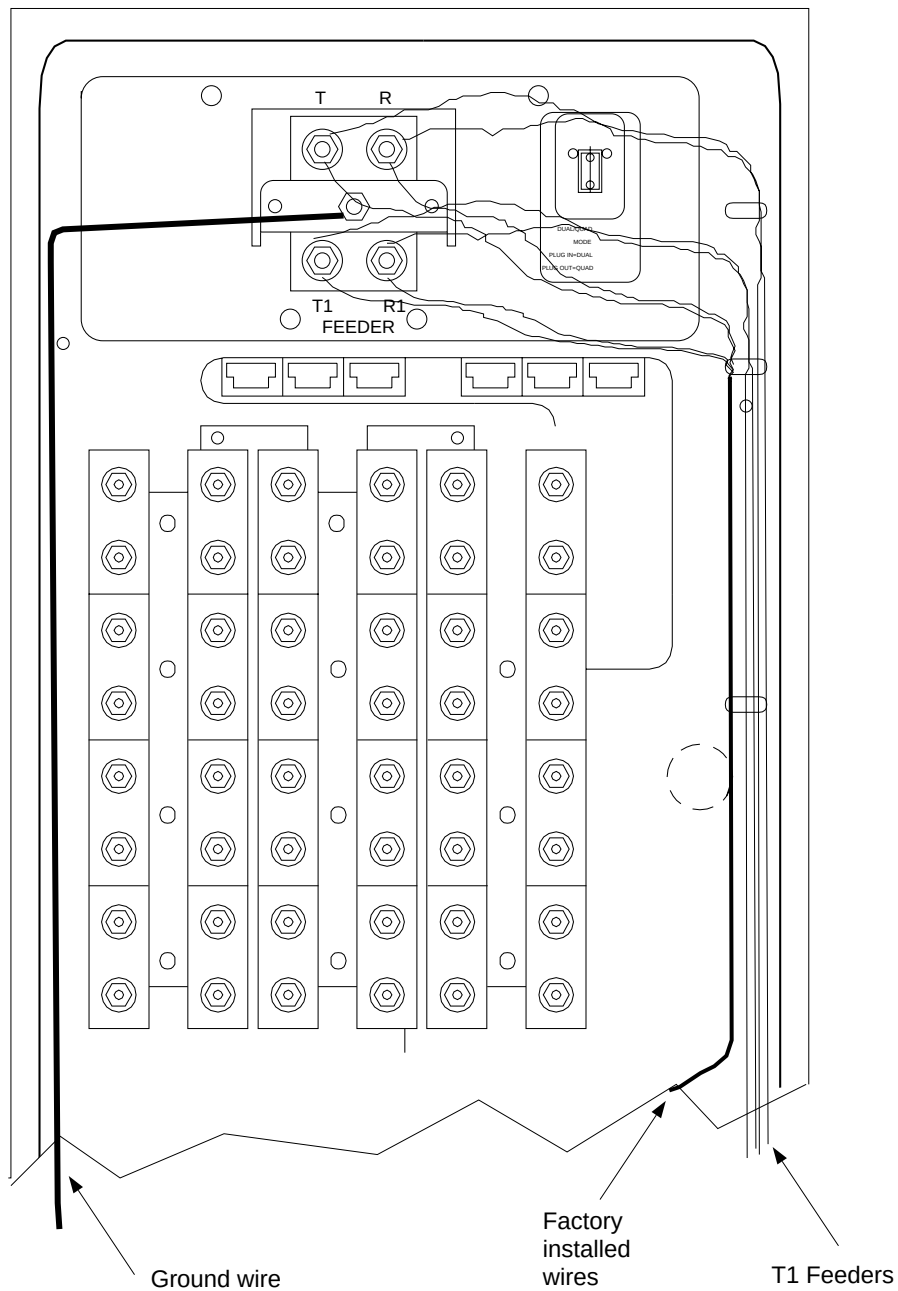


Figure 7-28. T1 Feeder Connection to MSDT

Copper Drop Cable and Ground Connections

Copper Drop Cable Connections

The MSDT provides connections for up to 24 voice-frequency (VF) lines. These lines are connected to either insulation displacement or binding post terminations located on the rear of the MSDT.

Install the copper drop cable in the MSDT as follows:

1. Open the rear door of the MSDT enclosure using a 216-type tool.
2. Insert the copper drop sheathed cable(s) through the foam seal in the bottom of the MSDT enclosure.
3. Arrange the foam to obtain a tight seal around the cables.
4. Cut each cable to a length of approximately 30 inches.
5. Mark the sheath at a point approximately 5 inches above the foam seal entry port (Figure 7-29). Remove the sheath from this point to the end of the cable.

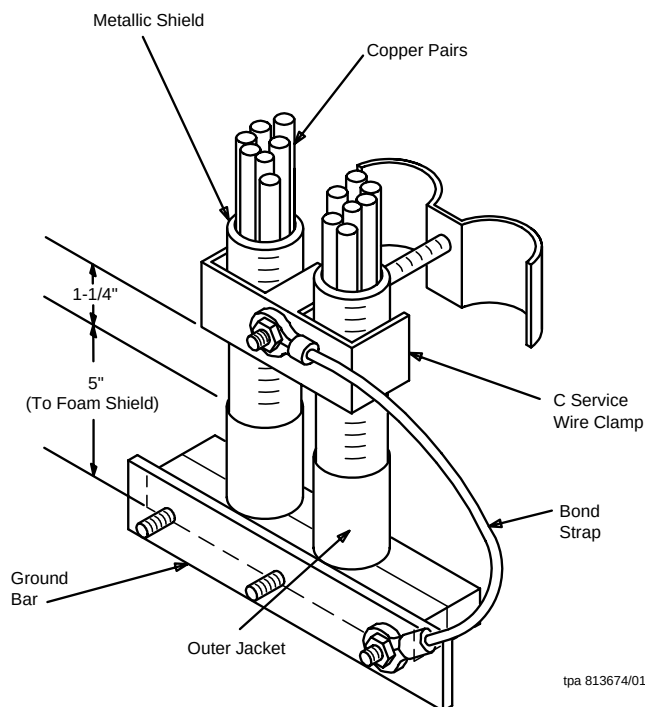


Figure 7-29. Copper Drop Cable Clamping Arrangement

6. Mark the metallic shield at a point approximately 1-1/4 inches beyond the sheath. Remove the metallic shield from this point to the end of the cable.
7. Clean any filling compound or plastic coating from the metallic shield to prepare it for proper bonding.
8. Attach a C service wire clamp to the fiber cable using the following method: Attach a C service wire clamp (not provided) to the metallic shield (Figure 7-29). One clamp may be used for two cables. Attach a flexible bond strap (not provided) from the C service wire clamp to a stud on the ground bar located on the bottom surface of the MSDT enclosure.
9. Dress the copper pairs up to the appropriate binding posts on the protector blocks and attach the wire to the terminals.
10. Record the address and other appropriate information on the rear door label per local procedures.
11. Store unused copper pairs in the area above the cables.
12. If necessary, seal the cable entrances using one of the methods described previously in this installation procedure near the beginning of the MSDT installation section.
13. Close and lock the rear door of the enclosure using the 216-type tool.

Ground Connection

This procedure is used to electrically ground an MSDT enclosure by attaching a wire from the ground lug on the MSDT enclosure to an approved ground connection.

Install the MSDT enclosure ground connection as follows:

1. Obtain an approved ground connection for the MSDT per local procedures.
2. Open the rear door of the MSDT enclosure using a 216-type tool.
3. Insert a size No. 10 AWG (or larger) ground wire, from an approved ground connection, through the foam seal in the bottom of the MSDT enclosure.
4. Route the ground wire to the ground lug located on the ground bar in the base of the MSDT enclosure.
5. Close and lock the rear door of the enclosure using the 216-type tool.

SLC-2000 Strand-Mounted MSDT Installation

The strand-mounted MSDT consists of a metal enclosure with 1 or 2 card cages and backplanes, 6 or 12 common unit circuit boards, and up to 6 or 12 channel unit circuit boards. Installation of the circuit boards in the card cage is presented in Chapter 8, "Operations and Maintenance — TOP."

Site Preparation

Prepare the proposed site to receive the MSDT enclosure as follows:

1. Verify the placement location and spacing from the pole (typically 48 inches).
2. Verify that the placement of the fiber cable is complete and a slack loop of 60 inches is present at the MSDT enclosure installation location.
3. Verify that the 25-pair, No. 19 AWG power cable has been placed.
4. Verify that the proper UCB1 splice case grip and grommet kits have been obtained for the power and fiber drop cables.

MSDT Enclosure Placement

Place and secure the MSDT enclosure to the strand cable using the following procedure:

1. Remove or loosen and rotate the two strand clamps on the strand hangers on the top of the enclosure.
2. Attach lifting hardware to the lifting holes located in the top flange of the enclosure and hoist or lift the enclosure into place.
3. Hook the strand hangers over the cable strand.
4. Replace or rotate the strand clamps into place so that the cable strand is located between the strand clamps and the strand hangers.
5. Tighten the strand clamp bolts.

Power Connections

Use the following procedure to route and splice the power cable wiring within the UCB1 splice closure:

1. At the top of the MSDT enclosure, remove and store the UCB1 cover and screws.
2. At the top of the MSDT enclosure, remove and store the two end clamps and screws.
3. Release the fiber organizer tray by pressing the holding clips on the sides of the tray. Set the tray, with attached fiber jumpers, near the front edge of the MSDT enclosure.
4. Loosen the screws holding the two clear plastic tray clips in the UCB1. Remove and store the plastic tray clips.

5. Position the power cable over the ports located at the rear of the UCB1 splice closure.



NOTE:

The copper cable will be spliced in the bottom section of the UCB1 splice closure.

6. Locate a point on the cable at the middle of the splice closure and measure and mark the cable 6 inches in both directions from this point.
7. Remove the outer sheath of the cable between the two marks.
8. Remove the exposed metallic armor except for 1 inch at each end.
9. Using a universal bond clamp, bond and ground the power cable metallic armor at each end to the flexible ground strap in the splice closure.
10. Install grommets, if used, and apply B sealant as needed.
11. Insert the cable with the grommets, if used, and grip assemblies into the rear ports of the splice closure.
12. Tighten the nuts on both grip assemblies to lock the cable in place.
13. Identify and separate from the power cable the two power pairs to be used for this closure.
14. Locate the two MSDT power pairs located in the hole in the middle of the splice closure.
15. Using the 700-3B supplied connector or other appropriate splice connector, taking note of polarity, connect the power pairs to the appropriate MSDT pairs.
16. Replace the two clear plastic tray clips into the splice closure and tighten the screws.
17. Replace the fiber organizer tray into the splice closure.

Fiber Cable Connections

Use the following procedure to route and splice the fiber cable within the UCB1 splice closure:

1. Use 635-501-101-25 to perform a midsheath entrance of the fiber optic cable.
2. Locate the two fiber jumpers stored in the fiber organizer tray.
3. Separate from the other fibers the two fibers to be spliced to the fiber jumpers.
4. Store the express fibers in the organizer tray.

5. Splice the fiber jumpers to the two fibers selected and store the splice in the fiber organizer tray.
6. Close the fiber organizer.
7. Apply B sealant to the underside of the UCB1 splice closure clamps, to the cover, and to the slit in the closure gasket.
8. Secure the clamps and cover them with the supplied bolts and torque them to 75 inch-pounds.

Copper Drop Cable Connections

Use the following procedure to route and connect the copper drop cable to the strand-mounted MSDT enclosure:

1. Install or verify that the copper terminal has been installed on the pole adjacent to the MSDT enclosure.
2. Remove and store the screws, gasket, and cover associated with the rear access panel (Figure 7-30).

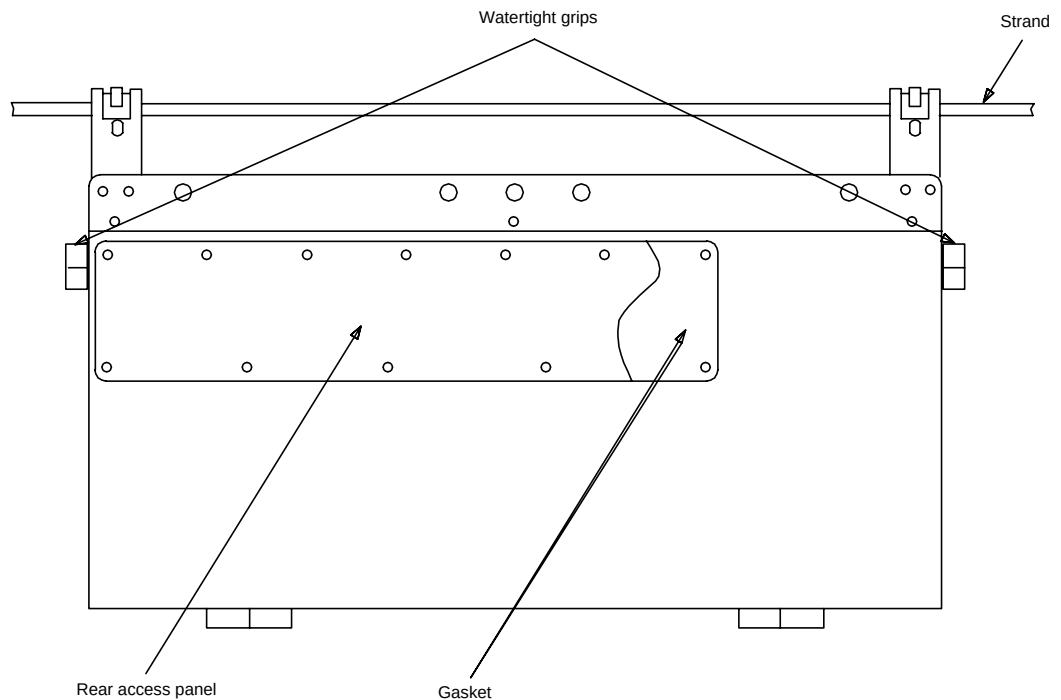


Figure 7-30. Strand-Mounted MSDT (Rear View)

3. Locate the two preterminated connectors inside the unit and bring them out through the access opening in preparation for splicing.
4. Locate the watertight grip (Figure 7-30) on the side of the cabinet facing the pole with the copper terminal. Remove and store the gland nut and internal rubber sealing gland located on the grip. The flat metal sealing washer may be discarded.
5. Arrange the stub cable for entry into the watertight grip.
6. Slip the gland nut and sealing gland over the stub cable.
7. Insert the stub cable through the watertight grommet, feeding the cable out through the access cover opening. Tighten the gland nut and sealing gland onto the watertight seal.
8. Remove the cable sheath from the stub cable up to the point where the cable comes out of the access opening.
9. Ground the metallic sheath of the stub cable to the grounding strap located inside the cabinet with the appropriate grounding hardware.
10. Splice the stub cable pairs to the preterminated connectors.
11. Store the splices and slack cable into the cabinet through the access cover opening.
12. Replace the gasket, access coverplate, and screws over the access opening.

SLC-2000 Rack-Mounted MSDT Installation

The rack-mounted MSDT consists of a metal mounting bracket with 1 or 2 card cages and backplanes, 5 or 10 common unit circuit boards, 1 or 2 option (CDTU) circuit boards, and up to 6 or 12 channel unit circuit boards. Installation of the circuit boards in the card cage is presented in Chapter 8, "Operations and Maintenance — TOP."

Install the rack-mounted MSDT using the following procedure:

1. Install two alignment pins into the two upper screw holes in the frame that align with the mounting holes in the MSDT metal mounting bracket.
2. Mount the MSDT in the frame while verifying that the alignment pins are inserted through the upper mounting holes in the mounting bracket.
3. Secure the MSDT mounting bracket to the frame using six No. 12-24 screws in the side mounting holes (three screws in each side).
4. Replace the alignment pins with the two remaining No. 12-24 screws.

Power Connections

This section contains the procedure for connecting the MSDT power cable after the MSDT has been installed in the frame.

Locate the **FWB** connector on the lower rear of the MSDT and insert the stub power cable connector into it.

Fiber/T1 Distribution Cable Connections

The rear of the rack-mounted MSDT can be equipped with a distribution cable connection for either a T1 metallic distribution cable or a fiber distribution cable. The connection point for a T1 metallic distribution cable is a 4-position terminal block located in the upper left-hand corner of the MSDT. The connection for a fiber distribution cable is an *ST* fiber optic cable connector also located in the upper left-hand corner of the MSDT.

Copper Drop Cable Connections

Drop cable connections to the rack-mounted MSDT are made at the RJ-11 jacks located on the rear of the MSDT.

SLC-2000 Underground-Mounted MSDT (U-MSDT) Installation

The 902A MSDT (COMCODE 107320525) (Figure 7-32) is a sealed enclosure containing the MSDT circuit packs for below ground mounting arrangements. It uses the –130 volts DC network powering arrangement and mounts in a handhold (COMCODE 407223940) with an integral swing arm lift out assembly.

Before beginning the installation process, obtain the following components in addition to the MSDT and the handhold enclosure:

- Fiber splice closure for splicing the fiber feeder optic cable to the supplied fiber optic stub cable with the MSDT



NOTE:

Lucent Technologies recommends a Lucent Technologies 2500 splice case.

- Copper splice closure for splicing from the power feeder cable to a copper stub cable providing power to the MSDT

- One of the following 25-pair drop wire below ground terminal channel product BMTs:
 - BMT 62025B2
 - BMT 60925B1
 - BMT 61225B3
- All needed circuit packs for the MSDT.

Install the underground MSDT as follows:

1. Install the handhold enclosure (Figure 7-31) using standard telephone practices (typically at the time of cable placement).



NOTE:

The handhold is shipped with a swing arm for mounting the MSDT. It also contains two 18-inch adjustable vertical mounting racks for mounting the splice cases to one side wall.

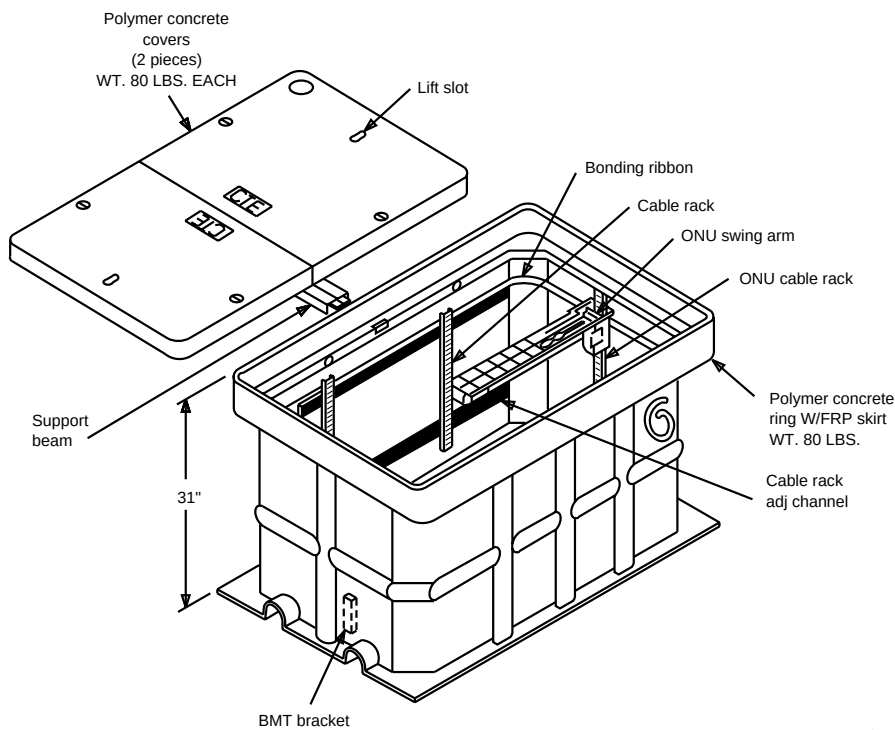


Figure 7-31. Underground MSDT Handhold Enclosure

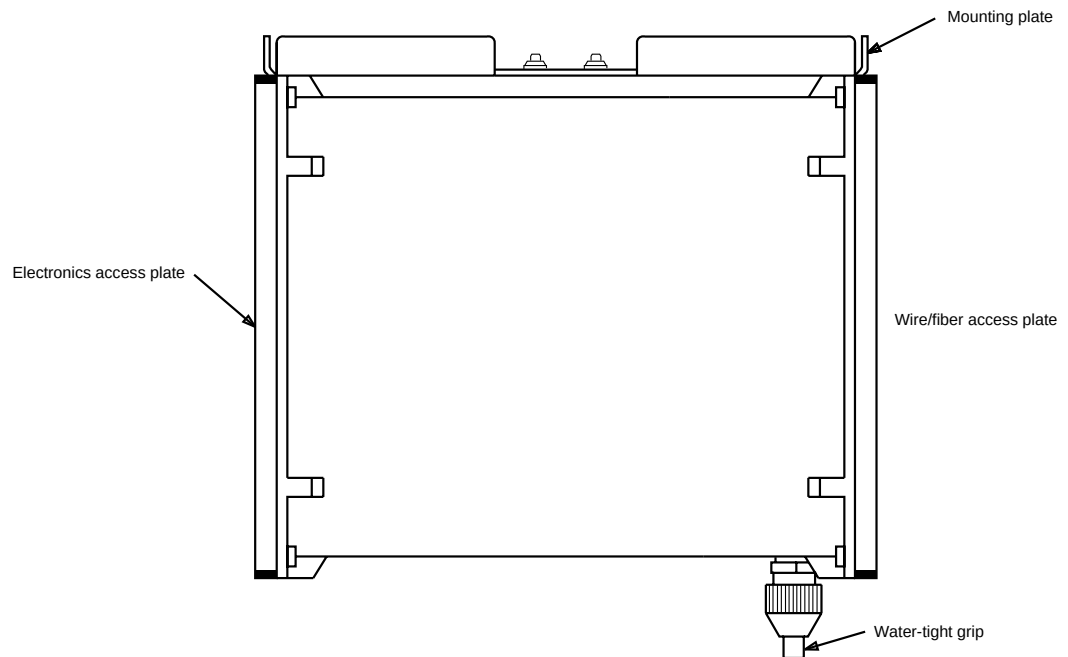
2. Attach the MSDT to the swing arm as follows:



NOTE:

The MSDT (Figure 7-32) is supplied with a stainless steel mounting plate with four 1/4-20 studs, nuts, and washers on its top surface.

- a. Place the swing arm (located in the handheld enclosure) in a vertical position. Lock it in place with the attached safety pin.
- b. Remove and retain the four nuts and supplied washers from the four studs on the top surface of the plate.
- c. Place the MSDT onto the swing arm positioned so its longest dimension is at right angles to the swing arm. Secure it with the four sets of washers and nuts previously removed.
- d. Carefully lower the MSDT into the handheld enclosure and lock it into place.



tpa 847786/01

Figure 7-32. Underground MSDT

3. Splice the fiber stub cable into the fiber distribution cable with the chosen splice case.



NOTE:

The MSDT is supplied with a 25-foot 2-fiber stub cable. One active (blue) and one spare (orange) fiber are provided. Store the splice case and associated slack cable along the side of the handhold so it does not interfere with the movement of the swing arm assembly or the MSDT.

4. Splice the power cable to a copper stub cable of sufficient length (approximately 6 feet) to easily enter the BMT terminal.

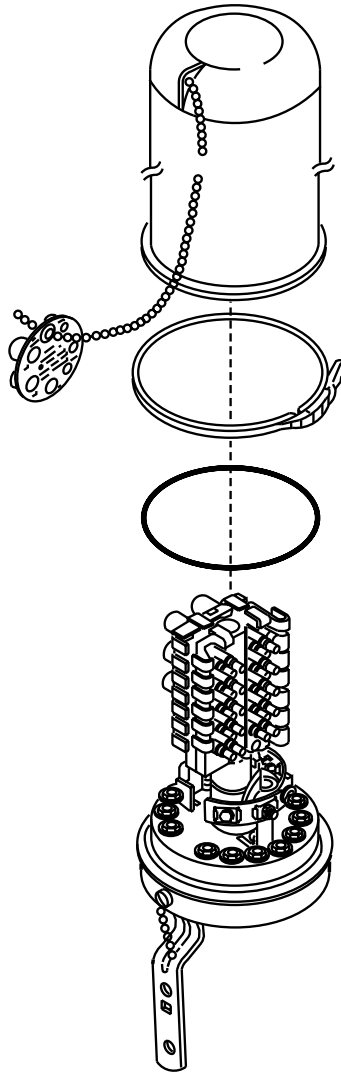


NOTE:

Store the copper splice case and associated slack cable along the side of the handhold so it does not interfere with the movement of the swing arm assembly or the MSDT.

5. Splice the BMT to the MSDT as follows:
 - a. Place the BMT terminal (Figure 7-33) onto its mounting bracket in the handhold (Figure 7-31).
 - b. Swing the MSDT into a vertical position.
 - c. Loosen the eight bolts from the access panel labeled Wire/Fiber access (Figure 7-32) and carefully remove the panel.
 - d. Loosen the watertight grip (Figure 7-32) containing the metal sealing plug by grasping the knurled section and unscrewing it. Remove the metal plug and discard it.
 - e. Feed the stub cable coming from the BMT through the watertight grip and out of the opening of the MSDT.
 - f. Inside the MSDT, locate the 3M 4005DPM splice module. Using another 3M 4005 module, splice the BMP stub cable to the MSDT cable matching color codes.
 - g. Position the splice into the MSDT and the copper stub cable so that it does not interfere with the access panel.
 - h. Tighten the watertight grip holding the copper stub cable.
 - i. Replace the access panel onto the MSDT ensuring that the O-ring and sealing surface are clean.
 - j. Tighten the eight bolts holding the panel in place.
 - k. Lower the MSDT into the handhold enclosure and lock it into place.
6. Connect the drop wire, previously spliced to the power distribution, to the 25th position on the BMT terminal block (Figure 7-33). Identify this connection as a power connection that should not be disturbed. Make

connections between the drop wires serving the residents into the BMT. The positions on the block correspond with the channels derived by the MSDT.



tpa 847785/01

Figure 7-33. Underground MSDT BMT Terminal

Distribution Fiber

The typical sequence of steps for installation and testing of the outside plant fiber optic cable is as follows:

1. Cable placement
2. Fiber splicing
3. Connectorization
4. Completion testing.

Recommendations and guidelines to be used when performing these installation and testing procedures are summarized in this section.

Cable Placement

Fiber optic cable should be placed in accordance with the procedures recommended in the following Lucent Technologies Practices:

- 629-200-206 (Buried — Placing)
- 629-200-215 (Buried — Plowing)
- 629-240-001 (Plowing Guidelines)
- 628-200-216 (Underground — Placing)
- 627-320-011 (Aerial — Placing).

Fiber optic cable placement should be monitored by on-site inspectors who are familiar with cable tension load ratings and minimum bend radius requirements. The cables received for placement have undergone extensive factory testing to ensure quality. If the cables are placed properly, no testing is necessary to ensure cable integrity.

Fiber Splicing

The passive rotary mechanical splice and the singlemode array splice are recommended for joining fiber optic fibers for distribution area applications.

It is recommended that the splices be verified through local procedure in some manner before the splice case is closed and placed.

Connectorization

The outside plant fibers are to be terminated at the HDT interconnect facility and the MSDT optical unit with singlemode *ST* fiber optic cable connectors, which should be installed according to the Lucent Technologies instruction manual for singlemode *ST* fiber optic cable connectors. Once the connectors are installed,

the loss measurements required for completion testing for the outside plant can be performed. Any attempt to make completion test measurements using anything other than permanent connectors is almost guaranteed to give inaccurate results.

Completion Testing

Completion testing is the measurement of the loss that is associated with the outside plant fiber and splices and terminating connectors. The completion tests are performed when the fiber paths are permanently terminated in system connectors (*ST* fiber optic cable connectors). The completion test is applied to each individual fiber path and provides the following:

1. Verification that the outside plant has been properly constructed
2. Verification that the outside plant meets the optical system limits
3. Maintenance records
4. Records for future upgrades.

Completion testing is performed at 1310 nm, corresponding to the system design wavelength. The recommended acceptance/rejection criterion for completion testing for loop plant systems is path loss. Path loss is defined as the total loss of all the fibers, splices, and the two end-point connectors (equivalent to one complete *ST* fiber optic cable connection) that constitute one complete fiber path from HDT to MSDT.

To verify that the path has been properly constructed and conforms to the designed value, the path loss measurements should be compared to completion test targets, which are based on the actual components (length of fiber and the number and types of splices) in each path.

SLC-2000 MSDT Upgrade From Dual Mode to Quad Mode Operation

The *SLC-2000* MSDT is capable of operating in either the dual or the quad mode as determined by the type of channel units installed in the card cage. In situations where dual channel units in the MSDT are being replaced with quad channel units, it is necessary to add an upgrade kit to the MSDT to convert from dual mode operation to quad mode operation. Two MSDT upgrade kits are available; one kit (ED-7C712-30, Group 80) is used for MSDTs equipped with binding post terminations and gas tube protection and the other kit (ED-7C712-30, Group 82) is used for MSDTs without protectors. This section covers the procedures for installing both types of upgrade kits.



NOTE:

SLC-2000 MSDT dual mode is not supported when used with a *SLC-2000* HDT.



CAUTION:

This operation is service affecting.

Installing ED-7C712-30, Group 80 Upgrade Kit

This item has been DA'd (discontinued availability)

Use the following procedure to install an ED-7C712-30, Group 80 upgrade kit in an MSDT:

1. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324). Remove all the circuit packs.
2. Remove the eight screws holding the top, middle, and bottom designation strips to the MSDT card cage. Remove and discard all three designation strips.
3. Use the eight screws provided with the ED-7C712-30, Group 80 kit to attach the new top, middle, and bottom designation strips to the MSDT card cage.
4. Replace all circuit packs removed in Step 1.
5. Close and lock the front door of the enclosure using the special allen-type key.
6. Open the rear door of the MSDT enclosure using a 216-type tool.
7. Obtain access to the dual/quad mode jumper by lowering the fiber organizer tray.
8. Remove and discard the dual/quad mode jumper.
9. Raise the fiber organizer tray and lock it in place.
10. Locate the six modular jacks located above the protector field and remove them from the backplane.
11. Remove the four screws holding the 12-protector field to the backplane cover. Remove the 12-protector field from the backplane cover.
12. Attach the new 24-protector field to the backplane cover using the four screws removed from the 12-protector field.
13. Connect the six modular jacks to their corresponding backplane connectors verifying that the plug (P) and jack (J) numbers match.
14. Close and lock the rear door of the enclosure using the 216-type tool.

Installing ED-7C712-30, Group 82 Upgrade Kit

Use the following procedure to install an ED-7C712-30, Group 82 upgrade kit in an MSDT:

1. Open the front door of the MSDT enclosure using the special allen-type key (COMCODE 840841324). Remove all the circuit packs.
2. Remove the eight screws holding the top, middle, and bottom designation strips to the MSDT card cage. Remove and discard all three designation strips.
3. Use the eight screws provided with the ED-7C712-30, Group 82 kit to attach the new top, middle, and bottom designation strips to the MSDT card cage.
4. Replace all circuit packs removed in Step 1.
5. Close and lock the front door of the enclosure using the special allen-type key.
6. Open the rear door of the MSDT enclosure using a 216-type tool.
7. Obtain access to the dual/quad mode jumper by lowering the fiber organizer tray.
8. Remove and discard the dual/quad mode jumper.
9. Raise the fiber organizer tray and lock it in place.
10. Close and lock the rear door of the enclosure using the 216-type tool.

Operations and Maintenance — TOP

8

Contents

Introduction	8-1
How To Use This Document	8-2
Safety Labels	8-3
Equipment and Craft Personnel Considerations	8-4
Turn-Up Summary	8-4
Numerical List of TOP Procedures	8-5

Introduction

This chapter [Task-Oriented Practices (TOP)] is used to accept, equip, and Turn-Up, and clear troubles for the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT). This chapter assumes that either the *SLC* Series 5 Carrier System has been equipped (using 363-205-400 central office terminal TOP for *universal* and 363-205-401 remote terminal TOP for *integrated* configurations) and turned up (using 363-205-406 end-to-end TOP), or the *SLC*-2000 Access System has been turned up using 363-208-001.

The MSDT refers to the *SLC*-2000 Multi-Services Distant Terminal. See Figure 8-1. The MSDT feature is supported by *SLC* Series 5 Carrier System Feature Package F (FPF) or *SLC*-2000 Access System, Release 2 or later. For *SLC* Series 5 configuration, Feature Package F provides Feature Package C (FPC) capabilities using the MC97779A1 BCU, AUB27 ADU, AUA105B TRUs, MSDT Server units, and high density optics shelf (HDOS) at the remote terminal (RT), connected to the MSDT equipment with a fiber optic facility. Feature Package B (FPB) capabilities are provided using these same ADU, BCU, TRUs, and the MSDT Server units connected through a high density optics shelf (HDOS) to the MSDT equipment, or through a DSX for metallic MSDT equipment. For *SLC*-2000 applications, the metallic distribution shelf (MDS) is configured to support fiber in the loop (FITL) and equipped with MSDT Server units and connected through a high density optics shelf (HDOS) to the MSDT equipment, or through a DSX for metallic MSDT equipment.

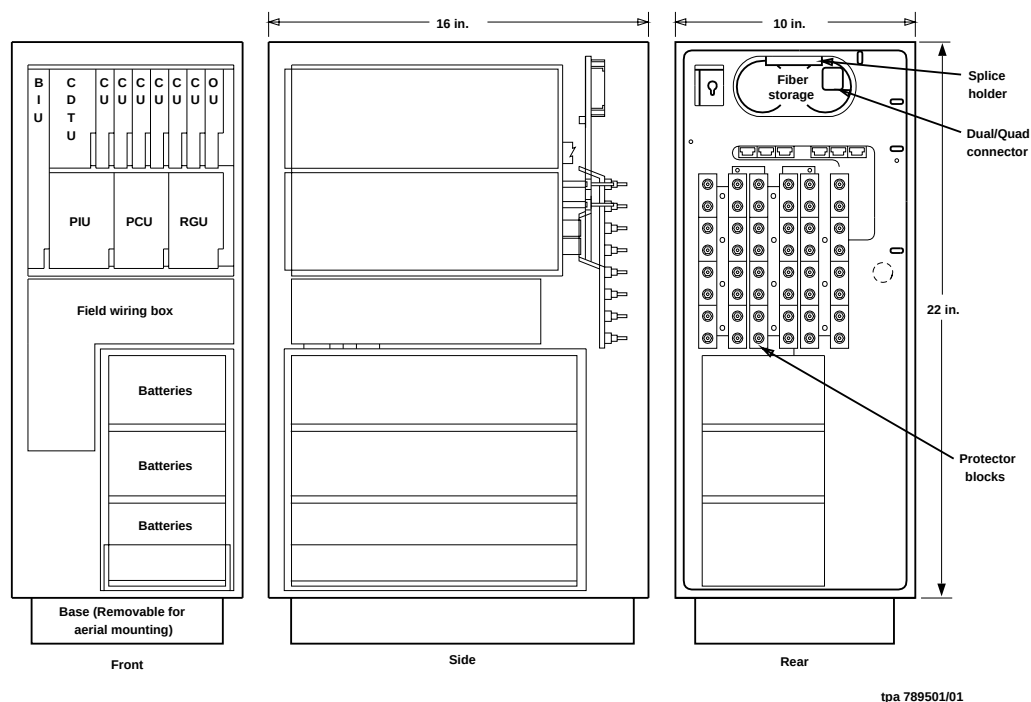


Figure 8-1. SLC®-2000 MSDT Enclosure

The MSDT may obtain power from commercial 120 V AC, –48 V DC local power, –130 V DC central powering, ± 130 V DC central powering, or 60 V AC central powering. Figure 8-1 shows channel units in the MSDT. The channel units are not required to Turn-Up the MSDT and need not be installed until end-to-end service is required.

How To Use This Document

To find the instructions for performing acceptance, turn-up, or maintenance tasks, proceed as follows:

1. Find your task in the Task Index List (**IXL-001**).
2. Turn to the indicated director level or detailed level procedure. All procedures in each section are in numerical order, regardless of type. Procedures in this TOP are of three types, as follows:
 - a. Non-Trouble-Clearing Procedure (**NTP**) — A director level procedure that lists normal work items to perform other than trouble clearing.

- b. Detailed Level Procedure (**DLP**) — Detailed step-by-step instructions.
 - c. Trouble Analysis Procedure (**TAP**) — Detailed step-by-step trouble-clearing instructions.
- 3. Perform all the items in the director level procedure (NTP) 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.
- 4. **IMPORTANT:** When you complete a DLP, you **MUST** return to the procedure that sent you there.
- 5. **IMPORTANT:** In most cases, 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 refer to TAP-101 to clear the trouble. Other helpful sources for trouble clearing may include the trouble analysis procedures in 363-205-500 *SLC Series 5 Carrier System Maintenance and Trouble Clearing TOP*. For *SLC-2000 Access System* trouble analysis procedures, refer to Maintenance Philosophy (TAD-100) in this document.
- 7. If you need assistance after completing all the applicable procedures in this section, call the Lucent Technologies Regional Technical Assistance Center (RTAC). The telephone number is **1-800-225-RTAC**.

Safety Labels

Safety labels in this document have the following definitions:



DANGER:

This indicates the presence of a hazard that will cause death or severe personal injury if the hazard is not avoided.



WARNING:

This indicates the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.



CAUTION:

This indicates the presence of a hazard that will or can cause minor personal injury or property damage if the hazard is not avoided. This includes equipment damage, loss of software, or service interruption.

Equipment and Craft Personnel Considerations



CAUTION:

An electrostatic discharge wrist strap, with a resistance between 250K and 1.5M ohms, should be worn when handling circuit packs to prevent possible damage to the circuit packs. Before using the wrist strap, check it for shorts, opens, and proper resistance value. If the strap does not pass these checks, it should not be used. To avoid possible personal injury while using the wrist strap, do not connect it to the power shelf or adjacent portions of the RT frame.

The channel bank assembly and associated equipment provide high-voltage ringing current and high-amperage power distribution. You should remove any metal jewelry before working on this equipment, particularly around the backplane. *Follow local personal safety procedures when working on any Lucent Technologies product.*

Turn-Up Summary

The turn-up of an MSDT system is typical of any carrier system equipment. The MSDT must be installed and wired to a power source at the site (central powering equipment must be established if used). When the MSDT is installed and power is available (see Chapter 7), the circuit packs are installed in the MSDT (this chapter) while isolated from the host digital terminal (HDT). The HDT carrier system (either *SLC* series 5 or *SLC-2000* remote terminal) must be turned up and tested end-to-end to the associated central office equipment. Then the link between the HDT and the MSDT (either fiber or T1 metallic) is established by installing the appropriate circuit packs at the HDT. Finally, customer service is added by installing channel units in the MSDT. The following provides a summary of activities required to establish MSDT customer service. The bullet items in a step can be done in any order:

1. **Preparation:**

- Install and make wiring connections to the MSDT (see Chapter 7).
- If required, establish central power point equipment (this chapter).

2. **Turn-Up HDT End-to-End:**

- For *SLC* Series 5 HDT, use 363-205-401 to Turn-Up the RT, 363-205-400 to Turn-Up the central office terminal (COT) (if universal document 363-202-400 for *SLC* 96 COT), and 363-205-406 to establish an end-to-end system. NTP-005 in this chapter provides optional system tests for a *SLC* Series 5 Carrier System HDT.
- For *SLC*-2000 HDT, use document 363-208-001 to equip the RT and MDS shelf (with FITL distribution mode), and establish end-to-end digital loop carrier (DLC) systems.

3. **Turn-Up MSDT:**

Perform NTP-003 to accept the MSDT equipment, then NTP-004 to Turn-Up the MSDT isolated from the HDT (no link established between the HDT and MSDT).

4. **Install the HDT MSDT Server:**

At the HDT, install the MSDT Server and associated facility equipment (either optical or DS1 electrical) to establish the link between the HDT and the MSDT.

- For *SLC* Series 5 HDT, use NTP-006 in this chapter.
- For *SLC*-2000 HDT, use NTP-012 in this chapter.

5. **Add Customer Services:**

Install channel units in the MSDT as required. Use 363-205-402 and 363-208-001 for reference.

Numerical List of TOP Procedures

Table 8-1 provides a means to verify that all elements are present. This information should not be used for direct access to a particular element because *most elements are not stand-alone procedures*.

Table 8-1. Numerical List of TOP Procedures

Element	Title
Introduction-000	Introduction
IXL-001	SLC [®] -2000 Multi-Services Distant Terminal Turn-Up Task Index List
NTP-002	Acceptance
NTP-003	Accept SLC [®] -2000 Multi-Services Distant Terminal Equipment
NTP-004	Turn-Up SLC [®] -2000 Multi-Services Distant Terminal
NTP-005	Perform CO to SLC [®] Series 5 Remote Terminal System Tests (Optional) for SLC-2000 Multi-Services Distant Terminal Application
NTP-006	Perform SLC [®] -2000 MSDT to CO End-to-End System Tests for SLC Series 5 Remote Terminal
NTP-007	Turn-Up J1C182BD Battery Plant in 51A 130-Volt DC Power Point Cabinet
NTP-008	Turn-Up ED-7C704-30 Bulk Power Plant in 80A 130-Volt DC Power Point Cabinet
NTP-009	Turn-Up –130 Volt DC Power Point
NTP-010	Add –130 Volt DC Distribution Lines
NTP-011	Turn-Up ±130 Volt DC Power Point and Distribution Lines
NTP-012	Perform SLC-2000 MSDT to CO End-to-End System Tests
TAD-100	Maintenance Philosophy
TAP-101	Clear SLC [®] -2000 MSDT System Alarms; MSDT Server Alarms; NE, MJ and DIGROUP, or MN Alarms at RT
TAP-102	Clear SLC [®] -2000 MSDT Power Trouble
DLP-500	Perform Overall Visual Inspection of Multi-Services Distant Terminal
DLP-501	Verify AC Power at MSDT Cabinet

Continued on next page

Table 8-1. Numerical List of TOP Procedures —Continued

Element	Title
DLP-502	Verify DC Power Feed Connections at MSDT Cabinet
DLP-503	Connect –48, –130, or ± 130 V DC Power Feed to MSDT
DLP-504	Install Batteries for Battery Reserve or Load Balancing
DLP-505	Install 120 V AC AUA414 PIU in MSDT
DLP-506	Install –48 V DC AUA415 PIU in MSDT
DLP-507	Install –130 or ± 130 V DC AUA416 PIU in MSDT
DLP-508	Install 120 V AC or –48 V DC AUA412 PCU in MSDT
DLP-509	Install –130 V DC AUA417 PCU in MSDT
DLP-510	Install AUA413 or AUA423 RGU in MSDT
DLP-511	Install MC97780A1, MC97789A1, MC97793A1, or MC97794A1 BIU in MSDT
DLP-512	Install BYB1B, BYB1C, BYB3, or BYB5 Optical Unit in MSDT
DLP-513	Install AUA411 or AUA411B CDTU in MSDT
DLP-514	Install Fan Unit and Connect Fan in MSDT
DLP-515	Set Options on AUA406, AUA408, <i>SPQ</i> [®] 808, or <i>SPQ</i> 809 (or Later) MSDT Server
DLP-516	Determine <i>SLC</i> [®] -2000 MSDT Circuit Arrangement
DLP-517	Perform <i>SLC</i> [®] -2000 MSDT MLT Channel Test
DLP-518	Test Single-Party POTS Channel End-to-End
DLP-519	Install 336A RECTIFIERS in J1C182BD Power Shelf
DLP-520	Perform Initial Installation and Tests of Batteries in 51A 130 Volt DC Power Point Cabinet
DLP-521	Perform Test of Batteries Using 197A BATTERY LOAD TEST SET
DLP-522	Check 197A Battery Load Test Set for Proper Operation

Continued on next page

Table 8-1. Numerical List of TOP Procedures —Continued

Element	Title
DLP-523	Install Lineage 2000 VR Series Batteries in 80A Cabinet Battery Compartment
DLP-524	Verify Connections to ED-83114-30 Control and Distribution Panel
DLP-525	Install and Test Power Units in Rectifier Shelf
DLP-526	Option and Install BYB2 Line Interface Unit in MSDT
DLP-527	Install -130 or ± 130 V DC AUA426 PIU in MSDT
DLP-528	Install ± 130 V DC AUA427 PCU in MSDT
DLP-529	Install 60 V AC AUA424 PIU in MSDT
DLP-530	Install 60 V AC AUA422 PCU in MSDT
DLP-531	Verify T1 Feeder Connections
DLP-532	Provision MSDT Server Unit Time Slot Allocation
DLP-533	Install <i>SPQ</i> [®] 808 or <i>SPQ</i> 809 (or Later) MSDT Server
DLP-534	Turn-Up HDT in <i>SLC</i> Series 5/MSDT System
DLP-535	Perform End-to-End System Test of HDT in <i>SLC</i> Series 5/MSDT System
DLP-536	Install 60 V AC AUA434 PIU in MSDT
DLP-537	Verify <i>SLC</i> [®] -2000 MSDT/BIU Software Download and Software Version
DLP-538	Install -130 V DC AUA436 PIU in MSDT
DLP-539	Convert a Conventional <i>SLC</i> -2000 FITL System (768 Lines) with HDOS to a DLC R4.5 Enhanced FITL System (1,152 Lines)

INTRODUCTION

General

After power is supplied to the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT), the MSDT is equipped with batteries (if required), two powering units (PIU and PCU), a ringing generator unit (RGU), bank interface unit (BIU), an optical unit (OU) or line interface unit (LIU), and an optional channel and drop test unit (CDTU). After the host digital terminal (HDT), either a *SLC*-2000 or *SLC* Series 5 remote terminal (RT), is turned up and established end-to-end to central office (CO) equipment (either a *SLC* COT bank or integrated to a TR-08 digital switch), the RT is equipped with MSDT Server channel units and supporting equipment to complete the CO-to-MSDT facility. Customer service is added as required by installing channel units in the MSDT.

Information to Know About MSDT Servers

MSDTs can be connected to a *SLC*-2000 Access System or a *SLC* Series 5 remote terminal (RT). The MSDTs gain access to the local switch through a *SLC*-2000 or *SLC* Series 5 RT carrier system. A *SLC* Series 5 RT carrier system equipped with Feature Package F (FPF) can be *integrated* (TR-08 Mode 1 or 2) or *universal*, and it can be connected to a Feature Package C (FPC) *SLC* Series 5 central office terminal [(COT) for *universal* configurations]. *Universal* means the RT is connected to a *SLC* central office terminal (COT); *integrated* means the RT is directly connected to a TR-08 compatible digital switch (such as the 5ESS[®] switch). A *SLC*-2000 RT can be equipped with *universal or integrated* TR-08 Mode 1 or 2 or TR-303.

A *SLC* Series 5 RT can be equipped with **AUA406** or **AUA408** MSDT Server channel units. The **AUA406** must be connected to an FPC COT. The **AUA408** supports TR-08 Modes 1 and 2 and can be connected to a *SLC* 96 COT or *integrated* into a TR-08 digital switch. The bandwidth allocated to an MSDT is selected by a faceplate switch on the **AUA406** or **AUA408** MSDT Server. When using an optics shelf (OS), this switch selects 3 to 12 slots (equivalent physical slots in the RT channel bank that supports 6 to 24 DS0 customer channels). When using a high density optics shelf (HDOS), only slots 1 and 7 are available for 6- or 12-slot applications. This provides 12 or 24 DS0 customer channels.

A SLC-2000 RT is equipped with an SPQ®**808** or later MSDT Server channel unit. This MSDT Server supports TR-08 Modes 1 and 2 and can be connected to a SLC 96 or SLC-2000 COT or *integrated* into a TR-08 or TR-303 digital switch. The bandwidth allocated to an MSDT is provisioned electronically by the craft interface terminal (CIT) digital loop carrier (DLC) subsystem command **ED-DT**:. This command allocates 0, 12, or 24 DS0 customer channels to an MSDT.

Fiber or Metallic T1 Distribution

All MSDT Servers can provide fiber distribution links to the MSDT. But the **AUA408** and SPQ808/SPQ809/SPQ810/SPQ811¹ servers can be optioned to provide a DSX-1 compatible signal to provide T1 digital line link to the MSDT using a repeater shelf such as a T1 extension shelf. When the metallic T1 feeder option is used, the MSDT must be ordered to be equipped with the **BYB2 LIU** instead of the **BYB1B** optical unit (**OU**). The **BYB2 LIU** provides either a T1 line power looping or a DSX-1 compatible interface to the metallic facility.

Special Services

The MSDT supports special service applications using the appropriate SLC Series 5 or SLC-2000 special service channel units. These circuits must be provisioned from the RT using a craft interface unit (CIU) at a SLC Series 5 RT, or the DLC subsystem CIT command **ED-T0** at a SLC-2000 RT. The SLC Series 5 Carrier System special services channel units only provide up to two circuits per channel unit. If the MSDT is configured for quad mode, two circuits, the last two (or three if the channel unit only provides one circuit) are not available. Quad channel special service units will use all four circuits available in a channel unit slot subject to slot restrictions. Refer to Chapter 3 of this document for more information.

MSDT Configurations

The MSDTs can be powered from a variety of power sources and may or may not require local battery reserve. The powering configurations are supported by the combination of power converter units (PCUs) and power interface units (PIUs). The MSDT can also be configured for dual or quad circuit channel units. The *quad mode must be used when the MSDT is served from a SLC-2000 RT*. Dual (or single) circuit channel units may be used if the MSDT is in the quad mode at the loss of available service capabilities.

1. The SPQ810 or SPQ811 DT Server can only host an MSDT if the SLC-2000 HDT contains software Release 4.5 or later.

SLC[®]-2000 Multi-Services Distant Terminal Turn-Up Task Index List

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

⇒ **NOTE:**
After performing the appropriate tasks for your configuration listed below, install channel units in the MSDT (as required) as directed in one of the following procedures:

- NTP-006 — *SLC* Series 5 HDT
- NTP-012 — *SLC*-2000 HDT.

For details, refer to 363-205-402 (*SLC* Series 5 HDT) or 363-208-001 (*SLC*-2000 HDT).

Turn Up Central Power Point Equipment

Turn Up J1C182BD Battery Plant in 51A –130 Volt DC Power Point Cabinet NTP-007

Turn Up ED-7C704-30 Bulk Power Plant in 80A –130 Volt DC Power Point Cabinet NTP-008

Turn Up –130 Volt DC Power Point. NTP-009

Add –130 Volt DC Distribution Lines NTP-010

Add ±130 Volt DC Distribution Lines NTP-011

⇒ **NOTE:**
Power to the Multi-Services Distant Terminal (MSDT) enclosure (120 V AC, 60 V AC, –48 V DC local powering, ± or –130 V DC central powering) must be available before these procedures can be done.

FIND YOUR JOB IN THE LIST BELOW THEN GO TO

General Tasks

Acceptance	NTP-002
Accept <i>SLC</i> [®] -2000 Multi-Services Distant Terminal Equipment	NTP-003
Turn Up <i>SLC</i> -2000 Multi-Services Distant Terminal	NTP-004
Maintenance Philosophy	TAD-100
Clear <i>SLC</i> -2000 MSDT System Alarms MSDT Server Alarms, NE, MJ and DIGROUP, or MN Alarms at HDT	TAP-101
Determine <i>SLC</i> -2000 MSDT Circuit Arrangement	DLP-516
Perform <i>SLC</i> -2000 MSDT MLT Channel Test	DLP-517

***SLC* Series 5 Remote Terminal Host Procedures**

Perform CO to RT System Tests (Optional) for <i>SLC</i> -2000 Multi-Services Distant Terminal Application	NTP-005
Perform <i>SLC</i> -2000 MSDT to CO End-to-End System Tests for <i>SLC</i> Series 5 Remote Terminal	NTP-006
Turn Up HDT in <i>SLC</i> Series 5/MSDT System	DLP-534
Perform End-to-End System Tests of HDT in <i>SLC</i> Series 5/MSDT System	DLP-535

***SLC*-2000 Remote Terminal Host Procedures**

Perform <i>SLC</i> -2000 MSDT to CO End-to-End System Tests	NTP-012
Verify <i>SLC</i> -2000 MSDT/BIU Software Download and Software Version	DLP-537

Acceptance

General

Acceptance tests are performed on the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) to ensure that proper installation procedures have been performed.

The MSDT has four basic powering arrangements: AC local powering, DC local powering, DC central powering, or AC central powering. The procedure for performing acceptance tests for the MSDT equipment is listed in NTP-003.

A procedure to verify the *SLC* Series 5 Carrier System has been turned up end-to-end and will function properly is found in NTP-005. This procedure should be done before MSDT equipment is turned up.

The procedures to turn up and test a *SLC*-2000 system are found in 363-208-001, *SLC-2000 User/Service Manual*.

The acceptance tests generally assume the following:

- That accurate and concise system designations and office records are available to properly identify system and equipment
- That any trouble found and not corrected during testing is referred to the responsible installation group
- That the test equipment used is available, properly tested, and working properly.

Accept *SLC*[®]-2000 Multi-Services Distant Terminal Equipment

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. Get support apparatus listed:

- 216- type tool
- Special key (allen-type wrench) — COMCODE 840841324
- Digital multimeter (DMM) with an accuracy of 1.0 percent and an AC/DC input impedance of ≥ 1 megohm.

2.



NOTE:

There are five different powering arrangements available for MSDTs:

- 120 V AC local power
- –48 V DC local power
- ± 130 V DC central power
- –130 V DC central power
- 60 V AC central power.

These five powering configurations are supported with one of four versions of power converter units (PCUs) and one of five versions of power interface units (PIUs). The 120 V AC and –48 V DC MSDTs can be equipped with batteries to provide reserve power if commercial power is lost. The –130 or ± 130 V DC network node provides reserve power; these configurations do not require batteries in the MSDT, but they can be equipped with batteries for peak load balancing. The 60 V AC central power mode provides backup power for the MSDT. The MSDT cabinets can be pad

mounted, pole mounted, wall mounted, strand mounted, or placed underground. MSDTs can also be mounted in 7-foot frames.

Verify that MSDT cabinet is mounted securely.

3.	Perform an overall visual inspection of MSDT equipment.	DLP-500
4.	Verify power feed connections to the MSDT:	
	A. With 120 AC or 60 V AC power feed	DLP-501
	B. With -48 V DC, -130 V DC, or ± 130 V DC power feed.	DLP-502
5.	If the MSDT is connected to the host digital terminal (HDT) using a T1 facility, verify the T1 line is connected to the protector block.	DLP-531
6.	Perform NTP-004 to turn up the MSDT when required.	

Turn Up *SLC*[®]-2000 Multi-Services Distant Terminal

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. Verify that the following tasks have been performed:
 - The *SLC*-2000 MSDT Acceptance procedures in NTP-003 have been performed.
 - The required circuit packs to be installed in the *SLC*-2000 MSDT are available.
 - Either the fiber drop is terminated with an *ST*[®] connector and connected to the **OU** backplane coupler labeled "FIBER" or the T1 facility is in place and is connected to the protector block.
 - The facility between the HDT and MSDT has not been connected end-to-end.

Obtain support apparatus listed below:

- Special key (allen-type wrench) — COMCODE 846244168
- Cleaning swabs
- Bottle of isopropyl reagent alcohol with dispenser
- Can of compressed air
- Digital multimeter (DMM) with an AC (true rms) and DC meter accuracy of 1.0 percent and an AC and DC input impedance of ≥ 1 megohm
- Optical power meter.

DO ITEMS BELOW IN ORDER LISTED**FOR DETAILS, GO TO**

2.

**CAUTION:**

An electrostatic discharge wrist strap, with a minimum resistance of 250K Ω , should be worn when handling circuit packs to prevent possible damage to the circuit packs. Before using the wrist strap, check it for opens, shorts, and minimum resistance value. If the strap does not pass these checks, it should not be used.

Unlock SLC-2000 MSDT closure using special hex key (allen-type wrench), if necessary. Disable door alarm switch.

3.

**NOTE:**

The battery reserve power option is available when the **AUA412 PCU** (120 V AC or -48 V DC local power) or **AUA426 PIU** (-130 V DC or ± 130 V DC central power) is used.

If required, install batteries in battery shelf and mount battery shelf in bottom of SLC-2000 MSDT closure. Connect battery shelf cable to the field wiring box (FWB) P301.

DLP-504

4. See Table C for PCU and PIU requirements.

Table C – SLC[®]-2000 MSDT Power Unit Requirements

Power Source	PIU	PCU
120 AC	AUA414	AUA412
60 AC	AUA424 or AUA434	AUA422
-48 DC	AUA415	AUA412
-130 DC	AUA416, AUA426*, or AUA436	AUA417
± 130 DC	AUA416 or AUA426*	AUA427

* The **AUA426 PIU** provides a battery interface for peak load balancing.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

Install appropriate PIU .	
A. Install 120 V AC AUA414 PIU .	DLP-505
B. Install 60 V AC AUA424 PIU .	DLP-529
C. Install 60 V AC AUA434 PIU .	DLP-536
D. Install –48 V DC AUA415 PIU .	DLP-506
E. Install –130 or ± 130 V DC AUA416 PIU .	DLP-507
F. Install –130 or ± 130 V DC AUA426 PIU .	DLP-527
G. Install –130 V DC AUA436 PIU .	DLP-538
5. Install appropriate PCU .	
A. AUA412PCU .	DLP-508
B. AUA422 PCU .	DLP-530
C. AUA417 PCU .	DLP-509
D. AUA427 PCU .	DLP-528
6. Install AUA413 or AUA423 RGU .	
7. Install MC97780A1 , MC97793A1 , MC97794A1 BIU (required with the AUA413 RGU) or MC97789A1 BIU (required with the AUA423 RGU).	
Comment: At this point, only CLF and SLOTS AVAILABLE 8 indicators will be lighted on the BIU. All other circuit packs should not have any indicators lighted. If the BIU NE indicator is lighted, the	
8. Install the appropriate feeder facility unit:	
A. Install BYB1B/BYB1C/BYB5 optical unit.	DLP-512
B. Install BYB2 line interface unit.	DLP-526
9. Install AUA411/AUA411B .	DLP-513

10. If required, install FAN UNIT in field wiring box (FWB) and connect fan cable to the FWB P302. DLP-514

11. Close and lock the *SLC*-2000 MSDT closure unless end-to-end tests are to be performed at this time.

12. Perform end-to-end tests when required:

A. For *SLC* Series 5 host digital terminal (HDT), perform NTP-005 at the RT. Then do NTP-006.

B. For *SLC*-2000 HDT, proceed to NTP-012.

13. Update office records.

Perform CO to *SLC*[®] Series 5 Remote Terminal System Tests (Optional) for *SLC*-2000 Multi-Services Distant Terminal Application

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

Introduction

This procedure checks the *SLC* Series 5 remote terminal (RT) channel bank and central office (CO) equipment to RT system for proper alarm responses. This procedure is intended to be used before any *SLC*[®]-2000 Multi-Services Distant Terminal (MDST) cabinet equipment is installed when initially establishing the *SLC* Series 5 Carrier System. These procedures should be done only once for each digroup to test system functionality.

Before doing this procedure, the CO and RT channel bank MUST BE turned up using 363-205-401, RT Turn Up TOP, and the appropriate documentation (363-20{2,5}-401, COT Turn Up TOP for *SLC* 96 or Series 5 COT). Then the system must be put in service using procedures in document 363-205-406, End-to-End System Tests TOP.

Summary

Verify that the AYB1Bs are not installed or the DS1 cross-connection to the MSDT has not been made. The procedure requires that the MSDT Server (AUA406 or AUA408) is not connected to an equipped MSDT. This procedure is used to cause system alarms and verifies that these alarms are reported to the CO. Set the MSDT Server SLOT ALLOCATION switch to "6" and install it in the 13/14 channel unit slots. The MSDT Server **CLF** and **RT NE** (CO FE) and MJ (MSDT Server MJ=ANY) or MN (MSDT Server MJ=12) indicators will light. Then set the SLOT ALLOCATION switch to "12" to cause a **CONFIG**uration alarm by selecting more channel unit slots, on the MSDT Server faceplate, than are available. This causes MSDT Server **CONFIG** and

DO ITEMS BELOW IN ORDER LISTED**FOR DETAILS, GO TO**

AUB27 CMP indicators to light at the RT. Move the MSDT Server to the 1/2 channel unit slots. The MSDT Server **CONFIG** goes off and the **CLF** lights. The **ADU MJ** and **BCU** digroup (**A, B, C, or D**) will light at both ends if the MSDT Server SLOT ALLOCATION option switch is set to 12 and the MSDT Server is installed in the three left-most channel unit slots of the digroup. Remove the MSDT Server and repeat for other digroups.

The MSDT Server unit is three channel unit slots wide. The circuit board makes a connection to the channel bank in the first (left-most) slot occupied by the MSDT Server. For example, when installed in digroup A channel unit slot 13, the MSDT Server faceplate covers channel unit slots "13/14," "15/16," and "17/18." The MSDT Server can access either 12 or 24 time slots of a digroup. The faceplate provides a SLOT ALLOCATION option switch to assign the number of physical channel unit slots allocated to the MSDT Server. Each channel unit slot is given two time slots on the backplane of the Series 5 RT channel bank. There are 12 channel unit slots per digroup. The accessed slots start with the three slots occupied by the MSDT Server and extend, contiguously, to the right. The physical channel unit slots that the MSDT Server accesses to the right must be empty and cannot wrap around the digroup (for example, cannot be installed in the seventh channel unit slot with the SLOT ALLOCATION switch set for "12"). The MSDT Server CONFIG indicator will light if it is installed in an unavailable channel unit slot or is optioned for more channel unit slots than are available. The SLOT ALLOCATION display will indicate the maximum number of available channel unit slots if set for more than are allowed, or zero if installed in channel unit slots already seized by a previously installed MSDT Server.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. Turn up the HDT in the <i>SLC</i> Series 5/MSDT system.	DLP-534

2. Perform the end-to-end system test of the HDT in the <i>SLC</i> Series 5/MSDT system.	DLP-535

3. Set the MSDT Server severity option switch to MJ=ANY . Set face-plate SLOT ALLOCATION switch to "6" (access to 12 time slots).	DLP-515

4. Install the **MSDT Server** in digroup A channel unit slot 1/2 and verify **CLF** lights (6 is displayed on the SLOT ALLOCATION display), **AUB27 NE** and **MJ** light, and **FE** and **MJ** are activated at the CO. Replace the following units one at a time if indicators do not light:

- **MSDT Server**
- **AUB27 ADU**
- **MC97779A1 BCU** .

Use SD drawing to correct wiring trouble if indicators do not light after replacing units.

Comment: The TRU FAIL indicator will light if it is not an AUA105 version. Replace failed TRU with an AUA105 version TRU. Press the ADU LED TEST button and verify all TRU indicators light (an incompatible version circuit pack FAIL LED will go off during an LED TEST).

5. Remove **AUA406** or **AUA408** MSDT Server and reinstall it in channel unit slot 13/14.

Response: The **CLF** will light (6 displayed). The **AUB27 CMP** goes off and all other alarms remain the same.

6. Remove MSDT Server, set the alarm severity option switch to **MJ=12**, and reinstall the server in channel unit slot 1/2 (left most).

Response: The **MN** indicator will light at both ends, and the **MJ** goes off. All other indicators remain the same.

Comment: Setting the severity option switch to **MJ=12** will cause Minor alarms for any failure condition that affects less than 24 channels.

Comment: Another MSDT Server can be installed next to the first one to cause channel unit conflict **CONFIG** alarms.

7. Set the MSDT Server SLOT ALLOCATION switch to "12."

Response: The **ADU MJ** and **BCU A** digroup indicators will light at both ends, and the **MN** goes off. All other indicators remain the same.

Comment: When the MSDT Server is installed in the first three channel unit slots (left most) and the SLOT ALLOCATION switch is set to "12," a CLF alarm will light the associated BCU digroup indicator.

8. Remove the MSDT Server.

Comment: If the MSDT Server is left installed, system alarms will not clear. This could mask in-service system alarms.

9. Repeat this procedure for digroups **B**, **C**, and **D** using Table D in DLP-516 for the correct server slot location.
-

10. Perform NTP-004 before performing NTP-006.

Perform *SLC*[®]-2000 MSDT to CO End-to-End System Tests for SLC Series 5 Remote Terminal

DO ITEMS BELOW IN ORDER LISTED

FOR DETAILS, GO TO

Summary

The Feature Package F (FPF) remote terminal provides the *SLC*[®] Series 5 Carrier System *SLC*-2000 Multi-Services Distant Terminal (MSDT) feature and offers the service capabilities of Feature Package B (FPB) Modes 1 and 2 or FPC-AutoCut. FPF is supported by the AUA406 (FPC-AutoCut) or AUA408 (FPB) MSDT Server units, AUB27 ADU, MC97779A1 BCU, AUA105 TRU, and AUA6()C or AUA6()D (required for Mode 2) version LIUs. The MSDT cabinet can be configured for dual channel unit or quad channel unit operation. The mode of operation is determined by a shorting plug (installed for dual mode, removed for quad mode) located under the fiber organizer in the back side of the MSDT cabinet. Dual channel units can be used in a Quad Mode MSDT, but only the first two circuits out of four circuits allocated to the slot can be used. The craft personnel should be provided the mode of operation from the work order or engineering center.

The central office (CO) equipment to remote terminal (RT) end-to-end system tests for FPF are the same as those found in 363-205-406 for an FPC or FPB Mode 1 or 2 system except CO-to-RT channel testing.



CAUTION:

The OU will be damaged if it is not removed and an AUA58() channel unit installed. Remove the OU before doing CO-to-RT channel tests.

When doing a CO-to-RT channel test, the phone will not ring, but you can hear a click on a hand held test set when the AUA58() channel unit attempts to apply ringing current. Do not do the CO-to-DT end-to-end tests found in 363-205-406 TOP.

DO ITEMS BELOW IN ORDER LISTED

FOR DETAILS, GO TO

1. Verify that CO-to-RT system tests have been done using procedures in 363-205-406, End-to-End TOP.

Comment: NTP-005 in this section provides procedures to test CO-to-RT system alarms using the AUA406 or AUA408 MSDT Server unit.

CO-to-MSDT System Tests Overview

This procedure checks the RT channel bank and RT-to-MSDT link for proper alarm responses. You should have the final channel assignment information (which channel unit slots to install the AUA406 or AUA408 in and how many channel unit slots to allocate) at this time.

Before doing this procedure, the MSDT MUST BE turned up using NTP-004.

These procedures are separated by activities done at the RT and at the MSDT. It is assumed that the AYB1B OU is not installed in the optics shelf, or the drop fiber is not cross-connected to the MSDT, or the T1 facility is not connected to the MSDT.

-
2. At the RT, set the AUA406 or AUA408 severity option switch (MJ=ANY or MJ=12; use MJ=12 unless work order specifies otherwise) and faceplate SLOT ALLOCATION option switch according to the work order. This will determine if the Series 5 carrier system ADU will display MJ or MN when the SLC-2000 MSDT system causes an alarm when less than 24 channels are affected.	DP-515
-

3. Install the **AUA406** or **AUA408** in the channel unit slot specified in the work order.

Comment: The TRU will fail if the TRU is not an AUA105 version. Replace any other version TRU with an AUA105 if necessary. Press the ADU LED TEST button and verify that all TRU indicators light (an incompatible version circuit pack FAIL LED will go off during an LED TEST).

Correct Response: The **AUA406** or **AUA408 CLF** will light if the AYB1B optical unit is not installed or the fiber cross-connection has not been made (or if the AUA408 is optioned for a DSX

interface and the cross-connection to an equipped T1 facility has not been made). *If the AUA406 or AUA408 SLOT ALLOCATION displays "12," the **BCU digroup (A, B, C, or D) indicator at both ends will light**, the **AUB27 NE and MJ or MN** indicators will light. The **CO FE and MJ or MN** alarms will be activated.*

Proceed to Step 4 after a correct response.

Incorrect Response: If the **AUA406 or AUA408 CONFIG** and **AUB27 CMP** light, the AUA406 or AUA408 has been placed in the wrong slot; the SLOT ALLOCATION option switch is set wrong; or the MSDT Server unit is in a channel unit slot conflict with another MSDT Server unit. Clear the AUA406 or AUA408 CONFIG trouble by correctly optioning or installing the MSDT Server unit.

Comment: Selecting the severity option switch to **MJ=12** will cause Minor alarms for any failure condition that affects less than 24 channels. If the AUA406 or AUA408 SLOT ALLOCATION displays "12," a failure condition that affects service to the MSDT will cause the ADU MJ and BCU digroup (A, B, C, or D) indicators to light.

If the AUA406 or AUA408 is optioned and installed correctly and the CONFIG indicator is ON, replace the following units to clear the trouble:

- **AUA406 or AUA408**
- **AUB27 ADU**
- **MC97779A1 BCU.**

If the AUA406 or AUA408 is installed per work order, record the digroup channel unit equipage and refer the trouble to the engineering center.

4. If necessary, install the feeder facility unit (BYB1B/BYB1C or BYB2) in the MSDT **OU** slot:

A. Install BYB1B/BYB1C optical unit in MSDT.	DLP-512
B. Install BYB2 line interface unit.	DLP-526

5. If necessary at RT, make the fiber distribution shelf/panel (for example, an *LGX*[®] system) or DSX-1 cross-connection to the outside plant fiber/T1 facility associated with the *SLC-2000* MSDT. DLP-516

Response: All alarms clear and **SLOT ALLOCATION** displays the number selected.

Comment: If the **CLF** alarm does not clear, verify that **AYB1B** is installed in the correct slot and the fiber cross-connection is correct, or the T1 line interface unit is installed and the T1 facility is functioning (DSX-1 cross-connection made and line repeaters installed and tested).

Comment: If the **CLF** or **DT** indicator is lighted, proceed to the MSDT and do **TAP-101**.

6.

 **NOTE:**
When doing an LED TEST, all common unit indicators in the RT channel bank should also light.

Press the **ADU LED TEST** button and verify that all **AUA406** or **AUA408** indicators light (the number 18 is displayed). Replace the following units if **AUA406** or **AUA408** indicator(s) do not light:

- **AUA406** or **AUA408**
 - **MC97779A1 BCU**
 - **AUB27 ADU**.
-

7. Proceed to the MSDT site.

8. Open the front of the MSDT and pull the door alarm switch to deactivate the door alarm (**DT** on RT **AUA406** or **AUA408** MSDT Server unit).

9. Verify that the **BIU SLOTS AVAILABLE** number is correct for the MSDT mode of operation. Use the following information to verify correct indication:

AUA406 or AUA408 SLOT ALLOCATION	BIU SLOTS AVAILABLE	
	Dual Mode	Quad Mode
6	6	3
12	6	6

Comment: Correct mode select option plug (located under the fiber organizer on the back side of the MSDT) setting (installed for Dual Mode, removed for Quad Mode). If the presence or absence of the shorting plug is correct, replace the BIU. If that does not fix the problem, check to make sure the connector is not shorted unintentionally or that the plug is not open or poorly inserted.

⇒ **NOTE:**
Flashing display on the **BIU** on AUA406 or AUA408 indicates that trunk processing has occurred. The link between the MSDT and HDT is OK. Check the DS1 input from the switch to the COT or multiplexer.

10.

⇒ **NOTE:**
This assumes the MSDT does not have alarms (BIU NE, PIU ON BAT, ...). Do **TAP-101** to clear MSDT alarms.

Press **BIU LED TEST** and verify that all **BIU** indicators light [the number 8 is displayed, all PIU, PCU, RGU, and CDTU (if equipped) indicators also light]. Replace **BIU** if any indicator does not light.

11.



NOTE:

Do this step only if you have battery backup.

For 120 AC powered MSDT, pull the AC disconnect plug and verify that **BIU NE** and **AUA414 PIU ON BAT** indicators light (**AUB27 ADU NE, MN**, and **AUA406** or **AUA408 DT** indicators at RT; **FE** and **MN** alarms will be activated). Then reinstall the disconnect plug.

12. The following will light the **BIU NE** indicator and cause the corresponding RT and CO alarms:

- Opening the back door (if equipped with a door alarm)
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.
- Removing the **RGU** (ringing generator unit)
DT, NE, and **MJ** at the RT;
FE and **MJ** alarms at the CO.
- Activating MSDT miscellaneous closure
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.
- Removing a PIU faceplate mounted 5A (if present) fuse (if batteries are present) (remove the PIU before reinstalling the fuse).
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.
- Blown fuse on the battery pack.
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.

13. Perform single-party channel tests (ringing, trip ring, talk, and dialing tests) on at least one MSDT channel slot. DLP-518

Comment: If the MSDT is operating in the quad mode and a dual channel unit is used to perform the channel test, only the first two circuits allocated to the slot can be tested.

14. Remove channel unit if not activating service for the circuit; close and lock the MSDT.

15. Update office records.

16. When required, populate the MSDT with channel units using 363-205-402, Channel Installation TOP. Remember that the craft interface unit (CIU) can only be used at the RT (or Series 5 COT), not at the MSDT, to provision special service channel units.

Turn Up J1C182BD Battery Plant in 51A 130-Volt DC Power Point Cabinet

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1.



NOTE:

This procedure provides steps for the turn-up of the J1C182BD power shelf and supporting equipment in a 51A cabinet used for a –130-volt DC power point. This procedure does not support any other use of the J1C182BD power shelf (for example, when used with digital loop carrier equipment). Refer to 640-250-296, *J1C182BD 20-Amp Bulk Power Shelf Turnup Procedure*, for any other application of the J1C182BD power shelf.

This procedure contains instructions concerning the installation of batteries into the cabinet and the various units into the J1C182BD power shelf assembly, and for verifying that the units are operating properly prior to turning up –130-volt DC power point equipment.

2. Get support apparatus listed:

- Special key (modified hex key) — COMCODE 846244168
- Digital multimeter (DMM) with an accuracy of 0.1 percent and an AC/DC input impedance of ≥ 1 megohm
- Permanent marker or equivalent (for battery installation).

3.



CAUTION:

An electrostatic discharge wrist strap with a minimum resistance of 250K ohms should be worn when handling circuit packs to prevent possible damage to the circuit packs. Before using the wrist strap, check it for opens, shorts, and minimum resistance value. If the strap does not pass these checks, it should not be used. To avoid possible personal injury while using the wrist strap, do not connect it to the power shelf or adjacent portions of the frame. Connect the wrist strap to ESD GRD jack on the fan unit, if present. If grounding jack is not present, connect wrist strap to bare-metal section of the frame well away from the power shelf.

-
4. Open cabinet using the hex key. Verify the AC disconnect is on and power shelf is plugged in.
-

5. Verify that four 30-amp fuses are installed on the **AUG4 BIU** (battery interface unit) and install in power shelf **BIU** slot.
-

6. Install up to five **336A** rectifiers in power shelf.

DLP-519

Comment: Ringing generator circuit packs are not used for 130-volt DC power point applications of the J1C182BD power shelf.

7.



NOTE:

Batteries are shipped directly from manufacturer.

Install and test *Lineage*[®]-2000 system IR Series batteries in 51A cabinet. Fill in installation information on record labels of the batteries.

DLP-520

-
8. Turn on each power shelf DC circuit breaker and verify that it does not trip. If a circuit breaker does trip, cabinet wiring trouble must be cleared before continuing.
-

9. Test the 2B FAN UNIT by pressing the **FAN TEST** button on the FAN CONTROL UNIT.

10. Turn off AC at disconnect and verify **BOD** on **AUG4 BIU** and **ALARM** on **336A** indicators light (may take up to 5 minutes). Replace unit if indicator does not light.

Comment: Running the fans (press and hold **FAN TEST** button) will shorten the time required to light the **BOD** indicator.

-
11. Turn on AC at disconnect.
-

- 12.



NOTE:

The batteries must have been installed for at least 48 hours before testing with the **197A BATTERY LOAD TEST SET**. If batteries have just been installed, perform this test at a later date.

Perform test of batteries using **197A BATTERY LOAD TEST SET**. DLP-521

13. When required, turn up the -130 V DC power point (only) equipment using **NTP-009**.
-

14. Update records.

Turn Up ED-7C704-30 Bulk Power Plant in 80A 130-Volt DC Power Point Cabinet

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. This procedure provides steps for the initial installation of the battery strings and CS787B540 power units in the rectifier shelf in an 80A cabinet equipped with the ED-7C704-30 bulk power plant, and for verifying that the units are operating properly prior to turning up 130-volt DC power point equipment.

-
2. Get support apparatus listed:
 - 216-type tool
 - Special key (modified hex key) — COMCODE 846244168
 - Digital multimeter (DMM) with an accuracy of 0.1 percent and an AC/DC input impedance of ≥ 1 megohm
 - Permanent marker or equivalent (for battery installation).

- 3.



CAUTION:

An electrostatic discharge wrist strap with a minimum resistance of 250K ohms should be worn when handling circuit packs to prevent possible damage to the circuit packs. Before using the wrist strap, check it for opens, shorts, and minimum resistance value. If the strap does not pass these checks, it should not be used. To avoid possible personal injury while using the wrist strap, do not connect it to the power shelf or adjacent portions of the frame. Connect the wrist strap to ESD GRD jack on the fan unit, if present. If grounding jack is not present, connect wrist strap to bare-metal section of the frame well away from the power shelf.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

4.



NOTE:
Batteries are shipped directly from manufacturer.

Install and test *Lineage*[®]-2000 system VR Series batteries in 80A cabinet skirt. DLP-523

5. Verify connections to ED-83114-30 control and distribution panel.	DLP-524

6. Install power units in rectifier shelf.	DLP-525

7.



NOTE:
Each circuit breaker on the control and distribution panel supplies power to one of the –130 power converters (these are not power converter shelves for ± 130 V). To identify circuit breakers, refer to the label located on the door opposite the control and distribution panel.

Turn on one circuit breaker and verify that it does not trip. If the circuit breaker does trip, cabinet wiring trouble must be cleared before continuing.

8. Turn circuit breaker off. Repeat Step 7 for each circuit breaker.

9. Test the FAN UNIT by pressing the FAN TEST button. (On the 2B unit, the FAN TEST button is on the FAN CONTROL UNIT. On the 4A unit, the FAN TEST button is on the FAN UNIT.)

