AT&T 363-206-202
Issue 5A Revision
July 1995

DDM-2000 OC-3 Multiplexer Releases 2, 3, 5, 6, and 7

User/Service Manual - Volume I

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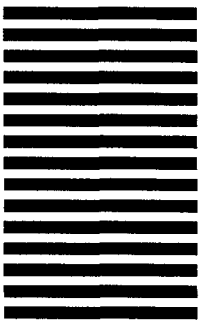
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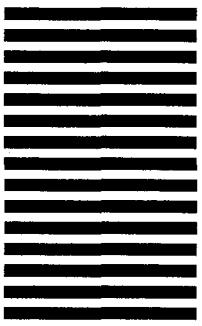
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Reason for Reissue

This document, Issue 5, replaces the *DDM-2000 OC-3 Multiplexer User/Service Manual*, Issue 4. The document is reissued to include Releases 6.2 and 7.1 features, applications, operations, and maintenance.

Release 6.2 and 7.1 features are listed in Section 1, "System Introduction".

Major changes in this issue are noted by bars (|) in the right margin.

Major changes include the following:

- Separated the manual into two volumes
- Removed references to the use of fans in central office environments for the DDM-2000 OC-3 Multiplexer. The DDM-2000 OC-3 Multiplexer does not need fans for arrangements in a central office (controlled) environment
- Added information on dual ring interworking (DRI)
- Added information for two new circuit packs: the 22D-U optical line interface unit (OLIU) and the 22G-U OLIU and universal optical connector versions of the 21D (21D-U) and 21G (21G-U) OLIUs
- Added information on channel state provisioning
- Added information on VT1.5 and STS-1 signal degrade protection switching
- Added information on OC-12 VT1.5 path switched ring (dual 0x1) applications
- Added information on automatic synchronization reconfiguration
- Added information on enhanced DS3 performance monitoring
- Added information on the SNC-2000 cPro Graphical User Interface and Provisioning Tool
- Added expanded TL1 messages.

Safety Instructions

Product Safety Labels

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

About This Document

Purpose

This *DDM-2000 OC-3 Multiplexer User/Service Manual, Volume I* includes Releases 2, 3, 5, 6, and 7 and provides the following:

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

The *DDM-2000 OC-3 Multiplexer User/Service Manual (TOP), Volume II* includes Releases 2, 3, 5, 6, and 7 and provides operation and maintenance (O & M) task oriented practice (TOP) supporting acceptance, turnup, and maintenance.

Intended Audiences

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

Reason for Reissue

This document, Issue 5, replaces the *DDM-2000 OC-3 Multiplexer User/Service Manual*, Issue 4. The document is reissued to include Releases 6.2 and 7.1 features, applications, operations, and maintenance.

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- Added information on VT1.5 and STS-1 signal degrade protection switching
- Added information on OC-12 STS-1/VT1.5 path switched ring (dual 0x1) applications
- Added information on automatic synchronization reconfiguration
- Added information on enhanced DS3 performance monitoring
- Added information on the SNC-2000 CPro Graphical User Interface and Provisioning Tool. The manual with or without software can be ordered through the Customer Information Center. See "Related Documentation."
- Added expanded TL1 messages.

This Issue 5A Revision is issued to include Release 7.2 (rings) of the OC-3 Multiplexer. Major changes include adding information for the following:

- Operations interworking with FT-2000 OC-48 Lightwave System networks
- OC-3 dual ring interworking with VT and STS drop and continue
- Large networks of up to 24 network elements

- Interworking between existing and new controllers
- Multiple gateway network element (GNE) support
- Enhanced DS1 and DS3 line and path performance monitoring. Enhanced DS3 performance monitoring requires new BBG4B circuit pack.
- The 22G2-U OLIU. The 22G2-U OLIU is the same as the 22G-U OLIU but, has improved receiver overload sensitivity, eliminating the need for an external attenuator for loopback testing. The 22G2-U can be used in place of the 22G-U in all applications.

Release 7.2 features are listed in Section 1, "System Introduction."

Safety Instructions

Product Safety Labels

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

These admonishments have the following definitions:

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

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

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

Lightwave Safety

An AT&T lightwave digital transmission system and associated optical test sets use semiconductor laser transmitters. The lasers emit lightwaves, at or near infrared wavelengths, into lightguide fibers. 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 viewer, since 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.

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

- Assume all circuit packs contain solid state electronic components that can be damaged by ESD. Use only AT&T manufactured UL† recognized circuit packs in this system. Recognized circuit packs are listed in this user/service manual.
- When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat. If a static-dissipating floor mat is used, be sure that it is clean.

* Registered trademark of F. J. W. Industries, Inc.

† Registered trademark of Underwriters Laboratories, Inc.

- Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats. If a static-dissipating table mat is used, be sure that it is clean.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- Keep all static-generating materials such as food wrappers, plastics, and styrofoam containers away from all circuit packs. Upon removal from the bay, immediately put circuit packs into static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.

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

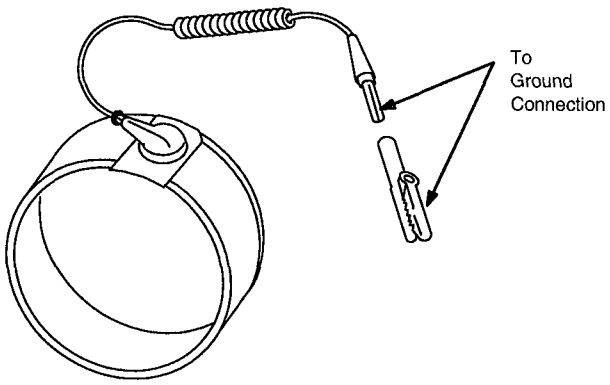


Figure A. Static Control Wrist Strap

IMPORTANT SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS.

IMPORTANT INSTALLATION SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS.

Related Documentation

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

- Number: AT&T 190-523-101 (manual only)

  Title: *SNC-2000 CPro User Manual*

  Audience: Maintenance personnel

  Content: Using the tool to provision and maintain ring networks.

  Order Comcode 107265944 for manual and software.

- Number: AT&T 363-206-200

  Title: *DDM-2000 OC-3 and OC-12 Multiplexers Applications, Planning, and Ordering Guide*

  Audience: Network Planners, equipment engineers, and sales teams

  Content: Features, applications, high-level description, operations, administration, maintenance, and provisioning (OAM&P), system planning, ordering, product support, reliability information, technical specifications, and a synchronous optical network (SONET) overview.

- Number: AT&T 363-206-201

  Title: *DDM-2000 OC-3 Multiplexer, System Commands Quick Reference*

  Audience: Maintenance personnel

  Content: Abbreviated list of system commands and parameters for DDM-2000 OC-3 Multiplexers through Release 7.2

- Number: AT&T 363-206-204

  Title: *DDM-2000 OC-3 Multiplexer Installation Manual*

  Audience: Customers planning to install the equipment

  Content: Customer installation instructions

- Number: AT&T 363-206-206

  Title: *DDM-2000 OC-12 Multiplexer — System Commands Quick Reference*

  Audience: Maintenance personnel

  Content: Abbreviated list of system commands and parameters for DDM-2000 OC-12 Multiplexers through Release 3.1

- Number: AT&T 363-206-207

  Title: *DDM-2000 OC-12 Multiplexer and OC-12 Regenerator User/Service Manual*

  Audience: Maintenance personnel

  Content: Detailed description, technical specifications, commands and reports, and operations and maintenance procedures for DDM-2000 OC-12 Multiplexers through Release 3.1 and OC-12 Regenerator through Release 2.0.

- Number: AT&T 363-206-208

  Title: *DDM-2000 OC-12 Multiplexer Installation Manual*

  Audience: Customers planning to install the equipment

  Content: Customer installation instructions

- Number: AT&T 363-206-220

  Title: *DDM-2000 OC-3/OC-12 Multiplexer Circuit Pack Options Job Aid*

  Audience: Maintenance personnel

  Content: List of circuit pack options

- Number: AT&T 363-206-222

  Title: *DDM-2000 OC-3/OC-12 Multiplexer Acceptance Task List Job Aid*

  Audience: Maintenance personnel

  Content: Checklist of acceptance and turnup procedures

- Number: AT&T 363-206-223

  Title: *DDM-2000 OC-12 Regenerator — System Commands Quick Reference*

  Audience: Maintenance personnel

  Content: Abbreviated list of system commands and parameters

- Number: AT&T 363-206-280

  Title: *DDM-2000 OC-3 Multiplexer User/Service Manual, Volumes I and II*

  Audience: Maintenance personnel

  Content: Detailed description, technical specifications, commands and reports (Volume I), and operations and maintenance procedures (Volume II) for DDM-2000 OC-3 Multiplexer Releases 8.0 and 9.0.

- Number: AT&T 363-206-281

  Title: *DDM-2000 OC-3 Multiplexer — System Commands Quick Reference*

  Audience: Maintenance personnel

  Content: Abbreviated list of system commands and parameters for DDM-2000 OC-3 Multiplexers Releases 8.0 and 9.0.

- Number: AT&T 363-206-290

  Title: *DDM-2000 OC-12 Multiplexer User/Service Manual, Volumes I and II*

  Audience: Maintenance personnel

  Content: Detailed description, technical specifications, commands and reports (Volume I), and operations and maintenance procedures (Volume II) for DDM-2000 OC-12 Multiplexer Release 5.0.

- Number: AT&T 363-206-291

  Title: *DDM-2000 OC-12 Multiplexer — System Commands Quick Reference*

  Audience: Maintenance personnel

  Content: Abbreviated list of system commands and parameters for DDM-2000 OC-12 Multiplexers Release 5.0

- Number: AT&T 363-206-300

  Title: *DDM-2000 FiberReach Applications, Planning, and Ordering Guide*

  Audience: Network Planners, equipment engineers, and sales teams

  Content: Features, applications, high-level description, operations, administration, maintenance, and provisioning (OAM&P), system planning, ordering, product support, reliability information, technical specifications, and a synchronous optical network (SONET) overview

- Number: AT&T 363-206-301

  Title: *DDM-2000 FiberReach User/Service Manual*

  Audience: Maintenance personnel

  Content: Detailed description, technical specifications, and operations and maintenance procedures for the DDM-2000 FiberReach Multiplexer

- Number: AT&T 363-206-310

  Title: *DDM-2000 FiberReach Multiplexer Installation Manual*

  Audience: Users planning to install the equipment

  Content: Customer installation instructions

- Number: AT&T 824-102-147

  Title: *AT&T 2000 Product Family Operations Interworking Guide*

  Audience: Maintenance personnel

  Content: Operations interworking information for the AT&T Product Family 2000 systems including DDM-2000 Multiplexers and FT-2000 OC-48 Lightwave System.

- Number: AT&T 824-102-148

  Title: *2000 Family of Products Operations Systems Engineering Guide*

  Audience: Engineers

  Content: Operations systems engineering information for the DDM-2000 Multiplexers and FT-2000 OC-48 Lightwave System.

- Number: AT&T 824-102-149

  Title: *SLC ®-2000 Access System Operations Systems Engineering Guide*

  Audience: Engineers

  Content: Operations systems engineering information for *SLC*-2000

- DDM-2000 OC-3 Drawings:

ED-8C724-10	OC-3 and OC-3/OC-12 Combined Bay Arrangements
ED-8C724-15	Cabling Plan (Rear Access)
ED-8C724-16	Cabling Plan (Front Access)
ED-8C724-20	Cable Assemblies
ED-8C724-21	Cable Assemblies
ED-8C724-22	Cable Assemblies
ED-8C724-30	DDM-2000 Shelf Assembly
ED-8C724-31	User Panel Assembly
ED-8C724-34	Releases 2 and 3 Software Ordering
ED-8C724-36	Release 5 Software Ordering
ED-8C724-37	Release 6 Software Ordering
ED-8C724-38	Release 7 Software Ordering
ED-8C724-39	Release 8 Software Ordering
ED-8C724-40	Release 9 Software Ordering
ED-8C733-30	Fan, Filter, and Baffle Assemblies
SD-7C510-01	Application Schematic
T7C510-31	Interconnect Wiring (Rear Access)
T7C510-32	Interconnect Wiring (Front Access)
801-525-168	Floor Plan Data Sheets

- DDM-2000 OC-12 Drawings:

ED-8C724-10	OC-3 and OC-3/OC-12 Combined Bay Arrangements
ED-8C727-10	Typical Bay Arrangements
ED-8C727-15	Cabling Plan (Rear Access)
ED-8C727-16	Cabling Plan (Front Access)
ED-8C727-20	Cable Assemblies
ED-8C727-21	Cable Assemblies
ED-8C727-30	Shelf Assembly
ED-8C727-31	User Panel Assembly
ED-8C727-34	DDM-2000 OC-12 Release 2 Software Ordering
ED-8C727-35	DDM-2000 OC-12 Release 3 Software Ordering
ED-8C727-36	DDM-2000 OC-12 Release 5 Software Ordering
ED-8C727-41	DDM-2000 OC-12 Regenerator Release 2 Software Ordering
SD-7C513-01	Application Schematic
T7C513-31	Interconnect Wiring Diagram (Rear Access)
T7C513-32	Interconnect Wiring (Front Access)
801-525-168	Floor Plan Data Sheets

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

- Number: AT&T 363-205-000

  Title: *SLC® Series 5 Carrier System Ordering Guide — Loop Transmission Systems* (to be replaced by AT&T 363-205-010)

- Number: AT&T 363-205-010

  Title: *SLC® Series 5 System Applications and Planning Guide*

- Number: AT&T 626-500-105

  Title: *80-Type Cabinets Ordering Information and Lettering Guide*

- Number: AT&T 626-500-115

  Title: *90-Type Cabinets Coding and Ordering Information.*

The following documents provide additional information about related equipment:

- Number: AT&T 363-206-150

  Title: *DDM-Plus User/Service Manual*

- Number: AT&T 363-206-151

  Title: *DDM-Plus Installation Manual*

- Number: AT&T 363-206-152

  Title: *DDM-Plus Quick Reference Guide*

- Number: AT&T 363-206-156

  Title: *DDM-Plus Equipment Engineering and Ordering Guide*

- Number: AT&T 363-206-157

  Title: *DDM-Plus Wall DT Installation Manual*

- Number: AT&T 365-303-102

  Title: *DSX-3 Cross-Connect Bay, Description, Operation, and Maintenance Manual*

- Number: AT&T 365-301-130

  Title: *System III DSX-3/4, Planning, Engineering, Installation, and Operation — System Reference Guide*

- Number: AT&T 365-331-000

  Title: *DACS III-2000 Release 2.0 Applications, Planning, and Ordering Guide*

- Number: AT&T 365-340-004

  Title: *DACS IV-2000 Release 2.1 Reference Manual*

- Number: AT&T 365-575-100

  Title: *FT-2000 OC-48 Lightwave System Applications, Planning, and Ordering Guide*

- Number: AT&T 636-299-120

  Title: *LGX® Distribution System, Planning, Engineering, Installation, and Operation System Reference Guide.*

Related Training

The National Product Training Center at Dublin, Ohio and Lisle, Illinois, provides management courses for planning, engineering, and ordering, as well as training for telecommunications technicians in installation, operations, and maintenance. Suitcasing of these courses is available. Consult your local AT&T Account Executive for more information or reservations. Call **1-800-TRAINER** for enrollment.

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

- Number: LW2212

  Title: DDM-2000 OC-3 and OC-12 Multiplexer Applications and Architecture

  Audience: Fundamental planners, account executives, and private telecommunications network technical consultants

  Content: General information about the DDM-2000 OC-3 and OC-12 Multiplexers including a product overview, applications, architecture, and deployment planning. This course is a prerequisite for LW2312.

- Number: LW2312

  Title: DDM-2000 OC-3 and OC-12 Multiplexer Equipment Engineering and Planning

  Audience: Facility planners, outside plant engineers, central office equipment engineers, and private network design engineers

  Prerequisite: LW2212

  Content: Information and guidelines required to plan and order DDM-2000 OC-3 and OC-12 Multiplexer equipment for loop feeder and interoffice applications.

- Number: LW2603

  Title: DDM-2000 OC-3 Multiplexer Linear Networks, Operations and Maintenance

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

  Content: Information supporting operations, maintenance, and provisioning the DDM-2000 OC-3 Multiplexer. On-site shelves are used for extensive hands-on experience.

- Number: LW2608

  Title: DDM-2000 OC-3 Multiplexer Ring Networks, Operation and Maintenance

  Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in ring network functions.

  Prerequisite: LW2603

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

- Number: LW2612

  Title: DDM-2000 OC-12 Multiplexer Operations and Maintenance

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

  Content: Information supporting operations, maintenance, and provisioning of the DDM-2000 OC-12 Multiplexer. Includes information on DDM-2000 OC-12 linear and ring applications. On-site shelves are used for extensive hands-on experience.

- Number: LW2618

  Title: Advanced Ring Network Applications, Operations, and Maintenance

  Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in day-to-day operations of FT-2000 OC-48 Lightwave System and/or DDM-2000 OC-3/OC-12 rings having dual ring interworking (DRI) traffic.

  Prerequisites: LW2608 and LW2616

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

At the time of this printing, a DDM-2000 FiberReach Multiplexer self-paced course is being developed. Contact your local AT&T Account Executive for more information.

Technical Support

Assistance in maintaining your installed system is available through the Regional Technical Assistance Center (RTAC) and the Technical Support Organization (TSO). As shown in Figure B, the AT&T single point of contact is the RTAC. RTAC personnel troubleshoot field problems 24 hours a day over the phone and, if necessary, on site. For technical assistance, notify your supervisor, your local technical support organization, or call **1-800-225-RTAC** in accordance with local operating instructions. One call guarantees support.

RTAC organizations are supported by a centralized TSO for transmission products. The TSO maintains a close relationship with Bell Laboratories and other AT&T organizations to expedite resolutions and maintain contact with the development community. This association provides continuous accessibility to every phase of a product life cycle and assures a prompt resolution to all inquiries.

The TSO has also established a dial-up technical support medium called COACH. COACH is a system of on-line support tools aimed at providing product news and bulletins, diagnostic services, compatibility information, and on-line documents. COACH tools provide you with the most up-to-date product information so that problems are either prevented or quickly resolved.

Many AT&T transmission products including DDM-2000 Multiplexers are supported by COACH.

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

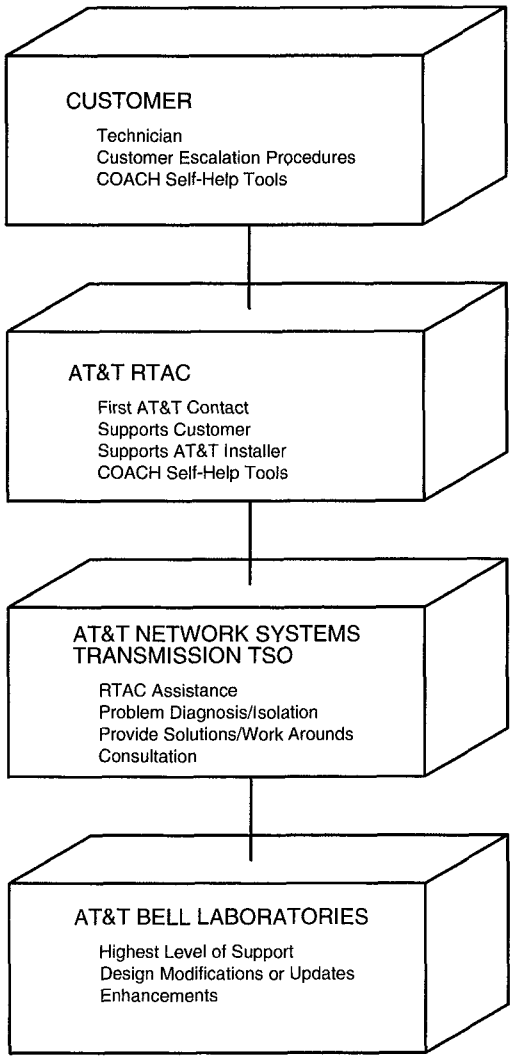


Figure B. Product Support

The COACH tools reside on a dedicated time-share computer accessible over toll-free lines and are available 24 hours a day, 7 days a week.

The following COACH tools are available:

- Diagnostic Dictionary
  Contains previously encountered problems and their solutions.
- News and Bulletins
  Immediately after a user logs into COACH, the news and bulletins tool displays bulletins containing urgent information related to the product. Users are informed about the presence of news items, which are less urgent, and can be read at their leisure.
- Compatibility Data
  This tool lists solutions to hardware/firmware configuration problems in the form of product changes which are available.
- COACH User's Guide
  This is an on-line version of how to use COACH.
- Change Notice
  This tool lists existing change notices (CNs and CCNs), including descriptions and implementation procedures.

For information on obtaining a COACH login, contact:

COACH Software Development
Department NB0031200
AT&T
1600 Osgood St.
North Andover, MA 01845

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

or

FAX to: **1-508-960-1772**

Engineering and Installation Services

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

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

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

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

All equipment engineered and installed by AT&T is thoroughly tested and integrated into a reliable system at cutover. Once approved by AT&T's Quality Assurance Test group, the system is turned over to the customer.

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

Transmission Systems Technical Support Services

The goal of AT&T's Transmission Systems Technical Support Services is to keep AT&T Transmission Systems products operating at maximum performance and to prevent problems from interrupting service to customers. The Transmission Systems Technical Support Services offerings include Extended Technical Support Services to pick up after the warranties end and Value Added Services from consultation and planning to turnkey operations and on-site maintenance programs.

Typical Extended Technical Support Services include:

- Operational and administrative services
- Technical consultation
- Post-warranty restoration services.

Typical Value Added Services include:

- Network design, growth planning, and performance analysis
- Multivendor troubleshooting
- Preventive and remedial maintenance.

Along with a national hotline number and on-line technical support, AT&T's Transmission Systems Extended Technical Support Services and Value Added Support plans allow you to specify the level of coverage needed to meet your specific needs from Basic through Unlimited Coverage.

For more information on AT&T's Transmission Systems Technical Support Services, contact your AT&T Account Executive.

Documentation Support

The AT&T Customer Information Development and Business Translations Organization provides a contact to report errors or to ask questions about information in this document. The document support telephone number is **1-800-334-0404 or 1-910-727-6681** (Monday through Friday, 8:00 a.m. to 4:00 p.m. EST).

How to Order Documents

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

Customer	Mail Order	Telephone Order *(Monday through Friday)*
Commercial Customers*	AT&T Customer Information Center Attention: Order Entry Section 2855 N. Franklin Road P.O. Box 19901 Indianapolis, IN 46219	Within USA: **1-800-432-6600** *7:30 a.m. to 6:30 p.m. EST* FAX: **1-317-322-6484** From Canada: **1-800-255-1242** Australia and all European Countries: Toll: **1-317-322-6416** All Other Countries: Toll: **1-317-322-6411** Worldwide: FAX: **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 AT&T.

AT&T entities should use Form IND 1-80.80 FA, available through the Customer Information Center.

Standing Orders

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 the 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. For questions regarding standing orders or to be placed on a standing order list, call the applicable AT&T Customer Information Center number listed above.

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If the feedback forms are missing, send comments on this document to:

Documentation Services
2400 Reynolda Road
Winston-Salem, NC 27106

You may also report errors or request changes to this document by calling the toll free number, **1-800-334-0404**, and giving the 9-digit document number.

Electronic Documentation

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

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

- To order, call your Technical Information Resource Manager, your AT&T Account Executive, or the AT&T Customer Information Center (1-800-432-6600).
- For pricing information, contact your AT&T Network Systems Account Executive or the AT&T Customer Information Center (1-800-432-6600). The CD-ROM Product Line Order NUmber for the All Access and Transport Products Grouping is AT&T 300-100-010.
- For technical information, call AT&T Documentation Support (1-800-334-0404).

System Introduction

1

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System Introduction

1

Overview

This section introduces the AT&T 2000 Product Family and briefly describes the DDM-2000 OC-3 Multiplexer.

Introduction to the AT&T 2000 Product Family

AT&T is focused on a carefully planned and growing product family designed to provide total network solutions. The family complies with the synchronous optical network (SONET) standard and builds on items that customers have found to be useful and successful in networks such as single-ended maintenance and upgrade capabilities. The AT&T 2000 Product Family includes the following products:

- DDM-2000 OC-3 Multiplexer
- DDM-2000 OC-12 Multiplexer
- FT-2000 OC-48 Lightwave System
- DACS III-2000 Cross-Connect System
- DACS IV-2000 Cross-Connect System
- *DACScan*™-2000 Controller
- *SLC*®-2000 Access System
- Business Remote Terminal-2000 (BRT-2000).

Introduction to the DDM-2000 OC-3 Multiplexer

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

The DDM-2000 OC-3 Multiplexer is designed for loop, interoffice, and customer location applications. DDM-2000 starts with many of the proven features of AT&T's DDM-1000 multiplexer and extends into the future with the flexibility of the SONET standard.

A single 8.5-inch high shelf supports a mix of digital signal 1 (DS1), digital signal 3 (DS3), optical carrier level 3 (OC-3), electrical carrier signal level 1 (EC-1), OC-3c (STS-3c), and IS-3 signal interfaces, satisfying a wide range of lightwave terminal and SONET electrical multiplexer applications. It supports point-to-point, hubbing, DS1/DS3 add/drop, STS-1 drop applications, ring networks, and upgrade to OC-12. See Section 9, "Maintenance Description", for software compatibility, inservice upgrades, and number of nodes supported by release.

The DDM-2000 OC-3 Multiplexer is designed for easy installation and operation. Centralized operation is supported by a full set of single-ended operations (SEO), control, and maintenance features. Automatic turnup tests and default provisioning simplifies installation. Most tasks can be performed using faceplate light-emitting diode (LED) displays and controls, while an optional craft interface terminal gives access to sophisticated maintenance, provisioning, and reporting features.

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

The DDM-2000 OC-3 Multiplexer has a phased release plan. This user/service manual covers Releases 2, 3, 5, 6, and 7 of the DDM-2000 OC-3 Multiplexer. The manual will be updated to cover additional releases as they become available.

DDM-2000 OC-3 Multiplexer Releases

The following features and software releases are covered in this manual:

Release 2 — OC-3 Fiber Hubbing

- Software Release 2.1
  - — Point to point
  - — Low speed DS1 and DS3
  - — Three-spoke hub
  - — STS-1 linear drop
  - — Repeater (21G)
  - — TL1 interface to NMA
- Hardware
  - — BBF2B TGS
  - — 21G OLIU
  - — DS1
  - — MXRVO
  - — DS3
  - — BBG5 SYSCTL
  - — BBG7 OHCTL
  - — Shelf

Release 3 — OC-3 Linear Add/Drop

- Software Release 3.1
  - — DS1/DS3 add/drop
  - — OC-3 hubbing with VT1.5 grooming
  - — OC-3/OC-12 interworking (21G OLIU)
  - — Repeater (22F OLIU)
  - — TL1 interface to NMA
  - — Security
  - — DS1 timing outputs
- Software Release 3.2
  - — OC-3/OC-12 interworking (21D OLIU)
  - — *SLC*®-2000 Release 1 and Release 2.0 interworking
- Hardware
  - — 22F OLIU (intermediate reach with TSI)
  - — BBF2B TGS
  - — 21D OLIU (IS-3)

Release 4 — OC-3/FT-2000 Transmission Interworking

Consolidated. All software and hardware features moved to DDM-2000 OC-3 Release 6.0

Release 5 — OC-3 Path Switched Rings (Supports Ring Topologies Only)

- Software Release 5.1 *
  - — VT1.5 and STS-1 path switched ring
  - — DS1 low-speed interface
  - — DS3 interface with STS-1 path protection switching and cross-connections
  - — EC-1 low-speed interface with VT1.5 or STS-1 based cross-connections
  - — Mixed DS1, DS3, and EC-1interfaces
  - — *SLC*®-2000 Release 1.0 and 2.0 interworking
  - — DS1 path performance monitoring (option)
  - — Synchronization messaging
  - — DS1 timing output
  - — TL1
  - — Security
- Hardware
  - — BBF3 DS1PM (optional)
  - — BBG6 STS1E (EC-1 low-speed interface)

Release 6 — Open Systems Interconnection (OSI) Interworking

- Software Release 6.0
  - — OSI 7-layer protocol stack over the DCC
  - — OC-3/OC-12 OSI interworking†
  - — Synchronization messaging
  - — DS1 path performance monitoring (option)
  - — VT1.5 performance monitoring (option)
  - — OC-3c (STS-3c) transport using 21D or 21G OLIU (option)
  - — EC-1 low-speed interface (BBG6 STS1E)
  - — EC-1 high-speed interface (BBG6 STS1E)
- Software Release 6.1
  - — Linear Extensions from OC-3 Ring
  - — TL1 provisioning messages for OPS/INE
  - — Additional TL1 messages
  - — Automatic synchronization reconfiguration
  - — *SLC*-2000 Release 3.0 interworking
- Software Release 6.2
  - — Channel state provisioning
  - — *SLC*-2000 Release 3.1 and 3.2 interworking
  - — Additional TL1 messages

- Hardware
  - — BBG6 STS1E (EC-1 high- and low-speed interface)
  - — Optional BBF3 DS1PM

Release 7 — OC-3 Enhanced Ring

- Software Release 7.0
  - — EC-1 Dual ring interworking with VT1.5/STS-1 drop and continue
  - — VT1.5 signal degrade protection switching
  - — OSI on rings
  - — OC-3 ring with optical extensions
  - — VT1.5 path performance monitoring (option)
  - — Automatic synchronization reconfiguration
  - — Additional TL1 messages
- Software Release 7.1
  - — Interworking with OC-12 ring
  - — Interworking with *SLC*-2000 Release 3.1 and 3.2 ring
  - — Channel state provisioning
  - — STS-1 signal degrade protection switching
  - — OC-12 STS-1/VT1.5 path switched ring (dual 0x1)
  - — Enhanced DS3 performance monitoring
  - — TL1 provisioning messages for OPS/INE
  - — Additional TL1 messages
- Software Release 7.2
  - — Interworking with new controllers (BBG8 SYSCTL and BBG9 OHCTL)
  - — Interworking with FT-2000 OC-48 Lightwave System
  - — OC-3/IS-3 dual ring interworking with VT and STS drop and continue
  - — Increased subnetwork size of 24 network elements
  - — Multiple operations systems gateway network element
  - — Provisionable X.25 packet size
  - — Enhanced performance monitoring
- Hardware
  - — 22G-U/22G2-U OLIU (long reach OC-3 with TSI)
  - — 22D-U OLIU (IS-3 with TSI)
  - — BBG4B DS3 circuit pack needed for enhanced DS3 performance monitoring for Release 7.2 and later releases

* Software Release 5.1 supersedes software Release 5.0.

† Requires DDM-2000 OC-12 Software Release 2.0.

Release Descriptions

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

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

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

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

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

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

Release 6.0 includes one new circuit pack (and associated software): the BBG6 STS1E which provides a high-speed or low-speed EC-1 interface. The STS1E circuit packs are used in the Function Unit slots for EC-1 electrical multiplexer (high-speed) or EC-1 low-speed applications. The optional VT1.5 performance monitoring (PM) feature provides the PM of the V5 byte for errored seconds, severely errored seconds, and unavailable seconds. The optional DS1 PM feature allows measuring of near-end performance and the extended superframe (ESF) far-end performance report of the incoming DS1 signal. This allows the service provider to determine the end-to-end performance of the DS1 signal. Enhanced security features include additional logins.

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

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

Release 7.0 is an enhanced ring release. Release 7.0 supports a "drop and continue" feature which is used with dual ring interworking (DRI) and 1+1 protected optical extension applications and an automatic synchronization reconfiguration feature. Release 7.0 features includes two new plug-ins (and associated software): the 22D-U and the 22G-U OLIUs. The 22D-U OLIU provides a low-cost IS-3 with time slot interchange (TSI) optical interface between colocated OC-3 and OC-12 and *SLC*-2000 ring shelves. The 22G-U OLIU has the same functionality of the 22F OLIU but with a 23 dB outside plant loss budget allowing for spans of up to 51 km. The 22D-U and 22G-U OLIUs support VT signal degrade path protection switching. The "U" designation for the 22D-U and 22G-U OLIUs means the OLIUs have Universal optical connectors. These OLIUs have adapters that allow the use of *ST*®, SC, or FC connectors on the faceplates. The 22F OLIU may be used in Release 7.0. The 22D-U and 22G-U OLIUs can be used in all releases that currently support 22F OLIUs (Release 3.1 and later).

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

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

Enhanced DS3 PM adds a collection of the DS3 parity-bit (P-Bit) and frame and multiframe (F&M) bit errored seconds, severely errored seconds, and unavailable seconds to the already provided coding violations and severely errored frame seconds. The feature is mainly used for DS3 tariff verification.

Release 7.2 is a ring release to allow interworking between the old controllers (BBG5 and BBG7) and the new controllers (BBG8 and BBG9).

- New applications:
  - — OC-3 operations interworking with FT-2000 OC-48 Lightwave System. Single ended operations and data communications channel (DCC) connectivity supported over OC-3 interfaces. Requires FT-2000 OC-48 Lightwave System Release 6.0 software.
  - — OC-3/IS-3 dual ring interworking with VT1.5/STS-1 drop and continue. Single-ended operations and data communications channel (DCC) connectivity between DDM-2000 systems or DDM-2000 and FT-2000 OC-48 Lightwave Systems in dual ring interworking applications.
  - — Increased subnetwork size. DDM-2000/*SLC*-2000/FT-2000 OC-48 Lightwave System subnetworks of 24 network elements.

- New features:
  - Multiple Operations System (OS) Gateway Network Element (GNE). In DDM-2000/*SLC*-2000 networks, more than one NEs can be physically connected to X.25 allowing OSs to automatically select an alternate GNE in case of primary GNE failure. The feature also allows different GNEs to support different OSs simultaneously.
  - Provisionable X.25 packet size of 128 or 256 bytes.
  - Enhanced performance monitoring. Enhancements to DS1 and DS3 line and path performance monitoring to further support tariff verification. Enhanced DS3 performance monitoring requires the new BBG4B DS3 circuit pack.
  - The 22G2-U OLIU. The 22G2-U OLIU is the same as the 22G-U OLIU but, has improved receiver overload sensitivity, eliminating the need for an external attenuator for loopback testing. The 22G2-U can be used in place of the 22G-U in all applications.

Applications

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Applications

2

Overview

The DDM-2000 OC-3 Multiplexer supports a wide range of loop feeder, interoffice trunking, and customer location applications with maximum economy and efficiency. This section highlights the ways the DDM-2000 OC-3 Multiplexer, along with the DDM-2000 OC-12 Multiplexer, other members of the 2000 Product Family, and the DDM-Plus low-speed extension system meet these diverse network needs. This interworking between AT&T 2000 Product Family members — particularly the interworking between the DDM-2000 OC-3 and OC-12 Multiplexers — is highlighted in many of the applications described in this chapter.

Introduction

The DDM-2000 OC-3 Multiplexer is particularly suited to the evolving needs of loop feeder applications. It offers many essential features: compact size, environmental hardening, single-ended operations, and capacity and topology upgrades. The DDM-2000 OC-3 Multiplexer's extensive set of topologies allows the network to be optimized for a particular route geography, service mix, and growth forecast.

The loop topologies include:

- Point-to-point
- Linear drop
- Fiber hubbing
- Add/drop with time slot interchange
- Self-healing ring
- Self-healing ring with OC-3 linear extensions
- SONET electrical multiplexing.

DDM-2000 Multiplexers provide the flexibility required for operation in today's changing telecommunications networks. With topology and capacity upgrades, a DDM-2000 network can be installed with minimum first cost, and then easily grown to add new sites and new services. Many DDM-2000 circuit packs are common with other AT&T 2000 Product Family products, resulting in further savings as the network evolves.

The DDM-2000 OC-3 Multiplexer provides the features necessary for interoffice transport applications. Examples include long span optics, easy capacity upgrades, and full DS1 and DS3 add/drop capability. Interoffice applications include point-to-point, stand-alone synchronous optical network (SONET) electrical multiplexing, and add/drop.

The DDM-2000 Multiplexers are also an ideal solution for private network and customer location applications. The DDM-2000 Multiplexers comply with electromagnetic compatibility (EMC) requirements per FCC Title 47, Part 15, and safety requirements per *UL** 1459 for equipment in dedicated equipment rooms. The DDM-2000 OC-3 Multiplexer also has Canadian Standards Association (CSA) Certification Standard C22.2 No. 225-M90. Standard access node configurations are available in AT&T's 51A, 80-type and 90-type BRT-2000 cabinets. Fiber distribution of DS1 services is supported with the DDM-Plus extension shelf, which allows mixing of DS1 line repeater interfaces for embedded metallic facilities and protected quad DS1 optical interfaces. DS0 and Integrated Services Digital Network (ISDN) services are supported from the *SLC*®-2000 Access System through copper and fiber distribution.

* Registered trademark of Underwriters Laboratories Inc

Loop Feeder Applications

The DDM-2000 OC-3 Multiplexer provides a full set of interfaces, topologies, operations and upgradability to provide the flexibility and ease of operation required to meet the dynamic requirements of the loop feeder environment.

Point-to-Point Topologies

OC-3 Point-to-Point

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

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

The DDM-2000 OC-3 point-to-point topology builds on the solid base established by the DDM-1000 Multiplexer. A single 8.5-inch shelf provides OC-3 optical transport for a mix of DS1 and DS3 traffic. Equipped in this way, the DDM-2000 OC-3 Multiplexer is a low cost, full-function terminal. The OC-3 point-to-point network (Figure 2-1) consists of OC-3 Multiplexers in the central office and remote terminal (RT) site, connected by four single-mode or multimode fibers (two service, two protection). At the RT site, the OC-3 Multiplexer typically interfaces to digital loop carrier systems like the *SLC* Series 5 Carrier System. DS1 extensions to customer premises or another RT site are provided by the DDM-Plus low-speed extension shelf, with a choice of DS1 line repeaters or quad DS1 optical interfaces. DDM-Plus optical interfaces can be terminated at a DDM-Plus extension shelf or a DDM-Plus distant terminal.

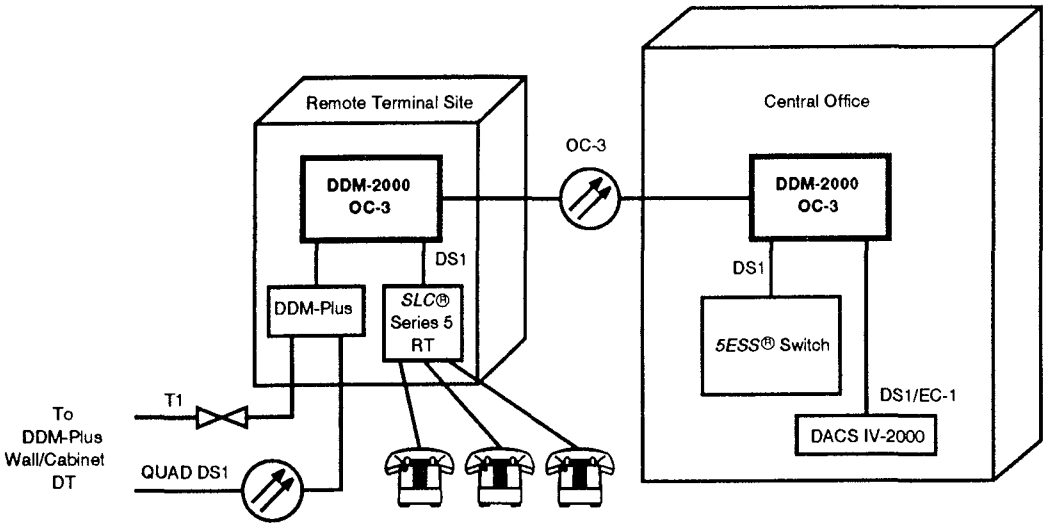


Figure 2-1. OC-3 Point-to-Point Loop Topology

Metro

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

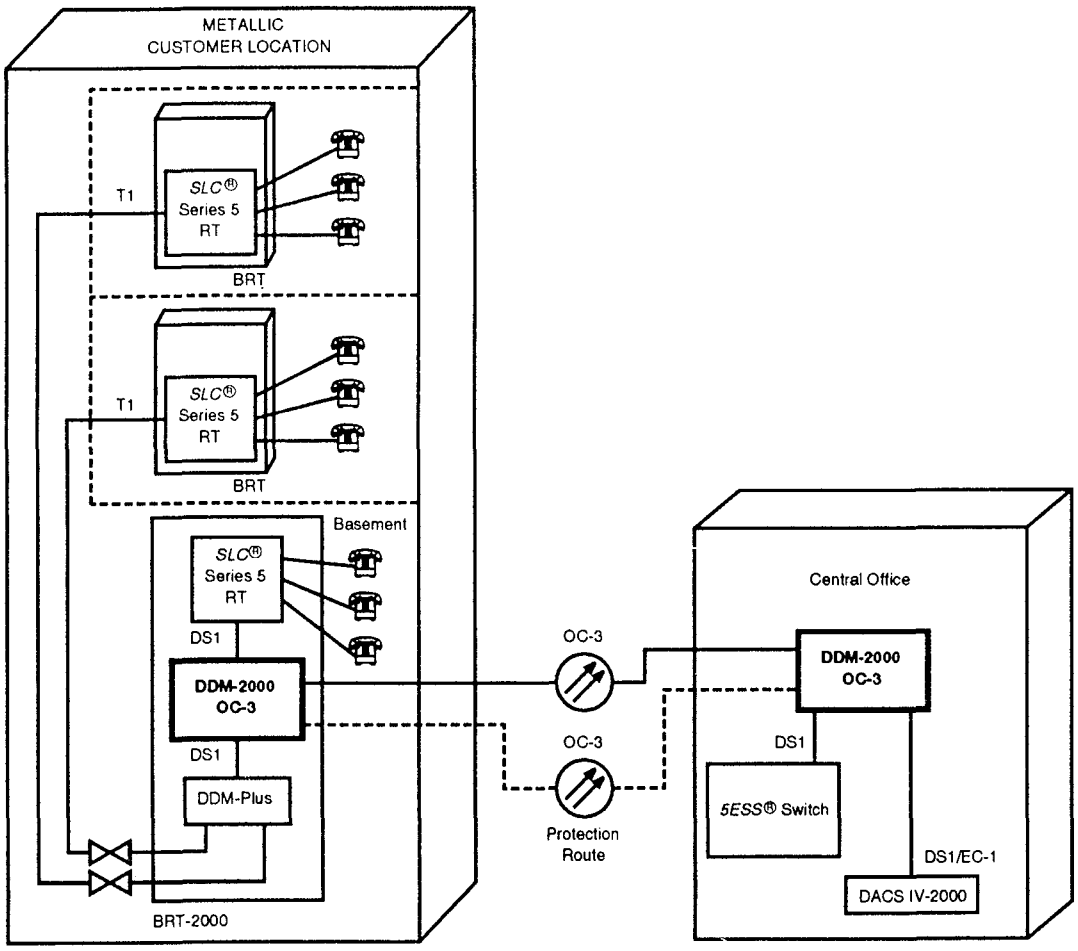


Figure 2-2. Metro Application — Copper in the Riser

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

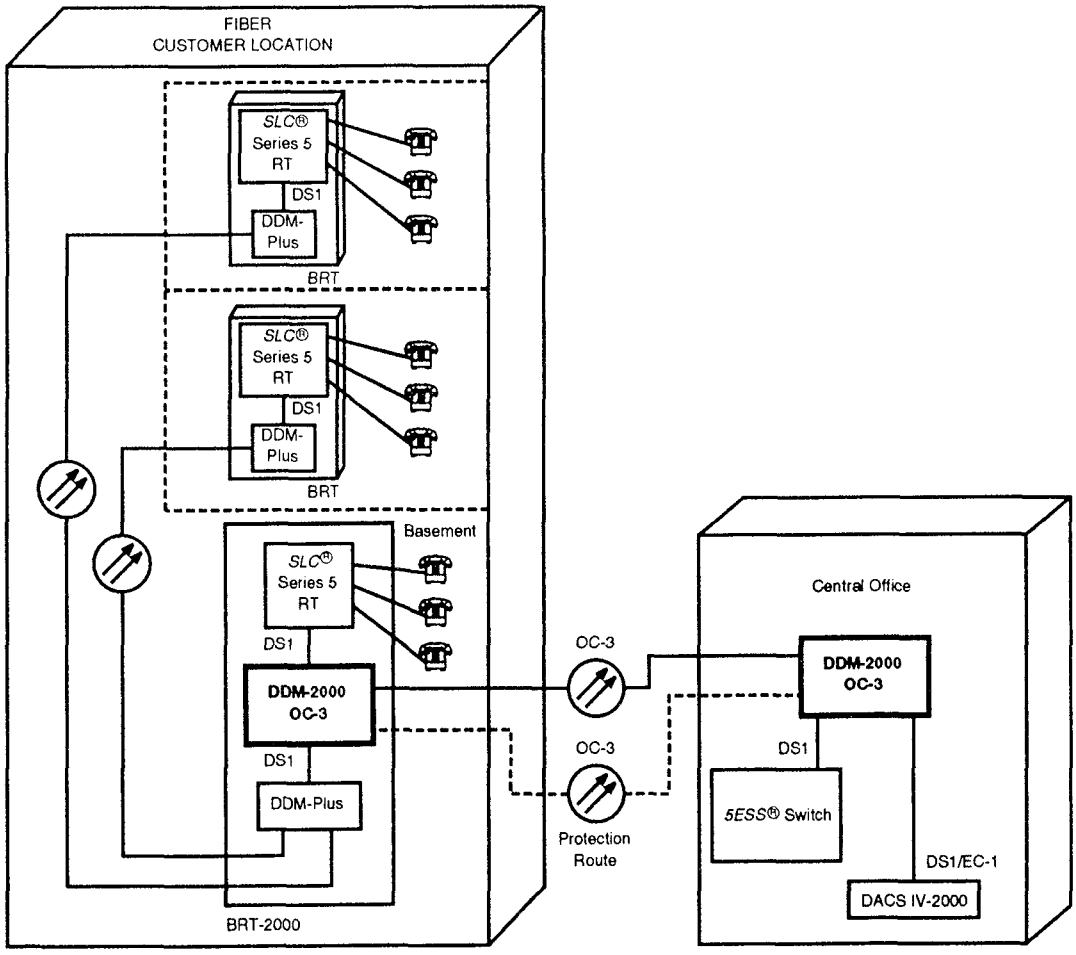


Figure 2-3. Metro Application — Fiber in the Riser

Campus CENTREX

DDM-2000 OC-3 and DDM-Plus systems provide bandwidth features to improve the delivery of CENTREX services. In a multisite campus application (Figure 2-4), *SLC* Series 5 Carrier System RTs and DDM-Plus optical extensions carry voice traffic from each building to a DDM-2000 OC-3 Multiplexer at a conveniently located remote terminal site. The DDM-2000 OC-3 Multiplexer provides economical and reliable access to the serving *5ESS*® switch. The OC-3 capacity supports a growing campus, as up to 84 DS1s (2016 voice channels) can be provisioned as needed.

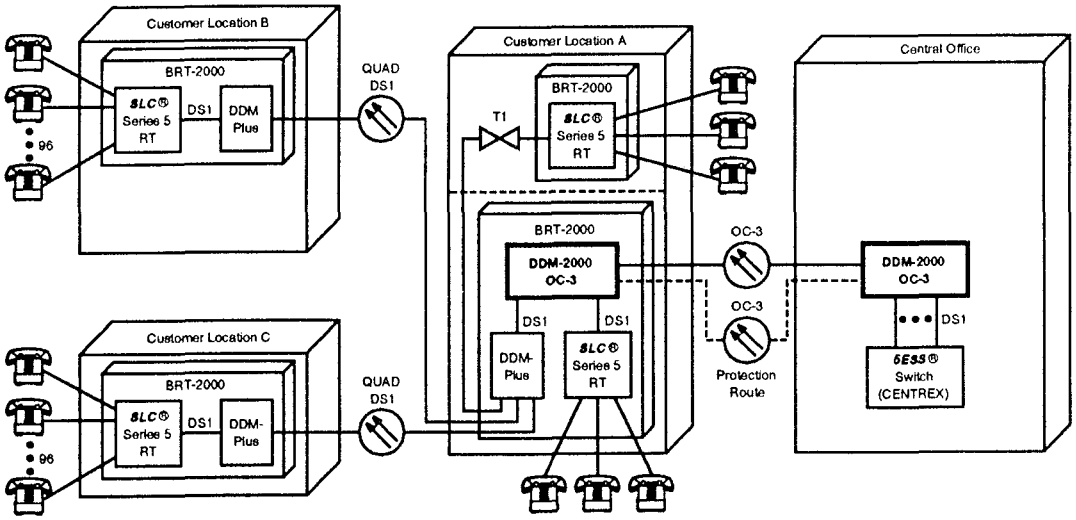


Figure 2-4. Campus CENTREX Application

Hubbing and Add/Drop Topologies

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

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

The VT1.5 TSI in DDM-2000 OC-3 is coupled with the STS-1 TSI in DDM-2000 OC-12, the DS0 TSI in *SLC*-2000 Access System, and DACS IV-2000 to provide full-spectrum bandwidth management across networks of all sizes and configurations. The following add/drop network examples highlight some applications of DDM-2000's advantages in this advanced networking environment.

OC-3 DS1 Add/Drop

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

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

DDM-2000 OC-3 Multiplexers configured in add/drop topologies can route traffic between a central office site and a set of RT sites, between RT sites or a mix of both traffic patterns. An initial add/drop network may start with OC-3 facilities, satisfying preliminary demand forecasts with minimum cost. Depending on the route's layout, existing cables and rights-of-way, and other planning concerns, the add/drop network may be arranged in a linear fashion (Figure 2-5) or in a hubbing topology (Figure 2-6). This flexibility in configuration allows the DDM-2000 network to be customized for each specific situation.

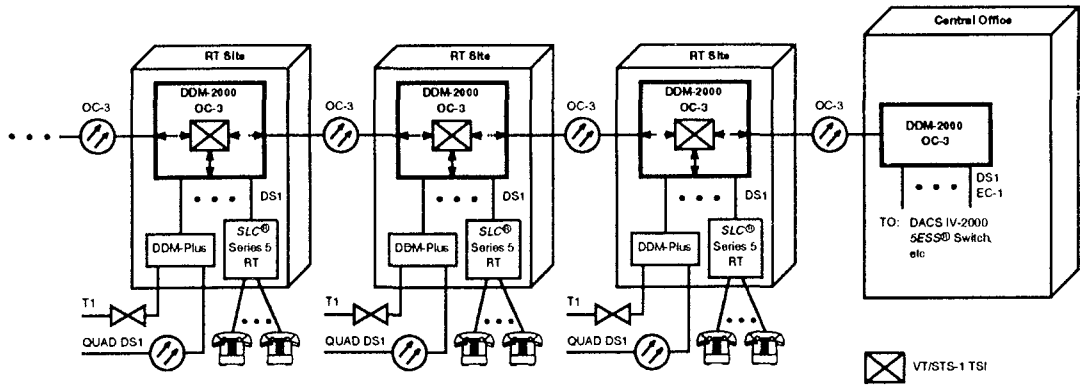


Figure 2-5. DS1 Add/Drop — OC-3 Linear Application

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

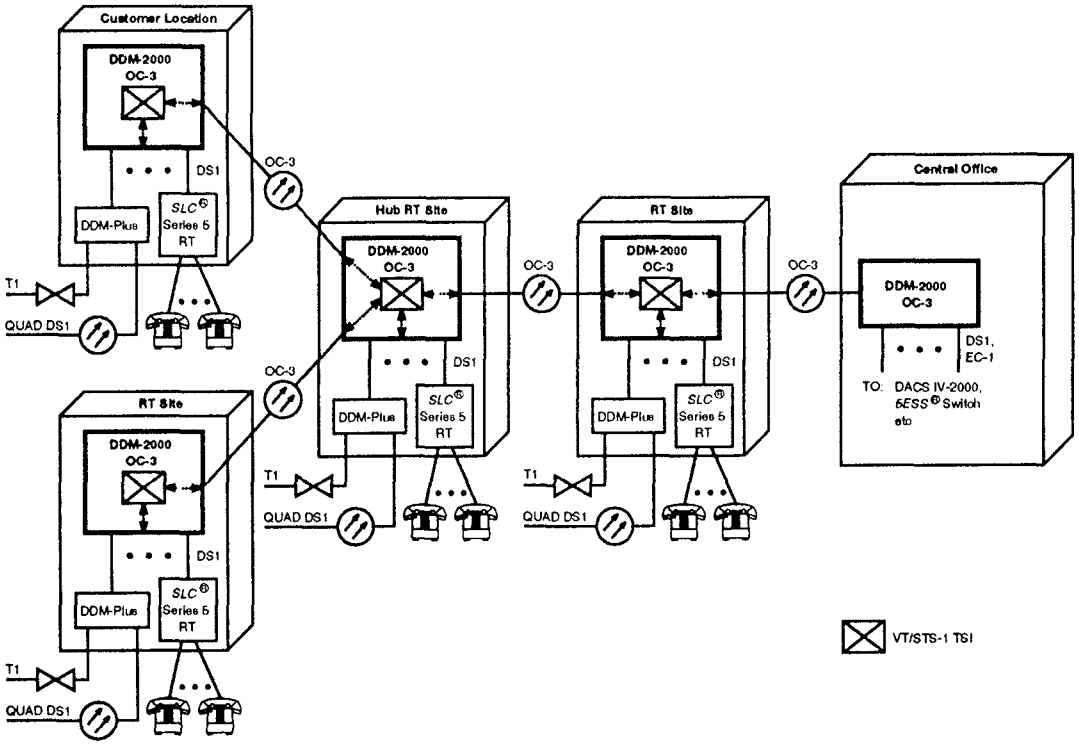


Figure 2-6. DS1 Add/Drop — OC-3 Hubbing Application

Small Industrial Park

A small industrial park, where each building uses more than a few DS1s, is shown in Figure 2-7. The higher bandwidth needs (for example, video) of some buildings suggest an OC-3 hubbing topology rather than quad DS1 optical extensions from a hub remote site. The hub may be in a customer location or a separate outdoor enclosure. From this hub site, OC-3 extensions feed business remote terminal cabinets containing a DDM-2000 OC-3 Multiplexer in each building.

The flexible time slot interchange (TSI) capability of the DDM-2000 Multiplexers can be used to manage the changing bandwidths needs of the industrial park.

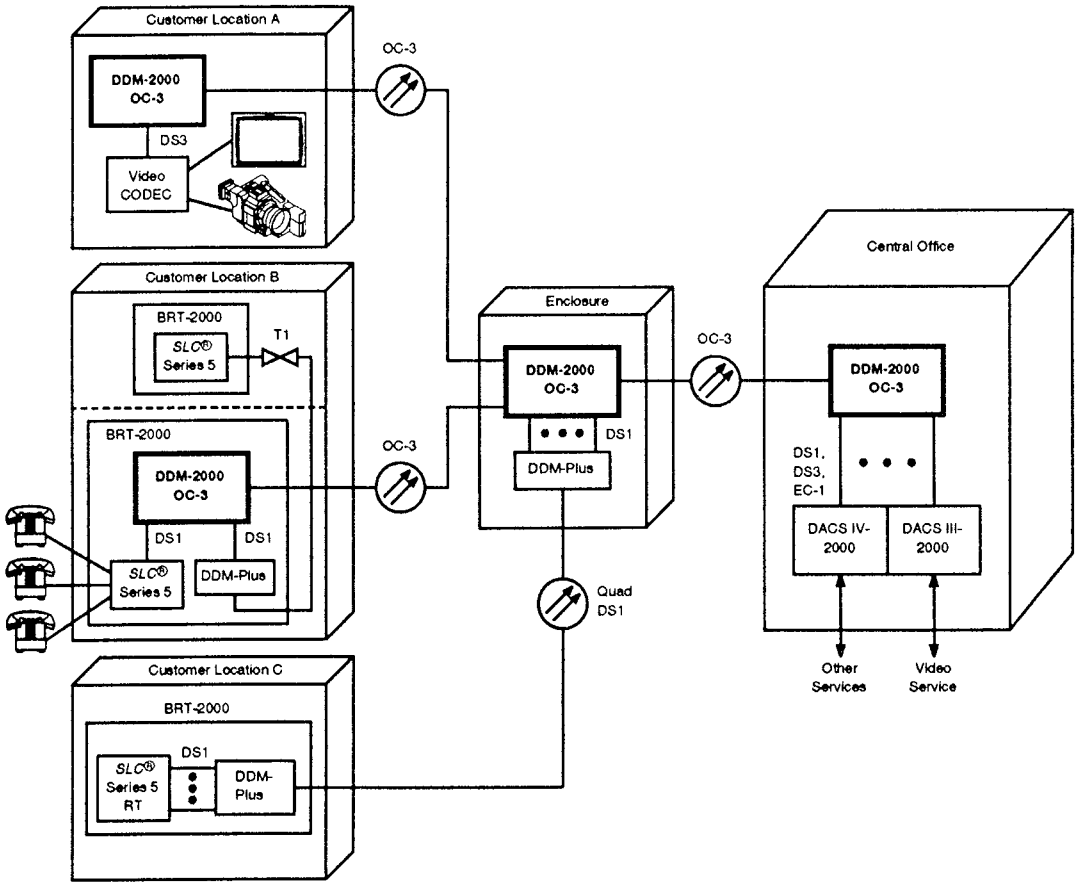


Figure 2-7. Small Industrial Park Application

Large Industrial Park

A large industrial complex with large bandwidth requirements equivalent to several STS-1 signals at each building requires an OC-12 hubbing topology. Such situations often arise at locations with high-density DS1 traffic and new DS3 services. The OC-12 hubbing application provides a flexible network solution to this application (Figure 2-8). The RT hub site can be located in a main building or centrally located in an outdoor enclosure.

The OC-12 capacity gives the planner many options to serve large collections of customers. Where DS3 services are needed (for example, for video), a BRT-2000 containing a DDM-2000 OC-3 Multiplexer should be installed adjacent to the DS3 terminal (for example, video coder/decoder [CODEC]). DS1 and voice-frequency service needs are also satisfied through other BRT-2000 configurations deployed as needed throughout the complex.

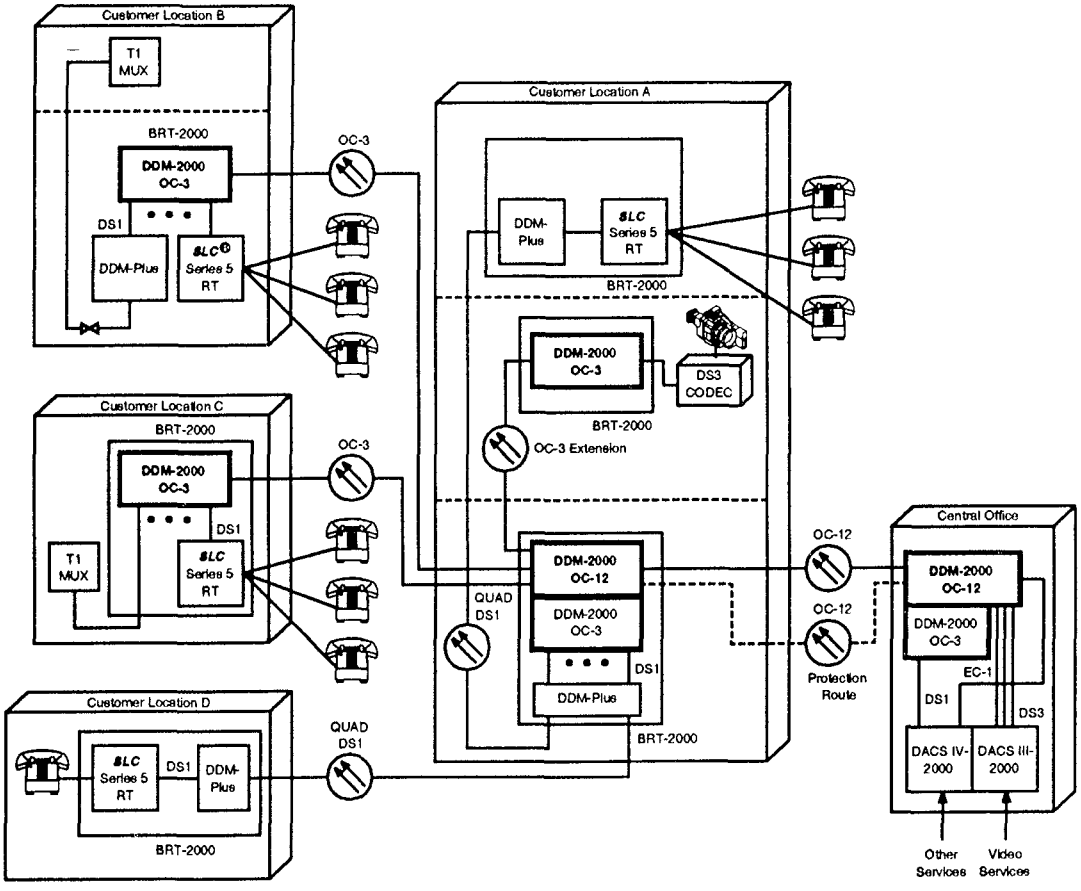


Figure 2-8. Large Industrial Park Application

Ring Topologies

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

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

The DDM-2000 OC-3 VT1.5 or STS-1 path switched rings operate as shown in Figure 2-9(a). Traffic entering a path switched ring node is sent onto both rotations of the ring. At the receiving node, the signal having the highest integrity (based on SONET path information) is selected and dropped as outgoing traffic. At intermediate nodes, the traffic is "passed-through" without changing the SONET path information. The DDM-2000 OC-3's VT1.5/STS-1 TSI capabilities make the provisioning of add/drop and pass-through traffic quick and easy.

The self-healing nature of the path switched ring is shown in Figure 2-9(b). In this case, the fiber failure between nodes C and D causes node C to switch from the counterclockwise ring to the clockwise ring, thus maintaining service between node A and C.

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

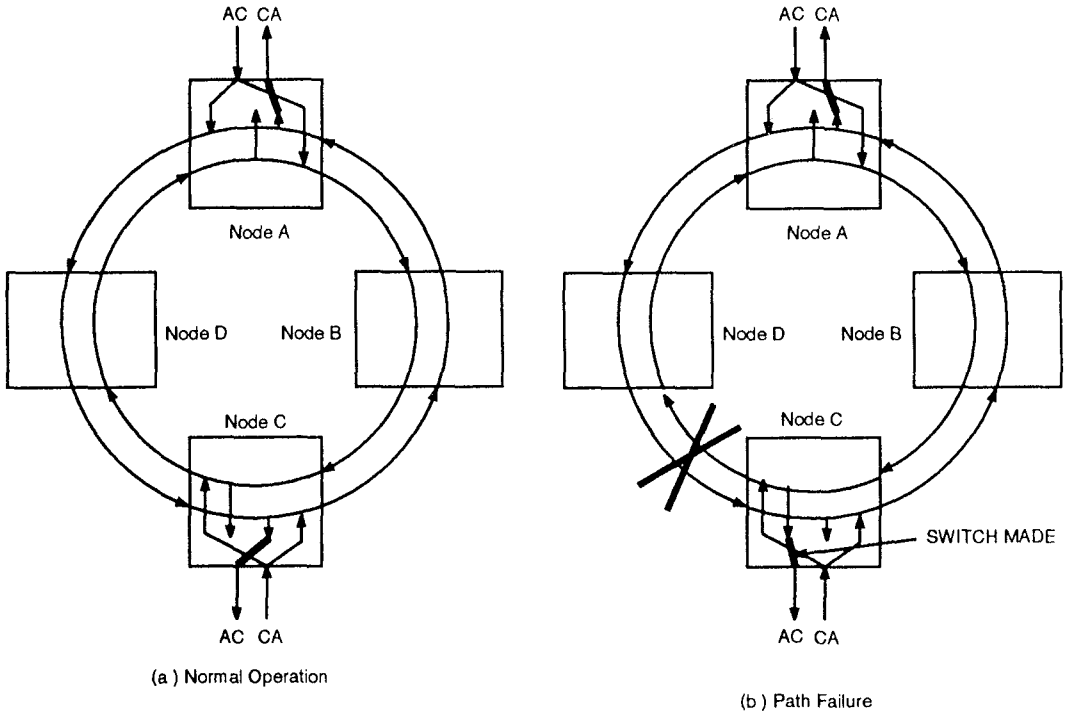


Figure 2-9. Path Switched Ring

OC-3 Path Switched Ring

The OC-3 path switched ring allows several remote sites to share the 2-fiber ring facility back to the CO (Figure 2-10). The DDM-2000 OC-3 Multiplexer interfaces to the ring through the Main slots at the OC-3 rate and uses its programmable VT1.5/STS-1 TSI capability. Path switching can be done on VT1.5 paths, STS-1 paths, or a mixture of these. Up to 84 DS1s, 3 DS3s, 3 EC-1s, or equivalent combination can be added/dropped from the DDM-2000 OC-3 Multiplexer path switched ring at any node. Because of the ring's path protection scheme, time slots must be reserved all the way around the ring for all ring traffic, limiting the capacity of the ring to the OC-3 line rate. Like the DDM-2000 OC-3 add/drop topology, the TSI feature offers full flexibility in assigning signals between low-speed DS1, DS3 or EC-1 ports, and the high-speed interface at each node. The DDM-2000 OC-3 Multiplexer can easily adapt to unpredicted growth at a ring node.

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

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

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

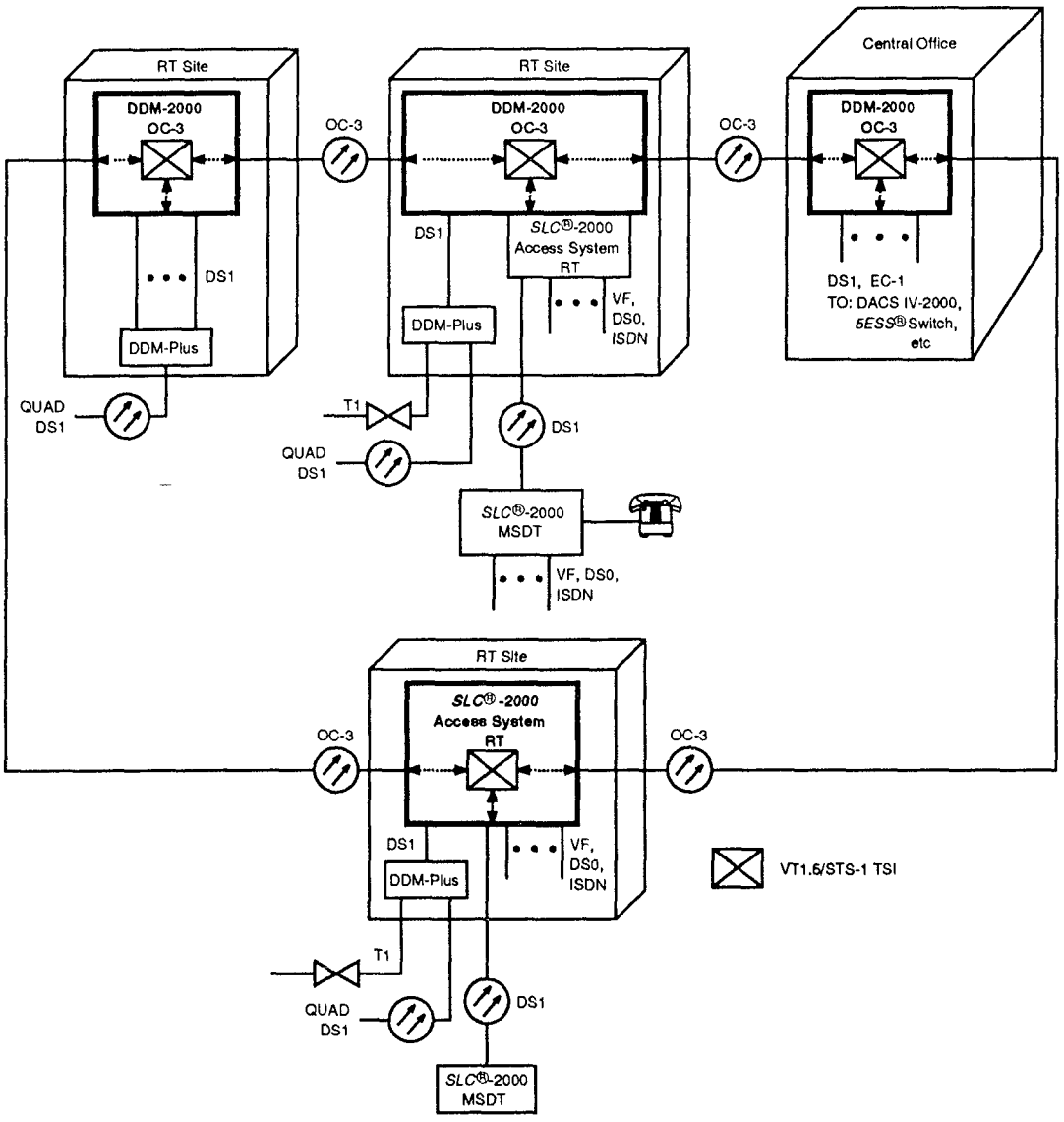


Figure 2-10. OC-3 Path Switched Ring

OC-12 Path Switched Rings

The DDM-2000 OC-12 Multiplexer provides STS-1 level path protection switched ring capability. As shown in Figure 2-11, it provides transport of 12 DS3s, 12 EC-1s, 4 OC-3cs, or a mixture with path switching at the STS-1 level (STS-3c level for OC-3c traffic). Such a ring provides an economical, flexible, and reliable solution for loop feeder networks.

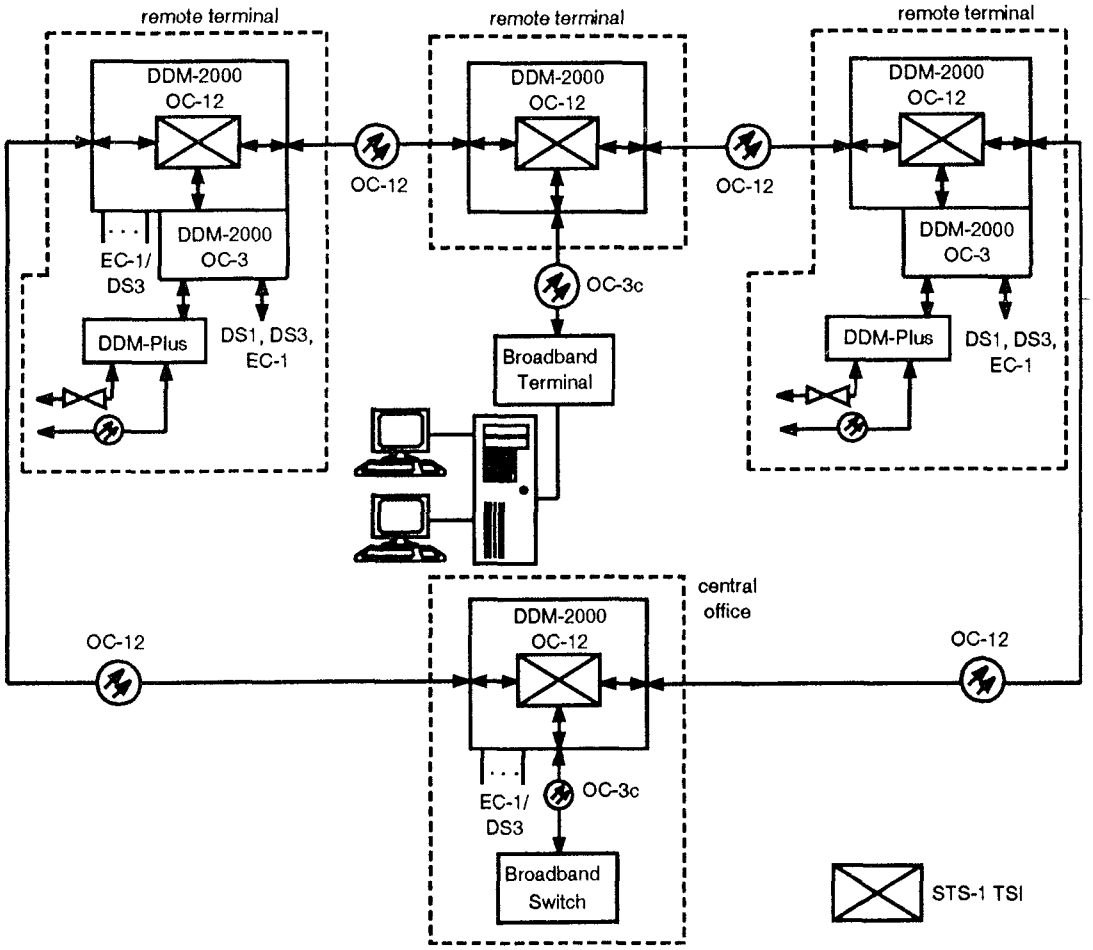


Figure 2-11. OC-12 Path Switched Ring — STS-1 Level Path Switching

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

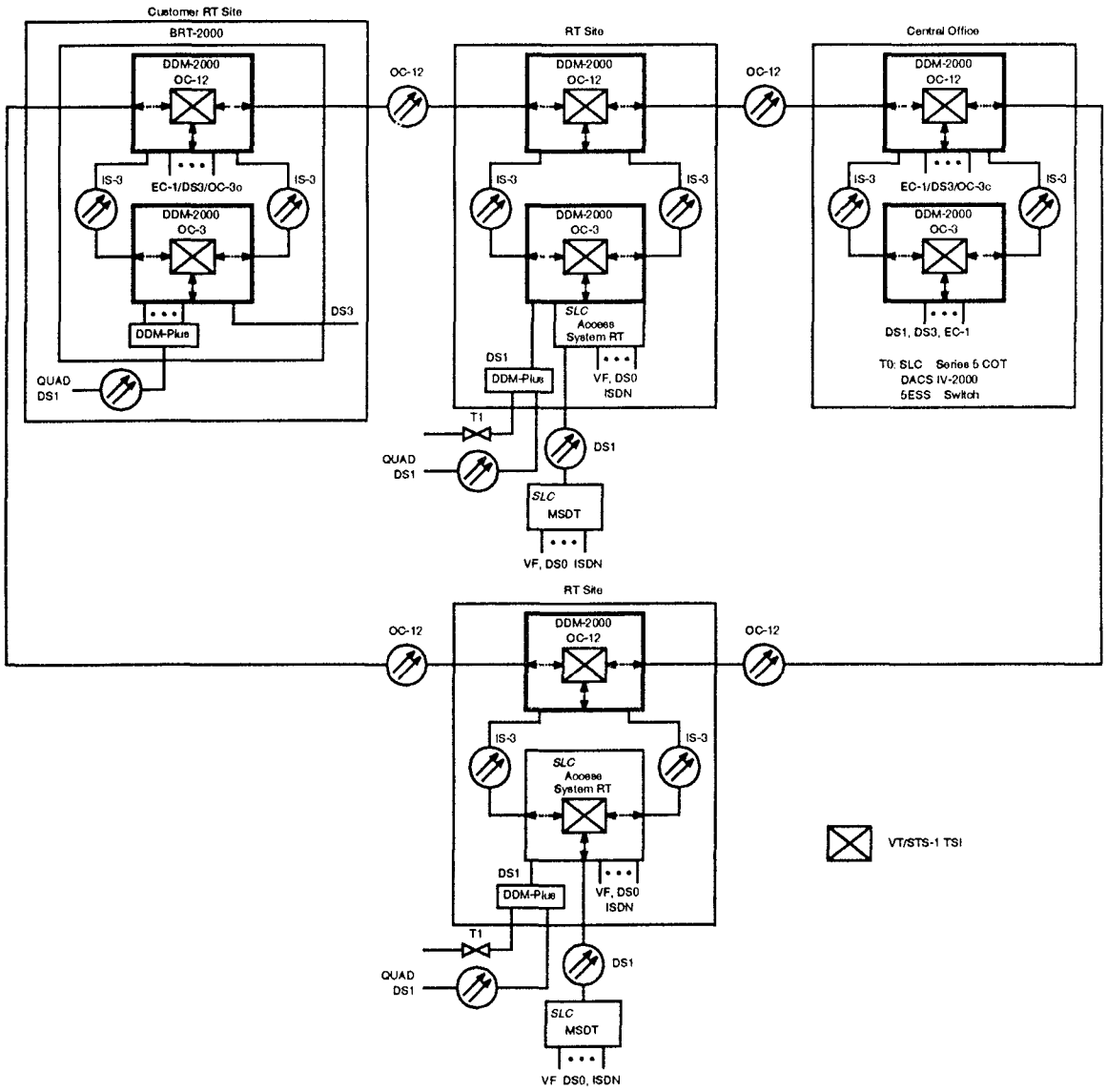


Figure 2-12. OC-12 Path Switched Ring - Mixed STS-1 and VT1.5 Path Switching

If fiber exhaustion is a problem, the 2000 Product Family provides several alternatives for the network planners to pick from, depending on the specifics of their application. If fiber is available, multiple DDM-2000 OC-3 Multiplexer rings can be installed, or if fiber is unavailable or if the administrative ease of a single ring is desired, a single DDM-2000 OC-12 Multiplexer ring can be installed. Fiber exhaustion often occurs when customer demand for voice, DS1, and DS3 services grows to fill the OC-3 ring's capacity. If the growth has come from only one or two sites and there is spare fiber in place, these high demand sites may be cut to a new OC-3 ring without interrupting service. Alternatively, driven by fiber exhaustion or evolution to customer DS3 services, the OC-3 ring may be upgraded in service to an OC-12 ring. In this configuration (Figure 2-12), DDM-2000 OC-3 Multiplexer equipment is colocated with a DDM-2000 OC-12 Multiplexer shelf to provide a unified VT1.5 path switched ring node with an OC-12 high-speed interface. VT1.5 bandwidth rearrangement is available which allows the unused VT1.5s from an STS-1 dropped at one site to be dropped at other sites. All DDM-2000 OC-3 and OC-12 Multiplexer shelves connected together in this subnetwork can communicate, using the single-ended operations capability of DDM-2000 Multiplexers. Once the DDM-2000 Multiplexer OC-12 ring is in place, it can be used by itself to provide STS-1 level path switching with DDM-2000 OC-3 Multiplexers to provide VT1.5 level path switching, or in a mixed configuration where both STS-1 level and VT1.5 level switching are supported simultaneously.

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

Virtual OC-3 Ring Service via OC-12 Ring

The DDM-2000 OC-12 path switched ring can be used in conjunction with the DDM-2000 OC-3 Multiplexer by an access provider to provide OC-3 ring service on an OC-12 ring for end users. It is becoming more frequent that a single end user desires a virtual private network from an access provider to connect several sites in a metropolitan area together. It is accomplished by deploying a DDM-2000 OC-12 ring in conjunction with DDM-2000 OC-3 Multiplexers, as shown in Figure 2-13. As described previously, the DDM-2000 OC-3 Multiplexers provide VT1.5 and STS-1 path switching; however, in this case, they are placed at end-user locations. The DDM-2000 OC-3 equipment is then used exclusively by that end user and three STS-1s worth of bandwidth are reserved on the OC-12 ring for that end user.

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

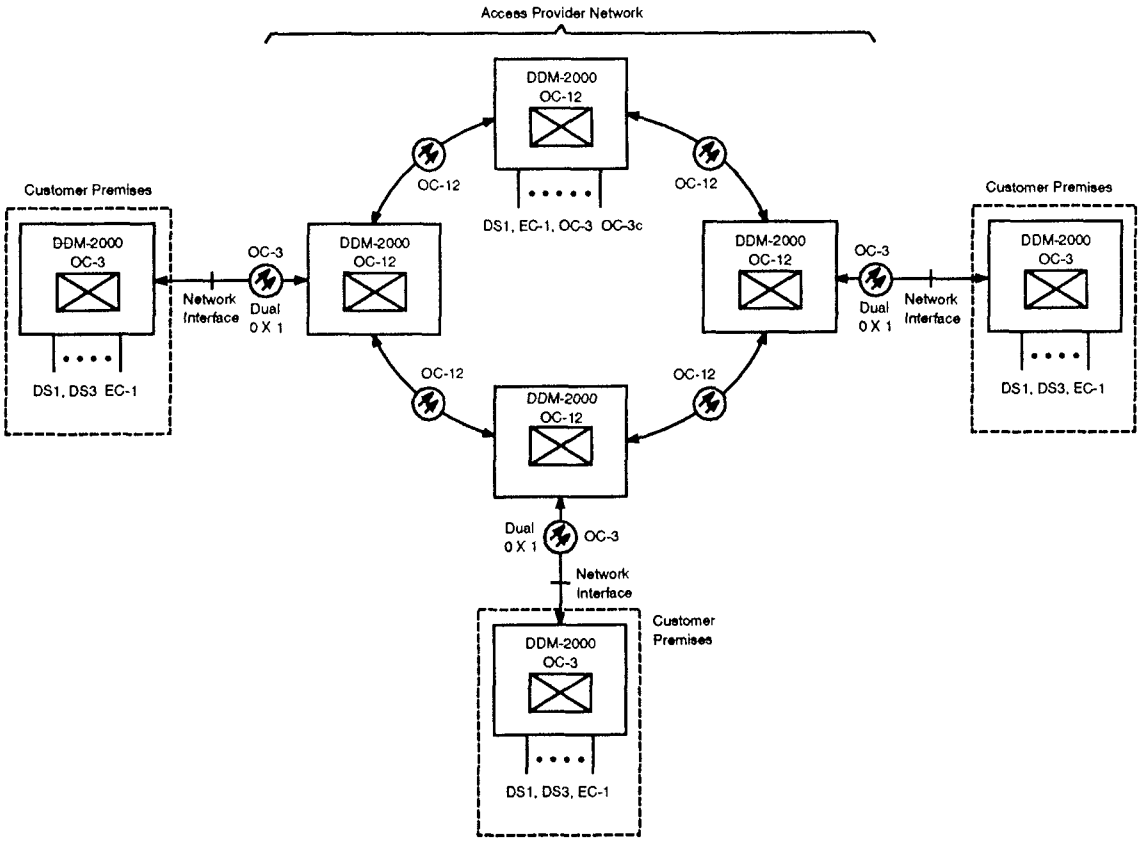


Figure 2-13. Virtual OC-3 Ring Service from OC-12 Ring

Folded Ring

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

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

When route diversity is not available or fiber cable cuts are not a driving concern, the 2-fiber path switched ring feature can be applied in a "folded " (a folded ring is a single path ring) configuration (Figure 2-14). This use of DDM-2000 OC-3, OC-12, and *SLC*-2000 access resource manager (ARM) path switched rings applies in particular to hubbing and linear topologies where there is no return path from the end remote site to the CO. While a complete cut through the fiber cable cannot be protected, single-node equipment failures are still protected. Furthermore, a 2-fiber ring ARM uses only one optical transmitter/receiver in each direction (two per remote shelf), in contrast to a 1+1 line protection arrangement that requires four optical transmitter/receivers per remote shelf. Thus the ring configuration reduces equipment costs, a benefit independent of its survivability advantage. The ring topology also makes node addition/deletion straightforward.

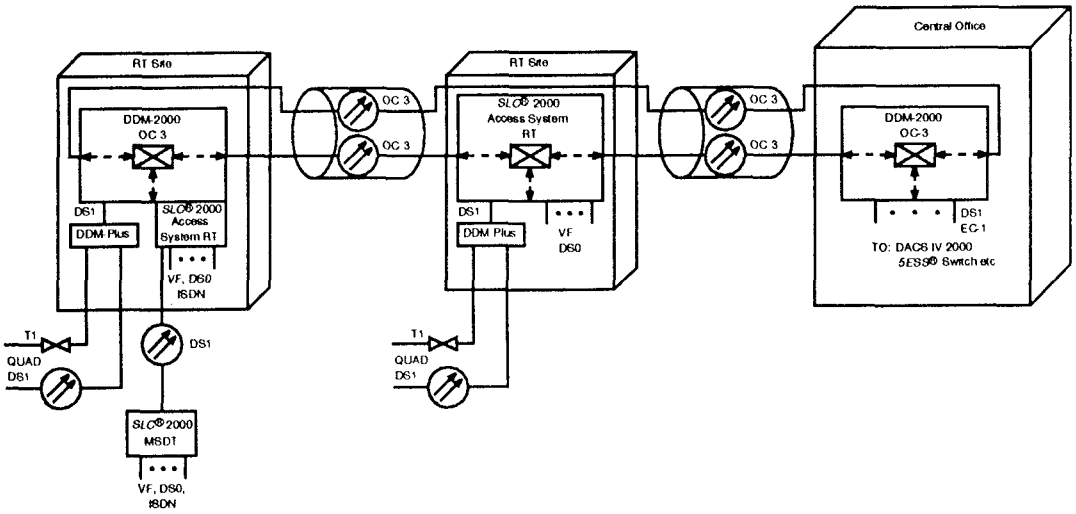


Figure 2-14. Folded Ring Application

OC-3 Linear Optical Extensions from OC-3 Rings

An additional topological flexibility offered by the DDM-2000 OC-3 and OC-12 Multiplexers is 1+1 protected linear OC-3 and IS-3 optical extensions from OC-3 and OC-12 rings. Using this capability, the DDM-2000 Multiplexers can support many of the new network configurations desired in the evolving loop feeder environment. As Figure 2-15 shows, an access provider can use linear optical extensions from an OC-12 ring to provide OC-3/OC-3c signals directly to end users. This gives bandwidth-hungry end users the bandwidth they need to conduct business, and it provides it to them via the path switched ring architecture they require for high service availability. If enabled, full single-ended operations are available on all network elements. This gives the end user full control of PM data, network reconfigurations, and provisioning of the network.

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

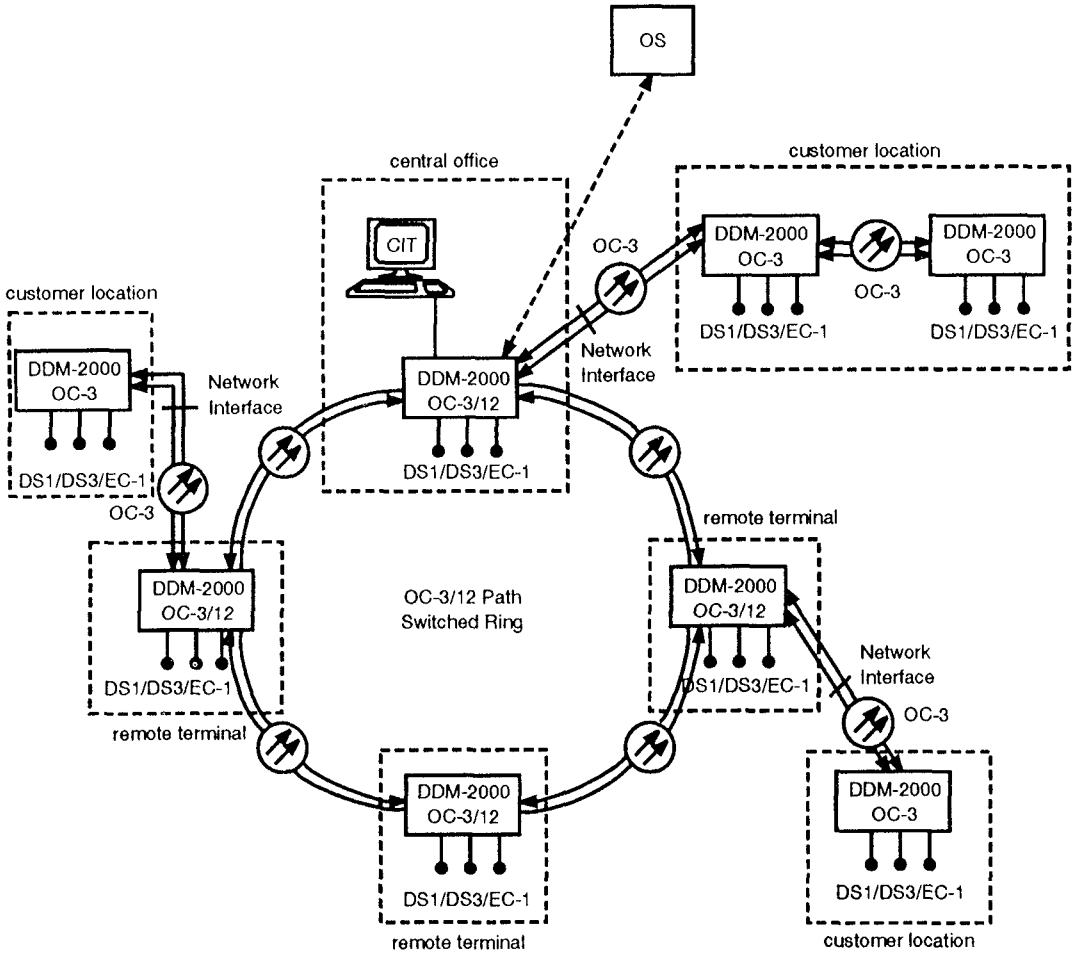


Figure 2-15. OC-3 Services Using Optical Extensions

DS1 Performance Monitoring for Tariff Verification

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

Figure 2-16 demonstrates a typical configuration for DDM-2000 OC-3 Multiplexers configured to provide DS1 performance monitoring (the M in boxes indicate DS1 path performance monitors. See Section 9, "Maintenace Description" for more information on DS1 performace monitoring). In this example, a business customer is using DS1s to interconnect a local area network (LAN) at their remote office with a LAN at their corporate headquarters. The DS1 circuit is provided by a public carrier. Starting at the corporate headquarters (location A), an extended superframe (ESF) formatted DS1 is fed into the DDM-Plus and DDM-2000 OC-3 equipment, carried across the public network, and delivered to the LAN Bridge/Router at the company's remote office (location Z). There the LAN bridge/router (owned by the business customer) evaluates the number of bit errors occurring in the trip from headquarters to the remote office and sends a message in the opposite direction of the ESF datalink, reporting these error statistics. The DDM-2000 OC-3 Multiplexer receives this message and stores the information locally on its DS1 performance monitoring circuit pack. The DDM-2000 OC-3 Multiplexer does this continuously, gradually building a repository of DS1 performance data on the link from location A to location Z. This information is always available to the public carrier's operations center by querying the DDM-2000 OC-3 Multiplexer via its CIT or TL1 links. Similarly, the DDM-2000 OC-3 Multiplexer at the company headquarters maintains all the performance data on the link from location Z to A. Taken together, these two sources of data provide verification of the 2-way DS1 link between location A and Z.

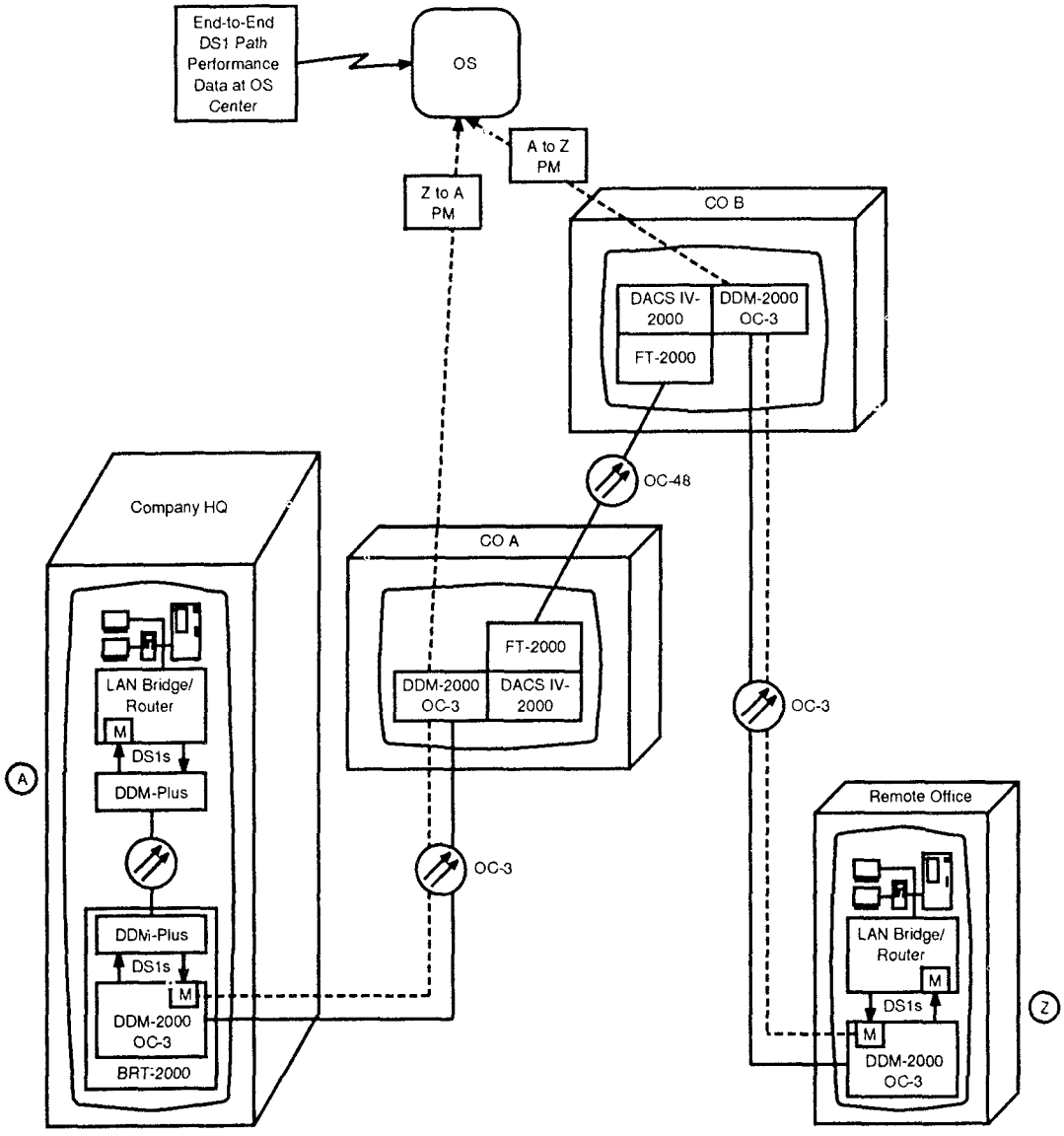


Figure 2-16. DS1 Path Performance Monitoring for Tariff Verification

2000 Product Family Interworking Applications

SLC-2000 Access System Remote Terminal

The *SLC*-2000 Access System is AT&T's next generation digital loop carrier (DLC) system. The *SLC*-2000 Access System can be installed in any existing pair gain application, providing telephone service, integrated services digital network (ISDN) capability, DS1 pipes, and special services. Full DS0 bandwidth management capabilities (based on Bellcore TR-303) provide for more efficient and flexible network growth. Fiber-to-the-home support is integrated with a fiber distribution shelf and the *SLC*-2000 Multi-Services Distant Terminal (MSDT) unit.

The *SLC*-2000 Access System can be integrated directly into SONET feeder networks with its optional OC-3 facility interface, eliminating separate OC-3 facility Multiplexers and DLC RTs. The *SLC*-2000 Access System RT can be configured as an OC-3 terminal or path switched OC-3 ring node. Figure 2-17 shows a point-to-point loop-feeder application of the *SLC*-2000 Access System's OC-3 interface (details of the *SLC*-2000 Access System's path switched ring application are discussed later in this section). The *SLC*-2000 Access System RT offers a mix of telephone service, special services, and ISDN services with an OC-3 feeder interface. In the CO, the DDM-2000 OC-3 Multiplexer provides single-ended operations and access for the RT, as well as intra-office (DS1 or EC-1) low-speed interfaces to digital cross-connect systems and switches.

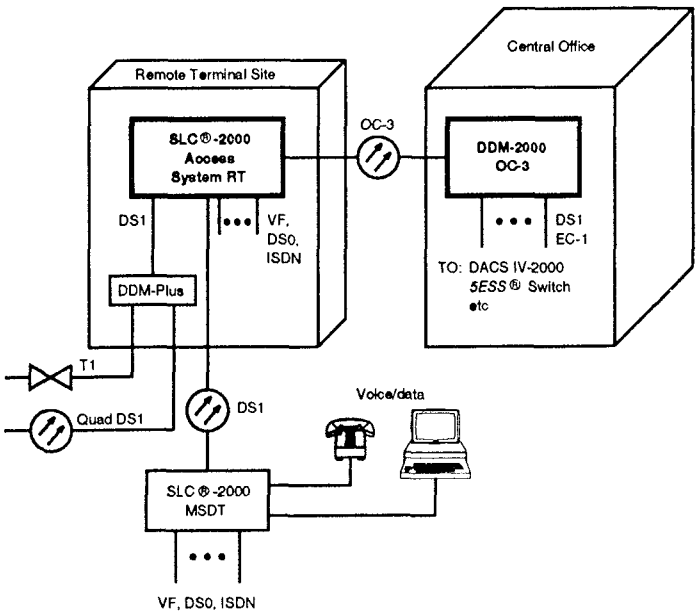


Figure 2-17. OC-3 Loop Carrier Interface Application

At hubbing and linear add/drop sites, a DDM-2000 Multiplexer and *SLC*-2000 Access System RT combine to create an integrated SONET DLC node. The DDM-2000 Multiplexer will provide the OC-3 and OC-12 facility interfaces and add and drop traffic to the adjacent *SLC*-2000 Access System RT via EC-1 or IS-3 interfaces. Figure 2-18 shows *SLC*-2000 Access System in an OC-12 hubbing application. A DDM-2000 OC-3 Multiplexer is used at one of the RT sites due to demand for more than 28 DS1 services.

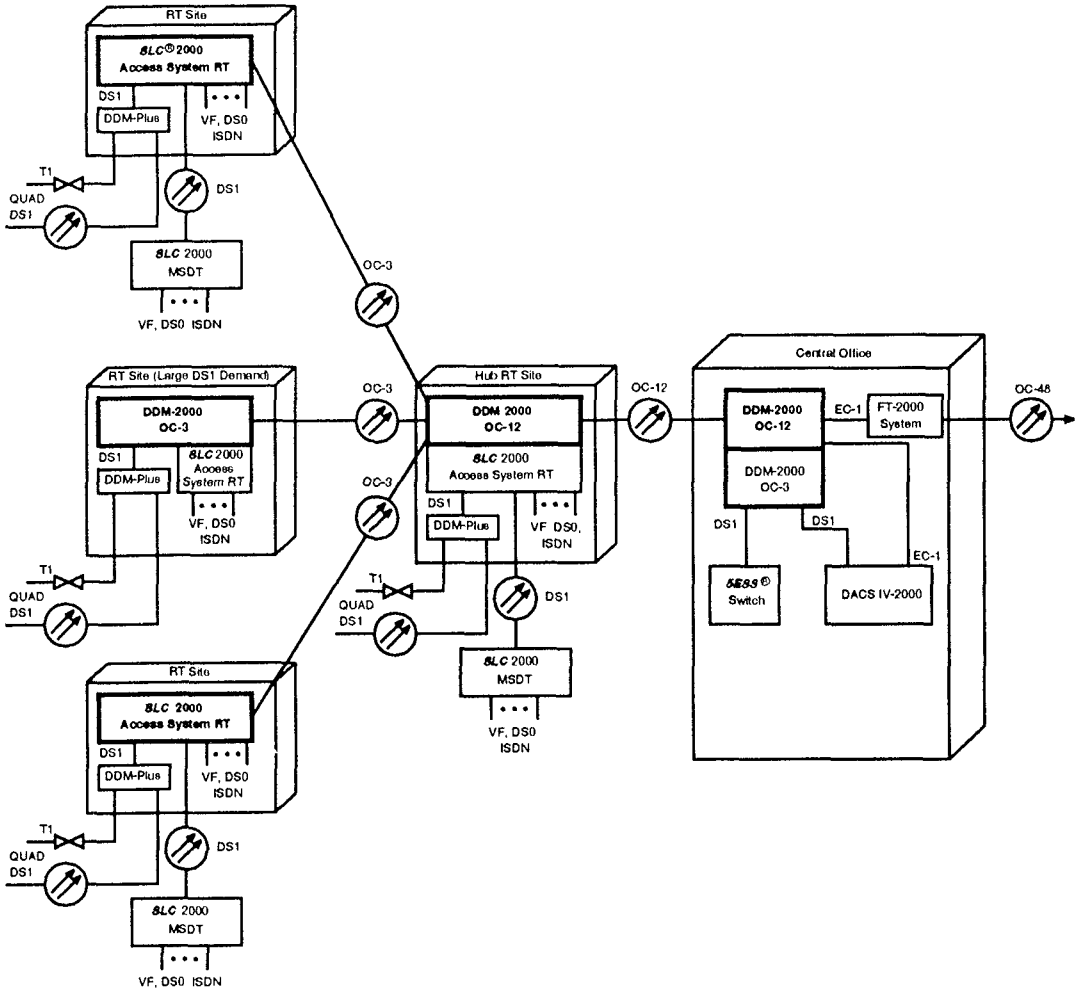


Figure 2-18. *SLC*-2000 Access System in an OC-12 Hubbing Application

DACS IV-2000/Access Network Integration

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

As shown in Figure 2-19, the DDM-2000 access network interfaces with a DDM-2000 central office shelf to terminate the fiber and perform operations, administration, maintenance and provisioning (OAM&P) functions. EC-1 electrical interfaces to DACS IV-2000 maintain STS-1 and VT1.5 SONET path connectivity (providing, for example, performance monitoring) and allow DACS IV-2000 to perform cross-connections on SONET STS-1 and VT tributaries.