10. When required, turn up the –130 V DC power point equipment using NTP-009 .

11. Update records.

Turn Up –130 Volt DC Power Point

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

Prerequisite

Before the –130 volt DC power point equipment can be installed, the –48 volt DC battery plant equipment must be turned up. Refer to **NTP-007** (*Turn Up J1C182BD Battery Plant in 51A 130-Volt DC Power Point Cabinet*) or **NTP-008** (*Turn Up ED-7C704-30 Bulk Power Plant in 80A 130-Volt DC Power Point Cabinet*) to equip the –48 volt DC battery plant as required. Figure 1 shows a block diagram of the components in the –130 volt DC power point.

1.



CAUTION:

Turning off a DC circuit breaker at a Power Point/RT (where the power shelf also powers SLC[®] Carrier System or DDM equipment) will interrupt service if the circuit breaker also powers in-service equipment.

Comment: Turn off the –48 V DC power shelf DC circuit breakers that supply power to the *Lorain*¹ Model HSB6H, List 1 –130 V power shelf(ves).

-
2. If not already installed, install the *Lorain* Model HSB6H, List 2 –130 V power converter modules in the converter shelf(ves).

Comment: For applications that require three converter modules, the third module is installed in the left half of the second converter shelf.

-
3. Turn on the DC circuit breakers. Verify that the green **PWR ON** LED lights on each converter module. If it does not, check the 30-amp fuse in the back of the converter and the –48 V battery plant equipment power feed. If –48 V power is present and the **PWR ON** LED does not light, replace the –130 V converter module.

1. Registered trademark of Reliance Comm/TEC Corporation.

4.



NOTE:

With no load, no converter module LEDs (except **PWR ON**) should be lighted. If the **FUSE ALM** is lighted, check the 10-amp converter fuse. If only **FAIL ALM** is lighted, try adjusting the **OUTPUT V. ADJ.**, then replace the converter module.

On each –130 V converter, measure DC voltage between the + and – **OUTPUT VOLTAGE** jacks (126 to 135 volts DC). If necessary, adjust the **OUTPUT V. ADJ.** (clockwise to increase output voltage) to obtain 130 volts DC.

5. To test the power point equipment, perform the following:

- Install a 3-amp fuse (blue 70-type fuse) in the –130 FUSE PANEL fuse holders **1** and **24**.
- Install an **AUA418 LOSU** in slots **1/2** and **47/48** in the J1C182PE-1 Limiter Output Source Unit (LOSU) shelf. Verify –130 volts DC (–128 to –136) between the **–130** and **–130R** jacks. If –130 volts DC is not present, check the 3-amp fuse, then replace the **LOSU**.
- Turn off the –48 volt DC circuit breakers to all but one –130 converter module. Verify the **LOSU**'s voltage is still present. Repeat for each converter module.
- Remove the two **LOSU** packs and the two 3-amp fuses.

6. Set the two miniswitches on the **AUA419 SCU** away from **ON** (toward the number). Install the **SCU** in the right-most slot of the J1C182PE-1 LOSU shelf. Press the **LED TEST** button. Replace the **SCU** if the **FAIL** and **ON BAT** LEDs do not light.

7. When required, connect copper distribution conductors that provide –130 V power to *SLC-2000* MDSTs using **NTP-010**.

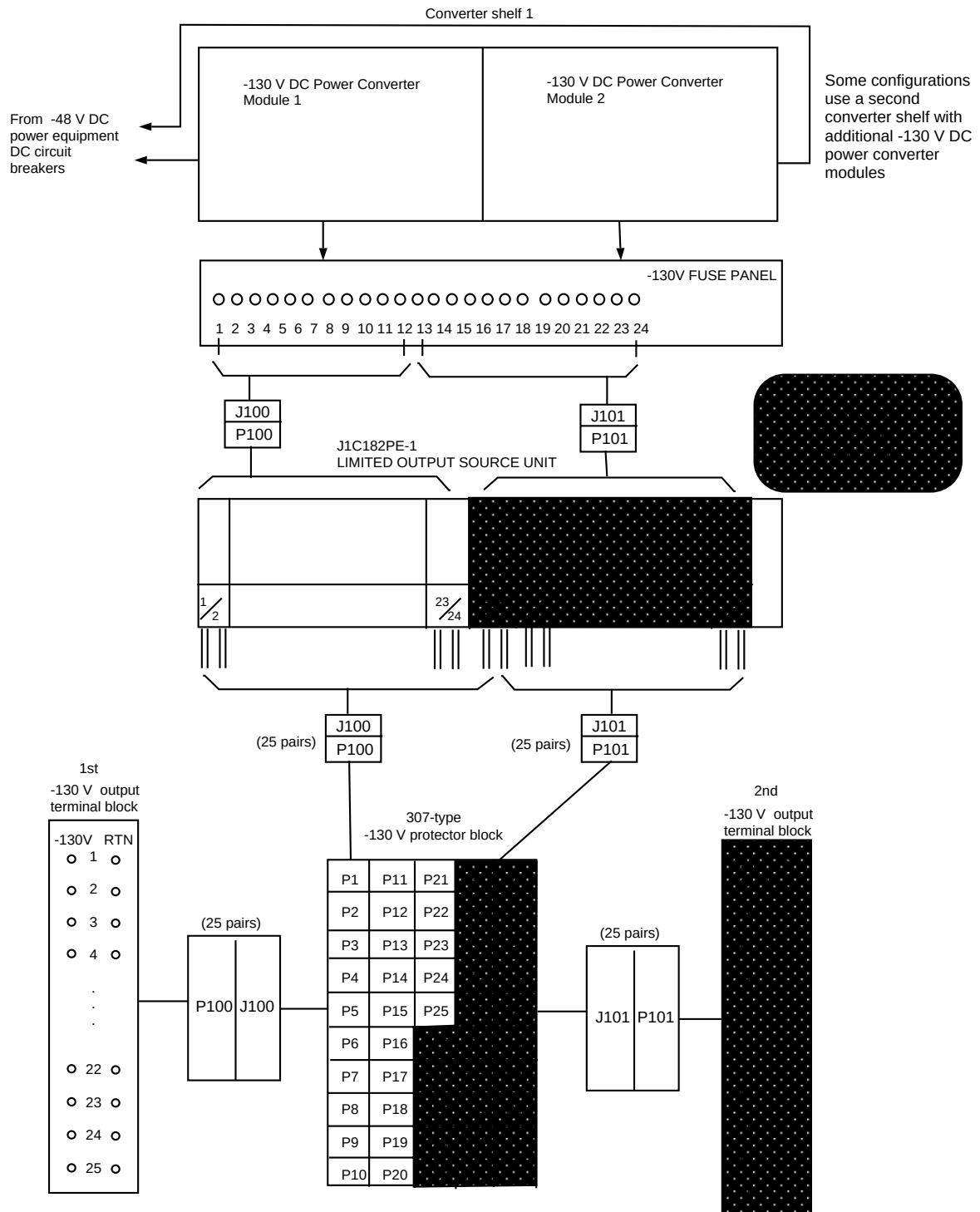


Figure 1 – Typical –130V Power Point Equipment

Add –130 Volt DC Distribution Lines

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

Prerequisite: Before the –130 volt DC distribution lines can be installed, the –130 volt DC power point equipment must be turned up. Refer to **NTP-009** (*Turn Up –130 Volt DC Power Point*).

Overview: Choose a –130 V output terminal position on which to attach the –130 volt DC power feed distribution wires. Refer to Table D to find the terminal position on which you are going to attach the power feed and determine in which –130 V FUSE PANEL holder to install a 3-amp fuse, in which J1C182PE-1 limited output source unit (LOSU) slot to install an **AUA418 LOSU**, and in which –130 V 307 protector block position to install a protector. After installing the fuse, **LOSU**, and protector, verify –130 volts DC on the output terminal before and after connecting the power feed wires (see Figure 2).

-
1. Choose a –130 V output terminal block position on which to attach the –130 volt DC power feed distribution wires (see Figure 2) as specified by the work order.

Comment: You may be required to connect several copper distribution pairs to a –130 V terminal (based on the distance to the MSDT).

-
2. Refer to Table D and find the output terminal position you chose. Note the associated –130 V FUSE PANEL fuse holder, the associated J1C182PE-1 **LOSU** slot, and the associated –130 V 307 protector block position.

-
3. Install a blue 70-type 3-amp fuse in the appropriate fuse holder on the –130 V FUSE PANEL.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

4. Install an **AUA418 LOSU** in the appropriate J1C182PE-1 LOSU slot. Verify –130 volts DC (–128 to –136) between the **–130** and **–130R** jacks. If –130 volts is not present, check the 3-amp fuse, then replace the **LOSU**.

Replace the **LOSU** if the **FAIL** LED is lighted.

Press the **AUA419 SCU LED TEST** button and verify the **LOSU FAIL** LED lights. If it does not light, replace the **LOSU** and repeat the LED test. If the **LOSU FAIL** still does not light, then replace the **SCU** (with both miniswitches set toward the number).

-
5. Install a 3B-type protector in the appropriate 307-type –130 V protector block position.
-
6. Verify –130 volts DC (–128 to –136) between the **–130 V** and **RTN** output terminal position. If –130 volts DC is not present, verify that you installed the fuse, LOSU, and protector in the correct positions. Then correct wiring trouble using the appropriate drawings.
-
7. Temporarily remove the protector and connect the –130 volt DC power feed wires to the –130 V output terminal position. Replace the protector and verify –130 volts DC (–128 to –136) at the –130 V output terminal position. If –130 volts DC is not present, correct power feed distribution cabling trouble (look for short circuit between the pair).

Table D – Power Point –130 Volt DC Power Feed Arrangements

3-Amp Fuse Holder	AUA418 in LOSU Slot	307 Protector Positions	–130 V Output Terminal	Terminal Positions
1	1/2	1	1st	1
		2	1st	2
2	3/4	3	1st	3
		4	1st	4
3	5/6	5	1st	5
		6	1st	6
4	7/8	7	1st	7
		8	1st	8
5	9/10	9	1st	9
		10	1st	10
6	11/12	11	1st	11
		12	1st	12
7	13/14	13	1st	13
		14	1st	14
8	15/16	15	1st	15
		16	1st	16
9	17/18	17	1st	17
		18	1st	18
10	19/20	19	1st	19
		20	1st	20
11	21/22	21	1st	21
		22	1st	22

Continued on next page

Table D – Power Point –130 Volt DC Power Feed Arrangements —*Continued*

3-Amp Fuse Holder	AUA418 in LOSU Slot	307 Protector Positions	–130 V Output Terminal	Terminal Positions
12	23/24	23	1st	23
		24	1st	24
13	25/26	25	1st	25
		26	2nd	1
14	27/28	27	2nd	2
		28	2nd	3
15	29/30	29	2nd	4
		30	2nd	5
16	31/32	31	2nd	6
		32	2nd	7
17	33/34	33	2nd	8
		34	2nd	9
18	35/36	35	2nd	10
		36	2nd	11
19	37/38	37	2nd	12
		38	2nd	13
20	39/40	39	2nd	14
		40	2nd	15
21	41/42	41	2nd	16
		42	2nd	17
22	43/44	43	2nd	18
		44	2nd	19

Continued on next page

Table D – Power Point –130 Volt DC Power Feed Arrangements —*Continued*

3-Amp Fuse Holder	AUA418 in LOSU Slot	307 Protector Positions	–130 V Output Terminal	Terminal Positions
23	45/46	45	2nd	20
		46	2nd	21
24	47/48	47	2nd	22
		48	2nd	23

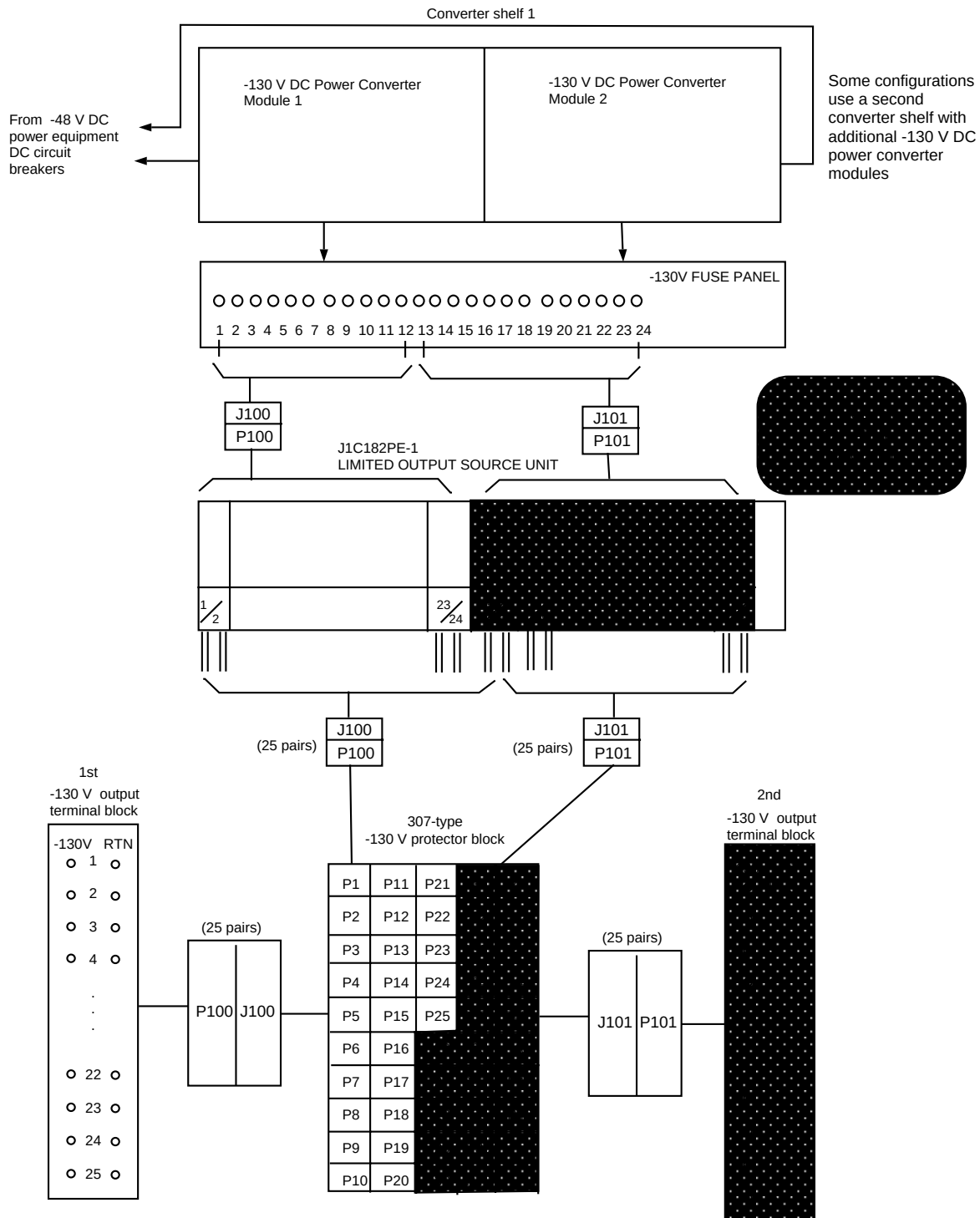


Figure 2 – Typical –130 V Power Point Equipment

Turn Up ± 130 Volt DC Power Point and Distribution Lines

Prerequisite: Before the ± 130 volt DC distribution lines can be installed, the -48 volt DC power equipment must be turned up. Refer to **NTP-007** (*Turn Up J1C182BD Battery Plant*) or **NTP-008** (*Turn Up ED-7C704-30 OLS Rectifier Shelf*) to equip the -48 volt DC battery plant as required.

Overview: Choose a -130 V output terminal position on which to attach the ± 130 volt DC power feed distribution wires. Refer to Table E to find the terminal position on which you are going to attach the power feed and determine on which -48 V FUSE PANEL holder to install a 5-amp fuse, on which J1C182PE-1 limited output source unit (LOSU) slot to install an **AUA428 LOSU**, and on which ± 130 V 307 protector block position to install a protector. After installing the fuse, **LOSU**, and protector, verify ± 130 volts DC on the output terminal before and after connecting the power feed wires (see Figure 3).

-
1. If not already installed, set the two miniswitches on the **AUA419 SCU** away from **ON** (toward the number). Install the **SCU** in the right-most slot of the J1C182PE-1 LOSU shelf. Press the **LED TEST** button. Replace the **SCU** if the **FAIL** and **ON BAT** LEDs do not light.
-

2. Choose a -130 V output terminal block position on which to attach the ± 130 volt DC power feed distribution wires (see Figure 3) as specified by the work order.

Comment: You may be required to connect several copper distribution pairs to a -130 V terminal (based on the distance to the MSDT).

3. Refer to Table E and find the output terminal position you chose. Note the associated -48 V FUSE PANEL fuse holder, the associated J1C182PE-1 **LOSU** slot, and the associated ± 130 V 307 protector block position.
-

4. Install a 5-amp fuse in the appropriate fuse holder on the -48 V FUSE PANEL.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

5. Install an **AUA428 LOSU** in the appropriate J1C182PE-1 LOSU slot. Verify ± 130 volts DC (256 to 272) between the **+130 V** and **-130 V** jacks. If ± 130 volts DC is not present, check the 5-amp fuse, then replace the **LOSU**.

Replace the **LOSU** if the **FAIL** LED is lighted.

Press the **AUA419 SCU LED TEST** button and verify that the **LOSU FAIL** LED lights. If it does not light, replace the **LOSU** and repeat the LED test. If the **LOSU FAIL** still does not light, then replace the **SCU** (with both miniswitches set toward the number).

-
6. Install a 5-pin type protector in the appropriate 307-type ± 130 V protector block position.
-
7. Verify ± 130 volts DC (256 to 272) between the **-130 V** and **RTN** output terminal position. If ± 130 volts DC is not present, verify you installed the fuse, LOSU, and protector in the correct positions. Then correct wiring trouble using the appropriate drawings.
-
8. Temporarily remove the protector and connect the ± 130 volt DC power feed wires to the **-130 V** output terminal position. Replace the protector and verify AUA428 LOOP FAULT LED is off and ± 130 volts DC (256 to 272) is present at the **-130 V** output terminal position. If ± 130 volts is not present, correct power feed distribution cabling trouble (look for short circuit between the pair).

Table E – Power Point ±130-Volt DC Power Feed Arrangements (See Note)

5-Amp Fuse Holder	AUA428* in LOSU Slot	307 Protector Positions	Terminal
1	5/6	1	1
2	11/12	2	2
3	17/18	3	3
4	23/24	4	4
5	29/30	5	5
6	35/36	6	6
7	41/42	7	7
8	47/48	8	8

Note: Sequentially assign any additional LOSU shelf positions.

* The AUA428 LOSU is three slots wide.

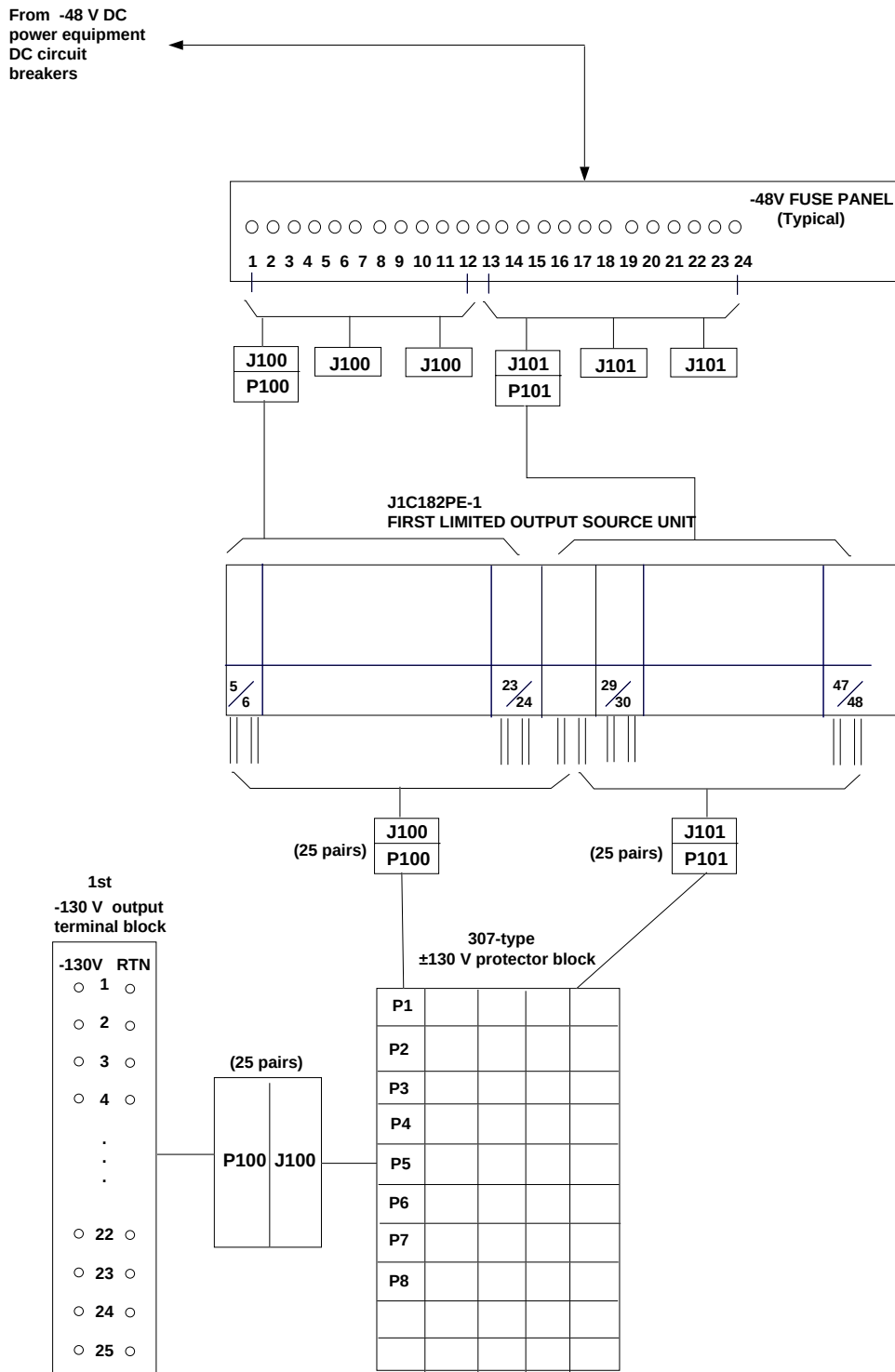


Figure 3 – Typical ±130 V Power Point Equipment

Perform *SLC*[®]-2000 MSDT to CO End-to-End System Tests — *SLC*-2000 HDT

Prerequisite

Before starting this procedure, you must perform the acceptance procedures to install the fuses in the high density optics shelf (HDOS), verify that the SONET subsystem has been turned up and connected end-to-end, verify that the DLC shelf has been turned up end-to-end using procedures in 363-208-001, *SLC-2000 User/Service Manual*. You must also verify that the *SLC*-2000 Multi-Services Distant Terminal (MSDT) has been turned up using **NTP-004**.

1. At the *SLC*-2000 RT, verify no alarms are present. Clear any alarms before continuing.
-
2. Use the SET-DISTRIBUTION user interface panel (UIP) command (or the **ed-distn** CIT command) to verify that the Metallic Distribution Shelf (MDS) has been provisioned for fiber in the loop (FITL) as follows:

On the UIP, press **Escape**, then press the **Scroll Menu** up or down arrow button until SET-DISTRIBUTION <ent> is displayed. Then press **Enter**. Press the **Scroll Menu** up or down arrow button until the appropriate shelf (SET-DISTN:SHELF 1 through 8) is displayed in the command string. Then press **Enter**.

If [FITL] is displayed, press **Escape** and continue with the next item.

If [MET] is displayed, remove both **MDC** packs in the MDS shelf. Then use the down arrow key until the appropriate distribution mode (FITL for fiber in the loop) is displayed in the command string. Press **Enter** to select this distribution mode on a shelf. A SET-DISTN:#:mode done message will be displayed. Reinstall the two **MDC** packs in the MDS shelf.



NOTE:

If the CIT command is used to provision the MDS shelf for fiber

in the loop (FITL), it is not necessary to remove the MDC packs in the MDS assembly.

3. Verify that the *SLC-2000* Multi-Services Distant Terminal (MSDT) has been accepted and turned up (in quad mode) using **NTP-004**.

4. Set options on the MSDT Servers. Only the **OU/DSX** needs to be set to **OU**; all other applicable options are provisioned via craft interface terminal (CIT) commands. DLP-515

5. From the work order, identify which Metallic Distribution Shelf and channel slots to install the MSDT Servers in. Refer to Table F and verify the slot is a valid location.

Table F – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes)

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame
MDS 1, shelf 1	CU 1	dt-1-1	1, F1	OU 1	SH-1-1
	CU 3 *	dt-1-3	1, F1	OU 3 *	SH-1-3
	CU 5	dt-1-5	1, F1	OU 5	SH-1-5
	CU 7 *	dt-1-7	1, F1	OU 7 *	SH-1-7
	CU 13	dt-1-13	2, F2	OU 13	SH-1-13
	CU 15 *	dt-1-15	2, F2	OU 15 *	SH-1-15
	CU 17	dt-1-17	2, F2	OU 17	SH-1-17
	CU 19 *	dt-1-19	2, F2	OU 19 *	SH-1-19
MDS 1, shelf 2	CU 1	dt-2-1	3, F3	OU 1	SH-2-1
	CU 3 *	dt-2-3	3, F3	OU 3 *	SH-2-3
	CU 5	dt-2-5	3, F3	OU 5	SH-2-5
	CU 7 *	dt-2-7	3, F3	OU 7 *	SH-2-7
	CU 13	dt-2-13	4, F4	OU 13	SH-2-13
	CU 15 *	dt-2-15	4, F4	OU 15 *	SH-2-15
	CU 17	dt-2-17	4, F4	OU 17	SH-2-17
	CU 19 *	dt-2-19	4, F4	OU 19 *	SH-2-19
MDS 2, shelf 3	CU 1	dt-3-1	5, F5	OU 1	SH-3-1
	CU 3 *	dt-3-3	5, F5	OU 3 *	SH-3-3
	CU 5	dt-3-5	5, F5	OU 5	SH-3-5
	CU 7 *	dt-3-7	5, F5	OU 7 *	SH-3-7
	CU 13	dt-3-13	6, F6	OU 13	SH-3-13

See notes and footnote at end of table.

Continued on next page

Table F – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame
MDS 2, shelf 3	CU 15 *	dt-3-15	6, F6	OU 15 *	SH-3-15
	CU 17	dt-3-17	6, F6	OU 17	SH-3-17
	CU 19 *	dt-3-19	6, F6	OU 19 *	SH-3-19
MDS 2, shelf 4	CU 1	dt-4-1	7, F7	OU 1	SH-4-1
	CU 3 *	dt-4-3	7, F7	OU 3 *	SH-4-3
	CU 5	dt-4-5	7, F7	OU 5	SH-4-5
	CU 7 *	dt-4-7	7, F7	OU 7 *	SH-4-7
	CU 13	dt-4-13	8, F8	OU 13	SH-4-13
	CU 15 *	dt-4-15	8, F8	OU 15 *	SH-4-15
	CU 17	dt-4-17	8, F8	OU 17	SH-4-17
	CU 19 *	dt-4-19	8, F8	OU 19 *	SH-4-19
MDS 3, shelf 5	CU 1	dt-5-1	1, F1	OU 1	SH-5-1
	CU 3 *	dt-5-3	1, F1	OU 3 *	SH-5-3
	CU 5	dt-5-5	1, F1	OU 5	SH-5-5
	CU 7 *	dt-5-7	1, F1	OU 7 *	SH-5-7
	CU 13	dt-5-13	2, F2	OU 13	SH-5-13
	CU 15 *	dt-5-15	2, F2	OU 15 *	SH-5-15
	CU 17	dt-5-17	2, F2	OU 17	SH-5-17
	CU 19 *	dt-5-19	2, F2	OU 19 *	SH-5-19
MDS 3, shelf 6	CU 1	dt-6-1	3, F3	OU 1	SH-6-1
	CU 3 *	dt-6-3	3, F3	OU 3 *	SH-6-3
	CU 5	dt-6-5	3, F3	OU 5	SH-6-5

See notes and footnote at end of table.

Continued on Next Page

Table F – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame
MDS 3, shelf 6	CU 7 *	dt-6-7	3, F3	OU 7 *	SH-6-7
	CU 13	dt-6-13	4, F4	OU 13	SH-6-13
	CU 15 *	dt-6-15	4, F4	OU 15 *	SH-6-15
	CU 17	dt-6-17	4, F4	OU 17	SH-6-17
	CU 19 *	dt-6-19	4, F4	OU 19 *	SH-6-19
MDS 4, shelf 7	CU 1	dt-7-1	5, F5	OU 1	SH-7-1
	CU 3 *	dt-7-3	5, F5	OU 3 *	SH-7-3
	CU 5	dt-7-5	5, F5	OU 5	SH-7-5
	CU 7 *	dt-7-7	5, F5	OU 7 *	SH-7-7
	CU 13	dt-7-13	6, F6	OU 13	SH-7-13
	CU 15 *	dt-7-15	6, F6	OU 15 *	SH-7-15
	CU 17	dt-7-17	6, F6	OU 17	SH-7-17
	CU 19 *	dt-7-19	6, F6	OU 19 *	SH-7-19
MDS 4, shelf 8	CU 1	dt-8-1	7, F7	OU 1	SH-8-1
	CU 3 *	dt-8-3	7, F7	OU 3 *	SH-8-3
	CU 5	dt-8-5	7, F7	OU 5	SH-8-5
	CU 7 *	dt-8-7	7, F7	OU 7 *	SH-8-7
	CU 13	dt-8-13	8, F8	OU 13	SH-8-13
	CU 15 *	dt-8-15	8, F8	OU 15 *	SH-8-15
	CU 17	dt-8-17	8, F8	OU 17	SH-8-17
	CU 19 *	dt-8-19	8, F8	OU 19 *	SH-8-19

See notes and footnote at end of table.

Continued on Next Page

Table F – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame

Notes:

1. The MSDT Servers must be installed in the slots listed. The circuits served do not necessarily correspond with the slot label that the MSDT Server is installed in (see 363-208-001 for details).

2. The access identifier (AID) has the syntax of:

dt-shelf#-physical slot # in HDT

where:

shelf# is the digital loop carrier (DLC) system or shelf number {1-8}

physical slot # in HDT is the slot for the MSDT Server {1,3,5,7,13,15,17,19}

3. The PCU powers four optical units to the left.

4. For a second HDOS, the shelf labels **SH-1** through **SH-4** refer to VRT shelves 5 through 8.

* These slots can only be used when the MSDT Servers are provisioned for 12 channels.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

6. For a fiber link (skip this item if using a T1 facility link) to the MSDT, if not previously installed, install the 1-Amp fuse and **AYB2 PCU** in the appropriate HDOS shelf fuse holder and PCU slot associated with the MSDT Server to be installed (see Table A).

Verify the **PCU FAIL** LED does not remain lighted when installed. If it does, then replace the **PCU**.

Comment: The **PCU FAIL** LED will flash briefly when installed. It will also light for about 1 second when removed. You can verify -48 V DC is supplied to the HDOS and that the 1-amp fuse associated with the **PCU** slot is installed and not blown (replace if blown) by observing this FAULT LED when installing or removing the PCU.

If not previously installed, install the **AYB1B/AYB1C/AYB5 OU** in the slot associated with the MSDT Server (see Table A).

Comment: If an optical power meter is available, verify -24 to -36 dBm (AYB1B or AYB1C) or -20 to -33 dBm (AYB5) receive power at the fiber distribution shelf/panel on the outside plant fiber associated with the *SLC-2000* MSDT. Verify that the *SLC-2000* MSDT is turned up or clear fiber trouble before continuing. Measure the optical power [-20.5 to -25.5 dBm (BYB1B or BYB1C) or -17.9 to -22.9 (BYB5) transmit power levels] on the fiber coming from the HDOS to check out the **OU**.

-
7. At *SLC-2000* RT, verify the fiber distribution shelf/panel (for example, an *LGX* system) or DSX-1 cross-connection has been made to the outside plant fiber/T1 facility associated with the *SLC-2000* MSDT.

-
8. Use the CIT to log into the DLC subsystem. Review and, if necessary, provision the MSDT Servers to the proper number of lines (DS0 circuits) to be served. Each MDC can serve 48 circuits, two groups of 24 (72 circuits, three groups of 24 for R4.5). The default provisioning (when the SET-DISTRIBUTION UIP command is executed) is for 24 lines to each of two MSDT Servers.	DLP-532

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

9. Install the MSDT Server in the appropriate channel unit slots in the appropriate Metallic Distribution Shelf (see Table A). The MSDT Server is two slots wide.

Response: All Alarms clear within 3 minutes.

Comment: If the software version of the MC97793A1 BIU at the MSDT contains a version that needs to be updated, the SLC-2000 HDT will download the current version of the SMU software into the BIU circuit pack. This feature will proceed as stated provided that the MSDT server is an SPQ®809 or later Server (see Chapter 3 for required circuit packs for BIU downloading and MSDT features). The ABN LED on the UIP will light and a fault message will appear indicating a software download message. The DT LED on the MSDT Server will flash within 5 minutes.

At the MSDT location, the seven-segment LED on the BIU circuit pack will indicate the percentage of software installation completed. For example, a numeric display of **1** indicates 10 percent, a numeric display of **2** indicates 20 percent, etc. In addition, all the LEDs on the BIU circuit pack will flash. The software download will be completed when the LEDs on the BIU stop flashing.



NOTE:

The BIU download procedure will result in call processing being interrupted. Established calls will be dropped after the BIU has installed the software load and is resetting to run on the new software load.

-
10. Proceed to the MSDT site.
-

11. Open the front of the MSDT and pull the door alarm switch to deactivate the door alarm (**DT** on RT MSDT Server unit).

Comment: If a software download to the BIU was initiated, verify that the installation is complete. Use the procedure in **DLP-537** to verify that the BIU software version corresponds to the features required for the MSDT application.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

12. Verify that the **BIU SLOTS AVAILABLE** number is correct for the MSDT mode of operation. It will display **3** if the MSDT is provisioned for "12" time slots. It will display **6** if the MSDT is provisioned for "24" time slots.

Comment: Change the mode select option plug as required (located under the fiber organizer on the back side of the MSDT). (The plug must be removed for Quad Mode in *SLC-2000* HDT applications.)

⇒ **NOTE:**
A flashing seven-segment display on the BIU indicates a trunk processing has occurred and the line between the MSDT and HDT is OK. Check DS1 input from the switch to the COT or the multiplexer.

13.

⇒ **NOTE:**
This assumes the MSDT does not have alarms (BIU NE, PIU ON BAT, ...). Do **TAP-101** to clear MSDT alarms.

Press **BIU LED TEST** and verify that all **BIU** indicators light [the number 8 is displayed, all PIU, PCU, RGU, and CDTU (if equipped) indicators also light]. Replace **BIU** if any indicator does not light.

14.

⇒ **NOTE:**
Do this step only if you have battery backup.

For 120 V AC powered MSDT, pull the AC disconnect plug and verify that **BIU NE** and **AUA414 PIU ON BAT** indicators light. At the *SLC-2000* HDT, verify that the appropriate fault messages associated with FITL distribution are displayed on the UIP. See Table A in TAP-101 of this document.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

15. The following will light the **BIU NE** indicator and cause the corresponding RT and CO alarms:

- Opening the back door (if equipped with a door alarm)
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.
- Removing the **RGU** (ringing generator unit)
DT, NE, and **MJ** at the RT;
FE and **MJ** alarms at the CO.
- Activating MSDT miscellaneous closure
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.
- Removing a PIU faceplate mounted 5A (if present) fuse (with battery pack backup) (remove the PIU before reinstalling the fuse)
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.
- Blown fuse on the battery pack
DT, NE, and **MN** at the RT;
FE and **MN** alarms at the CO.

16. Perform single-party channel tests (ringing, trip ring, talk, and dialing tests) on at least one MSDT channel slot.	DLP-518

Comment: If the MSDT is operating in the Quad Mode and a Dual channel unit is used to perform the channel test, only the first two circuits allocated to the slot can be tested.

17. Remove channel unit if not activating service for the circuit; close and lock the MSDT.

18. Update office records.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

19. Assign customer channel unit service at the *SLC-2000* MSDT as required.

Comment: You can use 363-208-001, **Channel Unit Installation** tab, or 363-205-402 TOP to install and test channel units. Provisionable channel units also must be provisioned and settings verified from the *SLC-2000* Access System RT using the **Channel Unit Installation** tab of 363-208-001.

Comment: The MSDT has channel slot restrictions for ISDN channel units. The AUA90 cannot be installed in MSDT channel unit slot 2 or 5. The AUA93 cannot be installed in slot 2 or 5 when optioned for 2B+D ISDN service. The AUA52B and AUA93 channel units have options that must be set when installed in the MSDT.



NOTE:

Provision the AUA93 ISDN channel unit as follows, depending on the *SLC-2000* HDT software release:

Release 4.1 or earlier. Provision the service selection using the physical option switches.

Release 4.2 or later. Provision the service selection using the **ent-t0** command from the CIT. Ignore the AUA93 physical option switches.



NOTE:

For the AUA52 used in an MSDT hosted by a *SLC-2000* HDT containing Software Release 4.2 or later, provision the channel unit using the **ED-T0** CIT command. The CIT provisioning for these channel units should be changed to match desired service settings before converting from releases prior to R4.2.

The MSDT supports up to eight ISDN BRI services using four AUA94 channel units installed in slots 1 through 4. Four DS0-rate VF services are provided

through a quad CU in slot 5. A quad channel unit in slot 6 is blocked from use when an AUA94 is deployed in the MSDT. When less than four AUA94 channel units are installed, the CU slots that are not used for ISDN can have a voice-frequency CU (single, dual, or quad). Refer to Chapter 3 for more information on ISDN features and BRI services with the MSDT.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Maintenance Philosophy

General

The *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) provides up to 24 POTS or special service circuits using a single optical fiber or a T1 facility between the host digital terminal [(HDT), either a *SLC*-2000 or a Feature Package F (FPF) Series 5 carrier system remote terminal (RT)] and the MSDT cabinet. The Series 5 RT/HDT must be equipped with the MC97779A1 BCU, AUB27 ADU, AUA105 TRUs, and AUA6()C or D version LIUs. A Series 5 central office terminal (COT, if used) must be equipped for Feature Package C (FPC) with the MC97755A1,2 BCU and AU2() CTU.

Alarms

The MSDT Server unit (AUA40{6,8} or *SPQ*[®]808, *SPQ*809 or later MSDT Server) in the HDT and the MC9778{0,9}A1 or MC97793A1 BIU at the MSDT provide summary alarms for the MSDT. The PIU, PCU, RGU, CDTU, and BIU at the MSDT, and the MSDT Server at the RT all have a FAIL indicator that lights when the circuit pack fails. The MSDT Server provides an alarm interface between the HDT Carrier System and the *SLC*-2000 MSDT system [includes the MSDT Server and AYB1B/AYB1C/AYB5, or BYB2 (T1 line) interface unit at the RT, fiber facility, and MSDT equipment]. In *SLC* Series 5 applications, the AUA406/AUA408 MSDT Server has an option to report MSDT system trouble as a Major (MJ=ANY) or Minor (MJ=12) alarm. When the MSDT system is alarmed, the HDT will indicate MJ/MN and NE alarms. The CO will indicate MJ/MN and FE alarms. In TR-08, the digroup (A, B, C, or D) indicator may also be lighted at both ends.

Trouble should be cleared in the HDT carrier system before attempting to clear MSDT system trouble. A Series 5 HDT carrier system trouble will light alarms on other common units (TRUs, LIUs, LSU, PCUs, etc.), and the MSDT Server SLOT ALLOCATION and BIU SLOTS AVAILABLE displays will flash when there is carrier system trouble. See Figure 4 and Figure 5 for the SLC Series 5 COT and RT alarm flow charts. A SLC-2000 trouble will light alarms on other common units (VTUs, MXRVOs, MDSs, PTUs, etc.) and can be isolated using the user interface panel (UIP) *retrieve-alarms* and *retrieve-faults* commands. Mechanized loop testing (MLT) tests can determine the status of a channel in the MSDT. The test will return a DC signature that indicates whether the facility link between the HDT and MSDT is good or bad and indicates possible trouble on the customer drop (off-hook, foreign voltage on drop, etc.). MLT test access will be denied on any digroup that has a digroup alarm caused by a carrier system trouble.

The following is a summary of MSDT Server and MC9778{0,9}A1 or MC97793A1 BIU faceplate alarm indicators.

MSDT Server Alarm Summary

FAIL	The MSDT Server pack has failed self-diagnostic tests.
CLF	Communication with the MSDT is lost.
DT	Trouble with equipment in the MSDT.
CATV DT (AUA406 only)	Trouble with equipment in the CATV.
CONFIG	Placement of a channel unit in the wrong slot or an error in the SLOT ALLOCATION option setting on the MSDT Server channel unit. Correct placement or SLOT ALLOCATION option setting to clear CONFIG alarm. If the MSDT Server is installed per work order, record the digroup channel unit equipage and refer the trouble to the engineering center. If CONFIG and DT are both on, the channel unit installation trouble is at the MSDT.
SLOT ALLOCATION AUA40{6,8} only)	The switch selects and the LEDs display the number of channel unit slots seized. The display indicates Zero when in conflict with a previously installed MSDT Server; the display flashes when an HDT carrier system trouble (not MSDT trouble) is detected.

MC9778{0,9}A1, MC97793A1, or MC97794A1 BIU Alarm summary

SLOTS AVAILABLE

The seven-segment LED displays the number of channel unit slots (left to right) that can be equipped with channel units at the MSDT and flash when an HDT carrier system trouble (not MSDT trouble) is detected.



NOTE:

Flashing seven-segment display and FE alarm on the BIU or AUA406/AUA408 unit indicates a trunk processing has occurred. The link between the MSDT and HDT is OK. Check the DS1 input from the switch to the COT or multiplexer. If the SLC-2000 HDT hosting the MSDT contains software Release 4.2 or later, the trunk processing indications will be cleared if the circuit pack currently being trunk processed is removed.

FAIL

The BIU pack has failed self-diagnostic tests.

NE

Trouble with equipment in the MSDT.

CLF

Communication with the MSDT Server is lost.

FE

Trouble with MSDT Server.

CONFIG

Placement of a channel unit in the wrong slot or an error in the SLOT ALLOCATION switch setting on the MSDT Server channel unit. Correct channel unit placement or SLOT ALLOCATION option setting to clear CONFIG alarm. If **CONFIG** and **FE** are both on, the channel unit installation trouble is at the RT. If **CONFIG** and **NE** are both on, the channel unit installation trouble is at the MSDT.



NOTE:

All LEDs on the BIU circuit pack will flash while a software download is in progress. This is not considered a trouble condition. See **DLP-537** for more information on this condition.

Trouble Analysis Procedures

A general knowledge of how the HDT system and *SLC-2000* MSDT system function and what alarm LED indications mean will aid in performing trouble analysis procedures (TAPs). TAPs in this volume generally assume the following:

- The system is equipped with the plug-ins required to make an operating system.
- There may be a single cause for multiple trouble indications.
- Only a single trouble is assumed to exist.
- The trouble is not caused by a carrier system failure.

In case of an alarmed system failure, the craftsperson is first directed to the HDT by an examination of **FE** (far end), digroup (A, B, C, or D) indicator, and **MJ** and **MN** indication at the CO equipment. Then the MSDT Server alarm indicators provide further trouble isolation information.

When maintenance for the system is the responsibility of a remote maintenance center, the center will respond to the initial system alarm and dispatch personnel to the appropriate location (CO or RT) to clear trouble. MLT test results may direct the craftsperson to the MSDT site.

A craftsperson can connect a craft interface terminal (CIT) at a CO DDM/*SLC-2000* node and remotely log in to the *SLC-2000* RT HDT and retrieve a fault and alarm list. The fault list can identify several fault conditions at the MSDT.

SLC-2000 MSDT system trouble clearing normally begins at the HDT using TAP-101.

Trouble clearing is based on replacement of plug-ins. Any options on replacement plug-ins must be set per the appropriate facility record. Whenever replacement of a plug-in does not cure the trouble, the original plug-in should be returned to operation.

The time interval between when a trouble is cleared and when the alarm LEDs go off is usually less than 35 seconds.

There are several indications that the craftsman may use to determine whether an error has been made during system maintenance:

- A new circuit pack (CP) is installed in the RT at turn-up or during maintenance. The CP's FAIL indicator (LED) should be observed to ensure that it lights momentarily, then goes off. The absence of this just powered up (JPU) indication should cause the craftsman to check for proper CP type, option settings, and location.
- A misplaced or misset MSDT Server should always cause the **CONFIG** indicator to light if the circuit pack placement/setting is in conflict with the MSDT Server installation rules.
- If the FAIL LED stays on following the replacement of a common unit, the CP is probably failed, is installed in the wrong position, contains incorrectly set options, or another circuit pack/wiring trouble may cause the trouble.

The following procedure may be used when a problem is indicated (as above) after replacement of a unit. A simple verification of craft personnel error may be made as follows: while observing the **FAIL** LED on the unit just replaced, depress the **ADU** (SLC Series 5 system) or **BIU LED TEST** switch or the **UIP LED TEST** switch (SLC-2000 Access System). If the **FAIL** LED on the replaced CP does not light, a craftsman error of the type listed above is indicated.



CAUTION:

An electrostatic discharge wrist strap, with a minimum resistance of 250K ohms, should be worn and connected to a suitable ground when handling circuit packs to prevent possible damage to the circuit packs. Before using the wrist strap, check it for opens, shorts, and minimum resistance value. If the strap does not pass these checks, it should not be used. To avoid possible personal injury while using the wrist strap, do not connect it to the power shelf or adjacent portions of the RT frame. The RT fan unit has an ESD GRD jack for wrist strap connection.

Customer Trouble Reports

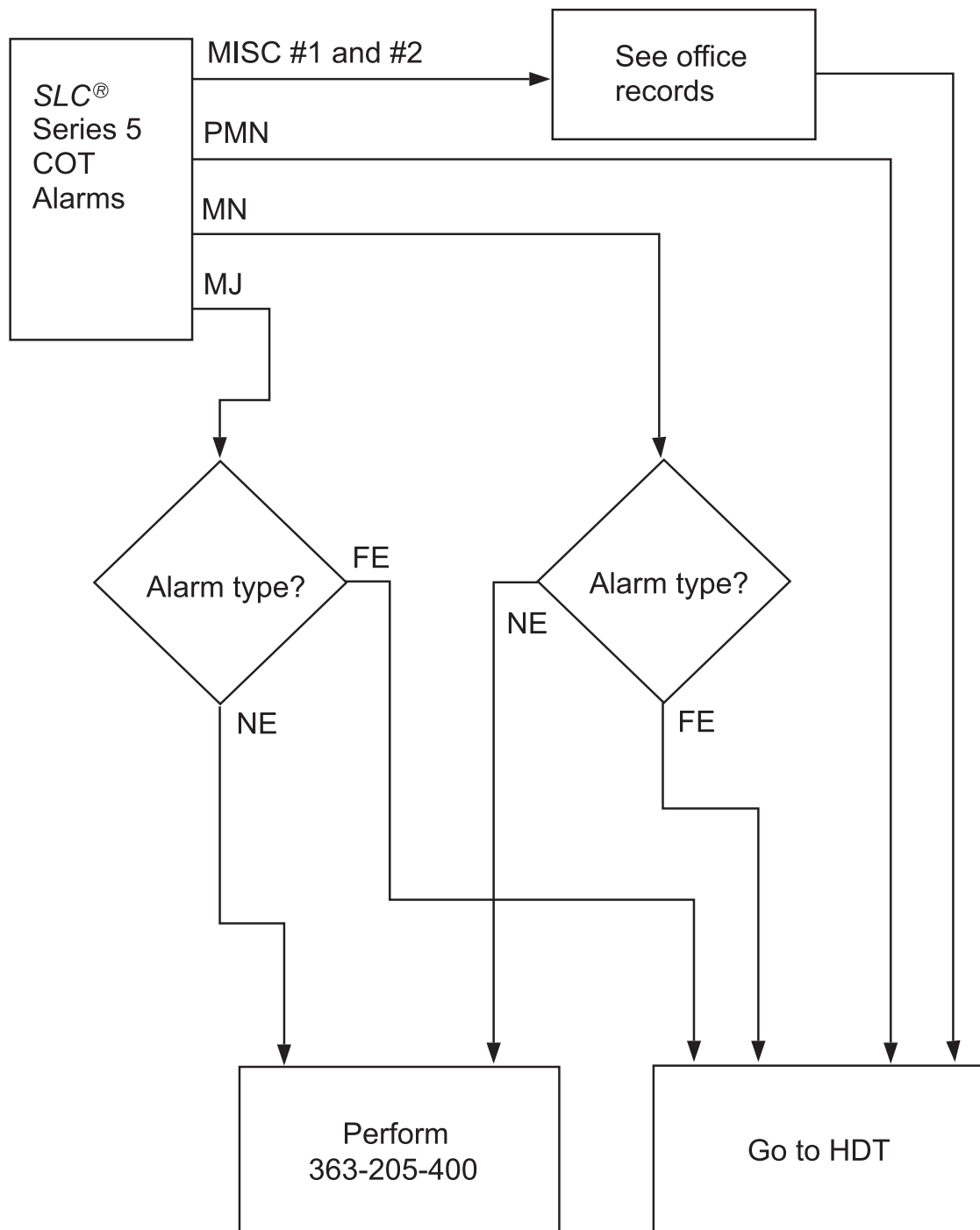
A customer trouble report is generally an unalarmed trouble and usually indicates a channel unit problem or distribution facility problem.

Single-party, multiparty, and coin service trouble reports are first received at the repair service bureau (RSB). The RSB uses MLT to test the circuit if it is available. The result of the MLT is a DC signature that indicates the status of the MSDT and drop pair health using the MSDT Server at the RT and the channel and drop test unit (CDTU) at the MSDT. The pair gain test controller (PGTC), extended test controller (XTC) PGTC emulation mode, or test bus control unit (TBCU) can test the MSDT channel unit and report its results to the MLT system. If the MLT test result reports a problem, a trouble report is initiated to the proper repair force and trouble analysis procedures begin at the RT or MSDT depending on the result. If the MLT test result finds no trouble with the MSDT system, a replacement of the COT channel unit (if universal) is performed first. Then if the trouble is still present, a replacement of the RT/MSDT channel unit is made.

Special service trouble reports are received at the special services center (SSC). The MSDT can provide 2-wire locally switched special services, coin service, 4-wire special services, and data service. The *SLC* Series 5 craft interface unit (CIU) or the *SLC*-2000 craft interface terminal (CIT) is used to provision the special service channel units. The *SLC* Series 5 Carrier System Channel Unit Installation TOP, 363-205-402, contains procedures to install and test channel units for a *SLC* Series 5 Carrier System host. The *Channel Unit Installation* tab in the *SLC*-2000 *Access System User/Service Manual*, 363-208-001, contains procedures to install and test channel units for a *SLC*-2000 system host. These procedures can be used to clear in-service special service troubles by performing the tasks to add channel service for the type of channel unit that has trouble. These procedures will clear the trouble conditions if the host system is causing the problem. Procedures in this document will clear troubles caused by the MSDT system. Customer equipment, drop pairs, or central office (or network) equipment can also cause the trouble condition.

Conclusion

When procedures in this document do not locate the trouble, an obscure trouble or multiple troubles are assumed to exist. The necessary schematic drawings (SDs), circuit descriptions (CDs), etc., should be available to assist in locating an obscure wiring problem.



alarm.cot.ps

Figure 4 – SLC® Series 5 COT Alarm Flowchart



Figure 5 – SLC® Series 5 RT Alarm Flowchart

Clear *SLC*[®]-2000 MSDT System Alarms; MSDT Server Alarms; NE, MJ, and DIGROUP or MN Alarms at HDT

General

This procedure is used to clear *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) trouble reports when the host digital terminal (HDT) Carrier System [either *SLC*-2000 or *SLC* Series 5 remote terminal (RT)] is working normally (no alarm indicators on power shelf equipment and other common units except the MJ or MN and possible Digroup alarms). The MSDT feature includes the MSDT Server (AUA406, AUA408, and *SPQ*[®]808, *SPQ*809 or later) unit, AYB1B/AYB1C/AYB5 optical unit or office repeater shelf (such as a T1 extension shelf), the fiber or T1 facility, and the MSDT equipment. CO-to-RT carrier system trouble conditions will cause the MSDT Server SLOT ALLOCATION¹ and MC9778{0,9}A1, MC97793A1, or MC97794A1 BIU SLOTS AVAILABLE displays to flash when the carrier system fails and nothing is wrong with the MSDT feature equipment. If the SLOT ALLOCATION¹ and SLOTS AVAILABLE displays are flashing, refer to the appropriate host carrier system documentation (363-208-001, User/Service Manual for *SLC*-2000, or 363-205-500, Maintenance TOP for *SLC* Series 5 Carrier System) to clear the *SLC* Carrier System trouble condition. This procedure is intended to clear trouble reports for a single MSDT and starts at the remote terminal (RT) or MSDT site. Central office (CO) equipment alarms caused by the MSDT feature trouble are typically FE, MJ, DIGROUP or MN. If there are no alarms but there are customer trouble reports, start trouble clearing at the RT unless mechanized loop testing (MLT) test results indicate otherwise. The MSDT Server and the BIU alarms provide a summary of all trouble conditions and may light the same indicators for different events. It is easy to determine the cause of a single event by indicators on other MSDT circuit packs. For multiple trouble conditions, you may clear one trouble and the BIU alarms may change or remain on because of the other event (for example, a miscellaneous closure lights the NE BIU indicator). The 363-208-001 provides procedures to clear MSDT troubles from a *SLC*-2000 system. Refer to Table A in this section to identify alarm and fault messages associated with FITL distribution modes.

1. Only the AUA406 and AUA408 MSDT Servers are equipped with SLOT ALLOCATION displays.

⇒ **NOTE:**
The AUA406 and AUA408 MSDT Servers are not supported in *SLC-2000* MSDT configurations.

⇒ **NOTE:**
This procedure may direct you to replace the BIU in the MSDT or an MSDT Server at a *SLC-2000* HDT. If you replace the BIU with a downloadable version (**MC97793A1**), the system may start to download software into the new BIU. A similar condition will occur if you replace an MSDT Server with a new version (for example, an *SPQ809* or later server in place of an *SPQ808* server). You can verify this by observing the associated fault message (Table A) at the *SLC-2000* HDT. Wait for the download to complete before proceeding to the next step (see **DLP-537**).

1. Is trouble on a single MSDT/MSDT Server, or associated with a shelf (AB or CD), or single digroup?

If **MSDT/MSDT Server** (*SLC Series 5 SLOT ALLOCATION* or **BIU SLOTS AVAILABLE** displays are not flashing), then continue with Step 2.

If **otherwise**, then use 363-205-500, *SLC Series 5 Carrier System Maintenance TOP*, or 363-208-001, *SLC-2000 User/Service Manual* to clear multiple channel trouble. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Comment: Events such as a broken distribution fiber cable may affect more than one MSDT, but each MSDT Server would have the CLF indicator lighted.

2. If you are at the RT, continue with Step 3; if you are at the MSDT, proceed to Step 9; if you are at the central office, go to the RT unless MLT test results indicate otherwise.
3. Replace any blown fuses in the high density optics shelf (HDOS). If a replacement fuse blows, remove the associated **PCU** and **OU** circuit packs. If a replacement fuse still blows, correct HDOS wiring using appropriate drawings. Install **PCU** then **OU** circuit packs and replace the circuit pack that causes the fuse to blow.
4. Replace any HDOS **PCU** with a **FAIL** LED lighted.
5. Press the **LED TEST** button and verify that all MSDT Server indicators light. Quickly replace the MSDT Server circuit pack if they do not.

Comment: For *SLC-2000* HDTs, the **INCOMP** LED on the MDC circuit pack will light and the MSDT Server's LEDs will not light if the shelf is configured for METL. If a replacement MSDT Server's LEDs do not light, verify that the shelf is configured for FITL using the user interface panel (UIP) **SET-DISTN** command. If necessary, remove both **MDC** packs in the shelf (upper or lower section) and change the distribution mode to FITL. Then reseal the **MDC** packs and repeat the LED test.

For *SLC* Series 5 HDTs, the MSDT Server's LED will light if the system is configured for FITL distribution.

6. Refer to Table G for the *SLC-2000* HDT user interface panel (UIP) alarm messages associated with FITL distribution. Refer to Table B for the *SLC-2000* HDT user interface panel (UIP) fault messages. Refer to Table I for the *SLC-2000* UIP alarm messages associated with LED indicators at the *SLC-2000* HDT and the *SLC-2000* MSDT. Refer to Table J for the *SLC-2000* UIP fault messages associated with LED indicators at the *SLC-2000* HDT and the *SLC-2000* MSDT. To view alarm or fault messages, press the UIP **Escape** button. Then press the **Scroll Menu** down arrow until **RETRIEVE-ALARMS: <ent>** or **RETRIEVE-FAULTS: <ent>** is displayed. Then press **Scroll Menu** down arrow to scroll through the messages.

Table G – SLC®-2000 UIP Alarm Messages Associated With FITL Distribution Mode (Notes)

UIP Alarm Messages		
Severity	Message	Meaning
MJ or MN	{aid} rcvd FITL YEL	Yellow alarm received from MSDT
MN	{aid} rcvd MISC	MISC alarm received from MSDT
MN	{aid} on battery	MSDT on battery power (Note 3)
MN	{aid} DT CU failed	CU failed at MSDT (Note 1)
MN/MN	{aid} piu failed	MSDT PIU failed
MN	{aid} ISDN slot err	ISDN CU placement violation in MSDT (Note 2)
MN	{aid} power alarm	Power source failure (Note 3)
MN/MN	{aid} in dual mode	MSDT is in dual mode (Note 4)
ABN	{aid} dnld abort	BIU software download/installation failed
ABN	{aid} downloading	BIU software downloading/installation in progress
MN	{aid} on rmt battery	MSDT on remote battery
MN	{aid} on loc battery	MSDT on local battery
MN	{aid} piu fuse fail	MSDT PIU fuse failed
MN	{aid} batt chrg fail	MSDT battery charger failed
MN	{aid} isdn cnflt	MSDT ISDN CU placement violation (Note 5)
See notes at end of table.		<i>Continued on next page</i>

Table G – SLC®-2000 UIP Alarm Messages Associated With FITL Distribution Mode (Notes) —Continued

UIP Alarm Messages		
Severity	Message	Meaning

Notes:

1. The general syntax of UIP messages: Alarm-severity:which end:AID message.
2. Each error message will print a circuit pack address identifier {aid}. For FITL error messages, the AID will generally begin with the characters 'dt', with the exception of errors involving the MSDT Server, which may begin with 'cu' (referencing the MDS CU slot holding the server).
3. Note that the MSDT Server's DT LED will also light when the error is reported by the MSDT.
4. The NE Activity is indicated where the cause of the message calls for corrective action starting at the RT.
5. In the following, the SLC-2000 FITL system enhanced alarm reporting is when the SLC-2000 HDT, MSDT Server, and the MSDT BIU operation supports the enhanced alarms.
 - a. The {aid} reported is of the associated MSDT Server if the SLC-2000 FITL system operation does not support enhanced alarms. See the SLC-2000 HDT Software Release 4.0 or Later Required Circuit Packs for Specific MSDT Features table in Chapter 3.
 - b. This message is displayed whenever MSDT reports ISDN channel unit placement violation.
 - c. This message is displayed in those versions of the SLC-2000 MSDT that do not support enhanced alarms.
 - d. SLC-2000 HDT does not support dual mode MSDT.
 - e. This message is displayed whenever SLC-2000 HDT determines ISDN channel unit placement violation at the MSDT.

Table H – SLC®-2000 UIP Fault Messages Associated With FITL Distribution Mode (Notes)

UIP Fault Messages		
Severity	Message	Meaning
MJ or MN	{aid} biu failed	MSDT BIU plug-in failed
MJ or MN, NE	{aid} DT CLF	RT-to-MSDT carrier-line-failure
MN	{aid} datalink fail	RT-to-MSDT ESF datalink failed
MN	{aid} cu failed	CU failed in MSDT
MN	{aid} door open	MSDT door(s) open
MJ or MN	{aid} rgu failed	MSDT ringing generator failed
MN	{aid} pcu failed	MSDT power converter unit failed
MN	{aid} cdtu failed	MSDT channel & drop-test unit failed
MN, NE	{aid} config	MSDT Server configuration error
MJ or MN, NE	{aid} failed	MSDT Server failed
MN	{aid} incompat	Incompatible CU in MSDT
MN	{aid} rcvd misc	MISC alarm received from MSDT
See notes at end of table.		<i>Continued on next page</i>

Table H – SLC[®]-2000 UIP Fault Messages Associated With FITL Distribution Mode (Notes) —Continued

UIP Fault Messages		
Severity	Message	Meaning

Notes:

1. The general syntax of UIP messages: Alarm-severity:which end:AID message.
2. Each error message will print a circuit pack address identifier {aid}. For FITL error messages, the AID will generally begin with the characters 'dt', with the exception of errors involving the MSDT Server, which may begin with 'cu' (referencing the MDS CU slot holding the server).
3. Note that the MSDT Server's DT LED will also light when the error is reported by the MSDT.
4. The NE Activity is indicated where the cause of the message calls for corrective action starting at the RT.
5. In the following notes, the SLC-2000 FITL system enhanced alarm reporting is when the SLC-2000 HDT, MSDT Server, and the MSDT BIU operation supports the enhanced alarms.
 - a. The {aid} reported is of the associated MSDT Server if the SLC-2000 FITL system operation does not support enhanced alarms. See the SLC-2000 HDT Software Release 4.0 or Later Required Circuit Packs for Specific MSDT Features table in Chapter 3.
 - b. This message is displayed whenever MSDT reports ISDN channel unit placement violation.
 - c. This message is displayed in those versions of the SLC-2000 MSDT that do not support enhanced alarms.
 - d. SLC-2000 HDT does not support dual mode MSDT.
 - e. This message is displayed whenever SLC-2000 HDT determines ISDN channel unit placement violation at the MSDT.

Table I – SLC-2000 UIP Alarm Messages and LED Indicators Associated With FITL Distribution Mode (Notes)

UIP Alarm Messages		LED Indicators	
Severity	Message	SLC [®] -2000 HDT	MSDT (BIU)
MJ or MN	{aid} rcvd FITL YEL	Server — DT	—
MN	{aid} rcvd MISC	Server — DT	Ne
MN	{aid} on battery	Server — DT	—
MN	{aid} DT CU failed	Server — DT	Ne
MJ/MN	{aid} piu failed	Server — DT	Ne
MN	{aid} ISDN slot err	—	Ne/Config
MN	{aid} power alarm	Server — DT	Ne
MJ/MN	{aid} in dual mode	Server — DT/config	—
ABN	{aid} dnld abort	—	—
ABN	{aid} downloading	Server — DT (Flashing)	All LEDs Flashing*
MN	{aid} on rmt battery	Server — DT	Fe
MN	{aid} on loc battery	Server — DT	Ne
MN	{aid} piu fuse fail	Server — DT	Ne
MN	{aid} batt chrg fail	Server — DT	Ne
MN	{aid} isdn cnflt	MDC — Incomp, Server DT/Config	NC/Config†

See footnotes at end of table.

Continued on next page

**Table I – SLC-2000 UIP Alarm Messages and LED Indicators Associated With
FITL Distribution Mode (Notes)—*Continued***

UIP Alarm Messages		LED Indicators	
Severity	Message	SLC®-2000 HDT	MSDT (BIU)

* The slot allocation seven-segment display indicates the percentage of downloading complete in 10 percent increments (for example, 1 = 10 percent , 2 = 20 percent , etc).

† The BIU near end (Ne) alarm LED may not come on during some fault conditions where MSDT link outages or FHA1 BIUs are used.

Table J – SLC-2000 UIP Fault Messages and LED Indicators Associated With FITL Distribution Mode (Notes)

UIP Fault Messages		LED Indicators	
Severity	Message	SLC [®] -2000 HDT	MSDT (BIU)
MJ or MN	{aid} biu failed	Server — DT	FAIL
MJ or MN, NE	{aid} DT CLF	Server — CLF	—
MN	{aid} datalink fail	Server — DT	CLF/Fe
MN	{aid} cu failed	—	Slot Alloc (Flashing)/Fe*
MN	{aid} door open	Server — DT	—
MJ or MN	{aid} rgu failed	Server — DT	Ne
MN	{aid} pcu failed	Server — DT	Ne
MN	{aid} cdtu failed	Server — DT	Ne
MN, NE	{aid} config	MDC — incomp	CLF
MJ or MN, NE	{aid} failed	MDC — fail	CLF
MN	{aid} incompat	MDC — incomp,	Ne/config
		Server — DT/config	
MN	{aid} rcvd misc	Server — DT	Ne

* Trunk processing (not necessarily a fault condition).

7. Examine the MSDT Server channel unit alarms and perform the item below for the lighted indicators.

FAIL

Replace MSDT Server channel unit with same option settings (faceplate *SLC* Series 5 SLOT ALLOCATION switch and board-mounted MJ switch).

CLF

- If the **DT** indicator is also on, the fiber facility and transmission from the MSDT to the RT are OK. The problem is in the transmit section of the RT (MSDT Server or OU) or receive section of the MSDT (BIU, OU, or BYB2).
- To clear the **CLF** with or without the **DT** alarm, perform the following list in the order given. If a replacement circuit pack does not clear the trouble, reinsert the original pack and continue with the next item:
 1. Remove and reseal the MSDT Server.
 2. Replace HDOS **PCU** with **FAIL** LED lighted. Replace any blown HDOS fuse(s).
 3. Replace the OU or look for T1 facility troubles.
 4. Replace the MSDT Server (see Note 2 in the General section of this TAP).
 5. Proceed to the MSDT and replace the OU or BYB2 LIU and check for T1 facility troubles.
 6. Replace the BIU (see Note 2 in the General section of this TAP).
 7. If all five units were replaced and the CLF alarm does not clear, use local procedures to repair fiber or T1 facility and/or wiring troubles.



NOTE:

If an optical power meter is available, verify -24 to -36 dBm (AYB1B or AYB1C) or -20 to -33 dBm (AYB5) receive power at the fiber distribution shelf/panel on the outside plant fiber associated with the *SLC*-2000 MSDT. Verify that the *SLC*-2000 MSDT is turned up or clear fiber trouble before continuing. Measure the optical power [-20.5 to -25.5 dBm (BYB1B or BYB1C) or -17.9 to -22.9 (BYB5) transmit power levels] on the fiber coming from the HDOS to check out the **OU**.

DT

Trouble is with the MSDT equipment or it may be a door alarm (no alarms at the MSDT for a door alarm). Proceed to MSDT site and go to Step 9.

Comment: The DT indicator will flash if the BIU software at the MSDT site is in the process of being updated.

CATV DT (AUA406 only)

This alarm is not supported.

CONFIG

Placement of a channel unit in the wrong slot or an error in the SLOT ALLOCATION² switch setting on the MSDT Server channel unit. This alarm should not be lighted when troubleshooting the SLC-2000 MSDT feature because this indicator lights during craft personnel activity with an MSDT Server or CIT at the RT or when a channel unit is installed at the RT or MSDT. The **CONFIG** indicator should not be left lighted when working with channel units at the RT. If **CONFIG** and **DT** are both lighted, the channel unit installation trouble is at the MSDT. If only **CONFIG** and no other indicators are lighted, check RT and MSDT for channel unit conflict.

Comment: Refer to the MSDT slot restrictions and alarm information in Chapter 3 of this document.

8. Was trouble cleared at the RT?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then proceed to MSDT and continue with Step 9.

9. On **BIU**, are any indicators lighted including FAIL and SLOTS AVAILABLE?

If **YES**, then continue with Step 10.

If **NO**, then do **TAP-102**.

Comment: If you see FAIL alarm indicators momentarily turn off (for about 1/4 second approximately once every 5 seconds, particularly on the PCU), replace the PCU before doing the LED TEST.

10. Are any indicators on the **PIU**, **PCU**, or **RGU** lighted?

If **YES**, then do **TAP-102**.

If **NO**, then continue with Step 11.

11. Press the **BIU LED TEST** button and verify that all **BIU**, **PIU**, **PCU**, **RGU**, and

2. Only the AUA406 and AUA408 MSDT Servers are equipped with SLOT ALLOCATION displays.

CDTU indicators light (quad channel unit **BUSY** LEDs may also light). Quickly replace any circuit pack if any of its indicators do not light. Replace the BIU if the replacement circuit pack indicators do not light (see Note 2 in the General section of this TAP).

Comment: The AUA412 PCU FAIL indicator will not light if the input power to the PCU is not available (no AC power, no –48 V DC local power, or blown MSDT 3A fuse). If the MSDT is on battery (ON BAT lighted on the PIU), do not use the LED TEST as a basis to replace the PCU.

12. At MSDT, is **FAIL** indicator lighted on any circuit pack?

If **YES**, then continue with Step 13.

If **NO**, then proceed to Step 15.

13. Replace circuit pack with **FAIL** indicator lighted. If more than one FAIL indicator is on, replace the following circuit packs with FAIL lighted in the following order:

- **PCU, PIU, or RGU** — Use **TAP-102** procedures to replace these circuit packs
- **BIU** (see Note 2 in the General section of this TAP)
- **CDTU**
- Any channel unit with **FAIL** lighted
- **FAN UNIT** — Replace fan unit.

14. Did MSDT trouble clear?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then continue with Step 15.

15. Examine the **BIU** alarms and perform the item below for the lighted indicators:

FAIL

Replace **BIU** (see Note 2 in the General section of this TAP).

NE and FAIL on any circuit pack

Replace the circuit pack with **FAIL** or **CHGR FAIL** lighted.

NE and ON BAT on PIU

Check PIU fuses. If the MSDT FNQ-3A or MDL-3 PIU fuse is blown, the AUA412/422 PCU is more than likely bad. Replace the AUA412/422

before replacing the PIU MSDT FNQ-3A or MDL-3 fuse. If necessary, clear AC or –48 V DC power feed trouble using **TAP-102**.

NE and no other alarms on any circuit pack

An **NE** and no other MSDT alarms can be caused by any combination of the following events:

- Miscellaneous alarm closure. Clear trouble that caused alarm.
- RGU or PIU absent, or an installed **AUA416 PIU** is defective.
- Blown battery shelf fuse (remove battery shelf hood and replace the 2A fuse), or failure of a single –48 V DC local powering source when more than one source is used. Clear power troubles using **TAP-102**.
- May be caused by failure of a channel unit. A channel unit failure will not cause alarms at the COT and is typically found from a customer trouble report. Remove channel units one at a time to find bad channel unit (will interrupt service if the channel is busy).

CLF

- If the **FE** indicator is also on, the fiber or T1 facility and transmission from the RT to the MSDT are OK and the trouble is in the transmit section from the MSDT (BIU/BYB1/BYB2) or the receive section at the RT (AYB1B/MSDT Server/office line powering repeater).
- To clear the **CLF** with or without **FE** alarm, perform the following list in the order given. If a replacement circuit pack does not clear the trouble, reinsert the original pack and continue with the next item:
 1. Replace the BYB1B OU or BYB2 LIU.
 2. Replace the BIU (see Note 2 in the General section of this TAP).
 3. Proceed to the RT and replace the AYB1B OU or office line powering repeater.
 4. Replace the MSDT Server (see Note 2 in the General section of this TAP).
 5. If all four units were replaced and the CLF alarm does not clear, use local procedures to repair fiber or T1 facility and/or wiring troubles.



NOTE:

If an optical power meter is available, verify –24 to –36 dBm (AYB1B or

AYB1C) or –20 to –33 dBm (AYB5) receive power at the fiber distribution shelf/panel on the outside plant fiber associated with the *SLC-2000* MSDT. Verify that the HDT is turned up or clear fiber trouble before continuing. Measure the optical power [–20.5 to –25.5 dBm (BYB1B or BYB1C) or –17.9 to –22.9 (BYB5) transmit power levels] on the fiber coming from the **BYB1B OU** to check out the **OU**.

FE

If only the **FE** BIU (only DT on MSDT server) indicator is on (CONFIG off) and the PIU does not have NET BAT on, the trouble is in the data link between the MSDT and RT. Replace the following units:

- Replace the MSDT BIU (see Note 2 in the General section of this TAP.
- Proceed to the RT if trouble did not clear, and quickly replace the MSDT Server (with same option settings).

CONFIG

Placement of a channel unit in the wrong slot. This alarm should not be lighted when troubleshooting the *SLC-2000* MSDT feature because this indicator lights during craft personnel activity with an MSDT Server or the CIT at the RT or when a channel unit is installed at the RT or MSDT. If **CONFIG** and **NE** are both lighted, the channel unit installation trouble is at the MSDT. If **CONFIG** and **FE** are both lighted, the channel unit installation trouble is at the RT. If only **CONFIG** and no other indicators are lighted, first check RT and MSDT for channel unit conflict. Then verify that the MSDT contains the MC97793A1 BIU if an AUA94 ISDN channel unit is used. The "**CONFIG** and **NE**" alarm pair does not light for a *SLC-2000* HDT.



NOTE:

Refer to the MSDT slot restrictions and alarm information in Chapter 3.

Comment: If an AUA94 ISDN channel unit is installed in a valid ISDN slot of an MSDT that contains a quad POTS channel unit in slot 6, the **NE** and **CONFIG** LEDs on the BIU will light. In addition, the **FAIL** LED on the AUA94 channel unit will light. To clear this incompatibility alarm, you must remove the ISDN channel unit. You then must remove the quad POTS channel unit to clear time slots for the ISDN D channels (either 23 or 24). After this, you may reinsert the ISDN channel unit without generating an alarm. The last channel unit inserted generating the incompatibility alarm must be removed first.

16. If the trouble condition could not be cleared by circuit pack replacement, refer to the appropriate schematic drawing (SD) (SD-7C166-01 MSDT channel bank, or SD-7C167-01 MSDT applications schematic) to correct MSDT wiring trouble.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Clear *SLC*[®]-2000 MSDT Power Trouble

GENERAL

The procedures to clear *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) alarms are found in **TAP-101**. This procedure is used to clear *SLC*-2000 MSDT powering trouble as determined in TAP-101. The remote terminal (RT) MSDT Server channel unit will indicate CLF when there is a power failure at the MSDT and battery reserve has been depleted. Power source trouble will light the PIU ON BAT if battery reserve is not depleted. When trouble clearing MSDT power trouble, this procedure assumes that commercial AC power is available to the MSDT or to the local/central powering equipment as appropriate.



CAUTION:

The PIU and RGU units have storage capacitors on the circuit board. When these units are unlatched, wait 1 minute for capacitors to discharge before handling.

1. Check fuses for the MSDT (AC fuse, PIU fuses) if using AC or –48 V DC. If the AC fuse is blown, replace it. If the replacement AC fuse blows again, replace the AUA414 or AUA424/AUA434 PIU. If the 5A MSDT PIU fuse is blown, the AUA412 or AUA422 PCU is more than likely bad. Remove the PIU and PCU, replace the fuse, and install the PIU. If the fuse blows again, disconnect the battery cable from P301 (may be a bad battery shelf heater) and replace the fuse. Replace the battery shelf if the fuse holds. If the fuse blows again, use appropriate schematic drawings (SDs) to correct wiring trouble. Reinstall the PCU. If the fuse blows when the AUA412 or AUA422 is installed, replace PCU and 5A fuse. To check battery shelf fuse (or faulty battery shelf connection), press the **AUA412 ON BAT TEST**. If the **PIU CHRG FAIL** and **ON BAT** fade off, remove the battery shelf hood and replace the battery shelf 2A fuse. (This test will interrupt service if the battery shelf fuse is blown, the battery reserve is depleted, or the battery shelf is not connected.)
2. Is **PCU** or **RGU FAIL**, or **PIU CHGR FAIL** on?

If **YES**, then continue with Step 3.
If **NO**, then proceed to Step 4.

3. Replace **PCU**, **PIU**, or **RGU** with **FAIL** indicator lighted. If more than one **FAIL** indicator is lighted, replace the circuit packs in the following order.
 - **PCU** — Replace PCU and verify faceplate voltages:
 - a. On **AUA412** or **AUA422**, –28 to –61 V DC at **–48 V** to **–48 V RTN**.
 - b. On **AUA417**, –65 to –130 V DC at **–130 V** to **–130 V RTN**.
 - c. On **AUA427**, 140 to 260 V DC at **+130 V** to **–130 V RTN**.
 - d. Check **PIU** (next bullet item) fuses and voltages if **AUA412 PCU** voltage is not in range.
 - e. Proceed to Step 7 if **AUA417** or **AUA427 PCU** voltage is not in range.
 - f. If replacement PCU **FAIL** indicator lights, another MSDT circuit pack may be causing the failure. Remove circuit packs one at a time to find a bad pack (RGU, BIU, BYB1B, CDTU, channel units, disconnect fan unit, disconnect battery shelf cable, then replace PIU). Replace the bad circuit pack, if found. If not found, reinstall all circuit packs and clear MSDT wiring trouble using SD-7C166-01 and SD-7C167-01.
 - **PIU** — Replace PIU and verify PIU faceplate voltages on the PIUs listed below:
 - a. On **AUA414**, 30.5 to 39.5 V AC (check AC fuse) **34 V AC** to **34 V AC RTN**. Proceed to Step 7 if 34 V AC voltage is not present.
–53 to –61 V DC (with good PCU installed) at **BAT** to **GND**.
 - b. On **AUA424/AUA434**, 26.5 to 46.5 V AC (check AC fuse) **42 V AC** to **42 V AC RTN**. Proceed to Step 7 if 42 V AC voltage is not present.
 - c. On **AUA415**, –28 to –60 V DC at **–48 V** to **–48 V RTN**. Proceed to Step 7 if –48 V DC voltage is not present.
–53 to –61 V DC (with good PCU installed) at **BAT** to **GND**.
 - d. On **AUA426**, –53 to –61 V DC (with good PCU and batteries installed) at **BAT** to **GND**. Proceed to Step 7 if DC voltage is not present (if required).
 - e. If replacement PIU **FAIL** indicator lights, another MSDT circuit pack may be causing the failure. Remove circuit packs one at a time to find a bad pack (disconnect battery shelf cable, then replace PCU). Replace the bad circuit pack/battery shelf, if found. If not found, reinstall all circuit packs and clear MSDT wiring trouble using SD-7C166-01 and SD-7C167-01.