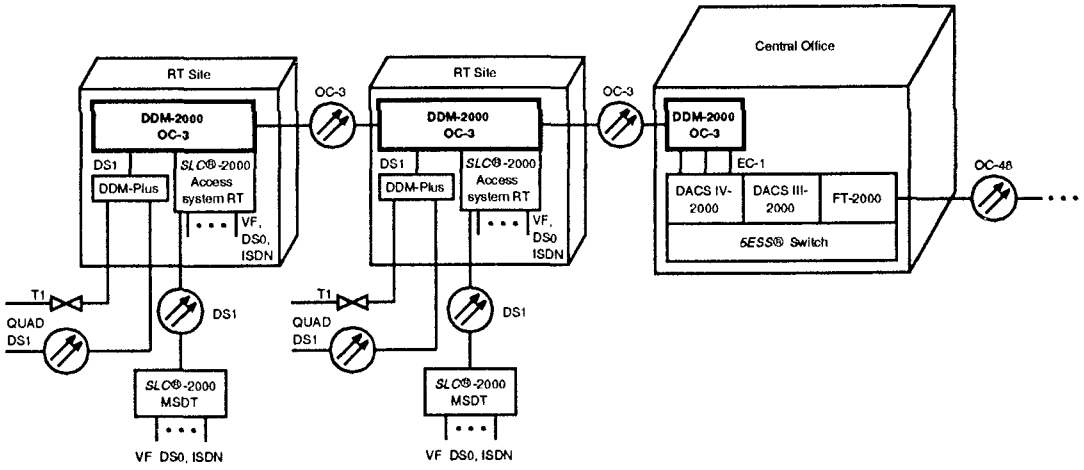


Figure 2-19. DACS IV-2000/DDM-2000 Access Application

Broadband Business Access Applications

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

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

The large multisite medical facility shown in Figure 2-20 uses broadband services for intersite imaging and video needs as well as lower bandwidth voice and data services into the public network based in ISDN primary rate interface (PRI) and basic rate interface (BRI) interfaces. These services can be delivered efficiently with the DDM-2000 OC-3, OC-12 and *SLC*-2000 Access System's flexible time slot interchange and add/drop capabilities. The ring architecture prevents service outage due to a cable cut or node failure.

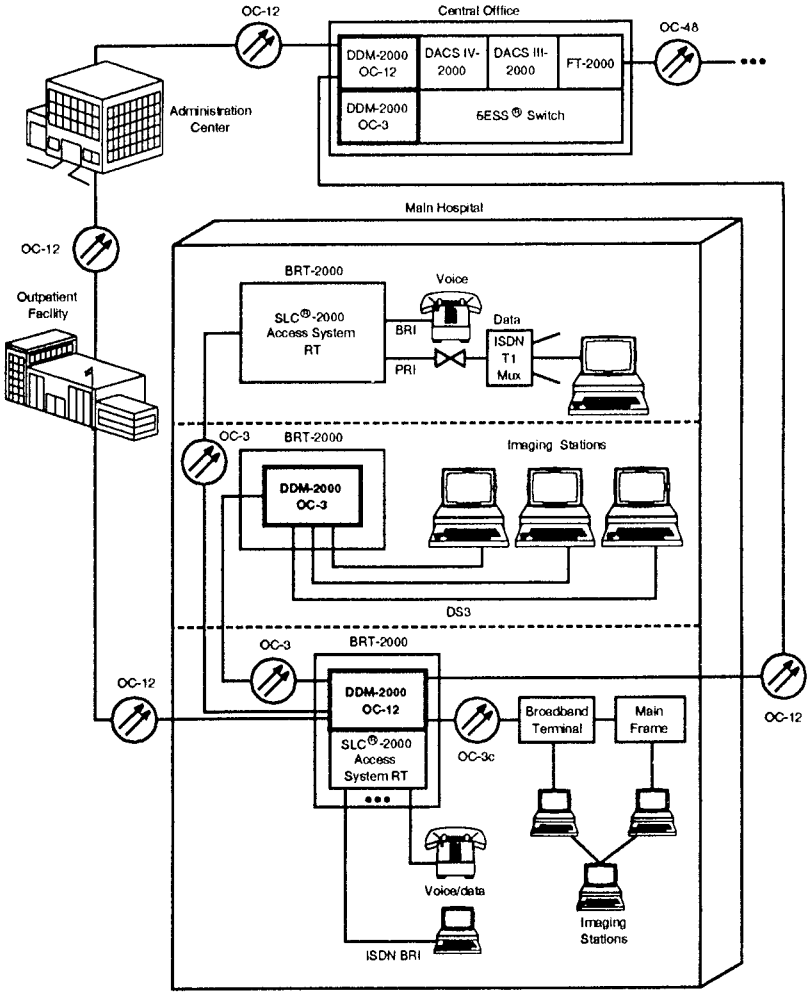


Figure 2-20. Self-Healing Medical Campus Network Application

Dual-Homed Self-Healing Access Topologies

End-users are demanding service with higher and higher availability. Service providers are responding with tariffs that rely on self-healing networks to offer such high availability service. Some of these tariffs even call for penalties for the service provider when service is interrupted or has a high error rate. Virtual rings that cover a large geographical area or interconnected path switched rings are a cost effective and popular way for a service provider to offer these high priority services.

Virtual Ring

Figure 2-21 shows a virtual ring configuration using DDM-2000 OC-3 ring nodes with DDM-2000 OC-12 point-to-point nodes to provide a high service availability architecture. This configuration will survive fiber, equipment, and catastrophic office failure since it provides an alternative service path through a secondary central office and uses the path switching ability of the DDM-2000 OC-3 to select between these two paths.

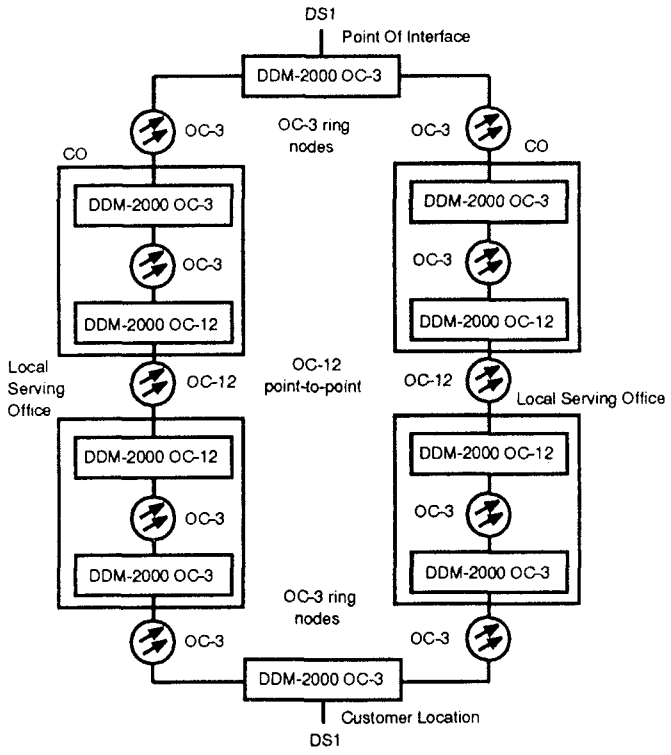


Figure 2-21. DDM-2000 Virtual Ring

Interconnected Rings

Interconnected rings or dual ring interworking (DRI), is a topology that connects two rings together at two geographically separate nodes. In addition to the facility and node failure protection that a single ring provides, the dual node interconnection between the rings provides an alternate route in the event of a catastrophic failure at one of the interconnecting nodes. Typically, such a topology is used to interconnect a loop feeder access ring to a higher bandwidth interoffice ring. As shown in Figure 2-22, DDM-2000 OC-3, OC-12, and FT-2000 OC-48 systems can be configured to offer this topology. Often the DDM-2000 equipment is used for the loop feeder access ring, and the FT-2000 OC-48 equipment is used for the interoffice ring. This architecture can withstand any single equipment or fiber failure in each of the rings or a failure (which could range from a central office shutdown in the case of fire, for example, or equipment failure, or failure of the facility connecting the two rings) of either of the two interconnecting nodes without losing service on either the access ring or the interoffice ring. Such a catastrophic failure would cause a service outage for a simple ring architecture.

OC-12 VT1.5 Path Switched Ring (Dual 0x1)

The dual 0x1 OC-3/IS-3 interface offers a significant advantage over the 1+1 protected OC-3/IS-3 interface for VT1.5 path switched ring applications. Dual 0x1 means two service lines (no protection lines) are used between the DDM-2000 OC-12 Multiplexer and the DDM-2000 OC-3 Multiplexer (OC-3 Main 1 OLIU to OC-12 Function Unit 1 OLIU and OC-3 Main 2 OLIU to associated OC-12 Function Unit 2P OLIU). Switching is not done on the DDM-2000 OC-12 Multiplexer; rather VT1.5 or STS-1 level switching is done on the DDM-2000 OC-3 Multiplexer. STS-1s can be dropped to DDM-2000 OC-3 shelves via the dual 0x1 interface at several nodes on the OC-12 ring. This allows full VT1.5 switching granularity across the entire OC-12 bandwidth at any node on the ring, resulting in a full-fledged VT1.5 path switched OC-12 ring. In contrast, the 1+1 protected OC-3/IS-3 interface is better suited for situations requiring STS-1 or STS-3c transport. The 1+1 OC-3/IS-3 interface allows STS-1/3c level switching to be done on the OC-12 shelf, allowing cost effective transport of larger bandwidth channels such as STS-1s and STS-3cs.

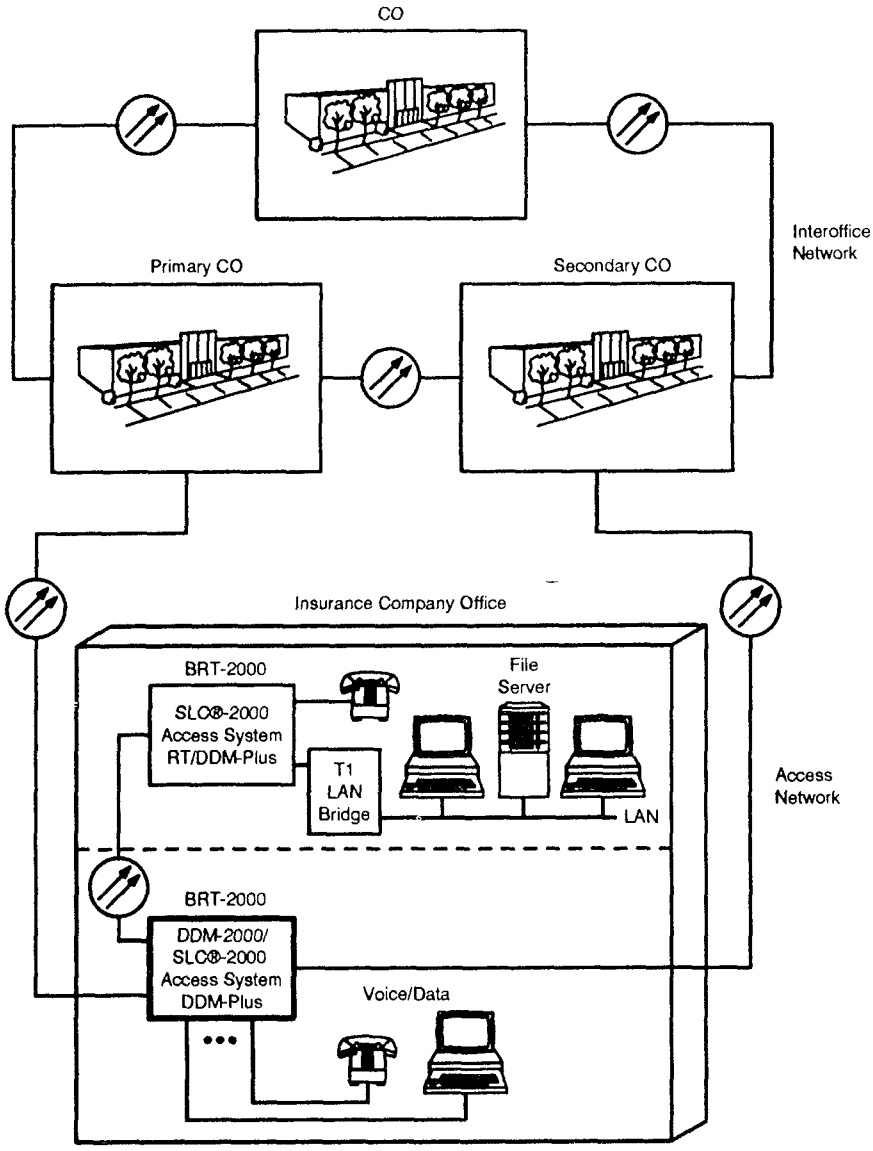
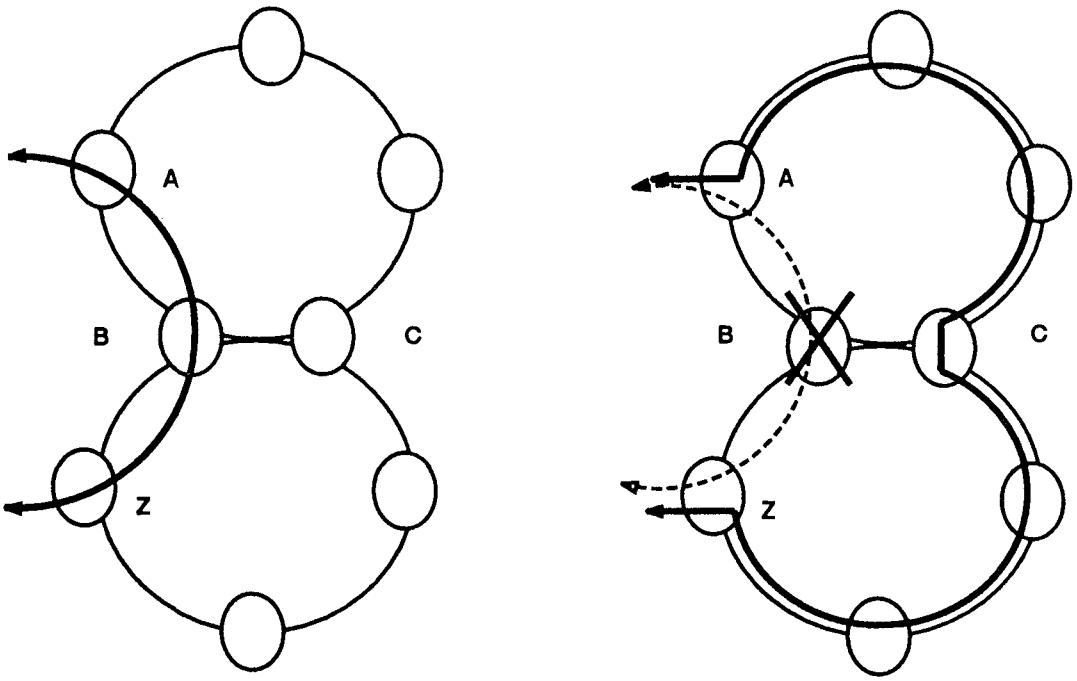


Figure 2-22. Dual Access Application

As Figure 2-23 shows, DRI allows a circuit (for instance, between nodes A and Z) with one termination in the upper ring and the other termination in lower ring to survive a failure of the shared node that is currently carrying service for the circuit. The failure is depicted by an "X" in the figure. The two shared nodes are Node B and Node C. Both nodes have the signal available to them at all times. When the failure occurs, the two terminating nodes and the two shared nodes switch so that traffic is carried through Node C and around the node failure.



1. DRI Configuration:
   Two Rings Sharing Two Nodes.
   Circuit Originating and Terminating in Node A and Node Z.

2. LOS Failure (Depicted by X) at Node B Routes Traffic via Node C.

Figure 2-23. Dual Ring Interworking Concepts

Figure 2-24 shows a DDM-2000 OC-3 (or OC-12) path switched ring interworking with an FT-2000 OC-48 bidirectional line-switched ring. In this application, the DDM-2000 provides an appearance of loop traffic at both the primary and secondary nodes by dropping traffic at the primary node and simultaneously continuing it on to the secondary node. This capability is called "drop-and-continue." The DDM-2000 OC-3 Multiplexer allows DS1 signals to be multiplexed for handoff at an economical EC-1 rate in the central offices. Also the DDM-2000 OC-3's flexible TSI can be used to prepackage all DRI protected DS1s into a single EC-1 for economical handoff to the OC-48 ring. DS3/STS1 clear channel services are also supported. The companion FT-2000 OC-48 ring picks up the traffic at these two nodes and carries it to the destination node, unless a failure condition causes a protection switch to the secondary signal. In the reverse direction, a similar process is followed with the OC-48 ring handing off the two copies of the signal at the primary and secondary nodes and the OC-3 ring providing the switching at the destination node.

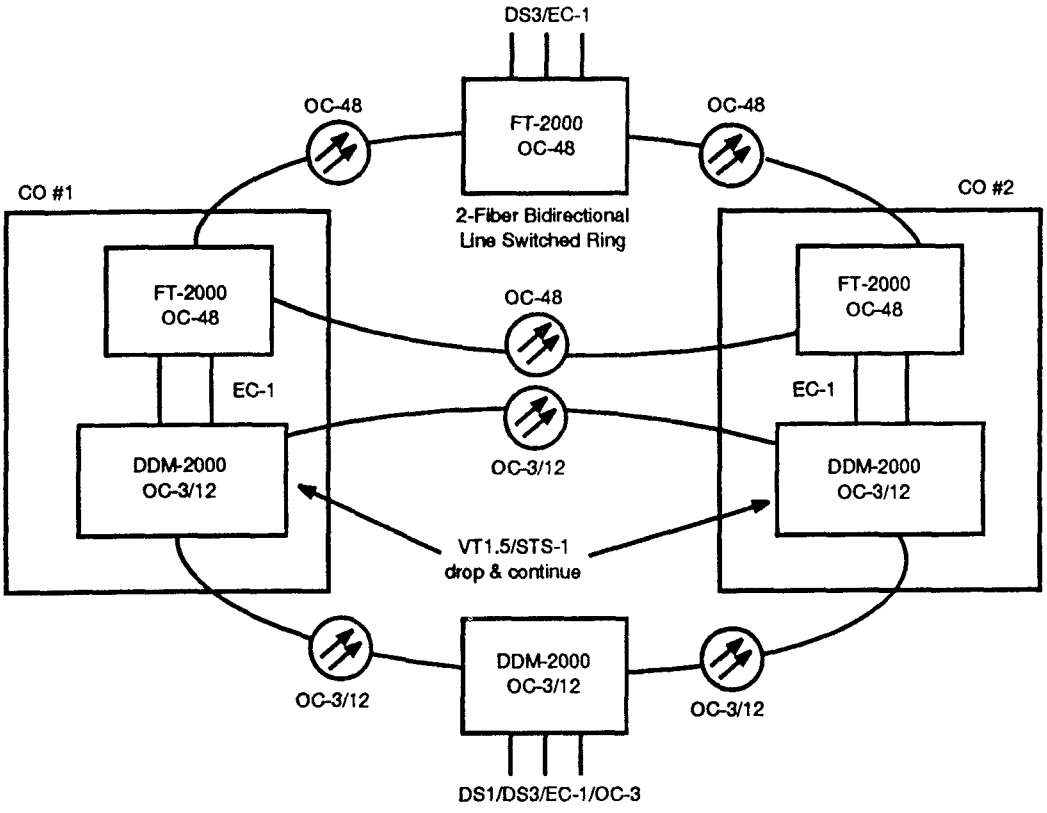


Figure 2-24. OC-3 to OC-48 Dual Ring Interworking

The DDM-2000 drop and continue feature also finds an excellent application in interconnecting two rings via an intermediate transport network. In the example shown in Figure 2-25, DDM-2000 OC-3 Multiplexer access rings act as a DRI pair via an FT-2000 OC-48 and DACS IV-2000 interoffice network. The advantage of this network is the grooming for DRI traffic provided by the DACS IV-2000. Both DDM-2000 OC-3 rings provide drop and continue at each of their two duplicate central offices. Both copies of the signal are transported as separate tributaries through the interoffice network, and path switching is implemented at the edges of the network. Signal redundancy is preserved on an end-to-end basis.

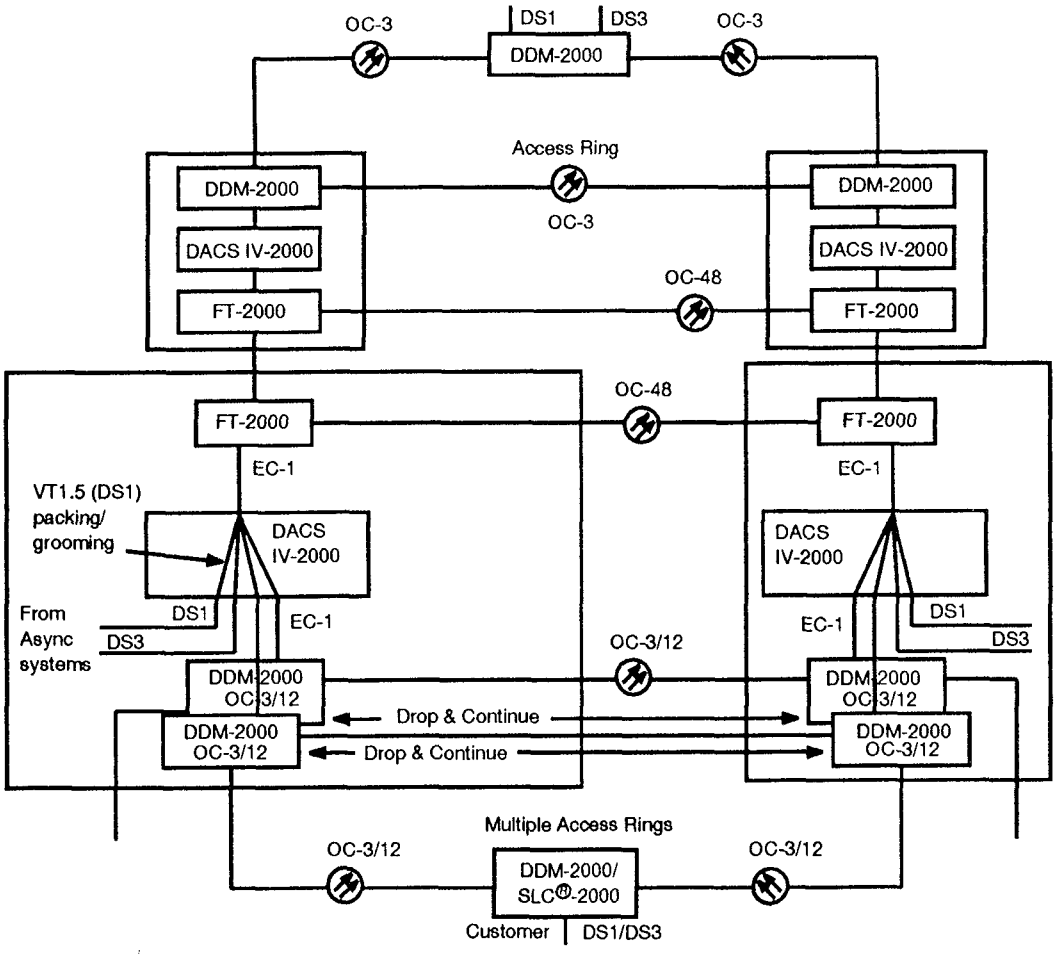


Figure 2-25. DDM-2000 Ring Interworking with FT-2000 Transport and DACS IV-2000 Grooming

OC-48 Upgrade

The AT&T 2000 Product Family offers upgradability from OC-3 and OC-12 line rates to the OC-48 rate. Such an upgrade may be needed in large metropolitan areas or in applications where new broadband services are deployed in large numbers. The 2000 Product Family protects the user from being locked in at either the OC-3 or OC-12 signal rates by offering an upgrade to the OC-48 rate, using the FT-2000 OC-48 Lightwave System. An EC-1 or OC-3 interface can be used to connect the FT-2000 OC-48 Lightwave System to either a DDM-2000 OC-3 or OC-12 Multiplexer.

Interoffice Applications

The DDM-2000 OC-3 Multiplexer provides the following features for the interoffice applications:

- DS1 transport
- DS3 transport
- EC-1 transport
- Independent synchronization
- Single-ended or independent operations
- Single-mode fiber spans up to 55 kilometers

Point-to-Point Topologies

OC-3 Point-to-Point

The OC-3 point-to-point interoffice application (Figure 2-26) provides cost-effective DS1, DS3, EC-1, and OC-3c transport in outstate trunk routes that do not justify the expense of OC-12 and higher capacity systems. Just as in the OC-3 point-to-point loop application, the network consists of a pair of DDM-2000 OC-3 shelves configured as optical terminals.

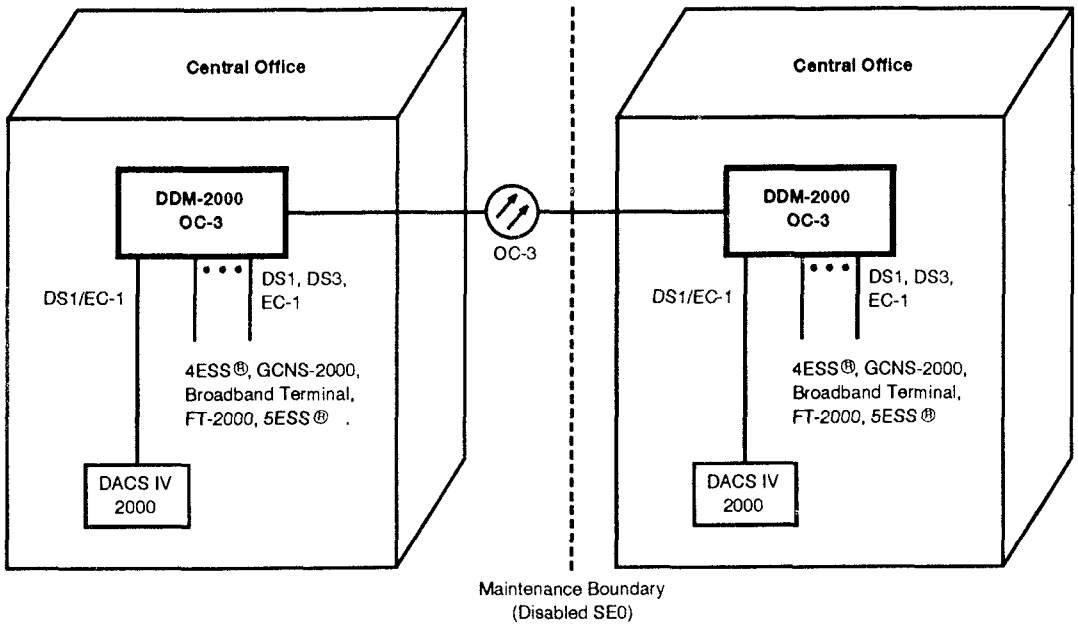


Figure 2-26. OC-3 Point-to-Point Interoffice Application

The DDM-2000 OC-3 Multiplexers allow independent synchronization of each site from its own office clock and have the ability to disable single-ended operations when the application crosses a maintenance boundary. Also, timing can be passed from one office clock to another with a DS1 timing output derived from an incoming OC-3 signal. The gigabit cell network switch (GCNS) in the figure is AT&T's asynchronous transfer mode (ATM) switch.

OC-3 Repeater

The DDM-2000 OC-3 Multiplexer supports single-mode fiber spans up to 55 kilometers (34 miles). For longer spans, the DDM-2000 OC-3 Multiplexer can be used in a repeater configuration shown in Figure 2-27. In this particular application of the STS-1 drop shelf configuration, all traffic passes between upstream and downstream OC-3 interfaces with no add/drop to/from low-speed interfaces.

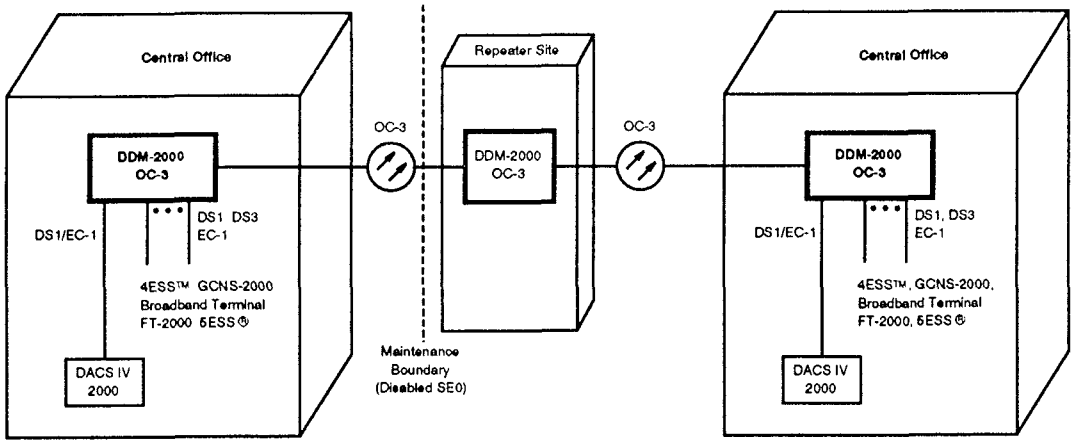


Figure 2-27. OC-3 Repeater Application

Add/Drop Topologies

OC-3 DS1 Add/Drop

The OC-3 DS1 add/drop application (Figure 2-28) provides an extremely flexible, cost-effective solution to small or medium cross-section interoffice networks such as outstate trunks. Low-density routes that primarily transport DS1 traffic are ideally suited to the DDM-2000 OC-3 Multiplexer's capacity, where the capability to add and drop single DS1 tributaries maximizes network utilization and planning flexibility.

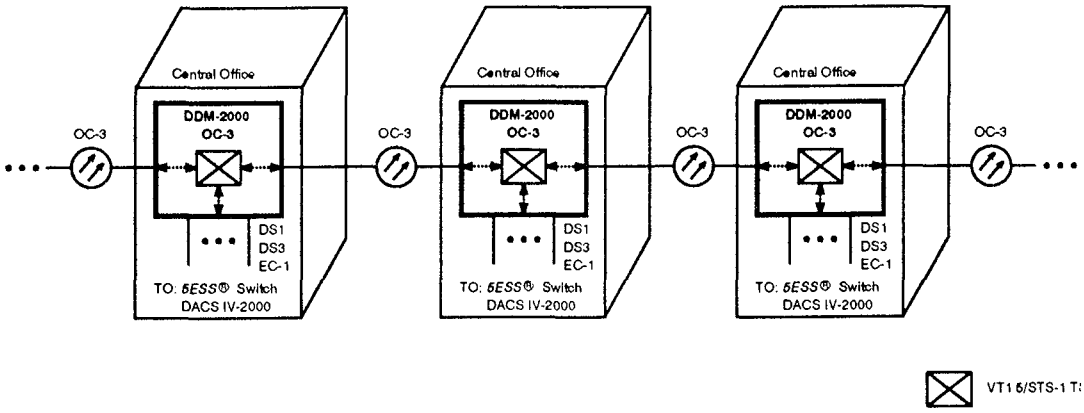


Figure 2-28. DS1 Add/Drop — OC-3 Interoffice Application

Ring Topologies

OC-3 Ring Topologies

A DDM-2000 OC-3 Multiplexer VT1.5/STS-1 path switched ring is a very effective self-healing network topology for small cross-section interoffice networks such as outstate trunks. Low-density routes that primarily transport DS1 traffic are ideally suited to the DDM-2000 OC-3 Multiplexer path switched ring. DS3s/EC-1s may also be carried between offices on DDM-2000 OC-3 Multiplexers (Figure 2-29).

Each ring node can be independently synchronized from a building integrated timing supply (BITS) clock. This BITS clock can also be timed, using the DDM-2000 OC-3 Multiplexer DS1 timing output feature.

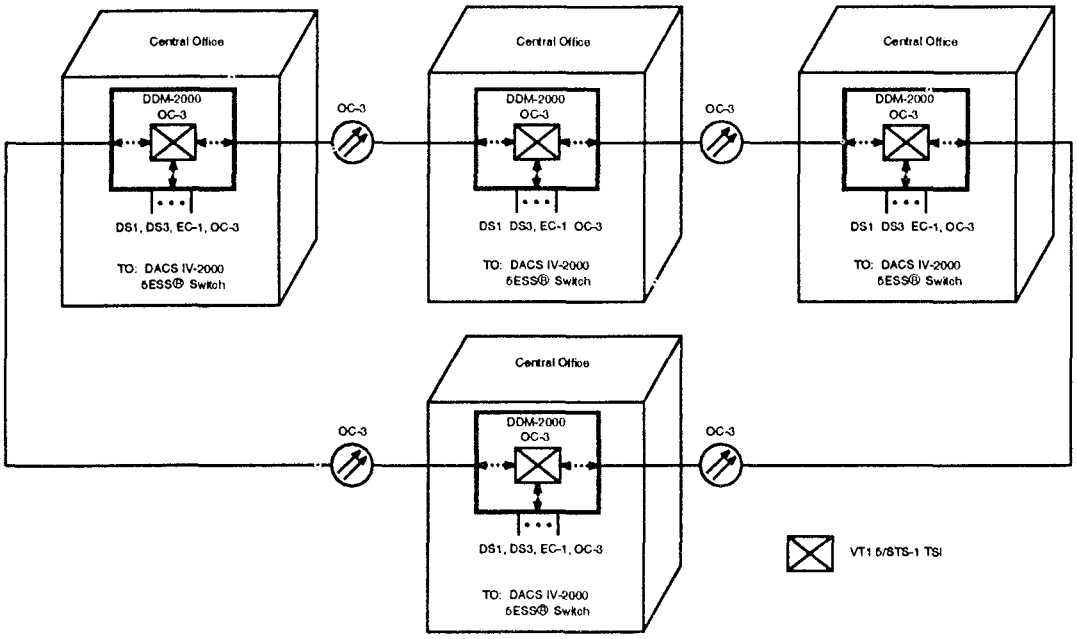


Figure 2-29. DDM-2000 Multiplexer Ring

OC-12 Ring Topologies

The DDM-2000 OC-3 and OC-12 Multiplexers' path switched ring capabilities work together to provide cost-effective transport for small or medium cross-section interoffice networks such as outstate trunks. Such a ring, shown in Figure 2-30, provides DS1, DS3, EC-1, and OC-3c transport.

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

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

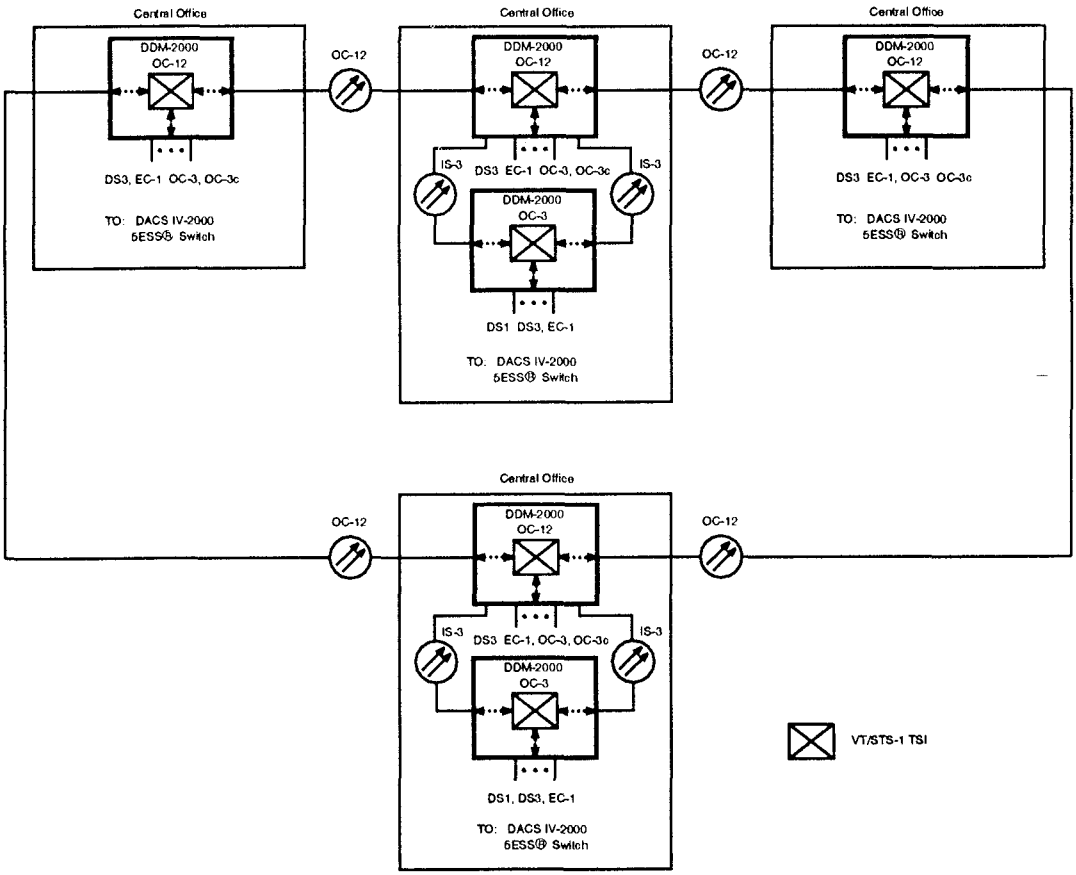


Figure 2-30. DDM-2000 OC-12 Path Switched Interoffice Ring

2000 Product Family Interworking Applications

SONET Electrical Multiplexer

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

The electrical multiplexer configuration, Figure 2-31, operates as three independent multiplexers, each creating a VT-formatted STS-1 from 28 DS1 low-speed interfaces. Traffic from each one of these electrical multiplexers can be carried over any SONET transmission network and can be terminated on any VT1.5-based SONET network element at the other end of the network. These include other DDM-2000 OC-3 Multiplexers and/or DACS IV-2000 Cross-Connect Systems.

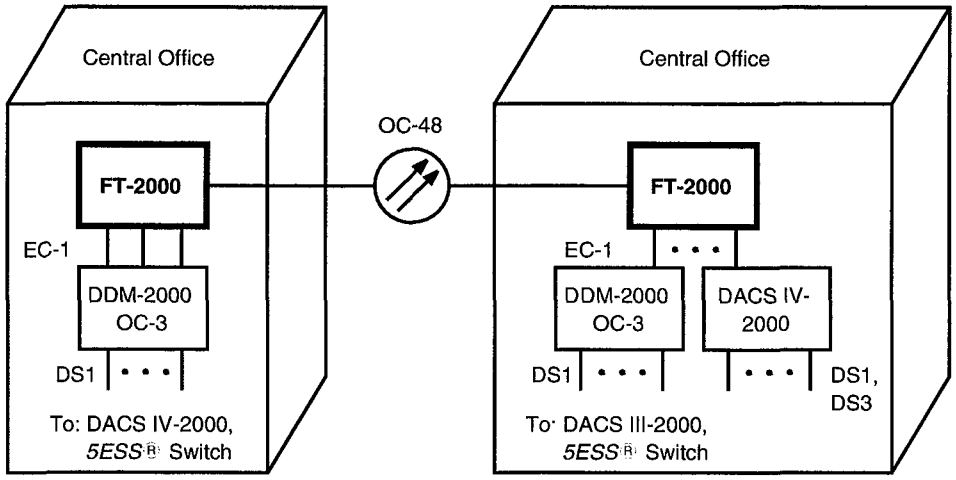


Figure 2-31. DDM-2000 OC-3 Electrical Multiplexer Application

Operations Interworking

Operations interworking provides the capability to access, operate, provision, and administer remote AT&T SONET network elements (NEs) from any location in a SONET subnetwork or from a centralized operations system.

Operations interworking is available among AT&T 2000 Product Family systems connected through the SONET DCC including:

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

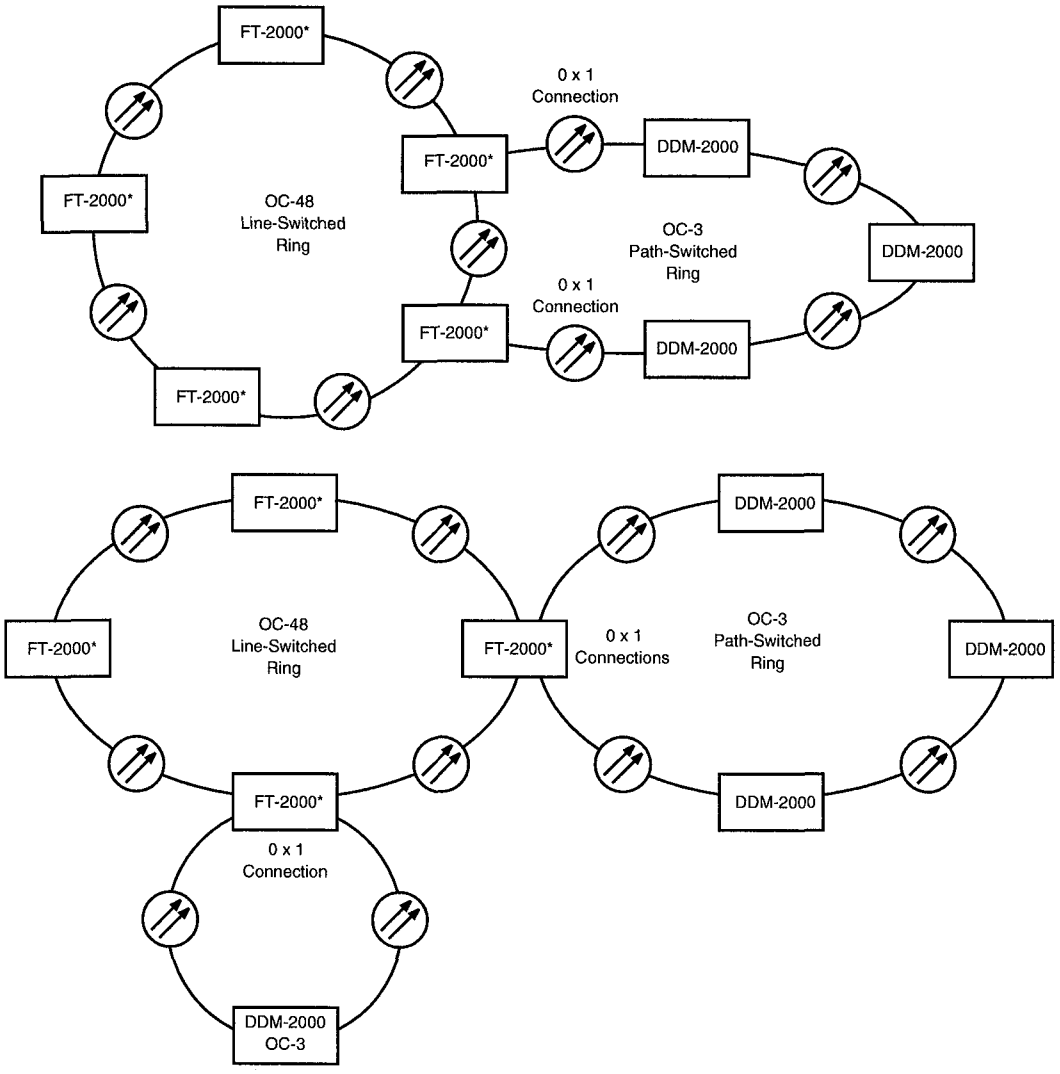
The FT-2000 OC-48 Lightwave System equipped with Release 6.0.0 software supports operations interworking applications with DDM-2000 OC-3 Multiplexers (Figure 2-32).

Messages carried on the SONET section data communications channel (DCC) support the following interworking applications:

- Remote login
- Gateway network element (GNE) operation
- Remote network element status
- Remote software download and copy.

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

information to all the other network elements in the alarm group. An alarm group can support up to 32 network elements although the maximum number of NEs supported in Release 7.2 is 24.



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

Figure 2-32. Operations Interworking Application

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

Figure 2-33 shows two types of OC-3 interface connections between FT-2000 OC-48 Lightwave System line switched rings and DDM-2000 OC-3 path switched rings.

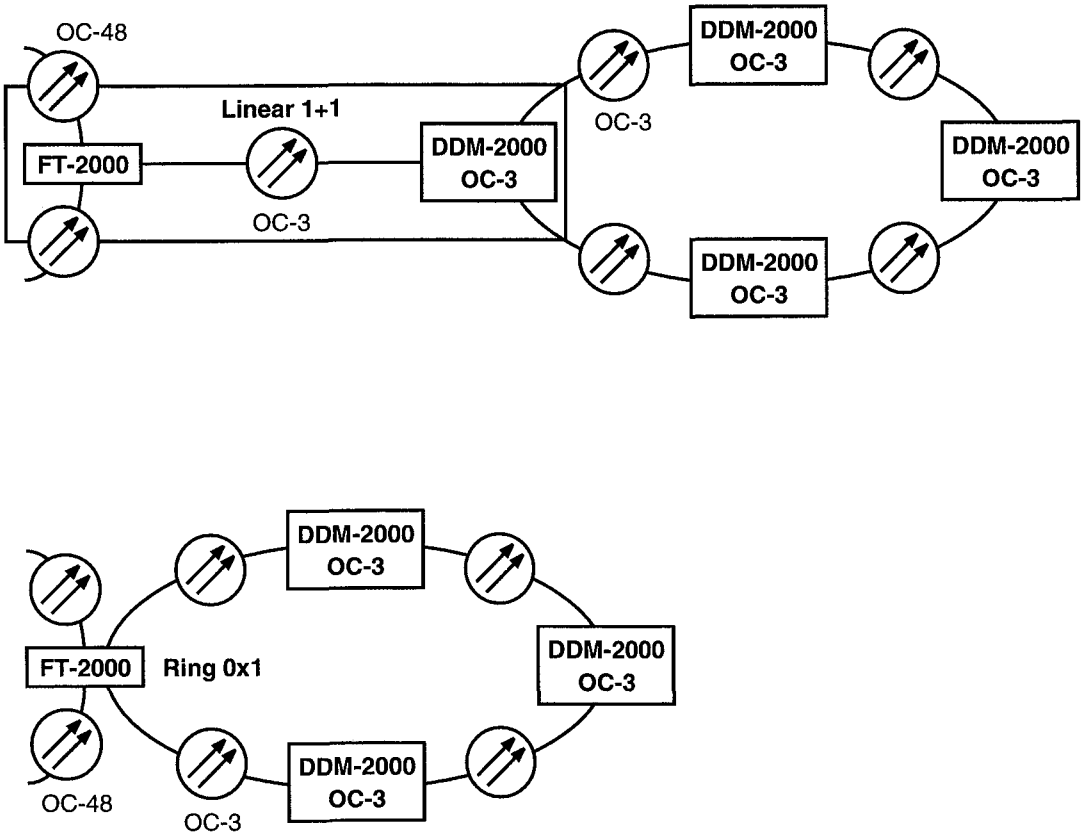


Figure 2-33. OC-3 Ring Interfaces with FT-2000 OC-48 Lightwave System

- Linear (1+1). In this configuration (top figure of Figure 2-33), there is a 1+1 OC-3 interface connection to an FT-2000 OC-48 Lightwave System NE. A failure of the 1+1 OC-3 interface will trigger a DDM-2000 OC-3 line protection switch. Figure 2-34 shows a major application of this feature in a DRI application using optical OC-3/IS-3 interfaces.
- Ring (0x1). In this configuration (bottom figure of Figure 2-33), there are two 0x1 OC-3 interface connections to one FT-2000 OC-48 Lightwave System NE. A failure of one of the 0x1 OC-3 interfaces will trigger a DDM-2000 OC-3 path protection switch.

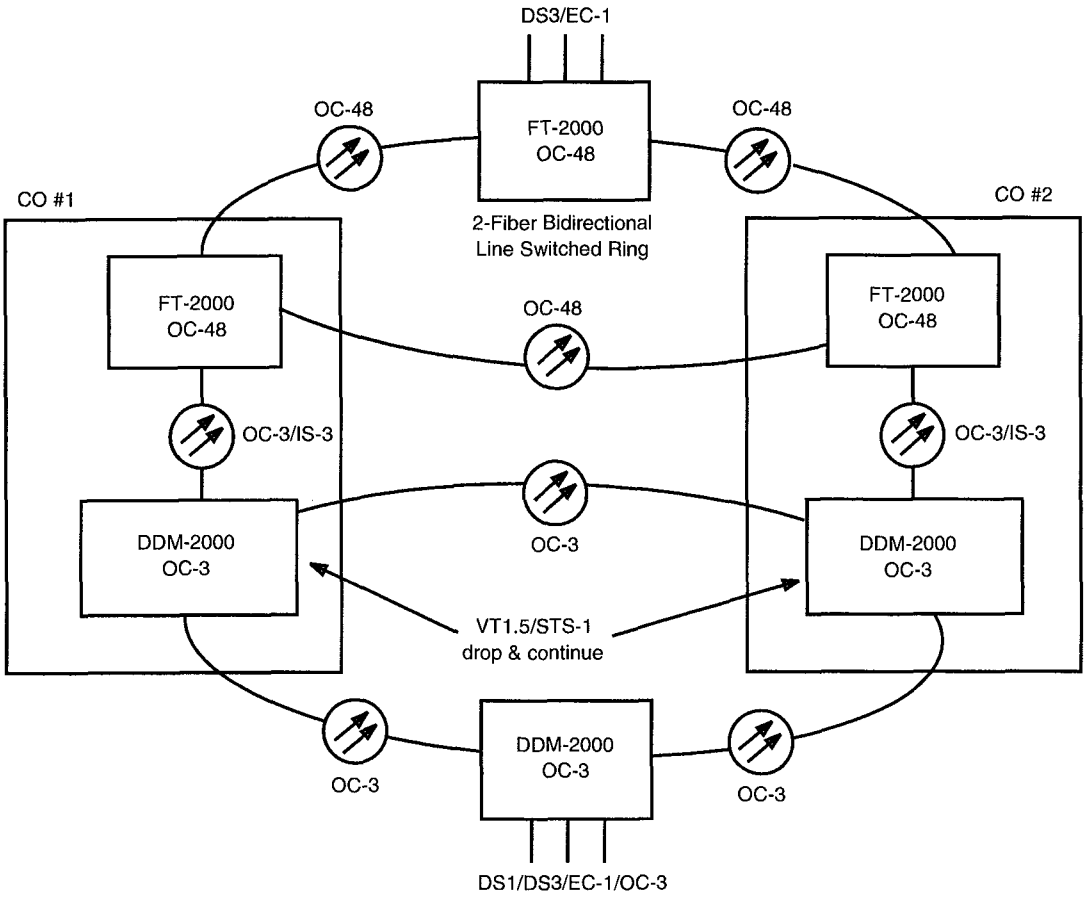


Figure 2-34. DDM-2000 OC-3 to FT-2000 OC-48 Lightwave System DRI

Private Network Applications

Private Data/Video/ATM Network

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

Many DDM-2000 features, such as high reliability, flexible networking configurations, and DS1/DS3/EC-1/OC-3c services satisfy private network needs. Figure 2-35 shows how DDM-2000 OC-3 and OC-12 Multiplexers provide flexible interconnection of several data/video networks. The two multibuilding campuses have local data needs served by ATM networks.

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

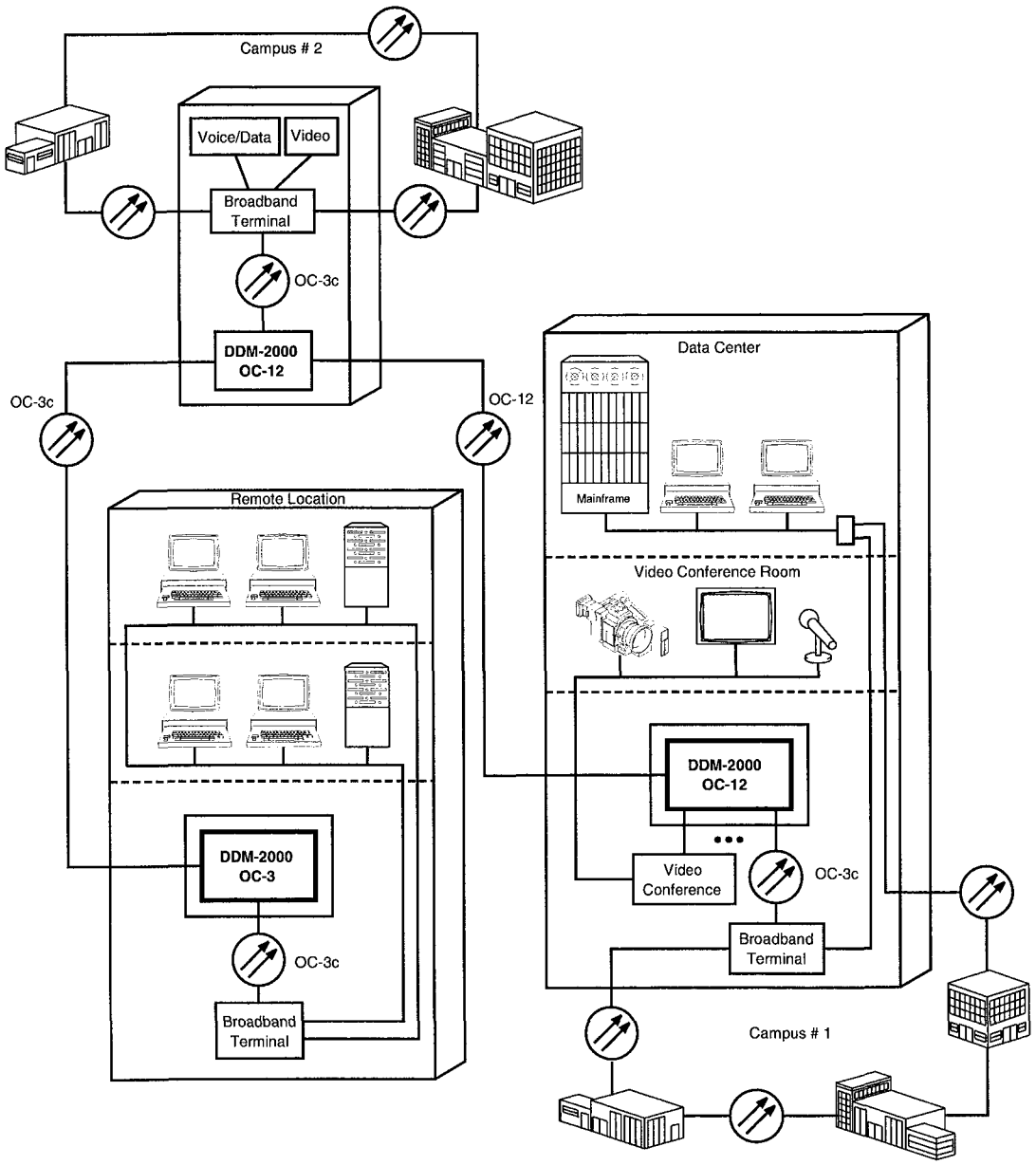


Figure 2-35. OC-3c Transport— Private Data/Video/ATM Network Application

Intelligent Vehicle Highway System (IVHS) Applications

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

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

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

Figure 2-36 shows a typical IVHS application. An IVHS network calls for carrying data between roadside equipment, such as traffic counters, speed sensors, variable messaging signs, video cameras, toll taking equipment, pay phones and call boxes, and a traffic operations center, where incoming data is processed and responses are generated. The DDM-2000 OC-3 and OC-12 Multiplexers provide a perfect backbone for carrying this information. The DDM-2000 OC-3 Multiplexer SONET ring capability, when coupled with diverse fiber routing on opposite sides of the roadway, makes the backbone completely self-healing in the face of failures. Such reliability is absolutely essential, especially as travelers come to depend more and more on IVHS networks. The VT1.5 and STS-1 bandwidth management capabilities of the DDM-2000 OC-3 and OC-12 Multiplexers allow flexible allocation of bandwidth to match the dynamics of a roadway system which is undergoing unpredictable changes in traffic patterns, breakdowns, accidents, and repairs. Such bandwidth management provides a system which meets the IVHS network needs in a cost-effective way. DDM-2000 OC-3 and OC-12 Multiplexers completely meet the transmission needs of an IVHS network.

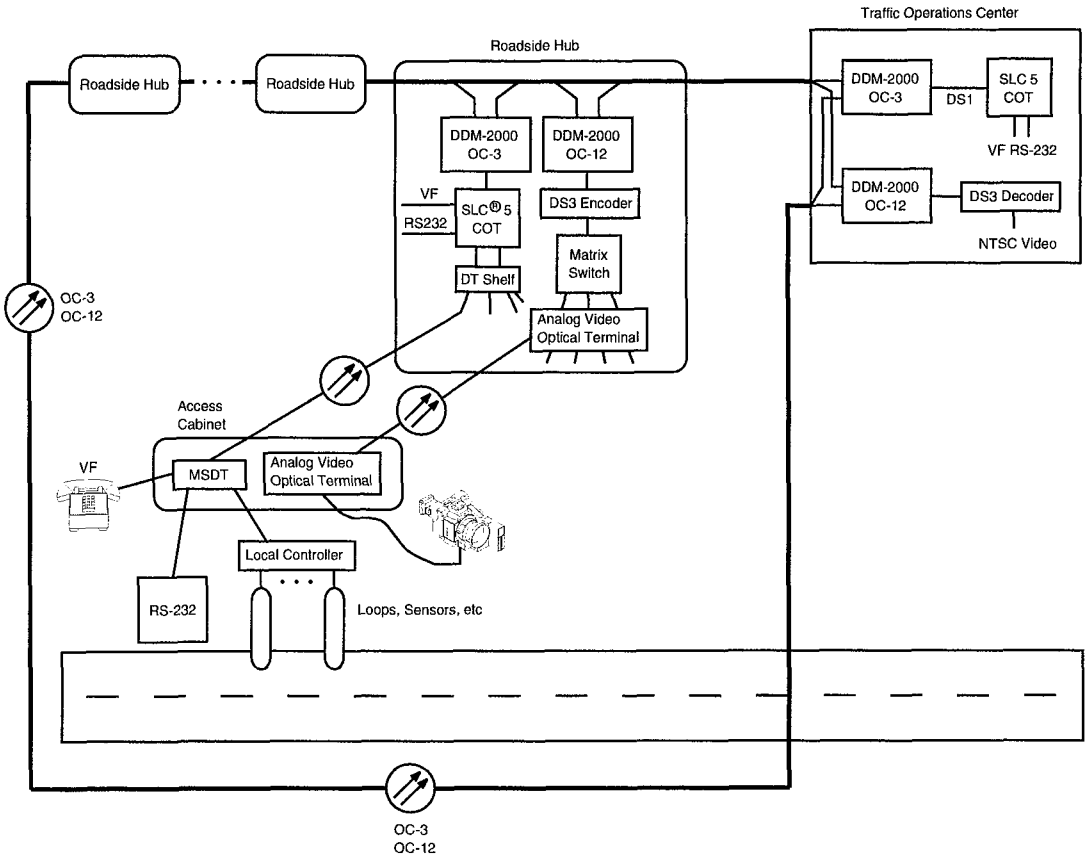


Figure 2-36. Intelligent Vehicle Highway System (IVHS) Application

Shelf Descriptions and Configurations

3

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Shelf Descriptions and Configurations

3

Overview

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

DDM-2000 OC-3 Multiplexer Shelf

The DDM-2000 OC-3 Multiplexer physically consists of a single shelf as shown in Figures 3-1 and 3-2. The shelf measures 8.5 inches high by 21.25 inches wide by 12 inches deep and fits in a standard 23-inch wide bay. Each shelf is a stand-alone entity with its own fiber cabling and interfaces to DSX-1, DSX-3, office power, and operations interfaces.

Cabling for office alarms, parallel telemetry, craft interface terminal (CIT) interfaces, DS1 timing inputs, and telemetry byte-oriented serial (TBOS) can be shared among shelves in a bay. The default configuration provides rear access cabling; front access through dangler cables is available as an option. Dangler cables are short lengths of connectorized cables that are brought over the top of the bay from the rear to provide front access to rear connectors. Front-mounted optical connectors facilitate shelf loopback and fiber tests; these optical *ST*® connectors are mounted on the optical line interface unit (OLIU) circuit pack faceplate. A DDM-2000 OC-3 Multiplexer shelf consists of the following:

- 36 circuit pack slots
  - — 26 four-inch slots
  - — 10 eight-inch slots
- User panel

- Fully connectorized backplane
- Front and back covers.

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

The next two 8-inch slots are for service and protection main OLIU circuit packs.

The following six 8-inch slots are for the function units. These slots are divided in three groups designated A, B, and C. The function unit slots can be equipped interchangeably by group, with each group 1+1 protected except for the OLIUs which are 1x1 protected. These slots are equipped, depending on the application, with DS3, MXRVO, STS1E, or OLIU circuit packs.

The next section of the shelf is reserved for the DS1 low-speed interface circuit packs. These slots are also divided into three groups designated A, B, and C which correspond to the function unit groups. Each group consists of eight 4-inch slots for service and optional protection DS1/DS1PM circuit packs (1x7 protected). Unused low-speed interface slots within a partially equipped group must be equipped with 177A Retainer cards if DS1/DS1PM protection is used. 177A Retainer cards are used to maintain protection; no other blanks are required.

Following this section of the shelf are two 8-inch slots reserved for control circuit packs. The auxiliary control slot is reserved for the overhead controller (OHCTL) circuit pack. The system controller slot is reserved for the system controller (SYSCTL) circuit pack.

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

- Two –48 volt fuses (5A)
- Four alarm LEDs
- ACO/TST pushbutton control
- Craft interface terminal (CIT) port
- Electrostatic discharge (ESD) jack.

Accidental insertion of same-size circuit packs in incorrect slots is prevented through circuit pack keying. The key mechanism is located on the faceplate latch, with an interference mechanism on the shelf. Only function unit family circuit packs (OLIU, MXRVO, DS3, or STS1E) can be inserted in function unit slots, only low-speed family (DS1 and DS1PM) circuit packs can be inserted in low-speed slots, and the SYSCTL and OHCTL circuit packs are keyed for their respective slots.

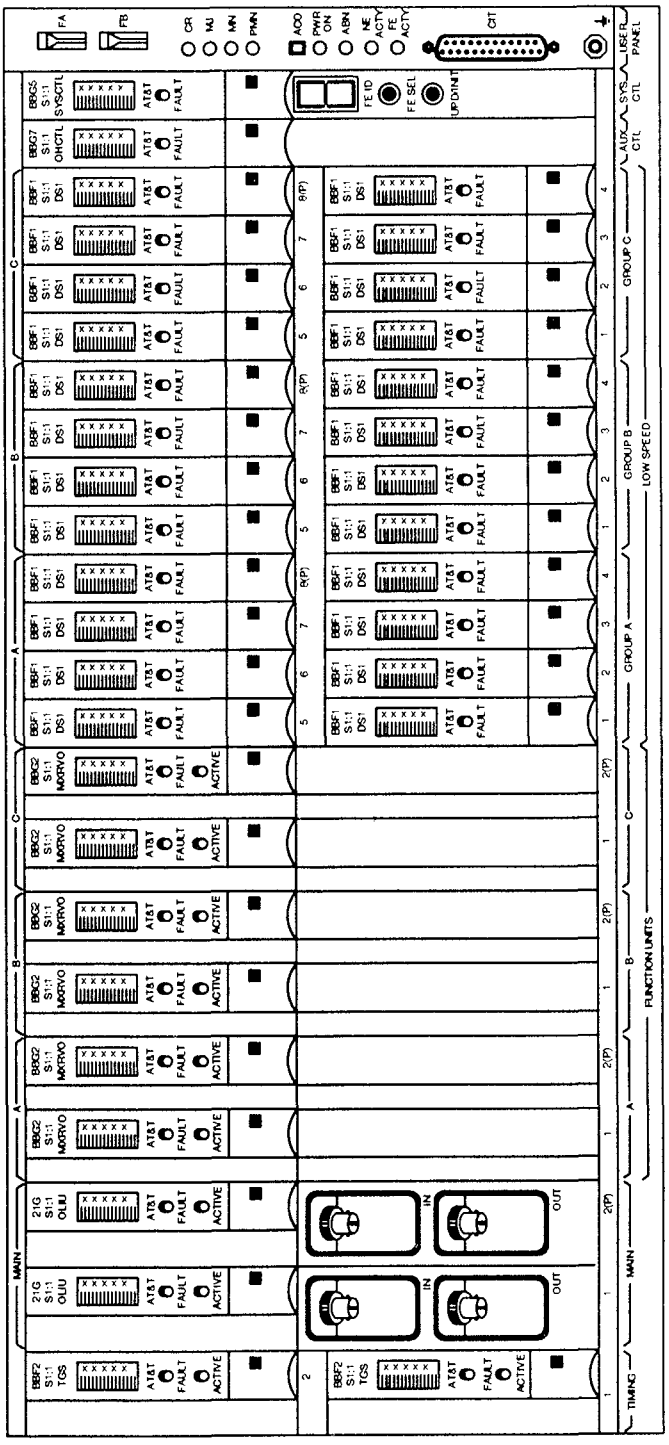


Figure 3-1. DDM-2000 OC-3 Multiplexer Shelf—Front View

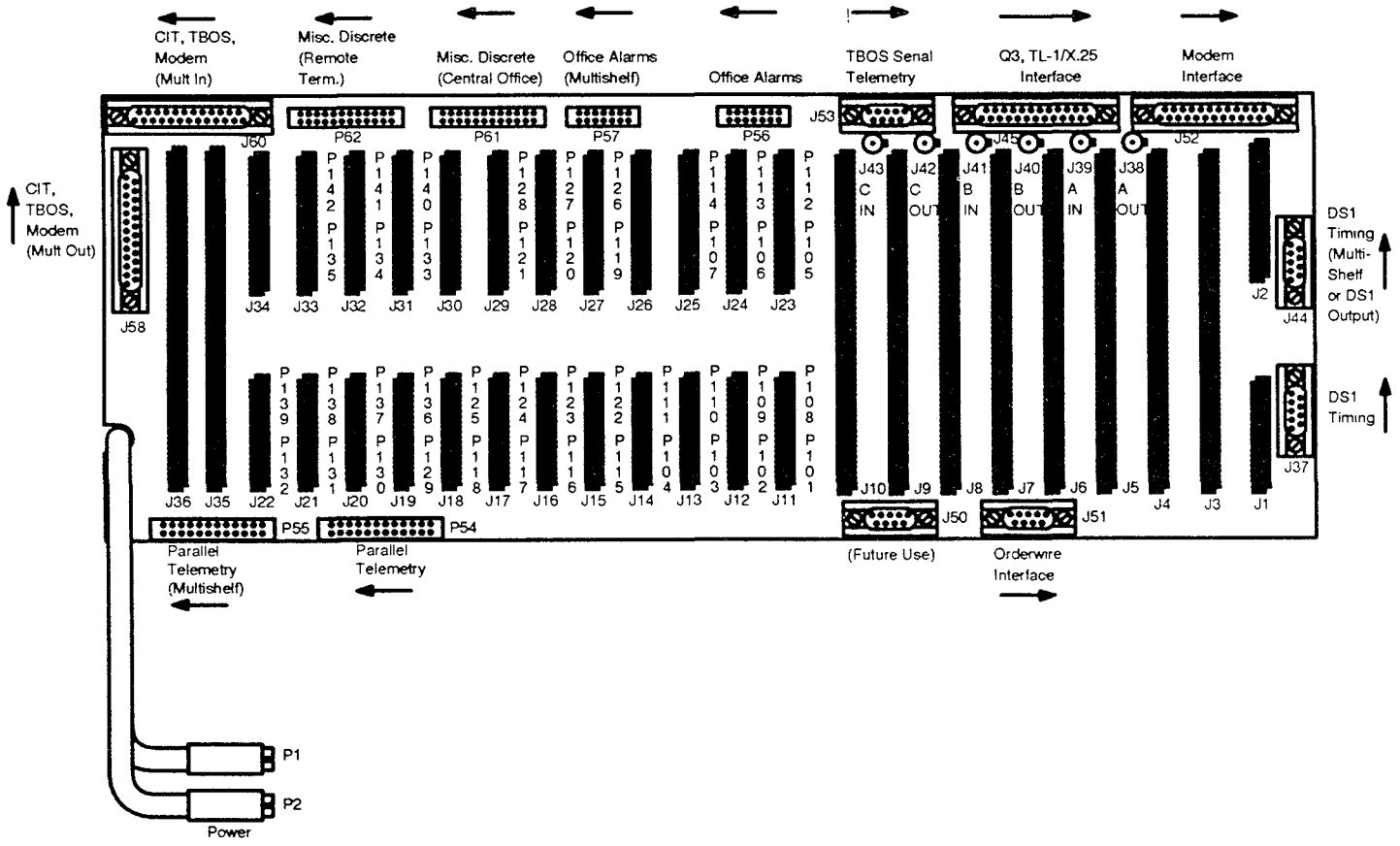


Figure 3-2. DDM-2000 OC-3 Multiplexer Shelf—Rear View

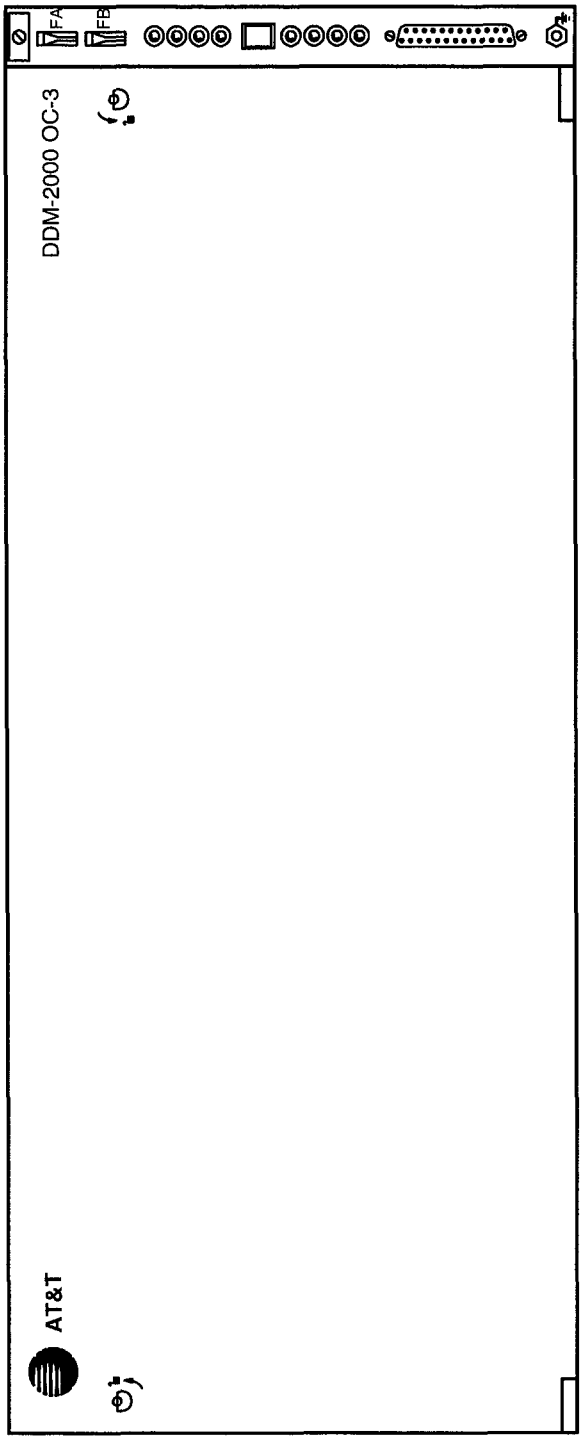


Figure 3-3. DDM-2000 OC-3 Multiplexer Front Panel

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

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

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

Product Code	Functional Name	Functional Designation
BBF1B	DS1 low-speed interface	DS1
BBF2 *	Synchronous timing generator	TGS
BBF2B	Synchronous timing generator	TGS
BBF3	DS1 Performance monitoring	DS1PM
BBG2	VT-to-STS-1 multiplexer	MXRVO
BBG4	DS3 low-speed interface	DS3
BBG4B †	DS3 low-speed interface	DS3
BBG5	System controller	SYSCTL
BBG6	EC-1 interface	STS1E (EC-1)
BBG7	Overhead controller	OHCTL
21D/21D-U OLIU	IS-3 OLIU	OLIU
21G/21G-U OLIU	OC-3 OLIU	OLIU
22F OLIU	OC-3 IS-3 OLIU	OLIU
22G-U OLIU	OC-3 Long Reach OLIU	OLIU
22G2-U OLIU ‡	OC-3 Long Reach OLIU	OLIU
22D-U OLIU	IS-3 OLIU with TSI	OLIU
177A	Retainer	-

* Discontinued availability (DA) 5/94.

† Required in Release 7.2 for enhanced DS3 performance monitoring.

‡ Does not require external attenuator for loopback testing. Replaces 22G-U.

Shelf Configurations

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

All applications should be equipped with a heat baffle as shown in ED-8C724-10, "OC-3 and OC-3/OC-12 Combined Bay Arrangements".

Table 3-2 is a list of circuit packs that are allowed mapped by release and shelf slots. For example in Release 2.1, there is only one choice for Main, AUXCTL, and SYSCTL slots. However, any combination of BBG2, BBG4, or 21G/21G-U circuit packs is allowed in the three Fn slots. Proper provisioning requires that both slots of a 1X1 pair have the same circuit pack type and that DS1 circuit packs require an MXRVO circuit pack in the Fn slots. For releases that support multiple low-speed circuit pack types, or that support two TG circuit pack types, or that support multiple OLIU circuit pack types, these units can be mixed. See Section 10, "Technical Specifications", for information on mixing OLIUs. See Section 7, "Circuit Pack Descriptions", for more information on these and other circuit packs.

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

Release Number	Slot Name							
	TG	Main	Fn-A	Fn-B	Fn-C	LS Group *	AUXCTL	SYSCTL
2.1 (Linear)	BBF2 BBF2B	21G/21G-U	BBG2 BBG4 21G/21G-U	BBG2 BBG4 21G/21G-U	BBG2 BBG4 21G/21G-U	BBF1 BBF1B	BBG7	BBG5
3.1 (Linear)	BBF2 BBF2B †	21G/21G-U 22F 22D-U 22G-U	BBG2 BBG4 21G/21G-U 22F 22D-U 22G-U	BBG2 BBG4 21G/21G-U 22F 22D-U 22G-U	BBG2 BBG4 21G/21G-U 22F 22D-U 22G-U	BBF1 BBF1B	BBG7	BBG5
3.2 (Linear)	BBF2 BBF2B †	21G/21G-U 22F 21D/21D-U 22D-U 22G-U	BBG2 BBG4 21G/21G-U, 21D/21D-U 22F 22D-U 22G-U	BBG2 BBG4 21G/21G-U, 21D/21D-U 22F 22D-U 22G-U	BBG2 BBG4 21G/21G-U, 21D/21D-U 22F 22D-U 22G-U	BBF1 BBF1B	BBG7	BBG5
5.1 ** (Ring)	BBF2 BBF2B †	22F 22D-U 22G-U	BBG4 BBG2 BBG6(ls)¶	BBG4 BBG2 BBG6(ls)¶	BBG4 BBG2 BBG6(ls)¶	BBF1 BBF1B BBF3‡	BBG7§§	BBG5
6.0, 6.1, and 6.2 (Linear)	BBF2 BBF2B †	21G/21G-U 22F 21D/21D-U 22D-U 22G-U	BBG2 BBG4 BBG6(hs)§ BBG6(ls)¶ 21G/21G-U, 21D/21D-U 22F 22D-U 22G-U	BBG2 BBG4 BBG6(hs)§ BBG6(ls)¶ 21G/21G-U, 21D/21D-U 22F 22D-U 22G-U	BBG2 BBG4 BBG6(hs)§ BBG6(ls)¶ 21G/21G-U, 21D/21D-U 22F 22D-U 22G-U	BBF1 BBF1B BBF3‡	BBG7††	BBG5
7.0, ** 7.1, ** and 7.2 ** (Ring)	BBF2 BBF2B †	22F ‡‡ 22D-U 22G-U	BBG2 BBG4/4B ¶¶ BBG6(ls)¶	BBG2 BBG4/4B ¶¶ BBG6(ls)¶ 22D-U 22G-U/ 22G2-U *** 22F	BBG2 BBG4/4B ¶¶ BBG6(ls)¶ 22D-U 22G-U/ 22G2-U *** 22F	BBF1 BBF1B BBF3‡	BBG7§§	BBG5

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

* 177A Retainer card must be installed in unused slots of a partially equipped muldem.

† The BBF2B circuit pack optionally provides DS1 timing outputs.

‡ The BBF3 is the DS1PM circuit pack, which can be used in place of or mixed with the BBF1/1B. If mixed, within a low-speed group, the protection circuit pack must be a BBF3. If the DS1PM feature is "enabled" using the **`set-feat`** command, the BBF3 has additional performance monitoring capabilities.

§ The BBG6(hs) is the BBG6 circuit pack with its switch set for high-speed.

¶ The BBG6(ls) is the BBG6 circuit pack with its switch set for low-speed.

** The 22-type OLIUs used in ring Releases R5.x and R7.x must be present in Main-1 and Main-2 for proper ring operation. If signal degrade protection is not used, the 22F and 22G OLIUs can be mixed in the same shelf. The BBF2B TGS is recommended for rings to minimize protection switching times in case of a manual circuit pack removal.

†† Must be Series 2:3 or later.

‡‡ Use the 22G-U/22G2-U or 22D-U if signal degrade protection is required.

§§ Must be Series 2:4A or later.

¶¶ BBG4B required in Release 7.2 for enhanced DS3 performance monitoring.

*** The 22G2-U OLIU does not require external attenuator for loopback testing. Can be used in place of the 22G-U in all applications.

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

- Terminating shelf
- Hubbing shelf
- STS-1 drop shelf
- EC-1 electrical multiplexer shelf
- DS1 add/drop shelf
- Ring shelf
- Dual ring interworking shelf
- Ring shelf with optical extensions.

OC-3 Terminating Shelf

Figure 3-4 shows an example of the OC-3 terminating shelf, used for point-to-point network applications and as the central office terminal of multispan loop access applications. The OC-3 terminating shelf uses the two main optical line interface unit (OLIU) slots to interface an OC-3 line to three function unit positions (A, B, C). Function unit and OLIU circuit packs are equipped in protection pairs, one service and one protection [denoted 1 and 2(P)]. Low-speed interface growth proceeds in STS-1 increments at the function unit slots. A DS3 interface is provided by the DS3 circuit pack (shown in slot C), an EC-1 interface is provided by the STS1E circuit pack in slot B, while DS1 services use the MXRVO function unit circuit pack. DS1 service growth proceeds in increments of 4 DS1s by equipping low-speed slots with DS1 or DS1PM circuit packs up to a maximum of 7 service units and 1 protection unit per Multiplexer. Thus, each protected 28 DS1 "muldem" requires 2 MXRVO and 8 DS1/DS1PM circuit packs. If DS1PM service circuit packs are equipped, the protection slot must also be equipped with a DS1PM circuit pack. Also, 2 MXRVO circuit packs (service and protection) must always be equipped whenever DS1PM circuit packs are equipped in the associated low-speed group.

Duplicated TGS circuit packs distribute local clock signals to the OLIU and function unit circuit packs.

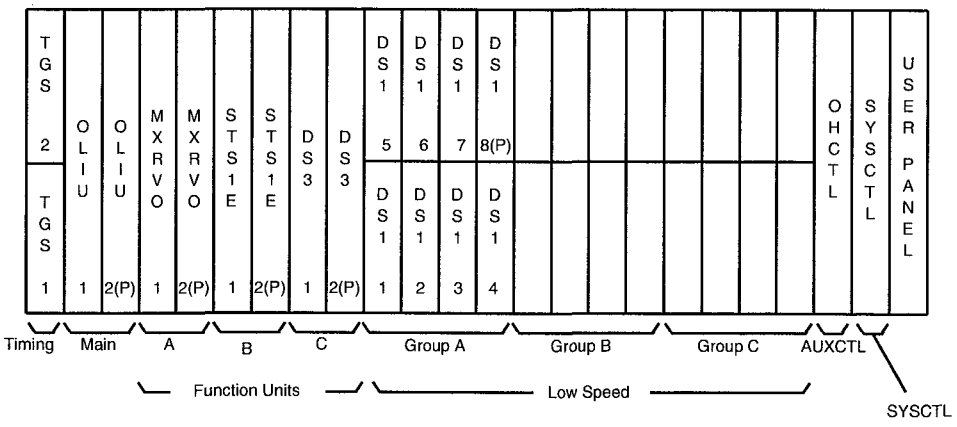


Figure 3-4. DDM-2000 OC-3 Terminating Shelf

OC-3 Hub Shelf

The OC-3 hub shelf (Figure 3-5) supports multiplexing and transport between a source node, a hub node, and two remote nodes. This example drops STS-1 #1 from the main OC-3 interface to 28 DS1 interfaces in the A-group, routes STS-1 #2 out of the OC-3 interface in the B group, and routes STS-1 #3 out of the OC-3 in the C group.

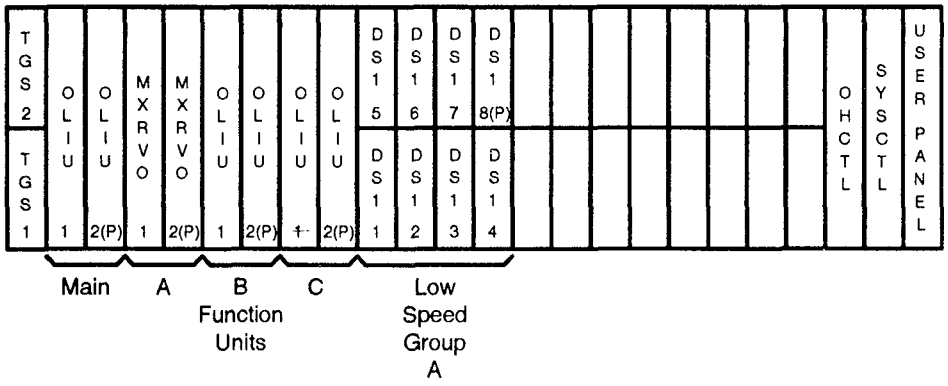


Figure 3-5. DDM-2000 OC-3 Hub Shelf

OC-3 STS-1 Drop Shelf

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

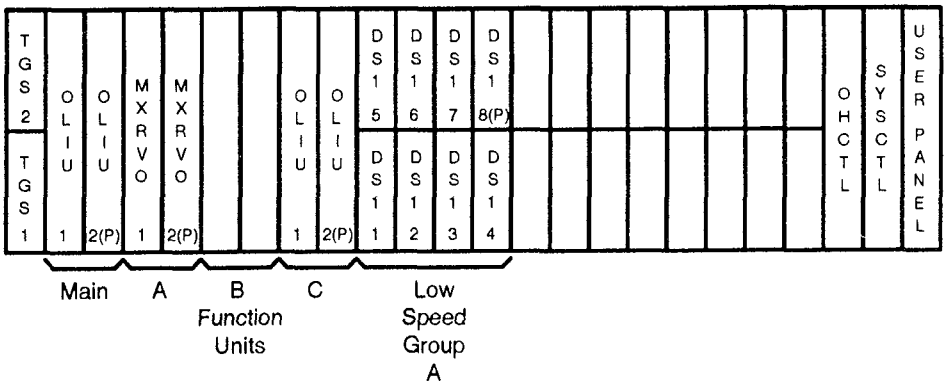


Figure 3-6. DDM-2000 OC-3 STS-1 Drop Shelf

EC-1 Electrical Multiplexer Shelf

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

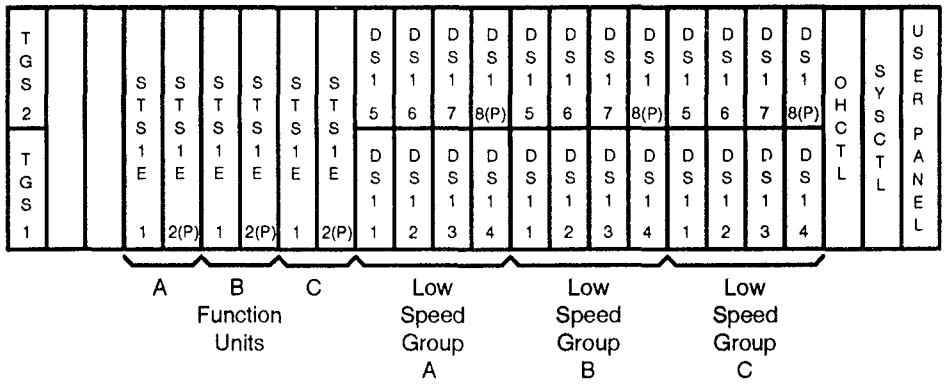


Figure 3-7. DDM-2000 OC-3 EC-1 Electrical Multiplexer Shelf

OC-3 DS1 Add/Drop Shelf

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

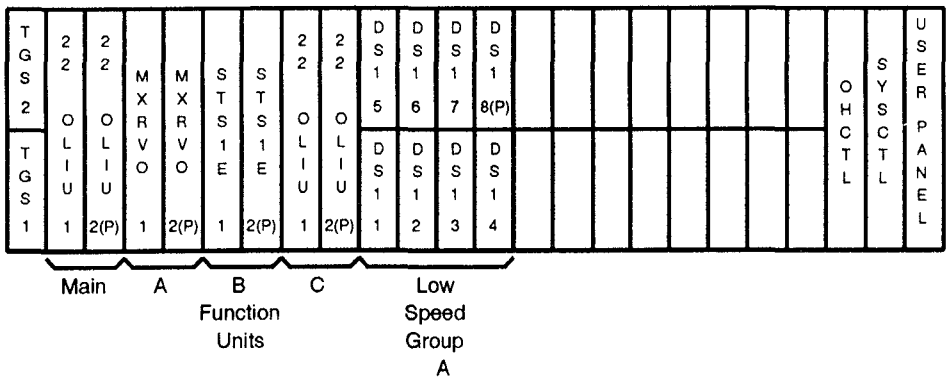


Figure 3-8. DDM-2000 OC-3 DS1 Add/Drop Shelf

OC-3 Ring Shelf

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

The shelf can be used in an OC-12 VT1.5 path switched ring (dual 0x1) application. The data communications channel (DCC) must be provisioned to support this application. See Section 8, "Administration and Provisioning" for information on dual 0x1 provisioning.

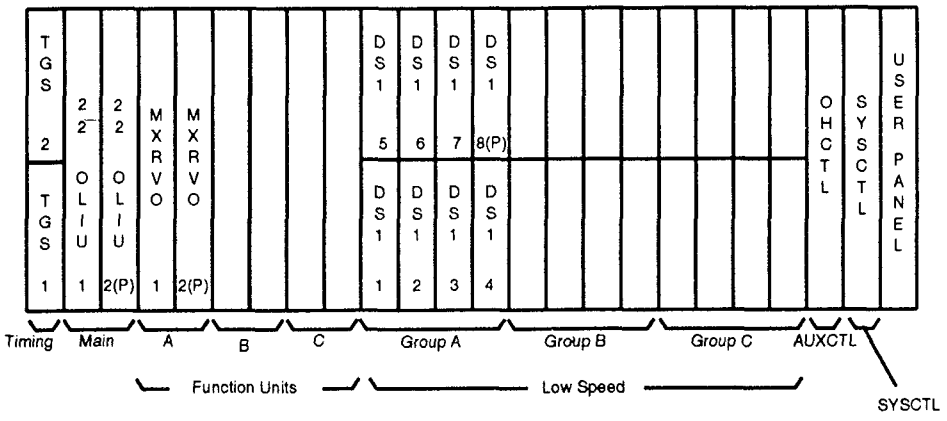


Figure 3-9. DDM-2000 OC-3 Ring Shelf

OC-3 Dual Ring Interworking Shelf

An example of an OC-3 dual ring interworking (DRI) shelf is shown in Figure 3-10. The 22-type OLIU circuit packs are equipped in the Main positions and can be equipped in Function Units A, B, or C. At least one pair of STS1E circuit packs must be equipped in at least one of the Function Unit slots. A DRI shelf can also support MXRVO and DS3 interfaces.

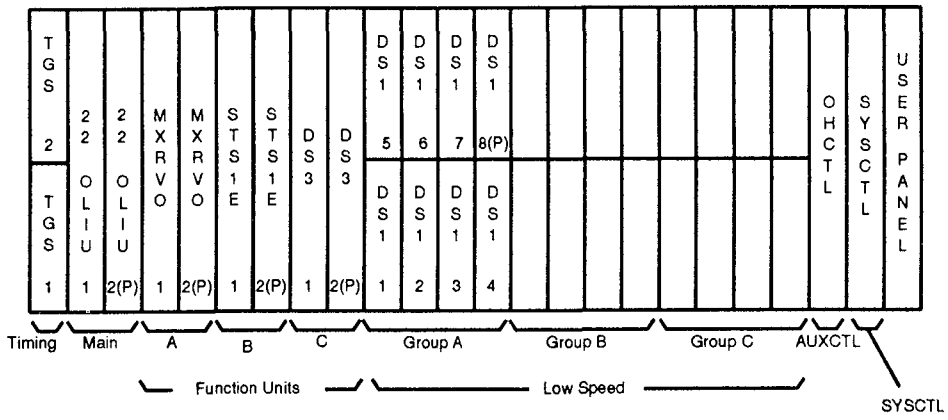


Figure 3-10. DDM-2000 OC-3 DRI Shelf

OC-3 Ring Shelf With Optical Extension

An example of an OC-3 ring shelf with an optical extension is shown in Figure 3-11. The 22-type OLIU circuit packs in the Main positions carry ring traffic. The 22-type OLIU circuit packs in Function Unit B or C positions provide the optical extension capability.

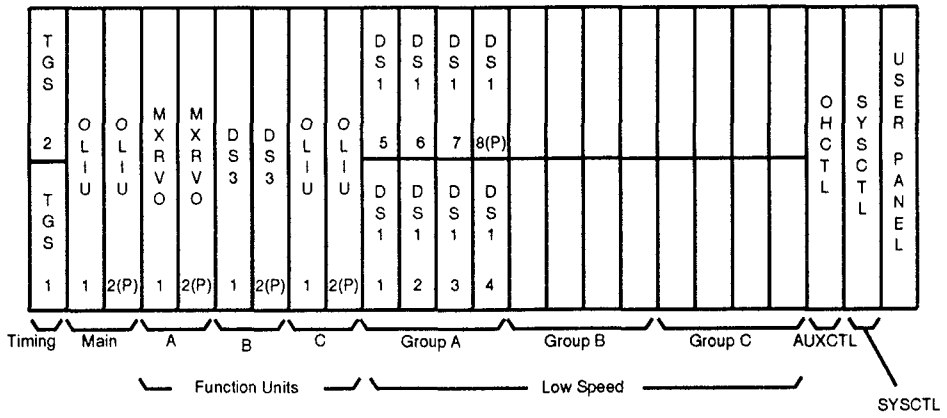
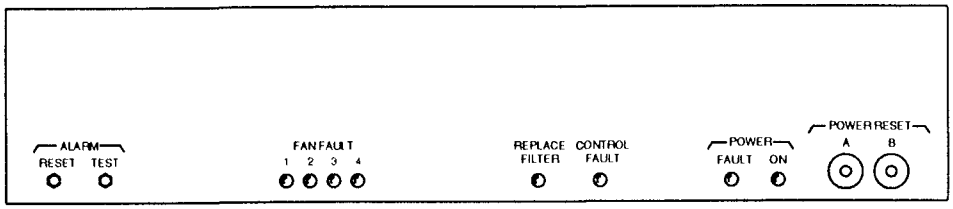


Figure 3-11. DDM-2000 OC-3 Ring Shelf With an Optical Extension

DDM-2000 Fan Shelf

The DDM-2000 Fan Shelf (Figure 3-12) provides forced convection cooling to DDM-2000 OC-12 shelves in controlled environments (central office and controlled environment vault) and DDM-2000 OC-3 shelves in uncontrolled environments.

Front View



Rear View

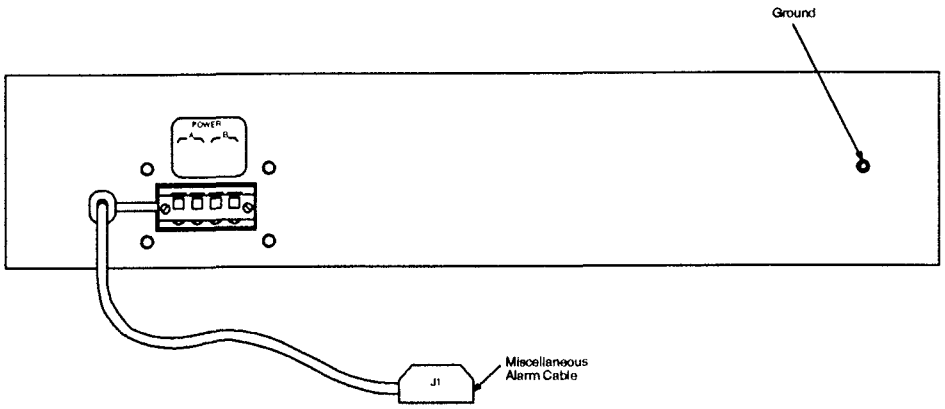


Figure 3-12. DDM-2000 Fan Shelf

The fan shelf is required in all DDM-2000 OC-12 Multiplexer applications in a controlled environment. The fan shelf is not required in OC-12 Regenerator applications. The fan shelf is only required in DDM-2000 OC-3 non-Network Equipment Building Standards (NEBS) environments (direct air inlet temperatures exceeding 50° C). The fan shelf is not required in DDM-2000 OC-3 controlled environment applications. All applications should be equipped with a heat baffle as shown in ED-8C727-10 for the DDM-2000 OC-12 Multiplexer and OC-12 Regenerator shelves and ED-8C724-10 for the DDM-2000 OC-3 Multiplexer.

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

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

When the front cover is removed, the four fan units and a 4-part switch to the left of center on the front of the shelf are visible. See Figure 3-13. The switches should be set as shown in Table 3-3.

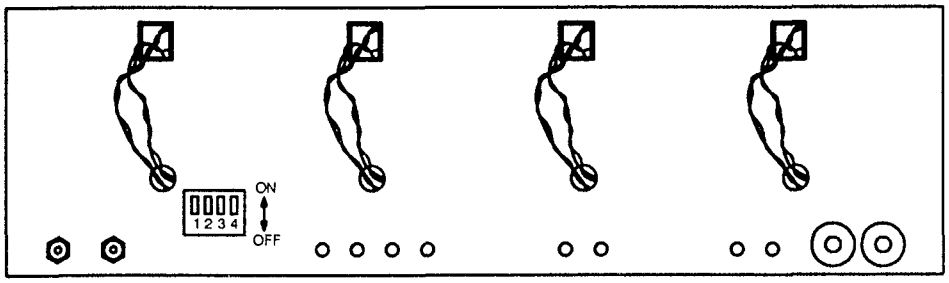


Figure 3-13. DDM-2000 Fan Shelf — Fan Switches — Front Cover Removed

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

Cooling Arrangement	Set Point	Switch Settings			
		S1	S2	S3	S4
DDM-2000 OC-3 * and DDM-2000 OC-12	400 fpm	on	off	on	on

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

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

A filter must be installed on the bottom of the DDM-2000 OC-3 or DDM-2000 OC-12 shelf that is directly under the fan shelf. The filter is attached to the bottom of the DDM-2000 OC-3 shelf by magnetic strips attached to the top of the filter frame.

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

* Registered trademark of Underwriters Laboratories Inc

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

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

Power

4

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Power

4

Overview

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

Introduction

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

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

Power Description

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

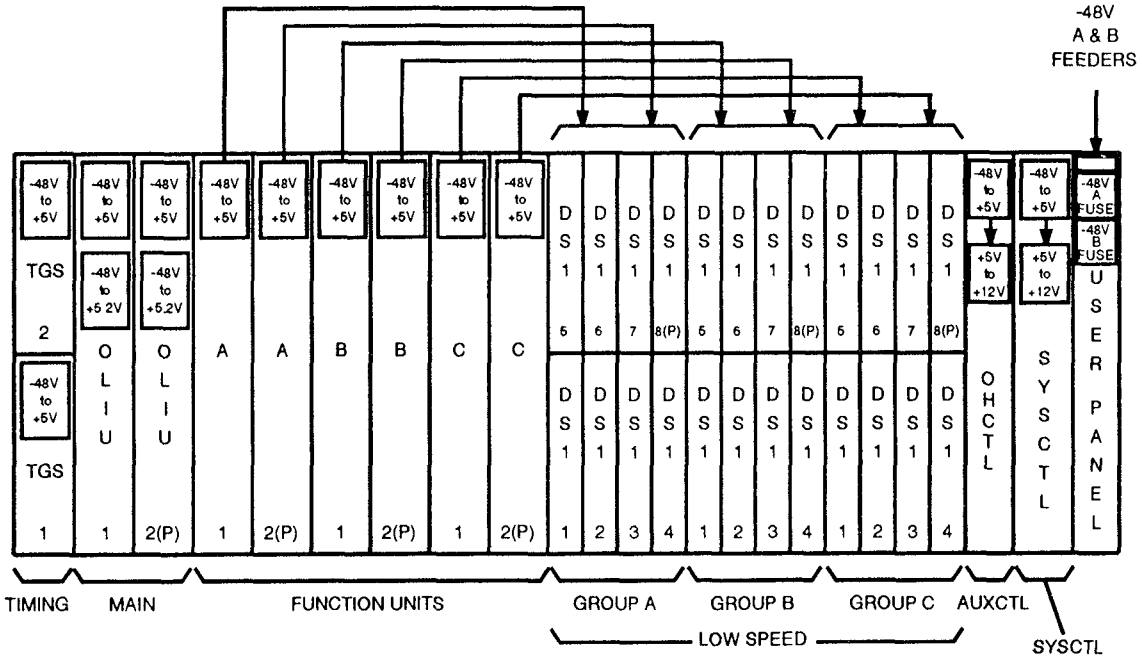


Figure 4-1. DDM-2000 OC-3 Power Architecture

Circuit Packs

OLIU Circuit Packs

The OLIU circuit packs are powered by two DC-to-DC converters located on the circuit packs. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and are fuse-mounted on each of the circuit packs. One converter supplies +5 volts and the other supplies –5.2 volts The 21D/21D-U OLIU circuit pack has one converter that supplies +5 volts and –5.2 volts.