- **RGU** — Replace RGU and verify faceplate voltages:
 - a. 75 to 85 V AC RMS superimposed on –42 to –70 V DC at **–20 Hz** to **GND** on the **AUA413 RGU**.
95 to 105 V AC RMS superimposed on –42 to –70 V DC at **–20 Hz** to **GND** on the **AUA423 RGU**.
 - b. –42 to –60 V DC at **–48 V** to **GND** for either **RGU**.
 - c. If replacement RGU **FAIL** indicator lights, another MSDT circuit pack may be causing the failure. Remove circuit packs one at a time to find a bad pack (CDTU, channel units, then replace PCU and PIU). Replace the bad circuit pack, if found. If not found, reinstall all circuit packs and clear MSDT wiring trouble using SD-7C166-01 and SD-7C167-01.

4. Are all indicators on the **PIU**, **PCU**, and **RGU** off?

If **YES**, then continue with Step 5.

If **AUA414** or **AUA415 ON BAT** alarm indicator is lighted, then check the PIU fuses. If the MSDT 5A fuse is blown, the AUA412 PCU is more than likely bad. Remove the AUA412 before replacing the MSDT 5A fuse and replace (with a new AUA412) the PCU. If the MSDT 5A fuse is OK or the ON BAT stays on after replacing the fuse, proceed to Step 7.

5. Press **BIU LED TEST** button. All indicators on PIU, PCU, RGU, CDTU, and BIU will light if nothing is wrong with these circuit packs and power is available. Depending on the LED TEST results, do the following:

- All indicators light. Continue with Step 6.
- Some indicators do not light. Quickly replace circuit pack(s) with indicators that did not light. Replace BIU if replacement circuit pack indicators do not light. Continue with Step 6 when all indicators light.

Comment: The AUA412 or AUA422 PCU FAIL indicator will not light if the input power to the PCU is not available (no AC power, no –48 V DC local power, or blown MSDT 5A fuse). If the MSDT is on battery (ON BAT lighted on the AUA414 PIU) do not use the LED TEST as a basis to replace the PCU.

- No indicators light. Proceed to Step 7.

Comment: If you see FAIL alarm indicators momentarily go off (particularly on the PCU), replace the PCU before doing the LED TEST.

6. What **BIU** indicators are lighted?

- Only SLOTS AVAILABLE number displayed.
STOP. YOU HAVE COMPLETED THIS PROCEDURE.
- SLOTS AVAILABLE number displayed and only **NE**, then continue with Step 7.
- Any other combination of BIU alarm indicators, then do **TAP-101**.

7.



NOTE:

The 120 or 60 AC power option does not have a voltage test point on the field wiring box. (See DLP-501 to check AC power feed.)

A defective **AUA416 PIU** will light the **BIU NE** alarm. Try replacing this circuit pack if **BIU NE** alarm is lighted.

A failure of a –48 V DC powering source causes a **BIU NE** when more than one source is used. Check the –48 volt power feeds using the –48 bullet item below.

When no indicators light for an LED TEST, there may be no power available for the MSDT circuit packs. Verify that the MSDT power source is receiving AC power (either at the –48 V DC or –130 V DC central powering source, or at the MSDT). Check voltages at field wiring box –48 V DC, ± 130 V DC, or –130 V DC power feed connections (see DLP-502) or AUA414/AUA424/AUA434 34/42 V AC voltage (see DLP-501).

- –48 (–28 to –61) V DC. If voltage is not present at each power feed connection to the MSDT, check the voltage at the customer premises power supply. If the voltage is OK, repair the power feeder cable per local procedures. If the power source voltage is low, disconnect one lead to check for short in power feed cable; otherwise, replace or repair power source per local procedures.

If the voltage is good at the MSDT, replace the field wiring box (FWB) protector associated with the power feed pair.

- –130 (–65 to –130) V DC.
 ± 130 (140 to 260) V DC.

If voltage is not present at each power feed connection to the MSDT, proceed to the DC central powering system.

At the central powering system, replace circuit pack(s) with **FAIL** lighted. Check bay fuses and power plant. Use NTP-009 or NTP-010 as guidelines to verify or replace central power point circuit packs. If the central power point power feed voltage is in range with the protector out, or the regulator voltage was OK but the MSDT is not getting power, repair the

power feeder cable per local procedures.

If the voltage is good at the MSDT, replace the FWB protector associated with the power feed pair.

- Measure 30 to 39 V AC at **34 V AC** to **34 V AC RTN** on **AUA414 PIU**
or
26.5 to 46.5 V AC at **42 V AC** to **42 V AC RTN** on **AUA424/AUA434 PIU**.

If you do not read any voltage and the field wiring box AC fuse and the 5A MSDT fuse have been replaced (Step 1), first verify AC power is available to the MSDT cabinet (*can be measured, using caution, at the AC disconnect plug* — see **DLP-501**). Replace the AUA414/AUA424/AUA434 PIU after verifying AC power to the MSDT. If the replacement PIU does not have 34/42 V AC present, refer to the appropriate SD drawings to correct wiring trouble.

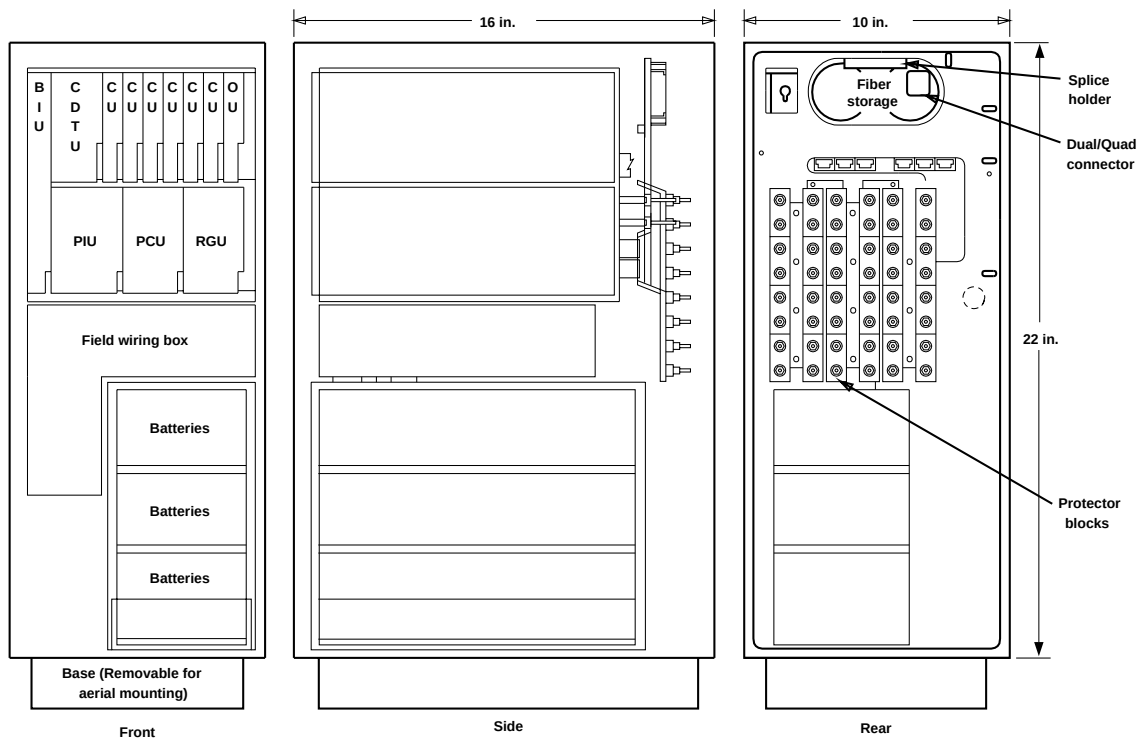
8. Repeat the procedure from Step 1.

Comment: Repeat to check for blown fuses, to check for alarms on any circuit pack, and to verify proper LED TEST indicators light.

Perform Overall Visual Inspection of Multi-Services Distant Terminal

1. Open the front of the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) cabinet (see Figure 6). Verify that no plug-in units are installed in the circuit pack equipment shelf. (Remove any units that are installed.)

Comment: To open an underground cabinet, remove the hand hole cover and pump out any water. Use the handles to unlock and lift the MSDT out of the hand hole. Rotate the MSDT 90° and seat it on the rim of the hand hole. Push handles down and lower rails from the top of the bell jar. Then lift off the bell jar cover.



tpa 789501/01

Figure 6 – Typical *SLC*[®]-2000 MSDT Enclosure Configuration

2. Verify that shelf is tightly secured and free of defects or damage. Resolve problems through local procedures.
3. Verify there are no broken, bent, or misaligned contacts on front of connectors. Resolve problems through local procedures.
4. Is one channel unit plug-in of any type available?

If **YES**, then continue with Step 5.

If **NO**, then proceed to Step 6.

5.



NOTE:

Plug-in units are not inserted into connectors until all tests and verifications have been completed.

Insert channel unit in the left most and right most channel unit slots to check for misaligned or bowed shelf. Remove unit and proceed to Step 7.

6. Inspect for misaligned, dented, or twisted shelf.
7. Is equipment shelf misaligned, dented, or twisted?

If **YES**, then continue with Step 8.

If **NO**, then proceed to Step 9.

8. Resolve problems through local procedures.
9. Verify that field wiring box (FWB) connectors are not damaged.
10. Open rear side of MSDT cabinet (Figure 1).
11. Verify there is no broken or damaged equipment (connectors, wiring, backplane wiring board, etc.). Resolve problems through local procedures.
12. Verify there are no bent, broken, or crossed terminals on backplane. Resolve problems through local procedures.
13. Verify that all cabling and wiring are terminated and tied into forms. Resolve problems through local procedures.

14.



NOTE:

Procedures to connect the fiber, customer drop, and ground cables are provided with the MSDT cabinet.

Verify that the fiber drop cable is securely clamped to the MSDT cabinet and excess fiber is stored in the fiber storage spool.

15. Verify that the customer drop pairs are connected to the protector block terminal.

16. Verify that the ground wire is securely attached to the MSDT cabinet.

17. Verify that the MSDT is equipped correctly for the mode of operation (dual or quad) as follows:

- For dual mode, there should be 12 protector pairs and the channel unit designation strip (on the front side) indicates two circuits per channel unit slot. A jumper plug must be installed under the fiber organizer to select dual mode.
- For quad mode, there should be 24 protector pairs and the channel unit designation strip (on the front side) indicates four circuits per channel unit slot. The jumper must be removed to select the quad mode.



NOTE:

SLC-2000 Access Systems do not support dual mode.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

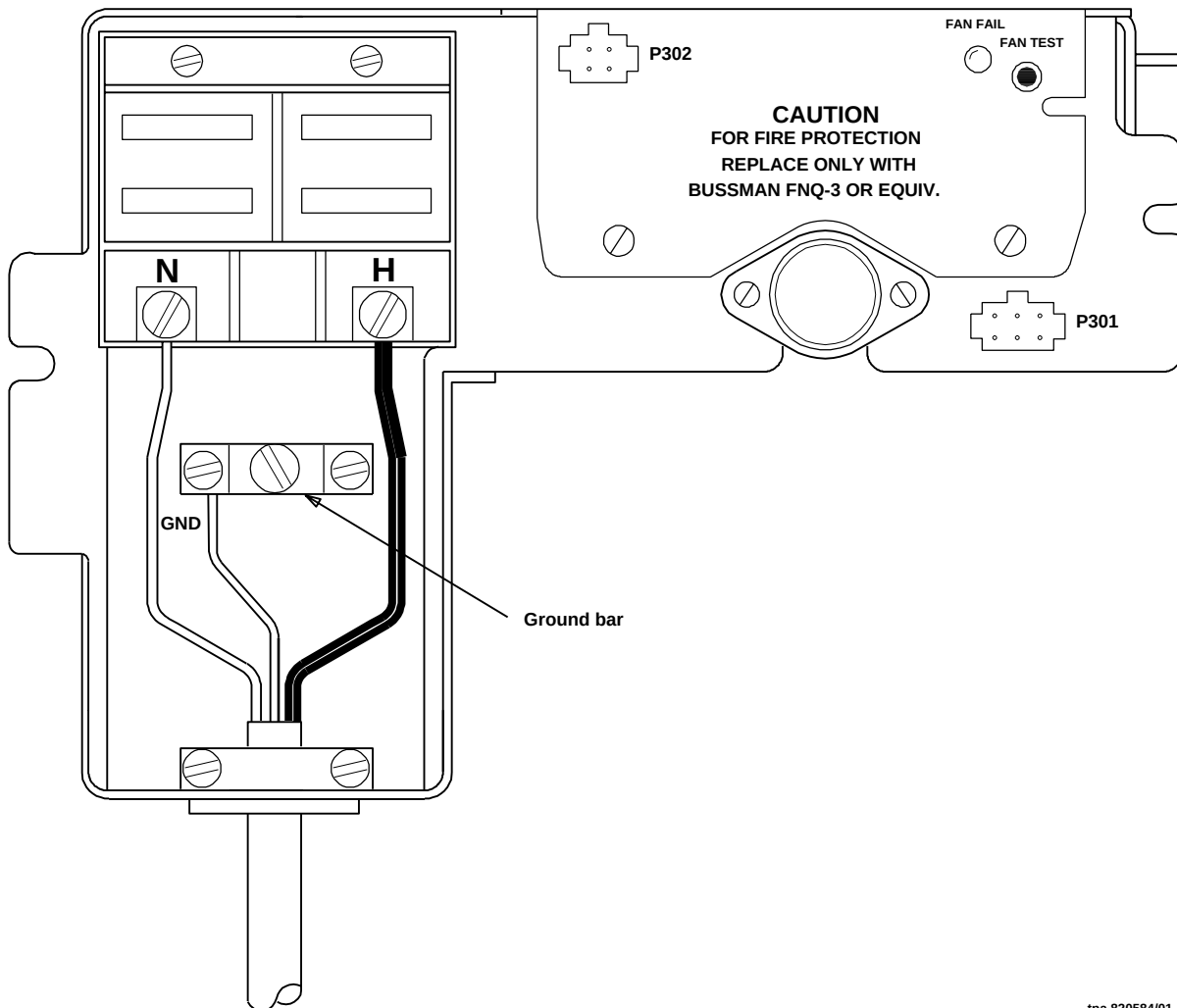
Verify AC Power at MSDT Cabinet

Summary: The SLC[®]-2000 Multi-Services Distant Terminal (MSDT) cabinet does not have convenience outlets where AC power can be verified. To verify 120 AC power, you must remove the AC fuse holder and cover to measure AC voltage between the hot (H) and neutral (N) wire lugs. Check for acceptable AC voltage (105-120), then replace cover and AC fuse holder.

To verify 60 AC power, you must remove the power feed cable F-connector on the bottom of the field wiring box (FWB) and measure AC voltage (40 to 65) between the center conductor and the cable ground sheath. Then reconnect the power feed F-connector to the FWB.

1. For 120 V AC power feed, continue with Step 2. For 60 V AC power feed, proceed to Step 7.
2. If necessary, remove AC disconnect plug. Also remove the FWB panel by removing the two retaining screws (see Figure 7).
3. Measure AC voltage between the **H** (hot) and **N** wire lugs.
Requirement: 120 V AC — 105 to 120 volts AC.
4. Were AC voltage requirements met?
If **YES**, then proceed to Step 6.
If **NO**, then continue with Step 5.
5. Resolve AC power trouble (if necessary) through local procedures.
6. Replace FWB panel and insert AC fuse holder. Tightly install FNQ-3 fuse in fuse holder.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.



tpa 820584/01

Figure 7 – 120 V AC Powering Connections

7. If necessary, remove cable power feed F-connector from the bottom left-hand side of the FWB panel (see Figure 8).
8. Measure AC voltage between the center conductor and the cable ground sheath.

Requirement: 60 V AC —40 to 65 volts AC.

9. Were AC voltage requirements met?

If **YES**, then proceed to Step **11**.

If **NO**, then continue with Step **10**.

10. Resolve AC power trouble (if necessary) through local procedures.
11. Reconnect cable power feed F-connector to the bottom of the FWB panel.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

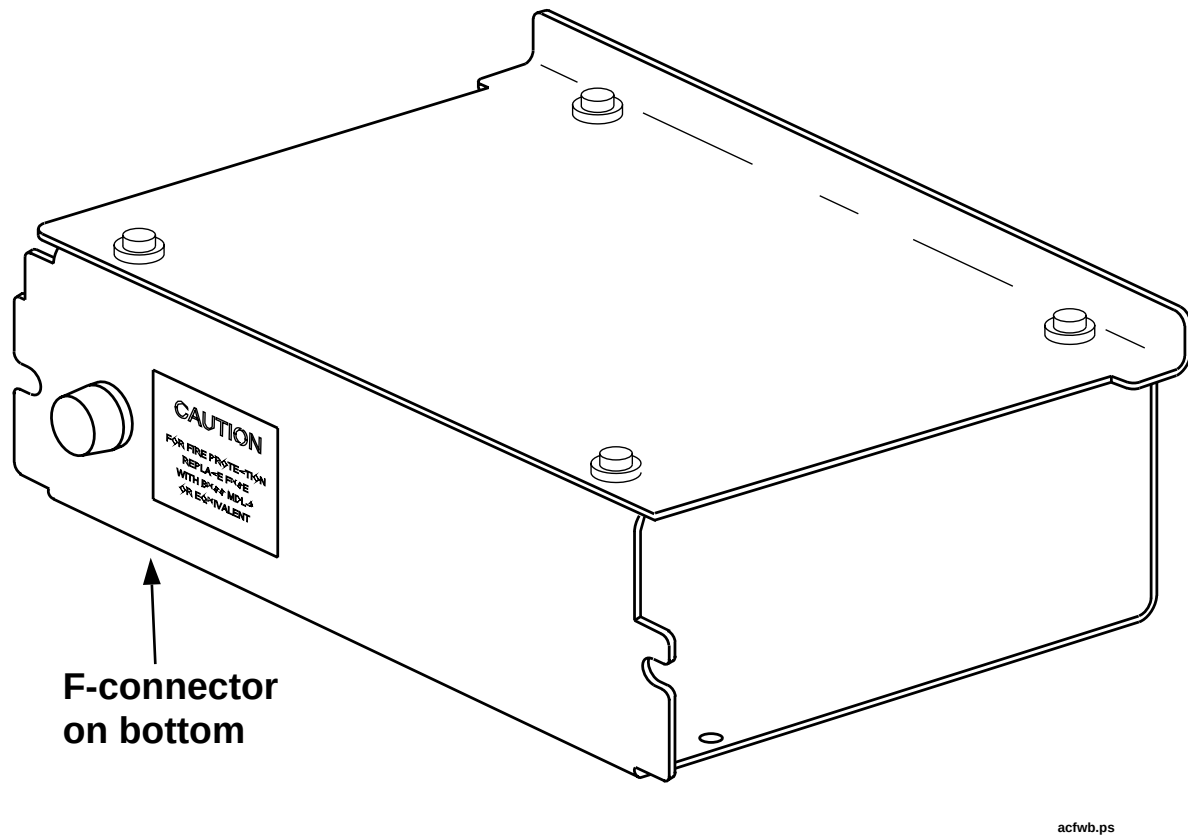


Figure 8 – 60 V AC Field Wiring Box Panel

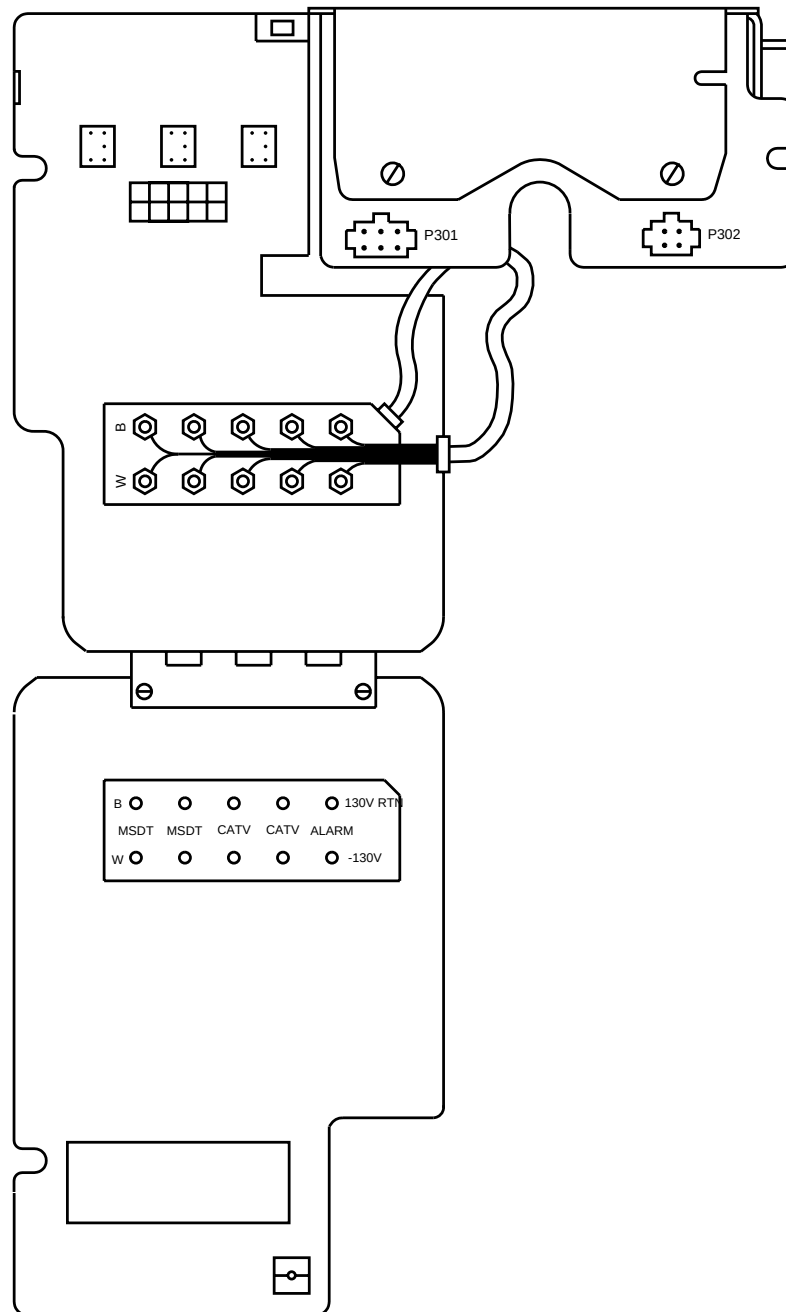
Verify DC Power Feed Connections at MSDT Cabinet

1. At the field wiring box (FWB) at the front side of the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) cabinet, verify connectors are not damaged and protectors are installed.
2. If DC power feed pairs are connected and the power source is operational, verify power feed voltages between terminals as follows:
 - –130 central powering power feed (see Figure 9 or Figure 10), –130 (–65 to –130) V DC on the **MSDT** terminal pair(s) under the flip down FWB cover
 - ± 130 central powering power feed (see Figure 11), 260 (130 to 260) V DC on the **MSDT** terminal pair(s) under the flip down FWB cover
 - –48 local powering power feed (see Figure 12), –48 (–28 to –61) V DC.

Comment: If not connected, use **DLP-503** to connect DC power feed pairs to the MSDT cabinet.

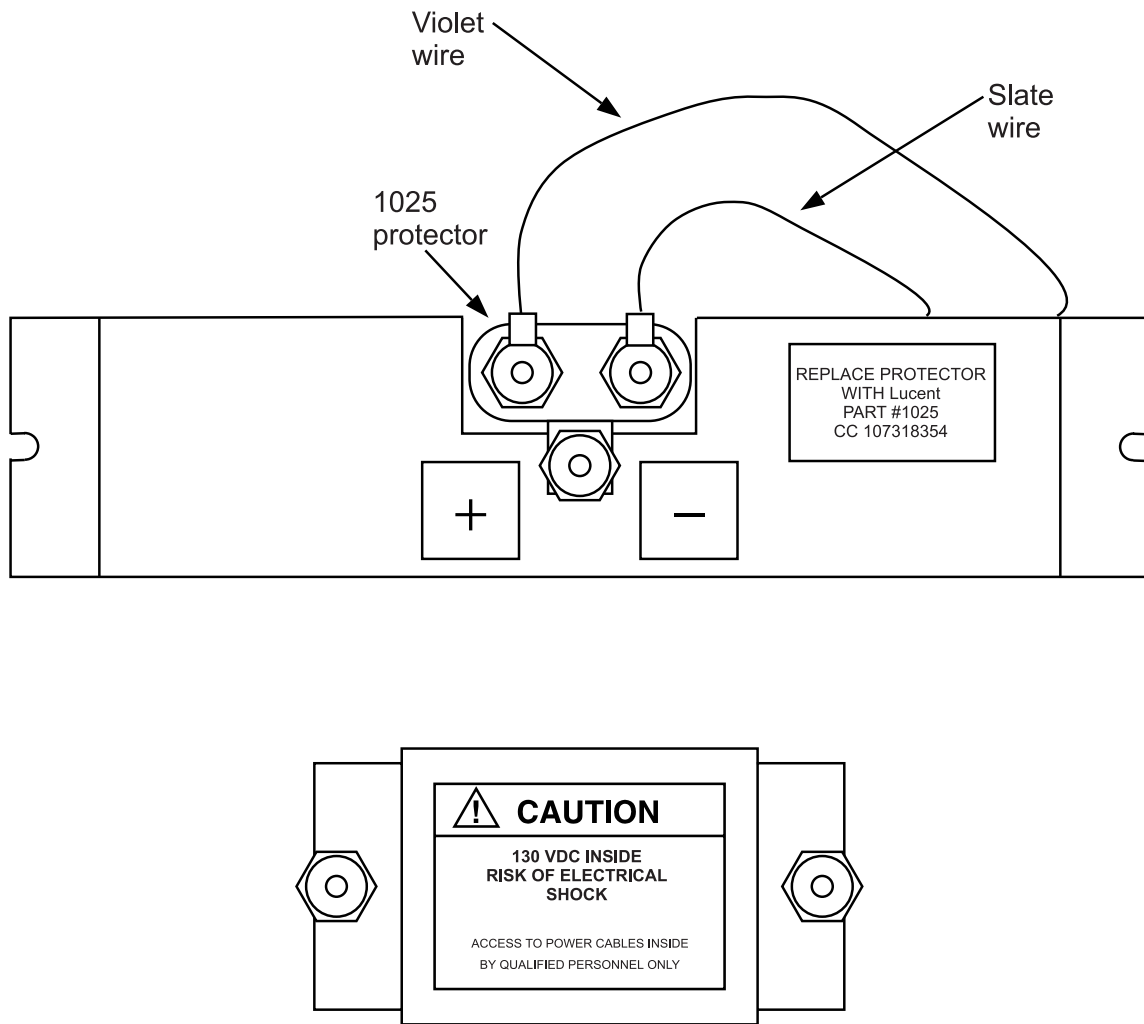
3. Resolve DC power trouble (if necessary) through local procedures.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.



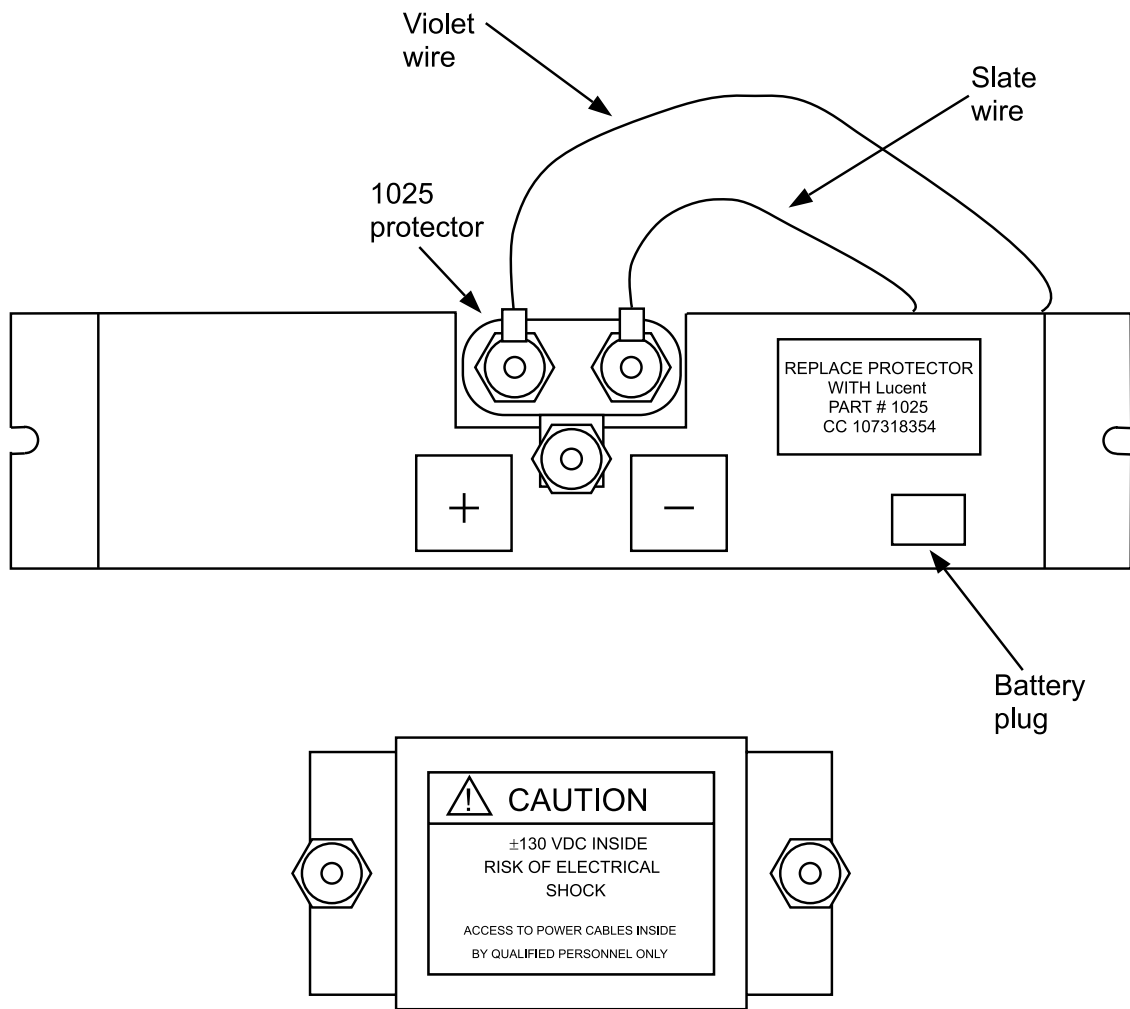
tpa 820568/01

Figure 9 – -130 V DC Power Feed Connections (Older Version)



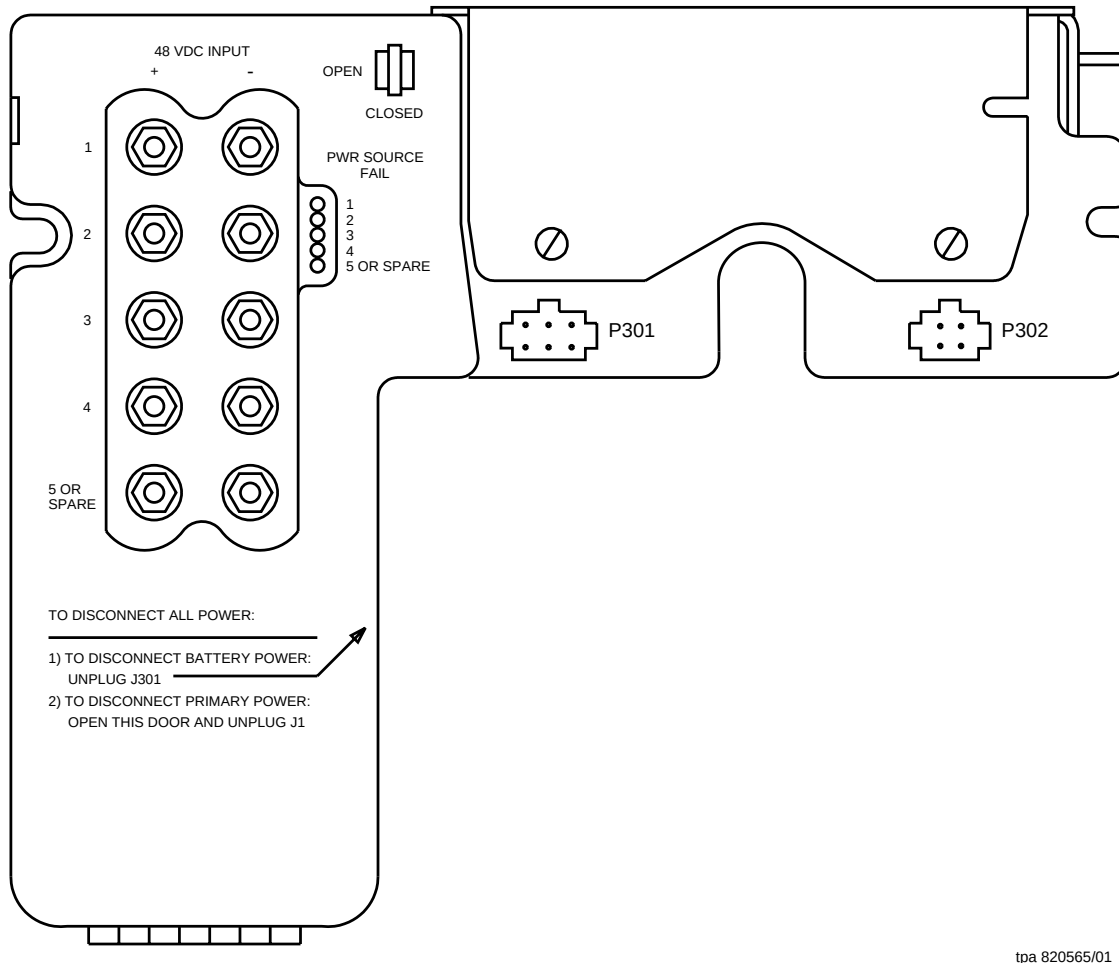
grp23fwb02.ps

Figure 10 – -130 V DC Power Feed Connections (Newer Version)



130fwb.ps

Figure 11 – ±130 V DC Power Feed Connections



tpa 820565/01

Figure 12 – –48 V DC Power Feed Connections

Connect -48 , -130 , or ± 130 V DC Power Feed to MSDT

1. Open the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) cabinet and locate the power connection terminal (Figure 13).

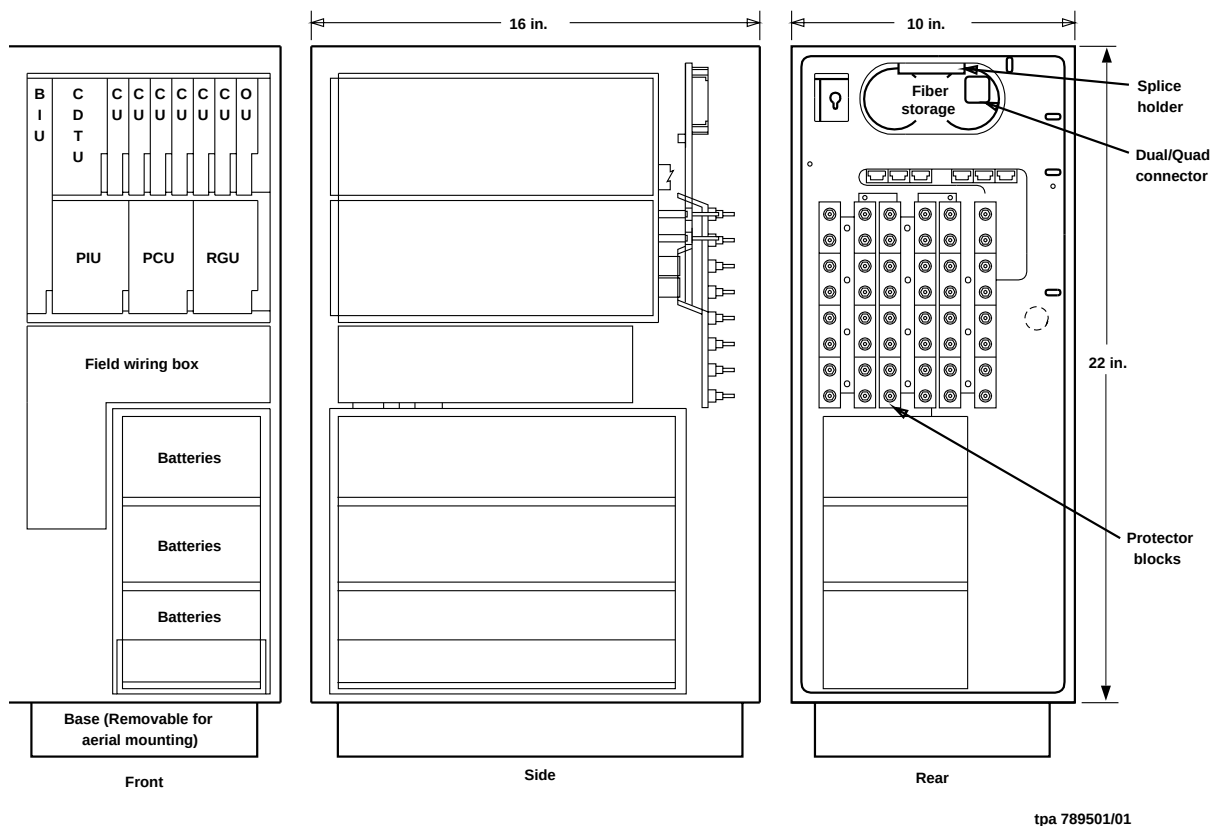


Figure 13 – *SLC*[®]-2000 MSDT Enclosure

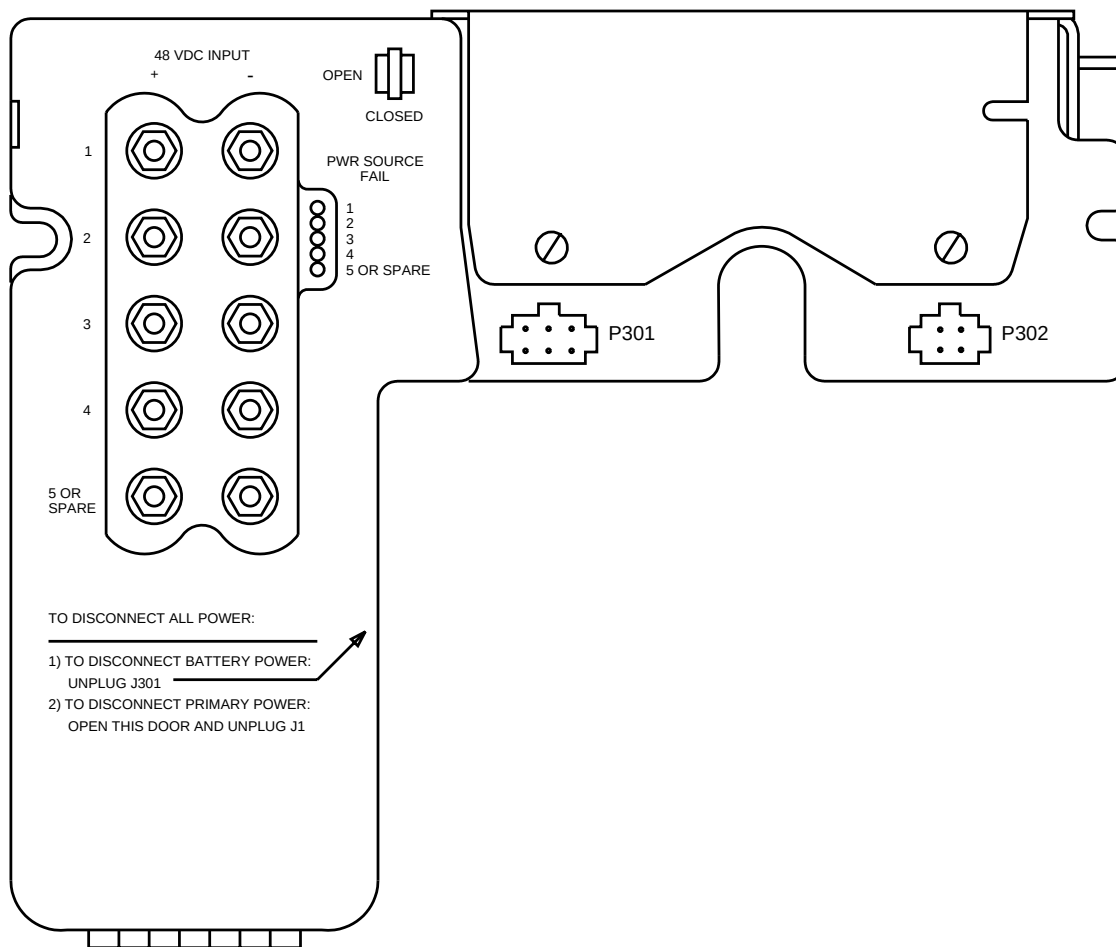
2. Connect -48 , -130 , or ± 130 V DC power feed pair(s) to MSDT power feed terminals on the field wiring box (FWB) as required (see Figure 14, Figure 15, Figure 16, or Figure 17 and Chapter 7 for more details).

3. Install power feed pair protectors in field wiring box (FWB) for each power feed.
4. After the power source is turned on, measure DC voltage for each power feed connection at the MSDT.

Requirement: **-48 V DC**, -28 to -60 V DC.
 -130 V DC, -65 to -130 V DC.
 ±130 V DC, 130 to 260 V DC.

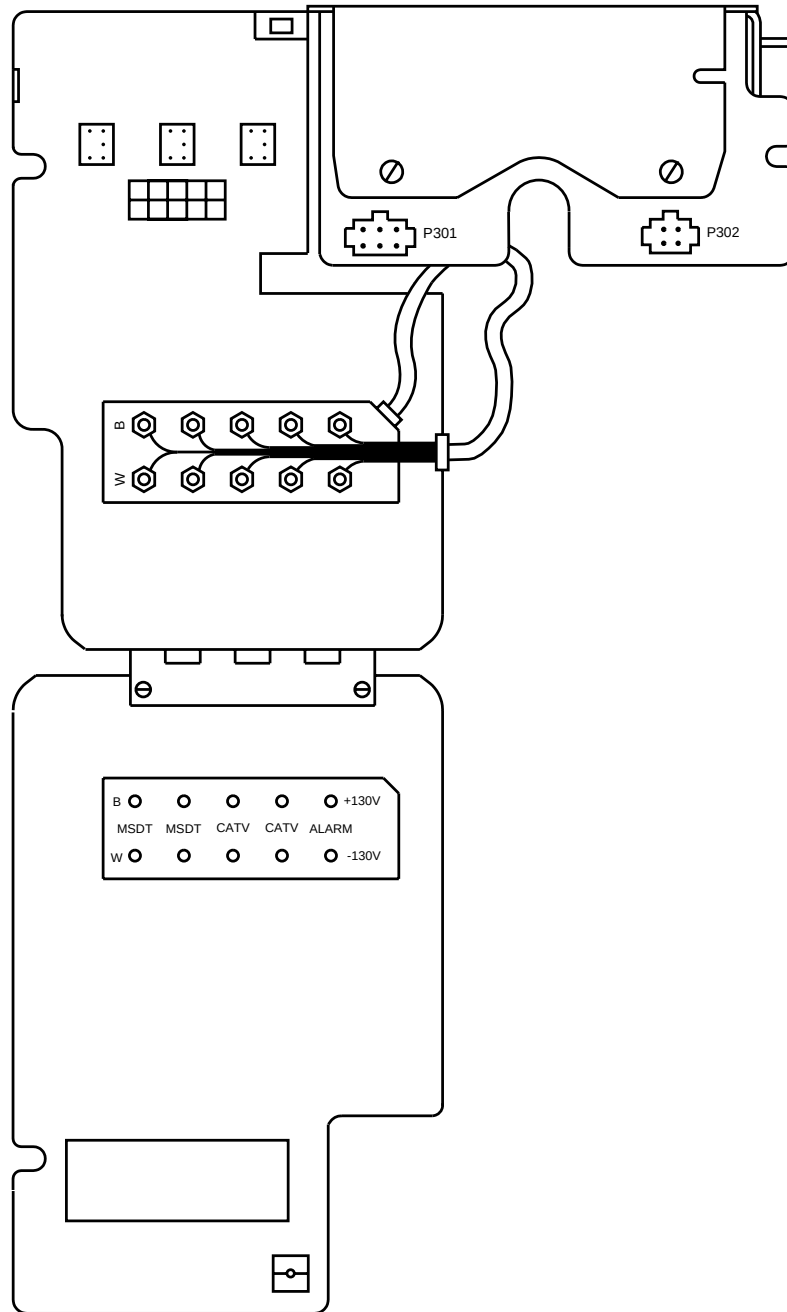
Comment: Power feed voltage troubles must be cleared before the MSDT can be turned up.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.



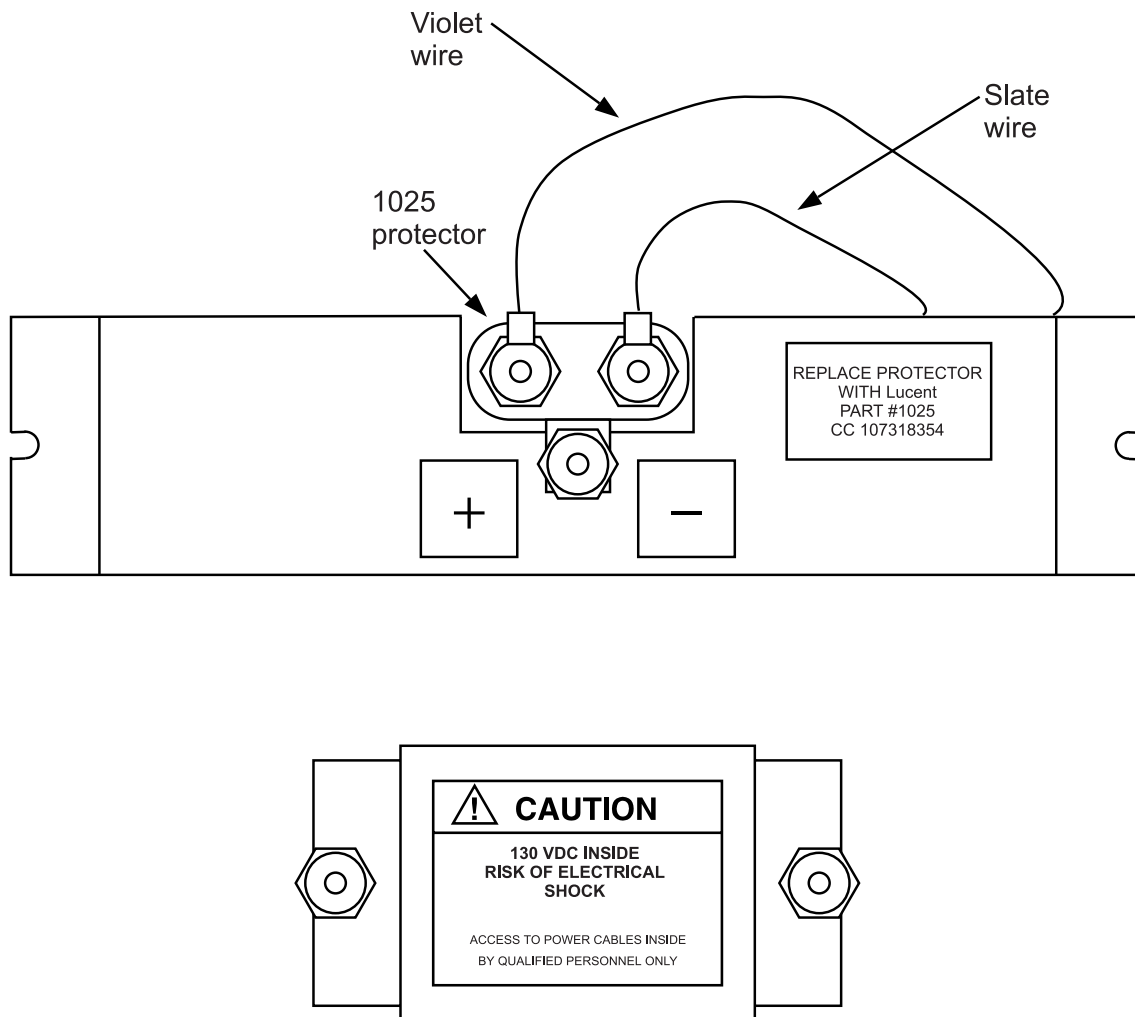
tpa 820565/01

Figure 14 – -48 V DC Power Feed Connections



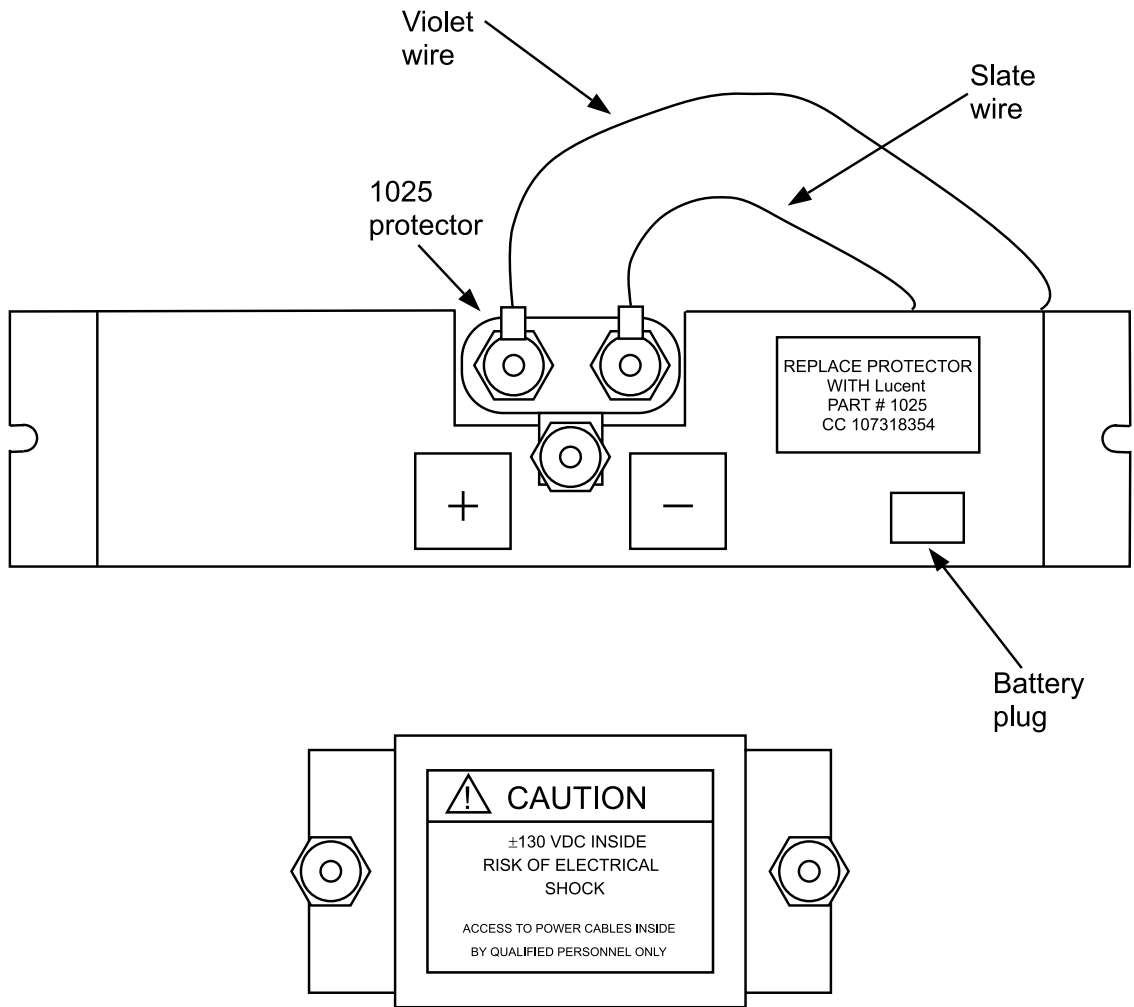
tpa 820568/01

Figure 15 – -130 V DC Power Feed Connections (Older Version)



grp23fwb02.ps

Figure 16 – –130 V DC Power Feed Connections (Newer Version)



130fwb.ps

Figure 17 – ±130 V DC Power Feed Connections

Install Batteries for Battery Reserve or Load Balancing

1.



CAUTION:

High current flow will occur if short is placed across battery terminals. Insulated tools must be used; any rings, watches, bracelets, etc., must be removed when working on batteries.

Measure 48 DC voltage across each KS-21906,L9 battery string. Note this reading for future reference.

Requirement: 45 to 56 V DC. Do not install battery string if voltage is not in this range.

2. Remove the battery shelf (two screws) and pop the battery shelf cover off retaining tabs.
3. Install battery string(s) in battery shelf (Figure 18).
4. Connect battery string cables to battery shelf.
5. Install 2A fuse in battery shelf.
6. Replace battery shelf cover on retaining tabs.
7. Mount battery shelf, using the two battery shelf mounting screws, to mounting brackets at the bottom front side of the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) cabinet.
8. Connect battery shelf cable to MSDT power connection field wiring box (FWB) **P301**.

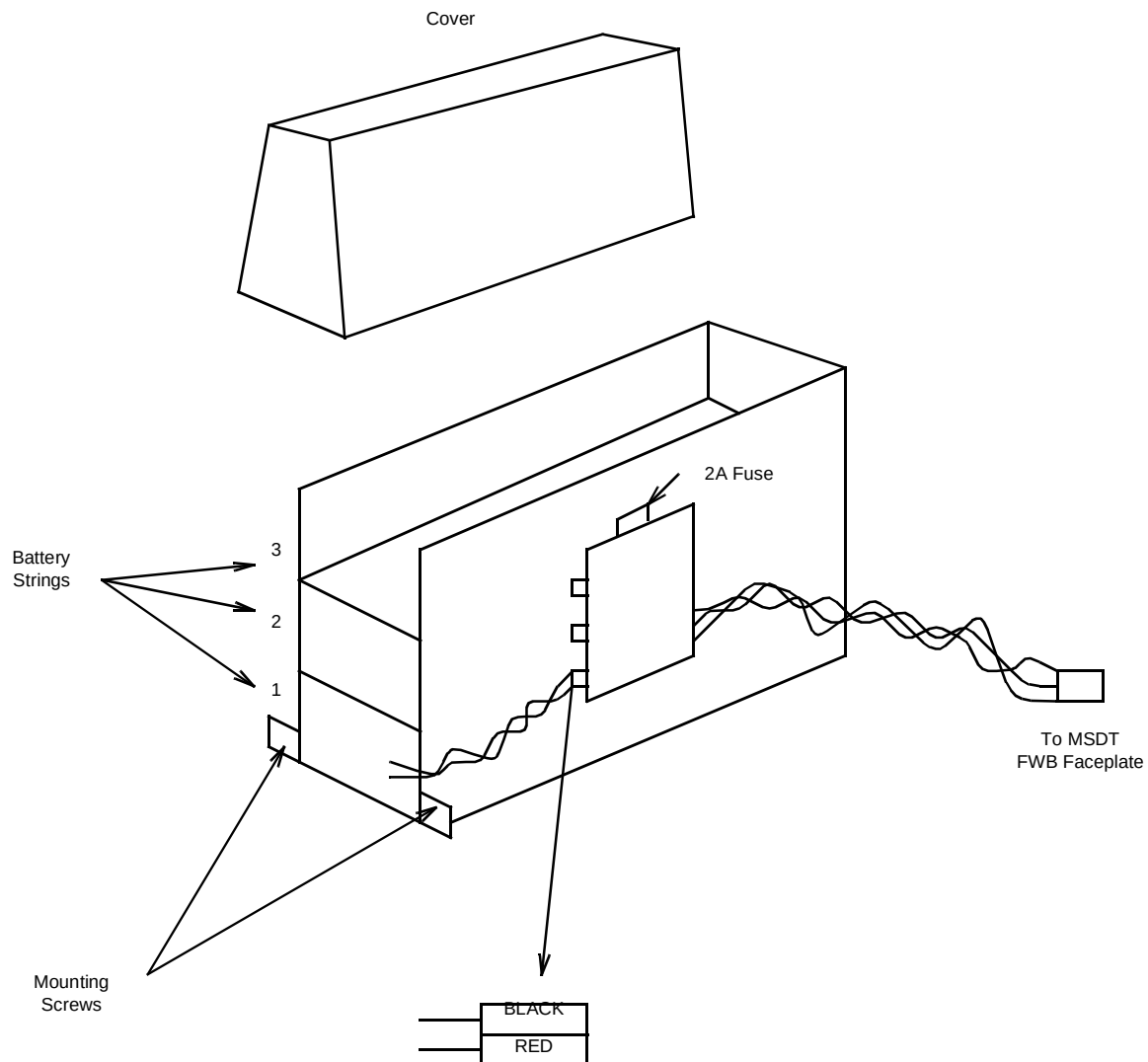


Figure 18 – SLC®-2000 MSDT Battery Shelf

9. Write the installation date (for each battery string installed) on the battery shelf cover label and battery label.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install 120 V AC AUA414 PIU in MSDT

1.



NOTE:

Fuses for the PIU should not be installed while the PCU is installed.
Remove the PCU before installing fuses in the PIU.

Remove **PIU** fuses and install **AUA414 PIU** in power interface unit (PIU) slot (Figure 19).

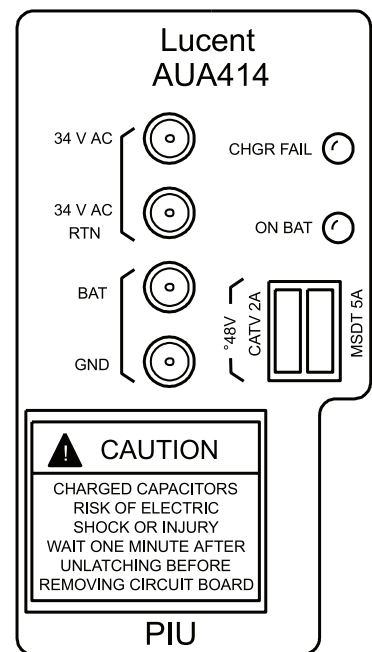
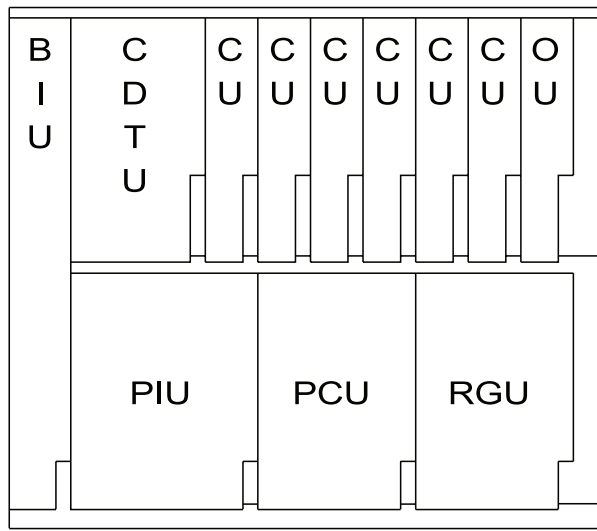


Figure 19 – 120 V AC AUA414 PIU

2. Measure AC (**34 V AC** to **34 V AC RTN**) PIU voltage.

Requirement: 34 (30.5 to 39.5) V AC.

3. Measure DC (**BAT** to **GND**) PIU voltage.

Requirement: BAT (–45 to –56) V DC (measured without PCU installed).

4. Were PIU voltage requirements met?

If **YES**, then continue with Step 5.

If **NO**, check battery lead connections, battery shelf fuse, and verify AC power (and AC fuse is good) to the cabinet. Replace PIU if no power trouble is found.



CAUTION:

Unlatch PIU and wait 1 minute for capacitors to discharge before handling.

5. Install **MSDT 5A** fuse. Install **CATV 2A** fuse if required.

6. Did fuse(s) blow?

If **YES**, then continue with Step 7.

If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Refer to appropriate schematic drawings (SDs) to clear *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) wiring trouble.

Install –48 V DC AUA415 PIU in MSDT

1.

- ➡ **NOTE:**
Fuses for the PIU should not be installed while the PCU is installed.
Remove the PCU before installing fuses in the PIU.

Remove **PIU** fuses and install **AUA415 PIU** in power interface unit (PIU) slot (Figure 20).

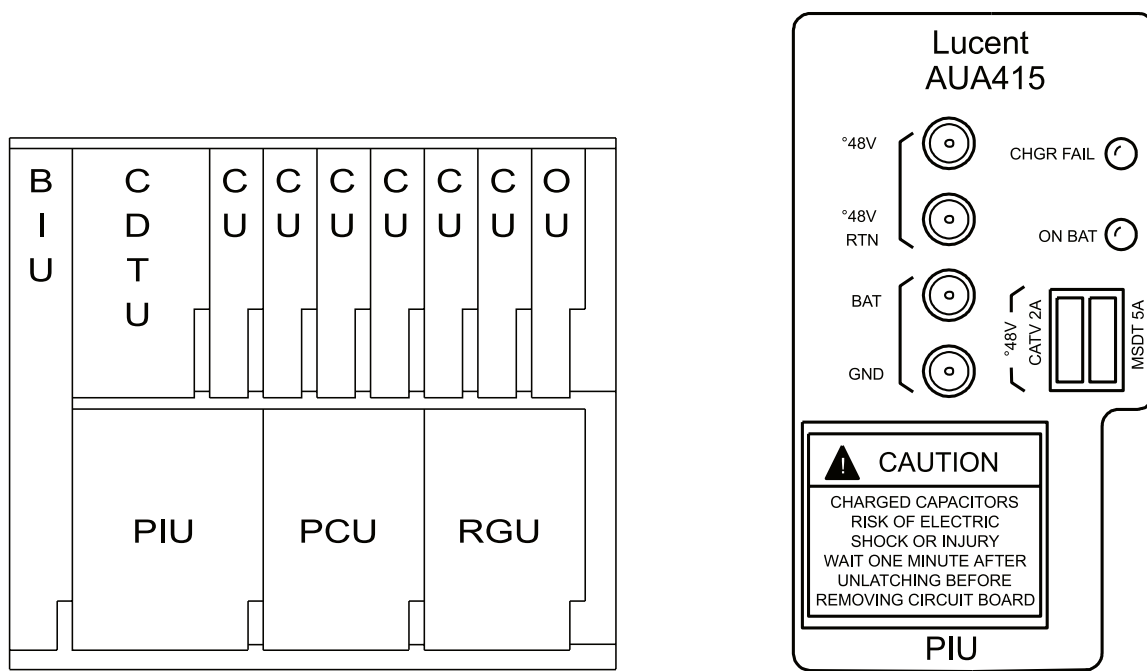


Figure 20 – –48 V DC AUA415 PIU

2. Measure –48 (–48 V to –48 V RTN) PIU DC voltage.
Requirement: –48 (–28 to –61) V DC.

3. Measure battery (**BAT** to **GND**) PIU DC voltage.

Requirement: BAT (45 to 56) V DC (measured without the PCU installed).

4. Were PIU voltage requirements met?

If **YES**, then continue with Step 5.

If **NO**, check battery lead connections and verify –48 V DC local power to the cabinet with good power feed protectors installed. Replace PIU if no power trouble is found.



CAUTION:

Unlatch PIU and wait 1 minute for capacitors to discharge before handling.

5. Install **MSDT 5A** fuse. Install **CATV 2A** fuse, if required.

6. Did fuse(s) blow?

If **YES**, then continue with Step 7.

If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Refer to appropriate schematic drawings (SDs) to clear *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) wiring trouble.

Install -130 or ± 130 V DC AUA416 PIU in MSDT

1. Verify or install MSDT protector in field wiring box (FWB).
2. Install **AUA416 PIU** in power interface unit (PIU) slot (Figure 21).

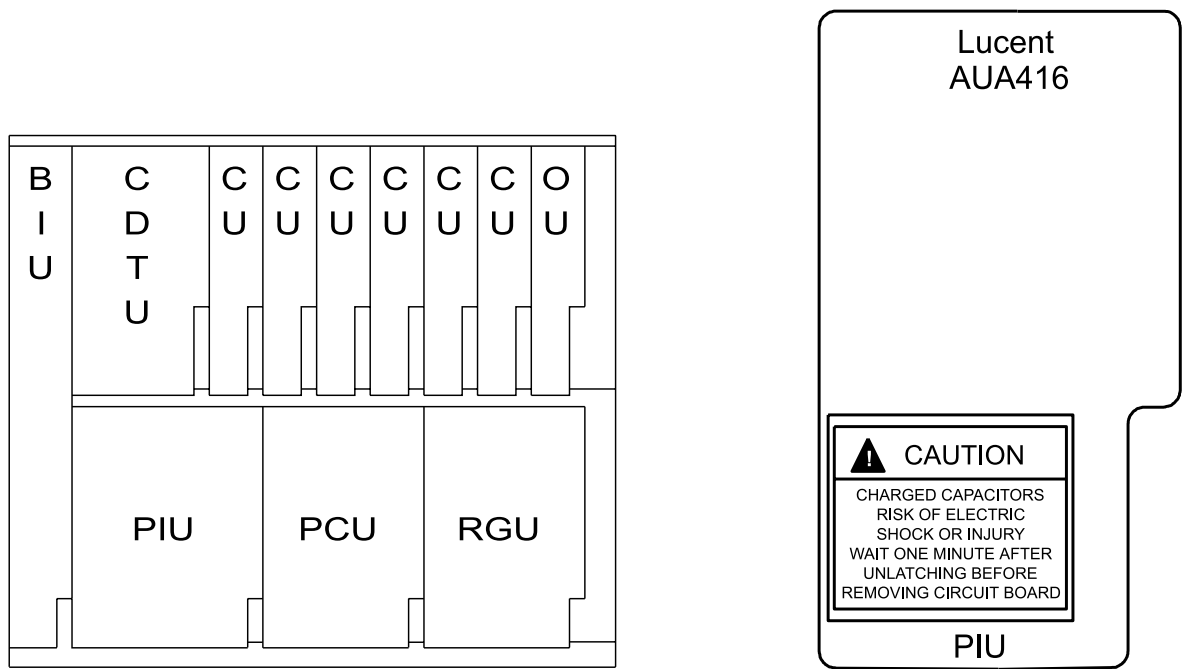


Figure 21 – -130 or ± 130 V DC AUA416 PIU

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Comment: The **BIU NE** indicator will light (with PCU and BIU installed) if this PIU is defective. During turn-up, the **BIU CLF** will also be lighted.

Install 120 V AC or –48 V DC AUA412 PCU in MSDT

1. Ensure that the **PIU MSDT 5A** fuse is installed. Install **AUA412 PCU** in power converter unit (PCU) slot (Figure 22).

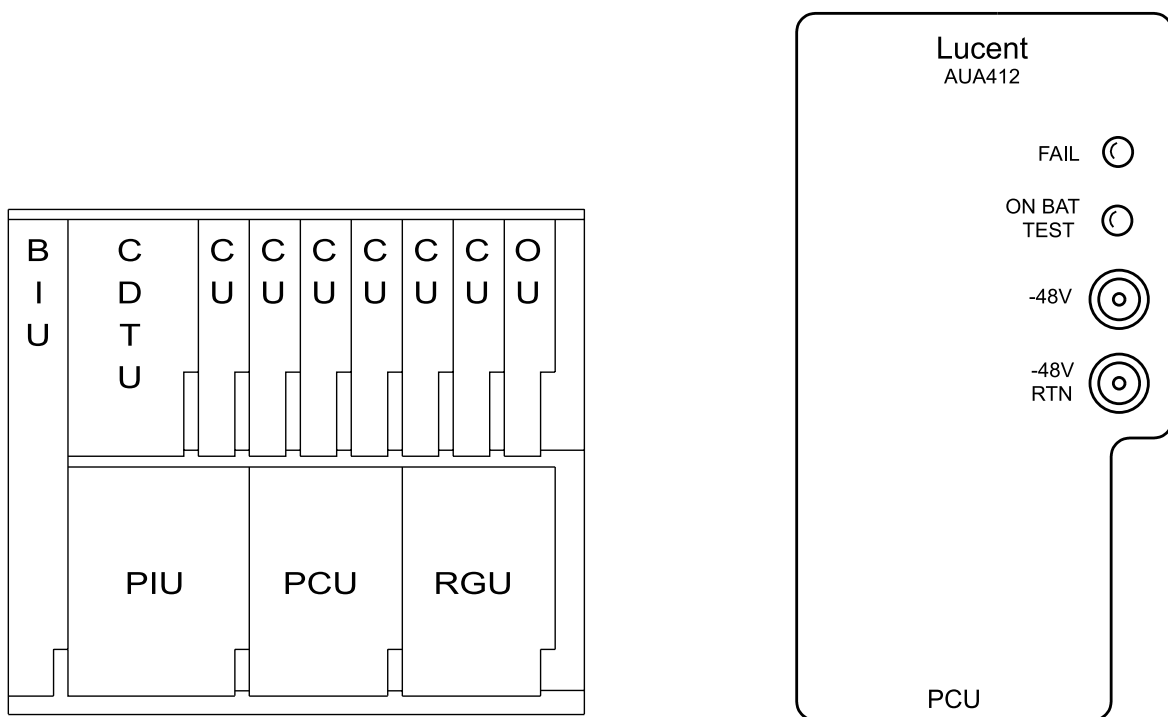


Figure 22 – 120 V AC or –48 V DC AUA412 PCU

2. Is **FAIL** indicator lighted on PIU or PCU?

If **YES**, continue with Step 3.

If **NO**, proceed to Step 6.

3. Replace **AUA412 PCU**, **AUA414 PIU**, or **AUA415 PIU** with **FAIL** lighted.



CAUTION:

Unlatch PIU and wait 1 minute for capacitors to discharge before handling.

4. Is **FAIL** indicator lighted?

If **YES**, continue with Step 5.

If **NO**, proceed to Step 6.

5. Use schematic drawings (SDs) to locate and repair wiring trouble.

6. Measure DC (**–48 V** to **–48 V RTN**) PCU voltages.

Requirement: **–48** (–28 to –61) V DC.

- 7.



NOTE:

The PIU is designed to accommodate temperature sensitive batteries and the DC output voltage lowers as temperature rises. At 20°C, the nominal output voltage is 57 ±1 volts DC with battery shelf connected and batteries fully charged.

Measure DC (**BAT** to **GND**) PIU voltages.

Requirement: 57 (45 to 60) V DC (measured with batteries connected, 56 to 64 with battery shelf cable disconnected).

Comment: This assumes the **PIU ON BAT** indicator is not lighted. Clear power trouble if ON BAT is lighted using **TAP-102** as guidelines.

8. Were PCU and PIU voltage requirements met?

If **YES**, then continue with Step 9.

If **NO**, replace PCU. If power trouble does not clear, replace PIU and repeat this procedure.

9. Press **PCU ON BAT TEST**.

Response: PCU **FAIL** and PIU **CHGR FAIL** and **ON BAT** indicators light.

Comment: The PIU indicators will fade out if the battery shelf fuse is blown or battery shelf cable is not connected.

10. For 120 V AC powering, pull the AC disconnect plug. For **–48 V** DC powering, proceed to Step 12.

Response: PIU **ON BAT** indicator lights.

11. Reinstall AC disconnect plug and proceed to Step 14.

12. For –48 V DC powering, pull the MSDT 5A PIU fuse to light the **PIU ON BAT**.

Response: PIU **ON BAT** indicator lights.

- 13.



NOTE:

Fuses for the PIU should not be installed if the PCU is installed. Remove the PCU before installing fuses in the PIU.

Unplug the PCU and reinsert the 5A fuse, then reinstall the PCU.

14. If the ON BAT TEST or AC disconnect test alarm indicator responses were not correct, replace the PCU, then replace the PIU after repeating indicator tests. Refer to appropriate SD drawings to correct SLC[®]-2000 Multi-Services Distant Terminal (MSDT) wiring trouble if replacement pack indicators do not respond to these tests correctly.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install –130 V DC AUA417 PCU in MSDT

Install **AUA417 PCU** in power converter unit (PCU) slot (Figure 1).

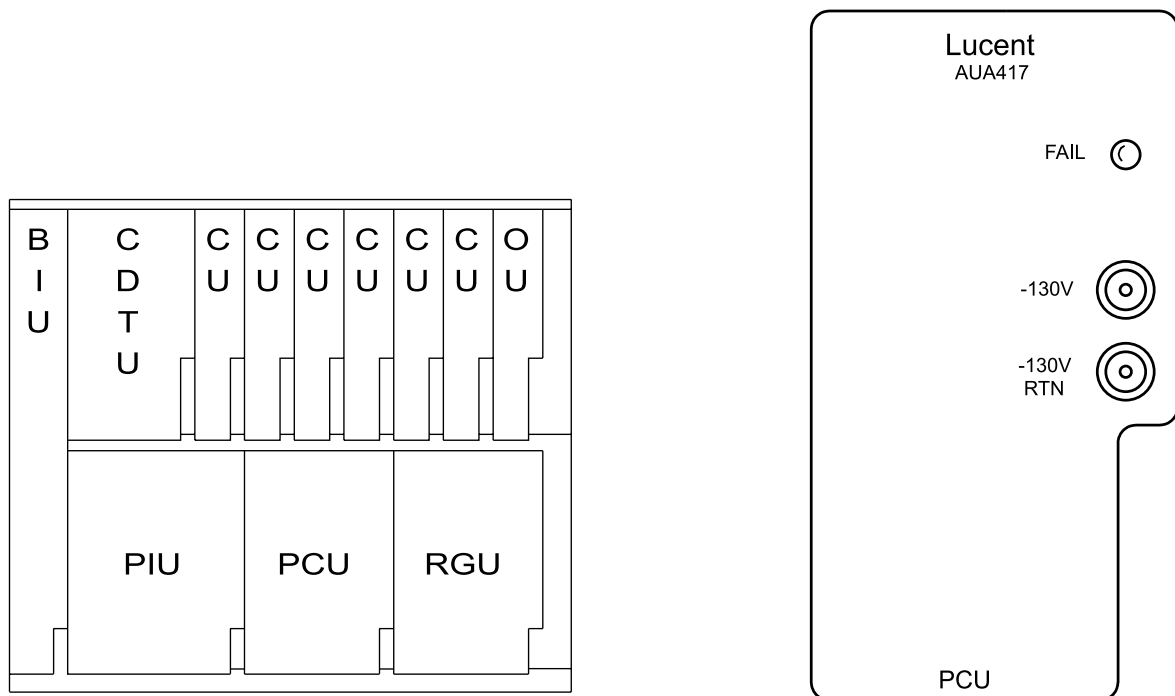


Figure 23 – –130 V DC AUA417 PCU

15. Is **FAIL** indicator lighted?

If **YES**, continue with Step 3.

If **NO**, proceed to Step 6.

16. Replace **AUA417 PCU**.

17. Is **FAIL** indicator lighted?

If **YES**, continue with Step 5.

If **NO**, proceed to Step 6.

18. Use SD drawings to locate and repair wiring trouble.

19. Measure DC (**-130 V** to **-130 V RTN**) PCU voltages.

Requirement: -130 (-65 to -130) V DC.

20. Were PCU voltage requirements met?

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, replace PCU. If power trouble does not clear, replace PIU and repeat this procedure.

Install AUA413 or AUA423 RGU in MSDT

1. Install **AUA413** or **AUA423 RGU** in ringing generator unit (RGU) slot (Figure 24).

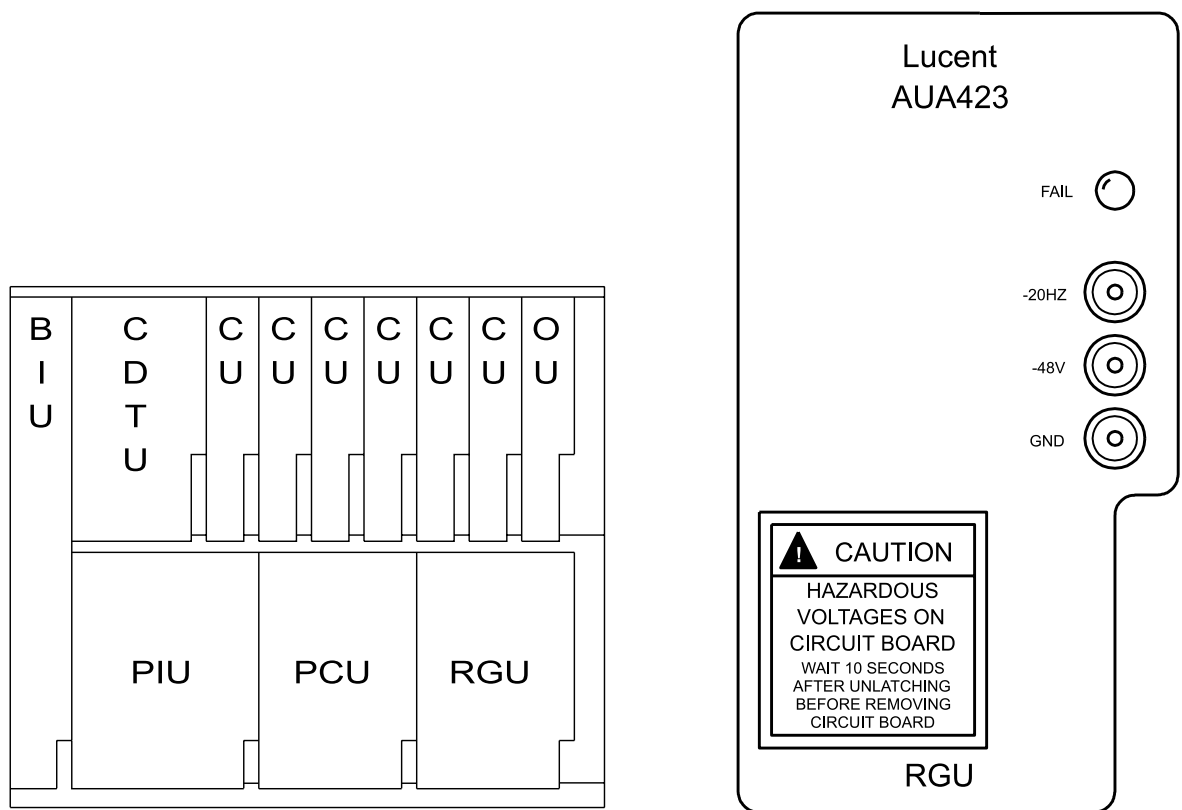


Figure 24 – AUA423 RGU

2. Is **FAIL** indicator lighted?

If **YES**, continue with Step 3.
If **NO**, proceed to Step 6.