TGS Circuit Packs

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

DS3 Circuit Packs

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

STS1E Circuit Packs

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

MXRVO Circuit Packs

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

DS1/DS1PM Circuit Packs

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

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

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

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

Control Circuit Packs

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

LEDs

A green power on (PWR ON) indicator on the user panel indicates that the shelf is receiving fused –48 volt power. The indicator will remain illuminated as long as either –48 volt feeder is supplying power to the shelf.

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

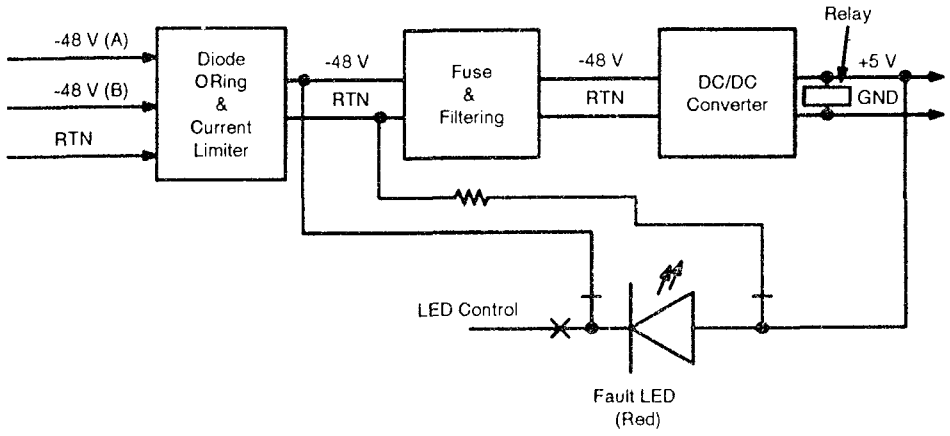


Figure 4-2. Circuit Pack Power and LED Control

Power Minor Alarm

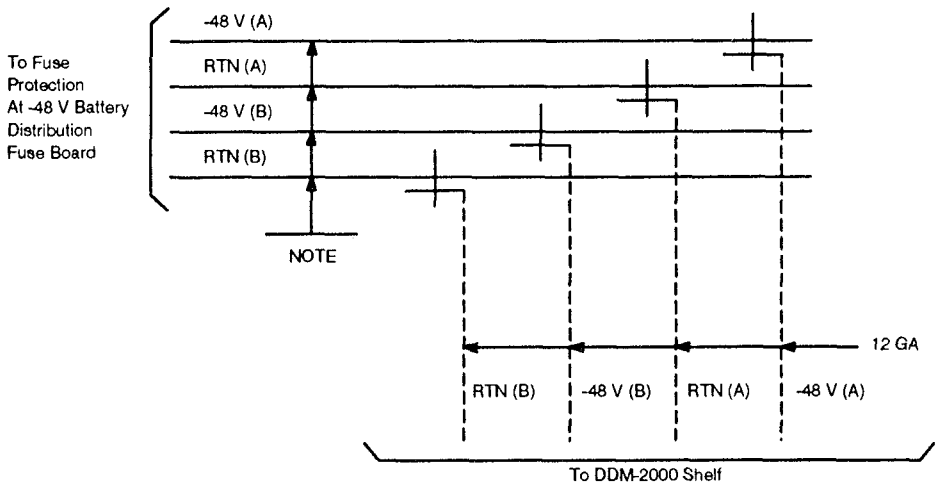
A yellow power minor (PMN) alarm LED is provided on the user panel to indicate an AC power failure at the remote terminal. The power minor alarm can be provisioned by a switch on the SYSCTL circuit pack at the central office (CO) to be either an office minor (MN) or office major (MJ) alarm. Power minor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

Power Distribution

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

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

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



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

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

Transmission and Synchronization Interfaces

5

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Transmission and Synchronization Interfaces

5

Overview

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

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

Application	Linear				Ring	
	R2.1	R3.1	R3.2	R6.x	R5.1	R7.x
DS1 Low-Speed	X	X	X	X	X	X
DS3 Low-Speed	X	X	X	X	X	X
EC-1 High-Speed	-	-	-	X	-	-
EC-1 Low-Speed	-	-	-	X	X	X
IS-3	-	-	X	X	-	X
OC-3	X	X	X	X	-	X
OC-3c	-	-	-	X	-	-

Transmission Interfaces

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

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

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

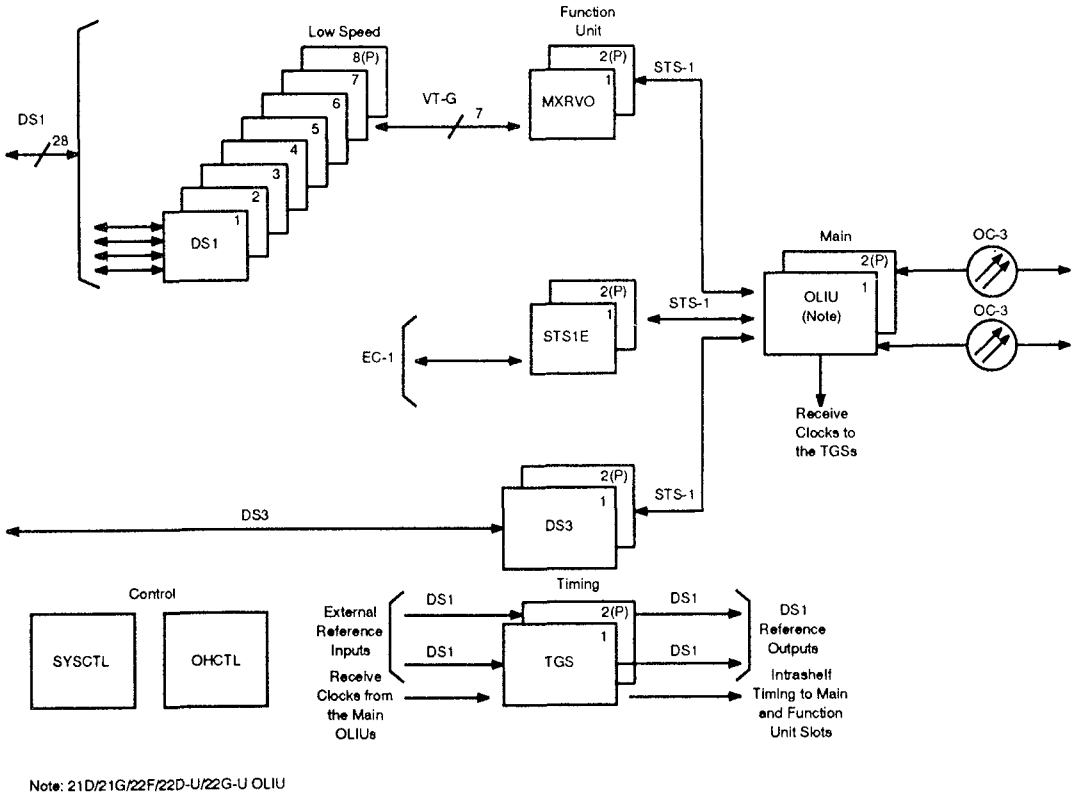


Figure 5-1. DDM-2000 OC-3 Multiplexer Block Diagram — Terminal

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

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

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

EC-1 electrical interfaces provide interworking between DDM-2000 OC-3 Multiplexers and other synchronous optical network (SONET) systems. The EC-1 high-speed interface lets the DDM-2000 OC-3 Multiplexer function as a SONET electrical multiplexer (Figure 5-4) between 28 DS1 signals and an EC-1.

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

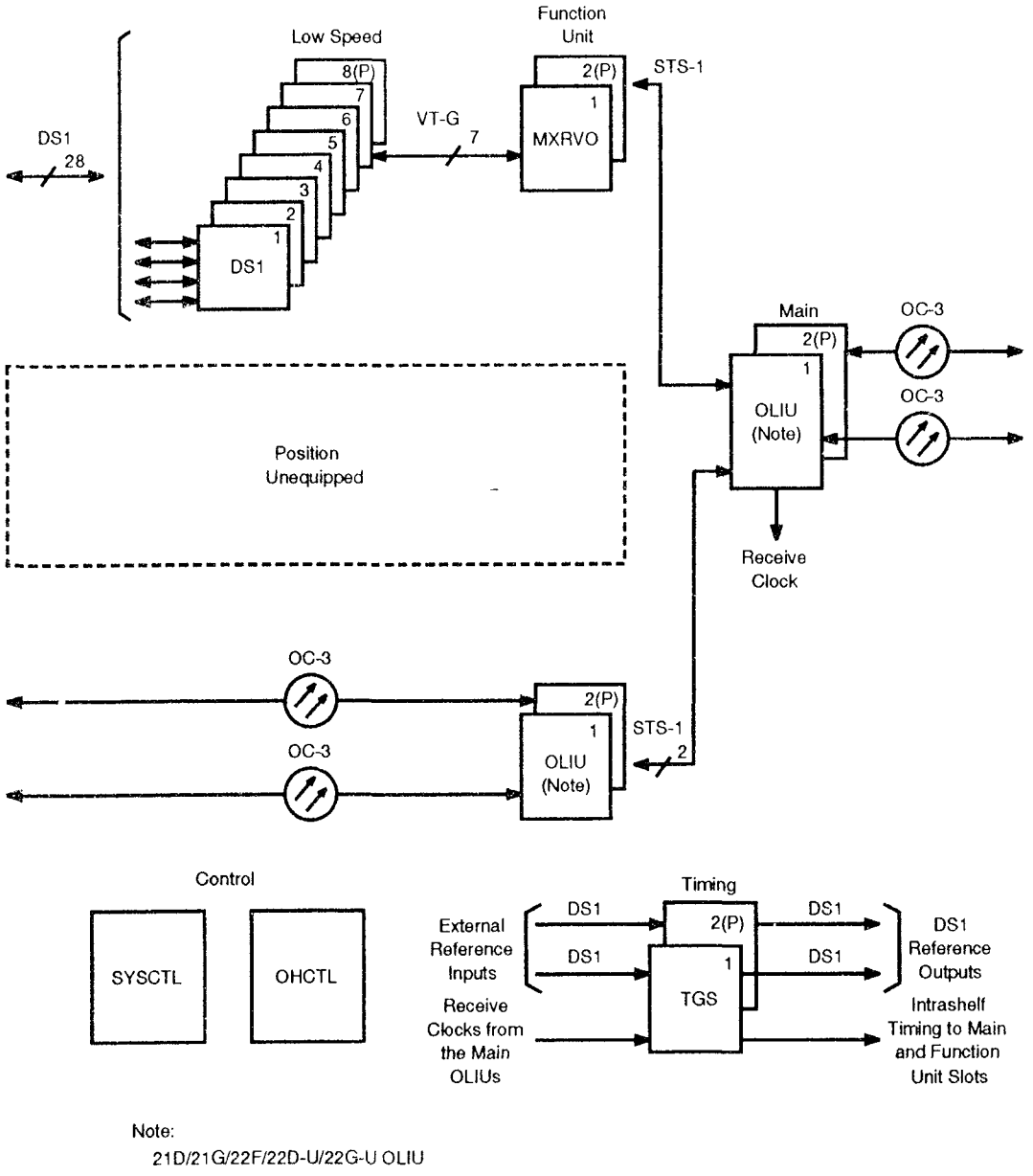
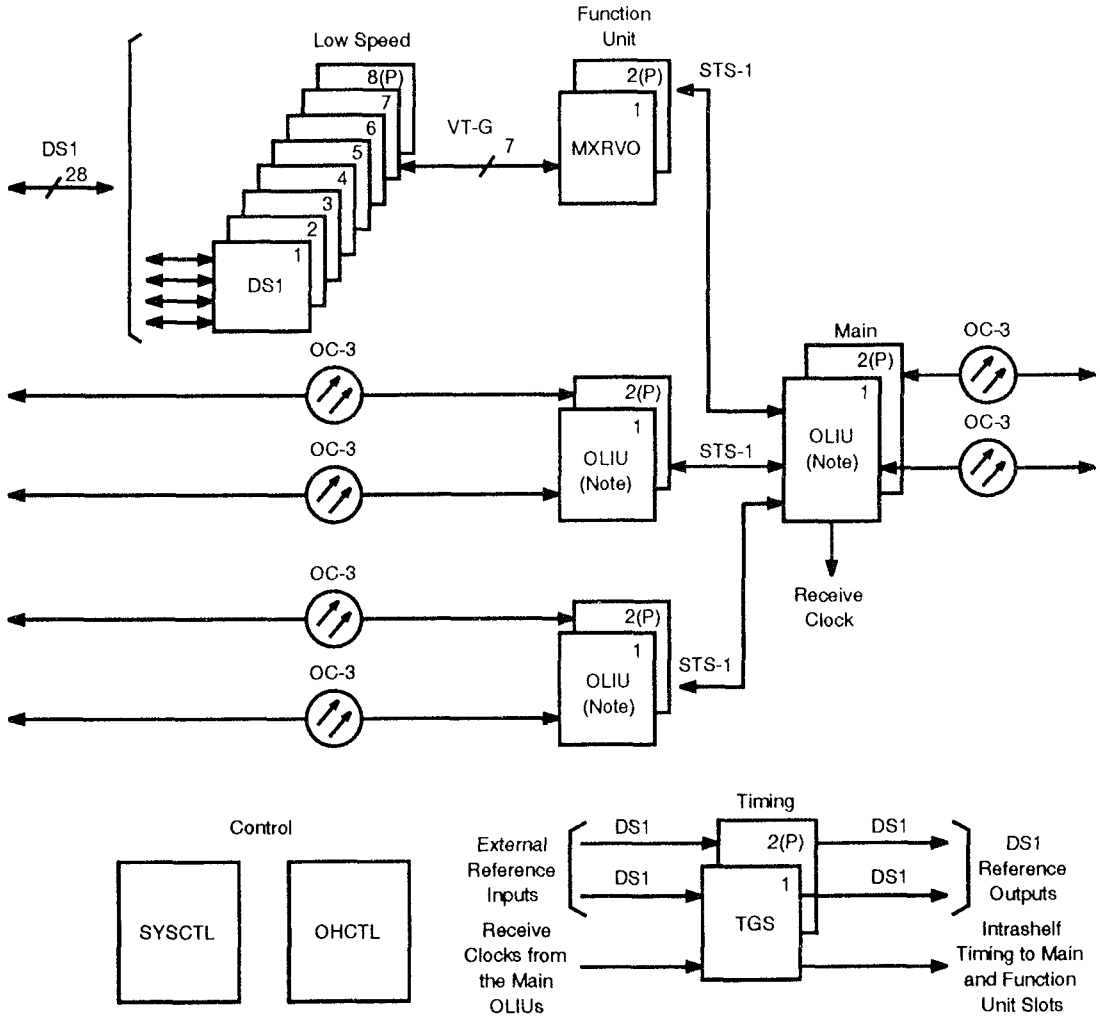


Figure 5-2. DDM-2000 OC-3 Multiplexer Block Diagram — STS-1 Drop



Note:
21D/21G/22F/22G-U/22D-U OLIU

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

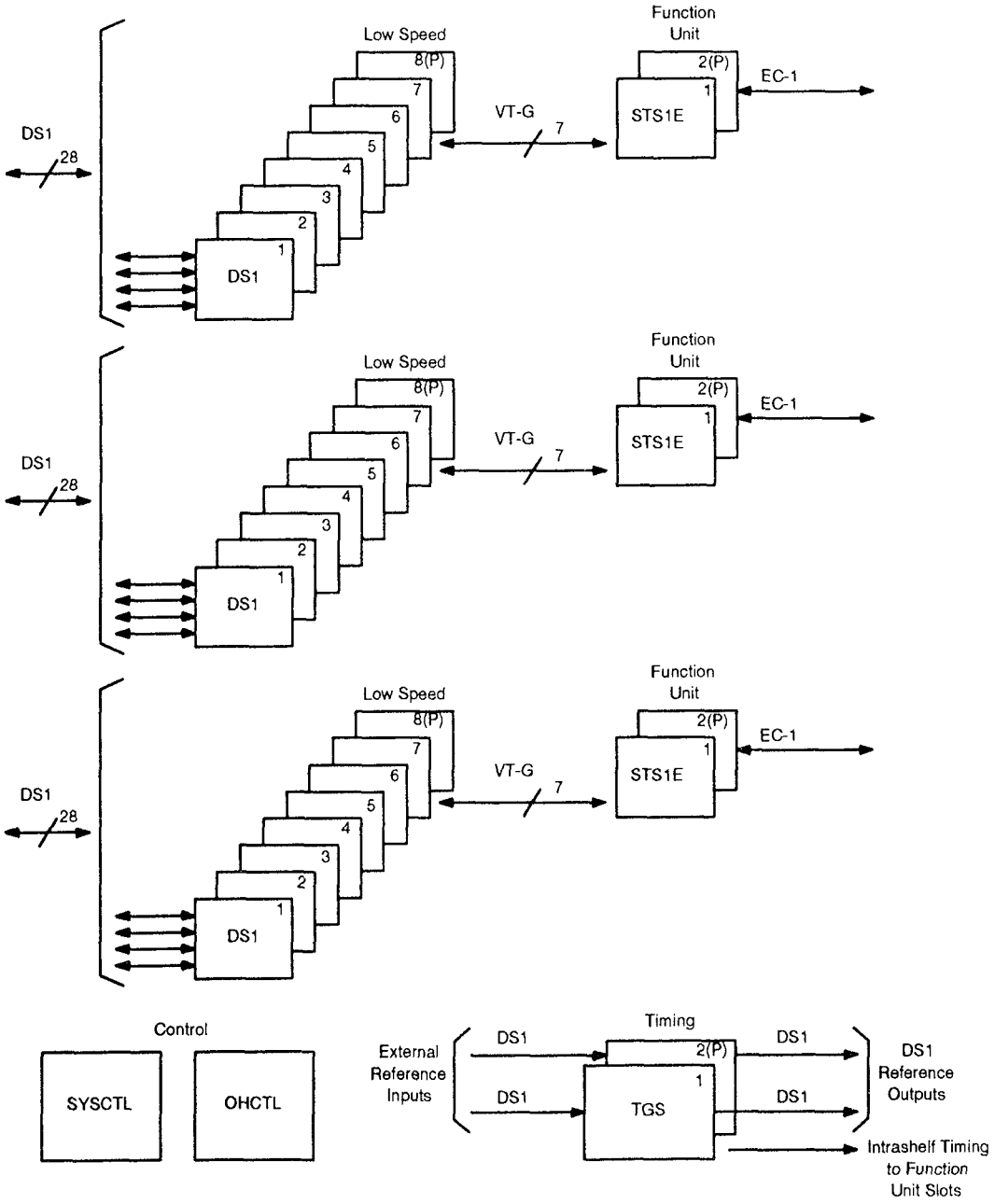
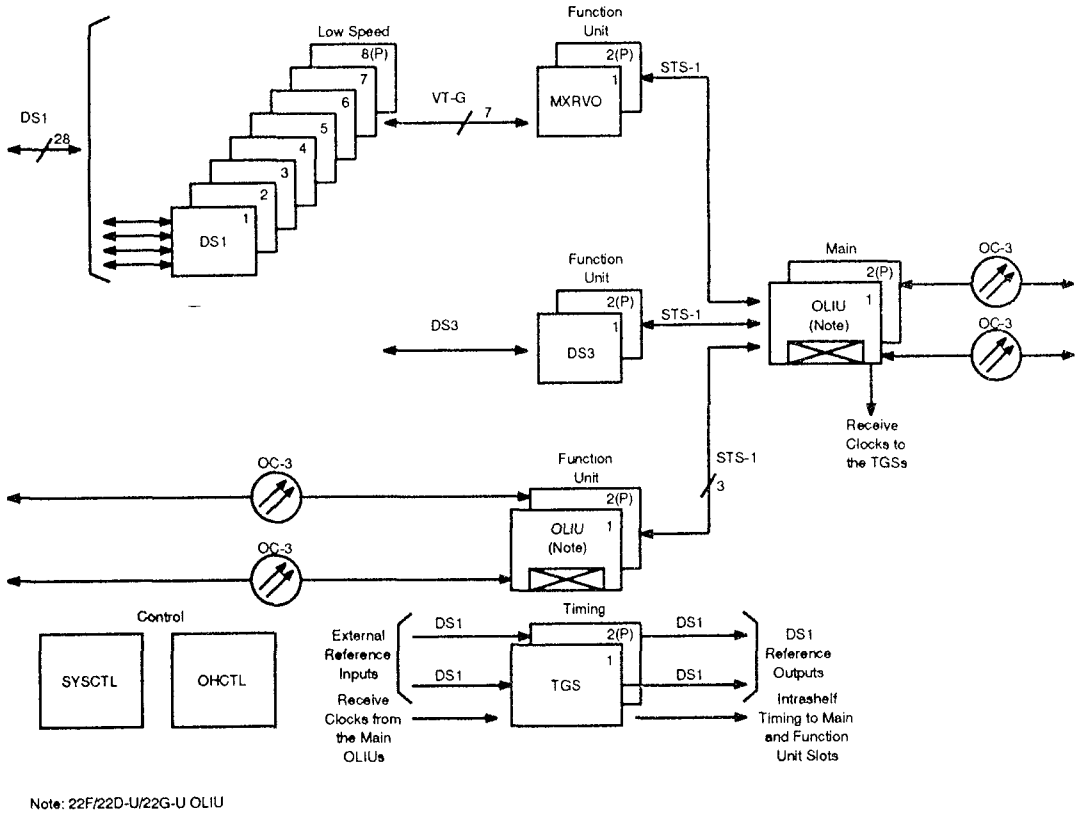


Figure 5-4. DDM-2000 OC-3 Multiplexer Block Diagram — SONET Electrical Multiplexer

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

Figure 5-5 is a block diagram of the DDM-2000 OC-3 Multiplexer VT1.5/STS-1 path switched ring application. The DDM-2000 OC-3 Multiplexer interfaces to the ring through the Main slots at the OC-3 rate and uses the programmable VT1.5/STS-1 TSI capability. Path switching can be done on VT1.5 paths, STS-1 paths or a mixture of these. Up to 84 DS1s, 3 DS3s, 3 EC-1s, 2 OC-3/IS-3 1+1 linear optical extensions, or equivalent combination can be added/dropped from the DDM-2000 OC-3 Multiplexer self-healing ring at any node. Because of the ring's path protection scheme, time slots must be reserved all the way around the ring for all ring traffic, limiting the capacity of the ring to the OC-3 line rate. Like the add/drop topology, the TSI feature offers full flexibility in assigning signals between low-speed DS1, DS3, EC-1 or OC-3 ports and the high-speed interface at each shelf.

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



Note: 22F/22D-U/22G-U OLIU

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

The DDM-2000 OC-3 Multiplexer can be provisioned as an OC-3/OC-3c repeater (Figure 5-6). This configuration provides a simple, cost effective method for extending an OC-3 line.

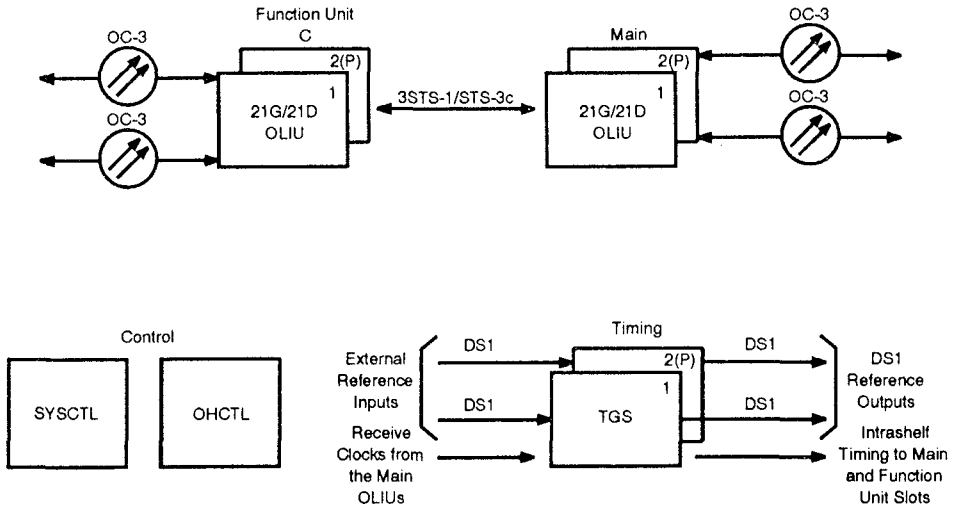


Figure 5-6. DDM-2000 OC-3 Multiplexer Block Diagram — OC-3/OC-3c Repeater

Synchronization Interfaces

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

- Free running from an internal oscillator
- Loop timing from an incoming optical interface. This timing reference is used to generate all outgoing signals and is also known as "line timing" for multispan applications.
- External timing from the digital synchronization network via DS1 references (DS1 External).

These timing modes are supported by both the BBF2 and BBF2B synchronous timing generator (TGS) circuit packs. The BBF2B circuit pack can be used in any BBF2 application and is preferred for use in ring networks.

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

Loop Timing. The reference signal feeding the phase-locked loop is selected from the internal oscillator or a loop-timing clock derived from the incoming optical line. In loop-timing mode, the OC-3 line being selected for transmission is also selected as the timing reference. In addition, if equipped with the BBF2B TGS, the OC-3 line in Function Unit C selected for transmission can optionally be selected for the timing reference. This selection is under the control of the on-board microcontroller and the system controller (SYSCTL) circuit pack and is dependent on the timing mode selected by the user via on-board selection switches and the status of the references. Loss of both loop-timing references causes the TGS circuit pack to go into holdover mode to maintain system timing.

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

Holdover. The TGS circuit pack has an internal TCVCXO that maintains shelf timing within ± 4 ppm for 24 hours in the event of an unprotected timing DS1 reference failure.

DS1 Reference Cascading (MULT mode). In a central office environment where multiple DDM-2000 Multiplexers are installed in a network bay frame, a pair of DS1 timing references from the local office clock can be shared by all shelves in the bay. This unique reference cascade feature reduces the number of clock ports needed to synchronize multiple DDM-2000 Multiplexers, thus minimizing network costs.

Each DDM-2000 provides two DS1 input ports and two DS1 output ports that reflect the DS1 signal appearing at the input ports. This cascade (MULT) feature reduces the number of clock ports needed to synchronize multiple colocated DDM-2000 Multiplexers, thus minimizing network costs. The incoming DS1 reference signals are input to the bottom shelf of a bay (Shelf 1) and cascaded towards the top of the bay using multipling cables. See AT&T 363-206-200, *DDM-2000 Multiplexer Applications, Planning, and Ordering Guide* for cabling information.

DS1 Synchronization Output. The DS1 output port of the BBF2 TGS circuit pack is permanently provisioned to MULT mode when the timing mode hardware switches on the circuit pack are set to "DS1 external".

The BBF2B TGS circuit pack can be provisioned to provide either a DS1 output for MULT mode or for network synchronization (SYNC OUT) mode.

The Free Running, Loop Timing, and DS1 External timing modes are supported by both the BBF2 and BBF2B TGS circuit packs. They can be combined into various subnetwork configurations, some of which are shown in Figure 5-7. The figures show basic single span configurations. In more complex subnetworks such as hubbing, these basic span configurations are duplicated and/or mixed, depending on the application, to produce a subnetwork synchronization configuration.

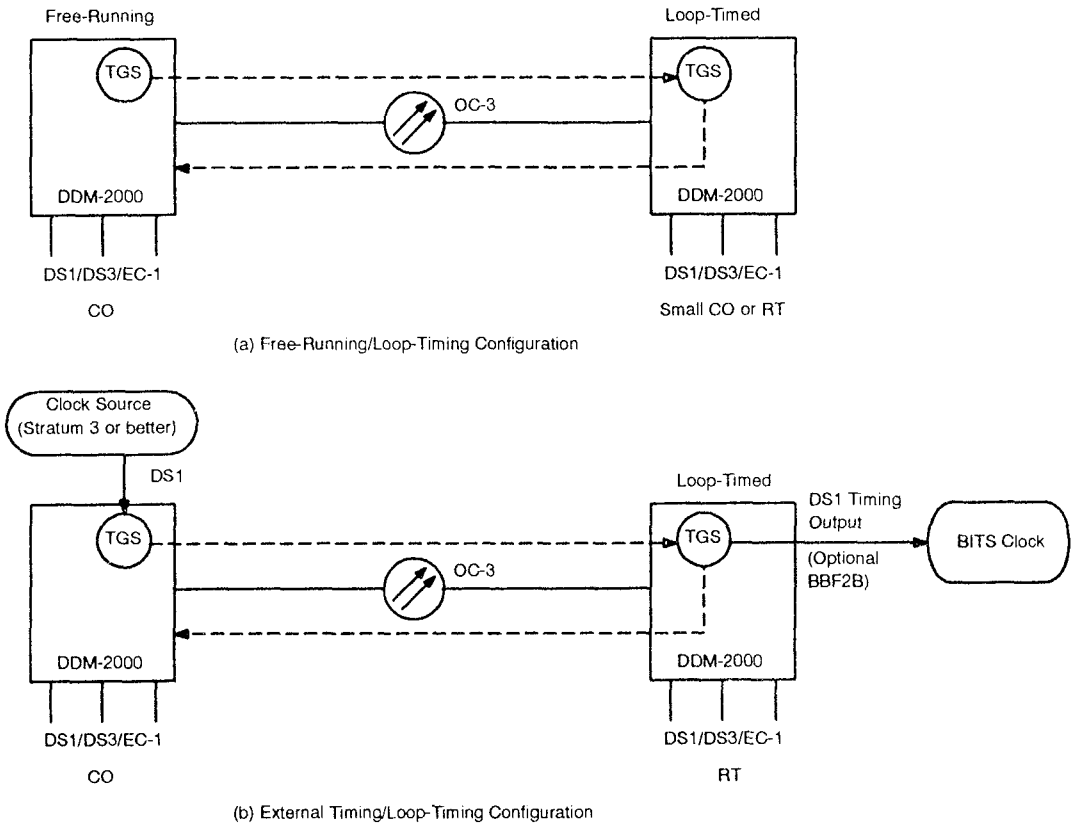
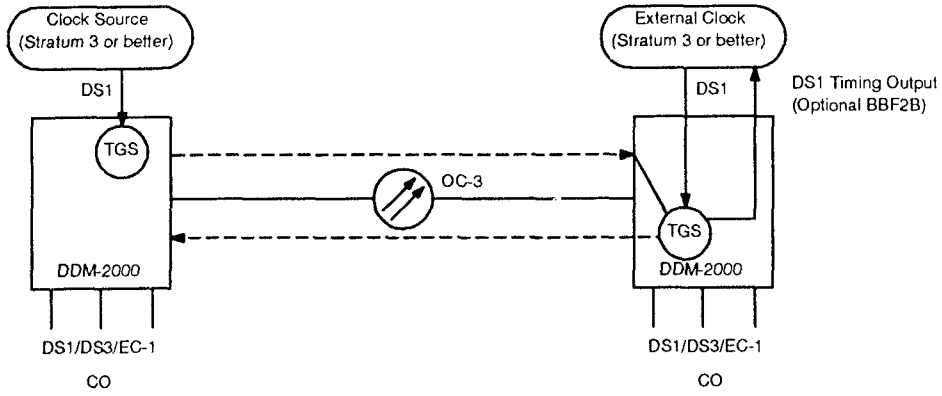


Figure 5-7. Synchronization Timing Configurations (Sheet 1 of 2)

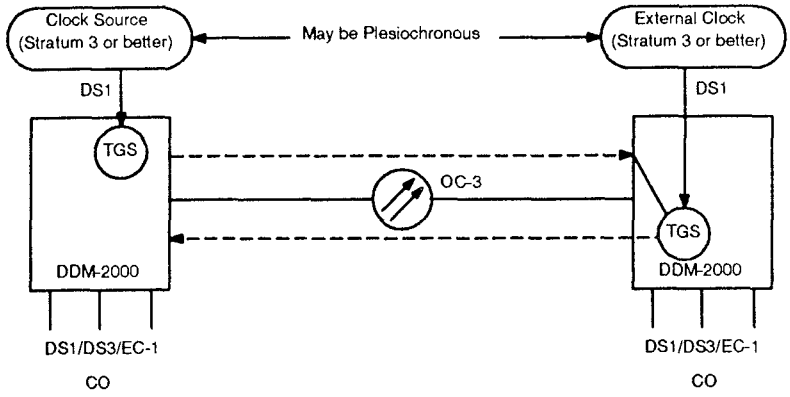
Figure 5-7a shows the central office (CO) system is internally timed (free-running). At the remote terminal (RT), the TGS derives its timing from the incoming optical signal and uses it to time itself and loop timing back to the CO.

Figure 5-7b and 7c shows the CO timed from an external Stratum 3 source. The RT derives its timing from the incoming optical line and, if an optional BBF2B TGS is used, can send a DS1 output to a BITS clock.

The external timing configuration (Figure 5-7d) uses external DS1 timing to each DDM-2000 Multiplexer in the network. Since this configuration requires local office clocks at each site, it is most suited to interoffice applications. A DDM-2000 network may have all DS1 references traceable to a primary reference source (synchronous operation) or multiple primary reference sources (plesiochronous operation).



(c) External Timing At Both Ends Configuration



(d) External Timing Plesiochronous

Figure 5-7. Synchronization Timing Configurations (Sheet 2 of 2)

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

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

Application	Linear				Ring	
	R2.1	R3.1	R3.2	R6.x	R5.1	7.x
Free Running	X	X	X	X	X	X
Loop Timing	X	X	X	X	X	X
External Timing	X	X	X	X	X	X
DS1 Sync Output (BBF2B)	-	X	X	X	X	X
Synchronization Messaging	-	-	-	X	X	X
Loop Timing from Fn-C (BBF2B)	-	-	X	X	-	X
Automatic Synchronization Reconfiguration	-	-	-	X *	-	X

* Release 6.1 and later linear releases.

SONET synchronization messaging is used to communicate the quality of subnetwork timing, internal timing status, and timing states throughout a subnetwork. Transitions to and from holdover or between OC-3 references, for shelf timing, and to and from DS1 AIS, for the DS1 Output, are based on synchronization messages received over the OC-3 line from which the DDM-2000 system is extracting timing (DDM-2000 OC-3 Release 5.1, 6.x, and 7.x).

In linear networks with synchronization messaging, the BBF2B circuit pack allows loop timing and automatic switching from either of two incoming optical interfaces, Main OLIU group or Function Unit slot C when equipped with an OLIU (Release 3.2 and 6.0).

In ring networks with synchronization messaging, either TGS circuit pack allows loop timing and automatic switching from either of the two ring optical interfaces (Release 7.x).

Synchronization Messaging

The DDM-2000 Multiplexers provide a synchronization messaging feature to ensure the integrity of network synchronization during both normal and abnormal conditions. Through the use of synchronization messaging, the current quality of the timing source can be conveyed from one DDM-2000 Multiplexer to the next. This capability allows the DDM-2000 Multiplexers to automatically change their timing reference in order to always maintain the highest quality timing available. The capability also allows the DDM-2000 Multiplexers to inform a local BITS clock when the DS1 timing output has been degraded and should no longer be used as a reference. This synchronization messaging feature is based on the scheme developed in the ANSI T1X1 standards committee.

Applications

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

1. DS1 Timing Output Integrity
2. Automatic Synchronization Reconfiguration
3. Synchronization Provisioning Integrity.

DS1 Timing Output Integrity

The DS1 timing outputs are typically used to distribute timing from the BITS clock in one office (master) to the BITS clock in the next office (slave), using the SONET transmission facilities between them as the synchronization vehicle. The BITS are typically of Stratum 2 or Stratum 3 accuracy while the DDM-2000 Multiplexers are considered a 20 ppm clock (between Stratum 3 and Stratum 4). The DDM-2000 Multiplexer does not introduce its own internal timing source onto the SONET facility but merely transfers the quality of its timing reference. This ability preserves the required hierarchical structure of the timing network and should be maintained at all times.

If the DDM-2000 Multiplexer at the master office enters holdover due to a disconnected reference cable or a local BITS failure, the quality of the DS1 timing output at the slave office will now be traceable directly to the DDM-2000 Multiplexer. The timing hierarchy has now been violated. Although the DDM-2000 Multiplexer will maintain Stratum 3 quality for at least 24 hours of holdover, the office BITS clock will likely have a more accurate holdover capability. Eventually the DDM-2000 Multiplexer holdover accuracy could exceed Stratum 3 quality and cause the slave clock to lose lock on the reference. Another scenario that could cause the quality of the DS1 timing output to be exceeded would be in applications where at least one loop timed DDM-2000 Multiplexer exists at a site between the master and slave offices. In this scenario, a fiber cut between the master office and the loop timed site would cause a DDM-2000 Multiplexer to enter holdover.

As shown in Figure 5-8a, SONET synchronization messaging notifies the DDM-2000 Multiplexer at the slave site to place AIS on the DS1 timing output. This BITS can then enter holdover or switch to an alternate reference.

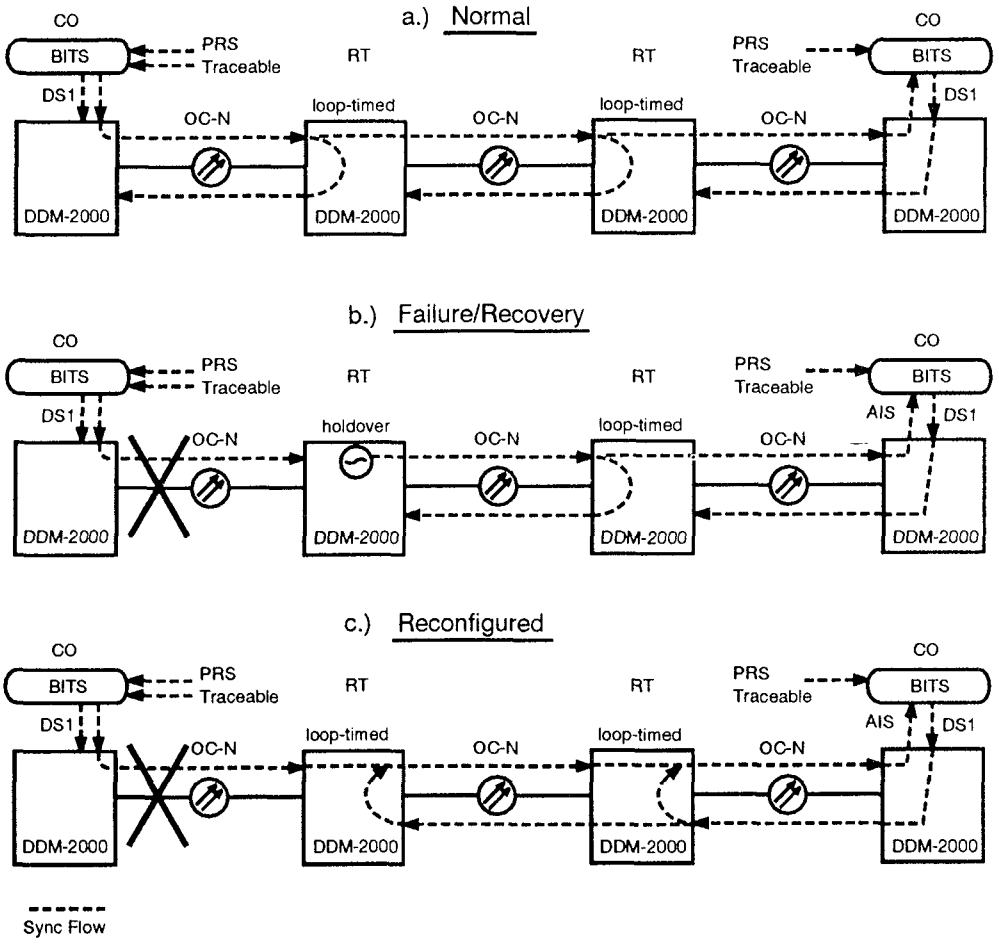


Figure 5-8. DS1 Timing Output — Dual Homing Linear

Automatic Synchronization Reconfiguration

SONET was designed to operate optimally in a synchronous environment. Although plesiochronous and asynchronous operation can be supported through the use of pointer adjustments, transmission quality is affected by the generation of additional jitter and wander due to pointer adjustments. Because of this, it is desirable to maintain synchronous operation whenever possible. Through the use of synchronization messages, the quality of the different timing references can be made available at each DDM-2000 Multiplexer. The DDM-2000 Multiplexer shelf can always determine the best timing reference available to it and switch to that reference (Release 6.1 and later linear, Release 7.0 and later

ring). Through this mechanism, the synchronous operation of the subnetwork can be maintained. The switching of timing references is hitless, and the synchronization messages also allow it to be done without creating timing loops in the process. Note that automatic synchronization reconfiguration applies only to switching between available and valid loop timing references and not between timing modes. For example, switching between loop timed to external timed or external timed to loop timed would not be supported.

In the linear dual-homing network in Figure 5-8c, normal operation includes an external timing reference at each of the central offices. The remote terminal sites are each loop timed from the central office DDM-2000 Multiplexers on the left. If a fiber failure occurs between the first two DDM-2000 Multiplexers, the synchronization autoreconfiguration feature will cause the loop timed DDM-2000 Multiplexers to change their direction of loop timing. This prevents any DDM-2000 Multiplexer from operating in holdover for an extended period of time.

Consider the access ring network in Figure 5-9. Under normal operation, the ring has one DDM-2000 Multiplexer externally timed and the others loop timed in the counterclockwise direction. If a fiber failure occurs between the first two DDM-2000 Multiplexers, the synchronization autoreconfiguration feature will cause the DDM-2000 Multiplexers to change their loop timing directions to clockwise. The result is that the ring is again operating synchronously. The ring already provides self-healing of the traffic, so it is especially important to maintain synchronous operation during this type of failure to prevent service degradation due to increased jitter and wander.

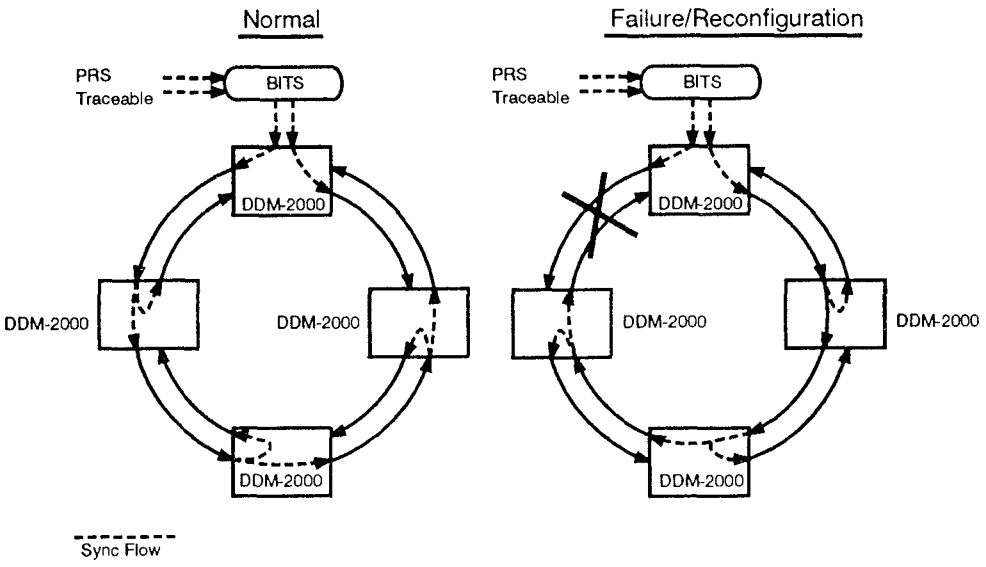


Figure 5-9. Synchronization Reconfiguration — Access Ring

Synchronization Provisioning Integrity

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

Feature Details and Options

As mentioned previously, SONET synchronization messaging is used to communicate the quality of the subnetwork timing throughout the subnetwork. This is done using bits 1-3 of the K2 byte found in the SONET overhead. If a DDM-2000 system is deriving timing from a given OC-N interface and synchronization messaging is enabled on that interface (Kbyte messages are enabled using the `set-ocn` command), the system interprets the received message to determine its internal timing status. The system also determines the state of the DS1 output, if the DS1 output is enabled. The DDM-2000 system also transmits over the particular OC-N interface and all other OC-N interfaces that are enabled for synchronization messaging, the appropriate message indicating the quality of its timing and its active timing mode. Table 5-3 lists the associated internal timing status and DS1 Output states that are associated with synchronization messages received from the OC-N interface when synchronization messaging is enabled. These messages can be retrieved using the `rtrv-sync` command. The table lists the messages from low to high quality.

Table 5-3. Synchronization Messages

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

* This column applies only when provisioned for loop time mode.

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

Synchronization messaging using the SONET K2 byte can be disabled on a per OC-N interface using the `set-ocn` command. Zeros will be transmitted on bits 1-3 of the K2 byte if this is done. The timing and synchronization status of a shelf can be determined using the `rtrv-sync` command.

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

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

When the DDM-2000 system is configured for external timing and its DS1 output port is provisioned for SYNC OUT mode, the Timing Looped Back message will be sent on the OC-N interfaces towards the network element from which the DS1 timing output is being derived. The Sync Quality Unknown message will be sent on all other OC-N interfaces where synchronization messaging is enabled. If the DS1 output is generating AIS while the system is configured in this way, the message Sync Quality Unknown will be transmitted on all OC-N interfaces.

When the DDM-2000 system is configured for free run or is in holdover mode, the Internal Clock message will be sent on all OC-3 interfaces where synchronization messaging is enabled.

When the DDM-2000 system is configured for loop timing, the Timing Looped Back message will be sent on the OC-N interfaces towards the network element from which the timing is being derived. The message received on the OC-N interface will be sent on all other OC-N interfaces where synchronization messaging is enabled.

With automatic synchronization reconfiguration (not supported in OC-12 linear configurations), the DDM-2000 Multiplexer systems use and compare the incoming synchronization messages on the OC-N interfaces available for loop timing to select the highest quality synchronization reference available. If the received quality levels are the same on the references available for timing, the existing loop timing reference takes precedence. This feature guarantees the non-revertive operation of reconfiguration. (Release 6.1 and later linear releases and 7.0 and later ring releases for OC-3; Release 3.0 and later ring releases for OC-12). The loop timing reference is provisioned by the `set-sync` command. The `switch-sync` command can be used to manually switch between timing references (Release 6.2 and later linear releases, Release 7.1 and later ring releases). Table 5-3 lists the synchronization messages in ascending order.

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

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

Table 5-4 lists the synchronization references available on DDM-2000 OC-3 and OC-12 system topologies.

Table 5-4. Available Synchronization References

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

Examples

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

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

Synchronization Reconfiguration in an Access Ring

Figure 5-10a shows the access ring operating in its normal configuration. The DDM-2000 Multiplexer at the CO is externally timed, and each of the other DDM-2000 Multiplexers are loop timed in a counterclockwise direction. The sync quality unknown (SQU) message is sent to indicate where timing is traceable to an external BITS and where it is valid to be used. The timing looped back (TLB) message is sent on the interface used as the loop timing reference because a timing loop would be created if this timing reference were used. Synchronization messaging and automatic synchronization have both been enabled for this network.

In Figure 5-10b, a fiber has been cut between sites A and B. Immediately, the DDM-2000 Multiplexer at site B enters holdover and sends out the internal clock (IC) message to site C. The DDM-2000 Multiplexer at site B can not switch to loop time from site C because it is receiving the TLB message on that interface and continues to derive timing from site B.

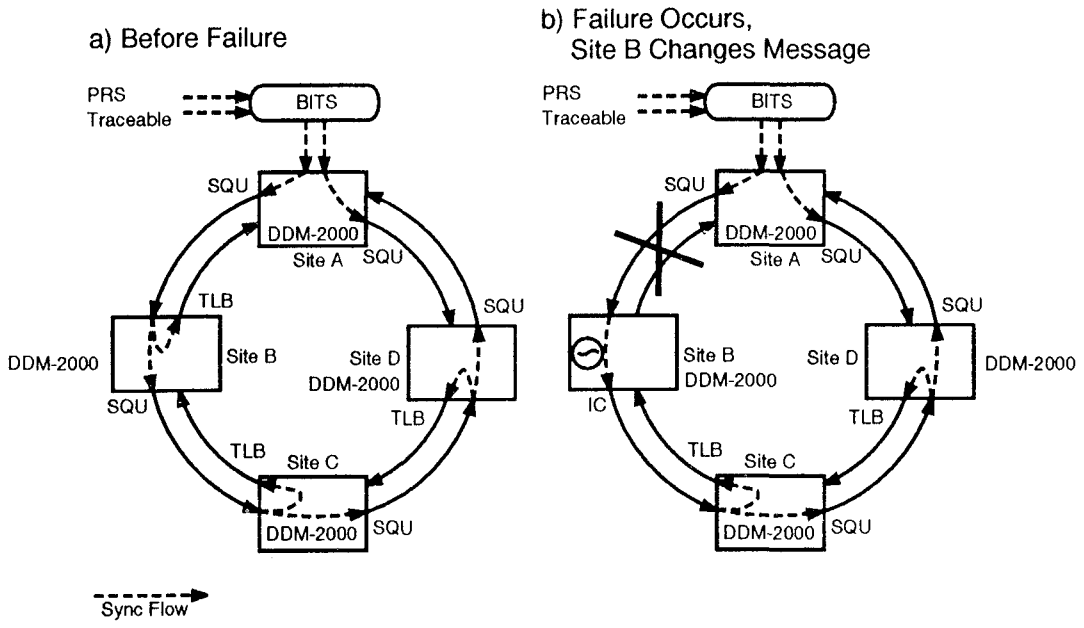


Figure 5-10. Synchronization Reconfiguration — Access Ring — Sheet 1 of 3

In Figure 5-10c, the DDM-2000 Multiplexer at site C detects the incoming IC message and sends out the IC message to site D. The DDM-2000 Multiplexer at site C can not switch to loop time from the other rotation because it is receiving the TLB message on that interface and continues to derive timing from Site B.

In Figure 5-10d, the DDM-2000 Multiplexer at site D detects the incoming IC message. Because this DDM-2000 Multiplexer is receiving the SQU message from site A, it will switch to loop time from site A because SQU is higher quality than IC. After the switch occurs, the TLB message is sent back to site A and the SQU message is retransmitted to site C.

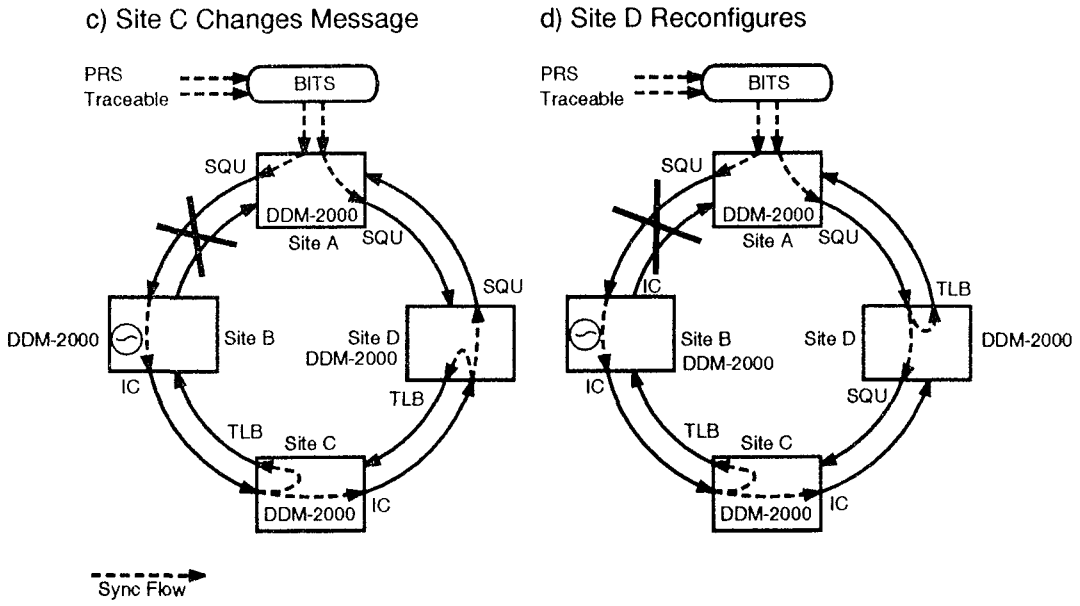


Figure 5-10. Synchronization Reconfiguration — Access Ring — Sheet 2 of 3

In Figure 5-10e, the DDM-2000 Multiplexer at site C detects the incoming SQU message from site D. The SQU message is a better quality message than the IC message being received from site B, so the DDM-2000 Multiplexer at site C switches to loop time from site D. After the switch occurs, the TLB message is sent back to site D, and the SQU message is retransmitted to site B.

In Figure 5-10f, the DDM-2000 Multiplexer at site B detects the incoming SQU message from site C. The SQU message is a better quality message than the internal holdover capability, so the DDM-2000 Multiplexer at site B switches to loop time from site C. After the switch occurs, the TLB message is sent back to site C, and the SQU message is forwarded to site A.

When the failure clears, the current synchronization arrangement remains in the new configuration unless it is manually switched back or another failure causes it to switch back (non-revertive operation).

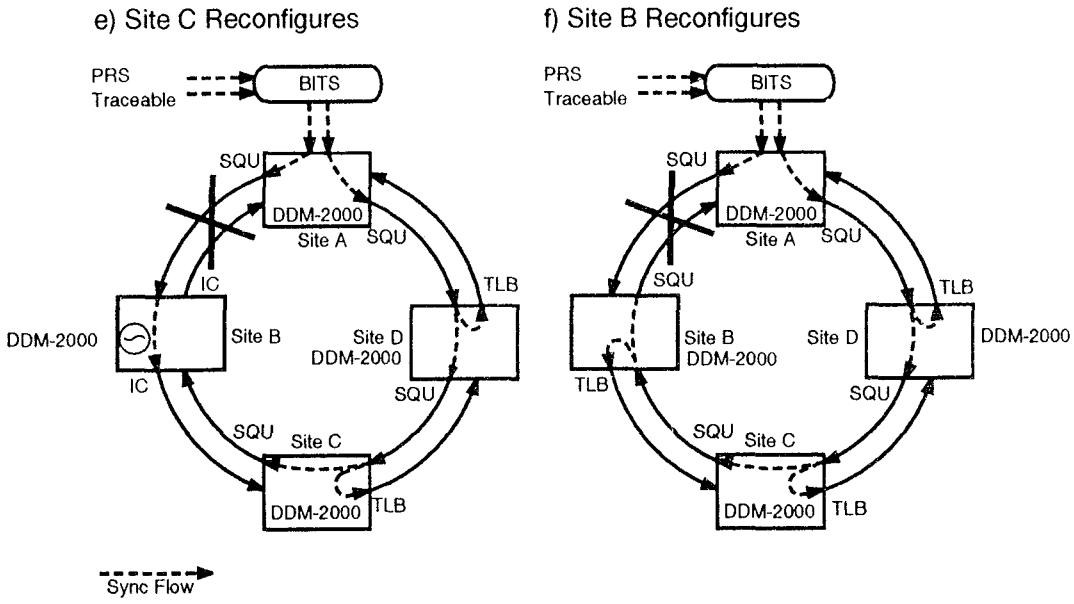


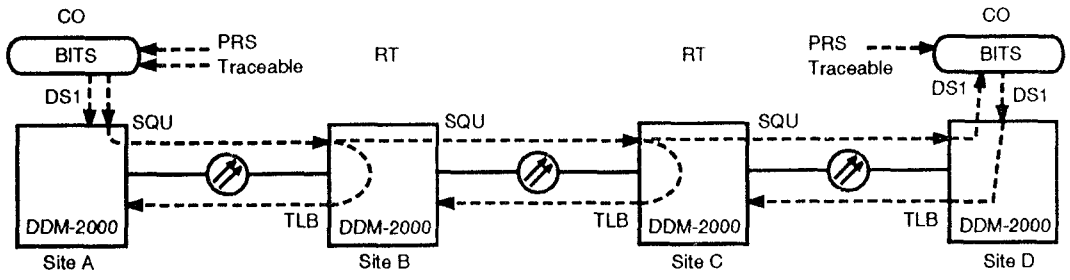
Figure 5-10. Synchronization Reconfiguration — Access Ring — Sheet 3 of 3

Synchronization Messaging to Support DS1 Timing Outputs

Figure 5-11a shows a dual homing linear network operating in its normal configuration. The DDM-2000 Multiplexer at site A is externally timed, and the DDM-2000 Multiplexers at sites B and C are loop timed from site A. The DDM-2000 Multiplexer at site D is also externally timed from another BITS which may be receiving timing from a DS1 timing output at site D, causing the outgoing TLB message to be sent from site D. Both BITS should be PRS traceable. The SQU message is sent to indicate where timing is traceable to an external BITS and where it is valid to be used. The TLB message is sent to indicate where loop timing has been used and, thus, where using that timing would create a timing loop. Synchronization messaging has been enabled for this network but automatic synchronization reconfiguration has not been enabled.

In Figure 5-11b, a fiber has been cut between sites A and B. Immediately, the DDM-2000 Multiplexer at site B enters holdover and sends out the IC message to site C.

a) Before Failure



b) After Failure, Site B Changes Message

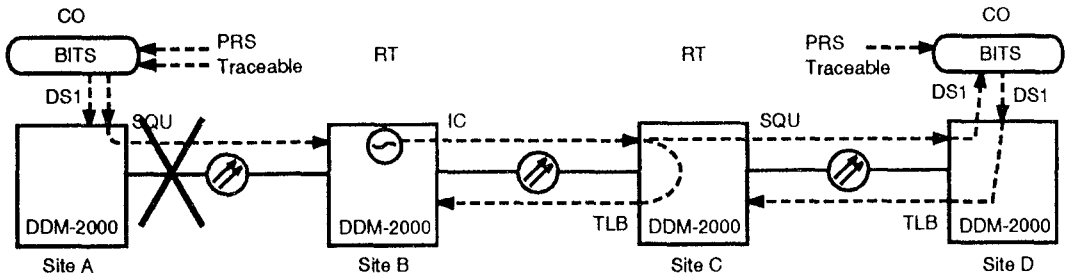


Figure 5-11. DS1 Timing Output with Fiber Failure — Sheet 1 of 2

In Figure 5-11c, the DDM-2000 Multiplexer at site C detects the incoming IC message from site B and forwards it on to site D.

In Figure 5-11d, the DDM-2000 Multiplexer at site D detects the incoming IC message from site C and sends out AIS to the BITS. The BITS will either switch to an alternate reference, if available, or enter holdover.

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

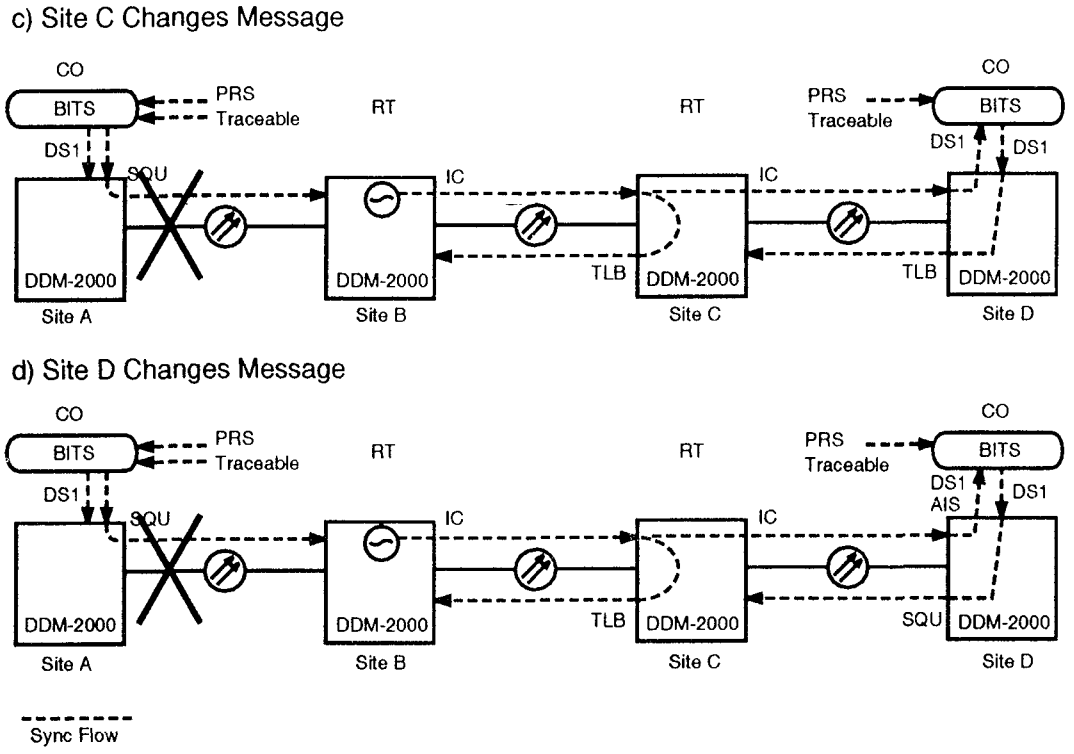


Figure 5-11. DS1 Timing Output with Fiber Failure — Sheet 2 of 2

Network Timing Distribution

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

Inter Office Timing Distribution

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

With OC-N timing distribution, the OC-N line signal, rather than a DS1 multiplexed into the SONET payload, will provide a timing transport mechanism better suited to a complex, heavily interconnected SONET network. In this configuration, a DS1 reference from the central office BITS clock still times the OC-N transmitted to the remote site; at the remote site, a DS1 output reference is created directly from the received OC-N signal (Figure 5-12).

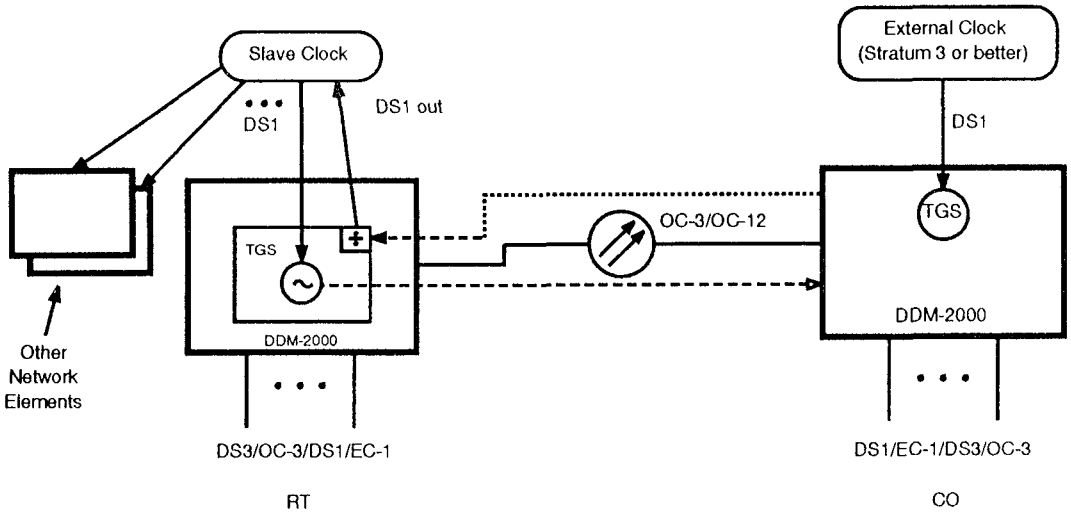


Figure 5-12. OC-N Derived DS1 Timing Reference

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

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

Access Network Timing Distribution

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

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

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

It is recommended that, where possible, the DS1 sources (switch, PBX, or other equipment) be traceable to the same timing source used to time the DDM-2000 SONET network. Multiplexed DS1 reference transport is also consistent with current planning and administration methods. Applications include passing synchronization from the public switched network to a PBX-based private network (Figure 5-13) and synchronizing an end-office remote switch to a larger office's host switch.

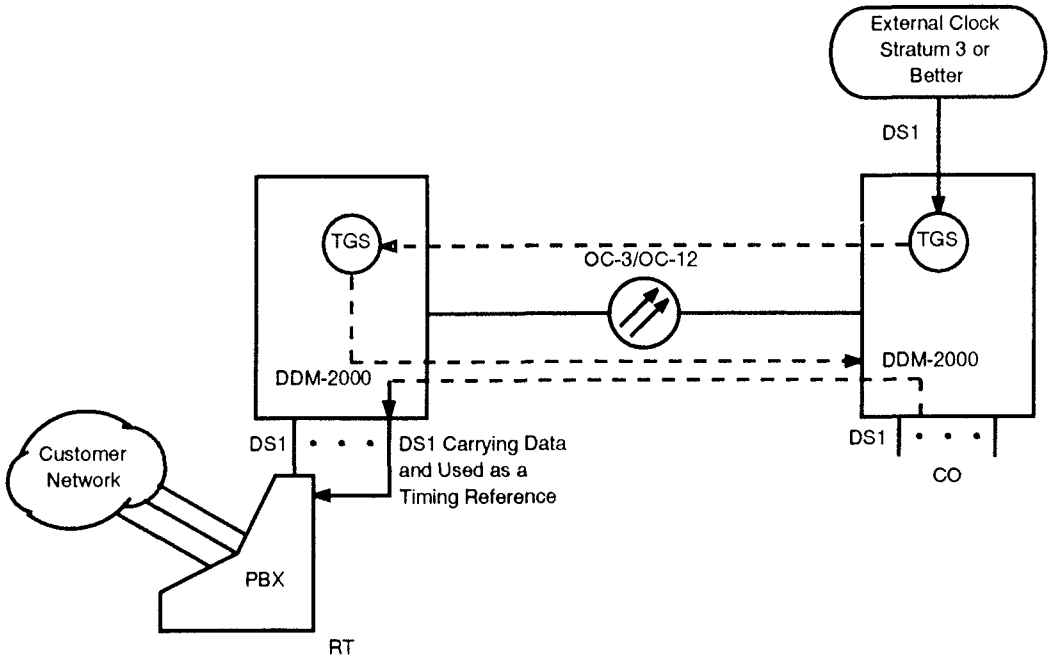


Figure 5-13. Timing from Multiplexed DS1

Operations Interfaces

6

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Operations Interfaces

6

Overview

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

Operations interfaces include:

- Two EIA-232-D craft interface terminal (CIT) interfaces
- User panel controls and indicators
- Equipment status indicators
- Office alarms
- TL1/X.25 interface to an alarm surveillance operations system such as Bellcore's Network Monitoring and Analysis (NMA) and Operations Systems/Intelligent Network Elements (OPS/INE) operations systems and AT&T operations systems.
- Serial telemetry (TBOS)
- Parallel telemetry
- User definable miscellaneous discrete environmental alarms and controls
- Orderwire.

Complete detailed information on the operations system interfaces is provided in AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide.*

Craft Interface Terminals

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

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

A CIT is an American Standard Code for Information Interchange (ASCII) terminal normally referred to as a "dumb" terminal. An *MS-DOS** personal computer (PC) is required for software download. Any PC may function as a CIT when loaded with a commercially-available terminal emulation program. See Section 10, "Technical Specifications" for PC specifications.

Table 6-1 lists some, but not all, of the terminals and PCs that can be used with the CIT interface. Note that some terminals and PCs may no longer be commercially available but can still be used.

* Registered trademark of Microsoft Corporation.

Table 6-1. Craft Interface Terminals

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

† Was *Teletype*® 5425 or ATTIS 4425.

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

§ Trademark of Digital Equipment Corporation.

¶ Registered trademark of Hewlett-Packard Company.

** With terminal emulation software.

†† Registered trademark of International Business Machines Corporation.

‡‡ Registered trademark of Toshiba Corporation.

§§ Registered trademark of NCR Corporation.

Local Access

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

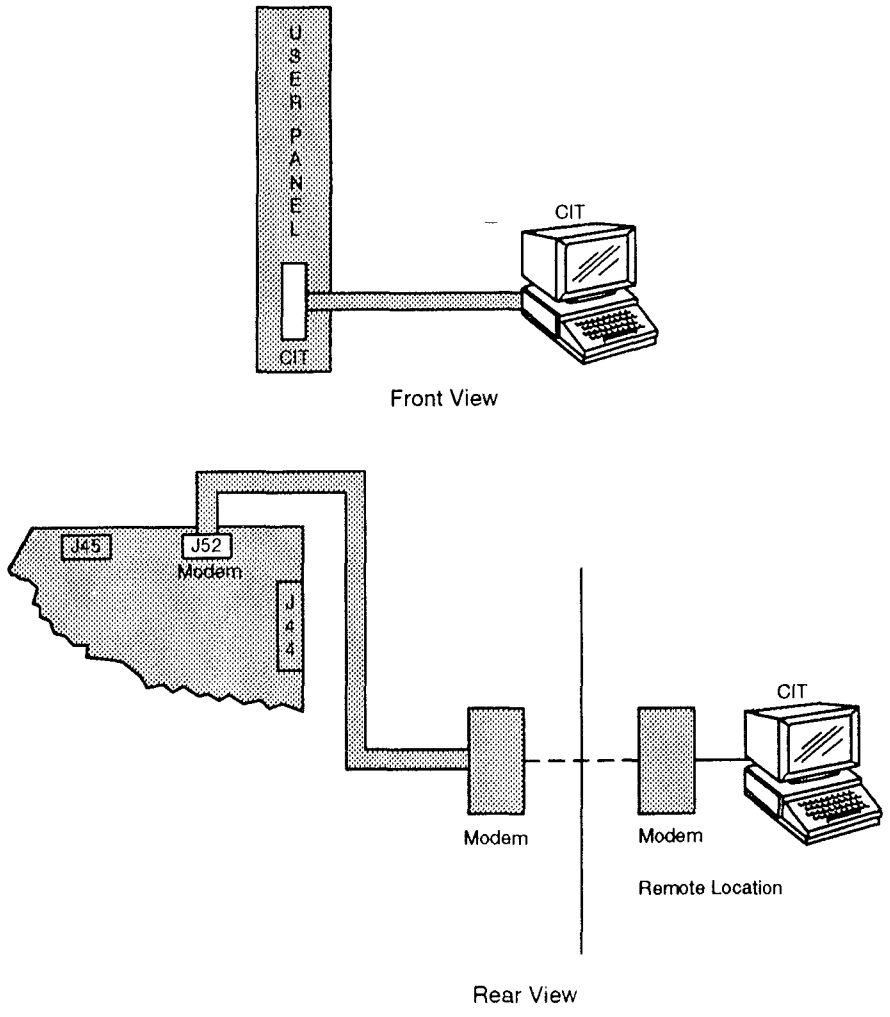


Figure 6-1. CIT Connectors

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

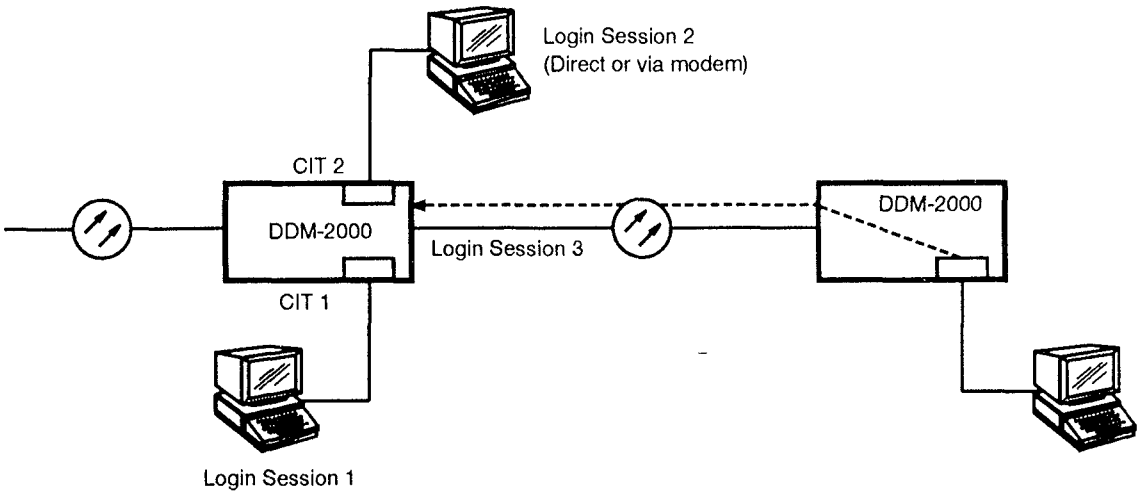


Figure 6-2. CIT Login Sessions

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

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

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

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

For example, with 6 shelves per bay and 8 bays in a subnetwork, access to 48 shelves is achieved with a single physical interface.

Using a PC as a CIT

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

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

Modem Access

The rear access CIT interface (CIT 2) is configured as DTE to allow a permanent modem connection without requiring a null modem. However, a null modem is required when connecting a CIT directly to the rear access DTE interface. CIT access via a modem connection is identical to local CIT access. Switch selected data rates of 300, 1200, 2400, 4800, 9600, and 19,200 baud are provided for both CIT interfaces.

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

* MS-DOS is a registered trademark and Windows is a trademark of Microsoft Corporation.

OC-3 Multiplexer and the terminal for a lower data rate. The data rate for the DDM-2000 OC-3 Multiplexer is set by switches on the SYSCTL circuit pack and is described in the Task Oriented Practice (TOP) section of this manual (Volume II).

The *NCR* 3170 computer and the AT&T *Safari*® computer have a built-in modem and meet the modem requirements.

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

- AT&T *Paradyne*® 2224-CEO modem (at 1200 and 2400 baud)
- AT&T *Paradyne* 2224 modem (at 1200 and 2400 baud)
- AT&T *Paradyne* 4024 modem (at 1200 and 2400 baud)
- AT&T *Paradyne* 2296 modem (at 4800 and 9600 baud)
- Hayes *V-series*† Smartmodems
- *Penril** Alliance V.32 modem.

Remote Access Using the Data Communications Channel (DCC)

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

* Registered trademark of Penril Corporation.

† Trademark of Hayes Microcomputer Products, Inc.

SNC-2000 cPro Graphical User Interface and Provisioning Tool

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

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

In response to a user, the tool automatically compiles and sends all the necessary commands to perform a task. If the user is provisioning cross-connections, for example, the tool automatically prevents provisioning errors by comparing the new provisioning information with the maintenance subnetwork inventory. For more information, see the on-line documentation provided with the tool. See Section 10, "Technical Specifications" for PC requirements to use the tool.

User Panel

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

* Microsoft is a registered trademark of Microsoft Corporation.

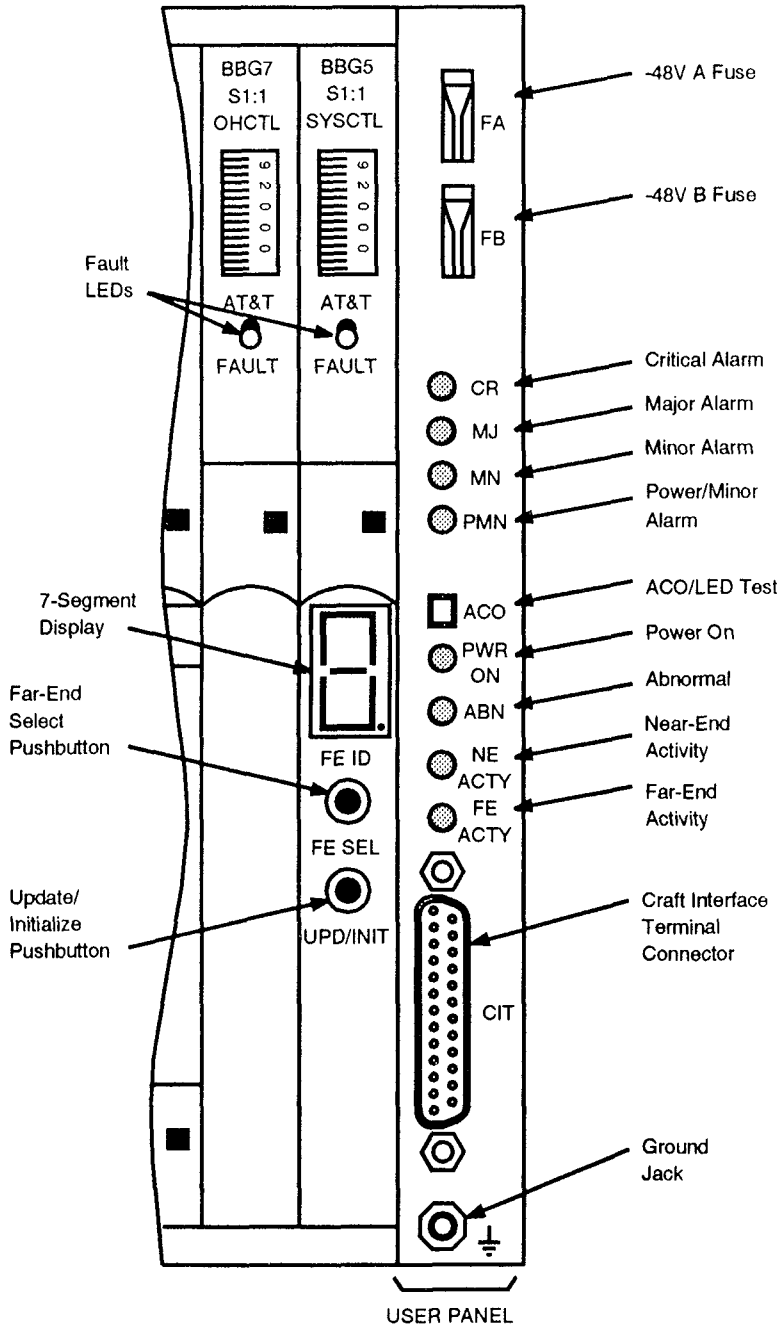


Figure 6-3. User Panel

User Panel LEDs

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

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

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

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

FE SEL Pushbutton

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

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

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

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

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

After cycling through the sites, "L." and the conditions of the local shelf are again displayed.

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

ACO/TST Pushbutton

The ACO/TST pushbutton tests all the LEDs on the shelf. All LEDs on the shelf will be lighted while the pushbutton is pressed. If the ACO pushbutton is pressed and held for more than 2 seconds, the three digits of the software release number are displayed in the 7-segment FE ID display. If there are any active alarms when the ACO pushbutton is pressed, the audible office alarms will be silenced, all parallel telemetry outputs except system identification (SID) status and ACO will be turned off, the parallel telemetry ACO output will be turned on, and the ACO LED (part of the pushbutton) on the user panel will be lighted.

UPD/INIT Pushbutton

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

Pushbutton Combinations

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

Table 6-2. DDM-2000 Pushbutton Combinations

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

* `init-sys:sysctl`. Used after a SYSCTL is replaced on an in-service system. Press pushbutton within 10 seconds of the processor startup sequence while the CR LED on the user panel is flashing.

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

Equipment Indicators

FAULT Indicators

Red FAULT indicators are provided on all circuit packs. Retainer cards do not have LEDs. DDM-2000 OC-3 Multiplexer. The circuit pack FAULT indicator is lighted whenever a failure has been isolated to that pack.

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

FAULT indicators on high- and low-speed transmission interface and timing circuit packs are flashed when a failure of the incoming signal is detected. For example, loss of signal, loss of frame, loss of pointer, or crossing of the signal fail or signal degrade threshold.

The FAULT LED on the BBG7 OHCTL blinks when a failure of the DCC from a far-end shelf is detected.

ACTIVE Indicators

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

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

Office Alarms

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

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

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

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

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

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

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

TL1/X.25 Interface

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

The DDM-2000 OC-3 Multiplexer Release 6.1 (linear), 7.1 (rings), and later, supports remote and automated provisioning from a provisioning operations system such as Bellcore's Operations System/Intelligent Network Element (OPS/INE) operations system. DDM-2000 OC-3 Multiplexer Release 6.2 (linear), 7.1 (rings), and later, also supports a provisioning interface to Raynet's RIDES operations systems for remote SLC-2000 Access Systems. The DDM-2000 OC-3 Multiplexer Releases 6.1 (linear), 7.1 (rings), and later also provide enhanced security. See AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide*, for more information.

The TL1 maintenance messages of the DDM-2000 OC-3 Multiplexer are based on Bellcore's TR-NWT-000833, Issue 3, Rev. 1, Issue 4, Supplement 1, and Issue 5, Rev. 1. The TL1 provisioning messages of the DDM-2000 OC-3 Multiplexer are based on Bellcore's TR-NWT-000199, Issue 2, and TA-NWT-000199, Issue 6, Supplement 1.

The following autonomous messages are supported:

REPORT ALARM (REPT ALM) —
autonomous reports of alarm conditions

REPORT ALARM ENVIRONMENT (REPT ALM ENV) —
autonomous reports of environmental alarm conditions

REPORT CONDITION (REPT COND) —
periodic autonomous reports of standing status conditions (Release 6.1 (linear), 7.1 (rings), and later)

REPORT DATABASE CHANGE (REPT DBCHG) —
autonomous reports of provisioning changes (Release 6.1 (linear), 7.1 (rings), and later)

REPORT EVENT (REPT EVT) —
autonomous reports of status conditions, including performance-monitoring threshold-crossing alerts (TCAs).

REPORT PERFORMANCE MONITORING (REPT PM) —
autonomous reports of performance-monitoring (PM) data
(Release 6.1 (linear), 7.1 (rings), and later)

REPORT SWITCH (REPT SW) —
autonomous reports of automatic circuit pack protection switches
(Release 6.1 (linear), 7.1 (rings), and later)

The following command/response messages are supported:

ACTIVATE-USER (ACT-USER) —
establishes a user login session
(Release 6.1 (linear), 7.0 (rings), and later)

ALLOW-MESSAGE (ALW-MSG) —
allows autonomous message reporting
(Release 6.1 (linear), 7.1 (rings), and later)

CANCEL-USER (CANC-USER) —
terminates a user login session
(Release 6.1 (linear), 7.0 (rings), and later)

DELETE-CROSS CONNECT (DLT-CRS) —
deletes a cross connection
(Release 6.1 (linear), 7.0 (rings), and later)

DELETE-USER-SECURITY (DLT-USER-SECU) —
deletes a user login
(Release 6.1 (linear), 7.1 (rings), and later)

EDIT-DATE (ED-DAT) —
changes the date and/or time
(Release 6.1 (linear), 7.1 (rings), and later)

EDIT-PRIVATE IDENTIFIER (ED-PID) —
changes a user's password
(Release 6.1 (linear), 7.1 (rings), and later)

EDIT-USER SECURITY (ED-USER-SECU) —
edits the security parameters associated with a user
(Release 6.2 (linear), 7.1 (rings), and later)

ENTER-CROSS CONNECT (ENT-CRS) —
enters a cross connection
(Release 6.1 (linear), 7.0 (rings), and later)

ENTER-EC1 (ENT-EC1) —
enters EC1 line attributes
(Release 6.1 (linear), 7.1 (rings), and later)

ENTER-OC3 (ENT-OC3) —
enters OC3 line attributes
(Release 6.1 (linear), 7.1 (rings), and later)

ENTER-STS1 (ENT-STS1) —
enters STS1 ring path signal degrade threshold
Release 6.2 (linear), (Release 7.1 (rings) and later)

ENTER-SYSTEM (ENT-SYS) —
modifies a network element's system attributes
(Release 6.2 (linear), 7.1 (rings), and later)

ENTER-T1 (ENT-T1) —
enters DS1 line attributes
(Release 6.1 (linear), 7.0 (rings), and later)

ENTER-T3 (ENT-T3) —
enters DS3 line attributes
(Release 6.1 (linear), 7.0 (rings), and later)

ENTER-USER-SECURITY (ENT-USER-SECU) —
enters a user login
(Release 6.1 (linear), 7.1 (rings), and later)

ENTER-VT1 (ENT-VT1) —
enters VT1.5 ring path signal degrade threshold
(Release 6.2 (linear), Release 7.1 (rings) and later)

INHIBIT-MESSAGE (INH-MSG) —
inhibits autonomous message reporting
(Release 6.1 (linear), 7.1 (rings), and later)

INITIALIZE-REGISTER (INIT-REG) —
initializes (resets) current performance-monitoring storage registers
(Release 6.1 (linear), 7.1 (rings), and later)

INITIALIZE-SYSTEM (INIT-SYS) —
initializes (resets) provisionable parameters to their default values
(Release 6.1 (linear), 7.1 (rings), and later)

OPERATE-ALARM CUTOFF (OPR-ACO) —
operates the alarm cutoff (ACO) to silence office audible alarms
(Release 6.1 (linear), 7.1 (rings), and later)

OPERATE-LOOPBACK (OPR-LPBK) —
operates a loopback
(Release 6.1 (linear), 7.1 (rings), and later)

OPERATE-PROTECTION SWITCH (OPR-PROTNSW) —
operates OC-N line protection switching capabilities
(Release 6.0 and later)
and operates ring path protection switching capabilities (Release 7.1 and later rings only)

OPERATE-SYNCHRONIZATION SWITCH (OPR-SYNCNSW) —
operates DS1 synchronization input reference protection switching capabilities (Release 5 and later)

RELEASE-LOOPBACK (**RLS-LPBK**) —
releases a loopback
(Release 6.1 (linear), 7.1 (rings), and later)

RELEASE-PROTECTION SWITCH (**RLS-PROTNSW**) —
releases OC-N line protection switching requests
(Release 6.0 and later)
and releases ring path protection switching requests
(Release 7.1 and later rings only)

RELEASE-SYNCHRONIZATION SWITCH (**RLS-SYNCNSW**) —
releases DS1 synchronization input reference protection switching requests
(Release 5 and later)

RETRIEVE-ALARM (**RTRV-ALM**) —
retrieves current alarm conditions and, for Release 2 only, current status conditions

RETRIEVE-ALARM-ENVIRONMENT (**RTRV-ALM-ENV**) —
retrieves current environmental alarm conditions
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-AUTONOMOUS OUTPUT (**RTRV-AO**) —
retrieves autonomous messages
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-ATTRIBUTE (**RTRV-ATTR**) —
retrieves alarm level attributes
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-ATTRIBUTE-ENVIRONMENT (**RTRV-ATTR-ENV**) —
retrieves the environmental alarm/status point attributes
(Release 6.2 (linear), 7.1 (rings), and later)

RETRIEVE-CONDITION (**RTRV-COND**) —
retrieves current standing status conditions
(Release 3 and later)

RETRIEVE-CROSS CONNECT (**RTRV-CRS**) —
retrieves cross connections
(Release 6.1 (linear), 7.0 (rings), and later)

RETRIEVE-EC1 (**RTRV-EC1**) —
retrieves EC1 line attributes
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-EQUIPMENT (**RTRV-EQPT**) —
retrieves circuit pack information
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-HEADER (**RTRV-HDR**) —
retrieves system ID, time, and date

RETRIEVE-MAP (**RTRV-MAP**) —
retrieves the topological map of the SONET subnetwork
(Release 6.2 (linear), 7.1 (rings), and later)

RETRIEVE-NETWORK ALARM (**RTRV-NTALM**) —
displays a report of the highest active alarm or status condition of each network element in the Alarm Group including the local network element.
(7.2 (rings), and later)

RETRIEVE-OC3 (**RTRV-OC3**) —
retrieves OC3 line attributes
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-PERFORMANCE MONITORING (**RTRV-PM**) —
retrieves PM data, including historical PM data.

RETRIEVE-PERFORMANCE MONITORING SCHEDULE (**RTRV-PMSCHED**) —
retrieves active PM report schedules
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-STS1 (**RTRV-STS1**) —
retrieves STS1 ring path signal degrade threshold
(release 6.2 (linear), Release 7.1 (rings) and later)

RETRIEVE-SYSTEM (**RTRV-SYS**) —
retrieves a network element's system attributes
(Release 6.2 (linear), 7.0 (rings), and later)

RETRIEVE-T1 (**RTRV-T1**) —
retrieves DS1 line attributes
(Release 6.1 (linear), 7.0 (rings), and later)

RETRIEVE-T3 (**RTRV-T3**) —
retrieves DS3 line attributes
(Release 6.1 (linear), 7.0 (rings), and later)

RETRIEVE-USER-SECURITY (**RTRV-USER-SECU**) —
retrieves user logins
(Release 6.1 (linear), 7.1 (rings), and later)

RETRIEVE-VT1 (**RTRV-VT1**) —
retrieves VT1.5 ring path signal degrade thresholds
(Release 6.2 (linear), Release 7.1 (rings) and later)

SCHEDULE-PERFORMANCE MONITORING REPORT (**SCHED-PMREPT**) —
schedules a PM report
(Release 6.1 (linear), 7.1 (rings), and later)

SET-ATTRIBUTE (**SET-ATTR**) —
sets alarm level attributes
(Release 6.1 (linear), 7.1 (rings), and later)

SET-ATTRIBUTE-ENVIRONMENT (**SET-ATTR-ENV**) —
sets the environmental alarm/status point attributes
(Release 6.2 (linear), 7.1 (rings), and later)

SET-SYSTEM IDENTIFICATION (**SET-SID**) —
sets the system ID, that is, the Source Identifier (SID)/Target Identifier (TID)
(Release 6.1 (linear), 7.1 (rings), and later)

SWITCH-TO PROTECTION-EQPT (**SW-TOPROTN-EQPT**) —
operates circuit pack protection switching capabilities
(Release 6.1 (linear), 7.1 (rings), and later)

SWITCH-TO WORKING-EQPT (**SW-TOWKG-EQPT**) —
releases circuit pack protection switching requests
(Release 6.1 (linear), 7.1 (rings), and later)

TEST-TRANSMISSION-T1 (**TEST-TRMSN-T1**) —
sets up an automated transmission test at the DS1 signal level
(Release 6.2 (linear), 7.1 (rings), and later)

TEST-TRANSMISSION-T3 (**TEST-TRMSN-T3**) —
sets up an automated transmission test at the DS3 signal level
(Release 6.2 (linear), 7.1 (rings), and later)

Section 10, "Technical Specifications" provides detailed specifications for the X.25 interface. Detailed information about the input and output parameters for these messages is provided in AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide*.

Serial Telemetry (TBOS)

Telemetry byte-oriented serial (TBOS) is a protocol that defines one physical interface for direct connection between the telemetry remote and the monitored equipment. The system provides a TBOS link to remote detailed alarm, status, and control information to/from an operations system (OS). The TBOS link is provided through a rear access RS-422 interface port. Data transmission is at 2400 baud. A TBOS display contains 63 alarm/status points to carry information from the DDM-2000 system to the OS and 64 control points to carry commands from the OS to the DDM-2000 system. Each DDM-2000 OC-3 Multiplexer shelf uses one TBOS display. The number of the display assigned to each shelf is determined by switches on the SYSCTL circuit pack. One TBOS link can be shared among multiple shelves in a single bay. A TBOS link can support up to eight displays in an OC-3 or OC-12 network or up to four OC-3 or OC-12 point-to-point networks or any combination less than or equal to eight.

A backup function is provided so that failure of a single DDM-2000 OC-3 system in the central office will not interrupt reporting for the other systems that share the same TBOS link. The backup function provided by each shelf is determined by switches on the SYSCTL circuit pack.

Two types of TBOS displays are provided: one for central office (CO) systems and one for remote terminal (RT) systems. The type of display used for each shelf is determined by the CO/RT selector switch on the SYSCTL circuit pack.

The sending and receiving of TBOS information via the DCC can be enabled or disabled via an option switch on the SYSCTL circuit pack. See Section 7, "Circuit Pack Descriptions" for the switch settings.

The alarm/status portion of the TBOS displays contains system alarm and status indications. Each TBOS point is defined as a status or alarm point. Alarm points are designated either as a service-affecting (SA) or non-service-affecting (NSA) indication.

The alarm hold-off and clear delays set for office alarms apply to the TBOS interface as well. In addition, alarm and status indications on the TBOS interface are held for a minimum of 20 seconds to ensure that they can be received by the OS.

The TBOS control displays for both CO and RT systems have protection switching, alarm cutoff, and processor reset control points. The TBOS control displays for RT systems also have control points to turn the miscellaneous discrete environmental controls on and off.

NOTE:
Some telemetry remotes, such as Northern Telecom's 7025 system, are not compatible with the TBOS backup feature of the DDM-2000. See AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide* for more information.

TBOS Display Tables

Tables 6-3 and 6-4 define the meaning of each point in the alarm and status displays and in the control displays for the DDM-2000 OC-3 Multiplexer. For more information on the TBOS interface and provisioning, refer to *AT&T 824-102-148, 2000 Family of Products Operations Systems Engineering Guide.*

TBOS Alarm and Status Points

Table 6-3 summarizes the DDM-2000 OC-3 Multiplexer TBOS alarm and status display.

Table 6-3. DDM-2000 OC-3 TBOS Alarm and Status Points

Point	Type (Note)	Central Office Condition	Type (Note)	Remote Terminal Condition
1	SA	Incoming DS1 Signal Failure (LOS+SF/SD)		
2	SA	Incoming DS3/EC1* Signal Failure (LOS+LOF*+SF/SD +STS1 LOP* +EC1 AIS*)		
3	NSA	Incoming OC3 Signal Failure (LOS+LOF+SF +STS1/STS3c** LOP)		
4	SA	Incoming OC3 Signal Failure (LOS+LOF+SF+AIS)		
5	SA	Incoming STS1/STS3c** LOP (on OC3)		
6	SA	Incoming VT Path AIS†/ LOP/Path Signal Degrade***		
7	NSA	Incoming OC3 Signal Degrade		
8	SA	Incoming OC3 Signal Degrade/STS Path AIS†/Signal Failure‡/Degrade†††		
9	NSA	Synchronization Equipment Failure		
10	SA			
11	NSA	Multiplex Equipment Failure		
12	SA			
13	NSA	Fuse/Power Circuit Failure		
14	NSA	Controller Failure/Provisioning Error		
15	NSA	Optical Terminating Equipment Failure		
16	SA			
17	NSA	DS1 Terminating Equipment Failure		
18	SA			
19	NSA	DS3/EC1* Terminating Equipment Failure		
20	SA			
21	NSA	Section Data Comm. Channel (DCC) Failure/Provisioning Error		
22	Alarm	Reserved for Future Alarm Use		
23	NSA	DS1 Terminating Equipment APS - Automatic Lockout		
24	NSA	OC3 APS Channel Failure §		
25	NSA	Protected DS1 Sync. Ref. Failure		
26	NSA	Unprotected DS1 Sync. Ref. Failure		
27	NSA	PM Summary TCA		
28	NSA	Invalid TBOS Command Received		
29	NSA	Incoming OC3 Line AIS		
30	NSA	Incoming VT Path AIS/LOP‡ /Path Signal Degrade***		
31	NSA	Incoming STS Path AIS/Signal Failure‡ /Degrade†††		
32	SA	Excessive Sync. Holdover		
33	NSA	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 1
34	NSA	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 2
35	NSA	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 3
36	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 4
37	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 5
38	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 6
39	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 7
40	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 8
41	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 9

See note and footnotes at end of table.

Table 6-3. DDM-2000 OC-3 TBOS Alarm and Status Points (Contd)

Point	Type (Note)	Central Office Condition	Type (Note)	Remote Terminal Condition
42	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 10
43	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 11
44	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 12
45	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 13
46	NSA	Fan Shelf Failure	NSA	Misc. Discrete Env. Alarm/Status 14
47	Alarm	Reserved for Future Alarm Use	NSA	External Minor
48	Alarm	Reserved for Future Alarm Use	NSA	Fan Control Relay Failure
49	Status	Inhibit Sync. Equipment Protection Switching		
50	Status	Inhibit DS1 Sync. Ref. Protection Switching		
51	Status	Holdover Mode Active		
52	Status	Incoming OC3 Line FERF		
53	Status	Manual Forced/Inhibit/Lockout OC3 Line Prot. Switching §		
54	Status	Manual Forced/Inhibit Function Unit Equipment Prot. Switching		
55	Status	Manual DS1 Terminating Equipment Protection Switch		
56	Status	Manual Forced/Lockout DS1 Terminating Equipment Prot. Switching		
57	Status	Abnormal Condition		
58	Status	Valid TBOS Command Received		
59	Status	Communication Failure (Not used in Release 1)		
60	Status	Incoming STS Path Yellow (Not used in Release 1)		
61	Status	Incoming VT Path Yellow (Not used in Release 1)		
62	Status	Reserved for Future Status Use		
63	Status	Reserved for Future Status Use		
64	-	TBOS Telemetry Link Failure		

Note: Each TBOS point is identified as either an alarm or status point. Alarm points are further distinguished as either service affecting (SA) or non-service affecting (NSA). Status points are always understood to be NSA.

The alarm/status distinction specified in this table is for telemetry remote polling purposes. Alarm points are assured of being communicated to the OS, whereas status points may not be communicated to the OS when alarm or hybrid polling is used. It is recommended that the telemetry remote station constants assign attributes to the DDM-2000 OC-3 TBOS points as follows:

Points 1 - 48 = alarms

Points 49 - 63 = status.

LOF = Loss of Frame, LOP = Loss of Pointer, LOS = Loss of Signal
SD = Signal Degrade Bit Error Ratio, SF = Signal Fail Bit Error Ratio
TCA = Threshold Crossing Alert

See footnotes at end of table.

Table 6-3. DDM-2000 OC-3 TBOS Alarm and Status Points (Contd)

* Release 5.1 and later EC-1 interfaces only.

** Release 6.0 and later STS3c signals only.

*** Release 7.0 and later ring releases, VT1.5 path switched ring applications only.

† Release 3.2 and later.

‡ Release 5.1 and later ring releases.

††† Release 7.1 and later ring releases, STS1 path switched ring applications only.

§ Not applicable to the main OC-3 lines in ring applications.

DDM-2000 OC-3 TBOS Control Points

Table 6-4 lists the TBOS control points for DDM-2000 OC-3 Multiplexer.

Table 6-4. DDM-2000 OC-3 TBOS Control Points

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
1	55&57&58	Manual LS Switch to Protection - MXR A, DS1 1-4 (switch-ls:ls-a-1:pri=manual)
2	55&57&58	Manual LS Switch to Protection - MXR A, DS1 5-8 (switch-ls:ls-a-2:pri=manual)
3	55&57&58	Manual LS Switch to Protection - MXR A, DS1 9-12 (switch-ls:ls-a-3:pri=manual)
4	55&57&58	Manual LS Switch to Protection - MXR A, DS1 13-16 (switch-ls:ls-a-4:pri=manual)
5	55&57&58	Manual LS Switch to Protection - MXR A, DS1 17-20 (switch-ls:ls-a-5:pri=manual)
6	55&57&58	Manual LS Switch to Protection - MXR A, DS1 21-24 (switch-ls:ls-a-6:pri=manual)
7	55&57&58	Manual LS Switch to Protection - MXR A, DS1 25-28 (switch-ls:ls-a-7:pri=manual)
8	55&57&58	Manual LS Switch to Protection - MXR B, DS1 1-4 (switch-ls:ls-b-1:pri=manual)
9	55&57&58	Manual LS Switch to Protection - MXR B, DS1 5-8 (switch-ls:ls-b-2:pri=manual)
10	55&57&58	Manual LS Switch to Protection - MXR B, DS1 9-12 (switch-ls:ls-b-3:pri=manual)
11	55&57&58	Manual LS Switch to Protection - MXR B, DS1 13-16 (switch-ls:ls-b-4:pri=manual)
12	55&57&58	Manual LS Switch to Protection - MXR B, DS1 17-20 (switch-ls:ls-b-5:pri=manual)
13	55&57&58	Manual LS Switch to Protection - MXR B, DS1 21-24 (switch-ls:ls-b-6:pri=manual)
14	55&57&58	Manual LS Switch to Protection - MXR B, DS1 25-28 (switch-ls:ls-b-7:pri=manual)
15	55&57&58	Manual LS Switch to Protection - MXR C, DS1 1-4 (switch-ls:ls-c-1:pri=manual)
16	55&57&58	Manual LS Switch to Protection - MXR C, DS1 5-8 (switch-ls:ls-c-2:pri=manual)
17	55&57&58	Manual LS Switch to Protection - MXR C, DS1 9-12 (switch-ls:ls-c-3:pri=manual)
18	55&57&58	Manual LS Switch to Protection - MXR C, DS1 13-16 (switch-ls:ls-c-4:pri=manual)
19	55&57&58	Manual LS Switch to Protection - MXR C, DS1 17-20 (switch-ls:ls-c-5:pri=manual)

See note and footnotes at end of table.