3.



CAUTION:

Unlatch RGU and wait 1 minute for capacitors to discharge before handling.

Replace **AUA413** or **AUA423** RGU.

4. Is **FAIL** indicator lighted?

If **YES**, continue with Step 5.

If **NO**, proceed to Step 6.

5. Use schematic drawings (SDs) to locate and repair wiring trouble.

6. Measure RGU AC and DC ringing voltages between **-20 Hz** and **GND**.

Requirement: **AUA413**: 75 to 85 V AC RMS

AUA423: 95 to 105 V AC RMS

AUA413 or **AUA423**: -42 to -70 V DC.

7. Measure RGU DC voltage between **-48 V** and **GND**.

Requirement: **AUA413** or **AUA423**: -42 to -60 V DC.

8. Were RGU voltage requirements met?

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, replace RGU. If ringing voltage trouble does not clear, replace PCU.

Install MC97780A1, MC97789A1, MC97793A1, or MC97794A1 BIU in MSDT

1. Install **MC97780A1, MC97789A1, MC97793A1, or MC97794A1 BIU** (Figure 25) in **BIU** slot.

Comment: The **MC97780A1, MC97793A1, or MC9779341 BIU** is required with the **AUA413 RGU**. The **MC97789A1 BIU** is required with the **AUA423 RGU**.

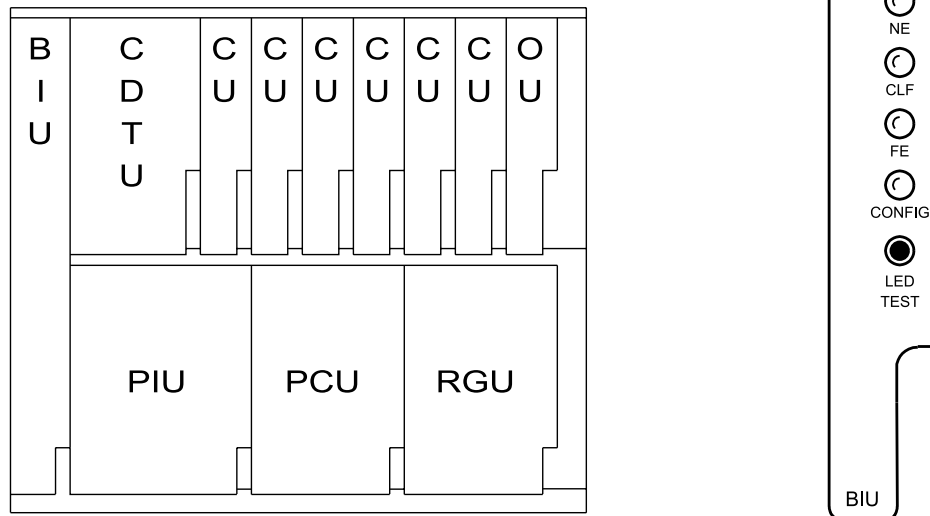


Figure 25 – MC97780A1 BIU Circuit Pack

2. Is **FAIL** indicator lighted?

If **YES**, continue with Step 3.
If **NO**, proceed to Step 6.

3. Replace the **BIU**.



NOTE:

The replacement BIU may require a software download. See **DLP-537** for more information.

4. Is **FAIL** indicator lighted?

If **YES**, continue with Step 5.
If **NO**, proceed to Step 6.

5. Perform the following to clear BIU FAIL:

- Replace PCU.
- Replace PIU.
- Use schematic drawings (SDs) to clear wiring trouble.

6. Press **LED TEST** on **BIU**.

Response: All indicators light on BIU, RGU, PCU, and PIU.

7. Do all indicators light?

If **YES**, then continue with Step 8.

If **NO**, replace circuit pack(s) that contain indicators that do not light and repeat LED TEST.

Comment: The AUA412 FAIL indicator will not light if the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) is operating on batteries (PIU ON BAT indicator lighted).

NO RESPONSE, replace BIU and repeat this procedure.

NO or **NO RESPONSE** after replacement, use SDs to clear wiring trouble

8. Are any indicators lighted on any MSDT circuit pack except **BIU CLF** and **SLOTS AVAILABLE** number?

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **YES**, then continue with Step 9.

9. The only alarm indicators you should have are CLF and 8 displayed when the BIU is first installed and the BYB1B is not installed. All other circuit packs should not have any indicators lighted. If the **BIU NE** indicator is lighted, the trouble is more than likely a power trouble (blown fuse, bad DC power feed, loss of AC power, or defective AUA416 PIU) or a miscellaneous alarm. Use TAP-101 and TAP-102 as guidelines to clear any alarms other than the CLF. The CLF alarm will not clear until the RT MSDT Server and optical units are installed and the MSDT system is put in service.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install BYB1B, BYB1C¹, BYB3, or BYB5 Optical Unit in MSDT

1. Remove protector cap and plug, apply alcohol to tip of cleaning swab, and clean optical coupling located on OU (optical unit) slot backplane.

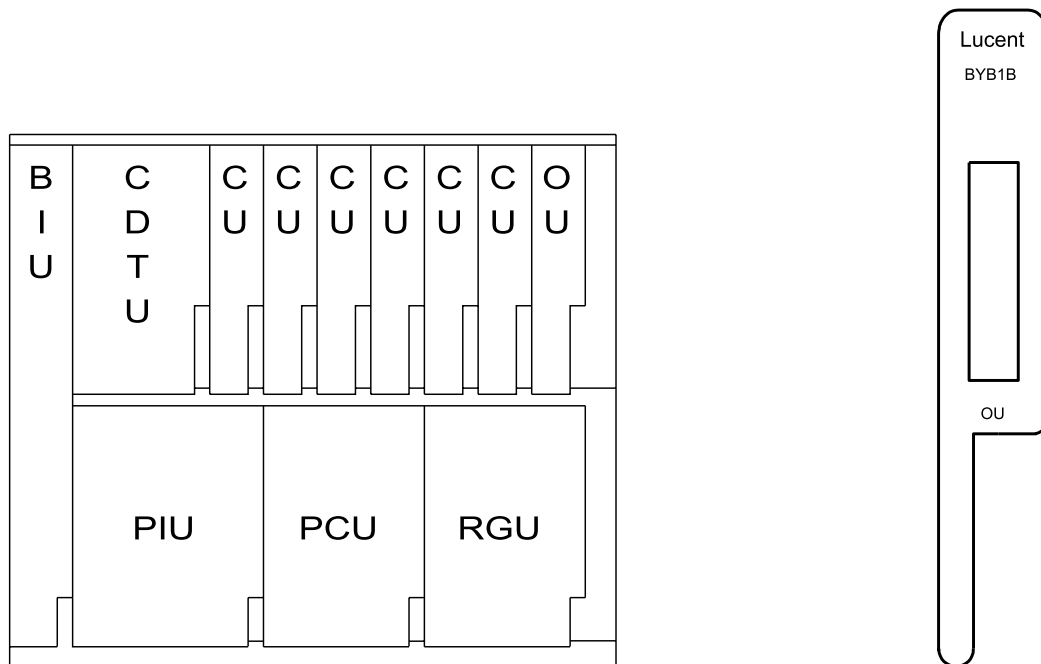


Figure 26 – BYB1B OU Circuit Pack

2. Use compressed air to dry optical coupling.
3. Get one **OU** (Figure 26) and inspect for physical damage.
4. Remove protective cover from optical connector on **OU**.

1. Discontinued Availability of the BYB1C OU. Replaced by the BYB3 OU.

5. Clean optical connector on **OU** using a *Kimwipes*¹ tissue moistened with alcohol. Dry the optical connector using compressed air.
6. Open the locking latch on the front of the **OU**.
7. Insert the **OU** in the **OU** slot of the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT).

Comment: The BIU alarms will depend on the status of the fiber link from the remote terminal (RT) (typically CLF and the number 8 displayed). The BIU alarm indicators will not change when the OU is installed unless the host RT system is turned up and equipped with MSDT Server unit and optical unit.

8. Record the optical transmit power of the OU using an optical power meter.
9. Record the optical receive power (from the HDT OU) from the far end using an optical power meter.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

1. Registered trademark of Kimberly-Clark Corp.

Install AUA411 or AUA411B CDTU in MSDT

1. Install the **CDTU** (Figure 27) in the channel and drop test unit (CDTU) slot.
-

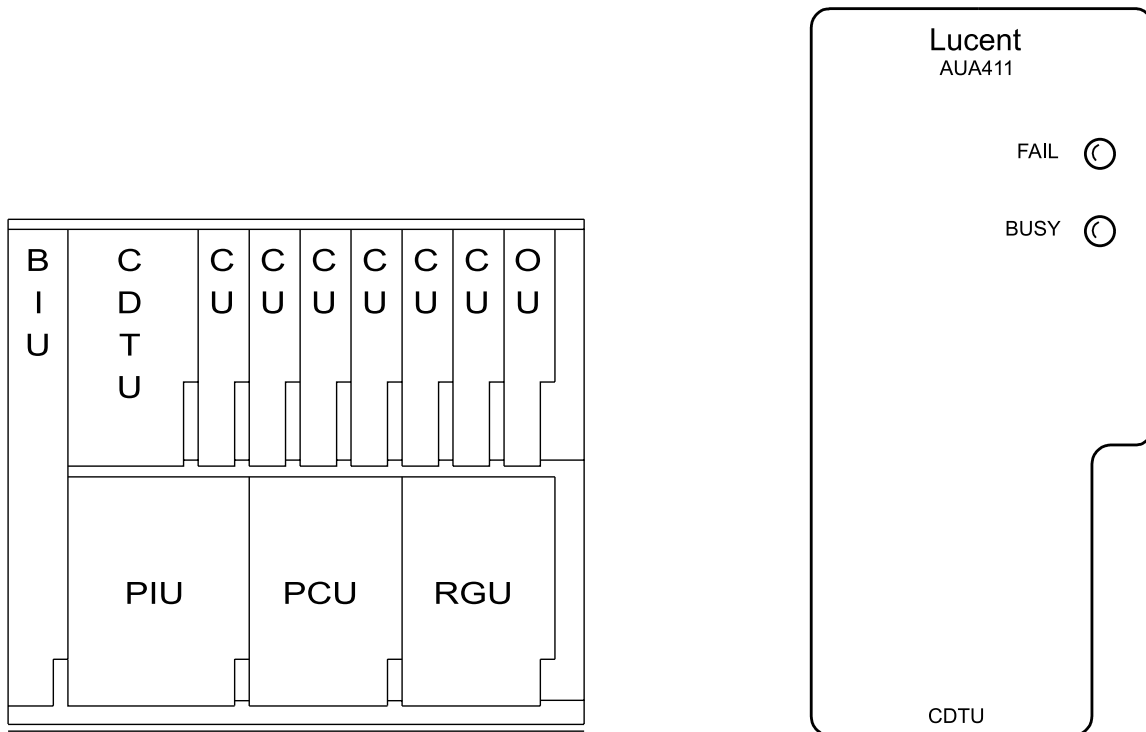


Figure 27 – AUA411/AUA411B CDTU Circuit Pack

2. Is **FAIL** indicator lighted?
If **YES**, continue with Step 3.
If **NO**, proceed to Step 6.
3. Replace the **CDTU**.

4. Is **FAIL** indicator lighted?

If **YES**, continue with Step 5.

If **NO**, proceed to Step 6.

5. Use schematic drawings (SDs) to locate and repair wiring trouble.

6. Press **LED TEST** on **BIU** and verify that the **CDTU** indicators light.

7. Do all **CDTU** indicators light?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, replace the **CDTU** and repeat LED TEST.

8. Do all **CDTU** indicators light?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, replace **BIU** and repeat LED TEST.

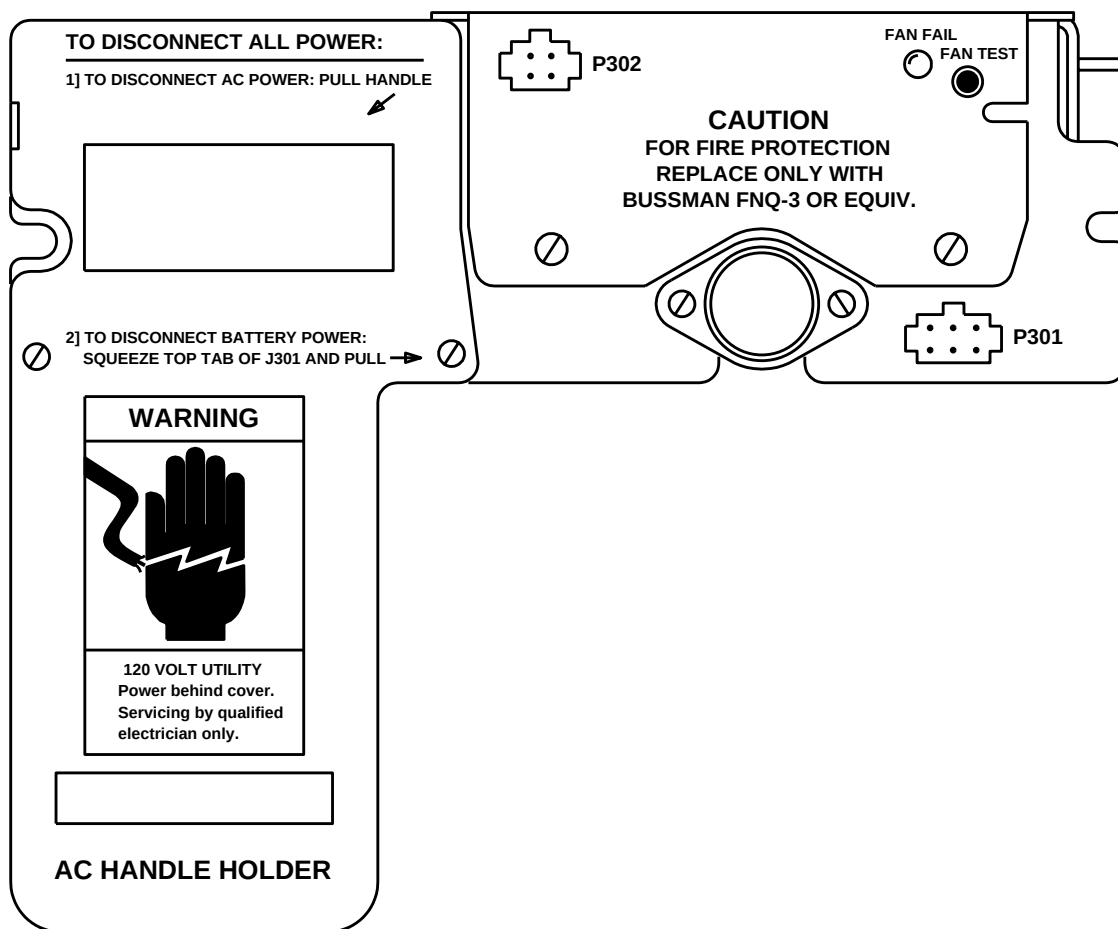
9. Do all **CDTU** indicators light?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, use SDs to clear wiring trouble.

Install Fan Unit and Connect Fan in MSDT

1. Remove the field wiring box (FWB) blank faceplate cover (Figure 28), if required, by unscrewing the two screws above the battery and fan plugs (P301 and P302).
2. Install the fan unit in the slot above the AC fuse holder. Mount the fan unit to the FWB using two screws.



tpa 813506/01

Figure 28 – Fan Unit Installed in Field Wiring Box

3. Connect fan cable to the FWB **P302**. If **FAN FAIL** indicator lights, replace fan.
4. Press and hold the fan unit **FAN TEST** button.

Response: The **FAN FAIL** indicator will light and then go off after 5 seconds.

5. Did the **FAN FAIL** indicator light and then go off?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO** or **stays ON**, then replace **Fan Unit** and repeat **FAN TEST** from Step 4.

Comment: If the FAN FAIL indicator still does not light and go off after replacing the Fan Unit, check fan cable connection and refer to appropriate schematic drawings (SDs) to clear wiring trouble.

Set Options on AUA406, AUA408, SPQ[®]808, or SPQ809 (or Later) MSDT Server

General

The MSDT Servers can be installed in either a *SLC*[®] Series 5 Carrier System remote terminal (RT) or a *SLC*-2000 RT. The AUA406 can only be installed in a Series 5 RT configured for *universal* Feature Package C (FPC) type service. The AUA408 can only be installed in a Series 5 FPB *universal* or *integrated* RT. The *SPQ*808 and *SPQ*809 (or later) MSDT Servers can only be installed in a *SLC*-2000 RT.

The following is a list of MSDT Server alarm indicators:

FAIL	The MSDT Server pack has failed self-diagnostic tests.
CLF	Communication with the MSDT is lost.
DT	Trouble with equipment in the MSDT.

FAIL	The MSDT Server pack has failed self-diagnostic tests.
CATV DT	Trouble with equipment in the community antenna television system (AUA406 only).
CONFIG	If the <i>SLC</i> Series 5 MSDT Server is installed per work order, record the digroup channel unit equipage and refer the trouble to the engineering center. A <i>SLC</i> Series 5 channel unit is in the wrong slot or there is an error in the SLOT ALLOCATION switch setting on the MSDT Server. Correct placement or <i>SLC</i> Series 5 SLOT ALLOCATION option setting to clear CONFIG alarm. If CONFIG and DT are both lighted, the channel unit installation trouble is at the MSDT. Lights when MSDT Server is optioned for more channel unit slots than are available, when installed in slots already seized, or when a special service channel unit placement conflict is detected (Mode 2).
SLOT ALLOCATION	This display and switch only function in a <i>SLC</i> Series 5 RT (not used in a <i>SLC</i> -2000 RT). The switch selects and the LEDs display the number of channel unit slots seized. Displays Zero when in conflict with a previously installed MSDT Server; flashes when a carrier system trouble (not MSDT trouble) is detected.

1. Is the MSDT Server being installed in a *SLC* Series 5 RT?

If **YES**, then continue with Step 2.

If **NO**, then proceed to Step 8.

- 2.

 **NOTE:**
The AUA408 is required for FPB.

Set the severity option switch on the **AUA406** (Figure 29) or **AUA408** (Figure 30) circuit board to **MJ=12** unless otherwise specified in work order.

Comment: If set to **MJ=ANY**, a failure of one *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) in a digroup will cause the **ADU MJ** to light. If set to **MJ=12**, the AUA406 must have 12 slots allocated to cause an **ADU MJ** and **BCU** digroup indicators to light; less than 12 allocated slots causes an **ADU MN**. When the SLOT ALLOCATION is set to 12, an MSDT failure will light the BCU digroup for either MJ=option setting.

3. Set the time slot allocation option:
 - A. On the **AUA406**, use a small flat blade screwdriver to select the number of channel unit slots [6 (12 channels) or 12 (24 channels)] the AUA406 seizes per work order.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

- B. On the **AUA408**, use a small flat blade screwdriver to select the number of channel unit slots [6 (12 channels) or 12 (24 channels)] the AUA408 seizes per work order.

Continue with Step 4.

4. Is the AUA408 (Figure 30) MSDT Server being connected to an optical facility (through an OU)?

If **YES**, then set the **OU/DSX** option to **OU**.

STOP. YOU HAVE COMPLETED THIS PROCEDURE

If **NO**, then continue with Step 5.

5. Set the **OU/DSX** option to **DSX**.
6. Set the **B/Z** option to **Z** unless the RT uses B8ZS line coding format.
7. Set the DSX equalization **TRAN-0,1,2** options as required (see Table K).

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

- 8.



NOTE:

The MJ-ANY/MJ-12 option is ignored on the MSDT Server installed in a SLC-2000 RT.

Is the *SPQ808* or *SPQ809* (or later) MSDT Server (Figure 31) being connected to an optical facility (through an OU)?

If **YES**, then set the **OU/DSX** option to **OU**.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

If **NO**, then continue with Step 9.

9. Set the **OU/DSX** option to **DSX**.
10. Set the **B/Z** option to **Z** unless the RT uses B8ZS line coding format.
11. Set the DSX equalization **TRAN-0,1,2** options as required (see Table K).

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

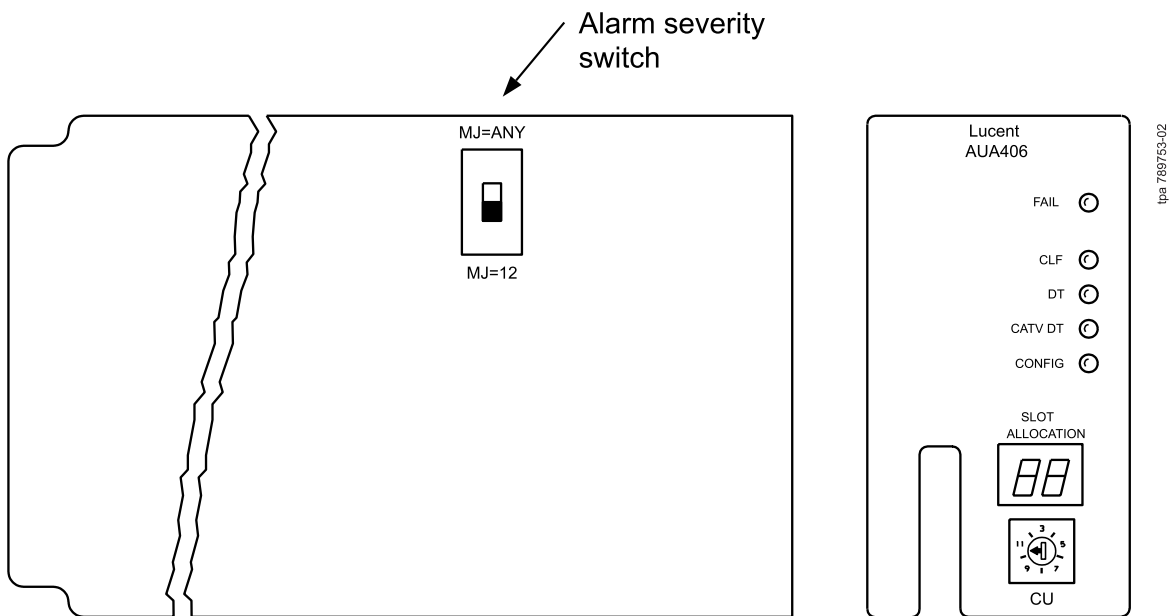


Figure 29 – AUA406 RT Channel Unit

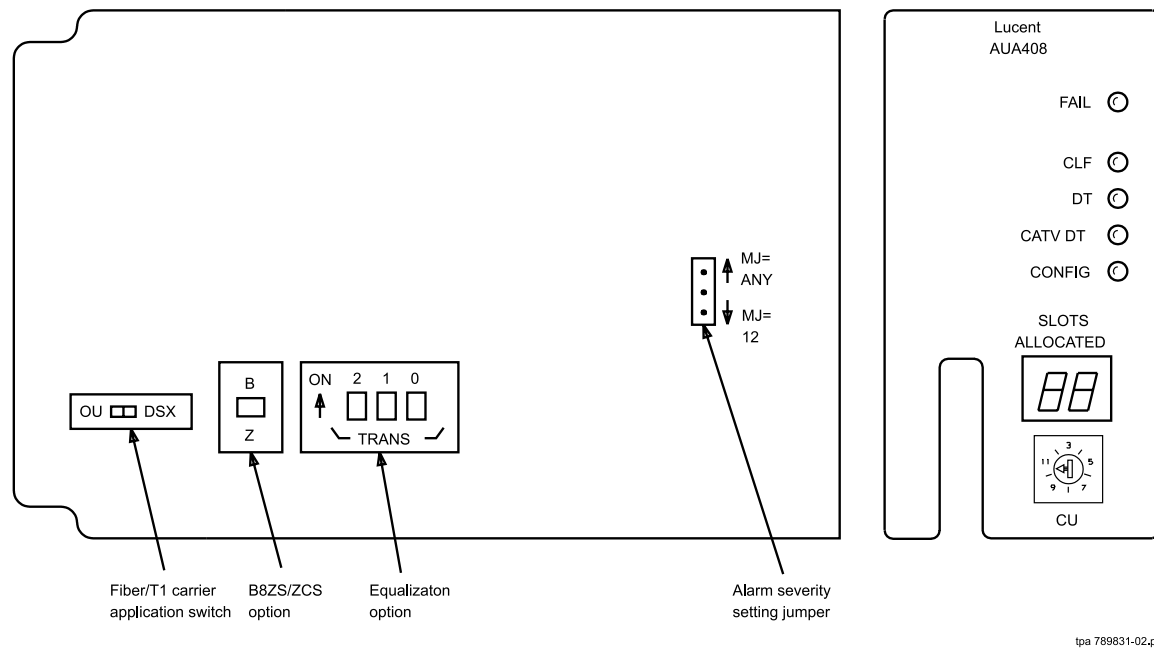
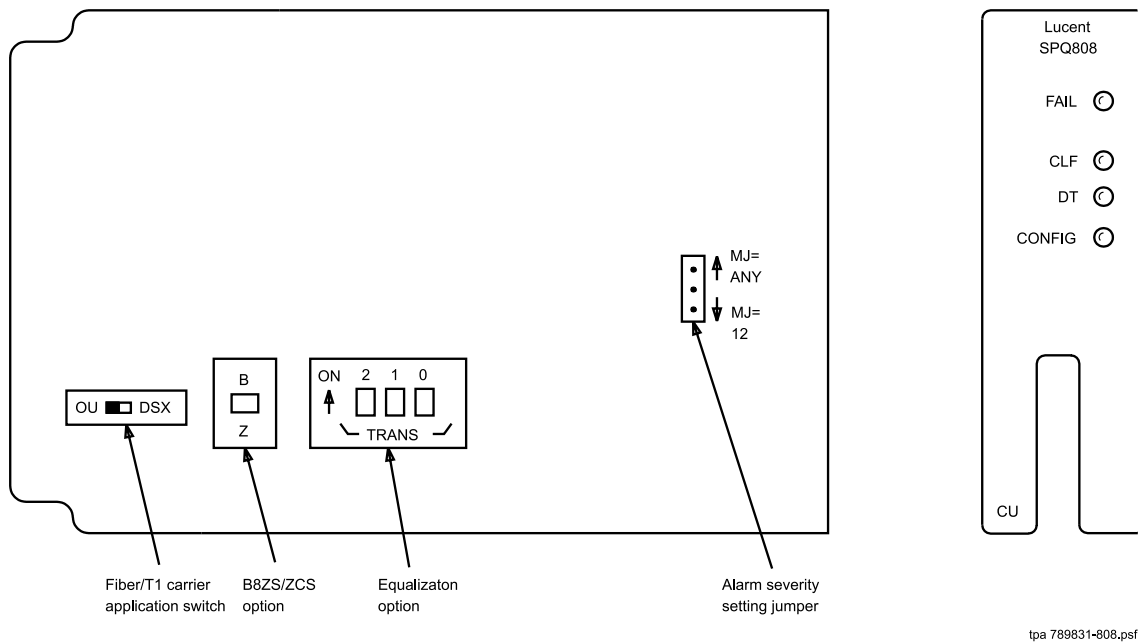


Figure 30 – AUA408 Option Switches

Table K – Equalization Option Settings

Trans-2	1	0	Distance to DSX-1 (Feet) (Note)
OFF	OFF	ON	0 to 132
OFF	ON	OFF	133 to 265
OFF	ON	ON	266 to 398
ON	OFF	OFF	399 to 532
ON	OFF	ON	533 to 655

Note: These distances are for ABAM cable used in the central office. Refer to 915-710-115 for calculations for other types of cable used for collocated RT and T1 extension applications.



tpa 789831-808.psf

Figure 31 – SPQ[®]808 or SPQ809 (or later) Option Switches

Determine *SLC*[®]-2000 MSDT Circuit Arrangement

Summary:

These steps can be used to find the relationships between remote terminal (RT) digroup channel positions and the associated *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) equipment. Use Table L or Table M to find the RT circuit of interest, the associated optical unit slot, and the fiber appearance. Use Table N or Table O to find the carrier system channel circuit of interest and the associated channel positions in the associated *SLC*[®]-2000 Multi-Services drop channel protectors at the MSDT.

1. Use Table A to find RT and digroups of interest in a Series 5 RT. Use Table B to find MDS assembly and shelf of interest in a *SLC*-2000 RT.
2. The high density optics shelf (HDOS) provides slots for 32 AYB1B optical units. These 32 slots are divided into 8 groups consisting of 4 slots per group. Each group can access a maximum of 48 DS0s. This allows two digroups from the RT to transmit a minimum of 12 DS0 channels to an MSDT — two 12-DS0 channels per digroup (see Figure 32). The channel unit slot designation where the server is installed will correspond with the HDOS shelf slot designation where the AYB1B optical unit is installed; for example, 1 for *SLC*-2000 and 1/2 for *SLC* Series 5 system. (See Table L and Table M.) One PCU location to the right of each grouping supplies power to that grouping; fuse F1 is associated with PCU1, etc.
3. The appearance of an optical fiber associated with an MSDT Server slot should be supplied with the work order. The actual labeling of these fibers is determined by the type of optical interconnect panel used and how the customer wants the fibers labeled. It is recommended to label the fibers with the same designation as the HDOS OU slot they are attached to (for example, SH-2-1).

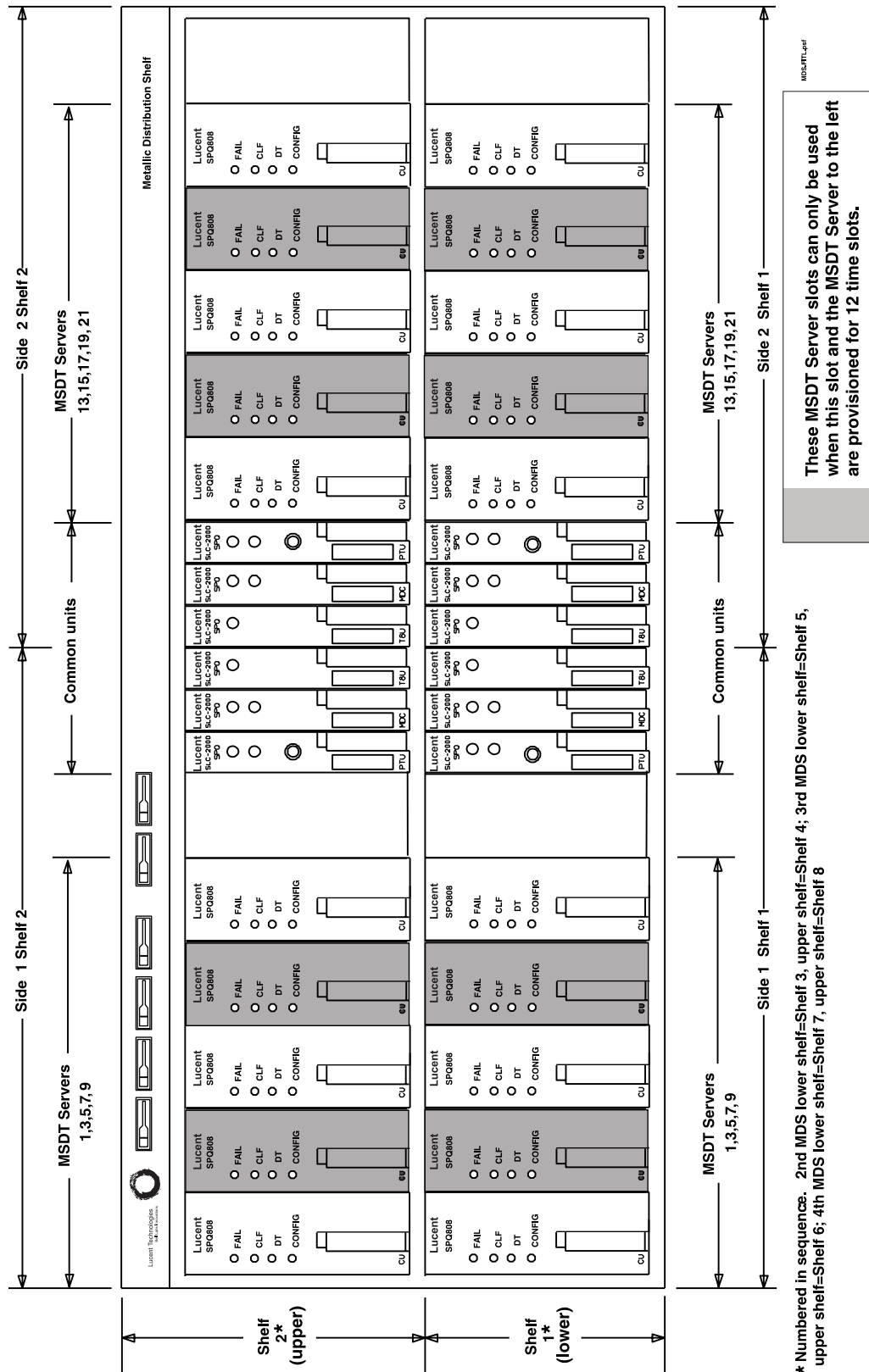


Figure 32 – First Metallic Distribution Shelf Assembly, Fiber Distribution

4. Refer to Table N and Table O to determine channel time slots served by MSDT channel unit slots and the associated drop protectors.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Table L – SLC[®] Series 5 to HDOS Circuit Configuration

		High Density Optics Shelf		
SLC Carrier System	MSDT Server Slot	PCU Slot and Fuse	Optical Unit Slot	Fiber Label at LGX[®]
Lower Assembly 1 Blue System	1/2	1,F1	1/2	SH-1-1
	13/14 *	1,F1	13/14 *	SH-1-13
	25/26	1,F1	25/26	SH-1-25
	37/38 *	1,F1	37/38 *	SH-1-37
	49/50	2,F2	49/50	SH-1-49
	61/62 *	2,F2	61/62 *	SH-1-61
	73/74	2,F2	73/74	SH-1-73
	85/86 *	2,F2	85/86 *	SH-1-85
Lower Assembly 1 White System	1/2	3,F3	1/2	SH-2-1
	13/14 *	3,F3	13/14 *	SH-2-13
	25/26	3,F3	25/26	SH-2-25
	37/38 *	3,F3	37/38 *	SH-2-37
	49/50	4,F4	49/50	SH-2-49
	61/62 *	4,F4	61/62 *	SH-2-61
	73/74	4,F4	73/74	SH-2-73
	85/86 *	4,F4	85/86 *	SH-2-85

See footnote at end of table.

Continued on next page

Table L – SLC® Series 5 to HDOS Circuit Configuration

		High Density Optics Shelf		
SLC Carrier System	MSDT Server Slot	PCU Slot and Fuse	Optical Unit Slot	Fiber Label at LGX®
Upper Assembly 2 Blue System	1/2	5,F5	1/2	SH-3-1
	13/14 *	5,F5	13/14 *	SH-3-13
	25/26	5,F5	25/26	SH-3-25
	37/38 *	5,F5	37/38 *	SH-3-37
	49/50	6,F6	49/50	SH-3-49
	61/62 *	6,F6	61/62 *	SH-3-61
	73/74	6,F6	73/74	SH-3-73
	85/86 *	6,F6	85/86 *	SH-3-85
Upper Assembly 2 White System	1/2	7,F7	1/2	SH-4-1
	13/14 *	7,F7	13/14 *	SH-4-13
	25/26	7,F7	25/26	SH-4-25
	37/38 *	7,F7	37/38 *	SH-4-37
	49/50	8,F8	49/50	SH-4-49
	61/62 *	8,F8	61/62 *	SH-4-61
	73/74	8,F8	73/74	SH-4-73
	85/86 *	8,F8	85/86 *	SH-4-85

* These slots can only be used when the MSDT Servers are provisioned for 12 channels.

Table M – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes)

MDS, Shelf First HDOS	MSDT Server-Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame
MDS 1, shelf 1	1	dt-1-1	1, F1	1	SH-1-1
	3 *	dt-1-3	1, F1	3 *	SH-1-3
	5	dt-1-5	1, F1	5	SH-1-5
	7 *	dt-1-7	1, F1	7 *	SH-1-7
	13	dt-1-13	2, F2	13	SH-1-13
	15 *	dt-1-15	2, F2	15 *	SH-1-15
	17	dt-1-17	2, F2	17	SH-1-17
	19 *	dt-1-19	2, F2	19 *	SH-1-19
MDS 1, shelf 2	1	dt-2-1	3, F3	1	SH-2-1
	3 *	dt-2-3	3, F3	3 *	SH-2-3
	5	dt-2-5	3, F3	5	SH-2-5
	7 *	dt-2-7	3, F3	7 *	SH-2-7
	13	dt-2-13	4, F4	13	SH-2-13
	15 *	dt-2-15	4, F4	15 *	SH-2-15
	17	dt-2-17	4, F4	17	SH-2-17
	19 *	dt-2-19	4, F4	19 *	SH-2-19
MDS 2, shelf 3	1	dt-3-1	5, F5	1	SH-3-1
	3 *	dt-3-3	5, F5	3 *	SH-3-3
	5	dt-3-5	5, F5	5	SH-3-5
	7 *	dt-3-7	5, F5	7 *	SH-3-7
	13	dt-3-13	6, F6	13	SH-3-13

See notes and footnote at end of table.

Continued on next page

Table M – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server-Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame
MDS 2, shelf 3 (Continued)	15 *	dt-3-15	6, F6	15 *	SH-3-15
	17	dt-3-17	6, F6	17	SH-3-17
	19 *	dt-3-19	6, F6	19 *	SH-3-19
MDS 2, shelf 4	1	dt-4-1	7, F7	1	SH-4-1
	3 *	dt-4-3	7, F7	3 *	SH-4-3
	5	dt-4-5	7, F7	5	SH-4-5
	7 *	dt-4-7	7, F7	7 *	SH-4-7
	13	dt-4-13	8, F8	13	SH-4-13
	15 *	dt-4-15	8, F8	15 *	SH-4-15
	17	dt-4-17	8, F8	17	SH-4-17
	19 *	dt-4-19	8, F8	19 *	SH-4-19
MDS 3, shelf 5	1	dt-5-1	1, F1	1	SH-5-1
	3 *	dt-5-3	1, F1	3 *	SH-5-3
	5	dt-5-5	1, F1	5	SH-5-5
	7 *	dt-5-7	1, F1	7 *	SH-5-7
	13	dt-5-13	2, F2	13	SH-5-13
	15 *	dt-5-15	2, F2	15 *	SH-5-15
	17	dt-5-17	2, F2	17	SH-5-17
	19 *	dt-5-19	2, F2	19 *	SH-5-19
MDS 3, shelf 6	1	dt-6-1	3, F3	1	SH-6-1
	3 *	dt-6-3	3, F3	3 *	SH-6-3

See notes and footnote at end of table.

Continued on next page

Table M – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server- Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame
MDS 4, shelf 6 continued	5	dt-6-5	3, F3	5	SH-6-5
	7 *	dt-6-7	3, F3	7 *	SH-6-7
	13	dt-6-13	4, F4	13	SH-6-13
	15 *	dt-6-15	4, F4	15 *	SH-6-15
	17	dt-6-17	4, F4	17	SH-6-17
	19 *	dt-6-19	4, F4	19 *	SH-6-19
MDS 4, shelf 7	1	dt-7-1	5, F5	1	SH-7-1
	3 *	dt-7-3	5, F5	3 *	SH-7-3
	5	dt-7-5	5, F5	5	SH-7-5
	7 *	dt-7-7	5, F5	7 *	SH-7-7
	13	dt-7-13	6, F6	13	SH-7-13
	15 *	dt-7-15	6, F6	15 *	SH-7-15
	17	dt-7-17	6, F6	17	SH-7-17
	19 *	dt-7-19	6, F6	19 *	SH-7-19
MDS 4, shelf 8	1	dt-8-1	7, F7	1	SH-8-1
	3 *	dt-8-3	7, F7	3 *	SH-8-3
	5	dt-8-5	7, F7	5	SH-8-5
	7 *	dt-8-7	7, F7	7 *	SH-8-7
	13	dt-8-13	8, F8	13	SH-8-13
	15 *	dt-8-15	8, F8	15 *	SH-8-15
	17	dt-8-17	8, F8	17	SH-8-17
	19 *	dt-8-19	8, F8	19 *	SH-8-19

See notes and footnote at end of table.

Continued on next page

Table M – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server- Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame

Notes:

1. The MSDT Servers must be installed in the slots listed. The circuits served do not necessarily correspond with the slot label that the MSDT Server is installed in (see 363-208-001 for details).

2. The access identifier (AID) has the syntax of:

dt-shelf#-physical slot # in HDT

where:

shelf# is the digital loop carrier (DLC) system or shelf number {1-8}

physical slot # in HDT is the slot for the MSDT Server {1,3,5,7,13,15,17,19}

3. The PCU powers four optical units to the left.

4. For a second HDOS, the shelf labels **SH-1** through **SH-4** refer to VRT shelves 5 through 8.

* These slots can only be used when the MSDT Servers are provisioned for 12 channels.

Table N – SLC[®]-2000 FITL TR-08 Channel Time Slots Served by the MSDT Channel Unit Slots

	Channel Time Slots Served					
MSDT Server Slot (Lines/DT)	DTCU 1	DTCU 2	DTCU 3	DTCU 4	DTCU 5	DTCU 6
CU 1 (24 lines)	1-4	5-8	9-12	13-16	17-20	21-24
CU 5	25-28	29-32	33-36	37-40	41-44	45-48
CU 13	49-52	53-56	57-60	61-64	65-68	69-72
CU 17	73-76	77-80	81-84	85-88	89-92	93-96
CU 1 (12 lines)	1-4	5-8	9-12	—	—	—
CU 3	13-16	17-20	21-24	—	—	—
CU 5	25-28	29-32	33-36	—	—	—
CU 7	37-40	41-44	45-48	—	—	—
CU 13	49-52	53-56	57-60	—	—	—
CU 15	61-64	65-68	69-72	—	—	—
CU 17	73-76	77-80	81-84	—	—	—
CU 19	85-88	89-92	93-96	—	—	—
MSDT drop protector	1-4	5-8	9-12	13-16	17-20	21-24
CIT AIDs* dropID#	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4

* The craft interface terminal (CIT) access identifier (AID) has the syntax of

dtdp-shelf#-physical slot # in HDT-physical slot in MSDT-dropID#

where:

shelf# is the digital loop carrier (DLC) system or shelf number {1-8}

Physical slot # in HDT is the slot for the MSDT Server {1,3,5,7,13,15,17,19}

physical slot in MSDT is the physical slot in the MSDT {1-6}

dropID# is the channel number in the MSDT slot {1-4} as given above.

Table O – SLC® Series 5 RT FITL Channel Service Arrangements in TR-08 Configuration

MSDT Server Slot (Lines/DT)	MSDT RT Quad Mode Channel Unit Slots and Channel Time Slots Served (Note)					
	1	2	3	4	5	6
1/2 (24 lines)	1-4	5-8	9-12	13-16	17-20	21-24
25/26	25-28	29-32	33-36	37-40	41-44	45-48
49/50	49-52	53-56	57-60	61-64	65-68	69-72
73/74	73-76	77-80	81-84	85-88	89-92	93-96
1/2 (12 lines)	1-4	5-8	9-12	—	—	—
13/14	13-16	17-20	21-24	—	—	—
25/26	25-28	29-32	33-36	—	—	—
37/38	37-40	41-44	45-48	—	—	—
49/50	49-52	53-56	57-60	—	—	—
61/62	61-64	65-68	69-72	—	—	—
73/74	73-76	77-80	81-84	—	—	—
85/86	85-88	89-92	93-96	—	—	—
MSDT drop protector	1-4	5-8	9-12	13-16	17-20	21-24
MSDT Server Slot (lines/DT)	MSDT RT Dual Mode Channel Unit Slots and Channel Time Slots Served (Note)					
	1	2	3	4	5	6
1/2 Dual (12)	1/2	3/4	5/6	7/8	9/10	11/12
13/14	13/14	15/16	17/18	19/20	21/22	23/24
25/26	25/26	27/28	29/30	31/32	33/34	35/36
37/38	37/38	39/40	41/42	43/44	45/46	47/48
49/50	49/50	51/52	53/54	55/56	57/58	58/60
61/62	61/62	63/64	65/66	67/68	69/70	71/72
73/74	73/74	75/76	77/78	79/80	81/82	83/84

See note at end of table.

Continued on next page

Table O – SLC[®] Series 5 RT FITL Channel Service Arrangements in TR-08 Configuration —

MSDT Server Slot (Lines/DT)	MSDT RT Quad Mode Channel Unit Slots and Channel Time Slots Served (Note)					
	1	2	3	4	5	6
85/86	85/86	87/88	89/90	91/92	93/94	95/96
MSDT drop protector	1/2	3/4	5/6	7/8	9/10	11/12

Note: The "channel time slot" number is used by the craft interface unit (CIU) to provision special service channel units.

Perform *SLC*[®]-2000 MSDT MLT Channel Test

Summary:

Channel testing for Multi-Services Distant Terminal (MSDT) circuits is supported by mechanized loop testing (MLT) using a DC test pair connected to the RT via pair gain test controller (PGTC), test bus control unit (TBCU), or a derived DC test pair provided by a remote measurement unit (RMU) capable of returning a DC delta signature (see Chapter 4) provided by the MSDT Server at the RT. The extended test controller (XTC) is supported only when connected in the PGTC emulation mode and the special features of the XTC are unavailable.

Channel testing for the MSDT circuits in an integrated *SLC*-2000 access system or a *SLC* Series 5 carrier system is supported by MLT but not XTC or PGTC. The test bus control unit (TBCU) connects the DC test pair or RMU to perform the bypass test as previously mentioned.

When a channel test is performed, the MLT identifies the circuit as being served by a *SLC* Carrier System. Then two tests are initiated. The first test performs channel unit functional tests, and the second test bypasses the carrier system [using a DC test pair or remote measurement unit (RMU)] and returns a DC delta signature from the MSDT Server that indicates the result of the attempted channel tests performed by the CDTU at the MSDT.

The MLT has no means of obtaining metallic access to the copper drop which connects to the MSDT. This situation is handled by having the CDTU in the MSDT to measure the health of the copper drop then report the results using DC programmable signatures. When a test is run, the MSDT Server at the RT returns a *DC signature* (Table P) to the MLT. A DC signature with 98K ohms or less Tip-to-Ring indicates a good fiber. A DC signature of 1000K ohms or more Tip-to-Ring indicates a failure condition associated with the fiber loop and trouble clearing should begin at the HDT site. A DC signature of less than 95K ohms may indicate a trouble condition at the MSDT or customer equipment/wiring. A failed DC signature indicates the RT unit has failed or the signal between the RT and MSDT is bad.

1.



NOTE:

After a fullx or loopx test, a channel test from STV should be performed.

Perform the MLT test on the MSDT circuit reported to have trouble but do not perform the tone test.

Comment: You should note the results of the *DC tests* during the loop test phase of the channel test.

Comment: If you perform the tone test, the results will be intermittent return tones.

2. Refer to Table A and perform the appropriate action according to the result of the MLT test signature.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Table P – SLC[®]-2000 MSDT Feature DC Signatures for Drop Tests

DC Signature (Resistance T-R) (Ohms)	Indication	Dispatch To
15K-24K	HDT/MSDT link up and MSDT common equipment failure or MSDT not equipped for testing	MSDT
24K-34K	HDT/MSDT link up and FEMF on drop	MSDT
34K-44K	HDT/MSDT link up and drop test OK	As indicated by channel test
44K-54K	HDT/MSDT link up and drop open	MSDT
54K-64K	HDT/MSDT link up and resistive fault	MSDT
64K-74K	HDT/MSDT link up and receiver off-hook (ROH)	MSDT or customer premises
74K-86K	HDT/MSDT link up and hazardous potentials on drop	MSDT
>1000K	HDT/MSDT link down	HDT

Test Single-Party POTS Channel End-to-End

Summary:

At central office (CO) equipment determine channel and directory number of channel being tested. At *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT), determine corresponding channel. At MSDT, connect a test telephone set with ringer connected for bridged ringing to channel being tested. Make talking, dialing, ringing, and ring-trip tests on at least one channel per MSDT.

1. Establish communication between craft personnel at the MSDT and CO.
2. At the CO equipment, select a channel slot to be tested and determine/assign directory number of channel. Inform craft personnel at the MSDT of channel selected (see DLP-516).
- 3.



NOTE:

Test telephone set should be connected for bridged ringing. Test calls should be made from protector block at the back of the MSDT cabinet protector block field to verify correct wiring.

At MSDT, install a single-party channel unit (*SPQ*[®]400/440 or AUA58) into the channel unit slot that coincides with the channel being tested and temporarily connect a test telephone set to the channel.

Response: Central office (CO) test line and MSDT telephone are connected.

4. At MSDT, lift handset and check for dial tone.
5. Is dial tone present at MSDT?

If **YES**, then proceed to Step 9.

If **NO**, then continue with Step 6.

6. Request CO personnel to review line assignment to ensure correct test number. If line assignment is correct, check test connections at MSDT and correct if needed. If dial tone is still not present, replace MSDT channel unit and check for dial tone.

7. Is dial tone present at MSDT?

If **YES**, then proceed to Step **9**.

If **NO**, then continue with Step **8**.

8. Use CO and MSDT schematic drawings (SDs) to check wiring. Use office drawings to check CO wiring. Look for tip and ring reversal between MSDT protector block terminal; also check COT channel appearance and office equipment, if universal. Correct wiring until dial tone is present at MSDT and proceed to Step **9**.

9. At MSDT, dial local MDF or CO number and make talk tests.

10. Was call completed with transmission in both directions?

If **YES**, then proceed to Step **14**.

If **NO**, then continue with Step **11**.

11. Replace MSDT channel unit and repeat talk tests (then replace COT channel unit if, universal).

12. Was call completed with transmission in both directions?

If **YES**, then proceed to Step **14**.

If **NO**, then continue with Step **13**.

13. Use CO and MSDT schematic drawings (SDs) to check wiring. Use office drawings to check CO wiring. Look for tip and ring reversal between MSDT protector block terminal; also check COT channel appearance and office equipment if, universal. Correct wiring and repeat Step **9** until talk is good in both directions.

14. At CO, dial test line number to ring telephone at MSDT.

15. At MSDT, does test telephone ring normally?

If **YES**, then proceed to Step **19**.

If **NO**, then continue with Step **16**.

16. Has tip and ring reversal been checked?

If **YES**, then continue with Step **17**.

If **NO**, then proceed to Step **18**.

17. Verify that the RGU FAIL indicator is not lighted and ringing voltage is present (see DLP-510 for requirements). Then replace, one at a time: MSDT channel unit first and then CO channel unit. Repeat this procedure from Step **4** after each replacement.

18. Look for tip and ring reversal at CO and MSDT and repeat from Step **14**.
19. At MSDT, lift telephone handset during ringing.
20. At MSDT, does ringing trip normally?

 If **YES**, then proceed to Step **22**.
 If **NO**, then continue with Step **21**.
21. Verify that the RGU FAIL indicator is not lighted and ringing voltage is present (see DLP-510 for requirements). Then replace, one at a time: MSDT channel unit first and then CO channel unit. Repeat this procedure from Step **4** after each replacement.
22. At MSDT, get volt-ohm-milliammeter (VOM) and condition it to measure DC volts.
23. Make sure test call is established and held between CO and MSDT.
24. At MSDT, connect (+) red lead of VOM to tip terminal and (–) black lead to ring terminal of MSDT test telephone.
25. At MSDT, does meter indicate between 4 V and 15 V DC?

 If **YES**, then proceed to Step **31**.
 If **NO**, then continue with Step **26**.
26. Check MSDT test connections and correct them, if needed.
27. At MSDT, does meter now indicate between 4 V and 15 V DC?

 If **YES**, then proceed to Step **31**.
 If **NO**, then continue with Step **28**.
28. Replace MSDT channel unit for channel being tested. If meter still does not indicate between 4 V and 15 V, replace CO channel unit.
29. At MSDT, does meter now indicate between 4 V and 15 V DC?

 If **YES**, then proceed to Step **31**.
 If **NO**, then continue with Step **30**.
30. Use CO and MSDT SDs to check wiring. Check CO wiring.
31. At MSDT, disconnect VOM meter.

32. Is this the last designated channel unit slot to be tested?

If **YES**, then continue with Step **33**.

If **NO**, then repeat from Step **2**.

33. Is MLT type testing available for use in testing channels?

If **NO**, then proceed to Step **42**.

If **YES**, then continue with Step **34**.

34. Request that Repair Service Bureau or Local Test Desk perform necessary MLT type channel tests.

Reference: **DLP-517**

35. Did tests pass?

If **YES**, then proceed to Step **41**.

If **NO**, then continue with Step **36**.

36. Check test connections and correct them, if needed. Replace MSDT channel unit (if universal, replace COT channel unit) and repeat Step **34**.

37. Did tests pass?

If **YES**, then proceed to Step **41**.

If **NO**, then continue with Step **38**.

38. Make sure MLT interface equipment is working properly and that you are using proper procedures. Repeat Step **34** and then proceed to Step **39**.

39. Did tests pass?

If **YES**, then proceed to Step **41**.

If **NO**, then continue with Step **40**.

40. Use office drawings and CO SDs to check wiring. Check for tip and ring reversal between CO channel appearance and office equipment; also between MSDT protector block connect terminal. Correct wiring problem, repeat Step **34** until tests pass, and then proceed to Step **41**.

41. Is this the last designated channel unit slot to be tested with MLT type system?

If **YES**, then continue with Step **42**.

If **NO**, then continue with Step **34**.

42. At MSDT, remove test telephone. At CO, remove test line.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install 336A RECTIFIERS in J1C182BD Power Shelf

Summary: Insert **336A RECTIFIER** into power shelf. Measure -42 to -56 V DC between $-$ (**1A/mV**) and $+$ (**CURRENT V**) on the power shelf (bottom two jacks). Unseat **336A RECTIFIER** and repeat for additional **336A RECTIFIERS**. Reseat all **336A RECTIFIERS**.

1.



NOTE:

Three **336A RECTIFIERS** are suggested for one or two battery strings and an additional two **336A RECTIFIERS** (total of five) are suggested for a third string of IR series batteries.

Get required number of **336A RECTIFIERS** and inspect for possible physical damage.

2. Verify that fuses on **336A RECTIFIERS** (Figure 33) are not blown.

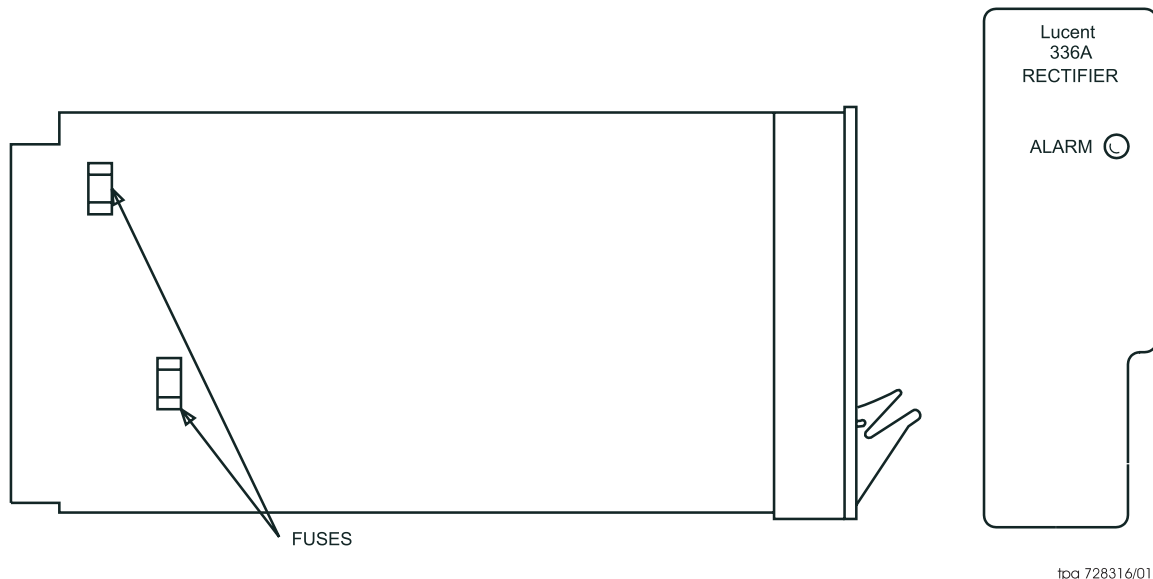


Figure 33 – Location of Fuses on 336A RECTIFIER

3. Insert one **336A RECTIFIER** into first vacant **RECT** slot (counting left to right) in power shelf (Figure 34).

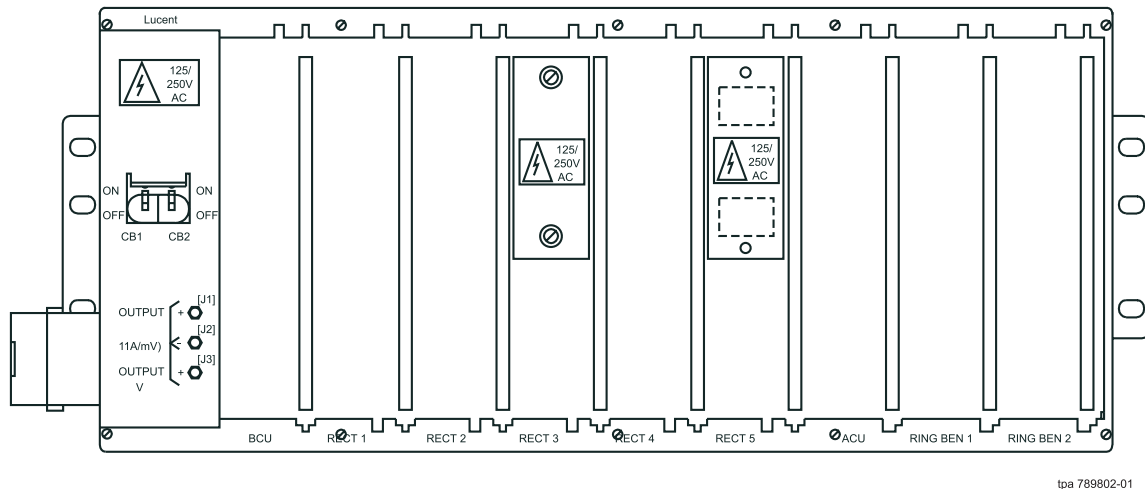


Figure 34 – J1C182BD Power Shelf

4. Condition DMM to measure DC volts.
5. Connect DMM test leads to **VOLTAGE –** and **VOLTAGE +** on the power shelf (bottom two jacks).
6. Does DMM indicate between –42 and –56 volts?
If **YES**, then proceed to Step **12**.
If **NO**, then continue with Step **7**.
7. Condition DMM to measure AC volts.
8. Operate AC power disconnect off and then back on.
9. Verify that AC power is connected to **P140** on the side of the power shelf. Check for presence of 105 to 129 volts AC at TB1 rear of power shelf (pin3 neutral; pin1 01 RECTs 1, 2, 3; pin4 02 RECTs 4 and 5). Verify that the 30-amp fuses on the **AUG4() BIU** are not blown.

10. Is correct voltage present?

If **YES**, then proceed to Step **11**.

If **NO**, then **refer trouble to installation group**.

11. Check wiring on power shelf using SD-7C163-01. Repeat procedure from Step **4** after trouble is found and corrected.

12. Is another **336A RECTIFIER** to be installed?

If **YES**, then continue with Step **13**.

If **NO**, then proceed to Step **15**.

13. Unseat **336A RECTIFIER(s)** installed previously.

14. Get another **336A RECTIFIER** and repeat from Step **2**.

15. Remove DMM test leads and reseal all **336A RECTIFIERS**.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Perform Initial Installation and Tests of Batteries in 51A –130 Volt DC Power Point Cabinet

Summary: Remove AC power from system. Install and connect four *Lineage*[®]-2000 IR-40C type batteries for first battery string. Measure voltage greater than 45 V DC on **VOLTAGE** – and + jacks on power shelf. Remove a connector for one of the IR-40C batteries in the string just tested. Repeat for additional battery shelves. Reconnect all IR batteries. Install 5-amp heater fuses (if required). Restore AC power to system.



CAUTION:

Do not substitute IR40 (COMCODE 406387739) or IR30 (COMCODE 406382754) batteries or any other batteries designed for constant current charging. These batteries are not compatible with the J1C18LBD power shelf. Using them may result in thermal runaway.

1.



DANGER:

High current flow will occur if short is placed across battery terminals. No attempt should be made to measure battery voltage across terminals.

Get four IR-40C (COMCODE 406456715) or IR30C (COMCODE 406456707) batteries for each battery string (12 total).

2. Ensure that the AC power disconnect is **off** for cabinet or that the AC power cord is disconnected from power shelf plug (**P140**). Verify that the **AUG4 BIU** is installed in the power shelf.

3.



NOTE:

For the 181A battery shelf, remove front cover of the battery shelf by lifting cover up and out to install the batteries.

Place batteries on battery shelves and dress battery cables as each battery is placed on shelf.

Comment: Battery string 1 uses two batteries per shelf on the lower two battery shelves.

Battery string 2 uses two batteries per shelf on the upper two battery shelves.

Battery string 3 uses four batteries in 181A mounting apparatus at the top of the battery section.

4. For each battery string, connect three of the four battery pigtail cables (J1, J2, J3). Leave the fourth (J4) unconnected at this time.

Comment: For battery string 1 or 2, there are two P-connectors per shelf (P1 P2, P3 P4, P5 P6, and P7 P8). Leave P4 (string 1) or P8 (string 2) unconnected.

Comment: For battery string 3, leave P4 unconnected.

- 5.

 NOTE:

To measure a battery string voltage accurately, all other battery strings must have one battery not connected.

Test one of the battery strings by connecting the fourth IR-40C battery pigtail cable J4 to P4 (string 1), P8 (string 2), or P4 (string 3).

6. Condition DMM to measure DC volts.
7. On power shelf, connect DMM to **VOLTAGE –** and **VOLTAGE +** (bottom two jacks). Verify that the AC disconnect is off on the AC power panel.
8. Does meter indicate greater than 45.0 volts DC?

If **YES**, then proceed to Step **16**.
If **NO**, then continue with Step **9**.
9. Check the four 30-amp fuses on the **AUG4**. Check battery lead connections at battery shelf.
10. Does meter indicate greater than 45.0 volts DC?

If **YES**, then proceed to Step **16**.
If **NO**, then continue with Step **11**.
- 11.

 NOTE:

If voltage requirements are not met after replacement battery is installed, original battery should be reinstalled in battery shelf.

Replace one of the batteries.

12. Does meter indicate greater than 45.0 volts DC?

If **YES**, then proceed to Step **16**.
If **NO**, then continue with Step **13**.

13. Have all batteries been replaced?

If **YES**, then continue with Step **14**.
If **NO**, then proceed to Step **15**.

14. Replace the **AUG4** and check battery lead connections at battery shelf.
Repeat procedure from Step **8** after locating and correcting trouble.

15.

⇒ **NOTE:**
If voltage requirements are not met after replacement battery is installed,
original battery should be reinstalled in battery shelf.

Select another battery in battery string and repeat from Step **11**.

16. Remove DMM test leads from power shelf.

17. Have all battery shelves been equipped and tested?

If **YES**, then proceed to Step **19**.
If **NO**, then continue with Step **18**.

18. Remove any one of the IR-40C battery pigtail connectors for the battery string
just tested. Go to next battery string and repeat from Step **5**.

19. Reconnect the IR-40C battery pigtail connector for each battery string.

20. If required, install good 5-amp fuse into **5 AMP FUSE HEATER** (on the AC
power panel for strings 1 and 2) fuse holders, and **HTR** fuse holder (on the
181A battery mounting apparatus for string 3).

21. Turn AC power disconnect on and ensure that AC power cord is connected to
power shelf plug (**P140**).

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Perform Test of 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 it near batteries to be tested (Figure 35).

2.



NOTE:

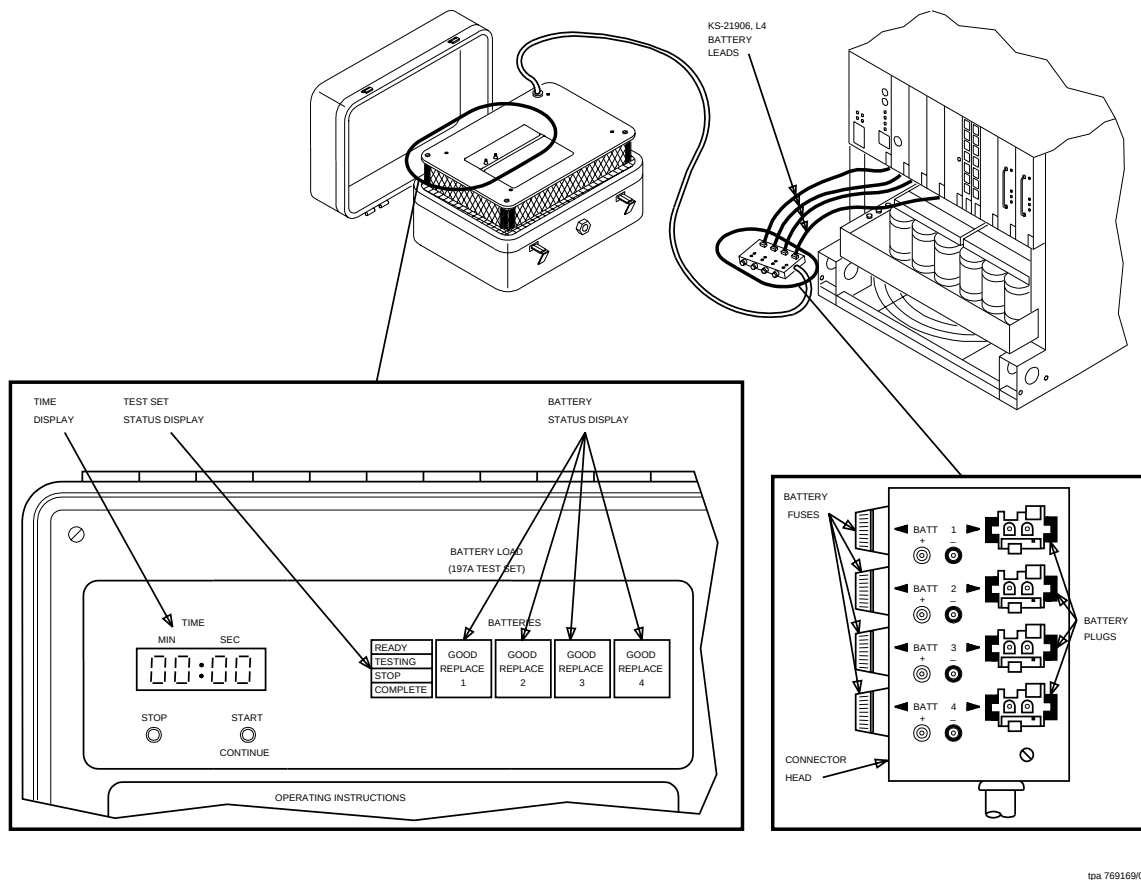
The 197A test set is intended to test batteries that are fully charged. A minimum of two days must be allowed between the time the batteries (new or replacement) are installed and this test is made.

Remove cover from **197A** test set.

3. Check **197A** test set for proper operation (if not already performed).

Reference: **DLP-522**

4. Ensure that system(s) associated with batteries to be tested has AC power available.



tpa 769169/01

Figure 35 – 197A Battery Load Test Set Test Connections

5.



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.

6.



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.

7.



NOTE:

If status display does not indicate battery number or battery status, **BATT** fuse may be blown, connector head or test set may be defective, or battery may be defective.

Does test set display indicate **REPLACE** for all batteries being tested?

If **YES**, then continue with Step 8.

If **NO**, then proceed to Step 10.

8. Replace all batteries and connect good batteries to battery shelf.

9. Repeat this test on replacement batteries after 48 hours.

10.



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 if 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.

11.



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 **12**.

If **NO**, then proceed to Step **13**.

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.*

Depress test set **STOP** button.

Response: **STOP** indicator on test set lights.

Proceed to Step **15**.

13. After 15 minutes, the test set **COMPLETE** indicator lights.

14. Is any **REPLACE** indicator on test set lighted?

If **YES**, then continue with Step **15**.

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Unplug and set aside all defective batteries.

16. Install and connect replacement batteries to battery shelf. Reconnect any remaining good batteries to battery shelf.

17. Repeat this test on replacement batteries after 48 hours.

Check 197A Battery Load Test Set for Proper Operation

1. Obtain **197A BATTERY LOAD TEST SET** (Figure 36).

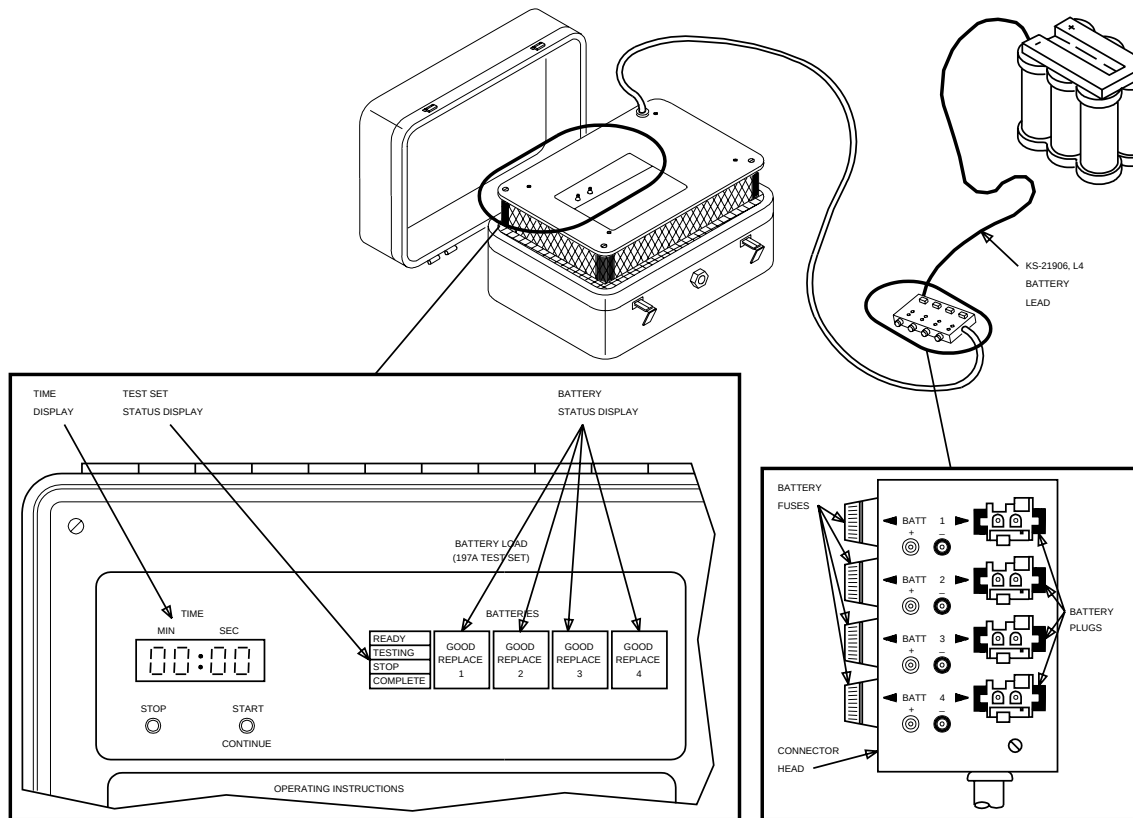


Figure 36 – 197A Battery Load Test Set Arrangement

2. Remove cover from test set.
3. At test connector head, verify that battery fuse holders each contain a 20-amp fast-blow fuse.
4. Obtain one IR-40C 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.



NOTE:

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, 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.

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 is defective. Ensure that **TESTING** indicator is not lighted (**READY** indicator lighted), unplug and set aside defective battery, 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 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.

Defective test set. Depress **STOP** button, unplug battery. 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.

Defective test set. Allow test to run for 15 minutes as shown on **TIME** display. When **COMPLETE** indicator lights, unplug battery. 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. Return test set for repair.

35. Defective test set. Return for repair.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install *Lineage*-2000 System VR Series Batteries in 80A 130 V Power Plant Cabinet Battery Compartment

Summary: Unpack and visually inspect the batteries for damage. Measure the voltage of each battery. Requirement: 4.20 V DC or higher. Place batteries in the battery compartment (Figure 37). Coat interbattery bus bars with *NO-OX-ID*¹ rust preventive protective coating. Connect the batteries together with the bus bar as shown in Figure 2. Connect battery string cable to batteries 1 and 12. Check the battery string voltage, note polarity and voltage (Requirement: minimum 50.4 V DC). Connect cable from power shelf to battery string cable. Repeat for second battery string to be installed.

1.



DANGER:

Batteries are electrically live (that is, have voltage on them) at all times and are able to supply several thousand amperes short circuit current. Great care should be exercised to avoid short circuiting the battery terminals. Insulated tools must be used; any rings, watches, bracelets, etc., must be removed when working on batteries.

Any contact of electrolyte with skin or clothing should be avoided. If contact occurs, the electrolyte can be neutralized by flushing with plenty of water. If electrolyte enters the eye, immediately flush the eye with water and seek medical help. If the batteries appear damaged in shipping, protective rubber apron, rubber gloves, and goggles should be worn by persons handling the batteries.



CAUTION:

The Lineage[®]-2000 System VR Series battery is a valve regulated, starved electrolyte lead acid cell. Should the case crack, it is possible that a small amount of electrolyte (1 ounce) could leak out. The electrolyte is sulfuric acid and should be handled as highly corrosive material. No battery installation should be attempted unless the installer has ready access to several gallons of water and a package of baking soda. Baking soda or solution of baking soda and water may be used to neutralize small amounts of electrolyte.

1. NO-OX-ID is a registered trademark of Sanchem, Inc.

Get equipment for installation:

- One ED-83242-31, G3 which consists of 12 *Lineage*-2000 System VR Series batteries, 11 interbattery bus bars, twenty-four 1/4-inch lockwashers, twenty-four 1/4-inch nuts, a container of the *NO-OX-ID* coating, and a form 1285 (all these items are supplied with the batteries).
 - One battery string cable (COMCODE 846278224, one for each battery string) (shipped with the cabinet as ED-7C711-30, Group 63).
 - One torque wrench (range between 30 inch-pound and 200 inch-pound) with insulated handle (or insulate the handle with electrical tape).
 - One 7/16-inch socket (for the 1/4-20 nut).
2. Unpack the batteries and inspect them for physical damage. Do not install any cell that appears to be damaged. Any cell that has leaked electrolyte should be considered defective.
 3. Condition DMM to measure DC volts.
 4. Measure the terminal voltage of each battery. Does meter indicate 4.20 V DC or higher for each battery?

 If **YES**, then proceed to Step 6.
 If **NO**, then continue with Step 5.
 5. Replace any battery that measures less than 4.20 V DC.
 6. Wipe battery terminals until clean and dry.
 7. Use special hex key (modified hex key) and 216-tool to open the battery compartment doors.
 8. Place all 12 batteries in the battery compartment as shown in Figure 37.

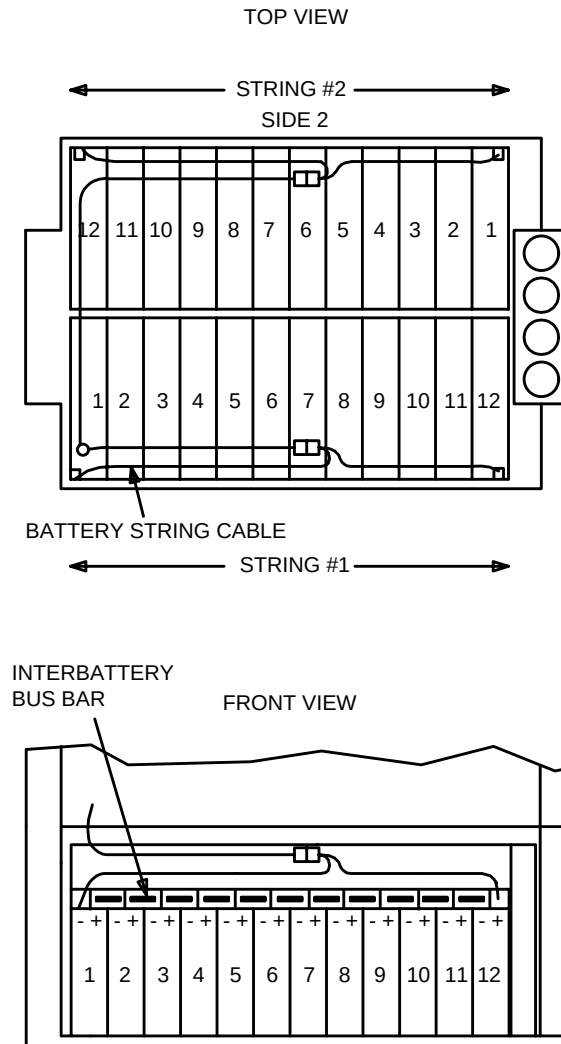


Figure 37 – Layout of *Lineage*[®]-2000 System VR Series Batteries in 80A Cabinet

9. Coat interbattery bus bars with *NO-OX-ID* coating and install them on the batteries as shown in Figure 38. Install 1/4-inch lockwasher and nut on battery post. Using insulated torque wrench with the socket, tighten nut to 55 inch-pounds torque. Repeat for each battery post until all 12 batteries are connected together.

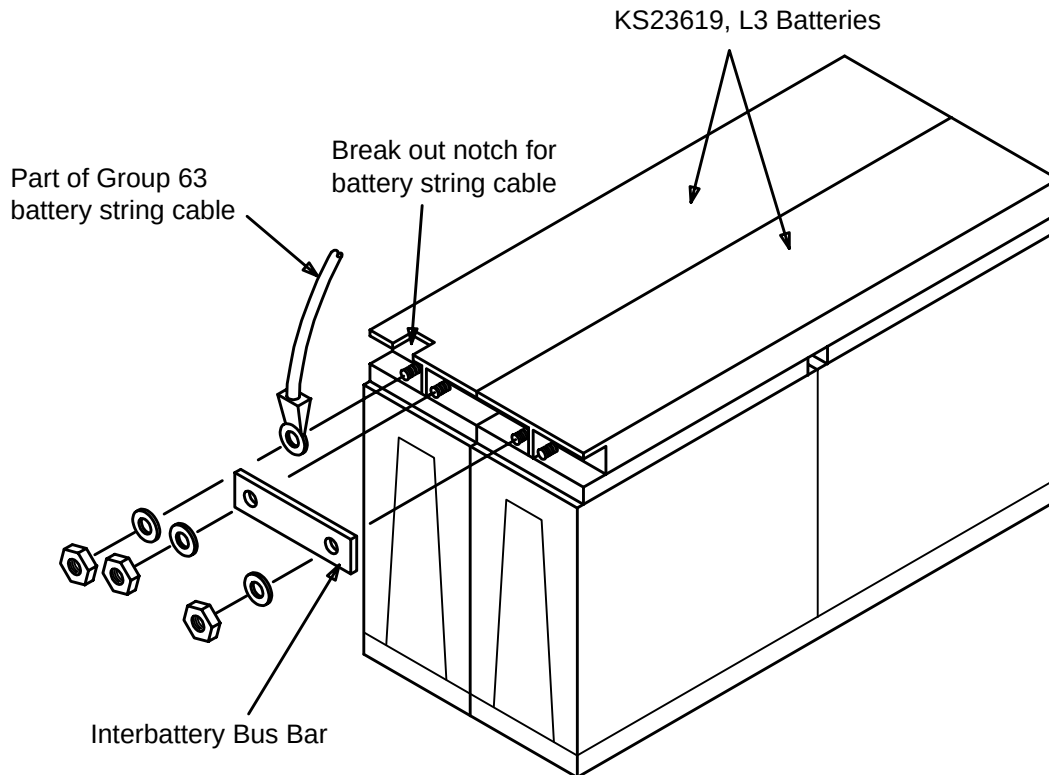


Figure 38 – Battery String Connections for Lineage[®]-2000 System VR Series Batteries

10. Cut a notch in the cover of battery No. 1 (above "-" battery post) and battery No. 12 (above "+" battery post) (see Figure 38). This is required to install the battery string cable.
11. Connect the battery string cable to battery No. 1 by terminating the lug marked **BAT 1 (-)** to the "-" (negative) battery post of the first battery in the string (Figure 2). Connect the battery string cable to battery No. 12 by terminating the lug marked **BAT 12 (+)** to the "+" (positive) battery post of the 12th battery as shown in Figure 2. Install the lockwasher and nut on the battery posts. Use insulated torque wrench to tighten the nuts to 55 inch-pounds torque.
12. Coat each battery connection with *NO-OX-ID* coating.
13. Condition DMM to measure DC volts. Measure battery string voltage at the connector (marked **STR "+"** and **STR "-"**) at the end of the battery string cable. Make sure measured polarity corresponds with polarity indicated on connector.

14. Does meter indicate battery string voltage –50.4 V DC or higher?

If **YES**, then proceed to Step **16**.

If **NO**, then continue with Step **15**.

15. Make sure there are 12 batteries in the string. Recheck battery connections and correct them, if necessary. If connections are correct, check individual battery voltage. Any battery that indicates less than 4.20 V DC should be replaced.

16. Connect the battery string cable **STR** connector to the connector designated **STR()** (1 or 2) on the end of the battery cable located in the battery compartment.

17. Dress cables in the battery compartment.

18.



NOTE:

To measure the battery string voltage accurately, disconnect any battery strings other than battery string being measured. [To disconnect other battery strings, unplug the battery string cable connector marked **STR** from the battery cable connector marked **STR()**.]

On control and distribution panel, connect DMM to **BAT()** (1, 2, 3, or 4) test point (Figure 39) and **PVR** test point for battery string being installed.

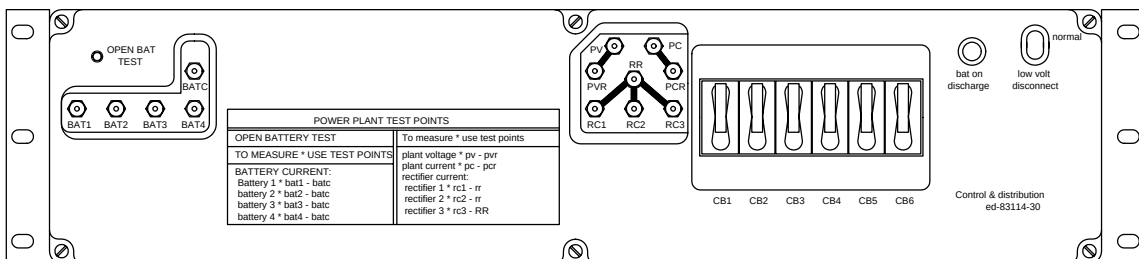


Figure 39 – Control and Distribution Panel

19. Does meter indicate battery string voltage of 50.4 V DC or higher?

If **YES**, then proceed to Step **21**.

If **NO**, then continue with Step **20**.

20. Visually inspect cable assembly between control and distribution panel and battery string. Use the DMM to check the battery for blown condition. Replace cable assembly fuse and/or cable assembly until meter indicates correct voltage.

21. Is this the last battery string to be installed?

If **YES**, then proceed to Step **22**.

If **NO**, then repeat from Step **1** for next battery string to be installed.

22. Disconnect test equipment. Reconnect any battery strings disconnected for voltage measurement. Close and lock battery compartment door.

23. Between one and three hours after the rectifiers are installed, measure the voltage of each battery in the string and record the voltages on form 1285 supplied with the batteries. Meter should indicate between 4.44 V DC and 4.64 V DC for each battery. Any battery outside this limit should be measured again within one week. If it is still outside the limit, replace the battery.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Verify Connections to ED-83114-30 Control and Distribution Panel

Summary: Verify that AC power is off. Verify that power and ground cables are connected. Verify connections on AYK1 and AYK2 circuit packs. Verify rectifier control cable connections to control and distribution panel. Verify battery installation.

1. On AC power panel, verify that AC power (utility) **CB1** circuit breaker is off and **CB6** (R1), **CB7** (R2), and **CB8** (R3) circuit breakers (for AC feeders to rectifier shelf) are also off (Figure 40).

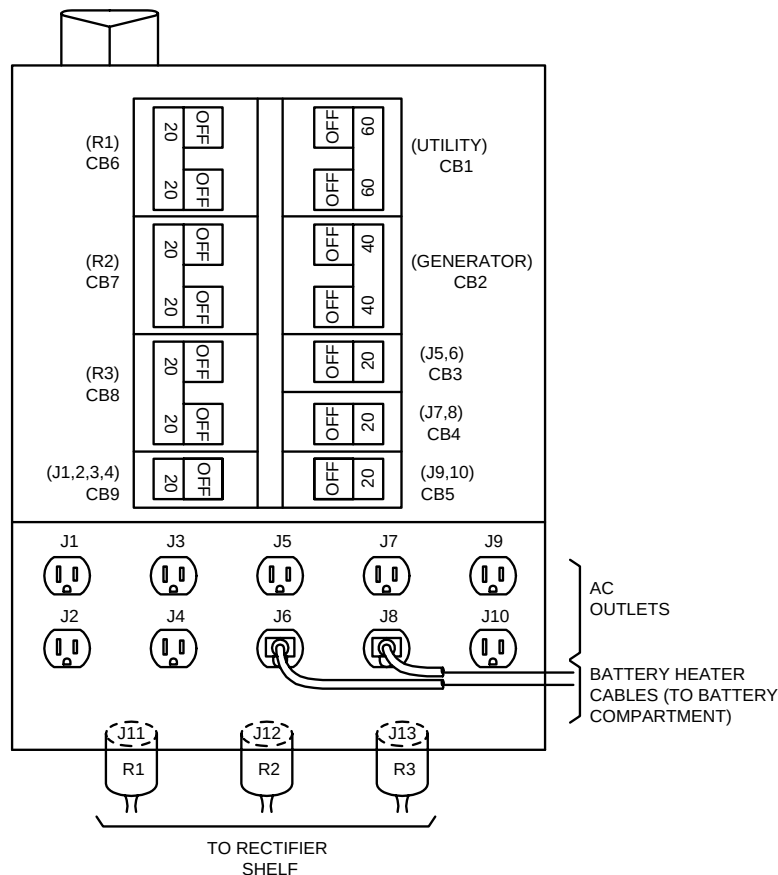


Figure 40 – Typical AC Power Panel in 80A –130 V Power Point Cabinet

2. Verify that no power units are installed.
3. Remove cover from control and distribution panel (Figure 41).

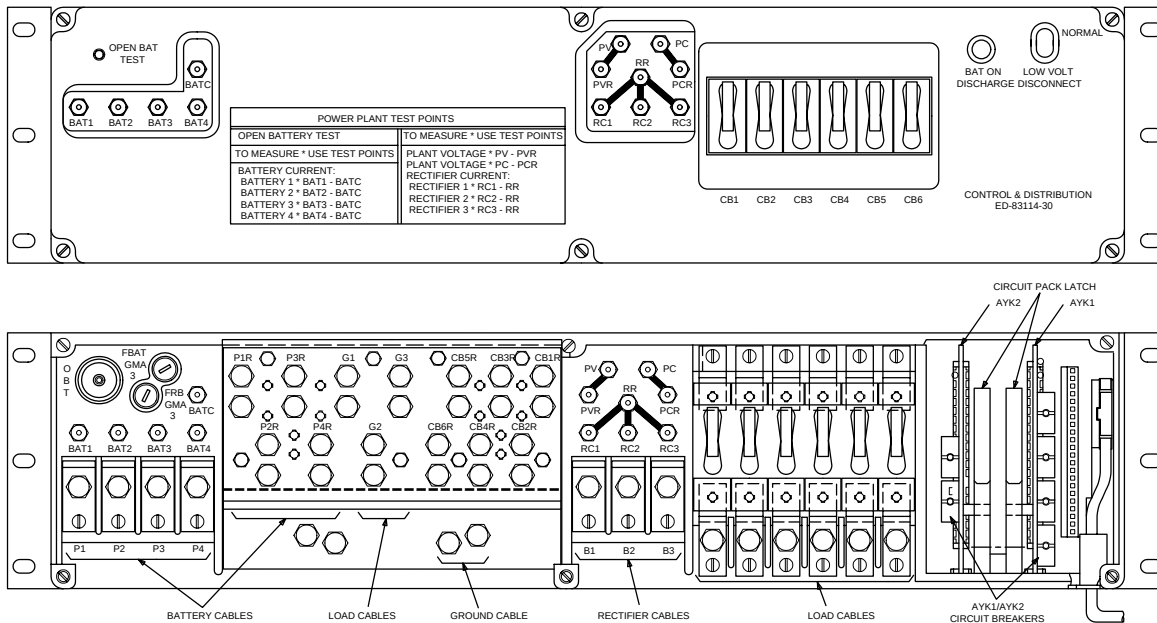


Figure 41 – Connections to Control and Distribution Panel

4. Verify that rectifier cables are connected to **B1**, **B2**, and **B3** terminals (Figure 41). Verify that rectifier return ground cables are connected to **G1**, **G2**, and **G3** terminals (Figure 41).
5. Verify that at least one battery string is connected to control and distribution panel [in battery compartment, make sure **STR()** connector is connected to battery string]. Condition DMM to measure DC volts. Measure battery string voltage at **BAT()** test point and **PVR** test point. Meter will indicate 50.00 V DC or more if battery string is connected.
6. Unseat (but do not remove) AYK1 circuit pack (Figure 42). Verify that rectifier control cables are connected with connectors firmly seated in **J3**, **J2**, and **J1** sockets (Figure 42).

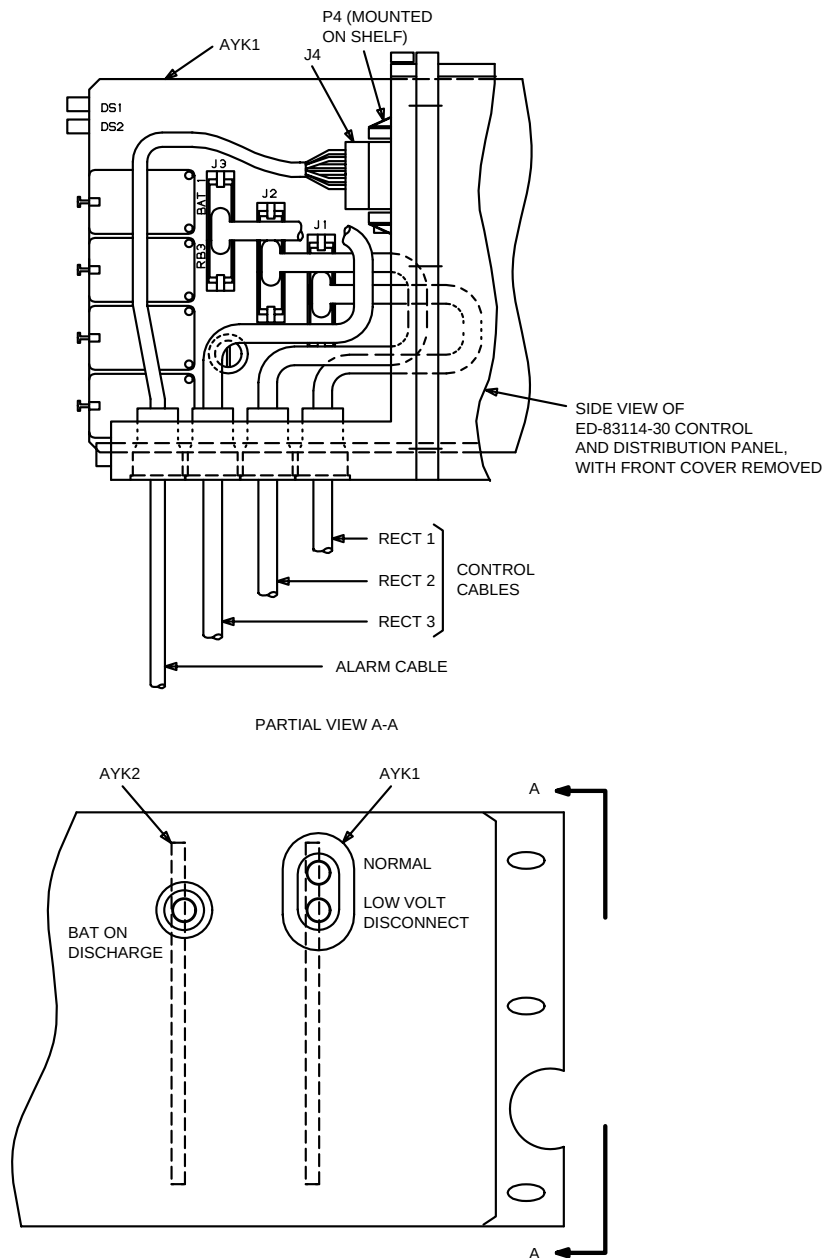


Figure 42 – AYK1 Circuit Pack Mounted in Control and Distribution Panel

7. Reseat AYK1 circuit pack. Verify that AYK1 and AYK2 circuit packs are fully seated. On AYK1 and AYK2, verify that all circuit breakers are set (pins pushed in).

8. On right-hand side of shelf (Figure 42), verify that alarm cable is connected with **J4** connector firmly seated in **P4** socket (Figure 42).

9.



NOTE:

The **FBAT** and **FRB** fuses are factory installed and should not be removed.

On control and distribution panel, verify that **FBAT** and **FRB** fuse holders are installed. On inside of panel cover, verify spare fuses are present and properly installed in fuse holders.

10. Replace cover on control and distribution panel.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install and Test Power Units in Rectifier Shelf

Summary: Install CS787B540 power units. Connect AC input and turn on AC power. On power units, measure float voltage. Requirement: between –54.3 V DC and –54.7 V DC. Connect output and control cables to power units. Requirement: **NORMAL** indicator lighted on control and distribution panel. Measure power unit output voltage. Requirement: between –54.3 V DC and –54.7 V DC. On control and distribution panel, turn on **CB()** circuit breaker(s) for systems to be installed.

1. On AC power panel, verify that AC power **CB1** (utility) circuit breaker is off and **CB6**, **CB7**, and **CB8** circuit breakers for R1, R2, and R3 feeders to rectifier shelf are also off (Figure 43).
2. Release cover from front of rectifier shelf.
3. Get **CS787B540** power unit (48 V DC, 25A OLS rectifier) and inspect for damage.
4. On rectifier shelf, set power unit in **RECTIFIER 1**, **RECTIFIER 2**, or **RECTIFIER 3** position for power unit being installed (Figure 44). Connect **P905-()** (P905-1, P905-2, or P905-3) AC input cable to **J905/V IN** connector on power unit (Figure 45).

Comment: These power units have no backplane connector. Power and control cables plug into connectors on right-hand side of power unit.

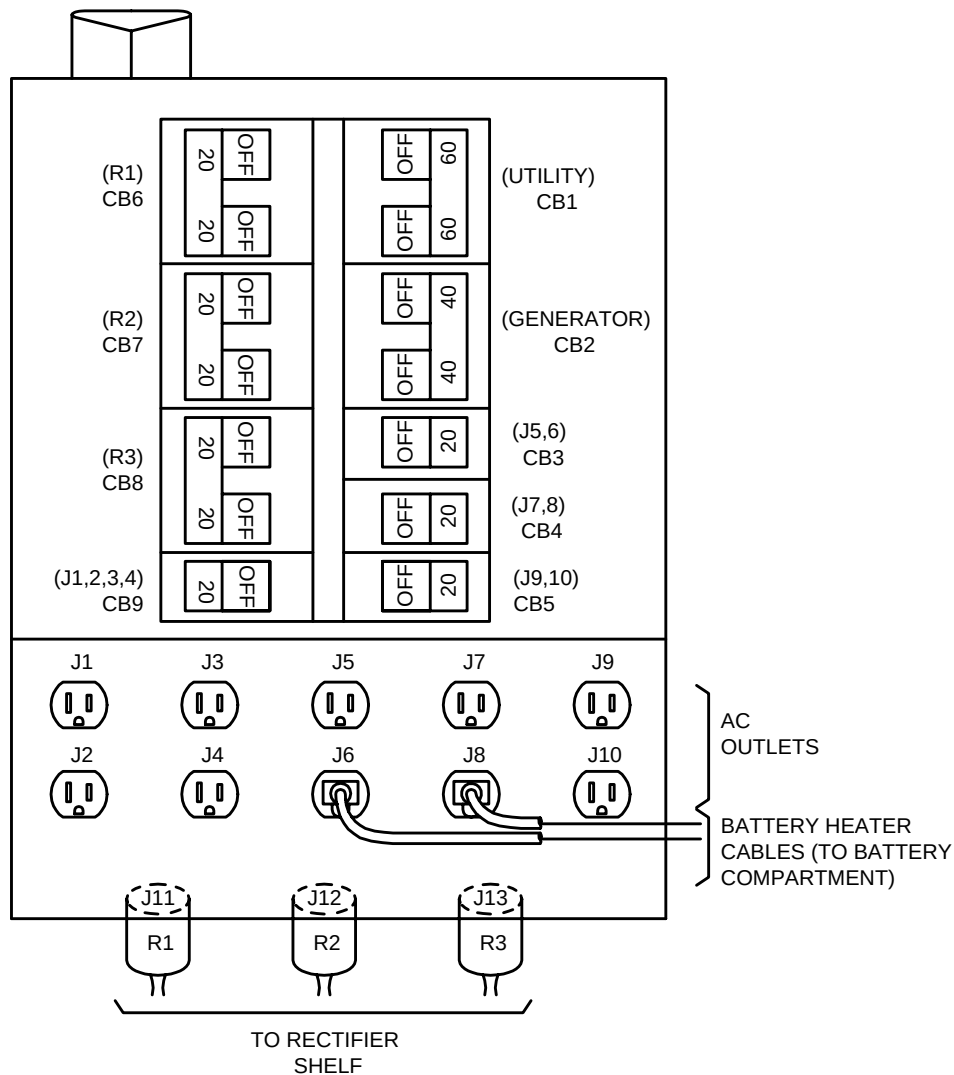


Figure 43 – Typical AC Power Panel in a Cabinet

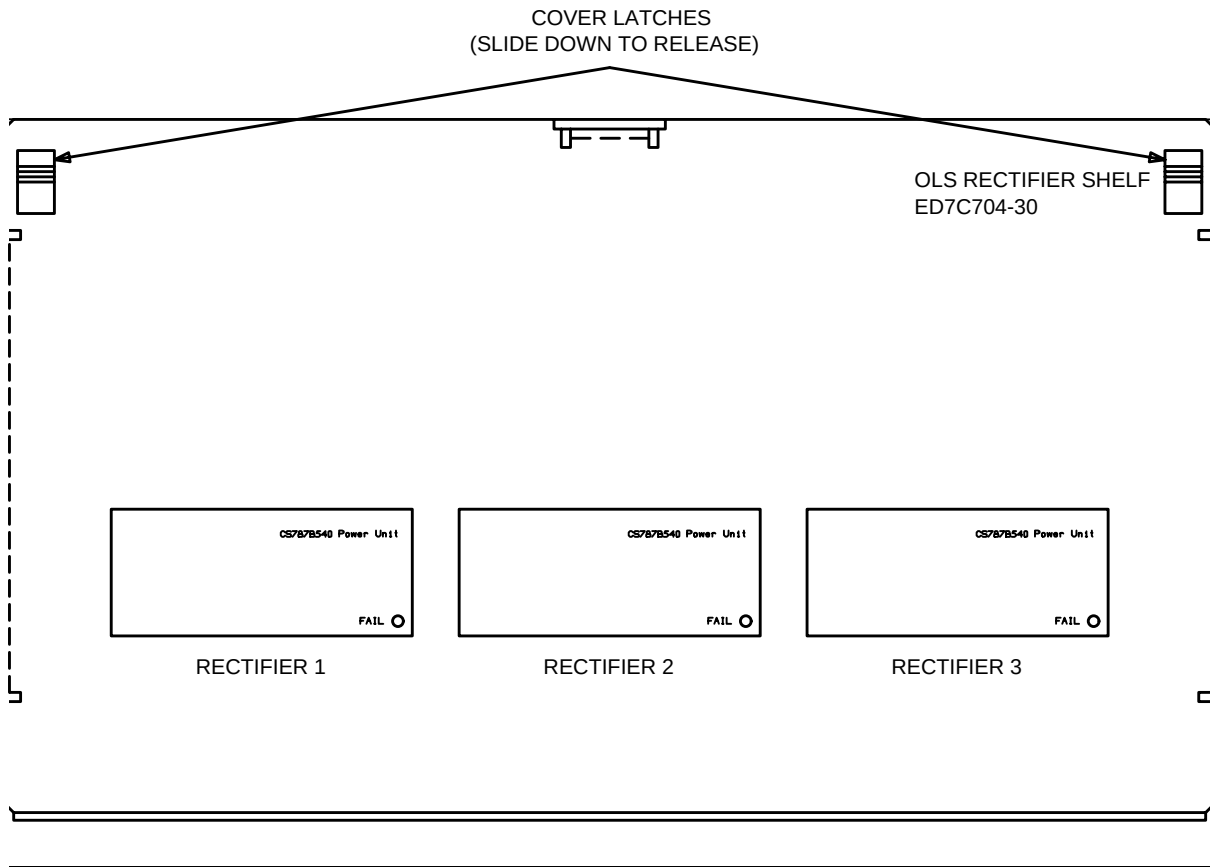


Figure 44 – ED-7C704-30 Rectifier Shelf (with Cover)

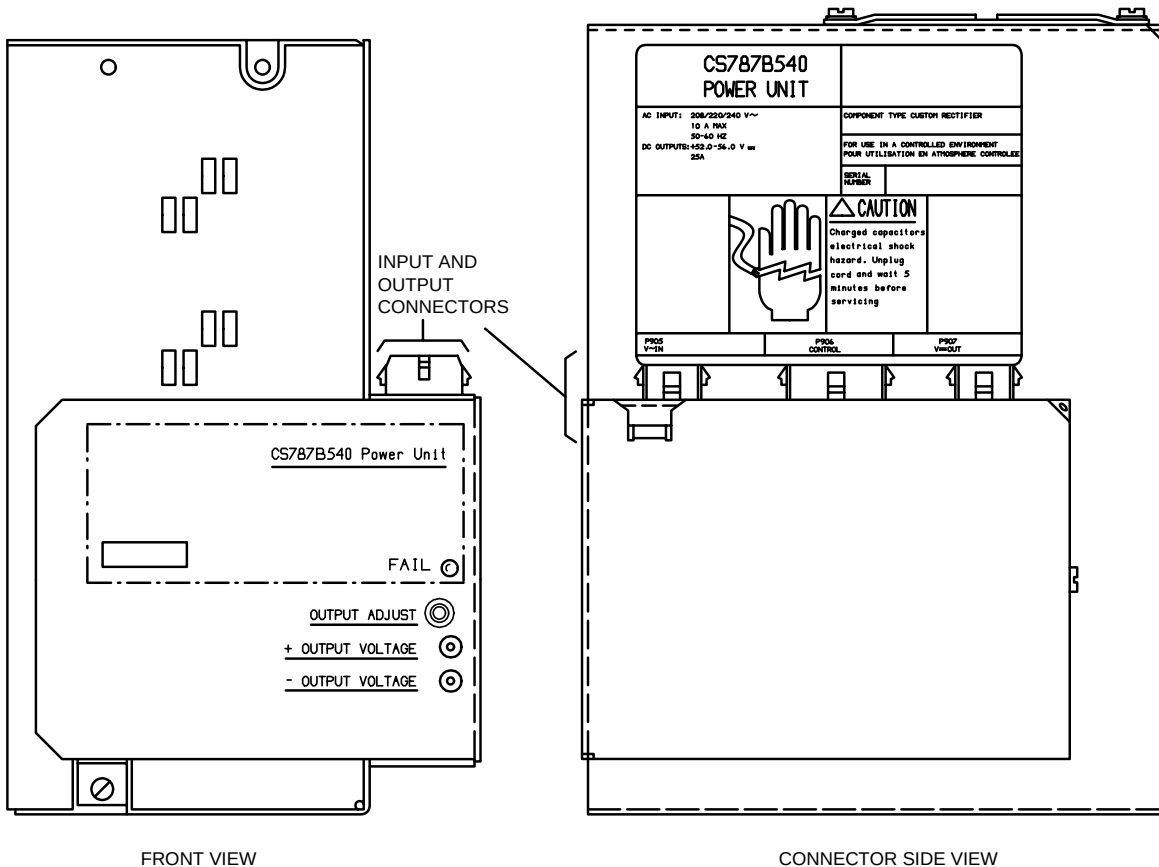


Figure 45 – Front and Top View of CS787B540 Power Unit

5. On AC power panel, turn on **CB1** (utility) circuit breaker.
6. On AC power panel for power unit being installed, verify that **R()** (R1, R2, R3) AC power cord from rectifier shelf is plugged into correct AC outlet (Figure 43). Turn on **CB()** (CB6, CB7, or CB8) circuit breaker to this feeder.
7. On power unit, is **FAIL** indicator off?
If **YES**, then proceed to Step **11**.
If **NO**, then continue with Step **8**.
8. On AC power panel for power unit being installed, turn off circuit breaker to **R()** feeder to power unit.
9. On rectifier shelf, unplug P905 connector and replace power unit.

10. Repeat from Step 4.
11. Condition DMM to measure DC volts. Meter accuracy must be ± 0.3 percent or better.
12. On power unit, connect DMM to + **OUTPUT VOLTAGE** and – **OUTPUT VOLTAGE** test points. Measure DC output voltage (power unit float voltage).
13. Does meter indicate between –54.3 V DC and –54.7 V DC?

 If **YES**, then proceed to Step 17.
 If **NO**, then continue with Step 14.
14. On AC power panel for power unit being installed, turn off circuit breaker to **R()** feeder to power unit.
15. On rectifier shelf, unplug P905-() connector and replace power unit.
16. Repeat from Step 4.
17. Is this the last power unit to be installed?

 If **YES**, then proceed to Step 19.
 If **NO**, then continue with Step 18.
18. On AC power panel for *installed* power unit, turn off circuit breaker to **R()** feeder and repeat from Step 3 for next power unit.
19. On AC power panel, verify that **CB()** circuit breaker(s) are off for **R()** feeder to power unit(s) being installed.
20. On control and distribution panel, verify that **CB()** circuit breakers are off.
21. On rectifier shelf, connect **P906** (P906-1, P906-2, or P906-3) cable to **J906/CONTROL** connector and **P907** (P907-1, P907-2, or P907-3) cable to **J907/V–OUT** connector on each power unit being installed (Figure 45).
22. On AC power panel, turn on circuit breaker(s) for **R()** feeder to power unit(s).
23. On control and distribution panel, is **NORMAL** indicator lighted?

 If **YES**, then proceed to Step 25.
 If **NO**, then continue with Step 24.

24. Check circuit breakers on AYK1 and AYK2 circuit packs. Reset any breaker that has tripped (pin popped out). If breaker trips again, replace circuit pack. If **NORMAL** indicator remains off, reinstall original circuit pack. Trouble may be in P906-() rectifier control cables, P907-() rectifier output cables, or J4 alarm cable between control and distribution panel and rectifier shelf. To check wiring on control and distribution panel, refer to SD-83109-01. To check cabinet cabling, refer to the appropriate application schematic for the cabinet. Correct wiring problem until **NORMAL** indicator is lighted.

25. Connect DMM to **PV** and **PVR** test points.

26. Does meter indicate between -54.3 V DC and -54.7 V DC?

If **YES**, then proceed to Step 28.

If **NO**, then continue with Step 27.

27. Refer to SD-83109-01 to check wiring on control and distribution panel. Correct wiring problem until meter indicates correctly.

28.



NOTE:

Each circuit breaker on control and distribution panel supplies an equipment bay according to the cabinet group arrangement. To identify circuit breakers, refer to the label located on the door opposite the control and distribution panel.

On control and distribution panel, turn on **CB()** circuit breaker to equipment bay for system(s) being installed.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Option and Install BYB2 Line Interface Unit in MSDT



WARNING:

Under no circumstances should the signal lines be run to outside plant cables or equipment when the BYB2 is optioned for the DSX mode. The DSX mode of operation is intended for inside plant applications only.

1. Set the **BYB2** (see Figure 46) line coding option (**S5-B/Z**) to the line coding specified in the work order [zero code suppression "Z" (AMI/ZCS), or bipolar with 8 zero code substitution "B" (B8ZS)].
2. Set both S3 and S4 facility interface options to either **DSX** (when connecting to a DSX-1) or **T1** (when connecting directly to a T1 facility).
3. Set the DSX line build-out switch **S6** per Table Q.
4. Set the T1 line transmit and receive pad switches **S2/S1/S5** per Table R.

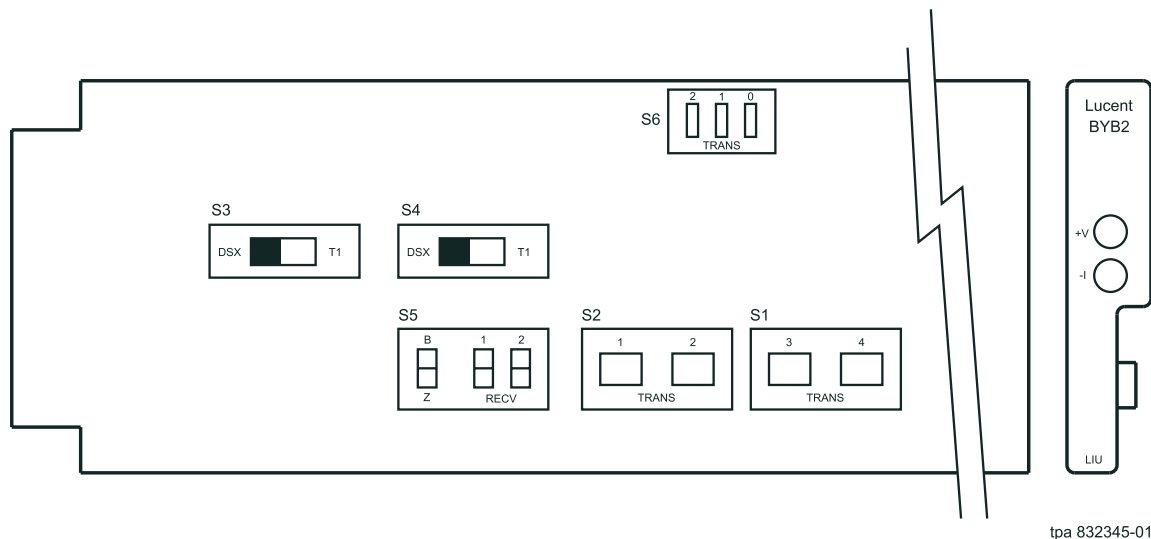


Figure 46 – BYB2 T1 Interface Faceplate and Switch Location

Table Q – DSX Mode Line Build-Out Settings

Distance to DSX-1 (Feet)	Equalizer Switch (S6) Settings		
	2	1	0
0-132	OFF	OFF	ON
133-265	OFF	ON	OFF
266-398	OFF	ON	ON
399-532	ON	OFF	OFF
533-655	ON	OFF	ON

Table R – T1 Mode Transmit and Receive Pad Settings

Inserted Loss (dB)	Transmit Pad (S2/S1) Switch Settings				Receive Pad (S5) Switch Settings	
	1	2	3	4	1	2
22.5	OFF	OFF	OFF	ON	-	-
15.0	OFF	OFF	ON	OFF	-	-
7.5	OFF	ON	OFF	OFF	OFF	ON
0	ON	OFF	OFF	OFF	ON	OFF

5. Insert the **BYB2** in the **OU** slot of the *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT).

Comment: The BIU alarms will depend on the status of the T1 link from the remote terminal (RT) (typically CLF and the number 8 displayed). The BIU alarm indicators will not change when the BYB2 is installed unless the host RT system is turned up and equipped with MSDT Server unit and T1 line is operational.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install –130 or ±130 V DC AUA426 PIU in MSDT

1. Verify (or install) the MSDT protector is installed in the field wiring box.
2. Install **AUA426 PIU** in power interface unit (PIU) slot (Figure 47).

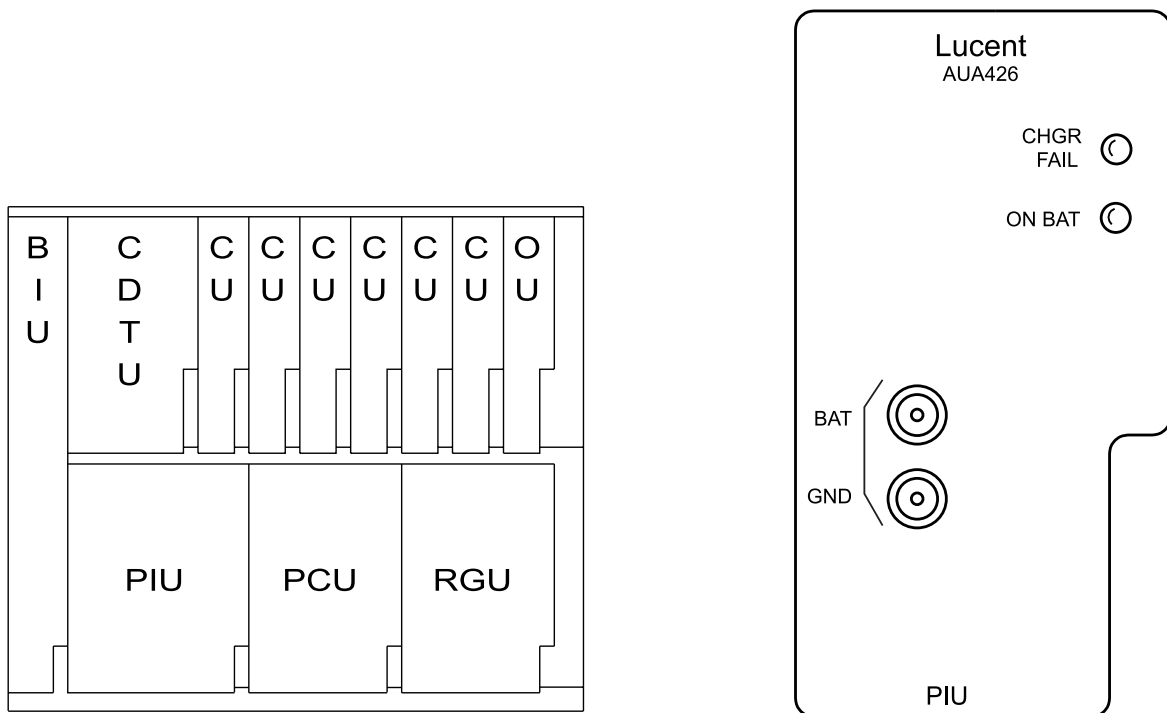


Figure 47 – –130 or ±130 V DC AUA426 PIU

3. Measure –48 (**BAT** to **GND**) PIU DC voltage.
Requirement: –48 (–45 to –56) V DC (measured without PCU installed).

4. Were PIU voltage requirements met?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, verify –130 V DC central powering connections to the field wiring box CATV terminals with good power feed protectors installed.

Replace PIU if no power trouble is found.



CAUTION:

Unlatch PIU and wait 1 minute for capacitors to discharge before handling.

Install ± 130 V DC AUA427 PCU in MSDT

1. Install **AUA427 PCU** in power converter unit (PCU) slot (Figure 48).

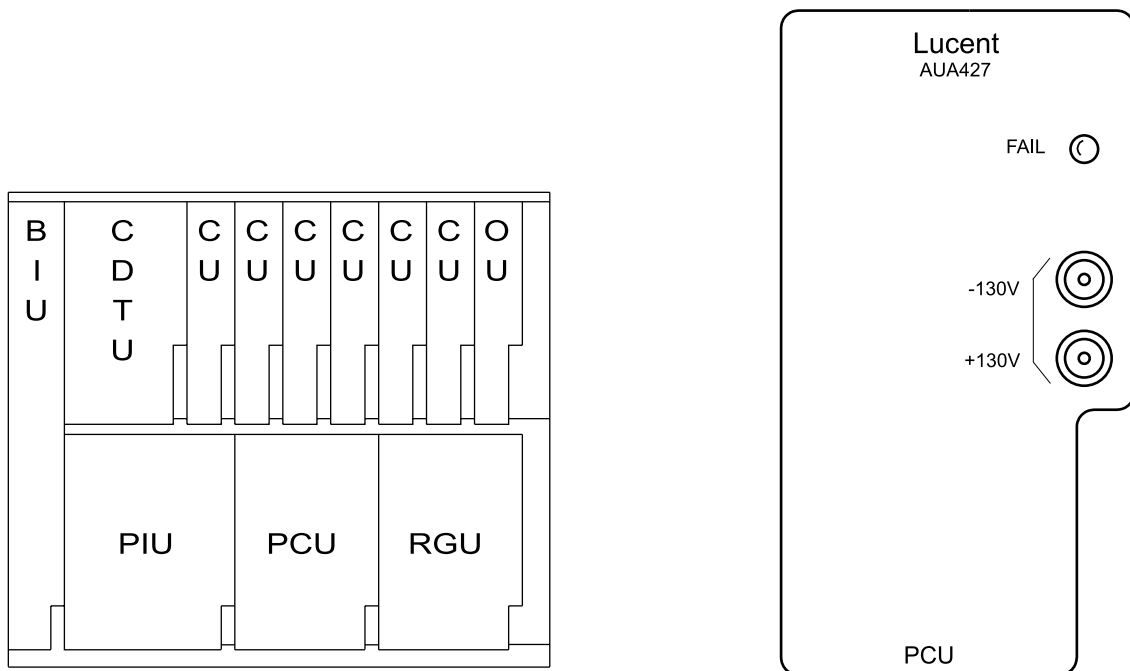


Figure 48 – ± 130 V DC AUA427 PCU

2. Is **FAIL** indicator lighted on PIU or PCU?
If **YES**, continue with Step 3.
If **NO**, proceed to Step 6.
3. Replace **AUA427 PCU**, **AUA416 PIU**, or **AUA426 PIU** with **FAIL** or **CHGR FAIL** lighted.

4. Is **FAIL** or **CHGR FAIL** indicator lighted?

If **YES**, continue with Step 5.

If **NO**, proceed to Step 6.

5. Use SD drawings to locate and repair wiring trouble.
6. Measure DC (**+130 V** to **-130 V RTN**) PCU voltages.
Requirement: 260 (140 to 260) V DC.
7. Were PCU voltage requirements met?

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, replace PCU. If power trouble does not clear, replace PIU and repeat this procedure.

Install 60 V AC AUA424 PIU in MSDT

1. Verify (or install) the MSDT protector is installed in the field wiring box.
- 2.

⇒ **NOTE:**
Fuses for the PIU should not be installed while the PCU is installed.
Remove the PCU before installing fuses in the PIU.

Install **AUA424 PIU** in power interface unit (PIU) slot (Figure 49).

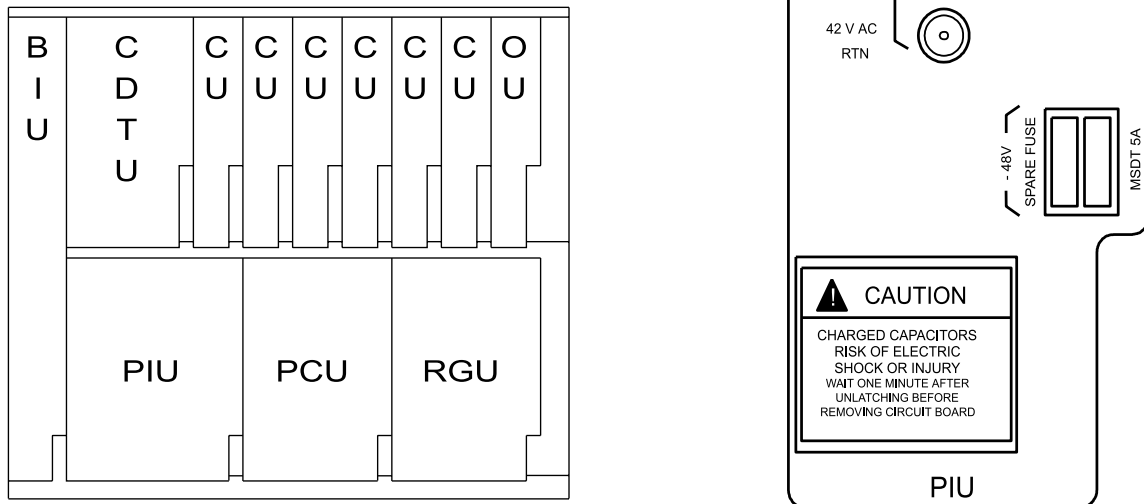


Figure 49 – 60 V AC AUA424 PIU

3. Measure AC (**42 V AC to 42 V AC RTN**) PIU voltages.
Requirement: 42 (26.5 to 46.5) V AC.

4. Were PIU voltage requirements met?

If **YES**, then continue with Step 5.

If **NO**, verify AC power (and AC fuse is good) to the cabinet. Replace PIU if no power trouble is found.



CAUTION:

Unlatch PIU and wait 1 minute for capacitors to discharge before handling.

5. Install **MSDT 5A** fuse. Install **SPARE 5A** fuse, if required.

6. Did fuse(s) blow?

If **YES**, then continue with Step 7.

If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Refer to appropriate schematic drawings (SDs) to clear *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) wiring trouble.

Install 60 V AC AUA422 PCU in MSDT

1. Ensure PIU fuses are installed. Then install **AUA422 PCU** in power converter unit (PCU) slot (Figure 50).

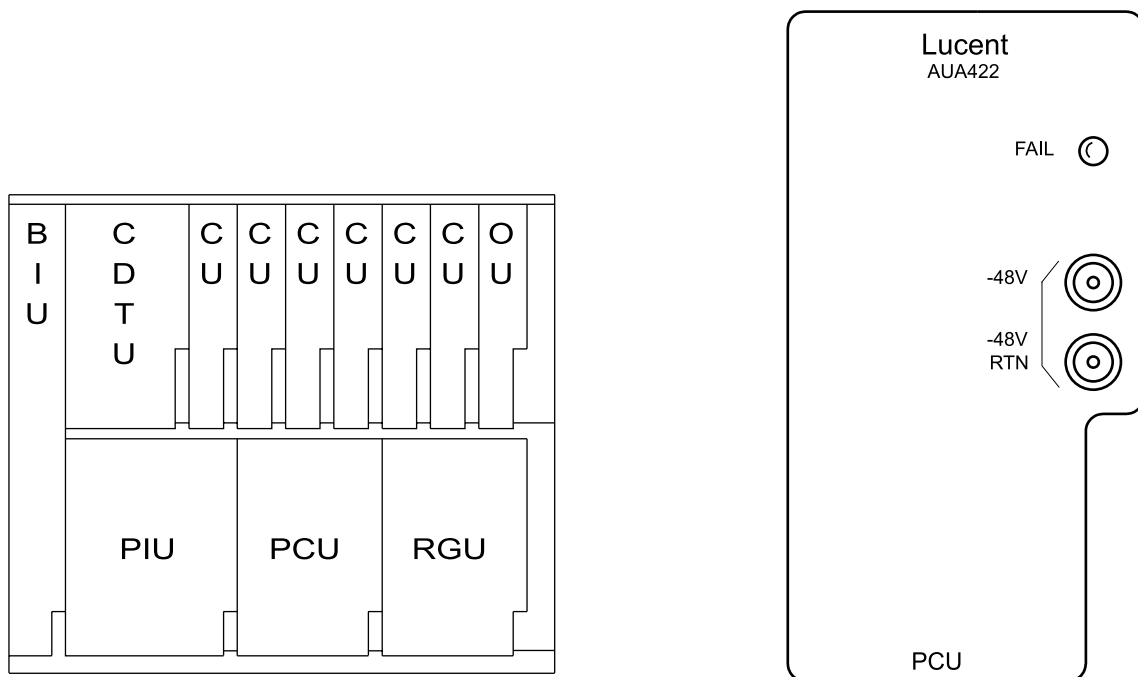


Figure 50 – 60 V AC AUA422 PCU

2. Is **FAIL** indicator lighted on PIU or PCU?

If **YES**, continue with Step 3.

If **NO**, proceed to Step 6.

3. Replace **AUA422 PCU** or **AUA424 PIU** with **FAIL** lighted.



CAUTION:

Unlatch PIU and wait 1 minute for capacitors to discharge before handling.

4. Is **FAIL** indicator lighted?

If **YES**, continue with Step 5.

If **NO**, proceed to Step 6.

5. Use schematic drawings (SDs) to locate and repair wiring trouble.

6. Measure DC (**-48 V** to **-48 V RTN**) PCU voltages.

Requirement: -48 (-28 to -60) V DC.

7. Were PCU voltage requirements met?

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, replace PCU. If power trouble does not clear, replace PIU and repeat this procedure.

Verify T1 Feeder Connections

1. Open the rear access door of the MSDT (see Figure 51) and verify that the ground wire from the T1 protector block is connected to the MSDT ground bus.
2. Verify that the T1 feeder pairs are connected to T/R and T1/R1 protectors.
3. Verify that the factory installed wires are connected to T/R and T1/R1 protectors.
4. Verify that the T1 feeder and factory installed wires are tied to the tie-down loops on the right side of the MSDT cabinet.
5. Resolve problems through local procedures.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

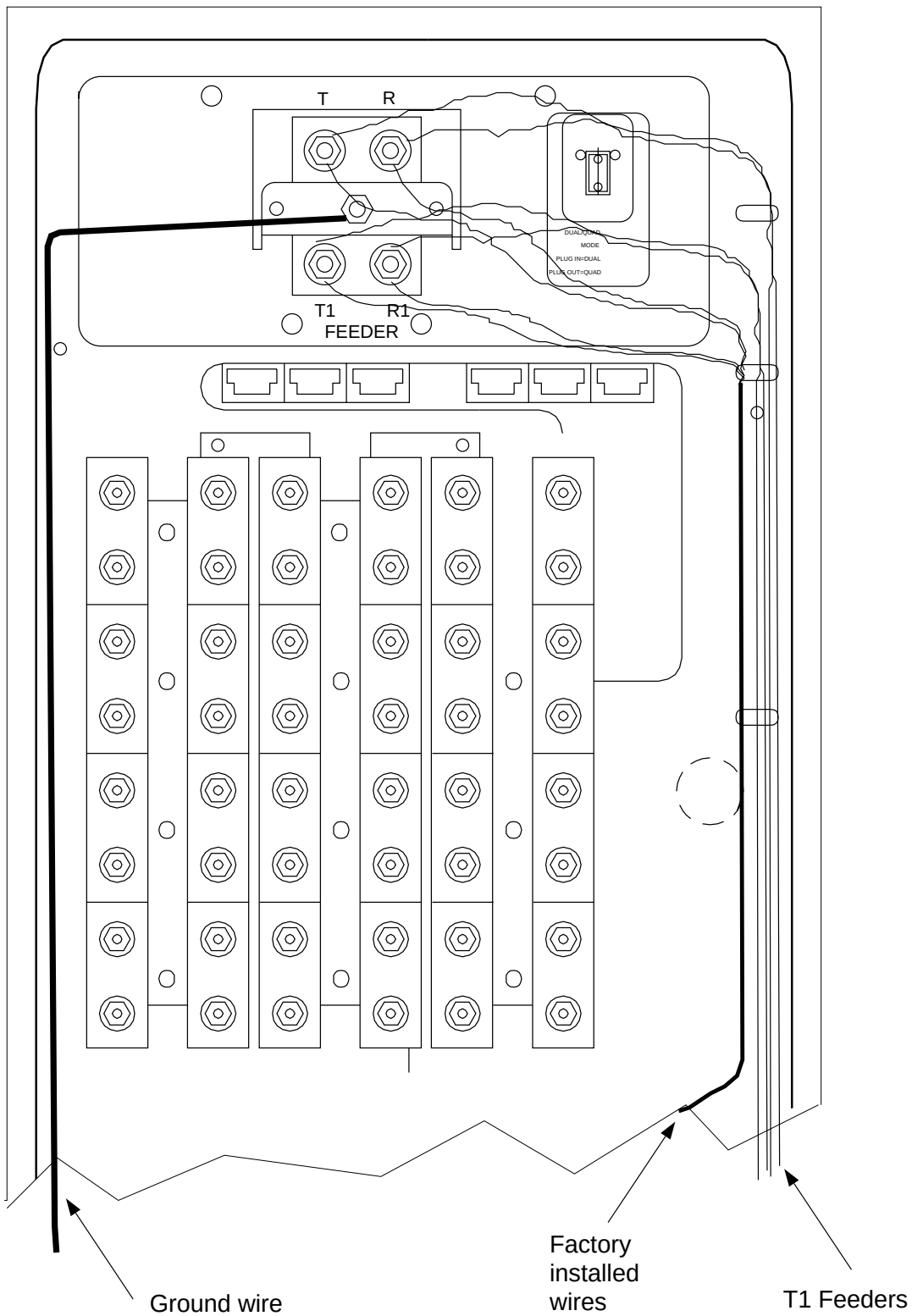


Figure 51 – T1 Feeder Connection to MSDT

Provision MSDT Server Unit Time Slot Allocation

1. Connect a craft interface terminal (CIT) to the user interface panel (UIP) CIT jack and log into the DLC subsystem. For details on logging into the system, refer to 363-208-003, *SLC[®]-2000 Access System Commands and Messages*.
2. Determine the access identifier (AID) of the MSDT Server channel unit slot. The AID has the following syntax:

dt - Shelf# - CU#

where:

shelf# is the digital loop carrier (DLC) system or shelf number {1-8} **CU#** is the first slot label number in the left most slot that the MSDT Server unit is installed in {1,3,5,7,13,15,17,19}.

example: *dt-1-1*

If 12 time slots are to be used, 2 MSDT Server slots (in a group of 24 time slots) must be provisioned for 12 time slots. The default number of time slots allocated is 24. The following Table S shows how 24-time slot groups are allocated:

Table S – Allocation of 24-Time Slot Groups

MSDT Server Slots for 24-Line MSDTs	
	1
	5
	13
	17
MSDT Server Paired Slots for 12-Line MSDTs	
First 12 Lines*	Second 12 Lines*
1	3
5	7
13	15
17	19

*Note that 12-line MSDT Servers are installed in pairs, with 24 lines per pair. Also note that the first server of the pair is installed in one of the slots that is also used for 24-line MSDT Servers (default provisioning). When installing 12-line MSDT Servers, first provision the first (left) MSDT Server of the pair to 12 lines, then provision the second (right) MSDT Server to 12 lines. It is permissible to have two 12-line MSDT Servers in one group and one 24-line MSDT Server in the other group of an MDC.

If MSDT Servers are to be provisioned for 12-line service, use the "**ed-dt::AID:lines=12**" CIT command to provision both MSDT Servers of the 24-line group. You can use the "**rtrv-dt::AID**" command to review the current circuit allocation to an MSDT Server. Refer to the previous page for AIDs of MSDT Servers.



NOTE:

This command is not valid if there are DS0 cross-connections active. Before changing the line states of the MSDT, remove the DS0 cross-connections.

- On the CIT, enter **rtrv-dt** to review the time slot allocation of an MSDT Server.
- At the *address=* prompt, enter the AID determined in Step 2.
Response: The CIT will print a message indicating the *Lines Provisioned Value* for the MSDT Server's slot whose AID you entered.

If the MSDT Server slot has the correct provisioned value for the number of lines, proceed to Step 8.

- Press DELeTE or CANceL key. Then enter **ed-dt**.

6. At the *address=* prompt, enter the AID determined in Step 2.
7. At the *lines=* prompt, enter the number of time slots to be allocated, 12 or 24.

If prompted for an *Execute?* enter "y".

Response: You will see a completion message for a valid command entry or an error message.

Comment: If groups of 12 time slots are to be allocated, you must use the **ed-dt** command to provision both MSDT Servers in the 24-time slot group.

8. Press DELeTe or CANceL key. Then enter **logoff** and disconnect the CIT, if necessary.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install *SPQ*[®] 808 or *SPQ*809 (or Later) MSDT Server

1. Verify that the metallic distribution shelf has been configured for fiber in the loop (FITL) with the SET-DISTN user interface panel (UIP) command.
2. Verify that the Multi-Services Distant Terminal (MSDT) Server has been provisioned for the correct number of time slots using the **ED-DT** craft interface terminal (CIT) command at the *SLC*[®]-2000 HDT.

Reference: **DLP-532**

3. Verify that the options have been selected on the MSDT Server.

Reference: **DLP-515**

4. Perform one of the following, depending on how the MSDT is fed from the HDT:
 - Optical Feeder Through the HDOS. Verify that the high density optics shelf (HDOS) is equipped with the appropriate fuse, **AYB2 PCU, OU**, and that the optical fiber connection has been made (see Table T).
 - Metallic Feeder. At the MSDT, verify that the MSDT LIU (BYB2) is properly installed and connected.

5. Verify that the *SLC*[®]-2000 MSDT has been turned up.

6. Install the MSDT Server in the appropriate channel unit slots in the appropriate metallic distribution shelf (see Table T).

Response: All alarms clear within 3 minutes.



NOTE:

If the following software and equipment are installed, a software download to the BIU will be initiated if the software in the BIU does *not* match the software in the SMU:

- SPQ809 or later MSDT Server .
- MSDT BIU is an MC97793A1.
- SLC-2000 HDT software Release is R3.2 or later.

If a software download to the BIU was initiated, verify that the installation is complete. Perform **DLP-537** to verify that the BIU software version corresponds to the features required for the MSDT application.



CAUTION:

At the SLC-2000 HDT, only MSDT Servers should be installed in the channel unit slots of a MDS assembly shelf provisioned for FITL distribution. Other channel units may adversely affect MSDT service (see Chapter 3 for exceptions).

7. Press the UIP **LED Test** button.

If all LEDs on the MSDT Server do not light, replace the MSDT Server.

If no MSDT Server LEDs light, replace the MSDT Server, then replace the associated **MDC**.

8. Did all alarms clear?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

If **NO**, then continue with Step 9.

9. Clear alarms using **TAP-101**.

Table T – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes)

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame
MDS 1, shelf 1	CU 1	dt-1-1	1, F1	OU 1	SH-1-1
	CU 3 *	dt-1-3	1, F1	OU 3 *	SH-1-3
	CU 5	dt-1-5	1, F1	OU 5	SH-1-5
	CU 7 *	dt-1-7	1, F1	OU 7 *	SH-1-7
	CU 13	dt-1-13	2, F2	OU 13	SH-1-13
	CU 15 *	dt-1-15	2, F2	OU 15 *	SH-1-15
	CU 17	dt-1-17	2, F2	OU 17	SH-1-17
	CU 19 *	dt-1-19	2, F2	OU 19 *	SH-1-19
MDS 1, shelf 2	CU 1	dt-2-1	3, F3	OU 1	SH-2-1
	CU 3 *	dt-2-3	3, F3	OU 3 *	SH-2-3
	CU 5	dt-2-5	3, F3	OU 5	SH-2-5
	CU 7 *	dt-2-7	3, F3	OU 7 *	SH-2-7
	CU 13	dt-2-13	4, F4	OU 13	SH-2-13
	CU 15 *	dt-2-15	4, F4	OU 15 *	SH-2-15
	CU 17	dt-2-17	4, F4	OU 17	SH-2-17
	CU 19 *	dt-2-19	4, F4	OU 19 *	SH-2-19
MDS 2, shelf 3	CU 1	dt-3-1	5, F5	OU 1	SH-3-1
	CU 3 *	dt-3-3	5, F5	OU 3 *	SH-3-3
	CU 5	dt-3-5	5, F5	OU 5	SH-3-5
	CU 7 *	dt-3-7	5, F5	OU 7 *	SH-3-7
	CU 13	dt-3-13	6, F6	OU 13	SH-3-13

See notes and footnote at end of table.

Continued on next page

Table T – SLC®-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX® Frame
	CU 15 *	dt-3-15	6, F6	OU 15 *	SH-3-15
	CU 17	dt-3-17	6, F6	OU 17	SH-3-17
	CU 19 *	dt-3-19	6, F6	OU 19 *	SH-3-19
MDS 2, shelf 4	CU 1	dt-4-1	7, F7	OU 1	SH-4-1
	CU 3 *	dt-4-3	7, F7	OU 3 *	SH-4-3
	CU 5	dt-4-5	7, F7	OU 5	SH-4-5
	CU 7 *	dt-4-7	7, F7	OU 7 *	SH-4-7
	CU 13	dt-4-13	8, F8	OU 13	SH-4-13
	CU 15 *	dt-4-15	8, F8	OU 15 *	SH-4-15
	CU 17	dt-4-17	8, F8	OU 17	SH-4-17
	CU 19 *	dt-4-19	8, F8	OU 19 *	SH-4-19
MDS 3, shelf 5	CU 1	dt-5-1	1, F1	OU 1	SH-5-1
	CU 3 *	dt-5-3	1, F1	OU 3 *	SH-5-3
	CU 5	dt-5-5	1, F1	OU 5	SH-5-5
	CU 7 *	dt-5-7	1, F1	OU 7 *	SH-5-7
	CU 13	dt-5-13	2, F2	OU 13	SH-5-13
	CU 15 *	dt-5-15	2, F2	OU 15 *	SH-5-15
	CU 17	dt-5-17	2, F2	OU 17	SH-5-17
	CU 19 *	dt-5-19	2, F2	OU 19 *	SH-5-19
MDS 3, shelf 6	CU 1	dt-6-1	3, F3	OU 1	SH-6-1
	CU 3 *	dt-6-3	3, F3	OU 3 *	SH-6-3

See notes and footnote at end of table.

Continued on next page

Table T – SLC®-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX®Frame
	CU 5	dt-6-5	3, F3	OU 5	SH-6-5
	CU 7 *	dt-6-7	3, F3	OU 7 *	SH-6-7
	CU 13	dt-6-13	4, F4	OU 13	SH-6-13
	CU 15 *	dt-6-15	4, F4	OU 15 *	SH-6-15
	CU 17	dt-6-17	4, F4	OU 17	SH-6-17
	CU 19 *	dt-6-19	4, F4	OU 19 *	SH-6-19
MDS 4, shelf 7	CU 1	dt-7-1	5, F5	OU 1	SH-7-1
	CU 3 *	dt-7-3	5, F5	OU 3 *	SH-7-3
	CU 5	dt-7-5	5, F5	OU 5	SH-7-5
	CU 7 *	dt-7-7	5, F5	OU 7 *	SH-7-7
	CU 13	dt-7-13	6, F6	OU 13	SH-7-13
	CU 15 *	dt-7-15	6, F6	OU 15 *	SH-7-15
	CU 17	dt-7-17	6, F6	OU 17	SH-7-17
	CU 19 *	dt-7-19	6, F6	OU 19 *	SH-7-19
MDS 4, shelf 8	CU 1	dt-8-1	7, F7	OU 1	SH-8-1
	CU 3 *	dt-8-3	7, F7	OU 3 *	SH-8-3
	CU 5	dt-8-5	7, F7	OU 5	SH-8-5
	CU 7 *	dt-8-7	7, F7	OU 7 *	SH-8-7
	CU 13	dt-8-13	8, F8	OU 13	SH-8-13
	CU 15 *	dt-8-15	8, F8	OU 15 *	SH-8-15
	CU 17	dt-8-17	8, F8	OU 17	SH-8-17
	CU 19 *	dt-8-19	8, F8	OU 19 *	SH-8-19

See notes and footnote at end of table.

Continued on next page

Table T – SLC[®]-2000 MDS to HDOS Circuit Configuration (Notes) —Continued

MDS, Shelf First HDOS	MSDT Server Slot	MSDT Server AID	HDOS PCU Slot and Fuse	HDOS OU Slot	Fiber Label at LGX[®] Frame

Notes:

1. The MSDT Servers must be installed in the slots listed. The circuits served do not necessarily correspond with the slot label that the MSDT Server is installed in (see 363-208-001 for details).

2. The access identifier (AID) has the syntax of:

`dt-shelf#-physical slot # in HDT`

where:

`shelf#` is the digital loop carrier (DLC) system or shelf number {1-8}

`physical slot # in HDT` is the slot for the MSDT Server {1,3,5,7,13,15,17,19}

3. The PCU powers four optical units to the left.

4. For a second HDOS, the shelf labels SH-1 through SH-4 refer to VRT shelves 5 through 8.

* These slots can only be used when the MSDT Servers are provisioned for 12 channels.

Turn Up HDT in *SLC*[®] Series 5/MSDT System

Overview: This procedure assumes that installation personnel are familiar with 363-205-401, *RT Acceptance and Turnup Procedures*.

⇒ **NOTE:**
Whenever circuit packs equipped with a **FAIL** LED are installed in the HDT bank, the **FAIL** LED will light briefly and then go out. Replace any pack whose **FAIL** LED remains lighted. Disregard all other indicators unless noted otherwise.

1. Perform the following items before beginning the procedure:
 - Obtain the required circuit packs for the banks being turned up.
 - Obtain a digital multimeter with an AC and DC meter accuracy of 1.0 percent and an AC and DC input impedance of ≥ 1 megohm.
 - Visually inspect the physical condition of all shelves in the HDT dual bank.
 - Visually inspect the electrical and optical cabling and interconnections (including ground connections) at the HDT frame and the optical interconnect.
2. At the HDOS shelf, install the AYB2B (PCU) into the appropriate slot being turned up. The PCU provides power to the four left-hand optical units.
- 3.

⇒ **NOTE:**
The **LFU** is not required if one of the following is true:

- You are connecting the HDT to a multiplexer and the multiplexer is not a DDM-1000 or a DDM-2000 Multiplexer.
- You are using the 61D (DSX) **LIUs**.
- You are using an AUA105 TRU here.

Install the **CFU** for the bank being equipped, **LFU**, and the facility shelf **PCU**. Measure the DC voltage on the **PCU** faceplate. The voltage should read between -42 and -56 V DC.

4. Install the **BCU** (MC97779A1) for the bank being equipped.



NOTE:

The **FAIL** LED will not light until the **ADU** is installed.

5. Condition the **ADU** (AUB27) as follows before installation:
 - a. On the **ADU**, set the option switches to preservice and equipped state for shelves being equipped.
 - Set option **S1** switches as follows:
 - Position **1** toward **PL** for protection switching or **NPL** for no protection switching.
 - Position **2** toward **64**.
 - Position **3** toward **ABP** if shelf group AB is being equipped.
 - Position **4** toward **CDP** if shelf group CD is being equipped.
 - Position **5** toward **ABE**.
 - Position **6** toward **CDE** if shelf group CD is being equipped. Otherwise, set it toward **CDU**.
 - Position **7** toward **1MJ** if RT MISC1 is to report a major alarm or toward **1MN** if RT MISC1 is to report a minor alarm.
 - Position **8** toward **2MJ** if RT MISC2 is to report a major alarm or toward **2MN** if RT MISC2 is to report a minor alarm.
 - Set option **S2** switches as follows:
 - Position **1** toward **13**.
 - Position **2** toward **FE**.
 - Position **3** toward **NC** for all preservice applications.
 - Position **4** toward **DBL**.
 - Position **5** toward **NPA**.
 - Position **6** toward **MNP**.
 - Position **7** and **8** unused.
 - Set switch **S3** towards **DL**.
 - Set the system identification rotary switches **S4** through **S7** to the bank ID number.
 - Set the rotary switches **S8** through **S11** to 0.
 - b. Set the **NORMAL/CLEAR** option plug for the **CLEAR** option.

6. Install the **ADU** and verify that the **BCU FAIL** and the **ADU FAIL, MN, and NE** indicators come on and, after approximately 20 seconds, go off. Disregard any indicators that may be lighted afterwards.
7. Install the **PCU** in the dual channel back shelves being equipped. Measure the DC voltage on all **PCUs** installed. The voltage should read between -42 and -56 V DC.
8. Install the **TRU(s)** for the shelves being equipped. Verify that the associated **BCU** digroup indicators are lighted.
9. Set the switches on the **LIUs** per the work order. If the **LIU** is B, C, or D, set the **RATE** switch (S4) to **64**.

10.



NOTE:

All **LIUs** in the same bank should have identical switch settings.

Install the **LIUs** in sequence for the shelves being equipped. Verify that the **BCU DIGROUP** indicators associated with the digroup go out after the **LIU** is installed.

11. Install the **AUA24 FCU**.
12. If protection switching is used, set the option switches on the **LSU** as follows:
 - **Faceplate Switches** — Off (right-hand side)
 - **Rate** — 64.
13. Install the **LSU**.
14. If protection switching is used, install the protection **LIU**.
15. Install the **CTU**.
16. Press and hold the **LED TEST** push button on the **ADU**. All indicators on the following units should be lighted for the bank being equipped:
 - **LIUs**
 - **TRUs**
 - **BCLU**
 - **CTU**.
17. If alarms are present, clear alarms using 363-205-401, *RT Acceptance and Turnup*.

18. At the HDOS shelf, install the AYB2B **PCUs** required. One AYB2B PCU provides power for a group of four optical unit slots to the left of the PCU.
19. Per the work order, install the **AUA406/AUA408** in the proper channel unit slot.
20. Set the **AUA406/AUA408** for the proper number of slots (as described in **DLP-515**).
21. Install the **AYB1B** optical unit in the optical shelf slot associated with the above inserted **AUA406/AUA408** channel unit.
22. Update the office records.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Perform End-to-End System Test of HDT in *SLC*[®] Series 5/MSDT System

Overview: This procedure assumes that system test personnel are familiar with 363-205-406, *End-to-End System Tests*.

1. Perform the following items before beginning the procedure:
 - Obtain a digital multimeter with an AC and DC meter accuracy of 1.0 per-cent and an AC and DC input impedance of ≥ 1 megohm.
 - Obtain a craft interface unit (CIU) (J99404TA).
 - Obtain a WP91067,L6 test cable.
 - Obtain a 1015B dial hand test set (butt set).
 - Ensure that the COT, HDT, and MSDT equipment has been installed, accepted, and turned up per the abbreviated COT, HDT, and MSDT turn-up procedures in this document.
2. If you are using a T1 digital facility, go to Step 4; otherwise, continue with Step 3.
3. Verify that the following connections and cross-connections have been made:
 - Connections and cross-connections between the COT, DSX cross-connect, and the DDM-1000 or a DDM-2000 multiplexer
 - Connections and cross-connections between the HDT, DSX cross-connect, and the DDM-1000 or a DDM-2000 multiplexer.

Proceed to Step 6.

4. Verify the following:
 - Proper digital line connections have been made at the COT.
 - Heat coils and carbon blocks have been installed at the COT MDF.
 - Digital line connections have been made at the HDT.
5. Ensure that the digital line repeaters have been installed and that the line installation is complete.

6. Ensure that **ADU** options are set identically and to in-service, then wait 10 minutes before continuing. Set option S1 switches as follows:
 - **3** — Toward **ABI** if shelf group AB is being equipped.
 - **4** — Toward **CDI**.

7.



DANGER:

If line powering LIUs are installed at the HDT, 130 V may be present on the connection to the outside cable pairs.

Do one of the following, depending on whether line powering LIUs are installed:

If line powering LIUs (AUA62, AUA62B, or AUA62C) are installed in the HDT bank assembly, perform the power loop test (**V** to **I** = 0.6 V DC; **V** to **V** = less than 138 V DC).

If line powering LIUs are NOT installed in the HDT bank assembly, continue with Step 8.

8. If the **FAIL** indicators on the COT **BCU**, **ADU**, and HDT **BCU** are all lighted, perform the system turn-up procedure using the **CIU**.
9. Do one of the following, depending on whether the system is equipped for protection switching:

If the system is equipped for protection switching, test the manual protection line switching operation.

If the system is NOT equipped for protection switching, go to Step 12.

10. Test the operation that denies protection line switching access to a digroup.
11. Test the automatic protection line switching.
12. Test the CO and HDT alarms (miscellaneous, power, etc.).
13. At the HDT, depress the **FAN TEST** push button to verify that all fans operate.

At the MSDT, use the 1015B butt set and **WP91067,L6** test cable to perform COT-to-DT talking, dialing, ringing, and ring-trip tests on all equipped channels.

14. Update the office records for the job completed on the assigned system for the installed digital line and channels and specify task(s) completed according to local office procedures.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install 60 V AC AUA434 PIU in MSDT

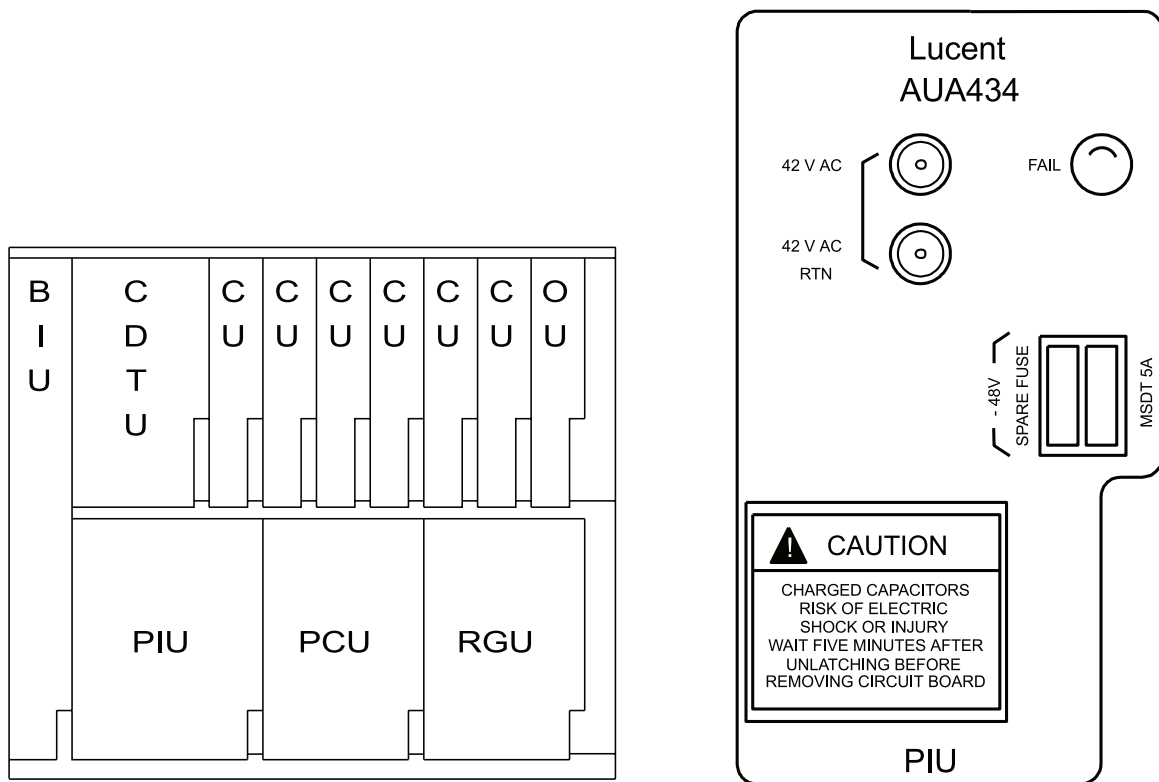
1. Verify (or install) the MSDT protector is installed in the field wiring box.
- 2.



NOTE:

Fuses for the PIU should not be installed while the PCU is installed.
Remove the PCU before installing fuses in the PIU.

Install **AUA434 PIU** in power interface unit (PIU) slot (Figure 52).



aua434.ins.ps

Figure 52 – 60 V AC AUA434 PIU

3. Measure AC (**42 V AC** to **42 V AC RTN**) PIU voltages.

Requirement: 42 (26.5 to 46.5) V AC.

4. Were PIU voltage requirements met?

If **YES**, then continue with Step 5.

If **NO**, verify AC power (and AC fuse is good) to the cabinet. Replace PIU if no power trouble is found.



CAUTION:

Unlatch PIU and wait 1 minute for capacitors to discharge before handling.

5. Install **MSDT 5A** fuse. Install **SPARE 5A** fuse, if required.

6. Did fuse(s) blow?

If **YES**, then continue with Step 7.

If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Refer to appropriate schematic drawings (SDs) to clear *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) wiring trouble.

Verify *SLC*[®]-2000 MSDT/BIU Software Download and Software Version

Prerequisite:

Verify that the correct version of the following circuit packs has been installed:

- At the HDT, ensure that the MSDT Server is the *SPQ*[®]809 Server.
- At the MSDT, ensure that the BIU is an MC97793A1.



NOTE:

Other BIU versions do not support downloading. If you have another version of the BIU, do not perform this procedure.

General:

If the BIU at the MSDT contains a version of software that needs to be updated, the *SLC*-2000 HDT will download the current version of its SMU software release into the BIU circuit pack at the MSDT. This download will also proceed if a new version of software is installed on the HDT's SMU (for example, a conversion from 3.02.01 to a later software release) or if the BIU circuit pack is replaced at the MSDT with an MC97793A1 BIU. You may verify the software version of the BIU after the completion of the downloading process to ensure it corresponds to the features listed in Chapter 3 of this manual.

Do not perform MSDT-related activities (such as retrieval of MSDT equipment inventory, MSDT DS1 performance monitoring, etc.) during the BIU downloading process.

To verify a BIU software download in a system that was previously turned up, perform Step 2 only.

1. **At the *SLC*-2000 HDT**, verify that the following BIU software download conditions occur:
 - **ABN LED on the UIP lights.** The ABN LED on the UIP will light.
 - **Fault message appears on UIP.** A fault message will appear on the UIP indicating that a software download is in progress.

- **MSDT Server's DT LED flashes.** The DT LED on the MSDT Server will begin to flash within 10 minutes.
2. **At the *SLC-2000* HDT**, after the software downloads, verify the software version in the BIU with the **RTRV-EQPT** CIT command. The system will display the BIU version string on the CIT screen. Refer to 363-208-003, ***SLC-2000 Access System Command and Message Manual***. See Table U for the software version number.
 3. **At the MSDT**, verify the following conditions within 10 minutes during a BIU software download:
 - **All LEDs on the BIU flash.** All LEDs on the BIU circuit pack will flash while the software download is in progress.
 - **BIU 7-segment display indicates the percentage of download completed.** The 7-segment display on the BIU circuit pack will indicate the percentage of software installation completed (for example, **1** = 10%, **2** = 20 percent).

The software download is complete when the BIU LEDs stop flashing.



NOTE:

The BIU download procedure will result in call processing being interrupted. Established calls will be dropped after the BIU has installed the software load and is resetting to run on the new load.

4. **At the MSDT**, after the software has downloaded, verify the software version of the BIU by pressing the BIU **LED TEST** for 15 seconds and releasing. A string of numbers will appear on the 7-segment display. The first four numbers displayed on the 7-segment display will correspond to a BIU version string shown in Table U.