Table 6-4. DDM-2000 OC-3 TBOS Control Points (Contd)

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
20	55&57&58	Manual LS Switch to Protection - MXR C, DS1 21-24 (switch-ls:ls-c-6:pri=manual)
21	55&57&58	Manual LS Switch to Protection - MXR C, DS1 25-28 (switch-ls:ls-c-7:pri=manual)
22	56&57&58	Lockout Switching - LS-A (switch-ls:ls-a-all:pri=lockout)
23	56&57&58	Lockout Switching - LS-B (switch-ls:ls-b-all:pri=lockout)
24	56&57&58	Lockout Switching - LS-C (switch-ls:ls-c-all:pri=lockout)
25	55&56&57 clear & 58	Reset Switching - LS-A (switch-ls:ls-a-all:pri=reset)
26	55&56&57 clear & 58	Reset Switching - LS-B (switch-ls:ls-b-all:pri=reset)
27	55&56&57 clear & 58	Reset Switching - LS-C (switch-ls:ls-c-all:pri=reset)
28	57&58 & 54 & 53	Forced Switch - FN-A (switch-fn:fn-a:pri=forced) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-a:pri=forced) (if OC3 equipped)
29	57&58 & 54 & 53	Forced Switch - FN-B (switch-fn:fn-b:pri=forced) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-b:pri=forced) (if OC3 equipped)
30	57&58 & 54 & 53	Forced Switch - FN-C (switch-fn:fn-c:pri=forced) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-c:pri=forced) (if OC3 equipped)
31	58	Manual Switch - FN-A (switch-fn:fn-a:pri=manual) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-a:pri=manual) (if OC3 equipped)
32	58	Manual Switch - FN-B (switch-fn:fn-b:pri=manual) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-b:pri=manual) (if OC3 equipped)
33	58	Manual Switch - FN-C (switch-fn:fn-c:pri=manual) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-c:pri=manual) (if OC3 equipped)
34	57&58 & 54 & 53	Inhibit Switching - FN-A (switch-fn:fn-a:pri=inhibit) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-a:pri=inhibit) (if OC3 equipped)
35	57&58 & 54 & 53	Inhibit Switching - FN-B (switch-fn:fn-b:pri=inhibit) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-b:pri=inhibit) (if OC3 equipped)
36	57&58 & 54 & 53	Inhibit Switching - FN-C (switch-fn:fn-c:pri=inhibit) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-c:pri=inhibit) (if OC3 equipped)
37	53&57&58	Lockout Switching - FN-A (only if OC3 equipped) (switch-line:fn-a:pri=lockout)

See note and footnotes at end of table

Table 6-4. DDM-2000 OC-3 TBOS Control Points (Contd)

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
38	53&57&58	Lockout Switching - FN-B (only if OC3 equipped) (switch-line:fn-b:pri=lockout)
39	53&57&58	Lockout Switching - FN-C (only if OC3 equipped) (switch-line:fn-c:pri=lockout)
40	57 clears & 58 & 54 clears & 53 clears	Reset Switching - FN-A (switch-fn:fn-a:pri=reset) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-a:pri=reset) (if OC3 equipped)
41	57 clears & 58 & 54 clears & 53 clears	Reset Switching - FN-B (switch-fn:fn-b:pri=reset) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-b:pri=reset) (if OC3 equipped)
42	57 clears & 58 & 54 clears & 53 clears	Reset Switching - FN-C (switch-fn:fn-c:pri=reset) (if MXRVO/DS3/STS1E † equipped) (switch-line:fn-c:pri=reset) (if OC3 equipped)
43	53&57&58/28 ‡	Forced Switch - Main ‡ (switch-line:main:pri=forced)
44	58/28 ‡	Manual Switch - Main ‡ (switch-line:main:pri=manual)
45	53&57&58/28 ‡	Inhibit Switching - Main ‡ (switch-line:main:pri=inhibit)
46	53&57&58/28 ‡	Lockout Switching - Main ‡ (switch-line:main:pri=lockout)
47	53&57 clear & 58/28 ‡	Reset Switching - Main ‡ (switch-line:main:pri=reset)
48	58	Manual Switch - TGS CP (switch-sync:s=circuitpack,pri=manual)
49	49&57&58	Inhibit Switching - TGS CP (switch-sync:s=circuitpack,pri=inhibit)
50	49&57 clear & 58	Reset Switching - TGS CP (switch-sync:s=circuitpack,pri=reset)
51	58	Manual Switch - Sync. Reference (switch-sync:s=reference,pri=manual)
52	50&57&58	Inhibit Switching - Sync. Reference (switch-sync:s=reference,pri=inhibit)
53	50&57 clear & 58	Reset Switching - Sync. Reference (switch-sync:s=reference,pri=reset)

See note and footnotes at end of table

Table 6-4. DDM-2000 OC-3 TBOS Control Points (Contd)

Control Point	CO and RT Verification Status Point (Note)	CO Control Function (Equivalent CIT Command)	RT Control Function (Equivalent CIT Command)
54	CO51&CO57 &CO58 or RT58*	Manual Switch - Sync. Mode (`switch-sync:s=mode,pri=manual`)	Operate Misc. Discrete Env. Control 1
55	CO51&CO57 clear & CO58 or RT58*	Reset Switching - Sync. Mode (`switch-sync:s=mode,pri=reset`)	Operate Misc. Discrete Env. Control 2
56	CO28 or RT58*	Reserved for Future Control Use	Operate Misc. Discrete Env. Control 3
57	CO28 or RT58*	Reserved for Future Control Use	Operate Misc. Discrete Env. Control 4
58	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env. Control 1
59	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env. Control 2
60	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env. Control 3
61	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env. Control 4
62	58	Alarm Cut Off (`opr-aco`)	
63	58	Processor Reset (`reset`)	
64	28	Reserved For Future Control Use	

Note: The verification status points identified as clearing in response to controls will be cleared *if* the verification status point was set prior to the TBOS control, and in the case of status point 57, abnormal condition; no other abnormal conditions exist.

* For each RT miscellaneous discrete environmental control point, it is recommended that a miscellaneous discrete environmental alarm or status point be wired and data based to serve as a verification status point to confirm that *the desired effect* of each miscellaneous discrete environmental control is achieved.

† Release 6 and later EC-1 interfaces only.

‡ These TBOS control points for Main are not applicable to the OC-3 lines for path switched ring applications. Therefore, these commands are not valid for ring applications.

Parallel Telemetry

A parallel telemetry interface is provided as an option to remote a minimum subset of alarm and status information to an operations center.

To provide a single point of access for office wiring, the telemetry outputs from all shelves in a bay can be wired together. This provides a physical OR'ing of the outputs for all shelves.

Since the parallel telemetry alarm closures reflect the office alarms, the alarm hold-off and clear delays apply to the parallel telemetry closures as well. In addition, parallel telemetry points are held for a minimum of 20 seconds to ensure that they can be received by the OS.

The following contact closures are provided:

- Alarms:
  - — Individual closures for CR, MJ, MN, and PMN alarm conditions are provided. The appropriate contact is closed when an alarm condition is detected.
  - — As with the user panel indicators and office alarms, when multiple alarms are active, the highest level parallel telemetry alarm closure is activated. When the highest level alarm clears, the parallel telemetry output "bumps down" to the next highest level active alarm.
- Statuses:

  The system provides status contact closures to transmit maintenance information to an operations center. The following status closures are provided:
  - — Near End (NE) Status - This closure identifies the near end as the location where an alarm was detected.
  - — Far End (FE) Status - These six closures identify the far end as the location where an alarm was detected. Six FE closures are provided to identify which remote site is reporting a fault.
  - — Carrier Line Failure (CLF) Status - This closure indicates detection of failures in a SONET optical or electrical line. This applies to SONET optical or electrical line failures detected incoming to the system.
  - — Incoming (INC) Status - This closure indicates detection of asynchronous electrical signal failures (that is, loss of signal or crossing of the signal fail threshold). Asynchronous electrical signal failures include low-speed DS1 or DS3 failures incoming to the system (from the DSX).

- — System Identification (SID) Status - This closure identifies the system raising alarms when alarms are paralleled among several systems within a bay. The system ID contact closures are not wired together, as can be done for other parallel telemetry outputs within a bay.
- — ACO Output (ACO-O) - Indicates that the ACO function is active. The system provides an ACO parallel telemetry response output to acknowledge the ACO parallel telemetry control input.

- Controls:
  - — The system provides an ACO parallel telemetry control. This control input is accepted from the associated maintenance center to silence all telemetry outputs except for the system identification and ACO status in systems that are wired in parallel.
  - — Activating the ACO function silences the office audible alarms and turns on the ACO LED on the user panel.

- User-Definable Miscellaneous Discretes - Parallel Telemetry Access:
  - — In addition to the parallel telemetry alarm, status, and control points described previously, the DDM-2000 OC-3 Multiplexer provides user-definable miscellaneous discrete environmental alarms and controls accessed through the parallel telemetry interface.

For more information on parallel telemetry provisioning and interface, see AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide.*

User-Definable Miscellaneous Discretes - Environmental Alarms and Controls

To allow monitoring and control of equipment colocated with a DDM-2000 OC-3 Multiplexer in a remote site, a set of user-definable miscellaneous discrete environmental alarms and controls is provided.

Fifteen miscellaneous discrete alarm/status points are provided to monitor environmental conditions at remote terminal sites (open door, high temperature, etc.). The first 14 points are activated by contact closures. The fifteenth point is designed for monitoring of remote structure power and fan apparatus (for example, DC power shelf failure); this point is activated by a –48 volt input.

Four control points are provided to control equipment (pumps, generators, etc.) at remote terminal sites. When activated, the control points provide a contact closure between the control point output and ground.

Miscellaneous discrete alarms/statuses and controls are transmitted between the remote DDM-2000 OC-3 Multiplexers and the CO DDM-2000 OC-3 via the SONET section DCC. OS access to the miscellaneous discretes alarm/status points is provided via the TBOS, TL1/X.25, and parallel telemetry interfaces at the CO DDM-2000 Multiplexer as illustrated in Figures 6-4 and 6-5. Access to the miscellaneous discrete alarm/status points is also provided through the CIT interface. The state of the control points can be reported, but not controlled, through the CIT.

The names and alarm levels of the 15 alarm/status points and the names of the 4 control points can be provisioned through the CIT in remote terminal systems. (Refer to the `set-attr-env`, `set-attr-cont`, `rtrv-attr-env`, and `rtrv-attr-cont` commands in Section 11, "Commands and Reports."

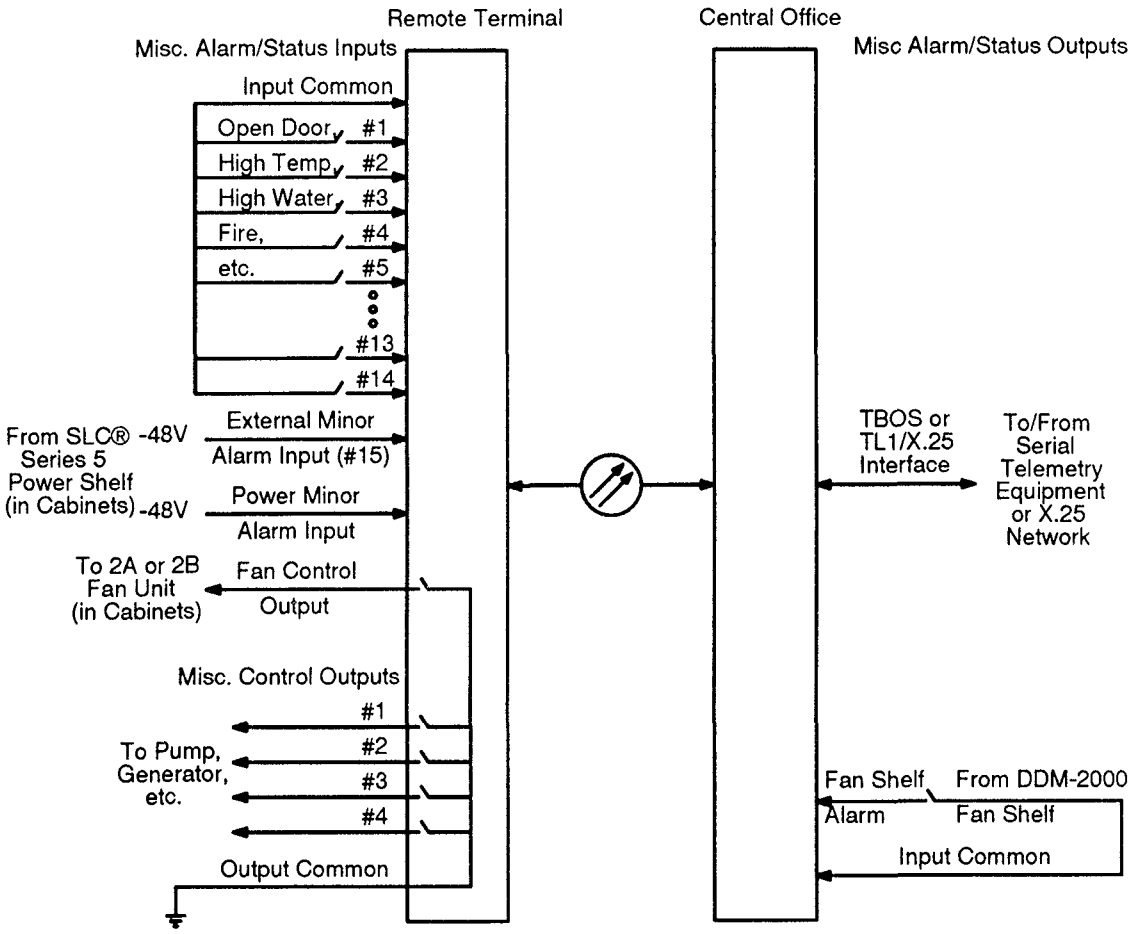
The following user-definable miscellaneous discretes alarm and control are provided.

- User-Definable Miscellaneous Discretes - Parallel Telemetry Access:
  - — In addition to the parallel telemetry alarm, status, and control points described previously, the DDM-2000 OC-3 Multiplexer provides user-definable miscellaneous discrete environmental alarms and controls. A set of 15 alarm/status outputs, from the DDM-2000 OC-3 Multiplexer to an OS, and 4 control inputs, from the OS to the DDM-2000 OC-3 Multiplexer are provided. These can be transmitted between an OS and remote DDM-2000 OC-3s through a parallel telemetry interface on the DDM-2000 OC-3.

— In multispan applications (for example, STS-1 drop and hubbing), the control points operated through the parallel telemetry interface at the DDM-2000 OC-3 in the CO are "broadcast" to all remote terminals connected to that DDM-2000 OC-3 Multiplexer in the CO.

— In multispan applications, the miscellaneous discrete environmental alarm and status points from all remote terminals connected to one DDM-2000 OC-3 in the CO are "ORed" by the DDM-2000 OC-3 in the CO for transmission to the OS through the parallel telemetry interface. The far end status points described above can be used to determine the location of a miscellaneous discrete environmental alarm.

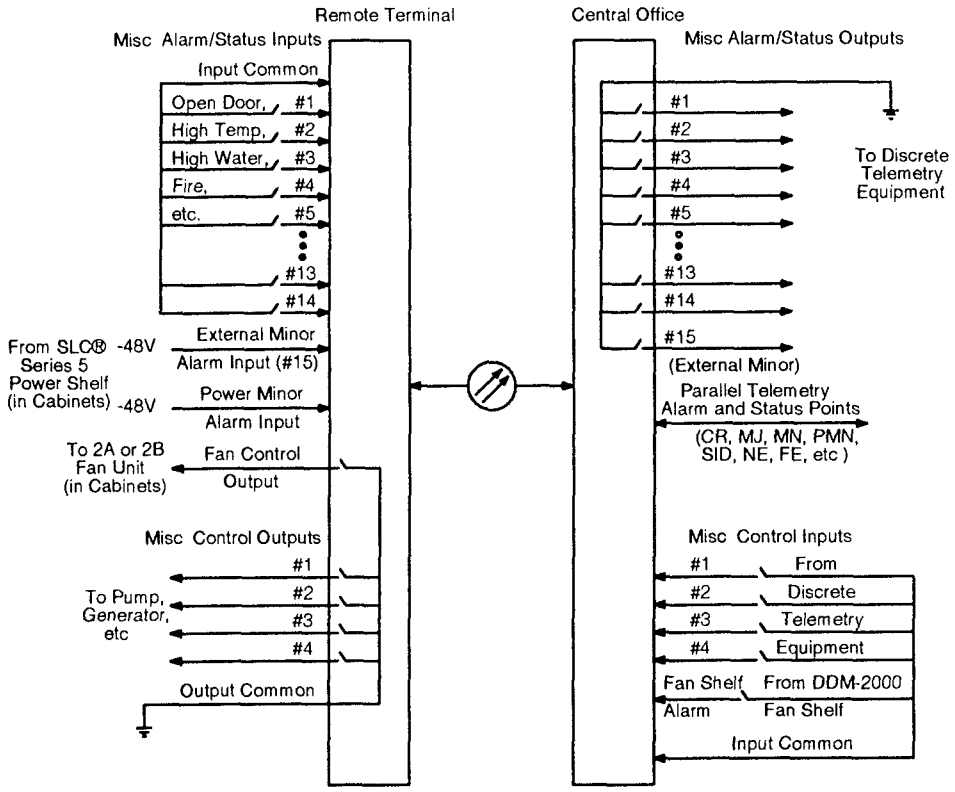
— Unlike the other parallel telemetry alarm, status, and control points described previously, the miscellaneous discretes are not ORed among shelves in a bay. Each shelf in a bay has its own set of miscellaneous discrete environmental alarms and controls.



Notes:

1. In a remote terminal, the output common must be wired to ground in all applications.
2. Misc. alarm input #1 is typically wired to open door alarm in AT&T cabinets.
3. Misc. alarm input #14 is typically wired to fan shelf alarm in controlled environment remote terminal applications where the fan shelf is required.

Figure 6-4. Miscellaneous Discrete Environmental Alarms and Controls (TBOS or TL1/X.25 at Central Office)



Notes:

1. In a remote terminal, the output common must be wired to ground in all applications.
2. Misc. alarm input #1 is typically wired to open door alarm in AT&T cabinets.
3. Misc. alarm input #14 is typically wired to fan shelf alarm in controlled environment remote terminal applications where the fan shelf is required.

Figure 6-5. Miscellaneous Discrete Environmental Alarms and Controls (Parallel Telemetry at Central Office)

Orderwire

The DDM-2000 OC-3 Multiplexer uses the E1 byte in the SONET overhead and provides a 64 kb/s complimentary metal oxide semiconductor (CMOS) or transistor-transistor logic (TTL) compatible interface to an external orderwire shelf to provide point-to-point voice communication between DDM-2000 systems. The orderwire shelf must be installed within 3 feet of the DDM-2000 Multiplexer to which it is connected.

The orderwire is available only between DDM-2000 OC-3 shelves connected to each other via OLIUs in the main slots. In multispan applications (for example, STS-1 drop or hubbing), orderwire communication is available only between the CO and the first RT.

Orderwire is not currently available in ring applications.

The DDM-2000 OC-3 Multiplexer system has been tested with the DANTEL* Orderwire Assembly A18-04588-02.

* DANTEL is a registered trademark of Dantel, Inc.

Circuit Pack Descriptions

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Circuit Pack Descriptions

7

Overview

This section provides a detailed functional description of the DDM-2000 OC-3 Multiplexer circuit packs.

Introduction

The circuit packs in the DDM-2000 OC-3 Multiplexer are divided into three main categories:

- Control circuit packs
  - — BBG5 system controller (SYSCTL)
  - — BBG7 overhead controller (OHCTL)
- Synchronization circuit packs
  - — BBF2 timing generator (TGS)
  - — BBF2B timing generator (TGS) (Release 3.0)
- Transmission circuit packs
  - — BBF1/BBF1B DS1 low-speed interface (DS1)
  - — BBF3 DS1 performance monitoring (DS1PM) (Release 5.1 and 6.0)
  - — BBG2 VT to STS-1 multiplexer (MXRVO)
  - — BBG4/BBG4B (Release 7.2) DS3 low-speed interface (DS3)

— BBG6 EC-1 high-speed and low-speed interface (STS1E) (low-speed Release 5.1; high- and low-speed Release 6.0)

— 21D/21D-U OC-3 (IS-3) optical line interface unit (OLIU) (Release 3.0)

— 21G/21G-U OC-3 (Long Reach) optical line interface unit (OLIU)

— 22F OC-3 Intermediate Reach) optical line interface unit (OLIU) (Release 3.0).

— 22D-U OC-3 (IS-3) optical line interface unit (OLIU) (Release 7.0)

— 22G-U (OC-3 Intermediate Reach) optical line interface unit (OLIU) (Release 7.0)

— 22G2-U (OC-3 Intermediate Reach) optical line interface unit (OLIU) (Release 7.2).

Compatibility

Note the following circuit pack compatibility requirements.

- The BBG5 SYSCTL circuit pack and the BBG7 OHCTL circuit pack are both required and must be running compatible software.
- Except during upgrades, 22-type OLIU circuit packs should not be mixed in the same shelf with 21-type OLIUs.
- If using software earlier than Release 3.1, you cannot use the DS1 timing outputs when the BBF2B TGS circuit pack is used in a system.

Universal Optical Connector

Circuit packs having a "-U" after their designation indicate that these circuit packs have a universal optical connector.

The following circuit packs are available with the connector:

- 21D-U OLIU (phased into manufacture)
- 21G-U OLIU (phased into manufacture)
- 22D-U OLIU
- 22G-U/22G2-U OLIU.

This connector (Figure 7-1) is a two-part connector consisting of a faceplate-mounted block and an optical buildout. The faceplate block optionally supports an *ST*, SC, or FC-type optical buildout.

A 0 dB *ST*-type connector is shipped as standard. Optional SC, or FC 0 dB or attenuated buildouts can be ordered separately. See Section 10, "Technical Specifications" for a list of universal buildout attenuators.

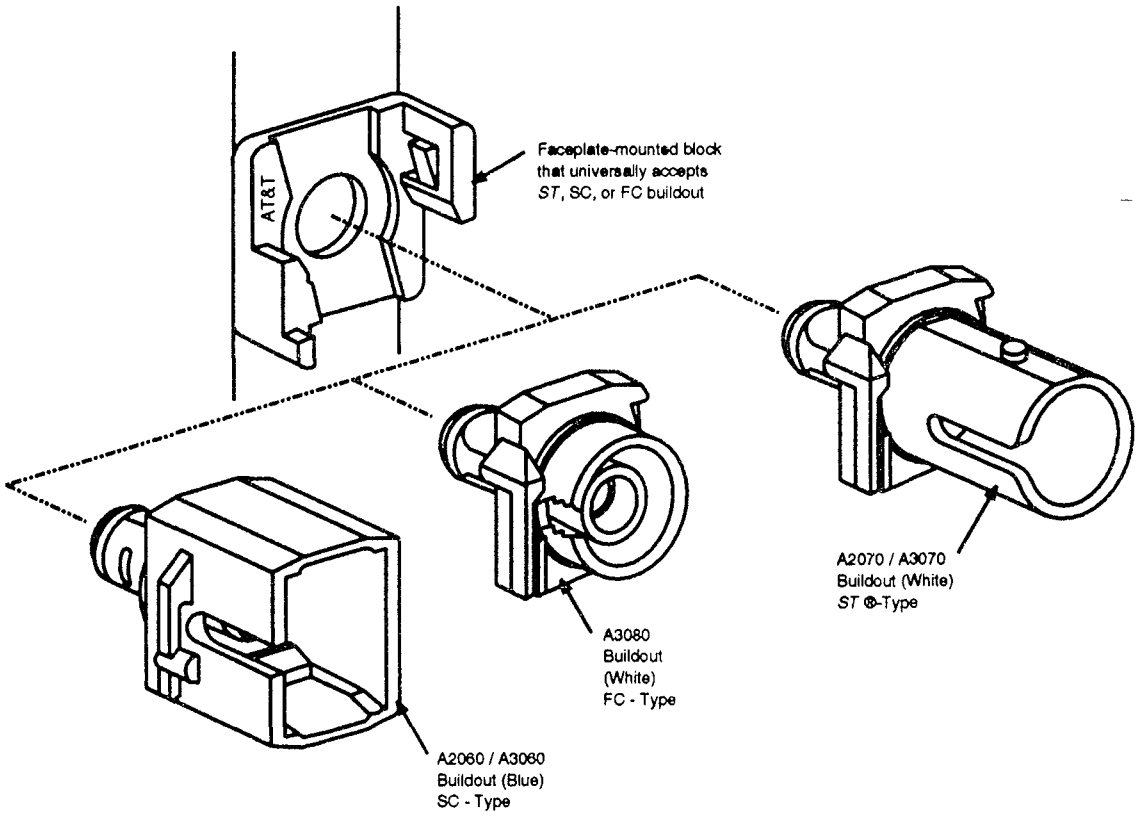


Figure 7-1. Universal Optical Connector

Control

There are two control circuit pack slots, one for the SYSCTL and one for an OHCTL. The control system controls and reports the status of the signal transmission through the DDM-2000 OC-3. All system features are implemented or supported through the control system. However, transmission is unaffected by control system failure. If a controller does fail, protection switches are not done. Therefore, if there is another circuit pack failure requiring a protection switch along with the controller failure, service may be affected depending on the function of the failed circuit pack. The control system continuously monitors the equipment to determine if a protection switch is necessary and to provide equipment performance information.

The control system in each shelf in a subnetwork can communicate with the control system of other shelves in that subnetwork via the synchronous optical network (SONET) section data communications channel (DCC). This allows a user at one point in the subnetwork to control the shelves throughout the network. All system features are implemented or supported through the control system.

BBG5 SYSCTL Circuit Pack Description

Purpose of Circuit

The BBG5 SYSCTL circuit pack is the main system controller in the system. Together with its companion overhead controller (OHCTL), it has control over all shelf functions and provides all user interfaces into the system.

BBG5 SYSCTL Faceplate Controls and Indicators

The BBG5 SYSCTL circuit pack faceplate controls and indicators are shown in Figure 7-2. The SYSCTL has a red FAULT LED and a 7-segment numeric LED display, as well as the FE SEL and UPD/INIT pushbuttons on its faceplate. The red FAULT LED lights on detection of a circuit pack failure or invalid switch setting. These controls and indicators are discussed in more detail under "User Panel" in Section 6, "Operations Interfaces".

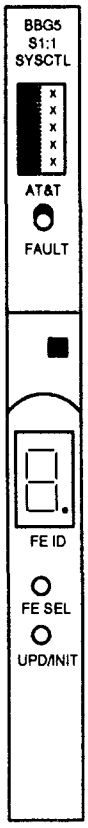


Figure 7-2. BBG5 SYSCTL Circuit Pack

General Description of Operation

The SYSCTL circuit pack provides the majority of the control functions on the shelf. These include circuit pack monitoring, performance monitoring, protection switching, and user interfaces.

The SYSCTL, which contains a microprocessor, controls links to all other circuit packs in the system and links to user interfaces. The processor also provides link access procedure (LAPD) and packet data processing to support SONET section DCC.

Detailed Description of Operation

Control Circuitry

Processor. Figure 7-3 provides an overall block diagram of the SYSCTL circuit pack. This processor is the highest level processor in the system.

Memory

Boot PROM. A small programmable read-only memory (PROM) is used for initializing the main processor and controlling flash-EPROM (FEPROM) upgrades.

Program Flash-EPROM. The main program is stored in the flash-EPROM, which combines the nonvolatility of EPROM with the in-circuit reprogramming ability of electrically erasable programmable read-only memory (EEPROM). FEPROM allows in-service software upgrades to be performed locally or remotely without replacing the SYSCTL circuit pack. Program upgrades of remote DDM-2000 OC-3 shelves can also be done via the overhead channel from the central office (CO). Of course, software upgrades may also be accomplished by replacing circuit packs with packs that have already had software upgrades.

RAM. The main processor's random access memory (RAM) is used to store all volatile information such as system alarms, performance-monitoring information, and parameters for the main processor's operating system.

EEPROM. All nonvolatile parameters such as provisioning are stored in the EEPROM, which maintains its data indefinitely during a power loss.

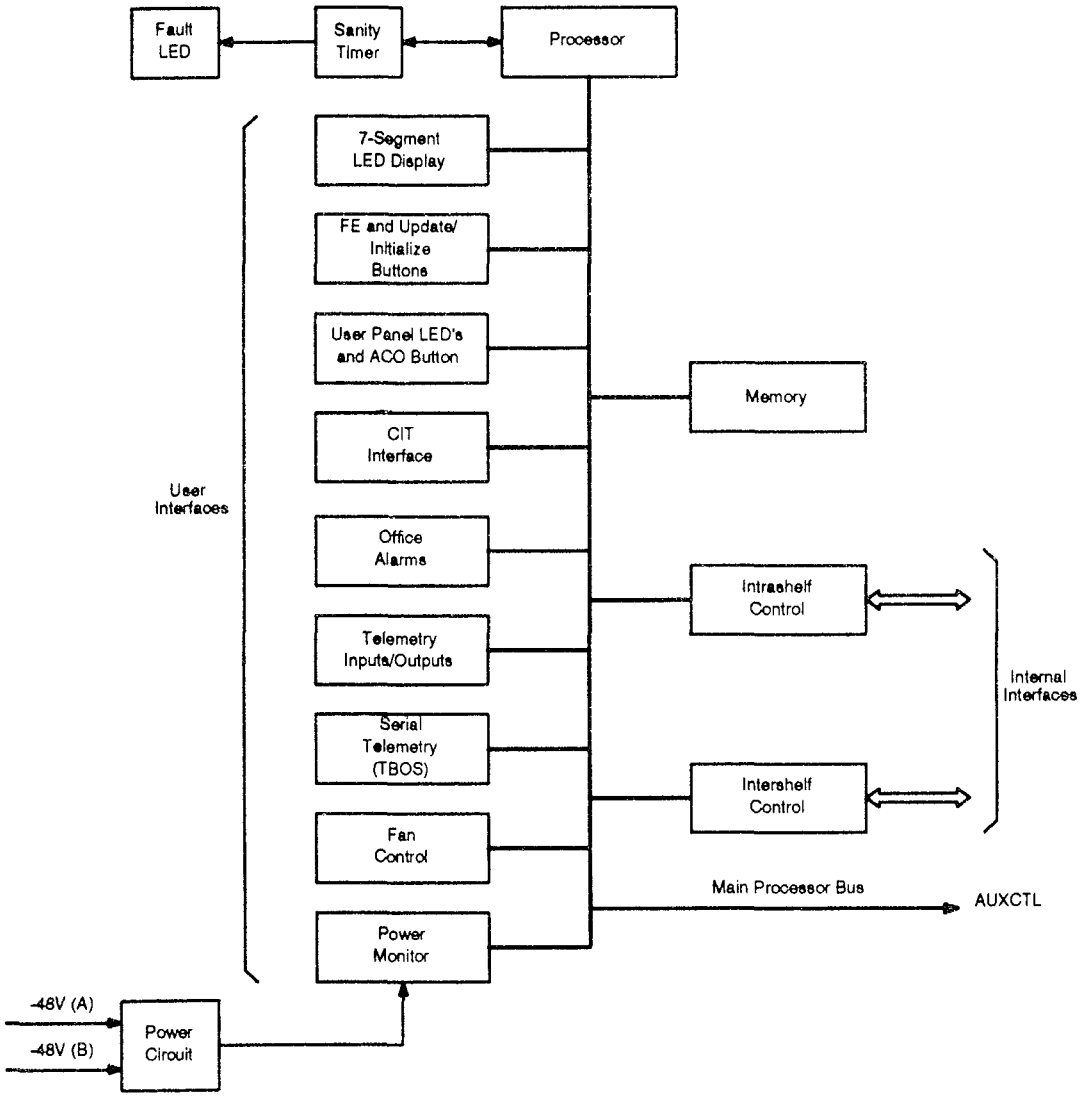


Figure 7-3. BBG5 SYSCTL Circuit Pack Block Diagram

Transmission/Timing Circuit Pack Interfaces

The main processor can read and write parameters on the transmission circuit packs through a custom serial interface called the intrashelf control bus. These circuit packs have a built-in serial link receiver which provides an address map into the device. Through this interface, the processor accesses the custom devices and circuit pack parameters, as well as a small EEPROM which stores each circuit pack's inventory information (*CLEI** code, date of manufacture, etc.). Through this link, the main processor can also light the faceplate LEDs on the circuit packs.

Redundancy has been built into this bus to allow a pack to be switched out of service in the event of a failure within a circuit pack.

Operation Interfaces

The SYSCTL supports all of the operations interfaces described in Section 6, "Operations Interfaces."

OC-3 Transport Overhead Channel

The OHCTL terminates an overhead channel from each Main and function unit slot in the shelf, passing information to the SYSCTL over the intrashelf processor bus.

Power Monitoring and Fan Control

The SYSCTL monitors the two –48 volt feeders and generates an alarm if one fails. It also monitors AC power in a remote terminal application via a power minor alarm input closure and can control the external fan, based on an on-board temperature sensor. The system also monitors the fan control relay for contact failure.

Interface to Other DDM-2000 OC-3 Shelves

The SYSCTL interfaces with SYSCTLs of other DDM-2000 OC-3 shelves through the intershelf control bus. This interface allows the user to access each DDM-2000 OC-3 shelf in a bay via a modem or craft interface terminal (CIT) connected to any shelf in that bay. The intershelf control bus also allows the user to share a single byte-oriented serial (TBOS) link among a maximum of four shelves [plus four associated remote terminal (RT) shelves], by connecting a single telemetry TBOS interface to one shelf in the bay.

Power Circuitry

The SYSCTL receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion to a +5 volt source to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

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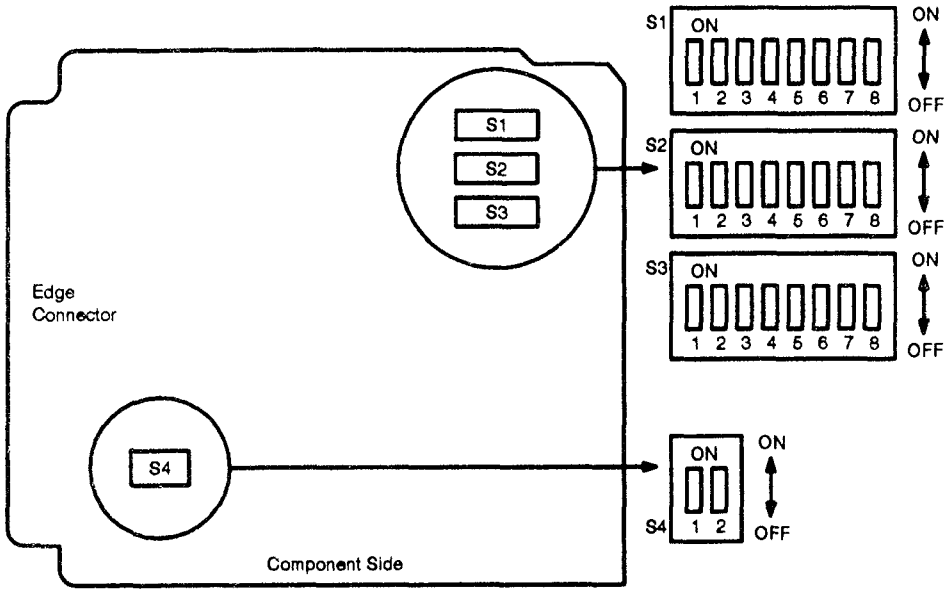
* COMMON LANGUAGE is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

BBG5 SYSCTL Hardware Settings

The SYSCTL circuit pack provisioning switches provide the following functions:

- TBOS Display Number — Allows TBOS display number to be set
- TBOS Backup Function — Sets the TBOS primary backup shelf, TBOS secondary backup shelf, normal TBOS, or no TBOS. The first shelf connected to a TBOS link should be provisioned as the primary backup, and at most one of the other shelves that are connected to the same TBOS link in the bay can be provisioned as the secondary backup.
- CO/RT Select — Selects the shelf location as a CO or RT; controls the operation of the miscellaneous discrete environmental alarms and controls
- Remote TBOS — Disables or enables remote TBOS
- Site ID No. — Identifies the DDM-2000 OC-3 shelf contained within a subnetwork as shown on 7-segment LED display and the parallel telemetry far-end status points. Site ID should be set to 7 in a central office. (In interoffice applications, one CO should be set to Site 7 and the other to any other site.) Site ID 8 should not be used if the parallel telemetry interface is used. Although 10 sites are possible, only site addresses 1-8 are supported **prior** to OC-3 Release 6.1 (linear) and OC-3 Release 7.0 (ring). For releases prior to OC-3 Release 6.1 (linear) or Release 7.0 (rings), if more than 8 sites (10 maximum) are needed, you must use unique combinations of the Site and NE (OHCTL) settings to prevent duplicate site/NE settings in the same maintenance subnetwork. Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are not used prior to OC-3 Release 6.1 (R7.0) and must be set to the **ON** position. Although site addresses 1-32 are supported for OC-3 Release 6.1 (linear) and OC-3 Release 7.0 (ring), or later, only 10 site addresses may be chosen out of the 32 possibilities (for example 1, 10, 20 and 30). Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are used in conjunction with Switch 2, sections 1, 2, and 3 (**S2-1**, **S2-2**, and **S2-3**) to support the new site addresses. You should use unique combinations of the Site and NE (OHCTL) settings to prevent duplicate site/NE settings in the same maintenance subnetwork.
- Shelf ID No. in a Bay — Identifies the DDM-2000 OC-3 shelf within a bay
- Front CIT Data Rate — Sets the CIT data rate
- Rear CIT (MODEM) Data Rate — Sets the MODEM data rate
- Power Minor (PMN) — Allows provisioning of the PMN alarm to office major or office minor alarm
- TBOS Termination — Sets the DDM-2000 OC-3 shelf as the terminating (last) or nonterminating (not last) shelf in a cascaded TBOS link.

The location and functions of the SYSCTL circuit pack option switches are shown in Figure 7-4.



Notes:

1. The switches are set by moving the slide toward the desired position.
2. If an invalid setting is selected, the FAULT LED lights and an alarm is generated. The FAULT LED will also light if the companion OHCTL is not inserted.

TBOS Display Number				TBOS Backup Function			CO/RT Select		Remote TBOS	
Value	S1-1	S1-2	S1-3	Value	S1-4	S1-5	Value	S1-6	Value	S1-7
1	ON	ON	ON	Primary	ON	ON	RT	OFF	Enabled	OFF
2	OFF	ON	ON							
3	ON	OFF	ON	Secondary	OFF	ON				
4	OFF	OFF	ON							
5	ON	ON	OFF	Normal	OFF	OFF	CO	ON	Disabled	ON
6	OFF	ON	OFF							
7	ON	OFF	OFF	No TBOS	ON	OFF				
8	OFF	OFF	OFF							

Note: Switches S1-8 and S3-8 must be OFF. If not set to OFF, there will be no FAULT indication, because these switches may be valid for other (non-DDM-2000) applications.

Figure 7-4. BBG5 SYSCTL Option Switches (Sheet 1 of 2)

Switch 2 (S2) Site ID Settings

Site ID Number Value	S2-1	S2-2	S2-3	S2-7 (Note)	S2-8 (Note)
1	ON	ON	ON	ON	ON
2	OFF	ON	ON	ON	ON
3	ON	OFF	ON	ON	ON
4	OFF	OFF	ON	ON	ON
5	ON	ON	OFF	ON	ON
6	OFF	ON	OFF	ON	ON
7	ON	OFF	OFF	ON	ON
8	OFF	OFF	OFF	ON	ON
9	ON	ON	ON	OFF	ON
10	OFF	ON	ON	OFF	ON
11	ON	OFF	ON	OFF	ON
12	OFF	OFF	ON	OFF	ON
13	ON	ON	OFF	OFF	ON
14	OFF	ON	OFF	OFF	ON
15	ON	OFF	OFF	OFF	ON
16	OFF	OFF	OFF	OFF	ON
17	ON	ON	ON	ON	OFF
18	OFF	ON	ON	ON	OFF
19	ON	OFF	ON	ON	OFF
20	OFF	OFF	ON	ON	OFF
21	ON	ON	OFF	ON	OFF
22	OFF	ON	OFF	ON	OFF
23	ON	OFF	OFF	ON	OFF
24	OFF	OFF	OFF	ON	OFF
25	ON	ON	ON	OFF	OFF
26	OFF	ON	ON	OFF	OFF
27	ON	OFF	ON	OFF	OFF
28	OFF	OFF	ON	OFF	OFF
29	ON	ON	OFF	OFF	OFF
30	OFF	ON	OFF	OFF	OFF
31	ON	OFF	OFF	OFF	OFF
32	OFF	OFF	OFF	OFF	OFF

Note: Although more than 10 NEs are possible in later releases, only site addresses 1-8 are supported **prior** to OC-3 Release 6 1 (linear) and OC-3 Release 7 0 (ring) For releases prior to OC-3 Release 6 1 (linear) or Release 7 0 (rings), if more than 8 NEs are needed, you must use unique combinations of the Site and NE (OHCTL) settings to prevent duplicate site/NE settings in the same subnetwork. Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are not used prior to OC-3 Release 6 1 (R7 0) and must be set to the **ON** position. Although site addresses 1-32 are supported for OC-3 Release 6 1 (linear) and OC-3 Release 7.0 (ring), or later, for Release 7.0 only 10 site addresses (for 10 NEs) may be chosen out of the 32 possibilities (for example 1, 10, 20 and 30) For Release 7.1, 16 site addresses may be chosen; for Release 7.2, 24 site addresses may be chosen Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are used in conjunction with Switch 2, sections 1, 2, and 3 (**S2-1**, **S2-2**, and **S2-3**) to support the new site addresses You should use unique combinations of the Site and NE (OHCTL) settings to prevent duplicate site/NE settings in the same subnetwork.

Figure 7-4. BBG5 SYSCTL Option Switches (Sheet 2 of 3)

Switch 2 (S2) Shelf ID Settings

Shelf ID Number			
Value	S2-4	S2-5	S2-6
1	ON	ON	ON
2	OFF	ON	ON
3	ON	OFF	ON
4	OFF	OFF	ON
5	ON	ON	OFF
6	OFF	ON	OFF
7	ON	OFF	OFF
8	OFF	OFF	OFF

Switch 3 (S3) Settings

Front Access Baud Rate				Rear Access Baud Rate				Power Minor (PMN)	
Value	S3-1	S3-2	S3-3	Value	S3-4	S3-5	S3-6	Alarm	S3-7
300	OFF	OFF	OFF	300	OFF	OFF	OFF	Minor	OFF
1200	OFF	OFF	ON	1200	OFF	OFF	ON		
2400	OFF	ON	OFF	2400	OFF	ON	OFF		
4800	OFF	ON	ON	4800	OFF	ON	ON		
9600	ON	OFF	OFF	9600	ON	OFF	OFF	Major	ON
19200	ON	OFF	ON	19200	ON	OFF	ON		
Invalid*	ON	ON	OFF	Invalid*	ON	ON	OFF		
Invalid*	ON	ON	ON	Invalid*	ON	ON	ON		

Note: Switch S3-8 must be OFF.
* If an invalid data rate is selected, the system defaults to 1200 baud and no alarm is generated.

Switch 4 (S4) Settings

TBOS Termination	
VALUE	S4-1
Not Last	OFF
Last	ON

Note: Switch S4-2 must be OFF.

Figure 7-4. BBG5 SYSCTL Option Switches (Sheet 3 of 3)

BBG5 SYSCTL Quick Reference Summary

Interface Functions

Intrashelf interface functions performed by the SYSCTL are as follows:

(a) Direct control of other circuit packs via a serial control link and intrashelf control bus

(b) Control of circuit pack and user panel LEDs

(c) Detecting the presence of, and identifying, circuit packs installed in the system

Craft Interface:

(a) Local and remote craft interface provisionable to 300, 1200, 2400, 4800, 9600, or 19,200 baud

(b) Provides interface for all advanced provisioning, performance monitoring, administration, and maintenance activities.

User Panel

(a) Alarm and status indicators

(b) Controls.

Telemetry Functions

Telemetry functions provided by the SYSCTL are as follows:

(a) TBOS alarm, surveillance, and control (AS&C) interface operating at 2400 baud

(b) Miscellaneous discrete environmental alarms and control.

Maintenance Functions

Maintenance functions provided by the SYSCTL are as follows:

(a) Automatic reset on powerup

(b) Fault detection, isolation, and reporting

(c) Protection switching control of other circuit packs

(d) Inventory information (*CLEI* code, date of manufacture, etc.).

Edge Connection Inputs/Outputs

Table 7-1 describes the SYSCTL input/output (I/O) connections.

Table 7-1. BBG5 SYSCTL I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
BMPD8	306		TRMCKP	248	
BMPD9	305		TRMCKN	247	
BMPD10	304		TRMCDP	148	
BMPD11	303		TRMCDN	147	
BMPD12	206		CSRTLM	128	
BMPD13	205		CSRTG1	121	
BMPD14	204		CSRTG2	021	
BMPD15	203		CSROL1	120	
BMPA1	313		CSROL2	020	
BMPA2	312		CSRHA1	119	
BMPA3	311		CSRHA2	019	
BMPA4	310		CSRHB1	118	
BMPA5	309		CSRHB2	018	
BMPA6	308		CSRHC1	117	
BMPA7	307	Intrashelf	CSRHC2	017	
BMPA8	212	Processor Bus	CSRLA1	116	
BMPA9	211		CSRLA2	115	
BMPA10	210		CSRLA3	016	
BMPA11	209		CSRLA4	015	
BMPA12	208		CSRLA5	140	
BMPA13	207		CSRLA6	139	
BCKOUT	214		CSRLA7	040	
TLMBSN	217		CSRLAP	039	
BMPRWN	314		CSRLB1	114	
BMPASN	315		CSRLB2	113	Intrashelf
BMPDSN	215		CSRLB3	014	Control Bus
MPINTN	316		CSRLB4	013	
DTACKN	216		CSRLB5	138	
FRCMJ	028		CSRLB6	137	
LSICKP	110		CSRLB7	038	
LSICKN	010		CSRLBP	037	
LSICDP	109	Intrashelf	CSRLC1	112	
LSICDN	009	Control Bus	CSRLC2	111	
LSIRDP	108		CSRLC3	012	
LSIRDN	008		CSRLC4	011	

Table 7-1. BBG5 SYSCTL I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
CSRLC5	136		FRXD	323	
CSRLC6	135		FTXD	223	CIT Interface
CSRLC7	036		FDTR	322	
CSRLCP	035		FDTRC	329	
BS0	105		FXMTBS	331	Intershelf
BS1	104		FRCVBS	330	Control Bus
BS2	103		FCLAIM	332	
BS3	006		RRXD	049	
BS4	005		RTXD	048	Modem
BS5	004	Intrashelf	RDTR	047	Interface
BS6	003	Control Bus	RS232N	222	
IICSCL	107				
IICSDA	007		RDTRC	229	
LINKEN	227		RXMTBS	231	Intershelf
SHELFID	226		RRCVBS	230	Control Bus
ACK1	225		RCLAIM	232	
ACK2	325				
	327		CRLED	321	
	326		MJLED	320	
	127		MNLED	319	
	126		PMNLED	318	User Panel
	125		FEALED	221	LEDs
	124	Not	ABNLED	220	
	123	Used	ACOLED	219	
	122		NEALED	218	
	224		ACON	328	User Panel
	027				ACO Pushbutton
	025				
	026		RYCRA1	146	
	024		RYCRA2	046	
	022		RYCRV1	145	
	235		RYCRV2	045	
	134		RYMJA1	144	
	133		RYMJA2	044	Office Alarms
	132		RYMJV1	143	
	131		RYMJV2	043	
	130		RYMNA1	142	
	032		RYMNA2	042	
	031		RYMNV1	141	
	030		RYMNV2	041	
	201				
	101				

Table 7-1. BBG5 SYSCTL I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
RTBOSP	334		RMPDGN	249	
RTBOSN	234	Serial Telemetry	TMPDGN	149	Test
XTBOSP	333	(TBOS)	SANDSN	348	Interface
XTBOSN	233		EXRSTN	228	
TLMIC	339		PMNTIN	243	Power Monitor
TLMI1	343	Telemetry	FANCTL	346	Fan Control
TLMI2	342	Inputs	-48VA2	200	
TLMI3	341		-48VA1	300	Power Input
TLMI4	340		-48VB2	001	
TLMI5	338		-48VB1	100	
TLMI6	337		-48VBT	301	
TLMI7	336		GRDFLT	347	
TLMI8	335		GRD	317	
TLMI9	242		GRD	213	
TLMI10	241		GRD	129	Ground Input
TLMI11	240		GRD	106	
TLMI12	239		GRD	102	
TLMI13	238		LATEGRD	029	
TLMI14	237		GRD	023	
TLMI15	236		ESDGRD	002	ESD Protection
TLMOC	345		+5VOUT	302	
TLMO1	344	Telemetry	+5VOUT	324	Power Output
TLMO2	246	Outputs	+5VOUT	202	
TLMO3	245		-	-	
TLM04	244		-	-	

BBG7 OHCTL Circuit Pack Description

Purpose of Circuit

The overhead controller (OHCTL) circuit pack is used in conjunction with the DDM-2000 OC-3 BBG5 system controller (SYSCTL). It provides overhead channel interfaces for the system.

Faceplate Indicator

The OHCTL circuit pack faceplate indicator is shown in Figure 7-5. The red FAULT LED lights on detection of circuit pack failure. The red FAULT LED flashes in the event of a SONET DCC failure.