NOTE:

The 7-segment display will continue with a string of numbers. **Ignore all but the first four numbers.**

Table U – BIU Version String and Corresponding SLC®-2000 Software Release

HDT SMU Software Release	MSDT BIU Seven Segment Display String (Notes 1 and 2)	CIT RTRV-EQPT Program Version Number (Notes 1 and 2)
3.02.01	0002xxx...	N/A
4.00.02	0003xxx...	Program Version 3.x
4.01.00	0004xxx...	Program Version 4.x
4.02.00	0005xxx...	Program Version 5
4.03.00	0005xxx...	Program Version 5
4.04.00	0005xxx...	Program Version 5
4.05.00	0005xxx	Program Version 5
4.06.00	0006xxx	Program Version 6

Notes:

1. Ignore all values designated by "x."
 2. The Program Version number displayed on the CIT will be valid after one of the following:
 - Two minutes after download completes
 - The MSDT link comes in service
 - The MSDT initialization clears.
-
5. Ensure that the BIU version string corresponds to the SMU software release. Refer to 363-208-023, *SLC-2000 Access System Software Release Description*, for more information on software releases.

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Install –130 V DC AUA436 PIU in MSDT

1. Verify (or install) the MSDT Protector is installed in the field wiring box.
2. Install **AUA436 PIU** in power interface unit (PIU) slot (Figure 53).

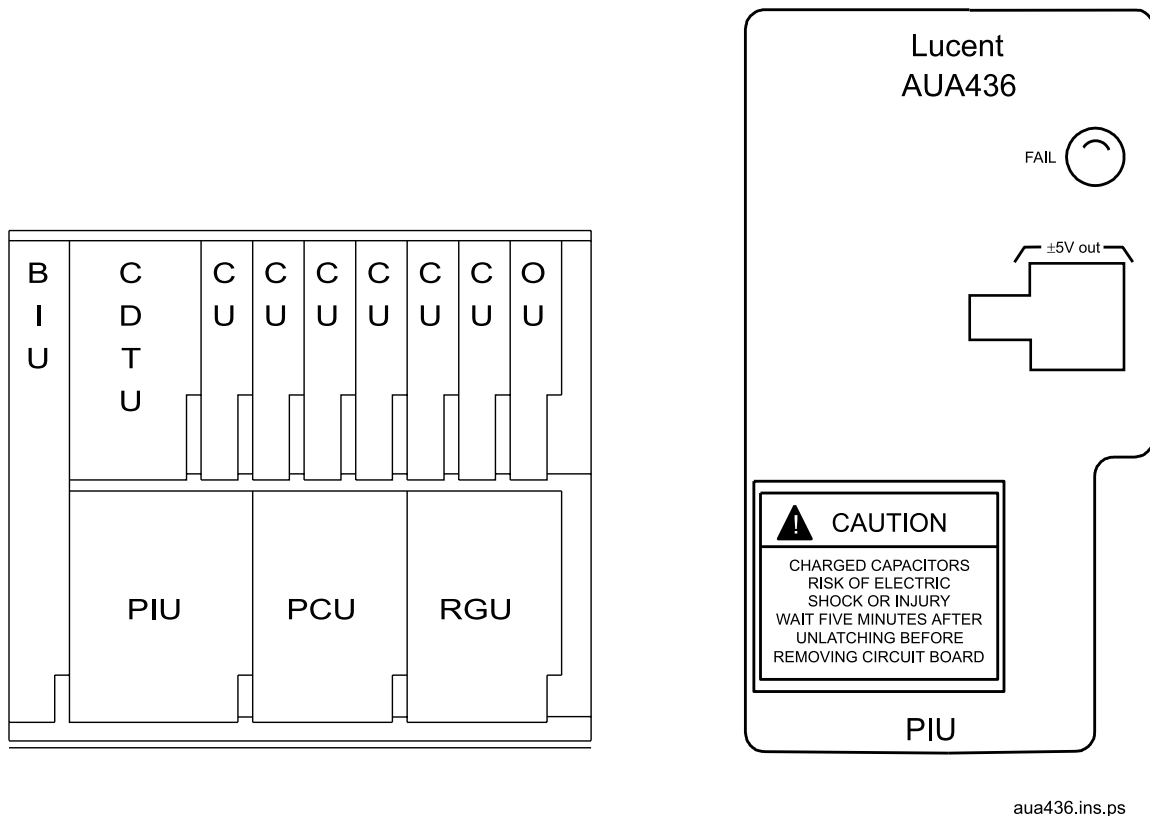


Figure 53 – –130 V DC AUA436 PIU

3. Is the **FAIL** indicator lighted?

If **YES**, then continue with Step 4.

If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. Refer to appropriate schematic drawings (SDs) to locate and clear *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) wiring trouble.

Convert a Conventional *SLC*[®]-2000 FITL System (768 Lines) With HDOS to a DLC R4.5 Enhanced FITL System (1152 Lines)

General:

This procedure can be used to convert a *SLC*[®]-2000 fiber in the loop (FITL) system with high density optics shelves (HDOS) serving 768 POTS lines to a *SLC*-2000 FITL system serving 1152 POTS lines. For the *SLC*-2000 Multi-Services Distant Terminal (MSDT), this procedure replaces existing cabling between the MDS and HDOS with new cabling between the MDS and a DSX-1 cross-connection and between the DSX-1 cross-connection and the HDOS.

This feature is supported by digital loop carrier (DLC) Software Release 4.5 (R4.5) and requires that R4.5 be installed in the system as part of the conversion.



CAUTION:

This procedure will interrupt service for any SLC-2000 MSDT currently being served by DT Servers in the MDS being converted.



NOTE:

Since the HDOS does not have the capability to equalize long cables, the total length of all cabling between the MDS backplane and the HDOS backplane, including dangles, must not exceed 35 feet. To avoid exceeding this cabling limitation, it is suggested that the DSX-1 cross-connection and the HDOS be located in the same or adjacent bays.

5. Verify DLC Software Release 4.5 (R4.5) in the *SLC*-2000 Access System being converted and allow sufficient time for the software to download to all distant terminals (DTs).
6. Install a DSX-1 cross-connection panel in the same bay with the current HDOS or in an adjacent bay.



NOTE:

If space to mount the DSX-1 panel is not available, a new HDOS and collocated DSX-1 panel would need to be added. The HDOS in the *SLC*-2000 Access System bay could also be used, but would result in longer service outage.

7. Run new MDS DS1 cables, ED-7C723-35, Group 19 Comcode 601845472), between the MDS and DSX-1 Panel.



NOTE:

Any of the cables listed in Table V can be used between the MDS and the DSX-1 panel instead of the ED-7C723-35, Group 19 cables, however, with the cabling limitation of 35 feet between the MDS and the HDOS, the use of these cables will require that the cables be shortened extensively to assure the cabling limitation is not exceeded.

Table V – DSX-1 Interface Cable Lengths Available

Length (ft.)	Description	Comcode
30.0	ED-7C723-35, G19	601845472
50.0	ED-7C723-35, G20	601845480
100.0	ED-7C723-35, G21	601845498
200.0	ED-7C723-35, G22	601845506

8. Connect only the DSX-1 Panel cable end to spare terminals for each MDS. Label the DSX-1 panel with the SLC-2000 Access System number, shelf number, and slot number.



NOTE:

To avoid exceeding the 35 foot total cabling limitation between the MDS and HDOS backplanes, the ED-7C723-35, Group 19 cables (30 feet long) must be shortened by cutting at the DSX-1 panel cable end.

9. Install new MDS/DSX-1 transmission cable assembly ED-7C723-35, Group 17 (601831043), by connecting the P191 and P192 connectors to the J191 and J192 connectors on the ends of the the ED-7C723-35, Group 19 cables (refer to Figure 54). Do not connect the MDS ends of the Group 17 cable yet.
10. Install a new HDOS DS1 cable, ED-7C723-35, Group 18, terminating only the DSX-1 panel end. Label the DSX-1 panel with the appropriate HDOS and slot notations.

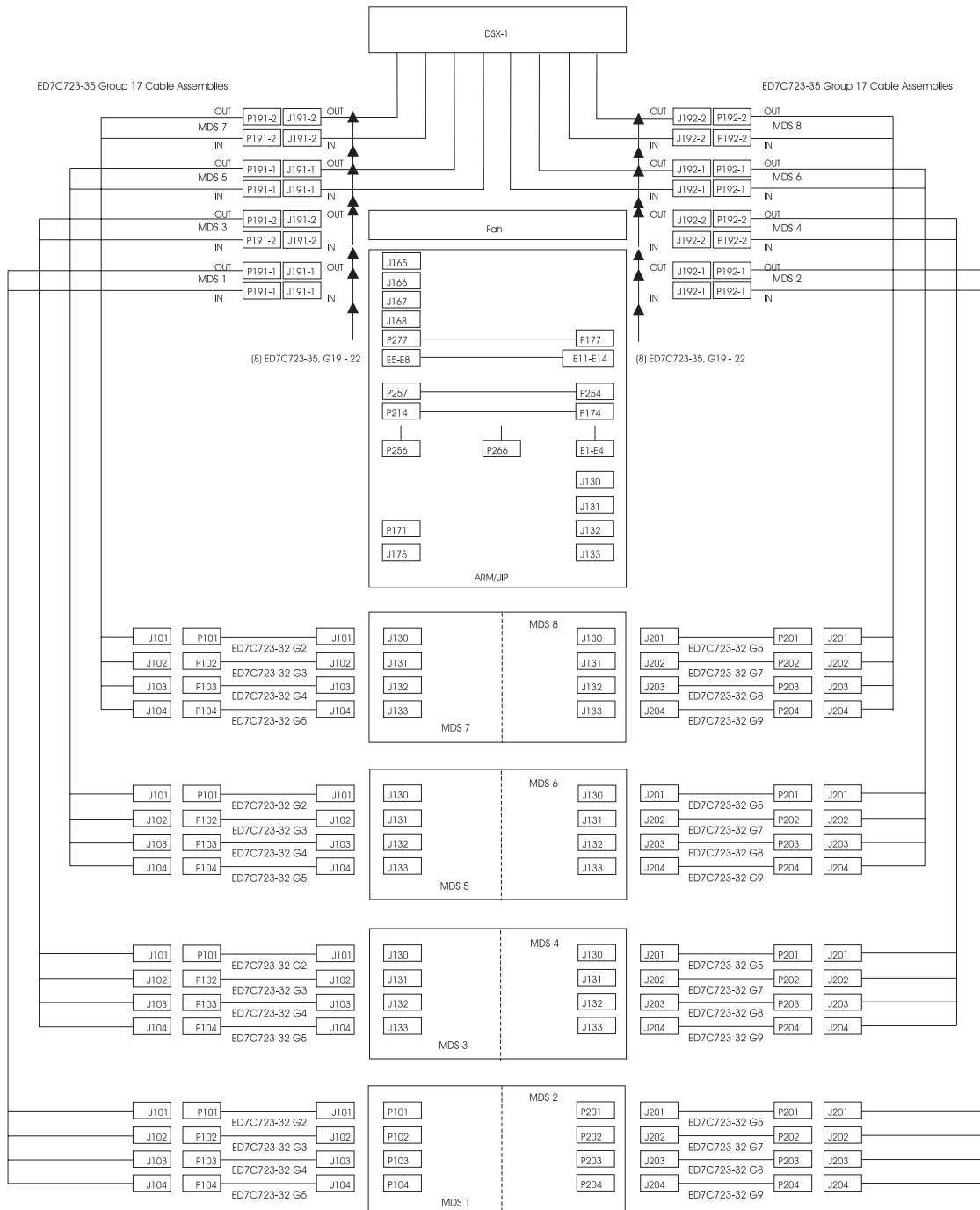


Figure 54 – MDS/DSX-1 Cabling Connections

11. Check for customer activity on all MSDTs in service on the *SLC-2000* system being converted. When an MSDT is found to have no active calls, use the **CIT ed-dt** command to reprovision service on the MSDT for zero lines of service. (Refer to 363-208-003, *SLC-2000 Access System, Commands and Messages*, for the **ed-dt** command pages.) Repeat the procedure for all MSDTs on the system.



NOTE:

Customers served by the MSDTs will be without service for the remainder of this procedure, but no calls would have been dropped.

12. Remove all active DT Servers from the MDS, set equalization for the new distance to the DSX-1 panel if necessary, and reinstall. A DT Server upgrade must be performed to support the MSDTs (for example, *SPQ*[®]808 Servers should be replaced with *SPQ*810 Servers).
13. Cross-connect the transmit pairs and receive pairs in the DSX-1 panel for the existing server/HDOS connections. Test for continuity from the MDS Server connector pins on the ED-7C723-35, Group 17 cable to the HDOS connector pins on the ED-7C723-35, Group 18 cable for each of the working server/HDOS associations. Refer to Table W and Table X for MDS DT Server slot and cable connectors association.

14.



NOTE:

There is one ED-7C723-34, Group 4 cable assembly per MDS shelf.

Disconnect the ED-7C723-34, Group 4 cable connections on both the MDS and HDOS ends.

15. Connect the new ED-7C723-35, Group 17 cable connectors J101 to J104 to the ED-7C723-32, Group 2 through 5 dangles (P101 through P104) from each MDS (refer to Figure 54) in matching increasing order.



NOTE:

The ED-7C723-32, Group 5 dangle (P104) was not used previously.

16. Connect the ED-7C723-35, Group 18 HDOS cable connectors P191-1, P191-2, P192-1, and P192-2 to the HDOS connectors J191-1, J191-2, J192-1, and J192-2, respectively (refer to Figure 55).
17. Reprovision the DT Servers for the appropriate "lines=" using the **ed-dt** CIT command. The choices are either 12 or 24 as previously optioned.
18. Verify that MSDTs are in service (for example, draw dial tone from an equipped channel with LDS connection).

STOP. YOU HAVE COMPLETED THIS PROCEDURE.

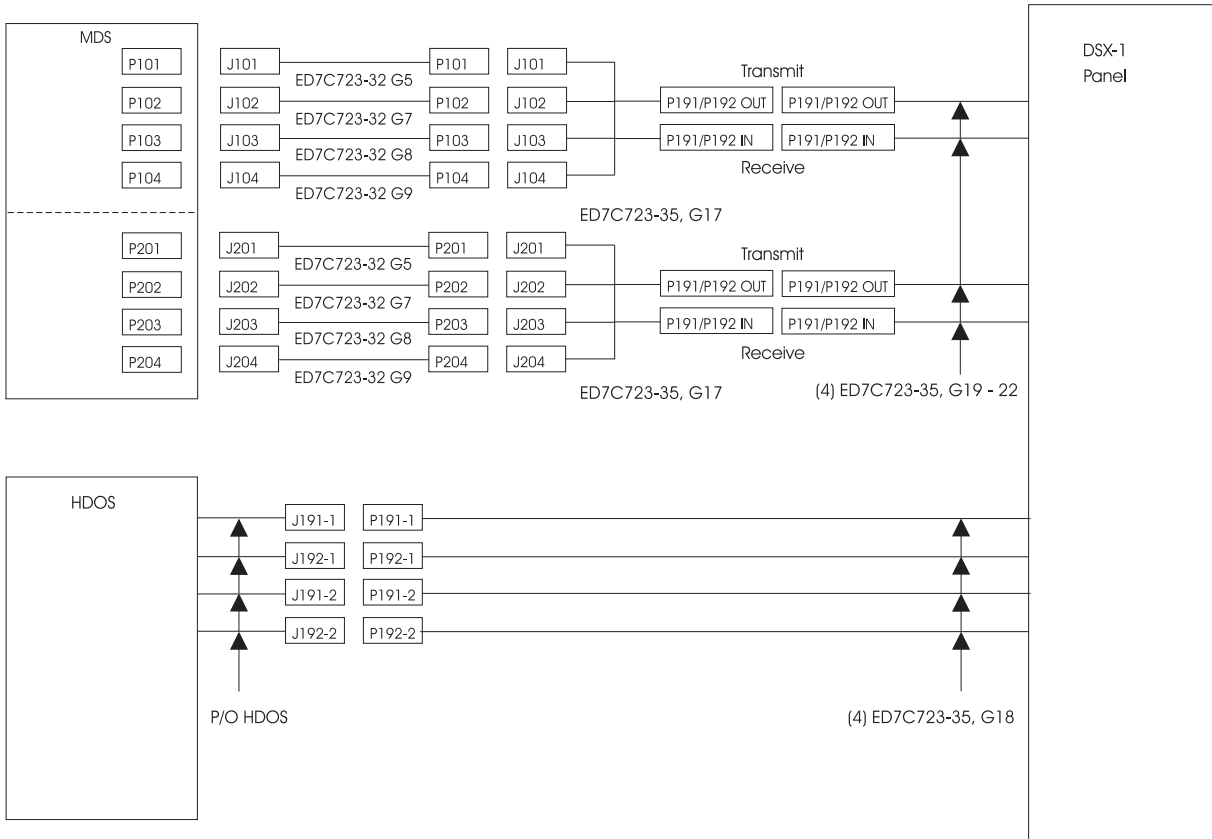


Figure 55 – DSX-1 Panel Cabling Connections

Table W – MDS Server Circuit Pack Slot Association (Odd Shelves)

Shelf No.	Shelf Conn.	Pins R,T	MDS Slot CU	P191/P192 ED-7C723-35, G17		DSX-1 Colors (Note)
				Connector	Pins R,T	
1 (Odd)	J101	1,26	1	OUT	1,26	BL-W, W-BL
		2,27		IN	1,26	BL-W, W-BL
		9,34	3	OUT	2,27	O-W, W-O
		10,35		IN	2,27	O-W, W-O
		17,42	5	OUT	3,28	G-W, W-G
		18,43		IN	3,28	G-W, W-G
		25,50	7	OUT	4,29	BR-W, W-BR
	J102	1,26		IN	4,29	BR-W, W-BR
		8,33	9	OUT	5,30	S-W, W-S
		9,34		IN	5,30	S-W, W-S
		16,41	11	OUT	6,31	BL-R, R-BL
		17,42		IN	6,31	BL-R, R-BL
		24,49	13	OUT	7,32	O-R, O-R
		25,50		IN	7,32	O-R, O-R
	J103	7,32	15	OUT	8,33	G-R, R-G
		8,33		IN	8,33	G-R, R-G
		15,40	17	OUT	9,34	BR-R, BR-R
		16,41		IN	9,34	BR-R, BR-R
		23,48	19	OUT	10,35	S-R, R-S
		24,49		IN	10,35	S-R, R-S
	J104	6,31	21	OUT	11,36	BL-BK, BK-BL
		7,32		IN	11,36	BL-BK, BK-BL
		14,39	23	OUT	12,37	O-BK, BK-O
		15,40		IN	12,37	O-BK, BK-O

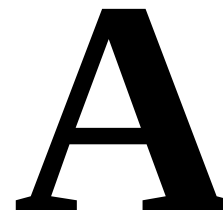
Note: The colors specified in this cable are true only if the transmission cable uses color code 4.

Table X – MDS Server Circuit Pack Slot Association (Even Shelves)

Shelf No.	Shelf Conn.	Pins R,T	MDS Slot CU	P191/P192 ED-7C723-35, G17		DSX-1 Colors (Note)
				Connector	Pins R,T	
2 (Even)	J201	1,26	1	OUT	1,26	BL-W, W-BL
		2,27		IN	1,26	BL-W, W-BL
		9,34	3	OUT	2,27	O-W, W-O
		10,35		IN	2,27	O-W, W-O
		17,42	5	OUT	3,28	G-W, W-G
		18,43		IN	3,28	G-W, W-G
		25,50	7	OUT	4,29	BR-W, W-BR
	J202	1,26		IN	4,29	BR-W, W-BR
		8,33	9	OUT	5,30	S-W, W-S
		9,34		IN	5,30	S-W, W-S
		16,41	11	OUT	6,31	BL-R, R-BL
		17,42		IN	6,31	BL-R, R-BL
		24,49	13	OUT	7,32	O-R, O-R
		25,50		IN	7,32	O-R, O-R
	J203	7,32	15	OUT	8,33	G-R, R-G
		8,33		IN	8,33	G-R, R-G
		15,40	17	OUT	9,34	BR-R, BR-R
		16,41		IN	9,34	BR-R, BR-R
		23,48	19	OUT	10,35	S-R, R-S
		24,49		IN	10,35	S-R, R-S
	J2DLP-53904	6,31	21	OUT	11,36	BL-BK, BK-BL
		7,32		IN	11,36	BL-BK, BK-BL
		14,39	23	OUT	12,37	O-BK, BK-O
		15,40		IN	12,37	O-BK, BK-O

Note: The colors specified in this cable are true only if the transmission cable uses color code 4.

Circuit Pack Data Sheets

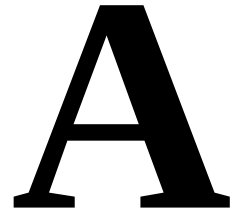


Contents

Introduction

A-1

Circuit Pack Data Sheets



Introduction

A description of each circuit pack that has been added at the remote terminal (RT) and *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) to support the fiber-in-the-loop (FITL) feature is contained in the circuit pack data sheets. A list of the Lucent Technologies practice numbers for the data sheets available for each of these units is given below. A copy of the actual data sheets follows.

List of data sheets

- 363-005-262 (AYB1B/AYB1C OU)
- 363-005-271 (BYB1B/BYB1C OU)
- 363-005-272 (MC97780A1 BIU)
- 363-005-273 (AUA406 RT MSDT Server)
- 363-005-274 (AUA408 MSDT Server)
- 363-005-275 (AUA411() CDTU)
- 363-005-276 (AUA412 PCU)
- 363-005-277 (AUA413 RGU)
- 363-005-278 (AUA414 PIU)
- 363-005-279 (AUA415 PIU)
- 363-005-280 (AUA416 PIU)
- 363-005-281 (AUA417 PCU)
- 363-005-282 (AUA418 LOSU)
- 363-005-283 (AUA419 SCU)
- 363-005-284 (BYB2 T1/DSX-1 LIU)
- 363-005-285 (AUA423 RGU)
- 363-005-286 (AYB2 PCU)
- 363-005-288 (*SPQ*[®]808/*SPQ*808B MSDT Server)
- 363-005-289 (MC97789A1 BIU)
- 363-005-290 (AUA426 PIU)
- 363-005-291 (AUA427 PCU)
- 363-005-292 (AUA428 LOSU)
- 363-005-293 (AUA424 PIU)
- 363-005-294 (AUA422 PCU)
- 363-005-295 (*SPQ*909 Channel Unit)
- 363-005-296 (AYB5 OU)
- 363-005-297 (BYB5 OU)
- 363-005-387 (*SPQ*809 MSDT Server)
- 363-005-389 (*SPQ*810 DT Server)
- 363-005-400 (MC97793A1 BIU).

Contents

Introduction	B-1
Functional Description	B-1
Physical Description	B-4
■ FSM Assembly	B-4
■ FSM Arrangement in the HDT	B-6
■ FSM Arrangement at the MSDT Site	B-10
Equipment Arrangement	B-10
Alarms	B-15
■ FSM CLEI Codes	B-16
FSM Installation Procedures	B-19
FSM Cable Acceptance Tests	B-29
■ Fiber Link Cable Acceptance Tests	B-29
OTDR Measurements Test	B-29
Fiber Loss Measurement Test	B-37
FSM End-to-End Acceptance Procedures	B-38
■ MSDT Server (HDT) to FITL MSDT End-to-End Test	B-39
■ FSM DSX-1 to FSM DSX-1 End-to-End Test	B-48
■ Local DSX-1 Cable Connections and Remote Alarm Cable Acceptance Tests	B-50
Glossary	B-54

Fiber Service Module (FSM)

B

Introduction

This appendix provides an overview along with installation and acceptance procedures for the Fiber Service Module (FSM) for the *SLC*[®]-2000 Access System. It includes the following sections:

- Functional description
- Physical description
- Installation procedures
- Cable acceptance procedures
- End-to-end acceptance procedures.

For a detailed description of the installation and end-to-end acceptance procedures, see 363-205-004, *SLC-2000 Multi-Services Distant Terminal Feature, User/Service and Ordering Manual*.

Functional Description

The FSM provides expanded fiber-in-the-loop (FITL) distribution capability for Multi-Services Distant Terminals (MSDTs) using DSX-1 transmission extensions (no protection switching). Located at both the *SLC*-2000 host digital terminal (HDT) site and at the MSDT site [optical network unit (ONU) locations], the FSM multiplexes up to 12 DSX-1s into a single 51.84-Mb/s digital bit stream for optical fiber transport. The optical loss budget is 10 dB from the HDT to the MSDT site. Figure B-1 shows a block diagram of the FSM in an HDT-to-MSDT arrangement.

The FSM meets customer needs to increase deployment of FITL MSDTs and DSX-1 extensions in various installation configurations.

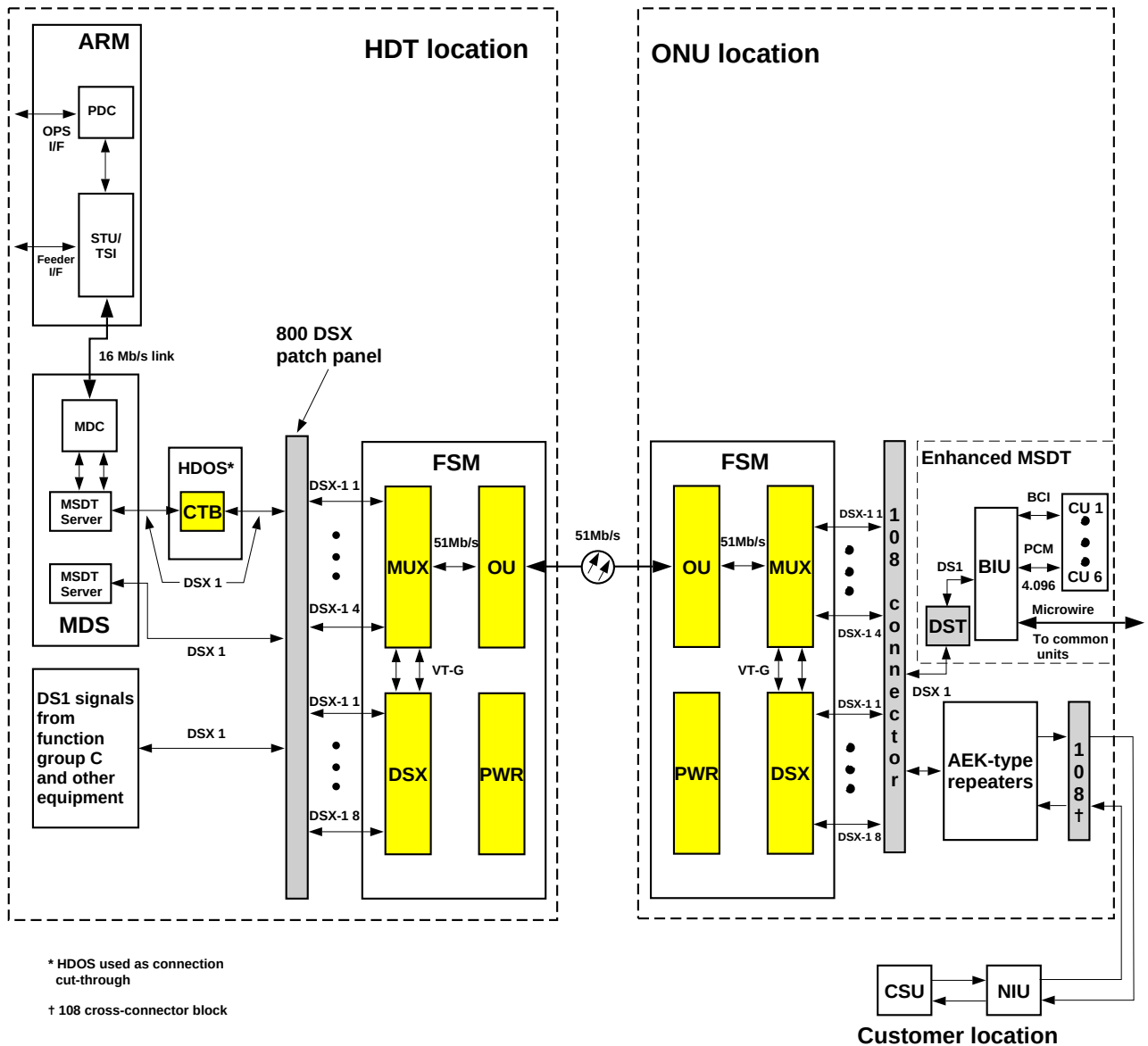
- **At the HDT site**, the FSMs will take up to 12 DSX-1 signals at the rate of 1.544 Mb/s from both the existing MSDT Servers and from other equipment and multiplex them into a single 51.84-Mb/s optical signal. DSX-1 signals from other equipment can include signals from the *SLC-2000* function group C. The FSM then transmits the optical signal to the MSDT site. In the opposite direction, the FSM receives the 51.84-Mb/s optical signal from the MSDT site and demultiplexes it back into DSX-1 signals for use by the *SLC-2000* HDT. All DSX-1 signals are functionally interchangeable.

When using the FSM, you replace the HDOS OU with a specially designed *cut-through board (CTB)*. As shown in Figure B-1, this board interfaces between the MSDT Server (*SPQ*®808 or *SPQ*809 circuit pack) and the FSM. The FSM does not affect existing link requirements between the MSDT Server and the MSDT.

Figure B-1 also shows a configuration that does not use the HDOS shelf. In this case, the MDS is wired directly to a DSX patch panel. However, when using this configuration, all MSDT Servers on that specific MDS shelf *must* go through the FSM. This configuration is not as flexible as using the HDOS/CTB configuration.

- **At the MSDT site**, the FSM receives the 51.84-Mb/s optical signal from the HDT site and demultiplexes it back into DSX-1 signals for use with the MSDT or other customer equipment. When used with other customer equipment, the FSM sends the DSX-1 signal to an AEK-type repeater that transmits the signal to the customer equipment. In the opposite direction, the FSM will take DSX-1 signals from the MSDT and from other equipment and multiplex them into a 51.84-Mb/s optical signal. It then transmits the optical signal to the HDT site.

When the FSM is the digital pipe to the HDT from the MSDTs, you replace the MSDT OU with a *digital signal translator (DST)* circuit pack. As shown in Figure B-1, this board interfaces between the backplane interface unit (BIU) of the MSDT and the FSM.



fsm.bd.ps

Figure B-1. Block Diagram of the Fiber Service Module (FSM) in a Typical HDT-to-MSDT Arrangement

Physical Description

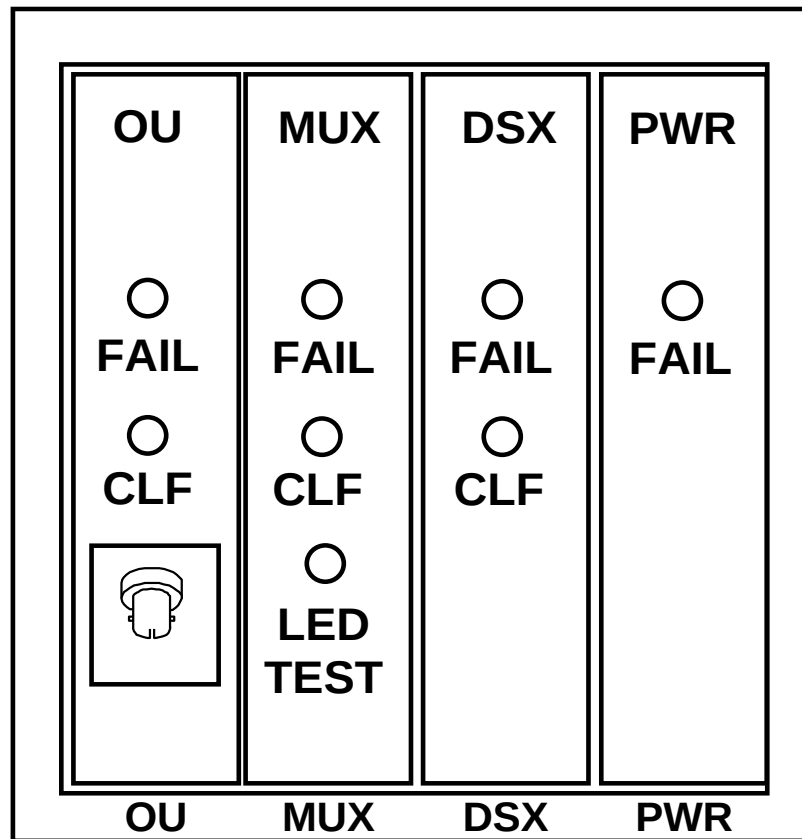
FSM Assembly

The FSM (Figure B-2) is made up of the following circuit packs:

- **PWR circuit pack (BDJ[®] 241).** This circuit pack supplies the FSM with ± 5 volts of power.
- **MUX circuit pack (BDJ243).** This circuit pack multiplexes four DSX-1 signals and two VT-G groups into a 51.84-Mb/s bit stream. At the HDT site, the MUX circuit pack can either interface DSX-1 signals from the MSDT Servers in the SLC-2000 MDS assembly or DSX-1 signals from other equipment such as function group C to the OU circuit pack. At the MSDT site, it interfaces between the OU circuit pack and either the DST or the AEK-type repeater.
- **DSX circuit pack (BDJ242).** This circuit pack multiplexes eight DSX-1 signals into two VT-G DS1 groups. The VT-G groups are then sent to the MUX circuit pack to be multiplexed into a 51.84-Mb/s bit stream.
- **OU circuit pack (BDJ244).** This circuit pack performs the electrical-to-optical and optical-to-electrical conversions. It provides a single-fiber bidirectional optical interface between the FSM at the HDT site and the FSM at the MSDT site.

The FSM also provides the following options and features:

- **Fault and Alarm Indications.** The FSM provides local LED fault indication and a summary alarm contact closure.
- **DSX-1 Line Failure.** The FSM transmits alarm indication signal (AIS) alarm indication when receive DSX-1 line failure is detected.
- **FSM Without the DSX Circuit Pack.** You can install the FSM without the DSX circuit pack (that interfaces eight DSX-1s) and still provide four DSX-1 fiber link transmission.
- **DSX-1 Repeater Shelf at MSDT Site.** At the MSDT site, the FSM also works with a DSX-1 repeater shelf for spans up to 1.5 kft (22 AWG PIC cable).
- **Cabling Options.** Cabling options are provided for new or retrofit installations of multiple FSMs at the RT/HDT.



fsmpacks.ps

Figure B-2. FSM With Circuit Packs

FSM Arrangement in the HDT

Figure B-3 shows the recommended arrangement of the FSM at the HDT. The following equipment at the HDT is associated with the FSM:

- **Fiber Service Shelf (FSS).** The FSM is located in the *fiber service shelf*. The fiber service shelf is located in the *SLC-2000* HDT bay and contains up to six FSMs. Since each FSM can support up to 12 DSX-1 signals, the fiber service shelf can support up to 72 DSX-1 signals. These DSX-1 signals can be a mix of VF circuits from the *SLC-2000* function group A and DS1s either from function group C or from other equipment (like an add/drop multiplexer and/or a digital cross-connect system).
- **HDOS AYB7 Cut-Through Board (CTB).** The FSM functionally replaces the OU in the HDOS assembly. When the FSM receives a DSX-1 signal from an MSDT Server in the MDS assembly, the signal must pass through a *cut-through board* in the HDOS assembly when the HDOS is used. The cut-through board passes the signal between the MSDT Server and the FSM without changing its characteristics. You must physically wire the connections between the AYB7 CTB and the DSX-1 patch panel block.



NOTE:

The CTB is not used when the MDS shelf connects directly to the DSX-1 panel.

- **Auxiliary Fuse Panel.** The FSMs at the HDT require an *auxiliary fuse panel* to provide a –48 volt feeder to power the FSMs. Lucent Technologies recommends a 1-amp fuse for each card cage.
- **DSX-1 Patch Panel.** This panel interfaces between the FSM and the source of the DSX-1 signal — usually either the MSDT Server or function group C.

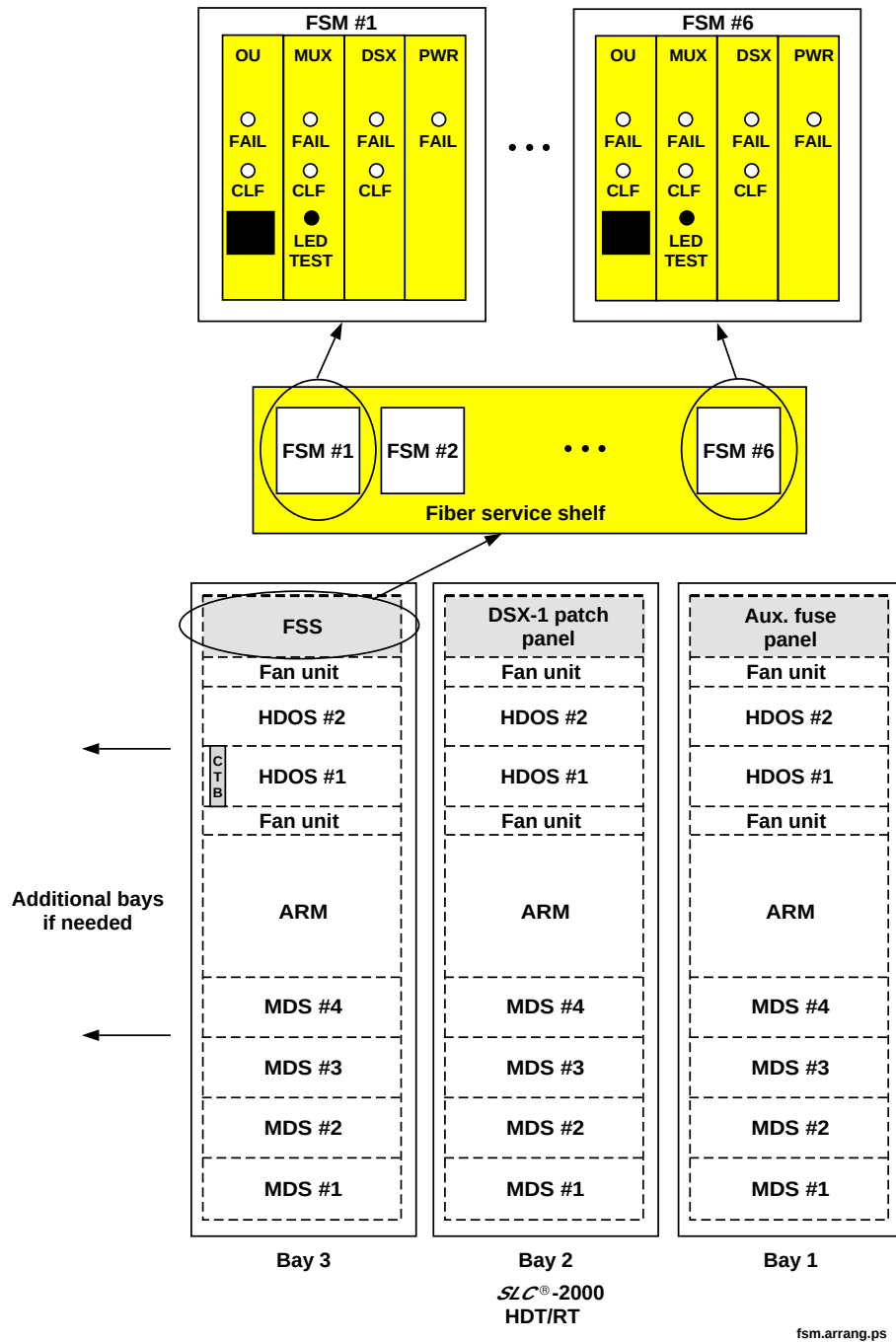
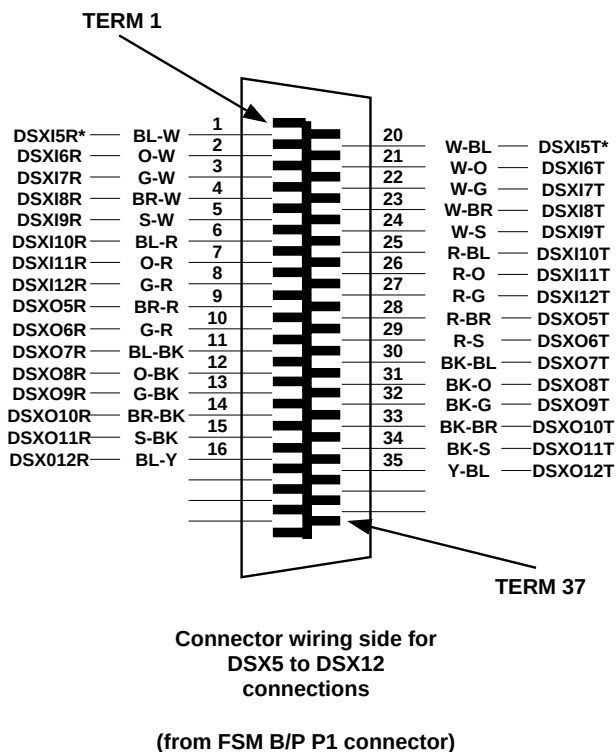
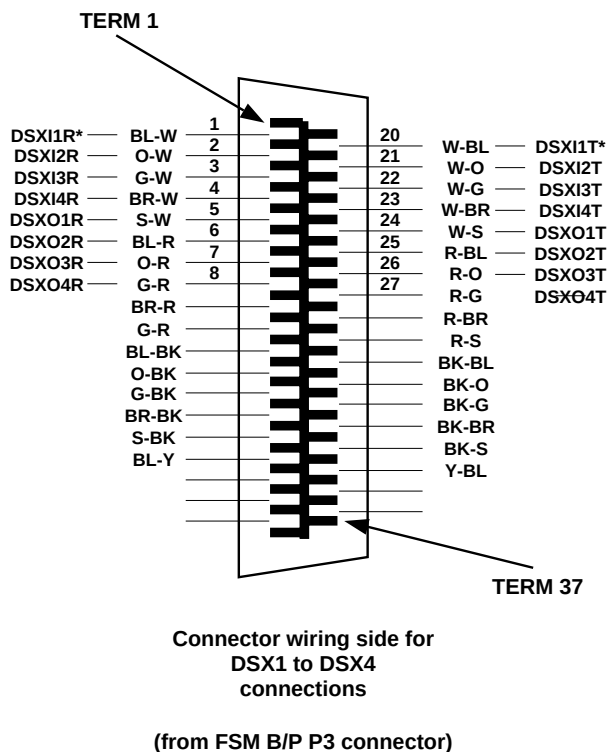


Figure B-3. Recommended FSM Arrangement in the HDT

Figure B-4 shows the color code and DSX-1 designation of each of the 12p DSX-1 circuits from the FSM to a DSX-1 patch panel for cables J6 and J7.



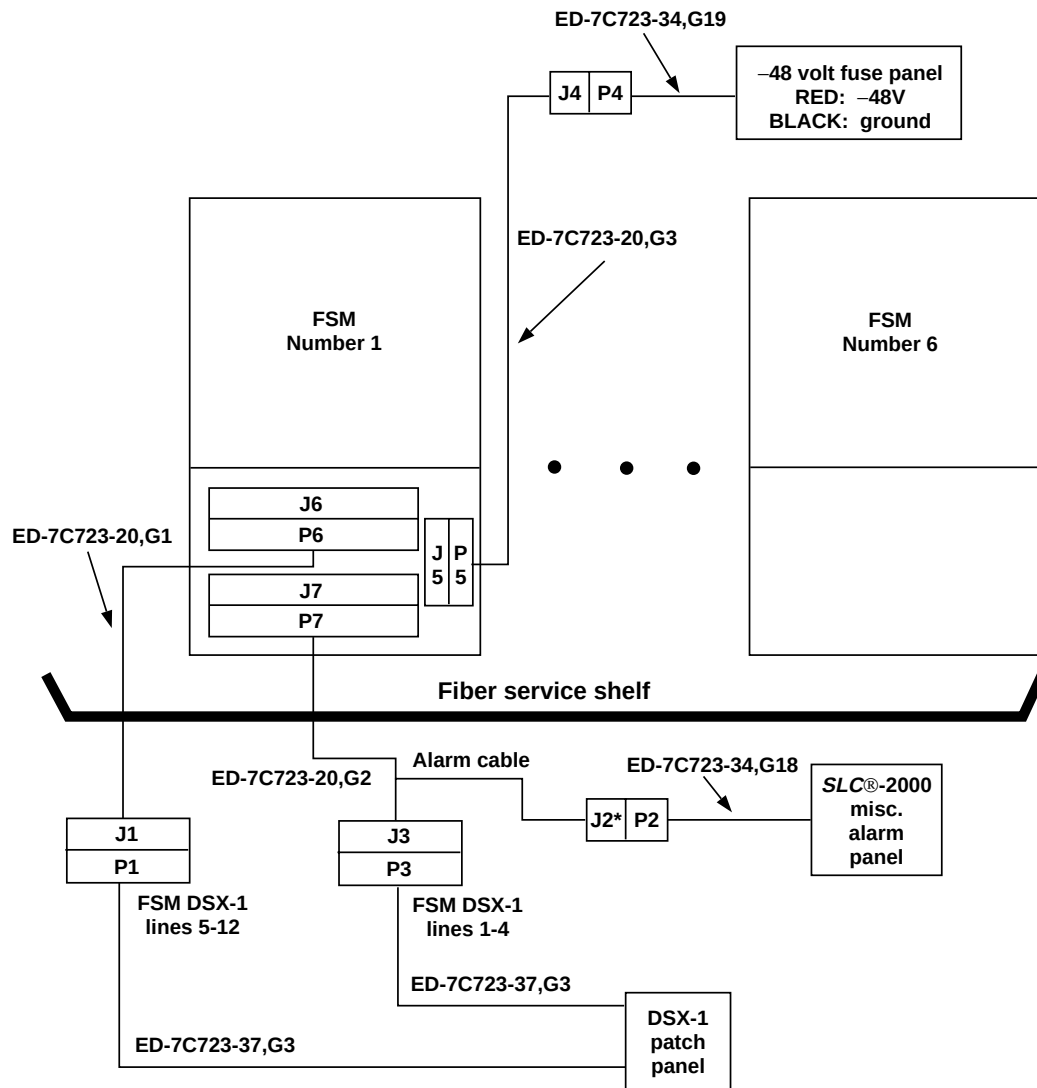
* Use the following pin designation examples:

- DSXI1R is DSX1 input 1 Ring
- DSXI1T is DSX1 input 1 Tip
- DSXO1R is DSX1 output 1 Ring
- DSXO1T is DSX1 output 1 Tip
- etc.

fsmhdtcon.ps

Figure B-4. FSM DSX-1 Wiring Diagram at HDT

Figure B-5 shows the wiring diagram of the FSM at the HDT.



* For the alarm leads:
- TLM0C is on lead number 1
- TLM0 is on lead number 6.

fsmhdtwire.ps

Figure B-5. FSM Wiring Diagram at HDT

FSM Arrangement at the MSDT Site

Equipment Arrangement

Figure B-6 shows the FSM equipment at the MSDT site. The following equipment at the MSDT is associated with the FSM:

- **841 Cabinet.** The 841 cabinet is an above-ground cabinet that can house up to four MSDTs, the FSM, and repeater equipment.
- **FSM/Repeater/Power Shelf (COMCODE 847367596).** This shelf at the MSDT site houses the following equipment:
 - **FSM Assembly.** This shelf houses the FSM assembly and its four circuit packs.
 - **Repeater Cage containing the AEK-type Repeaters.** Up to 12 AEK-type repeaters allow the FSM to interface DSX-1 signal cable for spans up to 1.5 kft (22 AWG PIC cable).
 - **Power Cage containing the Power Converter Unit (PCU) and Power Interface Unit (PIU).** The PCU (AUA422) and PIU (AUA424 or AUA434) provide –48 volts of power to the FSM and the repeaters.
 - Although the AUA434 PIU can be used, Lucent Technologies recommends using the AUA424 PIU when possible.
- **DST Circuit Pack.** The digital signal translator (DST) circuit pack replaces the OU in the MSDT when an FSM is used. It interfaces the DS1 rate signal from the MSDT's BIU with the DSX-1 line from the FSM. The circuit pack descrambles the DS1 signal from the BIU and sends it to the FSM. In the opposite direction, it scrambles the DSX-1 signal from the FSM and sends it to the BIU. It also provides signal level translation. Figure B-10 shows the connections between the DST circuit pack and the 108 connector (or equivalent).



WARNING:

Under no circumstances should the signal lines be run to outside plant cables or equipment when the BYB7 is being used in the DSX modes. The DSX mode is intended for inside plant applications only.

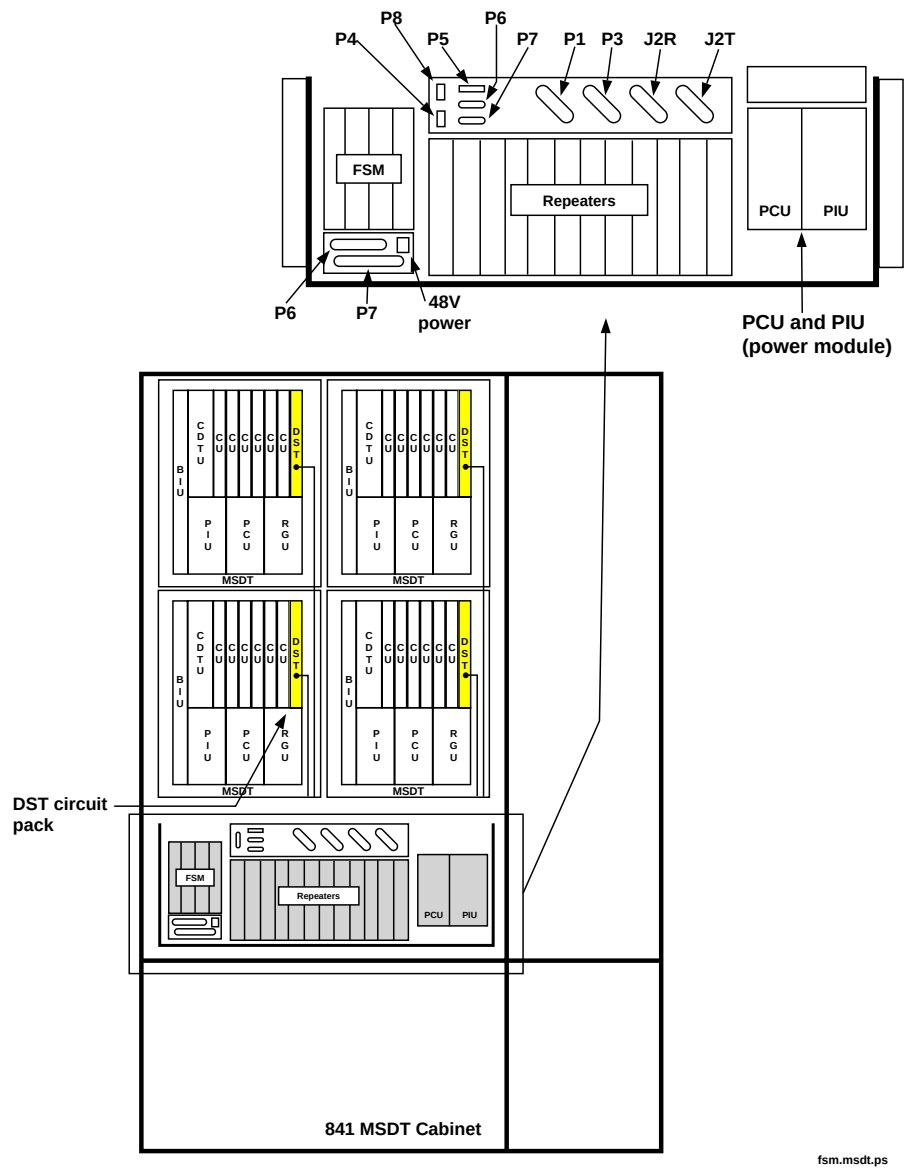


Figure B-6. FSM Equipment in the 841 MSDT Cabinet

Figure B-7 shows the T1 lightning protector field, FSM DSX-1 wiring block, repeater DSX-1 wiring block, repeater T1 wiring block, and the feeder distribution panel.

**CAUTION:**

Lucent Technologies recommends that the wiring of the DSX-1 and T1 blocks be done with twisted pair wire to minimize signal interference.

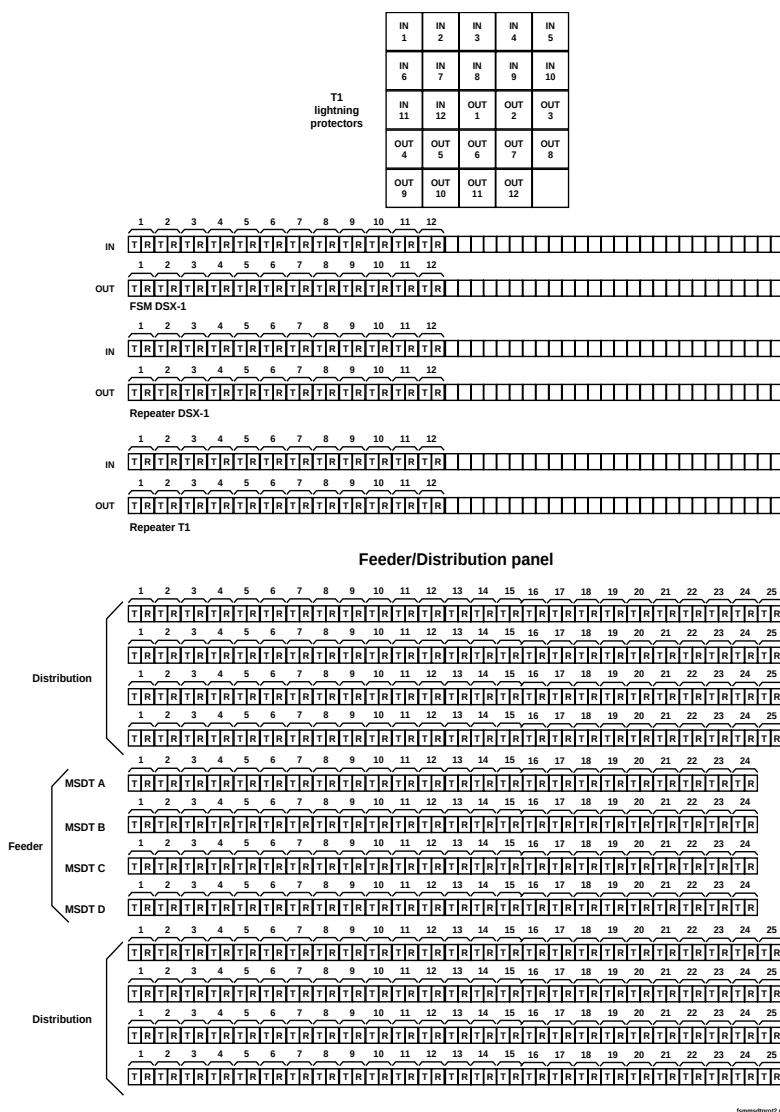
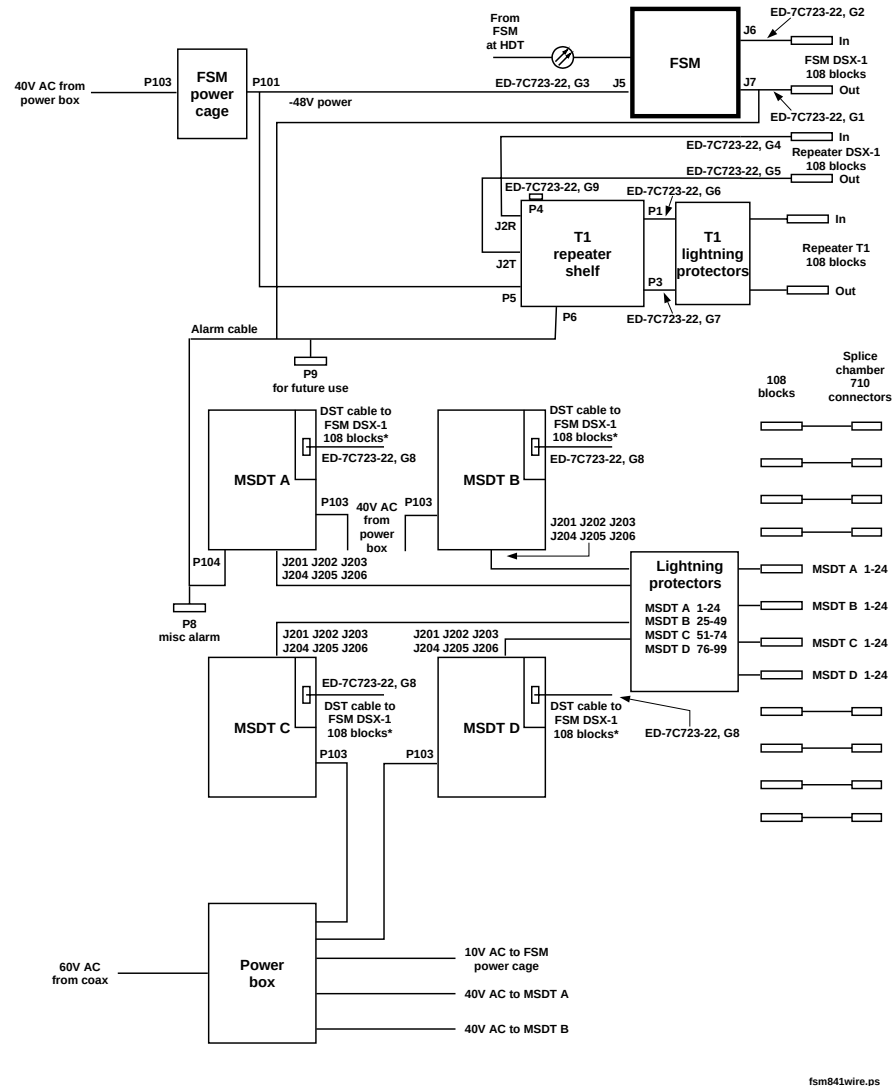


Figure B-7. FSM Protectors, Wiring Blocks, and Feeder/Distribution Panel in the 841 Cabinet

Figure B-8 shows the 841/MSDT/FSM cabinet wiring diagram.



* See Figure B-9.1 for the connections between the DST circuit pack and the 108 connector.

Figure B-8. 841/MSDT/FSM Cabinet Wiring Diagram

Figure B-9 shows the 841/MSDT/FSM repeater shelf assembly wiring diagram.

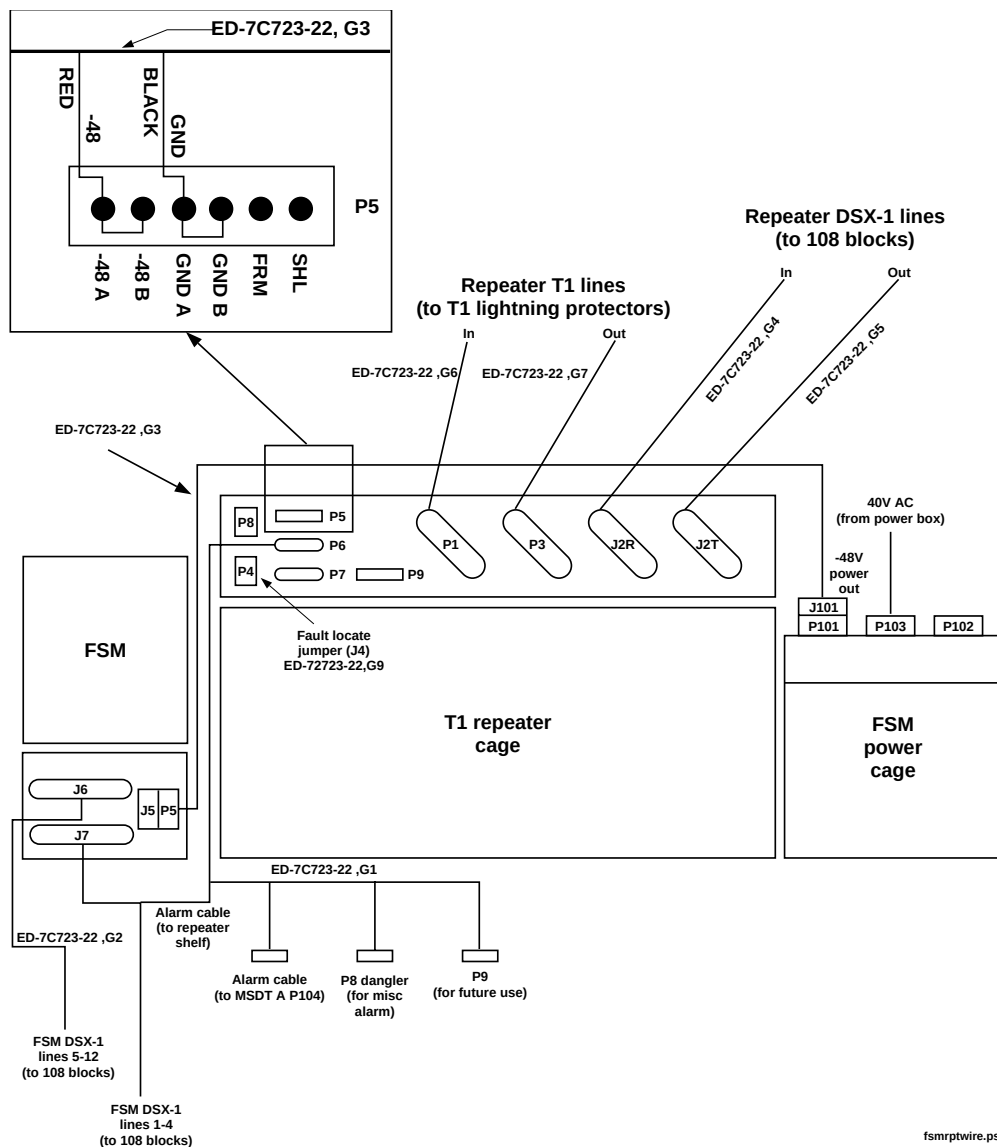


Figure B-9. 841/MSDT/FSM Repeater Shelf Assembly Wiring Diagram

Figure B-10 shows the connections between the DST circuit pack and the 108 connector (or equivalent).

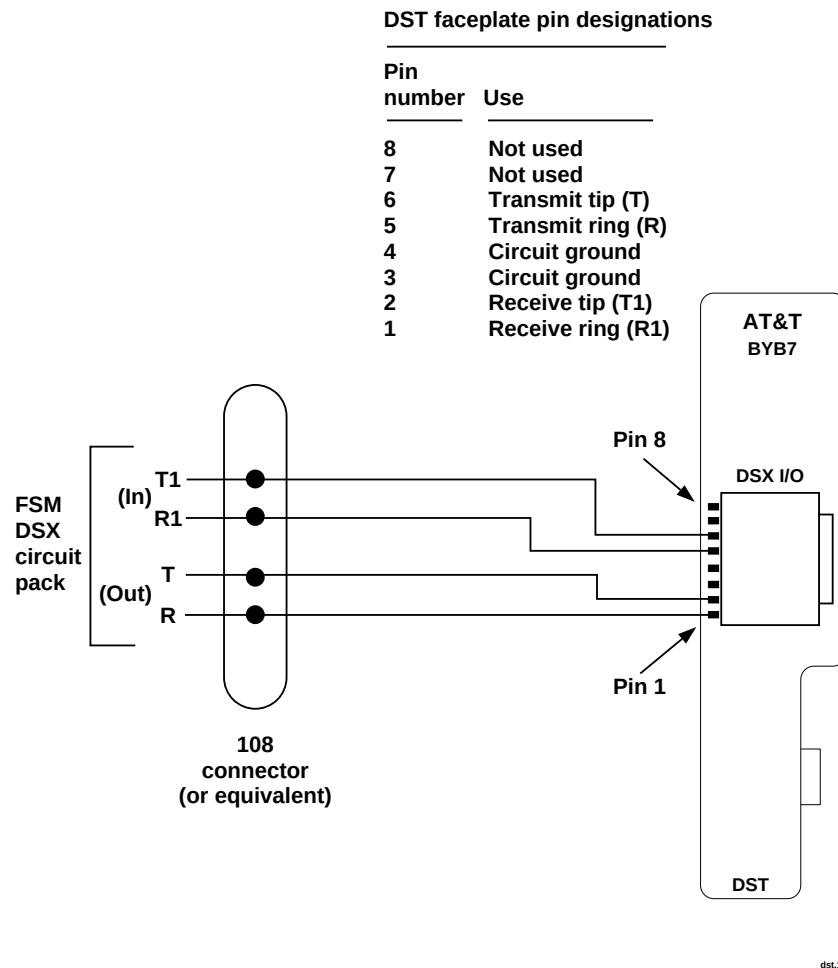


Figure B-10. Connections Between the DST Circuit Pack and the 108 Connector (or Equivalent)

Alarms

In the 841/MSDT/FSM cabinet arrangement, the T1 repeater shelf and the FSM alarms are sent to the HDT by MSDT (A). At the HDT, they can be accessed with the UIP or CIT. This alarm and the door alarm are on the P8 connector that is connected to P104 of MSDT (A). On P104, pins 3 and 4 are for the miscellaneous alarms and pins 1 and 2 are for the door alarm.

FSM CLEI Codes

Table B-1 lists the new FSM *CLEI* codes (and changes to the FITL *CLEI* codes) for the RT/HDT and MSDT shelves, modules, and plug-ins.


NOTE:

When using the SLC-2000 DLC to supply DSX-1 lines from the "C" function group to the FSM, you must order the MXRVO, the BBF1B DS1 low-speed interface card, and the cabling (ED-7C723-37, G1 or G2) that goes from the "C" function group to the DSX-1 patch panel. In addition, you need two cables (ED-7C723-37, G1 or G1) that connect the DSX-1 lines from the FSM to the DSX-1 patch panel.

Table B-1. CLEI Codes for FSM Applications

Equipment	Description (Note)	CLEI* Code	COMCODE or Drawing Number
<i>In the RT/HDT:</i>			
SPQ [®] -808	MSDT Server in MDS assy.	SAIUMBF	107063992
AUA408 Ser. 2	MSDT Server in MDS assy.	SAIUMB0	106275662
SPQ-809	MSDT Server in MDS assy. (TR-303)	5SCF900	107345100
SPQ-810 [†]	MSDT Server in MDS assy. (TR-303)	LFIU80P	107838955
HDOS	HDOS assembly	LFMAEKOAMA	J1C265AC-1L3
AYB7	HDOS cut-through board (CTB)	SAIUN90	107287435
AYB1B	HDOS optical unit	5SCF24ABAB	105550461
AYB2	HDOS power unit	LFOCEH0AAA	104432984
FSS	Fiber service shelf	SAMYABA	847528403
Cabling	FSM DSX-1 cable to DSX	—	ED-7C723-37,G2 (150 feet)
FSM (with cables)	Fiber service module (with cable)	SAMA290	601783343
Cabling	FSM DSX-1 cable to DSX	—	ED-7C723-37, G1 (75 feet)
See note and footnotes at end of table		Continued on next page	

Table B-1. CLEI Codes for FSM Applications —Continued

Equipment	Description (Note)	CLEI* Code	COMCODE or Drawing Number
BBG2	MXRV0	SNCMAA2	106439409
BBF1B	Low-speed DS1 interface	SNCLA70	106543606

841 Cabinet:

4 MSDTs, 4 Fiber jumper cables (No FSM)	F94OH0255	107276412
4 MSDTs, 5 Fiber jumper cables (with FSM)	F95OH0012	107500811
4 MSDTs, 1 Fiber jumper cable (with FSM)	F94OH0013	107500829
FSM / Repeater / Power Shelf	—	847367596

In the MSDT:

FSM (without cables)	Fiber service module	—	ED-7C723-21,G1
MSDT	Enhanced MSDT assembly	—	—
BYB7	MSDT DST pack (for the FSM) . See warning below.	SAIUNH0	107287401
MC97780A1 I3:3	MSDT BIU	5SCT42B	107129363
MC97793A1	MSDT BIU (downloadable, TR303)	5SPQACA	107255382
MC97789A1	MSDT BIU	5SCT42A	107163859
AUA411 S1:1	MSDT CDTU	5SPQAA3	106275696
AUA411B	MSDT CDTU (TR-303)	5SPQAC3	107431579
AUA413	MSDT RGU	5SPQADT	106275977
AUA424	MSDT PIU	5SPQABX	107086407
AUA434	MSDT PIU (60 V)	5SPQACB	107248965
AUA417	MSDT PCU	5SPQAA1	106436504
AUA422	MSDT PCU	5SPQABW	107086399
AUA423	MSDT RGU	5SPQADU	106835598

See Note and footnotes at end of table.

Continued on next page

Table B-1. CLEI Codes for FSM Applications —Continued

Equipment	Description (Note)	CLEI* Code	COMCODE or Drawing Number
—	Repeater shelf	T1M1KC0ARA	ED-8C730-31, G2 (Part number 007-00504-000)

**WARNING:**

Under no circumstances should the signal lines be run to outside plant cables or equipment when the BYB7 is being used in the DSX modes. The DSX mode is intended for inside plant applications only.

FSM circuit packs (in the RT/HDT and MSDT):

BDJ [®] 241 S1:1	FSM PWR pack	SAIUNJ0	107287351
BDJ242 S1:1	FSM DSX pack	SAIUNK0	107287369
BDJ243 S1:1	FSM MUX pack	SAIUNL0	107287377
BDJ244 S1:1	FSM OU pack	SAIUNM0	107287385

Note: Some plug-ins have switch settings that may be set by Operations Systems; data sheets for those plug-ins are to be provided.

* COMMON LANGUAGE is a registered trademark and CLEI, CLLI, and CLFI are trademarks of Bell Communications Research, Inc.

† The SPQ810 DT Server can only be used to host an MSDT when the SLC[®]-2000 HDT software release is 4.5 or later.

FSM Installation Procedures

Perform the following procedures for an FSM at both the HDT site and the MSDT site.



NOTE:

These are separate procedures that may be done (but do not have to be done in conjunction with one another).



WARNING:

To avoid eye injury, never look directly into the fiber output terminal of the OU.

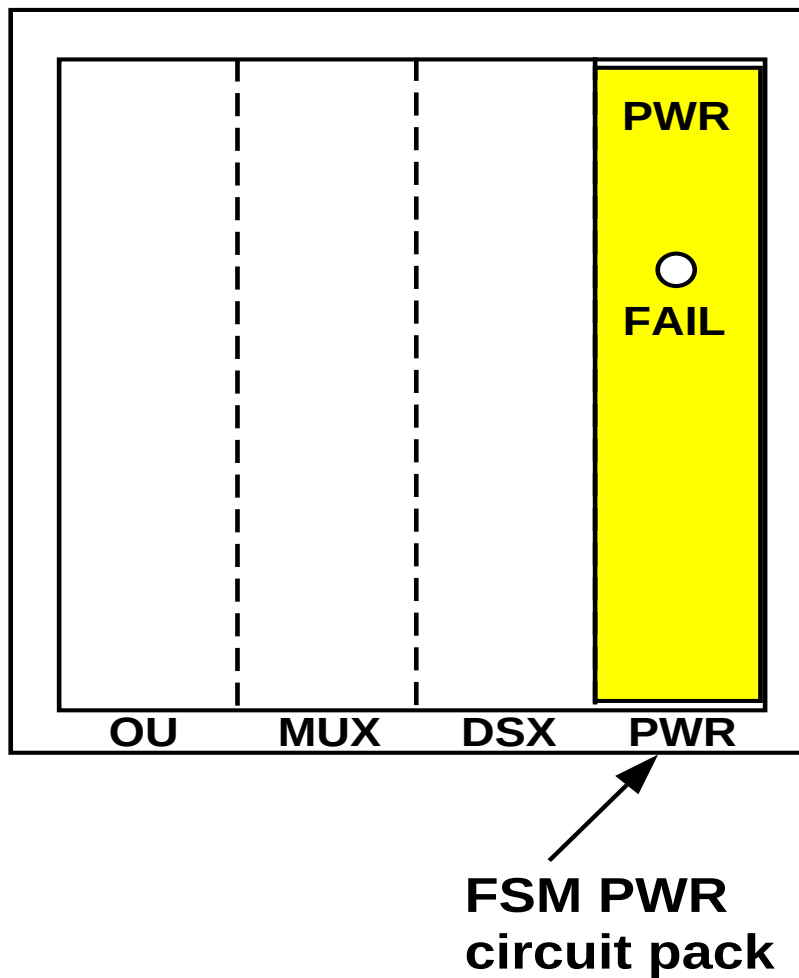


NOTE:

This procedure assumes that no external lines are connected to the FSM.

1. Obtain the following plug-in circuit packs and equipment:
 - DSX circuit pack (*BDJ242*) (optional)
 - MUX circuit pack (*BDJ243*)
 - FSM PWR circuit pack (*BDJ241*)
 - FSM OU circuit pack (*BDJ244*) and adapter to fit the fiber connector (as needed depending on the type of fiber connector if not an *ST*® connector)
 - Equipment to *loop back* each DSX-1 transmit side to receive side
 - Work order
 - Voltmeter.
2. Loop back all DSX-1 connections.
3. Verify that –48 volts is applied to the FSM by doing one of the following:
 - ***For an FSM at the HDT,*** measure the fuse panel voltage used for the FSM at the HDT.
 - ***For an FSM at the MSDT site,*** ensure that the PIU and the PCU are properly installed. Refer to the following detailed level procedures (DLPs) in Chapter 8, "Operation and Maintenance — TOP," in this manual. Be sure to install the PIU and PCU in the power module cage.
 - **DLP-529** — Install the PIU in the power module cage instead of the MSDT.
 - **DLP-530** — Install the PCU in the power module cage instead of the MSDT.

4. Install the FSM PWR circuit pack (*BDJ241*) (Figure B-11). The FAIL LED on the front of the circuit pack may light steadily or flash, but it will go off when the MUX circuit pack is installed.



fsmpwr.ins.ps

Figure B-11. FSM PWR Circuit Pack Installation

5. Set the options on the MUX circuit pack (Figure B-12) as follows:

- **LBO Option Switch** — Set for the approximate line length from the MUX circuit pack to the interfacing equipment. Line built-out (LBO) switches are set for the MUX group of four DSX-1s. Table B-2 shows the switch settings for the line lengths up to 655 ft. Table B-3 shows the individual switches that control the LBO function. For equipment adjacent to the FSM, the setting is normally 0-133.
- **DSX-1 Line Code** — set the S1 option switches to either B8ZS or AMI for each individual DSX-1. Table B-3 shows which individual switch controls which individual DSX-1 line (B/Z 1 to B/Z 4). Set the switch to ON for AMI/ZCS, and OFF for B8ZS.
- Always set SW8 on S1 to the off position.

Table B-2. MUX Circuit Pack LBO Switch Settings (Switch S1)

Distance (ft)	SW1	SW2	SW3
0 — 133	OFF	OFF	OFF
134 — 267	OFF	OFF	ON
268 — 400	OFF	ON	OFF
401 — 533	OFF	ON	ON
534 — 655	ON	OFF	OFF

Table B-3. MUX Circuit Pack Option Switches (Switch S1)

Switch Number	DSX Line Number
1	LBO1
2	LBO2
3	LBO3
4	B/Z DSX line 1
5	B/Z DSX line 2
6	B/Z DSX line 3
7	B/Z DSX line 4
8	Future Use

- **Master/Slave Clock Jumper** — Set to Master (M) at the HDT, and set to Slave (S) at the MSDT site.



NOTE:

When the MUX circuit pack jumper is set to master, the master clock source is the local 51.84-MHz clock oscillator. When the MUX circuit pack jumper is set to slave, it operates in a loop-timed mode and the clock source is the recovered clock input from the optical unit.

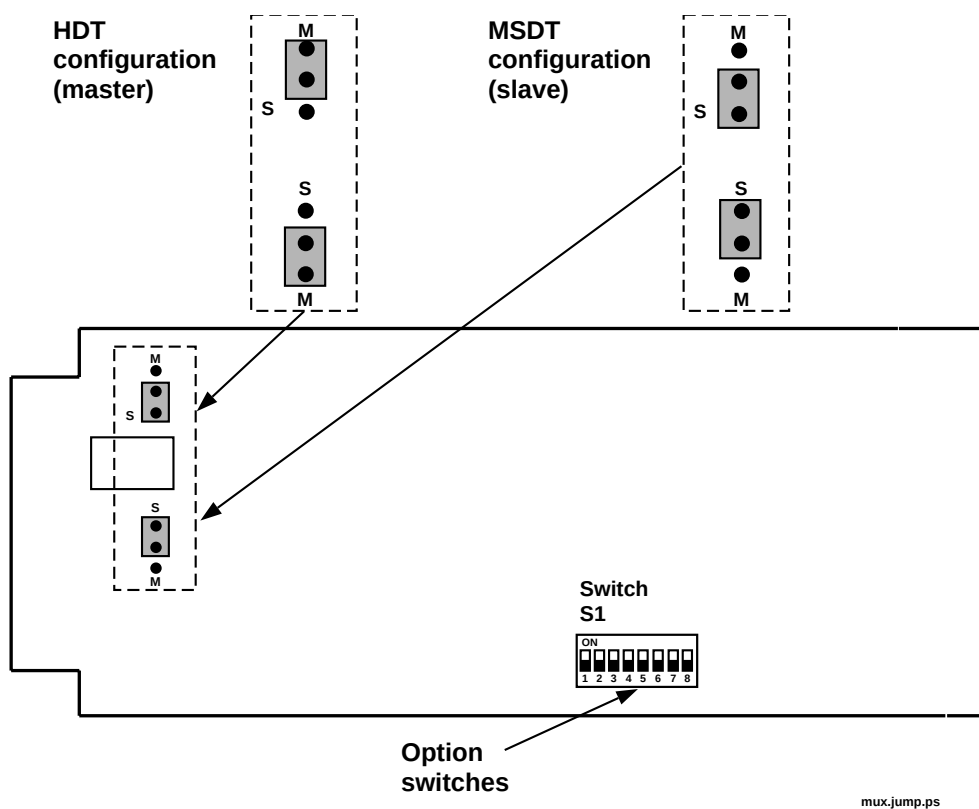
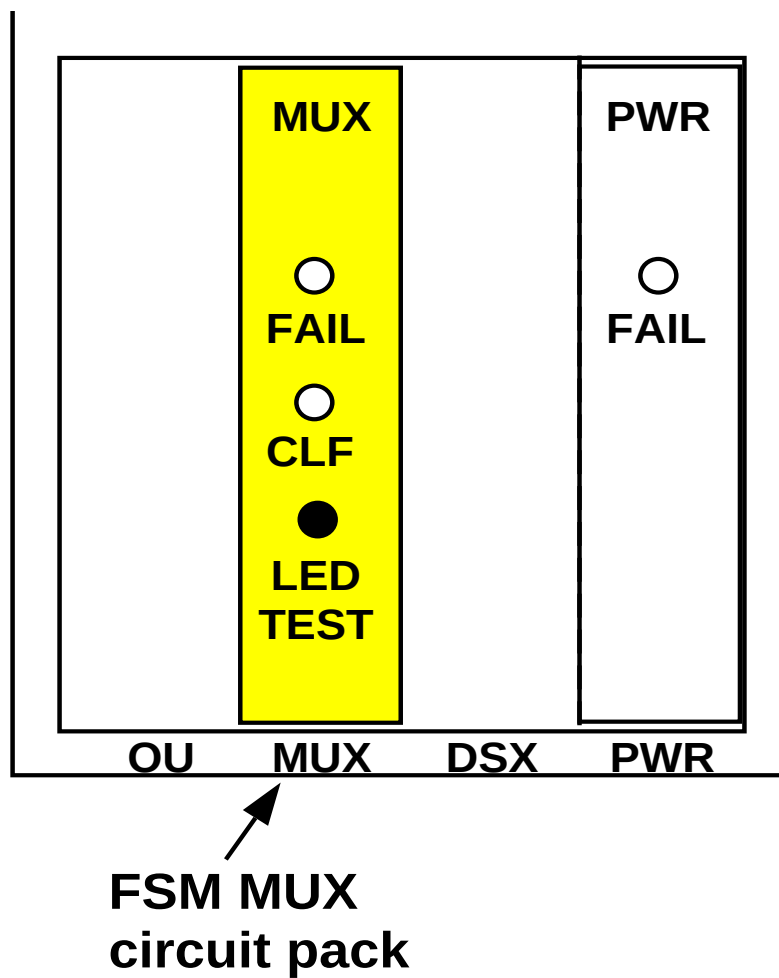


Figure B-12. MUX Jumper Straps and Option Switches

6. Install the MUX circuit pack (*BDJ243*) (Figure B-13) and do the following:
 - a. After installing the circuit pack, observe that the two LEDs on the pack light for a short period and then go off. Also, observe that the LED on the PWR circuit pack is off.
 - b. Press and hold the LED TEST switch. Observe that the LEDs light on both the MUX circuit pack and the PWR circuit pack.
 - c. Release the LED TEST switch. Observe that all LEDs go off.



fsmmux.ins.ps

Figure B-13. FSM MUX Circuit Pack Installation

7. If using the optional DSX circuit pack, set the options as follows (Figure B-14):
 - **LBO Option Switch** — Set for the approximate line length from the DSX circuit pack to the interfacing equipment. LBO switches are set for groups of four DSX-1s. Switch 301 sets LBO for DSX-1, 1 through 4, and switch 701 sets LBO for DSX-1, 5 through 8. Table B-4 shows the switch settings for the line lengths up to 655 ft. Table B-5 shows the individual switches that control the LBO function. For equipment adjacent to the FSM, the setting is normally 0-133.
 - **DSX-1 Line Code** — Set the S301 and S701 option switches to either B8ZS or AMI for each individual DSX-1. Table B-5 shows which individual switch controls which individual DSX-1 line (B/Z 1 to B/Z 8). Set the switch to ON for AMI/ZCS and OFF for B8ZS.
 - Always set SW8 on Switches 301 and 701 to the off position.

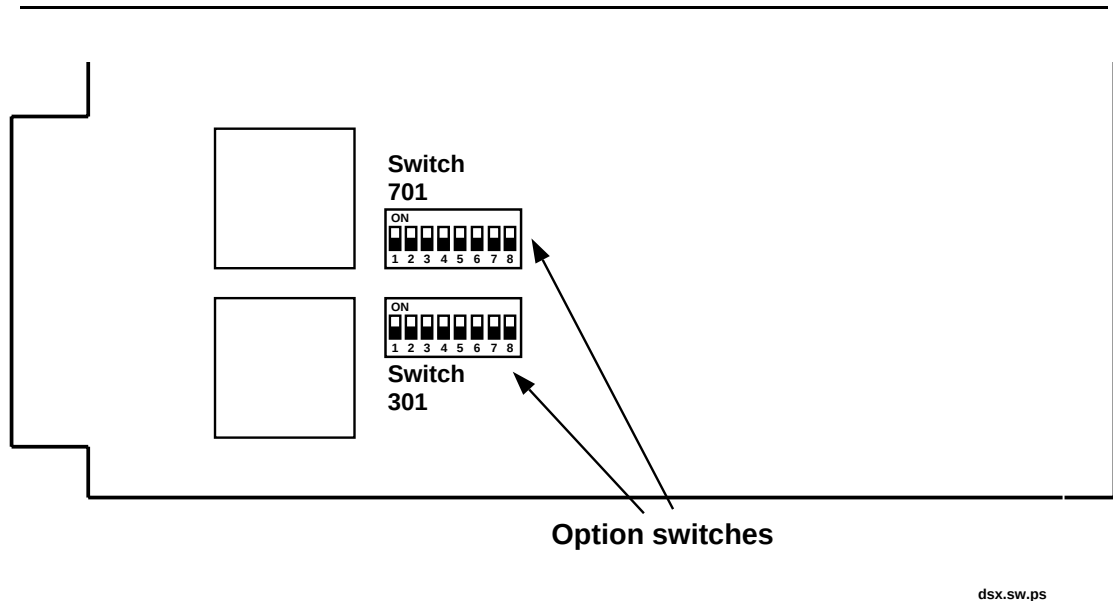


Figure B-14. DSX Option Switches

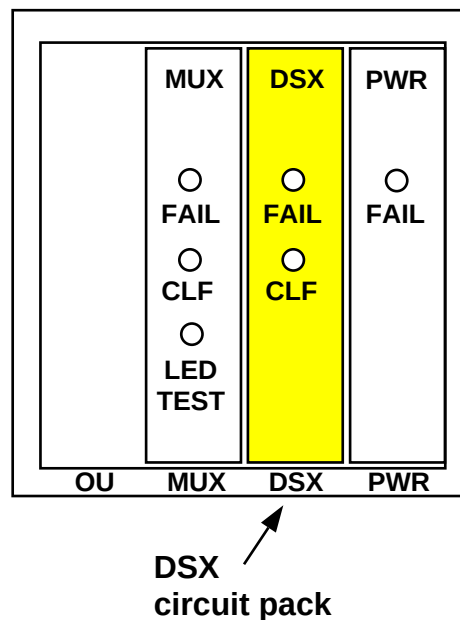
Table B-4. DSX Circuit Pack LBO Switch Settings

Distance (ft)	LBO1	LBO2	LBO3
0 — 133	OFF	OFF	OFF
134 — 267	OFF	OFF	ON
268 — 400	OFF	ON	OFF
401 — 533	OFF	ON	ON
534 — 655	ON	OFF	OFF

Table B-5. DSX Circuit Pack Individual Option Switch Function

Switch 301 DSX 1 — 4		Switch 701 DSX 5 — 8	
Switch Number	Function	Switch Number	Function
S1	LBO1	S1	LBO1
S2	LBO2	S2	LBO2
S3	LBO3	S3	LBO3
S4	B/Z DSX line 1	S4	B/Z DSX line 5
S5	B/Z DSX line 2	S5	B/Z DSX line 6
S6	B/Z DSX line 3	S6	B/Z DSX line 7
S7	B/Z DSX line 4	S7	B/Z DSX line 8
S8	Future Use	S8	Future Use

8. If the FSM DSX circuit pack is used, install the circuit pack (Figure B-15) and do the following:
 - a. After installing the circuit pack, observe that the two LEDs on the pack light.
 - b. After a brief period, observe that the two LEDs go off.
 - c. Press and hold the LED TEST switch on the MUX circuit pack. Observe that the LEDs light on the MUX circuit pack, the PWR circuit pack, and the DSX circuit pack.
 - d. Release the LED TEST switch. Observe that all LEDs go off.

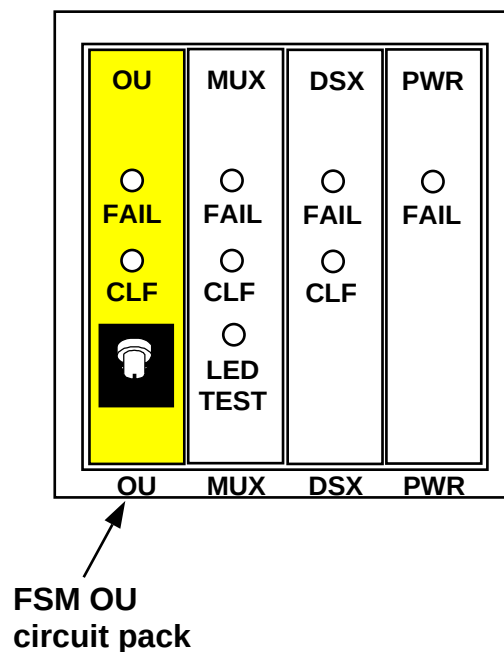


fsm dsx.ins.ps

Figure B-15. FSM DSX Circuit Pack Installation

9. Ensure that there is no fiber connected to the OU circuit pack.
10. ***If an AEK-type T1 repeater circuit pack is used at the MSDT site***, set the option settings on the repeater circuit pack to agree with the work order. Refer to the data sheet for the repeater if necessary — AEK86B (365-200-006) and AEK88 (365-200-004). (See Figure B-6 for repeater location.)

11. Install the FSM OU circuit pack (Figure B-16) and do the following:
 - a. After installing the circuit pack, observe that the two LEDs on the pack light.
 - b. After a brief period, observe that the FAIL LED goes off but the CLF LED stays on.
 - c. The CLF LED will stay on until you connect a fiber to the OU circuit pack.
 - d. Press and hold the LED TEST switch on the MUX circuit pack. Observe that the LEDs light on the MUX circuit pack, the PWR circuit pack, the DSX circuit pack (if installed), and the OU circuit pack.
 - e. Release the LED TEST switch. Observe that all LEDs go off (except the CLF on the OU circuit pack).



fsmou.ins.ps

Figure B-16. FSM OU Circuit Pack Installation

You have completed the FSM installation. You may now perform the FSM fiber link cable acceptance tests.

FSM Cable Acceptance Tests

Fiber Link Cable Acceptance Tests



NOTE:

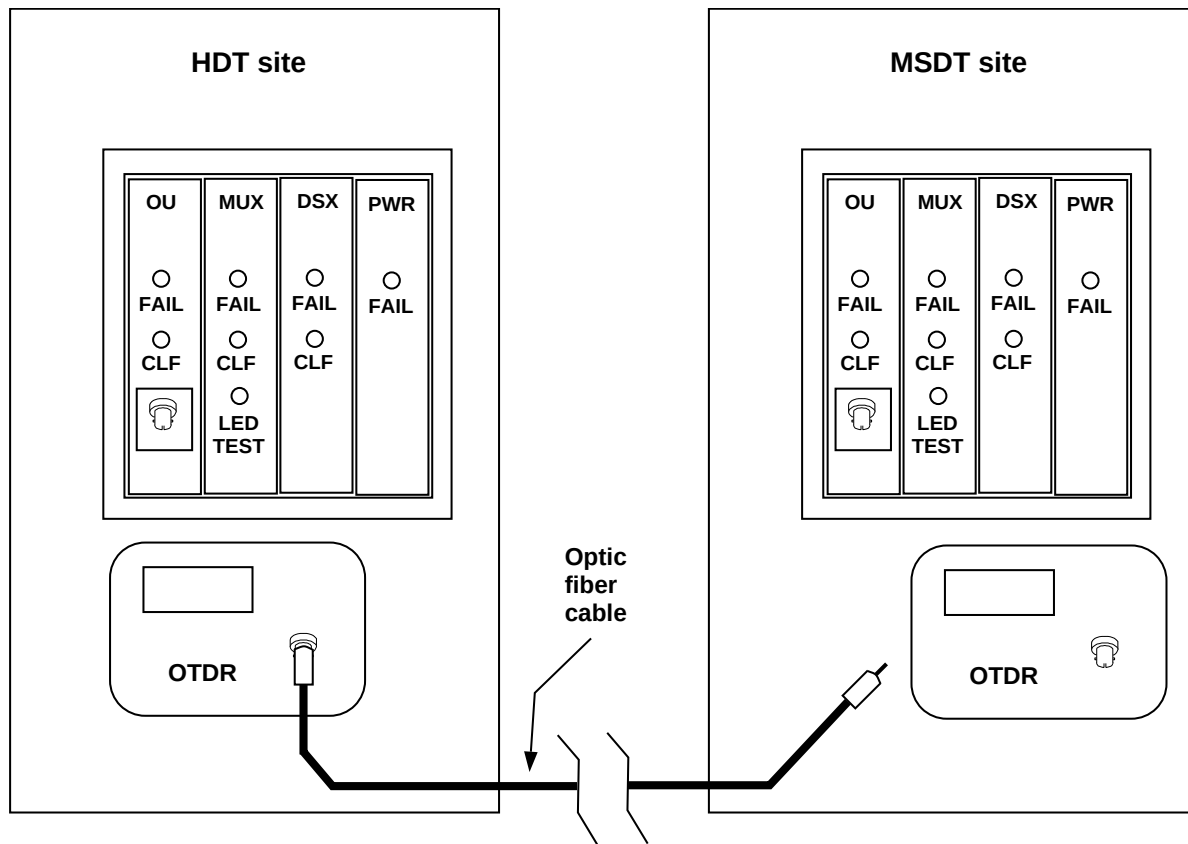
If the fiber has not been tested and an OTDR is available, perform the OTDR Measurements Test.

If an OTDR is NOT available, go directly to the Fiber Loss Measurement Test section.

OTDR Measurements Test

To perform this procedure, you must have craft personnel with an optical time delay reflectometer (OTDR) or equivalent at both the HDT site and the MSDT site.

1. **At both the HDT and MSDT sites**, obtain an OTDR or equivalent optical instrument.
2. Establish communications between the HDT and the MSDT sites.
3. If needed, perform the FSM installation procedure.
4. Measure the return loss of the fiber by doing the following steps:
 - a. **At the MSDT site**, ensure that the optical fiber cable is not connected to the OU or any other connector (Figure B-17).
 - b. At the HDT site, connect the optical fiber cable to the OTDR.
 - c. At the HDT site, read the return loss on the OTDR.
 - d. The return loss should not exceed –27 dB.
 - e. At the HDT site, disconnect the cable from the OTDR and leave it disconnected.



otdr01.ps

Figure B-17. Measuring Return Loss at the HDT Site

- f. **At the HDT site**, ensure that the optical fiber cable is not connected to the OU, OTDR, or any other connector (Figure B-18).
- g. At the MSDT site, connect the optical fiber cable to the OTDR.
- h. At the MSDT site, read the return loss on the OTDR.
- i. The return loss should not exceed -27 dB.
- j. At the MSDT site, disconnect the cable from the OTDR.

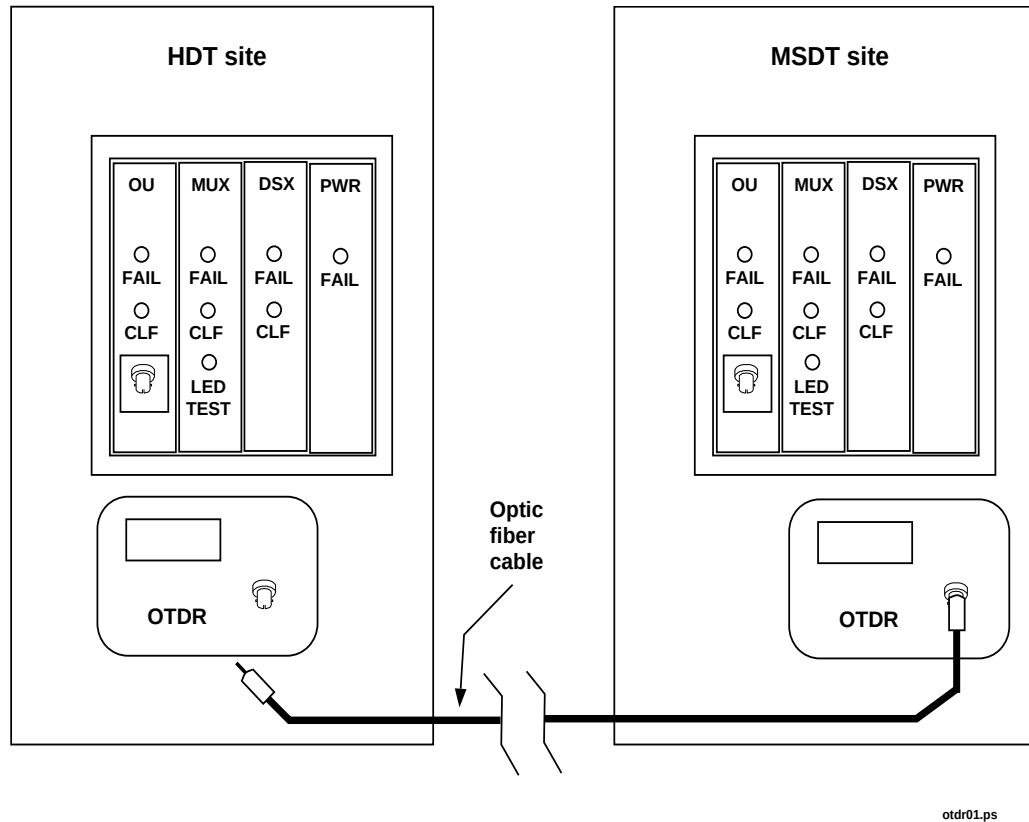
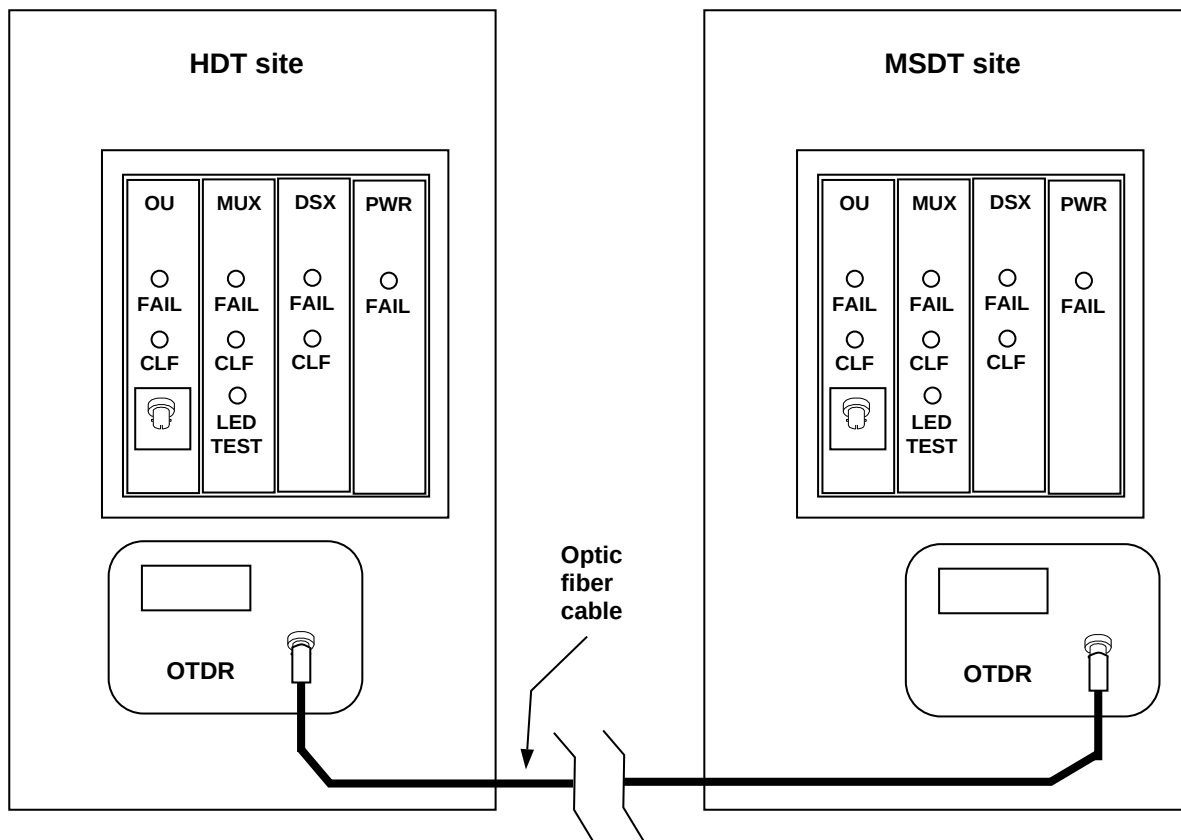


Figure B-18. Measuring Return Loss at the MSDT Site

5. Measure the total loss of the fiber by doing the following steps:
 - a. **At the HDT site**, connect the fiber to the transmit side of the OTDR (Figure B-19).
 - b. At the MSDT site, connect the fiber to the receive side of the OTDR and measure the total fiber loss.
 - c. The fiber loss should not exceed 10 dB.
 - d. At both the HDT and MSDT sites, disconnect the fiber from the OTDR.



otdr03.ps

Figure B-19. Measuring Total Loss of the Optic Fiber Cable

6. Measure the output power of the fiber connected to the OU circuit pack by doing the following steps:
 - a. At the HDT site, connect the fiber to the connector on the OU circuit pack (Figure B-20).



NOTE:

When connecting and removing the *ST* connector on the OU, it may be necessary to remove the OU from the FSM and reinsert it.

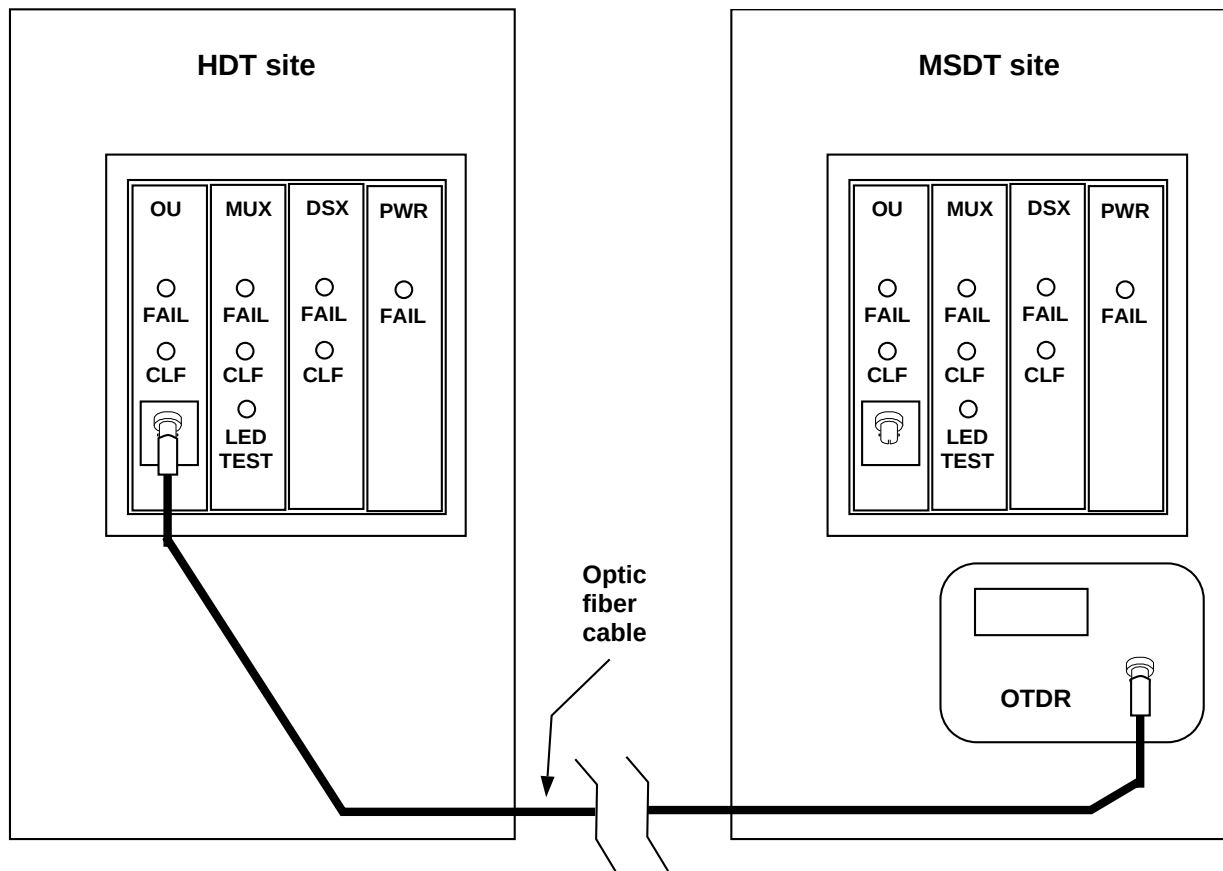
- b. At the MSDT site, connect the fiber to the OTDR and measure the power output of the fiber.



NOTE:

The power output should be $-22 \text{ dBm} \pm 2 \text{ dB}$ for a 10-dB fiber loss [that is, the OU power output ($-12 \text{ dBm} \pm 2 \text{ dB}$) minus the fiber cable loss].

- c. At the HDT site, disconnect the fiber cable from the connector on the OU circuit pack.
 - d. At the MSDT site, disconnect the fiber cable from the OTDR.



otdr04.ps

Figure B-20. Measuring Power Output of the Optic Fiber Cable at the MSDT Site

- e. At the MSDT site, connect the fiber to the connector on the OU (Figure B-21).
- f. At the HDT site, connect the fiber to the OTDR and measure the power output of the fiber.



NOTE:

The power output should be $-22 \text{ dBm} \pm 2 \text{ dB}$ for a 10-dB fiber loss [that is, the OU power output ($-12 \text{ dBm} \pm 2 \text{ dB}$) minus the fiber cable loss].

- g. At the MSDT site, disconnect the fiber cable from the connector on the OU circuit pack.
- h. At the HDT site, disconnect the fiber cable from the OTDR.

You have completed the fiber link cable acceptance tests. You may now perform the end-to-end acceptance tests.

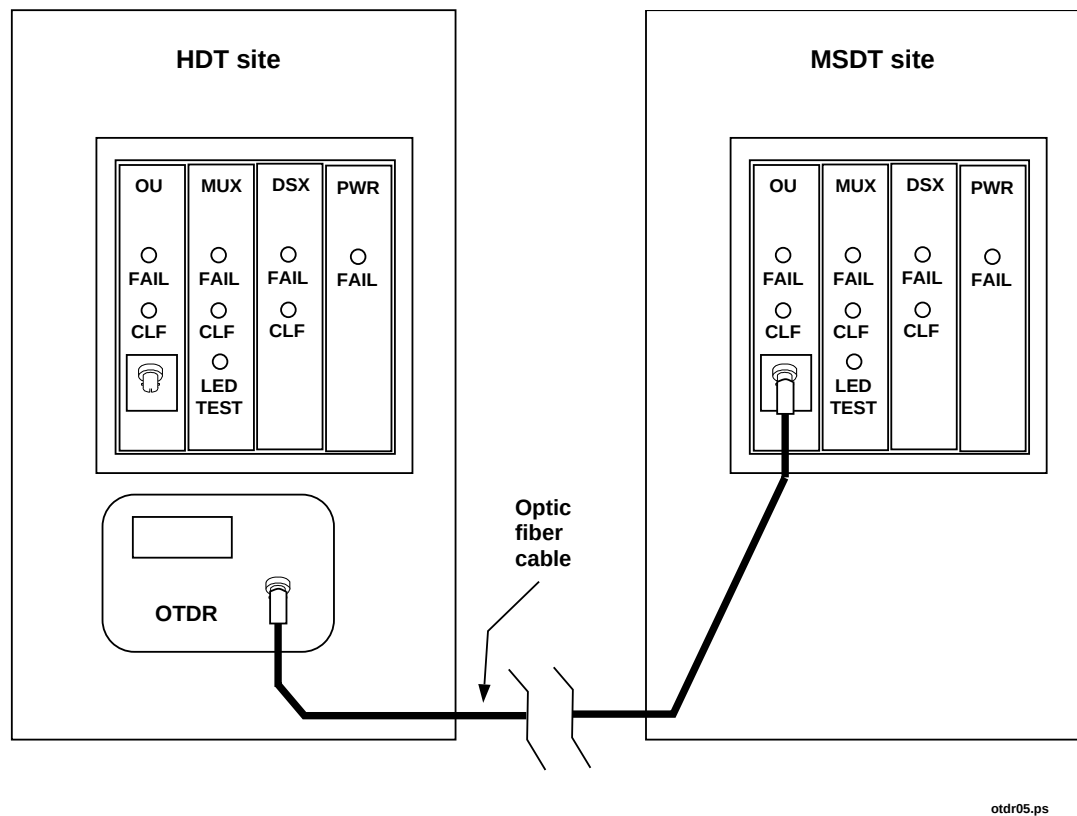


Figure B-21. Measuring Power Output of the Optic Fiber Cable at the HDT Site

Fiber Loss Measurement Test



NOTE:

When connecting and removing the *ST* connector on the OU, it may be necessary to remove the OU from the FSM and reinsert it.

1. ***At both the HDT and MSDT sites***, obtain an optical power meter.
2. ***At the HDT site***, measure the OU power output with an optical power meter.



NOTE:

The power output should be $-12 \text{ dBm} \pm 2 \text{ dB}$.

3. ***At the HDT site***, connect the fiber to the OU circuit pack.
4. ***At the MSDT site***, measure the power output of the fiber.



NOTE:

The power output should be greater than $-22 \text{ dBm} \pm 2 \text{ dB}$ (that is, for an OU power output of -12 dBm and a 10-dB fiber loss, this measurement would be -22 dBm . Fiber loss should not exceed 10 dB).

5. ***At the MSDT site***, measure the OU power output with an optical power meter.



NOTE:

The power output should be $-12 \text{ dBm} \pm 2 \text{ dB}$.

6. ***At the MSDT site***, connect the fiber to the OU circuit pack.
7. ***At the HDT site***, disconnect the fiber from the OU and measure the power output of the fiber.



NOTE:

The power output should be greater than $-22 \text{ dBm} \pm 2 \text{ dB}$ (that is, for an OU power output of -12 dBm and a 10-dB fiber loss, this measurement would be -22 dBm . Fiber loss should not exceed 10 dB).

8. ***At the MSDT site***, disconnect the fiber from the OU.
9. ***At the HDT site***, disconnect the fiber from the optical power meter.

You have completed the fiber loss measurement test.

FSM End-to-End Acceptance Procedures

This section includes two end-to-end acceptance tests, depending on the FSM application:

- ***MDS MSDT Server to FITL MSDT End-to-End Test.*** Perform this test when the FSM application is for an MSDT channel unit interface between a SLC-2000 HDT and a FITL MSDT. After performing this test, perform the local DSX-1 cable connections and remote alarm cable acceptance tests.
- ***FSM DSX-1 to FSM DSX-1 End-to-End Test.*** Perform this test when the FSM application is for DSX-1 use not involving MSDT channel unit service. An example would be when using the FSMs to interface between the HDT and customer equipment without MSDT channel units service application. After performing this test, perform the local DSX-1 cable connections and remote alarm cable acceptance tests.

MSDT Server (HDT) to FITL MSDT End-to-End Test

This procedure ensures that the DSX-1 lines can provide bidirectional transmission between the MSDT Server at the HDT and the MSDT. To perform this procedure, you must have craft personnel at both the HDT site and the MSDT site.

1. Obtain the following circuit packs and test equipment:

- ***At the HDT site:***

- MSDT Server (*SPQ808* or *SPQ809*)
- HDOS cut-through board (*AYB7*) (used when an HDOS shelf is in the configuration)
- Multimeter.

- ***At the MSDT site:***

- DST circuit pack (*BYB7*)
- Multimeter.



WARNING:

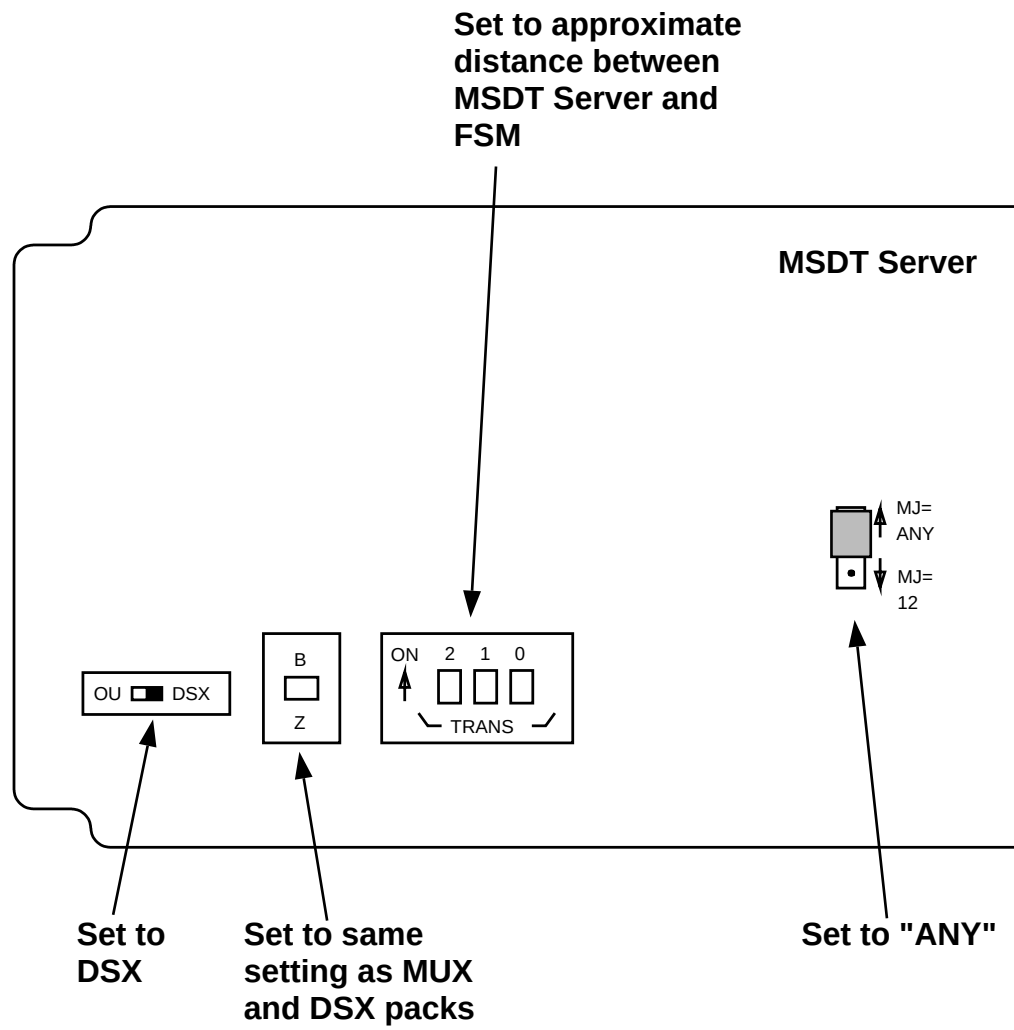
*Under no circumstances should the signal lines be run to outside plant cables or equipment when the *BYB7* is being used in the *DSX* modes. The *DSX* mode is intended for inside plant applications only.*

2. Establish communications with the other site.
3. Ensure that the *FSM installation* and the FSM cable acceptance tests have been completed.

4. Perform the following steps to configure the system for the end-to-end test:
 - a. **At the HDT site**, configure a *SLC-2000* virtual remote terminal (VRT) for FITL. Also, configure a server slot for either a 12- or 24-channel bandwidth. (Refer to 363-208-001 *SLC-2000 User/Service Manual* Channel Unit Installation: NTP-010 — Install and Test MSDT Servers for FITL Distribution.)
 - b. **At the HDT site**, set the option switches on the MSDT Server as follows (Figure B-22):
 - **OU/DSX** — DSX
 - **B/Z** — Same setting as on the FSM MUX or DSX circuit pack, set to either B (B8ZS) or Z (AMI/ZCS).
 - The B/Z setting must be consistent end-to-end throughout the system.
 - **TRANS** — set to approximate distance between the FSM and the MSDT Server (see Table B-6 for switch settings).
 - **MJ** (option strap) — ANY.

Table B-6. LBO Switch Settings (MSDT Server)

Distance (ft.)	SW2	SW1	SW0
0 — 132	OFF	OFF	ON
133 — 265	OFF	ON	OFF
266 — 398	OFF	ON	ON
399 — 532	ON	OFF	OFF
533 — 655	ON	OFF	ON



808option.ps

Figure B-22. Option Settings on the MSDT Server

- c. **At the HDT site**, install the MSDT Server in the VRT provisioned in a slot in the MDS assembly that corresponds to the VRT provisioned for FITL.
- d. **At the HDT site**, install the HDOS cut-through board (AYB7) in the HDOS shelf (if used) and wire it to the DSX patch panel. On the AYB7 CTB, the T,R transmit should be wired to the OUT of the transmit side of the DSX-1 block and the T1,R1 receive should be wired to the inside of the receive DSX-1 block.
- e. **At the HDT connector block or patch panel**, connect the MSDT Server's DSX-1 to the termination of DSX-1 number 1 (or selected DSX-1 to be installed) of the FSM. Use the cabling diagrams (Figure B-4 and Figure B-5) to find this termination.
- f. **At both the HDT and MSDT sites**, ensure that the fiber to the FSM OU is connected (Figure B-23).

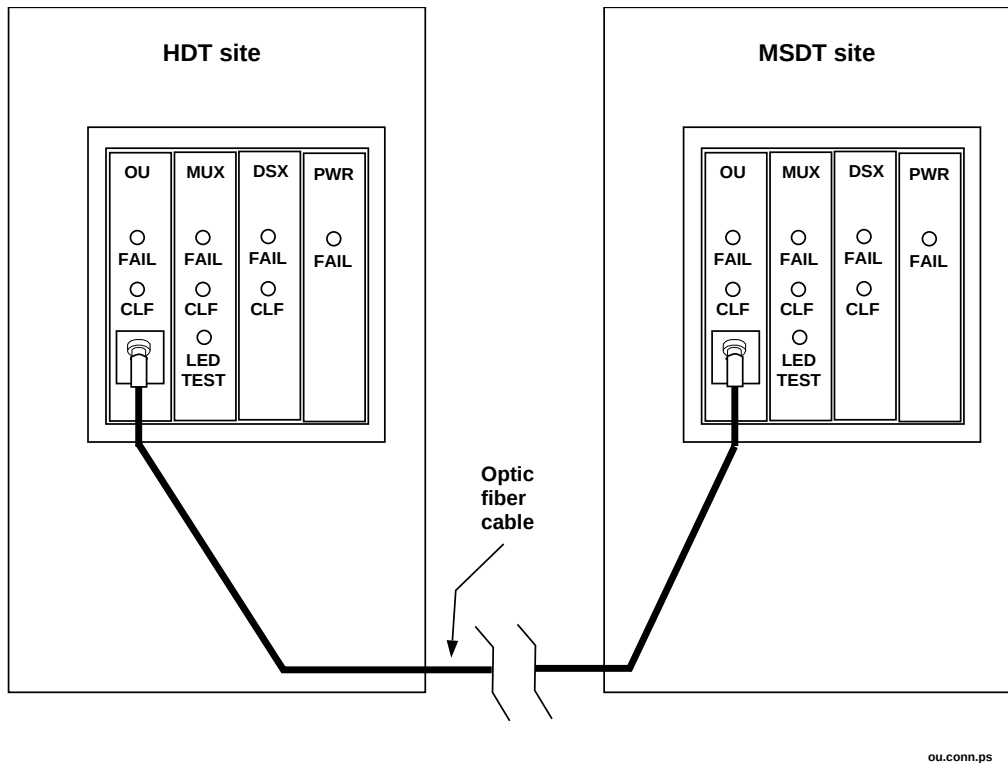


Figure B-23. Connecting the Fiber to Each FSM OU

g. **At the MSDT site**, do the following:

- On the DST circuit pack (BYB7), set the option switches (Figure B-24) as follows:



WARNING:

Under no circumstances should the signal lines be run to outside plant cables or equipment when the BYB7 is being used in the DSX modes. The DSX mode is intended for inside plant applications only.

- **B/Z Switch** — Set to either **B** (B8ZS) or **Z** (AMI/ZCS). Set to the same setting as the FSM MUX or DSX pack.
- **LBO Option Switch** — Set for the approximate line length from the DST circuit pack to the FSM equipment. Table B-7 shows the switch settings for the line lengths up to 655 ft.

Table B-7. LBO Switch Settings (DST Circuit Pack)

Distance (ft.)	SW2	SW1	SW0
0 — 132	OFF	OFF	ON
133 — 265	OFF	ON	OFF
266 — 398	OFF	ON	ON
399 — 532	ON	OFF	OFF
533 — 655	ON	OFF	ON

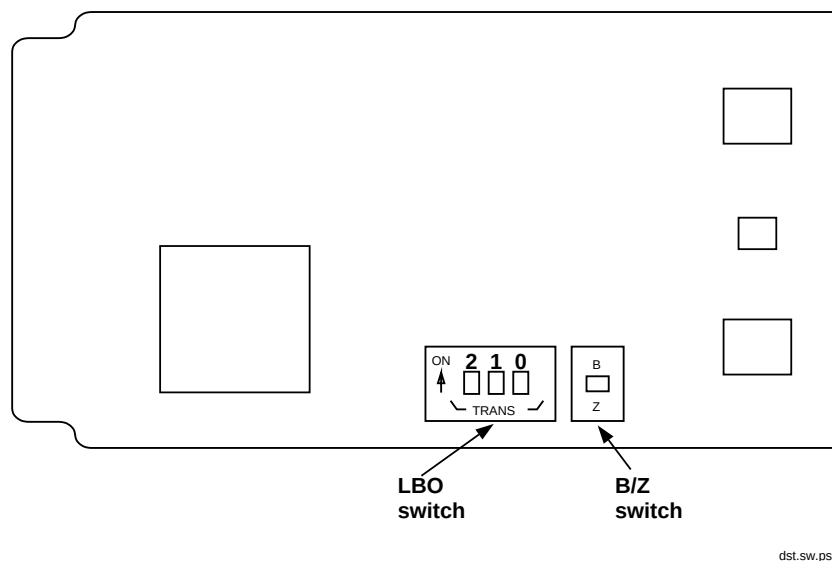


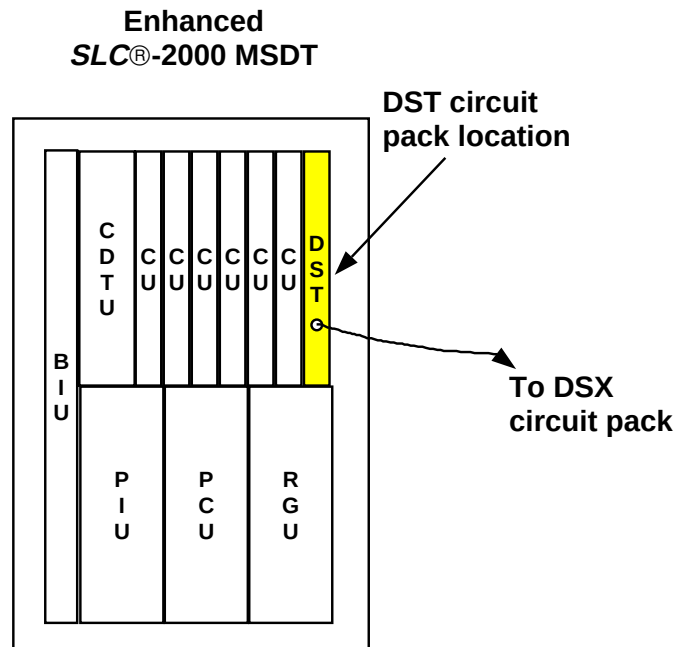
Figure B-24. DST Option Switch Locations

- Install the DST circuit pack (BYB7) in the MSDT slot that normally holds the BYB1B/BYB1C/BYB5 OU circuit pack (Table B-25).



WARNING:

Under no circumstances should the signal lines be run to outside plant cables or equipment when the BYB7 is being used in the DSX modes. The DSX mode is intended for inside plant applications only.



dst.ins.ps

Figure B-25. DST Location in the MSDT

- h. **At the MSDT site**, connect the transmit/receive pairs of DSX-1 number 1 (or selected DSX-1 to be installed) of the FSM to the DSX-1 line on the faceplate of the DST.
 - i. Remove the looped back connection via the 108 connector blocks and DST cable (ED-7C723-22, G8).
5. With the system configured for an end-to-end link connecting the HDT and MSDT FSMs (including –48 volts power), ensure that the following LEDs are off:
- **At the HDT site:**
 - MSDT Server — all LEDs
 - FSM — all LEDs

- **At the MSDT site:**
 - FSM — all LEDs
 - BIU circuit pack in the MSDT — all LEDs (except for slot designation).
- 6. **At the HDT site**, connect the multimeter to measure continuity on the remote alarm leads. Use the cabling diagram (Figure B-5) to determine the location of these leads.



NOTE:

As you proceed through the end-to-end test, observe that when a CLF LED is lighted on either FSM, the remote alarm contact closes (meter reads 0). When the CLF LEDs go off, the remote alarm contact opens (meter reads infinity).

- 7. Test the circuit from the HDT to the MSDT as follows:
 - a. **At the HDT site**, disconnect the DSX-1 transmit line of the MSDT Server connecting to the MUX pack of the FSM (DSX-1 number 1 or selected DSX-1).
 - b. **At the HDT site**, observe that the CLF LED on the FSM's MUX circuit pack blinks at a rate that indicates DSX-1 number 1 has failed (see Table B-8). The MSDT Server's CLF LED should also light.
 - c. **At the MSDT site**, observe that the CLF LED on the FSM's MUX circuit pack blinks at a rate that indicates DSX-1 number 1 has failed.
 - d. **On the BIU circuit pack at the MSDT site**, observe that the CLF and FE LEDs are lighted.
 - e. **At the HDT site**, reconnect the DSX-1 transmit line.
 - f. **At both the HDT and MSDT sites**, ensure that all LEDs are off.
 - g. At the MSDT site, the BIU LEDs may take up to 20 seconds to go off.
- 8. Test the circuit from the MSDT to the HDT as follows:
 - a. **At the MSDT site**, disconnect the DSX-1 transmit line of the BIU connecting to the MUX circuit pack of the FSM (DSX-1 number 1).
 - b. **At the MSDT site**, observe that the CLF LED on the FSM's MUX circuit pack blinks at a rate that indicates DSX-1 number 1 has failed.
 - c. **At the HDT site**, observe that the CLF LED on the FSM's MUX circuit pack blinks at a rate that indicates DSX-1 number 1 has failed (see Table B-8).
 - d. **On the MSDT Server circuit pack at the HDT site**, observe that the CLF and DT LEDs are on.
 - e. **At the MSDT site**, reconnect the DSX-1 transmit line.

- f. **At both the HDT and MSDT sites**, ensure that all LEDs are off.
9. Repeat Steps 7 and 8 for each DSX-1 connected to the FSMs.
-  **NOTE:**
Testing DSX-1 numbers 1 through 4 will result in a flashing CLF LED on the MUX circuit pack, while testing DSX-1 numbers 5 through 12 will result in a flashing CLF LED on the DSX circuit pack.
10. After testing all DSX-1 lines, ensure that no FSM CLF LEDs are on at either site.
-  **NOTE:**
DSX-1 lines must either be looped back or connected in an MSDT Server to MSDT link to ensure that CLF LEDs are off.
11. Test the optical fiber circuit as follows:
 - a. **At the HDT site**, disconnect the optical fiber from the FSM OU fiber connector.
 - b. **At both the HDT and MSDT sites**, ensure that the CLF LED on the FSM OU circuit packs lights.
 - c. **At the HDT site**, reconnect the optical fiber to the FSM OU fiber connector.
 - d. **At both the HDT and MSDT sites**, ensure that the CLF LED on the FSM OU circuit packs goes off.

You have completed the MDS Server to FITL MSDT End-to-End Test. Perform the local DSX-1 cable connections and remote alarm cable acceptance tests.

FSM DSX-1 to FSM DSX-1 End-to-End Test

This procedure ensures that the DSX-1 lines can provide bidirectional transmission between the patch panel at the HDT and the connector block at the remote site. To perform this procedure, you must have craft personnel at both the HDT site and the remote site.

1. ***At both the HDT and MSDT sites***, connect the fiber to the OU.
2. ***At both the HDT and remote sites***, obtain a Tekelec 8000 DS1 test set (or equivalent).
3. Establish communications with the other site.
4. Ensure that the *FSM installation* and the *FSM cable acceptance tests* have been completed.
5. ***At both the HDT and remote sites***, ensure that all DSX-1 lines are looped back.
6. ***At both the HDT and remote sites***, condition the transmit side of the DS1 test set as follows:
 - Line code (AMI/B8ZS) — set to the same position as in the FSM
 - Nominal output level
 - No DS1 errors
 - ESF framing
 - D1D
 - No signaling
 - QRSS data pattern.
7. ***At both the HDT and remote sites***, remove the loopback from DSX-1 number 1. Connect the DS1 test set to the DSX-1 number 1 transmit and receive tip and ring of the test sets at both sites.
8. After connecting the DSX-1 at both sites, monitor the test sets for at least 30 seconds. Ensure that the DS1 received at both ends is at a nominal level and is present without bit errors.
9. Test the circuit at the HDT as follows:
 - a. Remove the transmit lead from the test set.
 - b. Verify that the CLF LED on the FSM is blinking at a rate that identifies the DSX-1 number (see Table B-8).
 - c. Reconnect the transmit lead to the test set and verify that CLF LED on the FSM stops blinking and goes off.

10. Test the circuit at the remote site as follows:
 - a. Remove the transmit lead from the test set.
 - b. Verify that the CLF LED on the FSM is blinking at a rate that identifies the DSX-1 number (see Table B-8).
 - c. Reconnect the transmit lead to the test set and verify that CLF LED on the FSM stops blinking and goes off.
11. ***At both the HDT and remote sites***, replace the loopback on DSX-1 number 1. Remove the loopback from the next DSX-1. At both sites, connect the DS1 test sets to the next DSX-1 transmit and receive tip and ring and repeat from Step 8. Repeat the procedure until you have tested all DSX-1s.

You have completed the FSM DSX-1 to FSM DSX-1 end-to-end tests. Perform the local DSX-1 cable connections and remote alarm cable acceptance tests.

Local DSX-1 Cable Connections and Remote Alarm Cable Acceptance Tests

This procedure tests the DSX-1 cable connections and the remote alarm cable connection. You must perform this procedure for each FSM at both the HDT and MSDT sites.

1. Obtain a multimeter or any meter that measures continuity.
2. If needed, perform the FSM installation procedure.
3. ***For DSX lines connected to the MUX circuit pack***, loop back the four DSX-1 lines at the connector block or patch panel. Perform the following steps while referring to the sequence shown in Table B-8:
 - a. Remove the loopback at the connector block or patch panel for the 1st DSX-1 line shown in Table B-8.
 - b. With the loopback removed, ensure that the CLF LED on the MUX circuit pack is blinking the correct number of times (Table B-8).
 - c. Replace the loopback. Ensure that the CLF stops blinking and goes off.
 - d. Remove the loopback on the next DSX-1 shown in Table B-8. Repeat Steps b and c until you have tested all four DSX-1 lines connected to the MUX circuit pack.
 - e. Remove any two loopbacks. Ensure that the CLF LED lights and stays on continuously.
 - f. Replace the two loopbacks. Ensure that the CLF LED goes off.
4. ***For DSX lines connected to the DSX circuit pack*** (if used), loop back the eight DSX-1 lines at the connector block or patch panel. Perform the following steps while referring to the sequence shown in Table B-8:
 - a. Remove the loopback at the connector block or patch panel for the fifth DSX-1 line (first line to the DSX circuit pack) shown in Table B-8.
 - b. With the loopback removed, ensure that the CLF LED on the DSX circuit pack is blinking the correct number of times (Table B-8).
 - c. Replace the loopback. Ensure that the CLF stops blinking and goes off.
 - d. Remove the loopback on the next DSX-1 shown in Table B-8. Repeat Steps b and c until you have tested all eight DSX-1 lines connected to the DSX circuit pack.
 - e. Remove any two loopbacks. Ensure that the CLF LED lights and stays on continuously.
 - f. Replace the two loopbacks. Ensure that the CLF LED goes off.

5. At both the HDT and MSDT sites, connect the fiber to the FSM OU fiber connector.



NOTE:

At both the HDT and MSDT sites, ensure that all LEDs go off.

Table B-8. DSX-1 Cable Connection Testing Sequence

Testing Sequence	DSX-1 Line Number	FSM Circuit Pack		Number of Times CLF LED Blinks (Note)
		MUX Line	DSX Line	
1st	1	MUX-1		1
2nd	2	MUX-2		2
3rd	3	MUX-3		3
4th	4	MUX-4		4
5th	5		DSX-1	1
6th	6		DSX-2	2
7th	7		DSX-3	3
8th	8		DSX-4	4
9th	9		DSX-5	5
10th	10		DSX-6	6
11th	11		DSX-7	7
12th	12		DSX-8	8

Note: If two or more DSX-1 loopbacks from the same circuit pack are removed at the same time, the CLF LED on that pack will light and stay on continuously. In this case, DSX-1 lines will not be identified by the blinking CLF LED.

6. Test the remote alarm contact closures at the HDT site as follows:
 - a. Using the cabling diagram (Figure B-5), determine the location of the remote alarm contact closures.
 - b. Connect the meter's leads to the remote alarm contact closure points.
 - c. Remove the fiber connector from the OU circuit pack. With the CLF LED on the OU circuit pack on (no fiber connected to the OU), ensure that the meter reads approximately 0 ohms (depending on the length of the alarm cable).
 - d. This shows that the alarm contacts are *closed*, indicating that the system is trying to send an alarm to a remote location (CLF LED in the OU is on).
 - e. Reconnect the fiber to the OU. Ensure that the meter reads infinity (greater than 1M ohm).
 - f. Repeat the procedure for the opposite end.
7. ***If the FSM alarms are connected to an MSDT on one end and a SLC-2000 system on the HDT end***, perform the following procedure to test the alarm contact closures:
 - a. Cause an alarm at the FSM by removing a loopback from the MUX circuit pack.
 - b. At the BIU in the MSDT, ensure that the **NE** LED is lighted.
 - c. At the HDT, check the UIP or the CIT for an MSDT alarm.

You have completed the local DSX-1 cable connections tests and remote alarm cable connection acceptance tests.

Glossary

This section provides definitions for FSM and FITL acronyms and terms used in this appendix.

A

- ADM** Add-Drop Multiplexer.
- AIS** Alarm Indication Signal — a signal sent to *downstream* equipment that inhibits facility alarms in equipment along the downstream path.
- ARM** AccessResource Manager.
-

B

- BIU** Backplane Interface Unit — FITL circuit pack that terminates the HDT-MSDT link on the MSDT end and acts as the interface between the MSDT channel unit (CU) backplane and the distribution controller in the HDT/RT [either a metallic distribution controller (MDC) circuit pack in a *SLC-2000* HDT or a bank control unit (BCU) in a *SLC^ Series 5 RT*]. The BIU is the local controller for the MSDT.
-

C

- Channel Unit Shelf** Also called a metallic distribution shelf, the channel unit shelf refers to the upper or the lower half of an MDS assembly. When equipped with 24 quad channel units, a channel unit shelf will serve up to 96 customers via metallic loops.
- CTB** The cut-through-board is a circuit pack that replaces the AYB1B optical pack in the high density optics shelf (HDOS) at the RT/HDT location in FSM applications. (The HDOS is the same one used in FITL applications.) The CTB is required for the cable interface to an FSM; it enables the MUX circuit pack DSX-1 line to connect to the backplane DSX-1 line of an MDST server.

D

DCS Digital Cross-Connect System

DST The digital signal translator is a circuit pack installed in the MSDT channel unit shelf at the ONU location that interfaces a bidirectional 1.544 Mb/s DS1 line from the BIU with DSX-1 line interface to the MUX pack. It descrambles the DS1 line received from the BIU, transmits the descrambled DSX-1 to the MUX pack, and provides signal level translation.

DSX The digital signal cross-connect circuit pack is the FSM circuit pack that multiplexes eight DSX-1s into two VT-G DS1 groups for the MUX pack interface.

DSX-1 signal A 1.544 Mb/s balanced digital signal capable of driving a multipair 22 AWG PIC cable up to 655 feet.

DT The distant terminal is the network element closest to the subscriber that terminates an optical transmission path. The DT provides the optical/electrical interface and supports the channel units (CUs) that serve each metallic subscriber loop. It is the same as the Bellcore ONU network element.

Distribution Group The distribution group is a group of MSDT Servers (or channel units in a metallic system) that is associated with a metallic distribution controller (MDC) and occupies one half of a *channel unit shelf*. A distribution group serves two digroups in TR-08 systems, giving a maximum capacity of 48 VF services (DS0s).

F

FITL Fiber In The Loop.

FSM The Fiber Service Module is a four-circuit-pack module that multiplexes 12 DSX-1s into a 51.84-Mb/s digital bit stream with optical transmit and receive on a single optical fiber.

FSS Fiber Service Shelf

H

- HDT** The host digital terminal is the name given by Bellcore to *remote distant terminals (RDTs) or remote terminals (RTs)* of digital loop carriers with FITL distribution.
- HDOS** The high-density optics shelf is a shelf assembly that supports 32 AYB-size OU circuit packs and the associated power conversion units (PCUs) in *SLC-2000* FITL applications. When FSMs are used for DSX-1s in FITL applications, cut-through-boards (CTBs) can also be used in the OU slots.

L

- LBO** Line Build-Out

M

- MDC** The metallic distribution controller is a *SLC-2000* circuit pack that provides the interface between the channel unit circuits of individual metallic loops and the digital loop carrier system. In FITL applications, it interfaces between the MSDT Server and the DLC system.
- MDS** Metallic Distribution Shelf
- MSDT** The Multi-Services Distant Terminal is Lucent Technologies trade name for its DT (or ONU) with a service capacity of 24 VF subscriber loops (DSOs).
- MSDT Server** The MSDT Server is a channel-unit-slot-compatible circuit pack that plugs into the *SLC-2000* MDS assembly and interfaces between the MSDT and the RT/HDT. The *SPQ*[®]808 Server is a two-CU-slot wide circuit pack required for R2.0 and later *SLC-2000* FITL applications. The *SPQ*809 Server will be available in *SLC-2000* R4.1.
- MUX** The multiplex circuit pack is the FSM circuit pack that multiplexes four DSX-1s and two VT-G groups into a 51.84-Mb/s bit stream.

O

- ONU** Optical network unit is the name given by Bellcore to the network element closest to the subscriber that terminates the optical transmission path. See also the definition for *distant terminal*.
- OTDR** Optical time delay reflectometer
- OU** The optical unit is a circuit pack that performs the electrical-to-optical and optical-to-electrical conversion functions in the FSM HDT-MSDT link. The AYB1B is the 1.544-Mb/s OU circuit pack in the RT/HDT. It connects optically to the BYB1B OU in the MSDT. The FSM replaces the AYB1B in the RT/HDT and the BYB1B in the MSDT.

P

- PCU** Power Converter Unit
- PDC** Provisioning and Display Controller
- PIU** Power Interface Unit
- PWR** Power Circuit Pack

R

- RGU** Ringing Generator Unit
- RT** Remote Terminal

V

- VRT** Virtual Remote Terminal
- VT-G** Virtual Tributary Group, a four DSX-1 grouping

Contents

Introduction	C-1
Remote Terminal Location	C-4
■ CEV or Hut Installation	C-4
SLC [®] Series 5 HDT Bay	C-4
SLC-2000 HDT Bay	C-6
LGX [®] Lightguide Distribution Frame	C-9
Typical Bay Layouts and Ordering Information	C-11
■ 80A Cabinet Installation	C-11
■ 80D Cabinet Installation	C-11
■ 80E Cabinet Installation	C-12
SLC-2000 MSDT Equipment	C-19
Powering Equipment	C-25
Maintenance Equipment	C-28
Documentation	C-29
MSDT Service Configurations	C-32
Ordering Examples	C-36
■ Pre-Engineered Configurations	C-43
MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-43
MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement Protection with Binding Post	C-44
MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable	C-45
MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable	C-46

MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-47
MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post	C-48
MSDT -48VDC Rack Mount Application	C-49
MSDT $\pm$ 130VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post	C-50
MSDT $\pm$ 130VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-51
MSDT $\pm$ 130VDC Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable	C-52
MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-53
MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post	C-54
MSDT 60VAC Cabinet Wall/Aerial Mount with 25 Foot Stub Cable	C-55
MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement Protection with Binding Post	C-56
MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post	C-57
MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable	C-58

Ordering

C

Introduction

This appendix is designed to facilitate the equipment engineer's job of issuing a telephone equipment order (TEO). It is not intended to replace standard engineering documentation; for example, schematic drawings, equipment drawings, etc.

This appendix covers ordering information for a *SLC*[®]-2000 Multi-Services Distant Terminal (MSDT) closure and associated equipment and plug-in units. The host digital terminal (HDT) equipment and plug-in units that are dedicated to the *SLC*-2000 MSDT feature are also covered in this appendix. The HDT can be either a *SLC* Series 5 Carrier System or a *SLC*-2000 Access System remote terminal (RT). The HDT can interface the MSDT optically or metallically. In addition, an optional, miscellaneous mounted Fiber Services Module (FSM) can be used to interface with the MSDT. This optional FSM is covered in Appendix B. Other HDT equipment not specific to the MSDT application is not covered in this chapter but can be found in 363-205-000 (*SLC Series 5 Ordering Guide*) or 363-208-000 (*SLC-2000 Applications, Planning, and Ordering Guide*).

Since the central office terminal (COT) equipment used in a *SLC*-2000 Access System or a *SLC* Series 5 Carrier System Feature Package C (FPC) universal configuration is not unique to the *SLC*-2000 MSDT feature, ordering information for this equipment is not covered in this appendix but can be found in 363-205-000 (*SLC Series 5 Ordering Guide*) or 363-208-000 (*SLC-2000 Applications, Planning, and Ordering Guide*).

The following requirements apply to the *SLC-2000* MSDT feature when interfacing with a *SLC Series 5* system:

- The COT bank must be arranged for FPC.
- The common units for the COT must be chosen using the existing circuit pack selection rules for FPC COTs (refer to 363-205-000) and must include the following:
 - MC97755A1() bank control unit (BCU)
 - AUB2() channel test unit (CTU).
- The HDT bank must be arranged for Feature Package F (FPF).
- The common units for the HDT must be chosen using the existing circuit pack selection rules for Feature Package F (FPF) HDTs and must include the following units:
 - MC97779A1() BCU (FPF)
 - AUB27() alarm display unit (ADU)
 - Any C or D or higher series line interface unit (LIU)
 - AUA105() transmit/receive unit (TRU).
- The HDT must be arranged for *bulk power*.
- The HDT dual bank assembly must be J1C182AE-1, L().
- The HDT may be equipped with the following channel units:
 - AUA408 MSDT Server channel unit (CU)
 - AUA57 frequency selective ringing (FSR) CU (for dial tone access at the RT site; provides its own ringing)
 - AUA403 test CU [only for fiber-to-the-home (FTTH)].

The Series 5 HDT can interface to a transport facility optically using the high density optics shelf (HDOS), or metallicity through a DSX-1.

- If the HDT facility interface is optical using the HDOS, the HDT must be equipped with an HDOS (J1C265AC1, L2) and the following:
 - AYB2 power converter unit (PCU) required
 - AYB1() standard range optical unit (OU) or AYB5 extended range OU.
- If the HDT facility interface is metallic, the following equipment is used:
 - DSX-1 cross-connect panel.

The following requirements apply to the *SLC-2000* MSDT feature when interfacing with a *SLC-2000* system, Release 2.0 or higher:

- The HDT must be equipped with the following:
 - *SPQ*®808, *SPQ*809, *SPQ*810, or *SPQ*811MSDT Server, depending on the release.

The *SLC-2000* HDT can interface to a transport facility optically using the HDOS, optically using the Fiber Services Module (FSM), or metallicity through a DSX-1.

- If the HDT facility interface is optical using the HDOS, the HDT must be equipped with an HDOS (J1C265AC1, L4) and the following:
 - AYB2 PCU required
 - AYB1() standard range OU or AYB5 extended range OU.
- If the HDT facility interface is optical using the FSM, the HDT must be equipped with an HDOS, a fiber service shelf (FSS), up to six Fiber Service Modules in the FSS, and the following units:
 - AYB7 HDOS cut-through board (CTB)
 - See Appendix B for the FSM details.
- If the HDT facility interface is metallic, the following equipment is used:
 - 800 DSX-1 cross-connect panel.

When ordering the *SLC-2000* MSDT feature equipment in the ED-7C683-30 bulk powered 24-foot controlled environment vault (CEV) platform, the user *must* separately order *all* HDT and optical equipment being located in the *SLC* Carrier System bay (including associated circuit packs) since these items are not furnished with the structure (refer to 363-205-000 or 363-208-000). The installation of *SLC-2000* MSDT feature equipment in any other RT structure or location must be engineered and ordered specifically for each job.

Remote Terminal Location

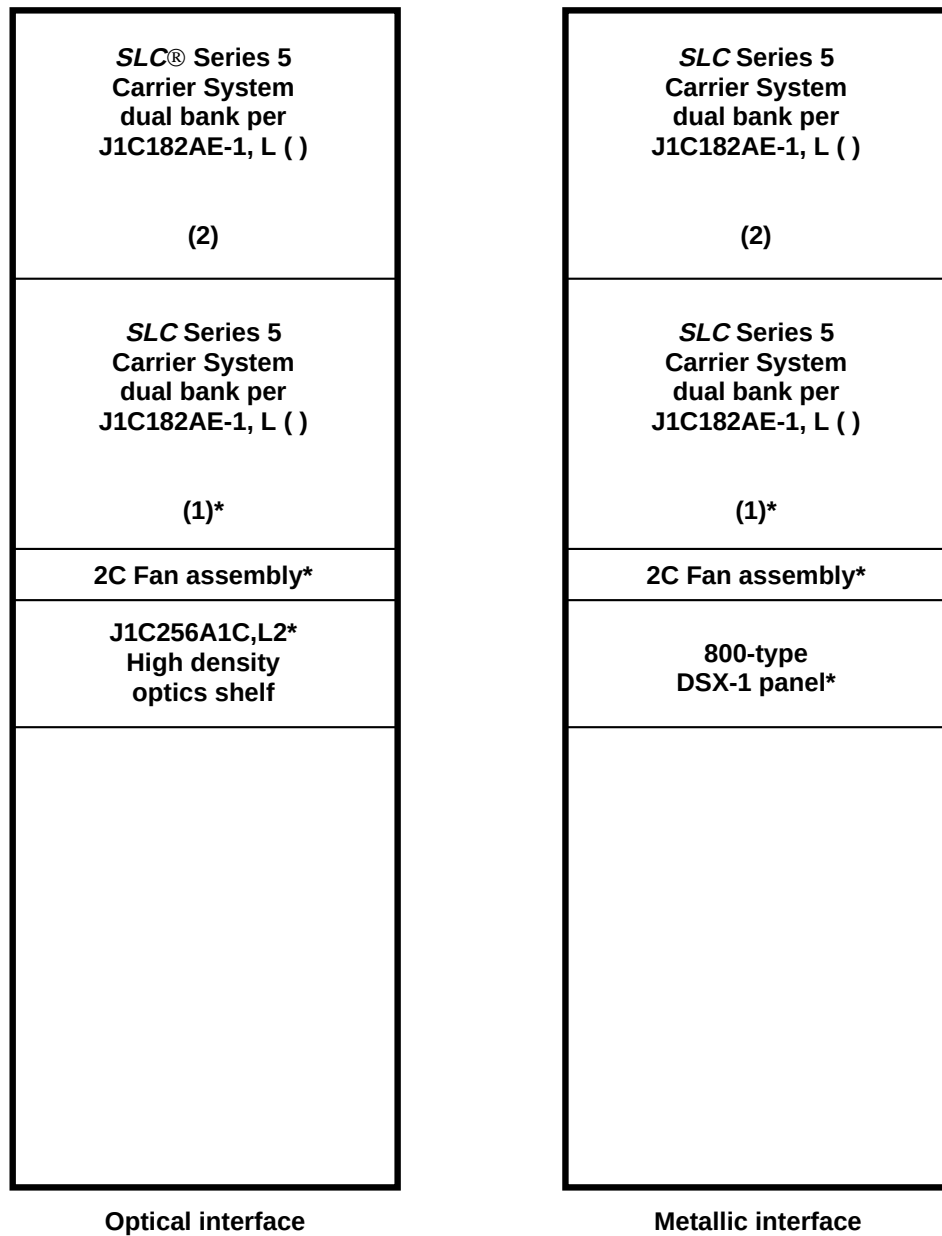
CEV or Hut Installation

Remote terminal carrier equipment installed in a CEV or hut consists of two main components:

- The RT carrier bay
- The *LGX*[®] lightguide distribution frame.

***SLC*[®] Series 5 HDT Bay**

The RT framework contains the Series 5 RT banks and the associated optical conversion equipment or DSX-1 panel. The J1C182AE-1, L() dual channel bank assembly with common circuit packs arranged for FPF is required and the AUA408 MSDT Server CU is used at the RT with the MSDT. One HDOS and associated OUs are required for up to two dual channel bank assemblies to provide the electrical-to-optical and optical-to-electrical conversions required to interface with the fiber distribution plant. If the HDT interface is metallic (the traffic to be carried over metallic T-Carrier facilities or another separate multiplexer), one DSX-1 cross-connect panel is required. One fan assembly is required for cooling. Typical 7-foot Series 5 Carrier HDT bays are shown in Figure C-1.



* Indicates equipment required for minimum configuration.

5config.ps

Figure C-1. Typical Layout for SLC® Series 5 HDT Carrier Bay

SLC-2000 HDT Bay

The RT framework contains one access resource manager (ARM) shelf assembly and four metallic distribution shelf (MDS) assemblies. The ARM shelf is equipped with common circuit packs, none of which are specific only to fiber-in-the-loop (FITL) systems, and the MDS shelves are equipped with *SPQ808* or *SPQ809* MSDT Server CUs for use with the MSDT.

If the facility interface is optical, the framework also contains up to two HDOS assemblies and two fan shelves. Each HDOS assembly contains associated OU circuit packs to provide the electrical-to-optical and optical-to-electrical conversions required to interface with the fiber distribution plant. One fan unit is required per each HDOS assembly for cooling.

The HDOS interfaces the MDS assemblies depending on the *SLC-2000* software releases:

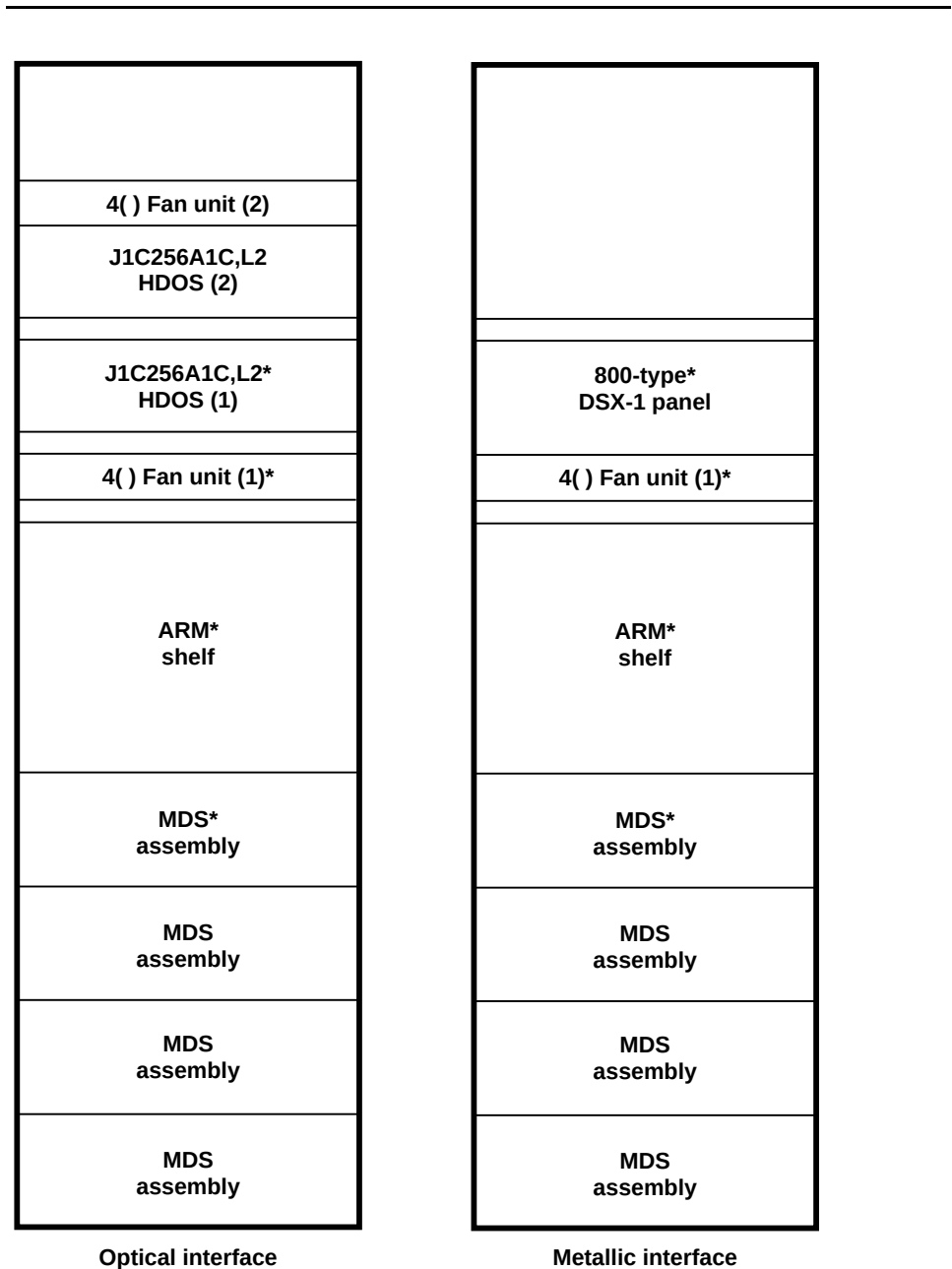
- **Release 4.4 or Earlier.** The HDOS interfaces with up to two MDS assemblies fully configured to provide services to thirty-two 12-line MSDTs. Each OU slot is connected through bay cabling to one CU slot in the MDS assembly, to the T-R and T1-R1 pairs of the MDS CU connector. For ease of reference, OU slots in the HDOS are numbered using the corresponding MDS CU slot numbers.
- **Release 4.5 or Later.** The HDOS interfaces the Servers in the MDS assembly through a DSX cross-connect panel. Providing there is an HDOS OU slot available, any Server slot in the MDS assembly can connect to any HDOS OU through the DSX cross-connect. The system uses the following cables for this connection:
 - **ED-7C723-35, G17:** One end of this 4-foot cable connects to the cable dangles on the MDS assembly shelf. The other end connects to the transmit and receive pairs of the ED-7C723-35, G19 cable.
 - **ED-7C723-35, G19:** This group actually consists of two cables — one for transmit pairs and one for receive pairs. One end of the cables connect to the ED-7C723-35, G17 cable and the other end connects to the DSX cross-connect. This cable group comes in 30-foot lengths.
 - **ED-7C723-35, G18:** One end of the cable connects to the cable dangles from the HDOS and the other end connects to the DSX cross connect.



CAUTION:

*The combined length of all cables between the Server connection on the MDS assembly backplane and the connection on the HDOS backplane can **NOT** exceed 35 feet. This includes the cable dangles on both the MDS assembly and the HDOS; the ED-7C723-35, G17; the ED-7C723-35, G19; and the ED-7C723-35, G18 cables. If needed, cut the ED-7C723-35, G19 cable to meet the 35-foot restriction.*

If the facility interface is metallic (the traffic to be carried over metallic T1 facilities or another separate multiplexer), one DSX-1 cross-connect panel and one fan unit are required. Typical 7-foot *SLC*-2000 HDT bays are shown in Figure C-2.



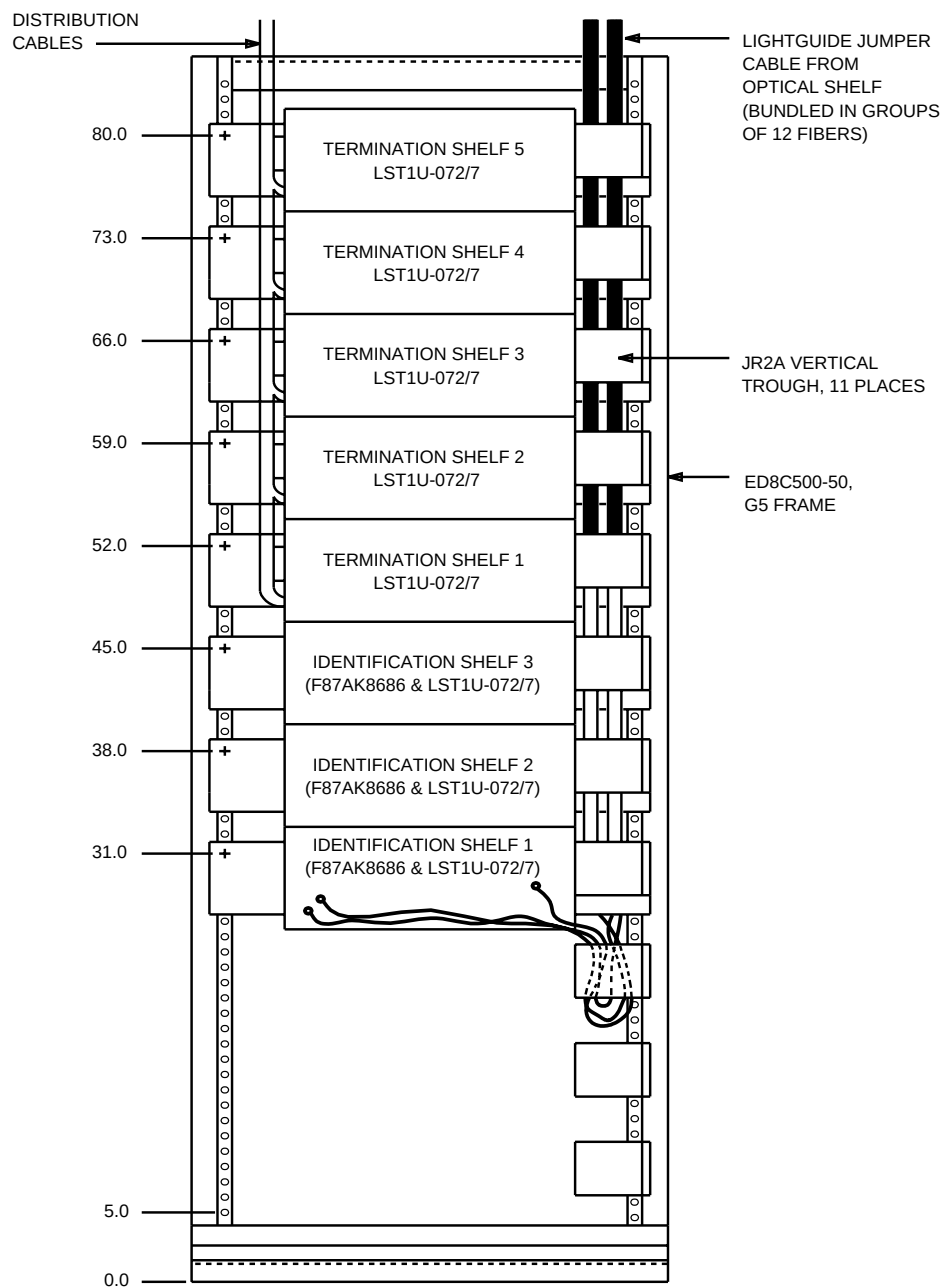
* Indicates equipment required for minimum configuration.

2000config.ps

Figure C-2. Typical Layout for SLC[®]-2000 Bay

***LGX*[®] Lightguide Distribution Frame**

The *LGX* lightguide distribution frame is used to interconnect the fibers from the HDOS assemblies in the RT bays to the outside plant (OSP) cable fibers. The lightguide interconnect (LIC) cables, containing up to 48 single fibers and equipped with *ST*[®] lightguide cable connectors at both ends, are run from the HDOS shelf assemblies to the *LGX* lightguide distribution frame for connection to the assigned OSP fibers. Up to 360 LIC fibers may be terminated in one 7-foot *LGX* lightguide distribution frame. The *LGX* lightguide distribution frame hardware consists of two main components: the LST1U-072/7 termination shelf and the F87AK8686 identification shelf.



tpa 777102/01

Figure C-3. Typical Layout for LGX® Lightguide Distribution Frame

Typical Bay Layouts and Ordering Information

Typical bay layouts and ordering information for *SLC-2000* MSDT feature RT/HDT equipment are provided in figures and tables as shown in Table C-1.

Table C-1. Figures and Tables for Typical Bay Layouts

Equipment Bay Type	Typical Bay Layout	Ordering Information
Series 5 RT/HDT Carrier Bay	Figure C-1	Table C-2
<i>SLC</i> [®] -2000 RT/HDT Bay	Figure C-2	Table C-3, Table C-4
<i>LGX</i> [®] Lightguide Distribution Frame	Figure C-3	Table C-5

80A Cabinet Installation

A *SLC-2000* RT can be located in an 80A cabinet and when fully equipped contains one ARM shelf assembly, four MDS assemblies, two HDOS assemblies, and two fan units. The ARM shelf assembly is equipped with common circuit packs and the *SPQ808*, *SPQ809*, *SPQ810* or *SPQ 811* MSDT server is used in the MDS assembly to interface the MSDT. The HDOS assemblies contain associated OUs to provide the electrical-to-optical and optical-to-electrical conversions required to interface with the fiber distribution plant. One fan unit is required per each pair of HDOS assemblies for cooling. Ordering information for an 80A cabinet equipped with *SLC-2000* MSDT feature RT equipment is provided in Table C-6.

80D Cabinet Installation

A *SLC-2000* RT can be located in an 80D bulk powered cabinet and when fully equipped contains two ARM shelf assemblies, eight MDS assemblies, four HDOS assemblies, and four fan units. The ARM shelf assembly is equipped with common circuit packs and the *SPQ808*, *SPQ809*, *SPQ810* or *SPQ 811* MSDT server is used in the MDS assembly with the MSDT. The HDOS assemblies contain associated OUs to provide the electrical-to-optical and optical-to-electrical conversions required to interface with the fiber distribution plant. One fan unit is required per each pair of HDOS assemblies for cooling. Ordering information for an 80D cabinet equipped with *SLC-2000* MSDT feature RT equipment is provided in Table C-7.

80E Cabinet Installation

A *SLC* Series 5 RT can be located in an 80E bulk powered cabinet which contains the Series 5 RT banks, the associated optical conversion equipment, fiber interconnect equipment, and, where required, centralized powering equipment. The J1C182AE-1, L() dual channel bank assembly with common circuit packs arranged for FPF is required, and only the AUA408 channel unit may be used at the RT with the *SLC*-2000 MSDT. One HDOS containing associated OUs is required with each dual channel bank assembly to provide the electrical-to-optical and optical-to-electrical conversions required to interface with the fiber distribution plant. One fan assembly is required per each pair of optics shelves for cooling. Two optics power shelves with associated circuit packs are also required to provide power for the RT banks and associated optical equipment mounted in an 80E cabinet. Ordering information for an 80E cabinet equipped with *SLC*-2000 MSDT feature RT equipment is provided in Table C-8.

Table C-2. SLC® Series 5 Carrier HDT Bay Equipment Unique to the MSDT Application

Qty of Order	Order Wording	COMCODE	Min	Bay Max	Bay Description	Notes
	ED-8C500-50, G5	601019458	1	1	7-foot Network Bay Framework	
	J1C182AE-1, List 3	601286214	1	2	RT Dual Channel Bank	1,2,3
	J1C265AC-1, List 2	601272065	1	1	HDOS, High Density Optics Shelf	2,5
	2C Fan Unit	106382336	1	2	RT Cooling Fan Assembly	2
	AUA408 Circuit Pack	106275662	1	32	12 or 24 DS0 Optical Channel Unit	4
	AYB1B OU	105550461	1	32	Standard Range Optical Unit	5
	AYB1C OU	107336448	1	32	Standard Range Optical Unit	5
	AYB5 Circuit Pack	107215287	1	32	Extended Range Optical Unit	
	AYB2 Circuit Pack	104432984	1	8	Power Converter Unit	6
	FS48E-E-35 LIC Cable	105642565	1	4	Lightguide Interconnect Cable 35 feet	
	FS1E-E Lightguide Jumper	846238384	1	64	Single Lightguide Jumper 18 feet	

Notes:

1. Order common units for the J1C182AE-1, L() dual channel banks per 363-205-000.
2. For minimum bay configuration, the high density optics shelf, the lower dual channel bank assembly, and the lower fan unit are installed.
3. Order J1C182AE-1, L3 when electromagnetic compliance (EMC) is required.
4. The AUA408 CU provides 12 or 24 channels of service to a single MSDT and occupies three adjacent channel unit slots in the dual bank assembly. The CU has full channel test capability, and drop test capability when used in conjunction with the AUA411 channel and drop test unit at the MSDT.
5. Each high density optics shelf may contain up to 32 OUs. One OU is required for each AUA408 CU. The AYB1B or AYB1C OU is used in applications with an outside plant loss budget of ≤ 9.8 dB; the AYB5 OU is used in applications with an outside plant loss budget of ≤ 13.3 dB.
6. The AYB2 PCU is required in the optics power shelf to provide power to the OUs. Each PCU provides power for four OU slots.

Table C-3. SLC®-2000 HDT Bay Equipment Unique to the MSDT Application

Qty of Order	Order Wording	COMCODE	Min	Bay Max	Bay Description	Notes
	SPQ®808 Circuit Pack	107063992	1	32	MSDT Server	
	SPQ®809 Circuit Pack	107345100	1 1	32 48	MSDT Server (TR-303) MSDT Server (TR-303)	4 5
	SPQ®810* Circuit Pack	107838955	1 1	32 48	DT Server (TR-303) DT Server (TR-303)	4 5
	J1C265AC-1, L4	601272065	1	2	High Density Optics Shelf (HDOS) Assembly	1,2
	AYB1B Circuit Pack	DA	1	32	Standard Range Optical Unit	2
	AYB1C Circuit Pack	DA	1	32	Standard Range Optical Unit	2
	AYB3		1	32	Standard Range Optical Unit	2
	AYB5 Circuit Pack	107215287	1	32	Extended Range Optical Unit	2
	AYB2 Circuit Pack	104432984	1	8	Power Conv. Unit	3
	4E† Fan Unit	106527039	1	2	RT Cooling Fan Assembly	
	4G Fan Unit	107378036	1	2	RT Cooling Fan Assembly	
	FS48E-E-35 LIC Cable	105642565	1	4	Lightguide Interconnect Cable 35 feet	
	FS1E-E Lightguide Jumper	846238384	1	32	Single Lightguide Jumper 18 feet	

See notes and footnotes at end of table.

Continued on next page

Table C-3. SLC[®]-2000 HDT Bay Equipment Unique to the MSDT Application

Qty of Order	Order Wording	COMCODE	Min	Bay Max	Bay Description	Notes

Notes:

1. For minimum bay configuration, the lower HDOS, the lower fan unit, the ARM shelf, and the highest MDS are installed.
2. Each HDOS may contain up to 32 OUs. One OU is required for each SPQ[®]808, SPQ809, or SPQ810 MSDT Server. The AYB1B, AYB1C, or AYB3 OU is used in applications with an outside plant loss budget of ≤ 9.8 dB; the AYB5 OU is used in applications with an outside plant loss budget of ≤ 13.3 dB.
3. The AYB2 PCU is required in the optics power shelf to provide power to the OUs. Each PCU provides power for four OU slots.
4. Release 4.4 and earlier.
5. Release 4.5 and later.

* The SPQ810 DT Server can only be used in an HDT containing SLC-2000 Software Release 4.5 or later.

† The 4E Fan Unit has been rated "discontinued availability (DA)" and cannot be ordered.

Table C-4. SLC[®]-2000 Access System Cabling Requirements for HDT Frames (Release 4.5 or Later)

ED Number	Group	Description
ED-7C723-35	G17	(COMCODE 601831043) Required when connecting the MDS assembly to a DSX cross-connect if the SLC-2000 HDT is hosting any of the following: ■ An MSDT through a metallic facility or an FSM (without using the cut-through-board) ■ An MSDT through an HDOS (Software Release 4.5 or later). The maximum number of cables per MDS assembly is two (one for each MDS assembly shelf containing a DT or MSDT Server). Each cable is 4 ft. in length. One end of the cable connects to the MDS assembly cable dangles. The other end connects to two cables — one for transmit pairs and one for receive pairs — of one of the following groups, depending on the length needed to reach the DSX cross-connect: ■ 30 feet: ED-7C723-35,G19 (COMCODE 601845472) ■ 50 feet: ED-7C723-35,G20 (COMCODE 601845480) ■ 100 feet: ED-7C723-35,G21 (COMCODE 601845498) ■ 200 feet: ED-7C723-35,G22 (COMCODE 601845506). You must use the G17 cable in conjunction with two cables from one of the above groups.
	G18	(COMCODE 601840960) Required in a SLC-2000 HDT containing Software Release 4.5 or later when the HDT is hosting an MSDT ONU through an HDOS. One end of the cable connects to the cable dangles from the HDOS and the other end connects to the DSX cross-connect  CAUTION: <i>The combined length of all cables between the Server connection on the MDS assembly backplane and the connection on the HDOS backplane can NOT exceed 35 feet. This includes the cable dangles on both the MDS assembly and the HDOS; the ED-7C723-35, G17; the ED-7C723-35, G19; and the ED-7C723-35, G18 cables. If needed, cut the ED-7C723-35, G19 cable to meet the 35-foot restriction.</i>
	G19	(COMCODE 601845472) Length — 30 feet. You must order this cable in pairs. See ED-7C723-35, G17 for this cable's description and use.

Continued on next Page

Table C-4. SLC[®]-2000 Access System Cabling Requirements for HDT Frames (Release 4.5 or Later)—Continued

ED Number	Group	Description
	G20	(COMCODE 601845480) Length — 50 feet. You must order this cable in pairs. See ED-7C723-35, G17 for this cable's description and use.
	G21	(COMCODE 601845498) Length — 100 feet. You must order this cable in pairs. See ED-7C723-35, G17 for this cable's description and use.
	G22	(COMCODE 601845506) Length — 200 feet. You must order this cable in pairs. See ED-7C723-35, G17 for this cable's description and use.

Table C-5. LGX® Lightguide Distribution Frame

Qty of Order	Order Wording	COMCODE	Bay Min	Bay Max	Description	Notes
Contact your Lucent Technologies Account Executive for ordering information.						

Table C-6. SLC®-2000 RT 80A Cabinet

Qty of Order	Order Wording		Max. Cab.	Description	Notes
	Drawing	Grp			
Contact your Lucent Technologies Account Executive for ordering information.					

Table C-7. SLC®-2000 RT 80D Bulk Power Cabinet

Qty of Order	Order Wording		Max. Cab.	Description	Notes
	Drawing	Grp			
Contact your Lucent Technologies Account Executive for ordering information.					

Table C-8. SLC® Series 5 Carrier System HDT in an 80E Bulk Power Cabinet

Qty of Order	Order Wording		Max. Cab.	Description	Notes
	Drawing	Grp			
Contact your Lucent Technologies Account Executive for ordering information.					

SLC-2000 MSDT Equipment

The SLC-2000 MSDT consists of a card cage and backplane that houses common and channel unit circuit packs. The MSDT card cage fully equipped is shown in Figure C-4. The MSDT can be mounted in a pedestal, underground enclosure, or frame. The pedestal enclosure can be mounted on the ground, pole, or wall. When mounted on the ground, the MSDT can be mounted by means of a buried base or a concrete or plastic pad. In some MSDT mounting arrangements (pedestal and underground), a field wiring box (FWB) will be attached to the bottom of the card cage. The FWB houses fuses and terminals for power connections. Each method of MSDT powering requires its own distinct FWB. The MSDT FWB power interface allows a variety of methods for providing external power to the MSDT. Two local powering options are available:

- 120 V AC
- -48 V DC.

Three central powering options are available:

- -130 V DC
- ± 130 V DC
- 60 V AC central powering.

Peak leveling (using batteries) is available to extend the loop range. Batteries can be installed in the pedestal enclosure for central peak leveling or to provide backup power.

Ordering information for the MSDT enclosure and associated plug-in units is provided in Table C-9 and Table C-10, respectively.

If the MSDT enclosure is to be mounted on a concrete pad, the pad must be fabricated locally according to the specifications given in ED-7C715-01. After the concrete pad has been placed, the MSDT base is attached to the concrete pad by means of four bolts (3/8 - 16 x 3/4 — 1) that screw into the metal inserts in the pad. Two MSDT bases are available for use with a concrete pad:

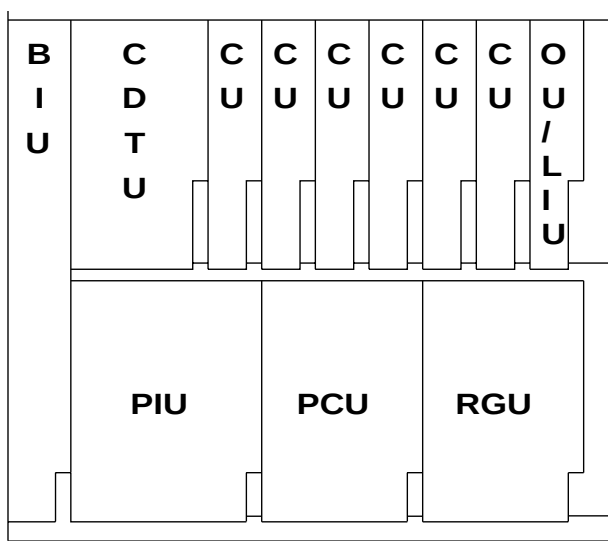
- 1-1/2 inch high (ED-7C712-30, G60) base
- 6-inch high (ED-7C712-30, G64) base.

For MSDT enclosures that are to be mounted on a plastic pad, there are two pads available from the following:

Associated Plastics, Incorporated
262 Kansas Ave.
Riverside, CA 92507
Tel (909)-787-0600

One of the plastic pads (MSDT 2831) measures approximately 31-1/2 inches wide, 28-1/2 inches deep, and 4 inches high and is designed to mount a single MSDT enclosure. The second plastic pad (MSDT 3333) measures approximately 33 inches wide, 32-1/2 inches deep, and 4 inches high and is designed to mount either two MSDT enclosures or one MSDT enclosure and an enclosure for video services. Each of the plastic pads is designed to be used with a handhole that may be obtained from the supplier of the pad.

The handhole (COMCODE 407223940) that is required to install the MSDT underground is available from Associated Plastics.



cardcg.msdt.ps

Figure C-4. MSDT Fully Equipped Card Cage

Table C-9. SLC®-2000 MSDT Enclosure

Qty of Order	Order Wording		Description
	Drawing	Grp	
	ED-7C712-30	G1	Lucent Technologies ultra light gray, fiber-in-the-loop basic enclosure.
	ED-7C712-30	G5	Rackmount framework and cabling to accommodate up to two (2) MSDT channel banks.
	DA	G10	Equipment required in addition to G1 or G2 to provide a card cage and backplane (MSDT channel bank) arranged for dual mode operation, which can accommodate up to six channel units (12 lines), with ST fiber optic connection.
	ED-7C712-30	G11	Equipment required in addition to G1 or G5 to provide a card cage and backplane (MSDT channel bank) arranged for quad mode operation, which can accommodate up to six channel units (12 lines), with ST fiber optic connection.
	ED-7C712-30	G20	Equipment required in addition to G1 to accept 120 V AC local input power.
	DA	G21	Equipment required in addition to G1 to accept -48 V DC local input power from up to five (5) external sources.
	ED-7C712-30	G22, 23	Equipment required in addition to G1 to accept ±130 V DC central input power.
	ED-7C712-30	G24	Equipment required in addition to G1 to accept 60V AC input power.
	ED-7C712-30	G25	Equipment required in addition to G1 to accept -48 V DC input power.
	ED-7C712-30	G30	Equipment required in addition to G20 or G22 to provide a battery compartment and battery heater for up to three strings of KS-21906, L9 batteries.
	DA	G40	Equipment required in addition to G10 to provide a backplane cover, binding post terminations, gas tube protectors, and wiring for 12 telephone lines.
	ED-7C712-30	G41	Equipment required in addition to G11 to provide a backplane cover, binding post terminations, gas tube protectors, and wiring for 24 telephone lines.
	DA	G42	Equipment required in addition to G10 to provide a backplane cover, insulation displacement (<i>Flexterm</i> ®) terminations, protection, and wiring for 12 telephone lines.
	DA	G43	Equipment required in addition to G11 to provide a backplane cover, insulation displacement (<i>Flexterm</i>) terminations, gas tube protectors, and wiring for 24 telephone lines.

Continued on next page

Table C-9. SLC®-2000 MSDT Enclosure — Continued

Qty of Order	Order Wording		Description
	Drawing	Grp	
	ED-7C712-30	G44	Equipment required in addition to G11 to provide a protected 25-foot stub cable for termination of up to 24 telephone lines.
	ED-7C712-30	G45	Equipment required in addition to G11 to provide a protected 25 foot stub cable, raw ended, for termination of up to 24 telephone lines.
	ED-7C712-30	G46	Equipment required in addition to G11 to provide a backplane cover, XX block, insulation displacement (<i>Flexterm</i>) terminations, gas tube protectors, and wiring for 24 telephone lines.
	ED-7C712-30	G50	Equipment required in addition to G5, G40, G41, G42, G43, G44, or G45 to provide a T1 interface (metallic) to the MSDT.
	ED-7C712-30	G60	Equipment required in addition to G1 to provide a 1-1/2 inch high base for concrete or plastic pad mounting.
	ED-7C712-30	G61	Equipment required in addition to G1 to provide a buried base for mounting one MSDT directly on the ground with no pad.
	ED-7C712-30	G62	Equipment required in addition to G1 to provide brackets for pole mounting.
	ED-7C712-30	G63	Equipment required in addition to G1 to provide brackets for wall mounting.
	ED-7C712-30	G64	Equipment required in addition to G1 to provide a 6-inch high base for concrete or plastic pad mounting.
	ED-7C712-30	G65	Equipment required in addition to G1 to provide a buried base for mounting the MSDT, with accessory area, directly on the ground with no pad (G100).
	ED-7C712-30	G70	Equipment required in addition to G1 or G2 to provide door alarm switches for both doors.
	DA	G80	Equipment required for field upgrade of G10 to G11 for enclosures requiring binding post terminations and gas tube protectors.
	DA	G81	Equipment required for field upgrade of G10 to G11 for enclosures requiring insulation displacement (<i>Quick Clip Flexterm</i>) terminations.
	ED-7C712-30	G100	Equipment required in addition to G1 and G65 to provide an accessory area for the MSDT.

Table C-10. SLC®-2000 MSDT Plug-In Units

Qty of Order	Order Wording	COMCODE	Qty per MSDT	Description	Notes
	AUA411 Circuit Pack	106275696	1	CDTU, Channel and Drop Test Unit	
	AUA411B Circuit Pack	107534976	1	CDTU, Channel and Drop Test Unit	SLC®-2000 Software Release 4.0 and later
	AUA412 Circuit Pack	106275969	1	PCU, Power Converter Unit (120 V AC/–48 V DC)	
	AUA413 Circuit Pack	106275977	1	RGU, Short-Loop Ringing Generator Unit	Loops $\leq 132 \Omega$
	AUA415 Circuit Pack	DA- Replaced by AUA414	1	PIU, Power Interface Unit (–48 V DC backpower only)	
	AUA423 Circuit Pack	106835598	1	RGU, Long-Loop Ringing Generator Unit	$133 \Omega \leq \text{Loops} \leq 1500 \Omega$
	AUA414 Circuit Pack	106296957	1	PIU, Power Interface Unit (120 V AC)	
	AUA417 Circuit Pack	106436504	1	PCU, Power Converter Unit (–130 V DC)	
	AUA422 Circuit Pack	107086399	1	PCU, Power Converter Unit (60 V AC)	
	AUA426 Circuit Pack	107086415	1	PIU, Power Interface Unit (± 130 V DC)	
	AUA427 Circuit Pack	107086423	1	PCU, Power Converter Unit (± 130 V DC)	
	AUA434 Circuit Pack	102248965	1	PIU, Power Interface Unit (60 V AC)	

Continued on next page

Table C-10. SLC®-2000 MSDT Plug-In Units —Continued

Qty of Order	Order Wording	COMCODE	Qty per MSDT	Description	Notes
	AUA436 Circuit Pack	107248973	1	PIU, Power Interface Unit (–130 V DC)	
	BYB1B Circuit Pack	DA- (discontinued availability)	1	OU, Standard Range Optical Unit	0 — 9.8 dB loss
	BYB1C Circuit Pack	DA	1	OU, Standard Range Optical Unit	0 — 9.8 dB loss
	BYB5 Circuit Pack	108042342	1	Extended Range Optical Unit	0 — 13.3 dB loss
	BYB2 Circuit Pack	106848682	1	T1/DSX-1 LIU, Line Interface Unit (See warning below)	
	MC97780A1 Circuit Pack	107129363	1	BIU, Backplane Interface Unit, Short-Loop	Loops < 132 Ω
	MC97789A1 Circuit Pack	106939572	1	BIU, Backplane Interface Unit, Long-Loop	133 Ω $\leq$ Loops $\leq$ 1500 Ω
	MC97793A1 Circuit Pack	107255382	1	BIU, Backplane Interface Unit, Short-Loop, Downloadable	
	MC97794A1 Circuit Pack	107258980	1	BIU, Backplane Interface Unit (supports DC alarm services)	

**WARNING:**

Under no circumstances should the signal lines be run to outside plant cables or equipment when the BYB2 is optioned for the DSX mode. The DSX mode of operation is intended for inside plant applications only.

Powering Equipment

There are five methods for providing external power to the MSDT: 120 V AC local powering, –48 V DC local powering, –130 V DC central powering, or ± 130 V DC central powering. In addition, the –130 V DC central powering and ± 130 V DC central powering have a peak leveling option. Although it is not possible to list all of the equipment needed to support all possible methods of providing 120 V AC local power, the following is a list of equipment needed for the more widely used methods.

- *Hoffman*^{*} A-6R44 3R unit or *Ekstrom*[†] enclosure/power ring (orderable from Ekstrom Industries, Inc., 23850 Freeway Park Drive, Farmington Hills, Michigan 48024-1197)
- Surface mount AC utility box (4 inch x 2-1/8 inch)
- Single position 120 V AC outlet
- AC power cord housed in a flexible conduit.

The following field wiring boxes (FWB) are available for use in the MSDT. The appropriate FWB that should be used is determined by the method used to provide external power to the MSDT.

- ED-7C712-30, Group 20 — This FWB is used in conjunction with the 120 V AC local powering option.
- This item has been DA'd — This FWB is used in conjunction with the –48 V DC local powering option. The Group 21 FWB supports up to five powering sources while the Group 22 FWB supports up to eight powering sources.
- ED-7C712-30, Group 23 — This FWB is used in conjunction with the ± 130 V DC central powering method.
- ED-7C712-30, Group 24 — This FWB is used in conjunction with the 60 V AC central powering method.
- ED-7C712-30, Group 25 — This FWB is used in conjunction with the –48 V DC central powering method.

A list of the equipment required to support the –48 V DC local powering option is given in Table C-11.

* Registered trademark of Federal Cartridge Corporation.

† Registered trademark of Ekstrom Industries, Inc.

Table C-11. -48 V DC Local Powering Equipment

Equipment	Apparatus Code	COMCODE
-48 V DC Local Power Source Enclosure Available from Robroy Industries, Belding, MI, Part No. J806HPL	—	—
Myers ST-1 Hub or Thomas & Betts 370 Hub	—	—
Surface Mount AC Utility Box (4" x 2-1/8")	—	—
Single Position 120 V AC Outlet	—	—
Single Position Outlet Coverplate	—	—
-48 V DC Entrance Grommet	WP 92128, L3	803764208*
Right Mounting Bracket	WP 92128, L3	846513893*
Left Mounting Bracket	WP 92128, L3	846513885*
Local Power Source	WP 92128, L1	406177006
Local Power Source Plus Enclosure with AC Power Cord	WP 92128, L2	406177014
Local Power Source Mounting Screws (six machine screws, No. 8/32, 1/4" long)	—	—
E-Type Armored Service Drop Burial Wire 22 Ga., 4-Conductor	AT-8776	—
C-Type Service Wire 22 Ga., 2- or 5-Conductor	AT-8545	—
E-Type Burial Wire 19 Ga., 2-Conductor	AT-8483	—

* Order all three items together using COMCODE 406185488.

A list of the -130 V DC central powering equipment installed in a 51A, 80A, and 80E cabinet is given in Table C-12.

Table C-12. -130 V DC Central Powering Equipment

Equipment	Apparatus Code	COMCODE
Power shelf	J1C182BD	846589513
Current limiter shelf	J1C182PE1, L1	
AUA418 -130 V DC		106438989
Dual Current limiter card		
AUA419 Shelf Common Unit		106866148
-130 V DC fuse panel		
-130 V converters (2)		
2B fan unit		105550420

A list of the ± 130 V DC central powering equipment is given in Table C-13.

Table C-13. ± 130 V DC Central Powering Equipment

Equipment	Apparatus Code	COMCODE
Power shelf	J1C182BD	846589513
AUA419 Shelf Common Unit		106866148
Current limiter shelf	J1C182PE1, L1	
AUA428 ± 130 V DC		107086431
Converter/Limiter card		
-130 V DC fuse panel		
2B fan unit		105550420

Maintenance Equipment

Installation, maintenance, and testing of *SLC-2000* MSDT feature systems will require certain items of test equipment. See Chapter 4 for detailed maintenance information. Listed in Table C-14 are some of the primary items of test equipment required for turn-up and maintenance of *SLC-2000* MSDT feature systems.

Table C-14. *SLC*[®]-2000 MSDT Feature Maintenance Equipment

Qty of Order	Order Wording	COMCODE	Qty	Min Description	Notes
	This item has been DA'd Replaced by J95404TL-4	601202674	1	Craft Interface Unit	1
	J99409OB-1, L1	601300742	1	Optical Backplane Maintenance Kit	2
	DA	405772591	1	Access Shelf	3
See notes and footnote at end of table.				<i>Continued on next page.</i>	

Table C-14. SLC[®]-2000 MSDT Feature Maintenance Equipment —Continued

Qty of Order	Order Wording	COMCODE	Qty	Min Description	Notes
	Allen-type Wrench	840841324	1	Door Access Tool	
	216C Tool	—	1	Door Access Tool	
	WP91067, L6	405525809	1	Test Cord	4

Notes:

1. The CIU is required for end-to-end system tests and provisioning during turn-up of a SLC-2000 MSDT with special service channels.
2. The optical backplane maintenance kit (OBMK) is used to clean the optical backplane couplings of any dust particles deposited on the optical sleeves. The OBMK also serves to insert or remove the protective plug on the circuit pack side of the backplane couplings during turn-up or customer service termination. The following consumables may be ordered as required for use with the OBMK:

CXM50 Software FLEXTIPS* Miniswabs

Chemtronics, Inc.
Hauppauge, NY 11788
COMCODE 405865916

Protective Plug

COMCODE 846238202

One miniswab and 20 protective plugs are supplied with the OBMK.

3. The access shelf is required when there is a need to access the backplane of the optical shelf for initial installation of the lightguide jumper cable or for replacement of a defective jumper and/or backplane coupling.
4. Allows access to tip/ring jacks on faceplate of channel units.

* Trademark of Chemtronics, Inc.

Documentation

A list of the documentation containing information pertinent to the SLC-2000 MSDT feature is included in Table C-15.

Table C-15. SLC[®]-2000 MSDT Feature Documentation

Document	Title
363-005-262	Data Sheet AYB1() HDOS Standard Range Optical Unit
363-005-271	Data Sheet BYB1() MSDT Standard Range Optical Unit
363-005-272	Data Sheet MC97780A1 Short-Loop Backplane Interface Unit (BIU)
363-005-274	Data Sheet AUA408 MSDT Server
363-005-275	Data Sheet AUA411 Channel and Drop Test Unit
363-005-276	Data Sheet AUA412 120 V AC and –48 V DC Power Converter Unit
363-005-277	Data Sheet AUA413 Ringing Generator Short-Loop
363-005-278	Data Sheet AUA414 120 V AC Power Interface Unit
363-005-279	Data Sheet AUA415 –48 V DC Power Interface Unit
363-005-280	Data Sheet AUA416 –130 V DC Power Interface Unit
363-005-281	Data Sheet AUA417 –130 V DC Power Converter Unit
363-005-282	Data Sheet AUA418 Limited Output Source Unit
363-005-283	Data Sheet AUA419 Shelf Common Unit
363-005-284	Data Sheet BYB2 T1 Interface Circuit Pack
363-005-285	Data Sheet AUA423 Long-Loop Ringing Generator
363-005-286	Data Sheet AYB2 Power Converter Unit
363-005-288	Data Sheet SPQ [®] 808 MSDT Server
363-005-289	Data Sheet MC97789A1 Long-Loop BIU
363-005-290	Data Sheet AUA426 ±130 V DC Power Interface Unit
363-005-291	Data Sheet AUA427 ±130 V DC Power Converter Unit
363-005-292	Data Sheet AUA428 ±130 V DC Limited Output Source Unit
363-005-295	Data Sheet SPQ909 LP-POTS Channel Unit
363-005-296	Data Sheet AYB5 HDOS Extended Range Optics Unit
363-005-297	Data Sheet BYB5 MSDT Extended Range Optics Unit
363-005-298	Data Sheet AUA434 60 V AC Power Interface Unit
363-005-299	Data Sheet AUA436 –130 V DC Power Interface Unit
363-005-387	Data Sheet SPQ809 TR-303 MSDT Server
363-005-389	Data Sheet SPQ810 TR-303 DT Server
363-005-400	Data Sheet MC97793A1 Short-Loop, Downloadable BIU

Continued on next page

Table C-15. SLC[®]-2000 MSDT Feature Documentation—Continued

Document	Title
363-205-004	<i>SLC-2000 Multi-Services Distant Terminal Feature User/Service Manual</i>
363-206-200	<i>DDM-2000 Multiplexer Applications, Planning, and Ordering Guide</i>
363-206-201	<i>DDM-2000 OC-3 Multiplexer, System Commands Quick Reference</i>
363-206-202	<i>DDM-2000 OC-3 Multiplexer User/Service Manual</i>
363-206-204	<i>DDM-2000 OC-3 Multiplexer Installation Manual</i>
363-206-206	<i>DDM-2000 OC-12 Multiplexer, System Commands Quick Reference</i>
363-206-207	<i>DDM-2000 OC-12 Multiplexer User/Service Manual</i>
363-206-208	<i>DDM-2000 OC-12 Multiplexer Installation Manual</i>

MSDT Service Configurations

The MSDT configuration depends upon the power option, interface type, drop organization, mounting arrangement, number of channels required, and the type of HDT. Table C-16 lists the choices for the HDT equipment, and Table C-17 lists the choices for the MSDT equipment.

Table C-16. The Host Digital Terminal (HDT) Equipment

Equipment	Description	Notes
SLC® Series 5 Carrier System HDT:		
AUA408	MSDT Server Card	One per MSDT
J1C265AC1, L2	High-Density Optics Shelf (HDOS)	Up to 16 24-line MSDTs or 32 12-line MSDTs
AYB1() or AYB3n	Standard Range OU Extended Range OU	One per MSDT (0 to 9.8 dB) One per MSDT (0 to 13.3 dB)
AYB2	Power Converter Unit	One per two 24-line MSDTs or one per four 12-line MSDTs
SLC-2000 Access System Host:		
SPQ®808, or SPQ809, or SPQ810*, or SPQ811	MSDT Server Card	One per MSDT
J1C265AC1, L4	High-Density Optics Shelf (HDOS)	Up to 16 24-line MSDTs or up to 32 12-line MSDTs
AYB1B, AYB1C,AYB3, or AYB5	Standard Range OU Extended Range OU	One per MSDT (0 to 9.8 dB) One per MSDT (0 to 13.3 dB)
AYB2	Power Converter Unit	One per two 24-line MSDTs or one per four 12-line MSDTs

* The SPQ810 and SPQ811 DT Servers can only be used in an HDT containing SLC-2000 Software Release 4.5 or later.

Table C-17. The MSDT Equipment

Equipment	Description	Notes
Basic Common Equipment (Choose one group - A or B)		One per 24-Line G10 MSDT (for 12 lines, choose G11 MSDT)
A: Fiber Interface:		
ED-7C712-30, G1	Basic MSDT Enclosure	Single Fiber
ED-7C712-30, G11	Card Cage and Backplane; 24 DS0s	Common Equipment
BYB1() or	Standard Range OU (0-9.8 dB)	
BYB5	Extended Range OU (0-13.3 dB)	
B: Metallic Interface:		
ED-7C712-30, G1	Basic MSDT Enclosure	T1/DSX-1
ED-7C712-30, G11	Card Cage and Backplane; 24 DS0s	Common Equipment
ED-7C712-30, G50	T1 /DSX-1 Termination	
BYB2	T1/DSX-1 Interface Card (See warning page C-26)	
Additional Common Equipment by Loop Characteristics (Choose one group - C or D)		
C: Urban/Suburban, Loops < 132 Ohms:		Short-Loop
MC97780A1 or	Short-Loop Backplane Interface Unit (BIU)	Common Equipment
MC97793A1	Short-Loop Downloadable BIU	
AUA413	Short-Loop Ringing Generator (RGU)	
D: Rural, 133 Ohms < Loops < 1500 Ohms:		Long Loop
MC97789A1	Long-Loop Backplane Interface Unit, BIU	Common Equipment
AUA423	Long-Loop Ringing Generator, RGU	
Additional Common Equipment by Powering Option (Choose one group - E,F,G, or H)		
E: Local 120 V AC Power:		
ED-7C712-30, G20	120 V AC Power Interface	
ED-7C712-30, G30	Battery Compartment & Heater	
AUA412	120 V AC & -48 V DC Power Converter Unit	
AUA414	120 V AC & -48 V DC Power Interface Unit	
KS-21906, L20	Battery String	for 12 lines ,use 2 strings; for 24 lines, use 3 strings

Continued on next page

Table C-17. The MSDT Equipment—*Continued*

Equipment	Description	Notes
F: Central 60 V AC Power (Via coaxial cable):		
ED-7C712-30, G24	60 V AC Power Interface	
AUA422	60 V AC Power Converter Unit	
AUA434	60 V AC Power Interface Unit	
G: Central –130 V DC Power:		
ED-7C712-30, G23	–130 V DC Power Interface	
AUA417	–130 V DC Power Converter Unit	
AUA436	–130 V DC Power Interface Unit	
H: Central ±130 V DC Power:		
ED-7C712-30, G22	±130 V DC Power Interface	
AUA426	±130 V DC Power Interface Unit	
AUA427	±130 V DC Power Converter Unit	
Drop Termination and Protection (Choose one - I,J,K,L, or M)		
I: This item has been DA'd	BP Terminations, GT Protectors & Wiring, 12 DS0s	BP= Binding Post
J: ED-7C712-30, G 41	BP Terminations, GT Protectors & Wiring, 24 DS0s	GT= Gas Tube
K: This item has been DA'd	ID Terminations, GT Protectors & Wiring, 12 DS0s	ID= Insulation Displacement
L: This item has been DA'd	ID Terminations, GT Protectors & Wiring, 24 DS0s	
M: ED-7C712-30, G 44	Splice Terminations, no Protectors, 24 DS0s	
Mounting Arrangement (Choose one - N through S)		
N: ED-7C712-30, G60	Concrete or plastic pad mounting; 1.5 inch base	
O: ED-7C712-30, G61	Buried mounting base for MSDT only	
P: ED-7C712-30, G62	Pole mounting brackets	
Q: ED-7C712-30, G63	Wall mounting brackets	
R: ED-7C712-30, G64	Concrete or plastic pad mounting; 6 inch base	
S: ED-7C712-30, G65	Buried mounting base for MSDT with accessory area	Use with G100.

Continued on next page

Table C-17. The MSDT Equipment—*Continued*

Equipment	Description	Notes
Optional Equipment		
Testing:		
AUA411	Channel & Drop Test Unit (CDTU)	Use with PGTC and MLT or Teradyne 4TEL* system.
Miscellaneous:		
BYB5	Extended Range Optical Unit	Use in place of BYB1() for applications which require ≥ 9.8 dB of outside plant loss budget (G11 is for 24 DS0s).
ED-7C712-30, G11	Card cage and backplane, 12 DS0s	
ED-7C712-30, G30	Peak-leveling battery housing	
ED-7C712-30, G70	Door alarm switches	
This item has been DA'd	Field upgrade of G10 to G11 with G40 or 41	
This item has been DA'd	Field upgrade of G10 to G11 with G42 or 43	
ED-7C712-30, G100	Cover for accessory area, use with G65	

* Trademark of Teradyne, Inc.

Ordering Examples

Table C-18 is an example of the items that must be ordered for a pedestal-mounted MSDT installation optically interfacing a Series 5 RT, powered by 120 V AC local power, and providing 24 short-loop lines, with testing capability. Table C-19 is an example of the items that must be ordered for a pole mounted MSDT installation optically interfacing a Series 5 RT, powered by – 130 V DC central power, and providing 12 long-loop lines, with testing capability. Table C-20 is an example of the items that must be ordered for a pad-mounted eight-MSDT installation optically interfacing a *SLC-2000* HDT, powered by 120 V AC central power, and providing 192 short-loop lines, with testing capability.

Table C-18. Pedestal-Mounted, 24 Service Lines, 120 V AC Locally Powered MSDT Interfacing to Series 5 HDT, Optical Loss < 9.8 dB

Item	Order Code	Qty
<i>Required at MSDT Location:</i>		
MSDT enclosure	ED-7C712-30, G1	1
24 DS0s	ED-7C712-30, G11	1
120 V AC local power	ED-7C712-30, G20	1
Battery compartment & heater	ED-7C712-30, G30	1
KS-21906, L16 Battery String	406405217	3
Binding post terminations	ED-7C712-30, G41	1
Pedestal mount	ED-7C712-30, G60	1
AUA411 CDTU	106275696	1
AUA412 120 V AC PCU	106275969	1
AUA413 Short-Loop RGU	106358856	1
AUA414 120 V AC PIU	106296957	1
BYB1() OU	106446727	1
MC97780A1 Short-Loop BIU	106383540	1
SPQ®909 Quad CU	107188179	6
<i>Required at HDT Location:</i>		
(In addition to Series 5 bank and commons)		
HDOS	J1C265AC1, L2	1
KS-21906, L20 batteries	406405217	3
Pedestal pad	ED-7C715-01	1
AYB1B OU or	105550461	1
AYB1C OU	107336448	1
AYB2 PCU	104432984	1
AUA408 MSDT Server	106275662	1

Table C-19. Pole-Mounted, 12 Service Lines, –130 V DC Centrally Powered MSDT Interfacing to Series 5 HDT, 9.8 dB < Optical Loss < 13.3 dB

Item	Order Code	Qty
Required at MSDT Location:		
MSDT enclosure	ED-7C712-30, G1	1
Dual mode operation	ED-7C712-30, G11	1
–130 V DC central power	ED-7C712-30, G23	1
Insulation displacement terminations	DA	1
Pole mount	ED-7C712-30, G62	1
AUA58B dual channel units	105710297	6
AUA411 CDTU	106275696	1
AUA417 –130 V DC PCU	106436504	1
AUA423 Long-Loop RGU	106835598	1
AUA436 –130 V DC PIU	106358161	1
BYB1B OU	106446727	1
MC97789A1 Long-Loop BIU	106939572	1
Required at HDT Location :		
(In addition to Series 5 bank and commons)		
HDOS	J1C265AC1, L2	1
AYB5 OU	107215287	1
AYB2 PCU	104432984	1

Table C-20. Pad-Mounted, 192 Service Lines, 24 DS0s/MSDT, Urban, Eight 120 V AC Powered MSDTs Interfacing to SLC®-2000 HDT

Item	Order Code	Qty
Required at MSDT Location :		
MSDT enclosure	ED-7C712-30, G1	8
Backplane, 24 DS0s	ED-7C712-30, G11	8
BYB1B OU	106446727	8

Continued on next page

Table C-20. Pad-Mounted, 192 Service Lines, 24 DS0s/MSDT, Urban, Eight 120 V AC Powered MSDTs Interfacing to SLC®-2000 HDT—Continued

Item	Order Code	Qty
MC97780A1 Short-Loop BIU	107129363	8
AUA413 Short-Loop RGU	106835598	8
120 V AC Power Interface	ED-7C-712-30, G20	8
Battery compartment & heater	ED-7C712-30, G30	8
AUA411 CDTU	106275696	8
AUA412 120 V AC & -48 V DC PCU	106275969	8
AUA414 120 V AC Power Interface Unit	106296957	8
KS-21906, L20 Battery String	406405217	24
ID term, GT Prot & Wiring	ED-7C712-30, G43	8
Pad Mounting, 1.5" base	ED-7C712-30, G60	8
SPQ®909 CUs	108188179	48
Required at HDT Location :		
AYB1B OU	105550461	8
AYB2 PCU	102432984	4
HDOS	J1C265AC1, L4	1
SPQ810 CU	107838955	8

Table C-21. Code NG — MSDT Rack Applications

Item	Quantity	ED or Comcode Number
23 Inch Relay Rack for 2 MSDTs	1	ED-7C712-30, G5
Card Cage	1 or 2	ED-7C712-30, G11
T1 Interface	1 per Card Cage	ED-7C712-30, G50
RGU & BIU per Loop Application	1 of each circuit pack	See Table C-23 on page C-41. Choose depending on Short Loop or Long Loop Application
OUs or LIUs	1	See Table C-24 on page C-42. Choose depending on Feeder Type
AUA411B CDTU (Optional)	1	107431597
AUA414 PIU	1	106296957
AUA412 PCU	1	106275969
Tip and Ring Pair Protectors	1 per Card Cage	See Table C-26. Choose depending on your application
Channel Units	Up to 6	See Document 363-208-000, <i>SLC-2000 Access System, Application Planning and Ordering Guide</i> . Choose channel unit depending on Service.

Table C-22. Code NH or M1— MSDT Cabinet Applications

Item	Quantity	ED or Comcode Number
MSDT Enclosure	1	ED-7C712-30, G1
Card Cage	1	ED-7C712-30, G11
T1 Interface	1	ED-7C712-30, G50
RGU & BIU per Loop Application	1 of each circuit pack	See Table C-23 on page C-41. Choose depending on Short Loop or Long Loop Application
OUs or LIUs	1	See Table C-24 on page C-42. Choose depending on Feeder Type
AUA411B CDTU (Optional)	1	107431597
Powering Option	1 PIU 1 PCU	See Table C-25 on page C-42. Choose the pair of powering circuit packs depending on your powering option.*
Tip and Ring Pair Protectors	1	See Table C-26 on page C-42. Choose depending on your application
Channel Units	Up to 6	See Document 363-208-000, <i>SLC-2000 Access System, Application Planning and Ordering Guide</i> . Choose channel unit depending on Service.
Battery Backup	1 to 4 Lines: 1 5 to 8 Lines: 2 9 to 24 Lines: 3	406405217 (KS-21906L20)

* Code M1 can include the ± 130 V DC, -130 V DC, or the 60 V AC options only.

Table C-23. RGU and BIU Loop Application

Application	RGU and Comcode	BIU and Comcode
Short-loop	AUA413 (106275977)	MC97793A1 (107255382)
Long-loop	AUA423 (106835598)	MC97789A1 (106939572)

Table C-24. Optical Units or Line Interface Units

Unit Type	Loss Budget	Service	Circuit Pack Code and Comcode	Also Required...
OU	0 - 9.8 dB	—	1 BYB3 (106358476)	AYB3 at HDT
OU	0 - 13.3dB	—	1 BYB5 (108042342)	AYB5 at HDT
LIU	—	T1 or DSX-1	1 BYB2 (106848682)	—
LIU	—	DSX-1	1 BYB7 (108027764)	1 10783670 cable per BYB7

Table C-25. Equipment for Specific Powering Options

Powering Option	PIU and Comcode	PCU and Comcode	Field Wiring Box
120 V AC	AUA414 (106296957)	AUA412 (106275969)	ED-7C712-30, G20
-48 V DC	AUA414 (106296957)	AUA412 (106275969)	ED-7C712-30, G25
±130 V DC	AUA426 (107086415)	AUA427 (107086423)	ED-7C712-30, G22
60 V AC	AUA434 (107248965)	AUA422 (107086399)	ED-7C712-30, G24
-130 V DC	AUA436 (107248973)	AUA417 (106436504)	ED-7C712-30, G23

Table C-26. Tip and Ring Pair Protectors

ED Number	Description
ED-7C712-30, G41	Provides backplane cover, binding post terminations, gas tube protectors, and wiring for 24 lines
ED-7C712-30, G44	Provides a protected 25 foot stub cable for termination of up to 24 lines
ED-7C712-30, G44	Provides backplane cover, insulation displacement terminations, protection, and wiring for 24 lines

Pre-Engineered Configurations

MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post

- **Comcode:** 108118738
- **Application Code:** NH
- **Model:** 1A
- **Equipment Provided:** Table C-27

Table C-27. MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G41	24 Lines Gas Tube Protection with Binding Post
1	ED-7C712-30, G20	120 V AC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	106296957	AUA414 120 V AC/-48 V DC PIU
1	106275969	AUA412 120 V AC/-48 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement Protection with Binding Post

- **Comcode:** 108119389
- **Application Code:** NH
- **Model:** 1B
- **Equipment Provided:** Table C-28

Table C-28. MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement Protection with Binding Post

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G46	24 Lines Insulation Displacement Protection with Binding Post
1	ED-7C712-30, G20	120 V AC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	106296957	AUA414 120 V AC/-48 V DC PIU
1	106275969	AUA412 120 V AC/-48 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable

- **Comcode:** 108118397
- **Application Code:** NH
- **Model:** 1C
- **Equipment Provided:** Table C-29

Table C-29. MSDT 120V Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G44	24 Lines with 25 Foot Stub Cable
1	ED-7C712-30, G20	120 V AC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	106296957	AUA414 120 V AC/-48 V DC PIU
1	106275969	AUA412 120 V AC/-48 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT -48VDC Cabinet Wall/Aerial Mount with
24 Lines with 25 Foot Stub Cable**

- **Comcode:** 108119405
- **Application Code:** NH
- **Model:** 2A
- **Equipment Provided:** Table C-30

Table C-30. MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G44	24 Lines with 25 Foot Stub Cable
1	ED-7C712-30, G25	-48 V AC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	106296957	AUA414 120 V AC/-48 V DC PIU
1	106275969	AUA412 120 V AC/-48 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT -48VDC Cabinet Wall/Aerial Mount with
24 Lines Gas Tube Protection with Binding Post**

- **Comcode:** 108119413
- **Application Code:** NH
- **Model:** 2B
- **Equipment Provided:** Table C-31

**Table C-31. MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube
Protection with Binding Post**

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G41	24 Lines with Gas Tube Protections, with Binding Post
1	ED-7C712-30, G25	-48 V AC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	106296957	AUA414 120 V AC/-48 V DC PIU
1	106275969	AUA412 120 V AC/-48 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT -48VDC Cabinet Wall/Aerial Mount with
24 Lines Insulation Displacement with Binding
Post**

- **Comcode:** 108119421
- **Application Code:** NH
- **Model:** 2C
- **Equipment Provided:** Table C-32

**Table C-32. MSDT -48VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation
Displacement with Binding Post**

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G46	24 Lines Insulation Displacement Protection with Binding Post
1	ED-7C712-30, G25	-48 V AC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	106296957	AUA414 120 V AC/-48 V DC PIU
1	106275969	AUA412 120 V AC/-48 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

MSDT -48VDC Rack Mount Application

- **Comcode:** 108119462
- **Application Code:** NG
- **Model:** 3A
- **Equipment Provided:** Table C-33

Table C-33. MSDT -48VDC Rack Mount Application

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G5	Rack Mount for Up to 2 MSDT Channel Banks
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	106296957	AUA414 120 V AC/-48 V DC PIU
1	106275969	AUA412 120 V AC/-48 V DC PCU

**MSDT ± 130 VDC Cabinet Wall/Aerial Mount
with 24 Lines Insulation Displacement with
Binding Post**

- **Comcode:** 108119447
- **Application Code:** M1
- **Model:** 4A
- **Equipment Provided:** Table C-34

**Table C-34. MSDT ± 130 VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation
Displacement with Binding Post**

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G46	24 Lines Insulation Displacement Protection with Binding Post
1	ED-7C712-30, G22	± 130 V DC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	107086415	AUA426 ± 130 V DC PIU
1	107086423	AUA427 ± 130 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT ± 130 VDC Cabinet Wall/Aerial Mount
with 24 Lines Gas Tube Protection with Binding
Post**

- **Comcode:** 108119454
- **Application Code:** M1
- **Model:** 4B
- **Equipment Provided:** Table C-35

Table C-35. MSDT ± 130 VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G41	24 Lines Gas Tube Protection with Binding Post
1	ED-7C712-30, G22	± 130 V DC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	107086415	AUA426 ± 130 V DC PIU
1	107086423	AUA427 ± 130 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT ± 130 VDC Cabinet Wall/Aerial Mount
with 24 Lines with 25 Foot Stub Cable**

- **Comcode:** 108121351
- **Application Code:** M1
- **Model:** 4C
- **Equipment Provided:** Table C-36

Table C-36. MSDT ± 130 VDC Cabinet Wall/Aerial Mount with 24 Lines with 25 Foot Stub Cable

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G44	24 Lines 25 foot Cable Stub
1	ED-7C712-30, G22	± 130 V DC Field Wiring Kit
1	ED-7C712-30, G30	Battery Storage
1	107086415	AUA426 ± 130 V DC PIU
1	107086423	AUA427 ± 130 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post

- **Comcode:** 108121369
- **Application Code:** M1
- **Model:** 5A
- **Equipment Provided:** Table C-37

Table C-37. MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G41	24 Lines Gas Tube Protection with Binding Post
1	ED-7C712-30, G24	60 V AC Field Wiring Kit
1	107248965	AUA434 60 V AC PIU
1	107086399	AUA422 60 V AC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post

- **Comcode:** 108121377
- **Application Code:** M1
- **Model:** 5B
- **Equipment Provided:** Table C-38

Table C-38. MSDT 60VAC Cabinet Wall/Aerial Mount with 24 Lines Insulation Displacement with Binding Post

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G46	24 Lines Insulation Displacement Protection with Binding Post
1	ED-7C712-30, G24	60 V AC Field Wiring Kit
1	107248965	AUA434 60 V AC PIU
1	107086399	AUA422 60 V AC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

MSDT 60VAC Cabinet Wall/Aerial Mount with 25 Foot Stub Cable

- **Comcode:** 108121385
- **Application Code:** M1
- **Model:** 5C
- **Equipment Provided:** Table C-39

Table C-39. MSDT 60VAC Cabinet Wall/Aerial Mount with 25 Foot Stub Cable

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G44	24 Lines 25 Foot Cable Stub
1	ED-7C712-30, G24	60 V AC Field Wiring Kit
1	107248965	AUA434 60 V AC PIU
1	107086399	AUA422 60 V AC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT -130VDC Cabinet Wall/Aerial Mount with
24 Lines Insulation Displacement Protection with
Binding Post**

- **Comcode:** 108121393
- **Application Code:** M1
- **Model:** 6A
- **Equipment Provided:** Table C-40

**Table C-40. MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation
Displacement Protection with Binding Post**

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G41	24 Lines Insulation Displacement Protection with Binding Post
1	ED-7C712-30, G23	-130 V DC Field Wiring Kit
1	107248973	AUA436 -130 V DC PIU
1	106436504	AUA417 -130 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT -130VDC Cabinet Wall/Aerial Mount with
24 Lines Gas Tube Protection with Binding Post**

- **Comcode:** 108121401
- **Application Code:** M1
- **Model:** 6B
- **Equipment Provided:** Table C-41

Table C-41. MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Gas Tube Protection with Binding Post

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G41	24 Lines Gas Tube Protection with Binding Post
1	ED-7C712-30, G23	-130 V DC Field Wiring Kit
1	107248973	AUA436 -130 V DC PIU
1	106436504	AUA417 -130 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

**MSDT -130VDC Cabinet Wall/Aerial Mount with
24 Lines with 25 Foot Stub Cable**

- **Comcode:** 108121419
- **Application Code:** M1
- **Model:** 6C
- **Equipment Provided:** Table C-42

**Table C-42. MSDT -130VDC Cabinet Wall/Aerial Mount with 24 Lines Insulation
Displacement Protection with Binding Post**

Quantity	ED or Comcode Number	Description
1	ED-7C712-30, G1	MSDT Enclosure
1	ED-7C712-30, G11	24 DS0 Bank
1	ED-7C712-30, G50	T1 Interface
1	ED-7C712-30, G63	Wall Mount
1	ED-7C712-30, G70	Door Alarms
1	ED-7C712-30, G44	24 Lines 25 Foot Cable Stub
1	ED-7C712-30, G23	-130 V DC Field Wiring Kit
1	107248973	AUA436 -130 V DC PIU
1	106436504	AUA417 -130 V DC PCU
1	846792547	Aerial Mount Bracket
1	108107731	Kit PXB4647 Parts
1	108120437	Power Cord Kit

Glossary

A

ADU

Alarm Display Unit

A/FCU

Alarm/Fan Control Unit

AGC

Automatic Gain Control

AID

Access Identifier

AIS

Alarm Indication Signal

ALC

Automatic Loss Compensation

ALIC

Analog Line to Integrated Carrier

ALT

Additional Line Take

AMI

Alternate Mark Inversion

ARM

Access Resource Manager

ARSB

Automated Repair Service Bureau

AWG

American Wire Gauge

B

BCU

Bank Control Unit

BER

Bit Error Rate

BFU

Bank Fuse Unit

BIU

Backplane Interface Unit

BP

Bulk Power

BPC

Bulk Power Closure

BRI

Basic Rate Interface

BRITE

Basic Rate Interface Transmission Extension

C**CATV**

Community Antenna Television

CDTU

Channel and Drop Test Unit

CEV

Controlled Environment Vault

CF

Current Feed

CIT

Craft Interface Terminal

CIU

Craft Interface Unit

CO

Central Office

COMCATS

Computerized Catalog System

COT

Central Office Terminal

CPE

Customer Premises Equipment

CPS

Central Powering System

CPW

Customer Premises Wiring

CS

Current Sink

CSA

Carrier Serving Area

CTB

Cut-Through Board

CT/DPAC

Connect-Through/Dedicated Plant Assignment Card

CU

Channel Unit

CV

Coding Violations

D

DCLU

Digital Carrier Line Unit

DDS

Digital Data System

DFR

Derived Feeder Record

DID

Direct Inward Dialing

DIP

Dual In-Line Package

DLC

Digital Loop Carrier

DLP

Detailed Level Procedure

DMM

Digital Multimeter

DS0

Digital Signal Zero

DS1

Digital Signal 1 Rate (1.544 Mb/s)

DST

Digital Signal Translator

DT

Distant Terminal

E

ECCR

Exchange Customer Cable Record

EEE

Electronic Equipment Enclosure

EMC

Electromagnetic Compliance

EOC

Embedded Operations Channel

EOL

End Of Life

ERL

Echo Return Loss

ERMS

Enhanced Rotary Mechanical Splice

ES

Errored Seconds

ESD

Electrostatic Discharge

ESF

Extended Superframe

F

FACS

Facility Assignment Control System

FEMF

Foreign Electromotive Force

FID

Facility Identifier

FTL

Fiber in the loop

FBC

Feature Package B

FPC

Feature Package C

FPF

Feature Package F

FSM

Fiber Service Module

FSR

Frequency Selective Ringing

FSS

Fiber Service Shelf

FTTC

Fiber to the curb

FTTH

Fiber To The Home

FWB

Field Wiring Box

FX

Foreign Exchange

FXO

Foreign Exchange - Office End

FXS

Foreign Exchange - Station End

H**HDIC**

High Density Fiber Interconnect

HDOS

High Density Optics Shelf

HDSL

High Bit-Rate Digital Subscriber Line

HDT

Host Digital Terminal

I**IDCU**

Integrated Digital Carrier Unit

IEEE

Institute of Electrical and Electronics Engineers

INA

Integrated Network Access

ISDN

Integrated Services Digital Network

ITH

Integral Test Head

L

LAC

Loop Assignment Center

LBO

Line Build-Out

LDS

Local Digital Switch

LEC

Local Exchange Carrier

LFACS

Loop Facility Assignment and Control System

LIC

Lightguide Interconnection Cable

LIU

Line Interface Unit

LMOS

Loop Maintenance Operations System

LOS

Loss of Signal

LOSU

Limited Output Source Unit

LP&PCP

Lightning Protection and Power Cross Protection

LS

Loop Start

LSAM

Local Splice Alignment and Measurement

LSIM

Low Stress Injection Module

LTC

Local Test Center

LTD

Local Test Desk

LTS

Loop Test System

LU

Living Unit

LXE

Lightguide Express Entry

M

MA

Maintenance Administrator

MC97780A1

Backplane Interface Unit

MDC

Metallic Distribution Controller

MDF

Main Distribution Frame

MDS

Metallic Distribution Shelf

MLT

Mechanized Loop Testing

MSDT

Multi-Services Distant Terminal

MTU

Maintenance Terminating Unit

MUX

Multiplexer Circuit Pack in FSM

N

NIU

Network Interface Unit

NPS

Network Powering System

NRZ

Nonreturn to Zero

NTP

Non-Trouble-Clearing Procedure

O

O&M

Operations and Maintenance

OAM&P

Operations, Administration, Maintenance & Provisioning

OBMK

Optical Backplane Maintenance Kit

OCU

Office Channel Unit

OHT

On-Hook Transmission

ONU

Optical Network Unit

OPS

Off Premises Station

OS

Operations System

OSP

Outside Plant

OSPE

Outside Plant Engineering

OTDR

Optical Time Delay Reflectometer

OU

Optical Unit

P

PAR

Peak to Average Ratio

PBX

Private Branch Exchange

PCU

Power Converter Unit

PDC

Provisioning and Display Controller

PDN

Passive Distribution Network

PGTC

Pair Gain Test Controller

PIN

Positive-Intrinsic-Negative

PIU

Power Interface Unit

PLAR

Private Line Auto Ring

PLR

Pulse Link Repeater

PM

Performance Monitoring

POTS

Plain Old Telephone Service

PP

Power Point

R**RGU**

Ringing Generator Unit

RMU

Remote Measurement Unit

ROH

Receiver Off Hook

RSA

Repair Service Administrator

RSB

Repair Service Bureau

RT

Remote Terminal

RTAC

Regional Technical Assistance Center

S

SAM

System Administration and Maintenance

SARTS

Switched Access Remote Test System

SES

Severely Errored Seconds

SMOLTS

Single-Mode Optical Loss Test Set

SO

Service Order

SONET

Synchronous Optical Network

SRL

Singing Return Loss

SSC

Special Services Center

T

TAC

Terminal Assignment Card

TAP

Trouble Analysis Procedure

TBCU

Test Bus Control Unit

TDM

Time Division Multiplex

TEO

Telephone Equipment Order

TL1

Transaction Language — 1 message set

TMC

Time Slot Management Channel

TOP

Task-Oriented Practice

TRU

Transmit/Receive Unit

TSI

Time Slot Interchange

TV

Trouble Verification

U**UIP**

User Interface Panel

U-MSDT

Underground MSDT

V**VF**

Voice Frequency

VFI

Voice-Frequency Interface

VOM

Volt-Ohm-Multiameter

VRT

Virtual Remote Terminal

W**WATS**

Wide Area Telecommunications Service

WDM

Wavelength Division Multiplexer

X**XTC**

Extended Test Controller

Symbols

±130 V DC Central Powering, 2-25
±130 V DC central powering, 5-10

Numerics

120 V AC local powering, 5-1
–130 V DC Central Powering, 2-24
–130 V DC central powering, 5-6
–130 V DC peak leveling powering, 5-14
300A **ST**[®] Fiber Optic Cable Connector Microscope, 3-94
–48 V DC Local Powering, 2-22
–48 V DC local powering, 5-2
60 V AC Central Powering, 2-26
60 V AC central powering, 5-14
80A cabinet, 3-3, 7-23
80A-BP Cabinet, 3-35
80A-HX cabinet, 6-27
80D cabinet, 3-4, 7-23
80D-HX cabinet, 6-27
80E cabinet, 7-1
80E-BP cabinet, 6-27
841 cabinet, B-10

A

Administration, 4-1
 Assignment, 4-8
 Growth, 4-7
 Provisioning, 4-2
 Rearrangement, 4-7
AEK-type repeater, B-10
Alarm output (HDOS), 6-8
Alarms — FSM (MSDT site), B-15
Applications
 Bandwidth Management, 2-17
 HDT Site Options, 2-1
 HDT to MSDT Facilities, 2-10
 MSDT Powering, 2-20
 MSDT Sharing, 2-15
 MSDT Site Options, 2-5
 Rural Applications, 2-30
AUA406 MSDT Server, 3-36, 3-37, 3-38
AUA408 MSDT Server, 3-36, 3-37, 3-38
AUA411 CDTU, 3-62, 3-67
AUA411B CDTU, 3-62
AUA412 PCU, 3-62, 3-69
AUA413 RGU, 3-62, 3-72
AUA414 PIU, 3-62
AUA415 PIU, 3-62
AUA416 PIU, 3-62
AUA417 PCU, 3-62, 3-69

AUA418, 3-59
AUA422 PCU, 3-62, 3-69
AUA423 RGU, 3-62, 3-72
AUA424 PIU, 3-62
AUA425 PIU, 3-62
AUA427 PCU, 3-62, 3-70
AUA434 PIU, 3-62
AUA90, 3-46
AUA93, 3-48
AUA94, 3-53
Audience for this document, xxv
Auxiliary fuse panel (FSM), B-6
AYB1B OU, 3-25, 6-7
AYB1C OU, 6-7
AYB2 PCU, 3-25, 3-44
AYB5 OU, 6-7

B

Backplane, 3-62
Bandwidth Management
 HDT to MSDT Optical Link, 2-18
 MSDT Bandwidth Management from *SLC* Series 5 HDT, 2-18
 MSDT Bandwidth Management from *SLC*-2000 HDT, 2-19
Battery backup, 3-76
BYB1B OU, 3-62, 3-67, 6-7
BYB1C OU, 3-62, 3-67, 6-7
BYB2 T1/DSX-1 LIU, 3-62, 3-67
BYB5 OU, 3-62, 3-67, 6-7

C

Cabinet, 80A-HX, 6-27, 6-29
Cabinet, 80D, 6-30
Cabinet, 80D-HX, 6-27
Cabinet, 80E-BP, 6-27
Cable placement, 7-80
Card cage, 3-62
Central office terminal (COT), 3-1
Central powering — HDT, 3-58
Channel units (MSDT), 6-1
Circuit pack data sheets, A-1
Completion testing, 7-81
Computerized Catalog System, xxxv
Connectorization, 7-80
Controlled environment vault (CEV), 3-2, 7-1, 7-23
Copper drop cable and ground connections
 wall, pole, and ground mounted MSDT installation, 7-69
Copper drop cable connections
 rack mounted MSDT installation, 7-75
 strand mounted MSDT, 7-73
COT — central office terminal, 3-1
COTS, xxxv

Courses

training catalog, xxxv

CTB (FSM), B-6

Cut-through board (CTB) — FSM, B-6

D

Data sheet for circuit packs, A-1

Direct ground mounted MSDT
installation, 7-43

DST circuit pack, B-10

DSX-1 patch panel, B-6

E

Electrical connections during *SLC* Series 5 installation, 7-6

Electrical connections during *SLC*-2000 installation, 7-28

Enclosure placement

strand mounted MSDT, 7-71

End-to-end acceptance procedures, B-38

Equipment fibers — installation, 7-22

F

Facilities — HDT to MSDT, 2-10

Conventional optical facility (FITL), 2-10

high bit-rate digital subscriber line (HDSL) modem facility,
2-13

Metallic facility, 2-12

Fan unit, 3-85

Fiber cable connections

strand mounted MSDT, 7-72

Fiber optic distributing shelf installation, 7-18

Fiber Optic Distributing Shelves Cabling — installation,
7-19

Fiber optic distribution shelves, 3-4, 3-29

Fiber optic interconnection cables (LICs), 7-1, 7-23

Fiber service shelf (FSM), B-6

Fiber splicing, 7-80

Fiber storage unit, 3-85

Fiber/T1 distribution cable connections

rack mounted MSDT installation, 7-75

wall, pole, and ground mounted installation, 7-59

Field wiring box, 3-60, 3-77

ED-7C712-30, Group 20 FWB, 3-78

ED-7C712-30, Group 21 FWB, 3-79, 3-80

ED-7C712-30, Group 23 FWB, 3-81

ED-7C712-30, Group 24 FWB, 3-83

FSM

Function description (FSM), B-1

Physical description (FSM), B-4

FSM alarms (MSDT site), B-15

FSM assembly, B-4, B-10

FSM auxiliary fuse panel, B-6

FSM Cable Acceptance Tests, B-29

FSM CLEI codes, B-16

FSM cut-through board., B-6

FSM DSX circuit pack, B-4

FSM equipment arrangement (MSDT site), B-10

FSM fiber service shelf, B-6

FSM installation procedures, B-19

FSM MUX circuit pack, B-4

FSM protectors blocks, B-12

FSM PWR circuit pack, B-4

FSM wiring blocks, B-12

FSM wiring diagrams

841/MSDT/FSM cabinet wiring diagram, B-13

841/MSDT/FSM repeater shelf assembly wiring diagram,
B-14

FSM DSX-1 wiring diagram at HDT, B-8

FSM wiring diagram at HDT, B-9

FSM/Repeater/Power Shelf, B-10

FSS (FSM), B-6

H

HDOS assembly, 3-4, 3-22, 3-44

HDT, 1-2

HDT — *SLC* Series 5 carrier system, 3-32

HDT — *SLC*-2000 Access System, 3-1

HDT Application Considerations

BRITE, 3-46

ISDN, 3-46

Mode 2, 3-55

T1 MSDT, 3-55

HDT Site Options

Long-Loop HDT Site Options, 2-2

Remote HDT Enclosures, 2-4

Short-Loop HDT Site Options, 2-2

SLC Series 5 HDT Site Options, 2-1

SLC-2000 HDT Site Options, 2-1

High density optics shelf assembly, 3-4, 3-22, 3-44

Host digital terminal (HDT), 1-2

I

Installation

2C fan unit installation, 7-6

4() fan unit installation, 7-28

ARM shelf installation, 7-24

Direct ground mounted MSDT installation, 7-43

distribution fiber installation, 7-80

ED-7C712-30, Grp. 80 upgrade kit, 7-82

ED-7C712-30, Grp. 82 upgrade kit, 7-82

HDT dual bank assembly installation, 7-2

HDT frame, 7-24

HDT frame installation, 7-2

High Density Optics Shelf (HDOS) Assembly installation,

- 7-4, 7-26
- LGX fiber optic distribution frame installation, 7-18, 7-37
- MDS Assembly installation, 7-24
- MSDT, 7-38
 - pad mounted MSDT installation, 7-41
 - pole mounted MSDT installation, 7-39
 - rack mounted MSDT installation, 7-74
 - SLC Series 5 HDT installation, 7-1
 - SLC[^]-2000 HDT, 7-23
 - strand mounted MSDT installation, 7-70
 - U-MSDT installation, 7-75
 - underground mounted MSDT installation, 7-75
 - wall mounted MSDT installation, 7-45
 - wall, pole, and ground mounted MSDT installation, 7-38
- ISDN
 - BRITE II, 3-48
 - ISDN BRI Services, 3-53
 - T-BRITE, 3-46

J

- J1C265AC-1, L2 HDOS assembly, 3-36
- J1C265AC-1, L3 HDOS assembly, 3-4
- J99409OB-1, L1 OBMK, 3-91

K

- KS-21906, L20 battery pack, 3-77

L

- L6 test cord, 3-94
- LGX fiber optic distribution frame, 3-36, 7-37
- Local Powering — 120 V AC, 2-20
- LOSU - limited output source unit, 3-59

M

- Maintenance, 4-10
 - alarms and fault sectionalization, 4-12
 - channel and drop testing, 4-12
 - DS1 performance monitoring, 4-10
 - Fault isolation procedure, 4-20
 - Integrated SLC-2000 Access System Testing, 4-17
 - ITH testing, 4-20
 - Mechanized loop testing (MLT), 4-13
 - MLT setup, 4-18
 - proactive maintenance, 4-11
 - Testing with systems other than MLT, 4-21
 - TR909 compatibility, 4-13

- MC97780A1 BIU, 3-62, 3-63
- MC97789A1 BIU, 3-62, 3-63
- MC97793A1 BIU, 3-62, 3-64
- MC97794A1 BIU, 3-62, 3-64
- Mini-hut, 3-2
- MSDT — Underground, 3-89
- MSDT connect, 7-22
- MSDT disconnect, 7-23
- MSDT Enclosure — Pedestal Type, 3-85
- MSDT Enclosure — Rack Mount, 3-87
- MSDT Enclosure — Strand Mount, 3-86
- MSDT Powering
 - Central Powering, 2-23
 - Local Powering, 2-20
- MSDT Server, 3-4
- MSDT Sharing
 - Rural Considerations, 2-17
 - Service Drop Distance, 2-16
- MSDT site options
 - Pedestal enclosure, 2-6
 - Pole mounted configuration, 2-7
 - Rack mounted configuration, 2-8
 - Strand mounted configuration, 2-7

O

- ONU, 1-2
- Optical fiber connections during SLC Series 5 installation, 7-17
- Optical fiber connections during SLC-2000 installation, 7-37
- optical network unit, 1-2
- Ordering
 - Applications Configurator Software, C-40
 - LGX Lightguide Distribution Frame, C-9
 - SLC Series 5 HDT Bay, C-4
 - SLC[^]-2000 HDT bay, C-6
- Outside plant cables — installation, 7-20
- Overview, 1-1

P

- Pad mounted MSDT
 - installation, 7-41
- Pair gain test controller (PGTC), 4-12
- Pair protectors — tip and ring, 3-85
- Patch panel — DSX-1, B-6
- Pedestal enclosure, 6-31
- Pedestal Type MSDT Enclosure Description, 3-85
- Performance monitoring (DS1), 4-10
- PGTC, 4-12
- Physical and environmental specifications
 - Series 5 HDT, 6-25
 - SLC[^]-2000 HDT, 6-28
 - SLC[^]-2000 MSDT, 6-31
- Pole mounted MSDT

- installation, 7-39
- Power
 - Central powering, ~ 130 V DC, 5-6
 - Central powering, ~ 130 V DC Peak Leveling, 5-14
 - Central powering, ± 130 V DC, 5-10
 - Central powering, 60 V AC, 5-14
 - Local powering, ~ 48 V DC, 5-2
 - Local powering, 120 V AC, 5-1
 - Pad mounted MSDT - power, 5-2
 - Pole mounted MSDT - power, 5-2
 - Wall mounted MSDT - power, 5-2
- Power — MSDT Powering, 2-20
- Power connections
 - rack mounted MSDT installation, 7-75
 - strand mounted MSDT, 7-71
 - wall, pole, and ground mounted MSDT installation, 7-46
- Product training
 - COMCATS, xxxv
 - Computerized Catalog System, xxxv
 - on-line catalog, xxxv
- Product training catalog, xxxv

R

- Rack mount MSDT, 6-32
- Rack Mount MSDT Enclosure Description, 3-87
- Rack mounted MSDT
 - installation, 7-74
- Rack mounted MSDT installation
 - copper drop cable connections, 7-75
 - fiber/T1 distribution cable connections, 7-75
 - power connections, 7-75
- Rural Applications
 - Alternative Solutions, 2-31
 - Economics, 2-31
 - Rural Features, 2-33
 - Rural Modernization, 2-30

S

- Sharing — MSDT, 2-15
- Site preparation
 - strand mounted MSDT, 7-71
- SLC-2000 HDT
 - HDT equipment additions to support MSDT, 3-4
 - Housing options (HDT), 3-1
- SLC-2000 HDT Software Release 4 or later
 - BIU downloading (SLC-2000 HDT Software Release 4 or later), 3-7
 - Enhanced alarms (SLC-2000 HDT Software Release 4 or later), 3-9
 - Link performance monitoring (SLC-2000 HDT Software Release 4 or later), 3-10
 - MSDT inventory retrieval (SLC-2000 HDT Software Release 4 or later), 3-10

- TR-303 basic services (SLC-2000 HDT Software Release 4 or later), 3-7
- TR-303 ISDN BRI 2B+D (SLC-2000 HDT Software Release 4 or later), 3-8
- TR-303 ISDN metallic circuit testing (SLC-2000 HDT Software Release 4 or later), 3-10
- TR-303 metallic circuit testing (SLC-2000 HDT Software Release 4 or later), 3-9
- SLC-2000 HDT Software Release 4.0 or Later
 - Features and required circuit pack (SLC-2000 HDT Software Release 4.0 or Later), 3-6
- SPQ⁸⁰⁸ MSDT Server, 3-38
- SPQ⁸⁰⁸ MSDT Server Channel Unit, 3-20
- SPQ⁸⁰⁹ MSDT Server Channel Unit, 3-20
- Strand mount enclosure, 6-31
- Strand Mount MSDT Enclosure Description, 3-86
- Strand mounted MSDT
 - copper drop cable connections, 7-73
 - enclosure placement, 7-71
 - fiber cable connections, 7-72
 - power connections, 7-71
 - site preparation, 7-71
- Strand mounted MSDT installation, 7-70

T

- Technical Specifications
 - Channel units, 6-1
 - Circuit maintenance, 6-24
 - Digital data performance, 6-25
 - HDOS alarm output, 6-8
 - Optical fiber link, 6-24
 - Optical units, 6-7
 - Ring generator, 6-8
 - Signaling, 6-24
 - Transmission specifications, 6-8
- Tip and ring pair protectors, 3-85
- Transmission specifications
 - AUA45 dual ringing repeater channel unit, 6-12
 - multiparty and FSR channel units, 6-11
 - VF channel units with adjustable settings, 6-15, 6-16

U

- U-MSDT
 - installation, 7-75
- Underground MSDT (U-MSDT) Description, 3-89
- Upgrade
 - dual mode to quad mode operation — upgrade, 7-81
 - ED-7C712-30, Grp. 80 upgrade kit, 7-82
 - ED-7C712-30, Grp. 82 upgrade kit, 7-82

W

- Wall mounted MSDT
 - installation, 7-45
- Wall, pole, and ground mounted MSDT
 - Fiber/T1 distribution cable connection installation, 7-59
 - installation, 7-38
- Wall, pole, and ground mounted MSDT installation
 - copper drop cable and ground connections, 7-69
 - power connections, 7-46
- Wiring diagrams (FSM)
 - 841/MSDT/FSM cabinet wiring diagram, B-13
 - 841/MSDT/FSM repeater shelf assembly wiring diagram, B-14
 - FSM DSX-1 wiring diagram at HDT, B-8
 - FSM wiring diagram at HDT, B-9
- WP91067, L6 test cord, 3-94