Figure 7-5. BBG7 OHCTL Circuit Pack

General Description of Operation

The OHCTL circuit pack provides the following five basic functions:

- Single-ended operation (SEO) communication channel
- Parallel telemetry
- Miscellaneous discrete outputs
- X.25 message-based operations interface
- Basic orderwire interface.

Detailed Description of Operation

OC-3 Transport Overhead Channel

Figure 7-6 provides an overall block diagram of the OHCTL circuit pack.

The OHCTL terminates an overhead channel from each Main and function unit slot. The overhead channel includes a 192 kb per section DCC (SONET bytes D1-D3) and a 64-kb/s orderwire channel (SONET byte E1).

Parallel Telemetry

The alarms and status supplied by the OHCTL as remote information accessible to an operations center are as follows:

- Alarms (CR, MJ, MN, PMN)
- Status (SID, NE, FE, INC, CLF, ACO)
- Control (ACO).

User Definable Miscellaneous Discrete Environmental Alarms and Controls

The system provides 4 miscellaneous discrete control outputs and 15 miscellaneous discrete alarm/status inputs when the DDM-2000 OC-3 is configured as a remote terminal. For this application, the SYSCTL supplies all of the necessary miscellaneous discrete I/O. When the DDM-2000 OC-3 resides in a central office, 4 control inputs and 15 alarm/status outputs are provided corresponding to the 4 control outputs and 15 alarm and status inputs at each remote terminal. In this configuration, the SYSCTL provides 4 inputs and 4 outputs, while the OHCTL provides the remaining 11 miscellaneous discrete outputs.

X.25 Message-Based Operation Interface

The OHCTL provides the TL1/X.25 interface to Bellcore Network Monitoring and Analysis (NMA) operation system.

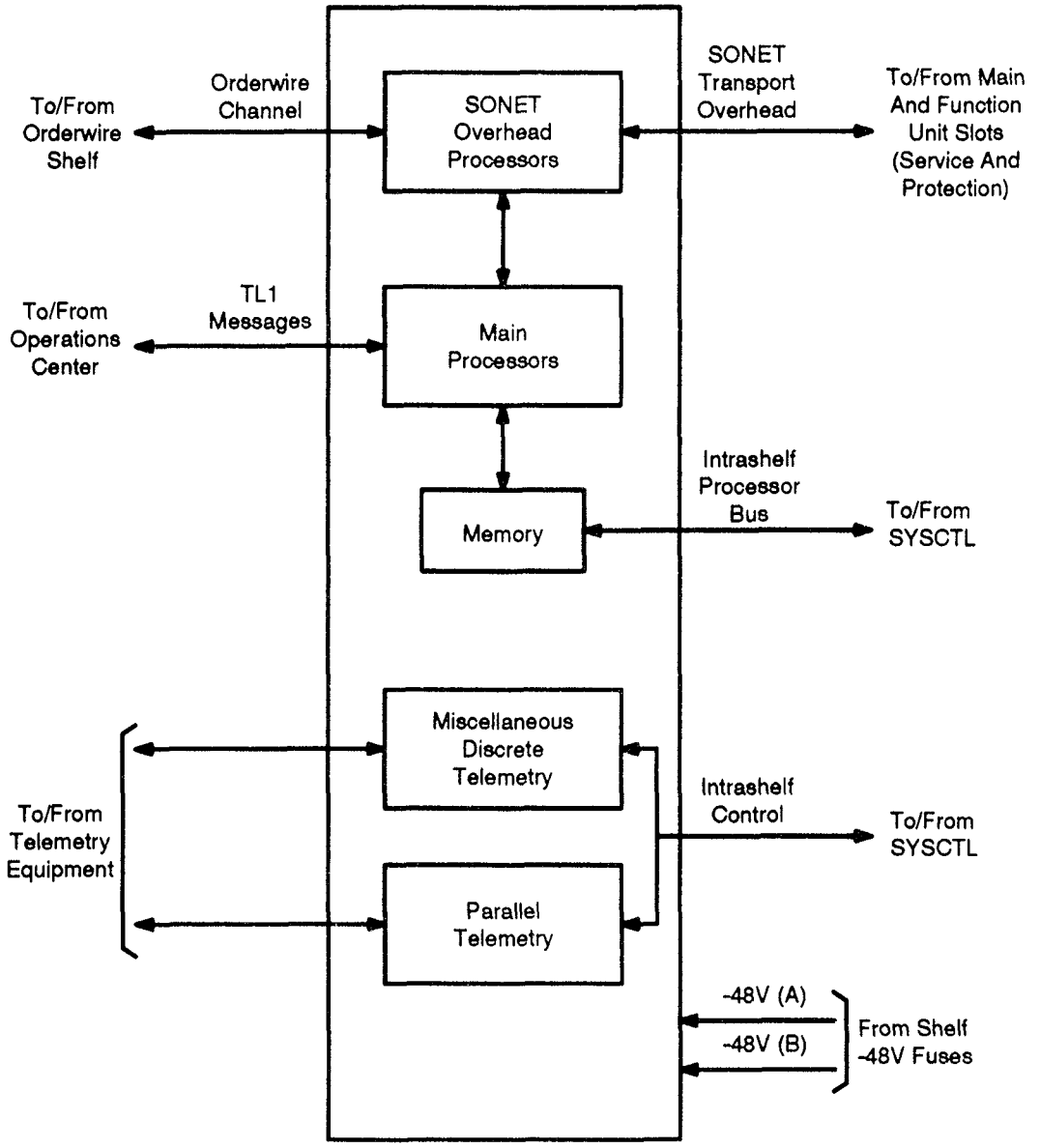


Figure 7-6. BBG7 OHCTL Circuit Pack Block Diagram

Orderwire Interface

The OHCTL provides orderwire capability via the overhead E1 byte. An external analog to digital converter supplying 64 kb/s data and clock signals is required to use this capability.

Interface Circuitry

The OHCTL circuit pack interfaces with the SYSCTL via the intrashelf control bus.

Maintenance Features and Modes

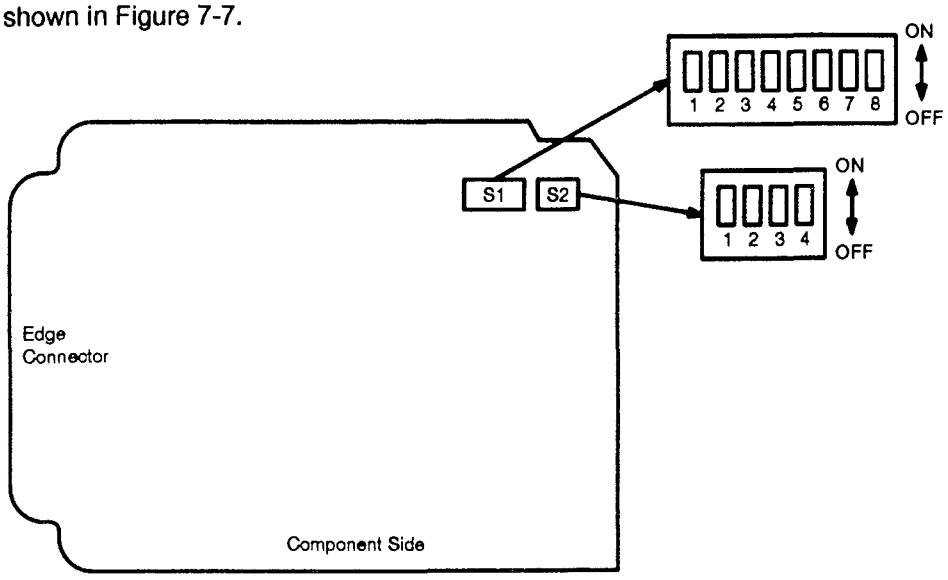
Failures of the OHCTL are not service affecting; therefore, there is no protection of the pack.

Power Circuitry

The OHCTL receives two sources of –48 volts which are diode ORed, fused, filtered, and converted to a +5 volts source to power the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

Hardware Settings

The OHCTL circuit pack switches provide network element number selection as shown in Figure 7-7.



Note: The switches are set by moving the slide toward the desired position.

Switch S1			
Network Element Number			
Value	S1-1	S1-2	S1-3
1	ON	ON	ON
2	OFF	ON	ON
3	ON	OFF	ON
4	OFF	OFF	ON
5	ON	ON	OFF
Invalid	OFF	ON	OFF
Invalid	ON	OFF	OFF
Invalid	OFF	OFF	OFF

Notes:

1. If an invalid setting is selected, the fault LED lights and an alarm is generated.
2. Switches S1-4, S1-5, S1-6, S1-7, and S1-8 must be ON.
3. Switch S2-1 should be ON and switches S2-2, S2-3, and S2-4 should be OFF. See "OSI Settings."
4. In Release 6, Note 3 applies to all shelves except the CO shelf connected main-to-main to another shelf. At the CO, Switches 2-1 through 2-4 should all be set to OFF to avoid alarms.
5. The FAULT LED will light if the companion SYSCTL is not inserted.

Figure 7-7. BBG7 OHCTL Circuit Pack Option Switches

OSI Settings

For Release 6.0 and all later releases, switch S2 is used to control the identification of the DCC for open systems interconnection (OSI) interworking. These settings are for the "Network Side" and "User Side" of network elements in a span. To avoid alarms, the network elements on each side of an optical span must have their network side/user side parameters set to opposite values.

Switch S2 corresponds to the following shelf slot positions.

- S2-1 Main
- S2-2 Function Unit A
- S2-3 Function Unit B
- S2-4 Function Unit C.

See the TOP section of this manual (Volume II) for the procedure to set S2.

OHCTL Quick Reference Summary

Functions

Major functions of the OHCTL circuit pack are as follows:

(a) SONET overhead channel interface to OLIU circuit packs

(b) Parallel telemetry to remotely provide alarm and status information to an operations center

(c) User-definable miscellaneous discrete environmental alarm and status outputs for monitoring auxiliary remote site equipment used with a DDM-2000 OC-3 shelf

(d) An X.25 message-based operations interface

(e) External orderwire interface

(f) Inventory information (*CLEI* code, date of manufacture, etc.).

Edge Connector Inputs/Outputs

Table 7-2 describes the OHCTL I/O connections.

Table 7-2. BBG7 OHCTL I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
BMPD8	306		TLMO12	239	
BMPD9	305		TLMO13	238	
BMPD10	304		TLMO14	237	
BMPD11	303		TLMO15	236	
BMPD12	206		TLMO16	235	
BMPD13	205		TLMOC	345	
BMPD14	204		TLMIC	339	Discrete Telemetry
BMPD15	203		TLMI1	343	Outputs
BMPA1	313		TLMI2	342	
BMPA2	312		TLMI3	341	
BMPA3	311		TLMI4	340	
BMPA4	310		PTCOM	014	
BMPA5	309		PTCR	115	
BMPA6	308		PTMJ	114	
BMPA7	307	Intrashelf	PTMN	113	
BMPA8	212	Processor Bus	PTPMN	112	
BMPA9	211		PTACOO	111	
BMPA10	210		PTACOI	007	
BMPA11	209		PTSID	110	Parallel Telemetry
BMPA12	208		PTCLF	109	
BMPA13	207		PTINCM	108	
BCKOUT	214		PTNE	015	
TLMBSN	217		PTFE1	013	
BMPRWN	314		PTFE2	012	
BMPASN	315		PTFE3	011	
BMPDSN	215		PTFE4	010	
MPINTN	316		PTFE5	009	
DTACKN	216		PTFE6	008	
CSRTLM	128	Intrashelf Control Bus	FRCMJ	028	
RTBPMP	334		ROWCLK	103	
RTBPMN	234	Serial Telemetry (TBOS)	ROWDAT	104	Orderwire
XTBPMP	333	Pass-Through	TOWCLK	003	
XTBPMN	233		TOWDAT	004	
TLMO1	344		RRXD	249	
TLMO2	246		RTXD	248	
TLMO3	245		RDTR	247	Modem Pass-Through
TLMO4	244		RRXDR	149	
TLMO5	338	Discrete Telemetry	RTXDR	148	
TLMO6	337	Outputs	RDTRR	147	
TLMO7	336		ROHCK1	127	
TLMO8	335		ROHFR1	125	
TLMO9	242		ROHDA1	123	SONET Overhead
TLMO10	241		ROHCK2	126	
TLMO11	240		ROHFR2	124	

Table 7-2. BBG7 OHCTL I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
ROHDA2	122		Q3RTS	332	
TOHCK1	027		Q3TCK	331	
TOHFR1	025		Q3DTR	330	
TOHCK2	026		Q3RID	329	
TOHFR2	024		Q3TDA	323	TL1 Interface
TOHDA1	022		Q3RCK	232	
TOHDA2	224		Q3CTS	231	
ROHAC1	121		Q3DSR	230	
ROHAF1	119		Q3DCD	229	
ROHAD1	117		Q3RDA	223	
ROHAC2	120		OHRSTN	049	
ROHAF2	118		DEVRXD	220	Test Interface
ROHAD2	116		DEVTXD	320	
TOHAC1	021		WDDISN	348	
TOHAF1	019		–48VRT	301	
TOHAC2	020		–48VA1	300	
TOHAF2	018		–48VA2	200	Power
TOHAD	016		–48VB1	100	
ROHBC1	140	SONET Overhead	–48VB2	001	
ROHBF1	138		GRD	317	
ROHBD1	136		GRD	213	
ROHBC2	139		GRD	129	
ROHBF2	137		GRD	107	
ROHBD2	135		GRD	102	Ground
TOHBC1	040		GRD	029	
TOHBF1	038		GRD	023	
TOHBC2	039		GRD	036	
TOHBF2	037		GRD	042	
TOHBD	035		GRD	017	
ROHCC1	146		GRD	007	
ROHCF1	144		GRD	029	
ROHCD1	142				
ROHCC2	145				
ROHCF2	143				
ROHCD2	141				
TOHCC1	046				
TOHCF1	044				
TOHCC2	045				
TOHCF2	043				
TOHCD	041				

Synchronization

Synchronization Functions

The DDM-2000 OC-3 Multiplexer supports three synchronization modes:

- DS1 timing input from Stratum 3 or better office clock for central office applications
- Free running in central office applications when external timing inputs are not available
- Loop timing for remote timing functions.

The TGS circuit pack supports all three timing modes. In addition, the BBF2B TGS circuit pack provides a DS1 timing output that is used for network synchronization and allows loop timing and DS1 Output timing to be derived from an OLIU in function unit C.

The timing circuit packs distribute clock and frame signals, derived from the selected reference source, to the transmission circuit packs.

BBF2/BBF2B TGS Circuit Pack Description

Purpose of Circuit

The synchronous timing generator (TGS) circuit pack provides timing for the shelf and a DS1 output for use as a reference signal by other shelves in the bay. The BBF2B TGS circuit pack also provides a DS1 output signal for use as a reference signal to time a building integrated timing supply (BITS) for network synchronization and allows loop timing to be derived from an OLIU in function unit C.

TGS Faceplate Indicators

The TGS circuit pack (BBF2 shown) faceplate indicators are shown in Figure 7-8.

The red FAULT LED lights on detection of circuit pack hardware failure or improper switch settings.

The red FAULT LED flashes in the event of an incoming DS1 timing reference failure.

The green ACTIVE LED lights when the circuit pack is providing timing to the rest of the shelf.

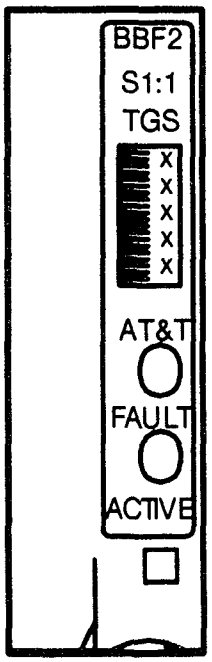


Figure 7-8. BBF2 TGS Circuit Pack

General Description of Operation

The TGS circuit pack provides timing signals to the DDM-2000 OC-3 circuit packs. The TGS circuit pack is microprocessor controlled and has the capability to synchronize to external DS1 references or to loop references from an incoming optical signal. The on-board oscillator has sufficient accuracy to provide timing signals without synchronization references for point-to-point systems (free-running). In addition to these functions, the BBF2B TGS circuit pack provides a DS1 timing output for network timing distribution.

The TGS circuit pack supports three timing modes to serve a wide range of DDM-2000 OC-3 synchronization needs: external timing, loop timing, and free running. In addition, the BBF2B TGS circuit pack supports external timing or loop timing with DS1 output provisioned for network synchronization.

In external timing mode, each TGS circuit pack accepts one DS1 reference from an external Stratum 3 or better clock and one cross-coupled from its companion TGS circuit pack. A high-stability digital phase-locked loop (DPLL) removes any transient impairments on the DS1 reference for improved jitter performance.

In loop-timing mode, the TGS circuit pack derives local shelf timing from the received OC-3 signal. In addition, if equipped with a BBF2B TGS circuit pack, the timing function can also be derived from an OLIU equipped in function unit C. This option is only available through software provisioning

In free-running mode, the TGS circuit pack derives timing from a high stability temperature-compensated, voltage-controlled crystal oscillator.

In case of unprotected synchronization reference failure, the TGS circuit pack will switch to "holdover mode" and continue to provide system timing, using the internal oscillator to maintain the last known good reference frequency.

DS1 Timing Output

The DS1 Output provided by the TGS circuit pack can be provisioned to one of two modes of operation:

- MULT
  - — This mode is normally used to distribute a DS1 timing reference to other shelves in the bay. In this mode, the distributed DS1 Output is derived from the external DS1 reference that is input to the shelf.
- SYNC OUT (BBF2B only)
  - — This mode is used to distribute a DS1 timing reference to a BITS. In this mode, the distributed DS1 Output is based on the timing signal the TGS circuit pack has derived from the received OC-3 signal from either the Main OLIU or an OLIU equipped in function unit C.

— If the DS1 output is provisioned for SYNC OUT mode, DS1 AIS will be inserted on detection of unprotected OC-3 line failure.

Detailed Description of Operation

Control Circuitry

Overall block diagrams for the BBF2 and BBF2B TGS circuit packs are shown in Figures 7-9 and 7-10. The TGS circuit pack interfaces with the SYSCTL via the intrashelf control bus. Through this interface, the SYSCTL monitors the health of the TGS circuit pack to provide alarm reporting. The SYSCTL also controls TGS circuit pack switching and mode functions, as well as controlling the faceplate LEDs.

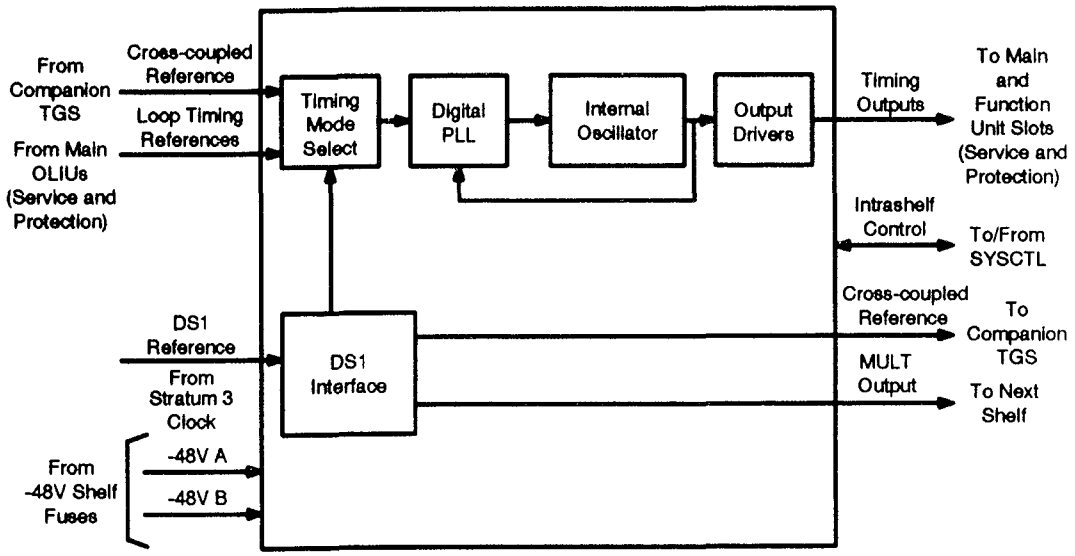


Figure 7-9. BBF2 TGS Circuit Pack Block Diagram

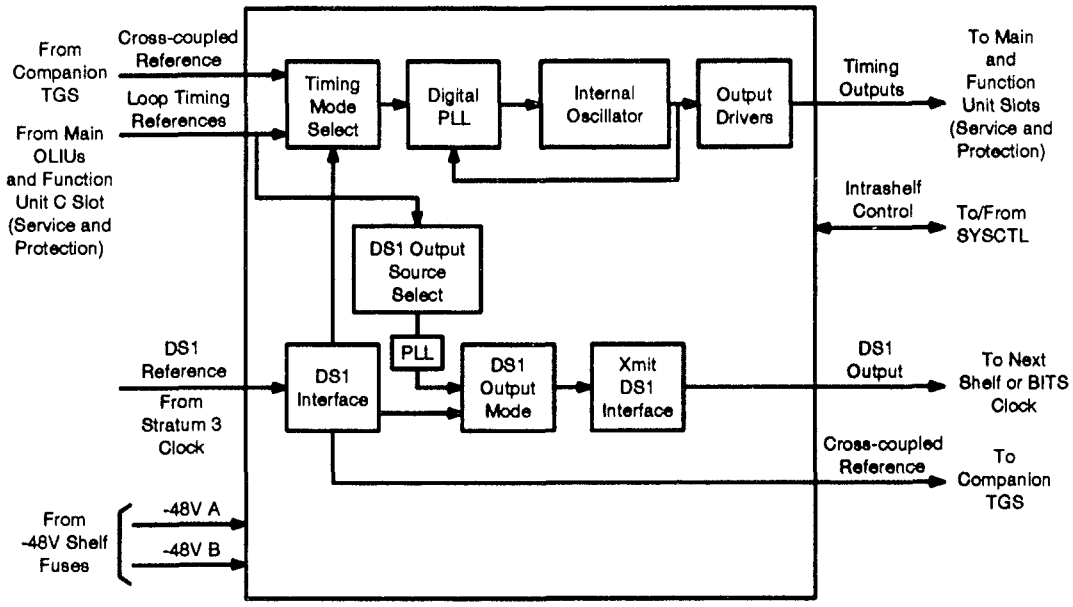


Figure 7-10. BBF2B TGS Circuit Pack Block Diagram

Timing Circuitry

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

Loop Timing. The reference signal feeding the phase-locked loop is selected from the internal oscillator or a loop-timing clock derived from the incoming optical line. In loop-timing mode, the OC-3 line being selected for transmission is also selected as the timing reference. In addition, if equipped with the BBF2B TGS, the OC-3 line in function unit C selected for transmission can optionally be selected for the timing reference. This selection is under the control of the on-board microcontroller and the SYSCTL and is dependent on the timing mode selected by the user via on-board selection switches and the status of the references. Loss of both loop-timing references will cause the TGS circuit pack to go into holdover mode to maintain system timing.

Free Running. For free-running operation, a digital phase-locked loop (DPLL) is implemented using a digital counter, a microcontroller, a digital-to-analog converter, and a 51.84-MHz temperature-compensated, voltage-controlled crystal oscillator (TCVCXO). The microcontroller and resident firmware determine the loop parameters and loop performance, as well as reference monitoring and switching functions. The microcontroller periodically reads phase information contained in the digital counter. This information is used by the firmware to determine phase error and subsequently control the frequency output of the TCVCXO. The phase-locked loop incorporates a microprocessor as the loop filter. Firmware in this processor determines the loop bandwidth and performance as well as monitoring and switching functions.

DS1 Output. The DS1 output port of the BBF2 TGS circuit pack is permanently provisioned to MULT mode when the timing mode on the circuit pack is DS1 externally timed. In this mode, the DS1 output signal is a regenerated version of the DS1 input reference signal and is used to distribute this input timing reference to other shelves in the bay.

The DS1 output port of the BBF2B TGS circuit pack can be provisioned for either MULT or SYNC mode via a hardware switch. In the SYNC mode, the DS1 output signal derives its timing from the incoming OC-3 lines through timing synchronization signals from the DDM-2000 OC-3 Main OLIUs (main-1 or main-2), which is the default, or function unit C by software command.

Selection of these timing synchronization signals for the DS1 output in SYNC mode is controlled by the SYSCTL circuit pack. This selection can be provisioned via software command to "track" the active received side of the OC-3 line used for transmission, to always select its timing from the specified OC-3 line (main-1 or main-2), or function unit C (fn-c-1 or fn-c-2), regardless of its maintenance condition. Loss of timing reference for the DS1 output will result in the insertion of DS1 alarm indication signal (AIS) on this output port.

Holdover. The TGS circuit pack has an internal TCVCXO that will maintain shelf timing in the event of an unprotected timing DS1 reference failure (that is, holdover mode). The oscillator is also used to support free-running mode.

Clock Output Functions

Intrashelf Timing Distribution. The generated timing signals are distributed through output drivers to the Main and function unit slots. The TGS circuit pack provides eight differential 51.84-MHz master clock signals and eight differential 8-kHz composite STS-1 frame sync signals. In the 8-kHz sync signal, every fourth pulse is stretched to double width, providing an embedded 2-kHz reference for the virtual tributary (VT) superframe synchronization.

DS1 Outputs. The DS1 output port can be provisioned by hardware switches for MULT mode or DS1 timing synchronization (SYNC OUT) mode.

- SYNC OUT Mode
  - — The DS1 output port can be provisioned in the BBF2B TGS circuit pack to be the DS1 signal derived from the received OC-3 line, which is used for network timing distribution, when the BBF2B TGS circuit pack is in the loop or external timing mode.
- MULT Mode
  - — In external timing mode, the DS1 external reference can be cascaded to other shelves in the bay through the DS1 outport port.

Protection Circuitry

In both external and loop-timing modes, the synchronization references are continuously monitored for error-free operation. If the active reference becomes corrupted, the TGS circuit pack will select the standby reference without causing service degradations (that is, hitless reference switching). If both reference inputs are corrupted, the TGS circuit pack enters holdover mode where the DPLL holds the on-board oscillator frequency at the last good reference sample while the references are repaired.

In addition, optional 1x1 nonrevertive TGS circuit pack protection is provided. When the active TGS circuit pack microcontroller determines that its clock output is out of tolerance, it suppresses its timing outputs and signals its TGS circuit pack companion unit of its failed condition. The suppressed timing outputs

cause a timing hardware switch to the standby TGS circuit pack by the transmission circuit packs.

Fault Detection Circuitry

The TGS circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the TGS circuit pack is inserted or recovers from a transient failure.

The incoming DS1 references are monitored for:

(a) Loss of signal (128 consecutive zeros)

(b) DS1 alarm indication signal (AIS)

(c) Loss of frame

(d) Excessive out-of-frame count

(e) Greater than 10^{-3} bit error rate (BER).

Power Circuitry

The TGS circuit pack receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion to a +5 volt source to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

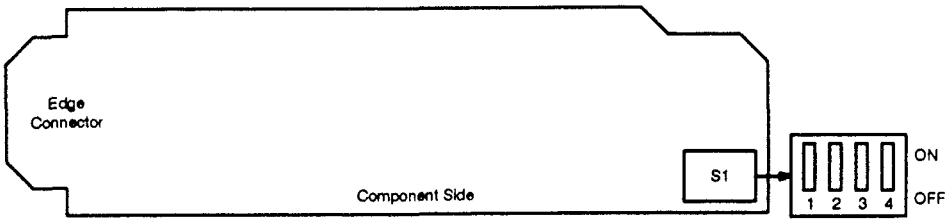
TGS Hardware Settings

The TGS circuit pack option switches provide the following functions:

- DS1 Reference Line Coding — Selects either alternate mark inversion (AMI) or AMI with bipolar 8-zero substitution (B8ZS) line coding for both DS1 input and DS1 output.
- DS1 Reference Format — Selects either super frame (SF) or extended super frame (ESF) for both DS1 input and DS1 output.
- Timing Mode — Sets timing mode to free run, external DS1, or loop timed.
- DS1 output mode — Sets DS1 output (SF or ESF "all ones" signal") for intershelf timing derived either from DS1 external input or from network timing distribution derived from received line (BBF2B only). Reference for DS1 timing output is taken from either the Main or function unit C OLIU groups.
- Sets equalizer switch for proper cable length when provisioned for SYNC OUT mode. Equalizer settings will be automatically set to shortest cable length when the DS1 output is provisioned for MULT mode.

The location of the option switches for the BBF2 and BBF2B TGS circuit packs is shown in Figures 7-11 and 7-12, respectively.

The location of the option switches for the BBF2 and BBF2B TGS circuit packs is shown in Figures 7-11 and 7-12, respectively.



Notes:

1. The switches are set by moving the slide toward the desired position.
2. If the invalid switch setting is selected, the FAULT LED lights and an alarm is generated.

TGS DS1 Line Coding and Frame Format Switch Settings (Note)

DS1 Line Code	Switch S1-1	DS1 Frame Format	Switch S1-2
AMI *	ON	SF *	ON
B8ZS	OFF	ESF	OFF

Note: Controls line coding and frame format for both DS1 input and output.

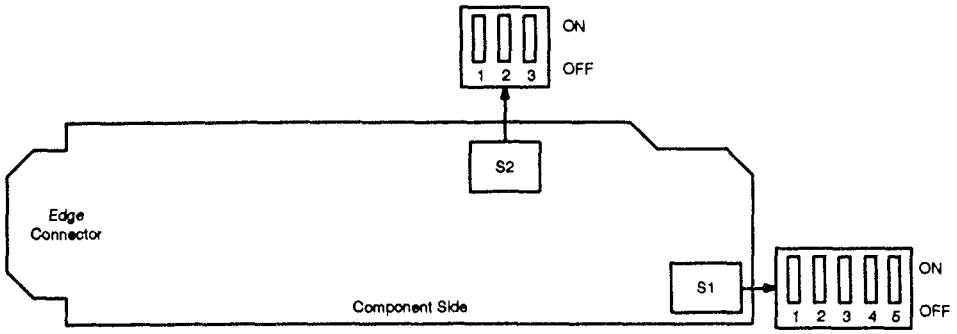
* Factory default.

TGS Timing Mode Switch Setting

Timing Mode	Switch Settings	
	S1-3	S1-4
Free Running	ON	ON
DS1 External*	OFF	ON
Loop Timing	ON	OFF
Invalid	OFF	OFF

* Factory default.

Figure 7-11. BBF2 TGS Option Switches for DDM-2000 OC-3



Notes:

1. The switches are set by moving the slide toward the desired position.
2. If the invalid switch setting is selected, the FAULT LED lights and an alarm is generated.
3. The Main OLIU is the default reference when in Loop Timing or SYNC OUT mode.

TGS DS1 Line Coding and Frame Format Switch Settings (Note)

DS1 Line Code	Switch S1-1	DS1 Frame Format	Switch S1-2
AMI *	ON	SF *	ON
B8ZS	OFF	ESF	OFF

Note: Controls line coding and frame format for both DS1 input and output.

* Factory default.

TGS Timing Mode Switch Settings

Timing Mode	Switch Settings		
	S1-3	S1-4	S1-5 (DS1 Output)
Free Running	ON	ON	OFF
DS1 External, MULT Mode*	OFF	ON	OFF
Loop Timing Main†	ON	OFF	OFF
Loop Timing, SYNC OUT Mode†	ON	OFF	ON
DS1 External, SYNC OUT Mode†	ON	ON	ON
Invalid	OFF	OFF	ON
Invalid	OFF	OFF	OFF
Invalid	OFF	ON	ON

* Factory default.
† Main OLIU is default; function unit C by `set-sync` command (Release 3.2).

Figure 7-12. BBF2B TGS Option Switches for DDM-2000 OC-3 (Sheet 1 of 2)

Equalizer Switch Settings

Equalization (Note)	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
131' to 262'	ON	OFF	ON
262' to 393'	ON	OFF	OFF
393' to 524'	OFF	ON	ON
524' to 655'	OFF	ON	OFF
Invalid	OFF	OFF	OFF
Invalid	OFF	OFF	ON
Invalid	ON	ON	ON

Note: Distance in feet for 22 gauge PIC (ABAM) cable.

Figure 7-12. BBF2B TGS Option Switches for DDM-2000 OC-3 (Sheet 2 of 2)

TGS Quick Reference Summary

Provisioned Modes

The TGS circuit pack can be provisioned through on-board option switches to any one of three timing modes: (a) External timing mode (b) Loop timing mode or (c) Free-running mode.

In addition, the BBF2B TGS circuit pack can be provisioned through on-board option switches to provide a DS1 output for network timing distribution or for shelf timing distribution. Loop timing from the Main OC-3 line is the factory default. Loop timing for function unit C can be provisioned with the CIT.

Holdover Mode

The holdover mode maintains the last good reference frequency during unprotected failure of external or loop-timing references.

Maintenance and Control

The following maintenance functions are provided on the TGS circuit pack: (a) DS1 reference monitoring, (b) TGS and OLIU circuit pack protection switching, and (c) Inventory information (*CLEI* code, date of manufacture, etc.).

DS1 Output

— DS1 Output (MULT output) derived from external DS1 input reference for intershelf timing

— DS1 Output (SYNC OUT) derived from received OC-3 line for network timing distribution (BBF2B only).

Edge Connector Inputs/Outputs

Table 7-3 describes the TGS I/O pins.

Table 7-3. TGS I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
MCLK1P	014		BS1-3	003-5	
MCLK1N	114		IICSCL	204	
MCLK2P	013		IICSDA	304	Control
MCLK2N	113		BMPA9	303	
MCLK3P	012		BMPA10	203	
MCLK3N	112		BMPA11	103	
MCLK4P	011		CSR	104	
MCLK4N	111		DS1TIP	118	DS1 Interface
MCLK5P	009		DS1RNG	119	
MCLK5N	109		DS1TIPO	218	
MCLK6P	008		DS1RINGO	219	
MCLK6N	108		LTCKSO	019	
MCLK7P	007		LTCKPO	318	Loop Timing
MCLK7N	107		LTCKSA	217	Reference
MCLK8P	006		LTCKPA	317	
MCLK8N	106		LTCKPC	305	
FSYN1P	214		LTCKSC	205	
FSYN1N	314		XREFI	117	Cross-Coupled
FSYN2P	213		XREFO	017	Reference
FSYN2N	313		XSANI	116	
FSYN3P	212		XSANO	016	Service/Protection
FSYN3N	312		XSTATI	115	Cross Coupling
FSYN4P	211	Timing	XSTATO	015	
FSYN4N	311		-48VA2	200	
FSYN5P	209		-48VA1	300	
FSYN5N	309		-48VB2	001	Power
FSYN6P	208		-48VB1	100	
FSYN6N	308		-48VRT	301	
FSYN7P	207		GND	102	
FSYN7N	307		GND	202	
FSYN8P	206		GND	302	
FSYN8N	306		GND	010	
DIAGR	316		GND	110	
DIAGT	315		GND	210	Ground
DIAGEN	216		GND	310	
SANDIS	215		GND	018	
SLOTID	105		GND	118	
			ESDGND	002	ESD Ground

Transmission

The transmission circuit packs are the DS1, DS1PM, MXRVO, OLIU, DS3, and STS1E.

BBF1/BBF1B DS1 Circuit Pack Description

Purpose of Circuit

The DS1 circuit pack provides a low-speed interface between asynchronous DS1 rate signals and SONET virtual tributary group (VT-G) signals.

DS1 Faceplate Indicator

The DS1 circuit pack FAULT indicator is shown in Figure 7-13. This red FAULT LED is lighted by the SYSCTL on detection of a DS1 circuit pack failure. In the event of an incoming signal failure, this LED flashes on and off.

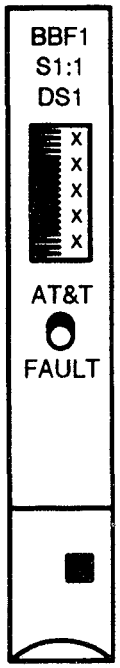


Figure 7-13. BBF1 DS1 Circuit Pack

General Description of Operation

The DS1 circuit pack terminates four bidirectional DS1 lines complying with standard DSX-1 signal specifications. The DS1 circuit pack interfaces to the MXRVO circuit pack at the VT-G rate (6.912 MHz) and to the SYSCTL.

The BBF1 and BBF1B DS1 circuit packs are functionally equivalent. Either one can be used to replace the other. The BBF1B has improved protection switching performance on circuit pack removal and insertion.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-14 provides an overall block diagram of the DS1 circuit pack. The transmit direction points towards the VT-G and the receive direction points toward the DS1s. In the transmit direction, the DS1 receives four balanced DS1 bipolar signals. Each of these signals passes through a relay to a DS1 interface circuit that converts it to unipolar nonreturn to zero (NRZ) format, recovers its clock, and sends it to the multiplexer (MUX) circuit. The MUX circuit converts each DS1 rate input into a 1.728 Mb/s VT1.5 signal, and then byte interleaves the four VT1.5s to create a VT-G signal that it sends to the MXRVO pack using the frame sync and clock received from the MXRVO.

Receive Direction. The DS1 receives a VT-G with clock and frame information from the MXRVO and demultiplexes the VT-G into four unique VT1.5 signals. Each VT1.5 passes through circuitry that performs pointer interpretation, removes the VT path overhead bits, the fixed stuff bits, and the overhead communications channel bits, and desynchronizes the embedded DS1. The DS1 rate signal is AMI or B8ZS encoded, preequalized with a selectable line build out (LBO). It is then sent as a balanced signal to a DSX-1 that may be located up to 655 feet from the DDM-2000 OC-3.

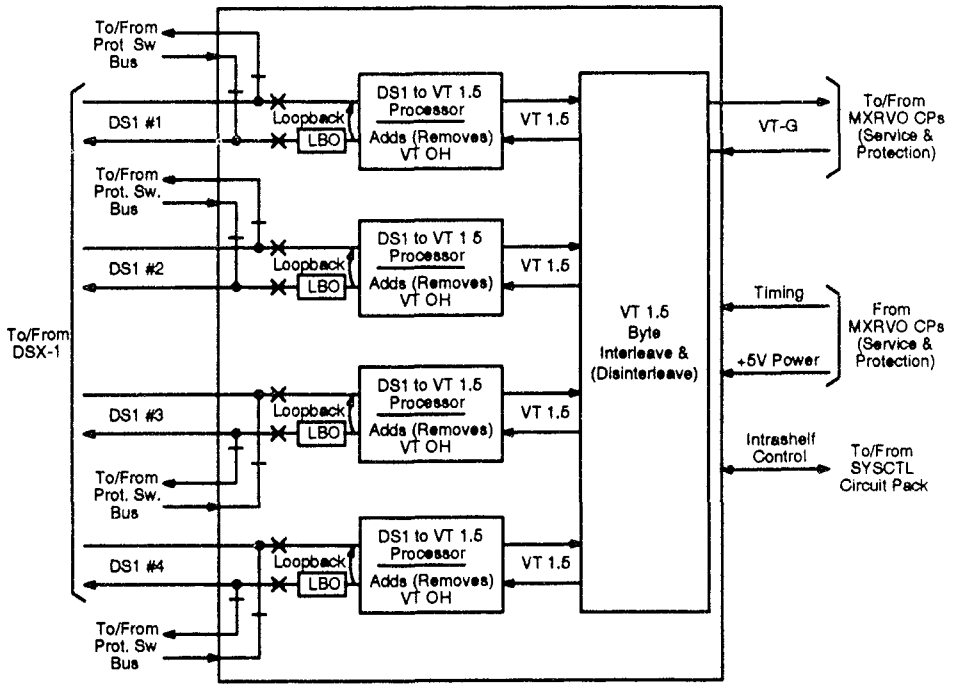


Figure 7-14. BBF1/BBF1B DS1 Circuit Pack Block Diagram

Control Circuitry

The DS1 circuit pack interfaces with the SYSCTL via the intrashelf control bus. Redundancy in the intrashelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The DS1 provides maintenance elements for reporting the status of the circuit pack and the incoming VT1.5 and DS1 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the DS1 responds to control signals from the SYSCTL [such as FAULT light-emitting diode (LED) control].

Timing Circuitry

The timing distribution to the DS1 contains ten timing signals: two high-speed clocks (active and standby), four VT-G clocks (two active and two standby), and four frame sync signals (two active and two standby).

The DS1 receives from the MXRVO a synchronous transport signal (STS-1) rate high-speed clock that provides the frequency reference for the desynchronizing phase-locked loop (PLL). This high-speed reference clock is also used to synthesize the DS1 rate AIS clock source for the DS1 devices and to provide a DS1 test signal.

The DS1 uses the VT-G clocks (6.912 MHz) and the frame sync signals it receives from the MXRVO to clock VT-G data to/from the MXRVO.

Protection Circuitry

Optional 1x7 revertive DS1 circuit pack protection is provided and this protection is independent of the MXRVO circuit pack(s). The DS1 protection switch points are implemented with on-board relays on the DSX-1 side and with logic selectors at the VT-G level on the active and standby MXRVO circuit packs. The SYSCTL controls these relays through two serial interfaces so that a failure of one serial interface to the DS1 does not prevent control of the relays. If +5 V power on the DS1 fails, the relays default to the protection state. If the SYSCTL is removed, the relays remain in their current state.

Shorting contacts are provided in the DS1 backplane connector so that when the circuit pack is removed, the DSX-1 cable pairs short through to the protection bus.

CAUTION:
Unused low-speed interface slots within a partially equipped group must be equipped 177A Retainer cards if DS1 protection is used. Failure to do so may result in corrupted transmission. The BBF3 DS1PM circuit pack can be mixed with the BBF1/1B. If mixed, the protection circuit pack must be a BBF3 DS1PM.

When a DS1 circuit pack is inserted, the relays are in the protection state until the SYSCTL determines that the circuit pack is good.

Fault Detection Circuitry

The DS1 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the DS1 circuit pack is inserted or recovers from a transient failure. The incoming DS1 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-6}. Incoming VT1.5 signals are monitored for VT AIS, VT LOP, and yellow.

Loopbacks

The DS1 circuit pack provides one DS1 loopback for each DS1 low-speed interface. The loopback is implemented inside the MUX/DEMUX/DESYNC device and bridges the desynchronizer output signal (transmitted towards the DSX-1) back into the DS1 synchronizer input. When the loopback is operated, the DS1 interface device forces AIS towards the DSX-1. The loopback is controlled by the SYSCTL via the intrashelf control bus.

Performance Monitoring

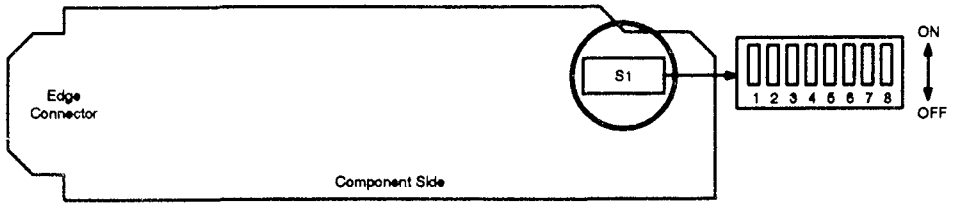
The DS1 circuit pack monitors VT path parameters derived from the V5 coding violations (Release 5.1 and later ring releases or 6.0 and later linear releases software is required for this feature).

Power Circuitry

The MXRVO circuit packs supply +5 V power to the DS1 circuit packs in the corresponding DS1 circuit pack groups. These two inputs are diode ORed and the output is fused and then filtered before it is used to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

DS1 Hardware Settings

The line coding and line build out (LBO) are switch settable. The locations of the DS1 circuit pack option switches are shown in Figure 7-15.



Note: The switches are set by moving the slide toward the desired position.

DS1 Cable LBO Settings

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 KHz	DIP Switch Settings		
			S1-1	S1-2	S1-3
0 to 133*	0 to 90*	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

* Minimum of 30 feet required to meet EMI requirements.

DS1 Line Code Settings

Line Code Format	DIP Switch Settings			
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)
B8ZS	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON

Notes:
1. Switch section 8 (S1-8) is unused and ignored by the system.
2. Line code is software overrideable.

Figure 7-15. BBF1/BBF1B DS1 Option Switches

DS1 Quick Reference Summary

Transmit Functions

Major transmit functions of the DS1 circuit pack are as follows:

(a) Receives four AMI or B8ZS encoded DS1 signals from a DSX-1

(b) Recovers DS1 clock and NRZ data from each DS1 signal

(c) Synchronizes and maps each data signal to a VT1.5 synchronous payload envelope (SPE)

(d) Inserts VT path overhead

(e) Multiplexes four VT1.5 SPEs to a byte-interleaved VT-G signal

(f) Provides the VT-G signal to a MXRVO circuit pack.

Receive Functions

Major receive functions of the DS1 circuit pack are as follows:

(a) Receives a SONET VT-G clock and frame synchronizing signals from its associated MXRVO

(b) Demultiplexes the VT-G into four VT1.5 signals

(c) Terminates VT path and the embedded DS1 signal from each VT1.5 SPE

(d) Desynchronizes the DS1 signals

(e) Encodes each DS1 signal into either AMI or B8ZS format

(f) Preequalizes (with line build out) each DS1 and provides them to a DSX-1 as bipolar signals.

Control Functions

The major control functions of the DS1 circuit pack are as follows:

(a) Protection switching for MXRVO circuit pack protection

(b) VT path overhead processing

(c) Internal fault detection

(d) Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

(a) Detects VT path AIS

(b) Inserts DS1 AIS toward fiber and toward DSX-1

(c) Inserts and detects VT path yellow signal.

Edge Connector Inputs/Outputs

Table 7-4 describes the DS1 input/output (I/O) pins.

Table 7-4. DS1 I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
DSXO1T	209		TVTCSP	316	
DSXO1R	208		TVTCSN	315	
DSXO2T	207		TVTFMS	313	
DSXO2R	206		TVTDAS	311	
DSXO3T	205		RVTCSP	016	VT-G Signals
DSXO3R	204		RVTCSN	017	(Service)
DSXO4T	203		RVTFMS	014	
DSXO4R	202	DS1 Interface	RVTDAS	013	
DSXI1T	217		DC52SP	118	
DSXI1R	216		DC52SN	018	
DSXI2T	215		TVTCPP	317	
DSXI2R	214		TVTCPN	318	
DSXI3T	213		TVTFMP	312	
DSXI3R	212		TVTDAP	310	
DSXI4T	211		RVTCPP	219	VT-G Signals
DSXI4R	210		RVTCPN	218	(Protection)
PSXO1T	109		RVTFMP	015	
PSXO1R	108		RVTDAP	012	
PSXO2T	107		DC52PP	119	
PSXO2R	106		DC52PN	019	
PSXO3T	105		LSICKP	307	
PSXO3R	104		LSICKN	306	
PSXO4T	103		LSICDP	010	
PSXO4R	102	DS1 Protection	LSICDN	009	
PSXI1T	117		LSIRDP	008	
PSXI1R	116		LSIRDN	007	
PSXI2T	115		CSR	200	Control
PSXI2R	114		BMPA11	303	
PSXI3T	113		BMPA10	304	
PSXI3R	112		BMPA9	305	
PSXI4T	111		BS1	302	
PSXI4R	110		BS2	201	
+5VS	301	Power	BS3	101	
+5VP	001		IICSDA	003	
ESDGRD	100	ESD Protection	IICSCL	004	
GRD	011				
GRD	314	Ground			
GRD	300				
GRD	002				

BBF3 DS1PM Circuit Pack Description

Purpose of Circuit

The DS1PM circuit pack provides all of the functions of a BBF1B circuit pack and also provides performance monitoring (PM) of SF and ESF signals to allow for T1 tariff verification. For PM, the DS1 signals from the DSX are monitored. Performance monitoring data from the opposite direction is provided by accessing the ESF data link.

DS1PM Faceplate Indicator

The DS1PM circuit pack FAULT indicator is shown in Figure 7-16. This red FAULT LED is lighted by the SYSCTL on detection of a DS1PM circuit pack failure. In the event of an incoming signal failure, this LED flashes on and off.

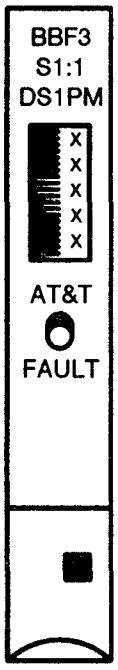


Figure 7-16. BBF3 DS1PM Circuit Pack

General Description of Operation

The DS1PM circuit pack terminates four bidirectional DS1 lines complying with standard DSX-1 signal specifications. The DS1PM circuit pack interfaces to the MXRVO circuit pack at the VT-G rate (6.912 MHz) and to the SYSCTL.

The DS1 and DS1PM circuit packs are, with respect to transmission, functionally equivalent. In addition to performing all of the functions of the DS1 circuit pack, the DS1PM circuit pack provides performance monitoring for the DS1 rate transmit signals (Release 5.1 and later ring releases or 6.0 and later linear releases software is required to use the DS1PM circuit pack).

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-17 provides an overall block diagram of the DS1PM circuit pack. The transmit direction points towards the VT-G and the receive direction points toward the DS1s. In the transmit direction, the DS1PM receives four balanced DS1 bipolar signals. Each of these signals passes through a relay to a DS1 interface circuit that converts it to unipolar nonreturn to zero (NRZ) format, recovers its clock, and sends it to the multiplexer (MUX) and framing (framer) circuits. The MUX circuit converts each DS1 rate input into a 1.728 Mb/s VT1.5 signal and then byte-interleaves the four VT1.5s to create a VT-G signal that it sends to the MXRVO circuit pack, using the frame sync and clock received from the MXRVO.

Receive Direction. The DS1PM receives a VT-G with clock and frame information from the MXRVO and demultiplexes the VT-G into four unique VT1.5 signals. Each VT1.5 passes through circuitry that performs pointer interpretation, removes the VT path overhead bits, the fixed stuff bits, and the overhead communications channel bits, and desynchronizes the embedded DS1. The DS1 rate signal is AMI or B8ZS encoded, preequalized with a selectable line build out (LBO), and then sent as a balanced signal to a DSX-1 that may be located up to 655 feet from the DDM-2000 OC-3.

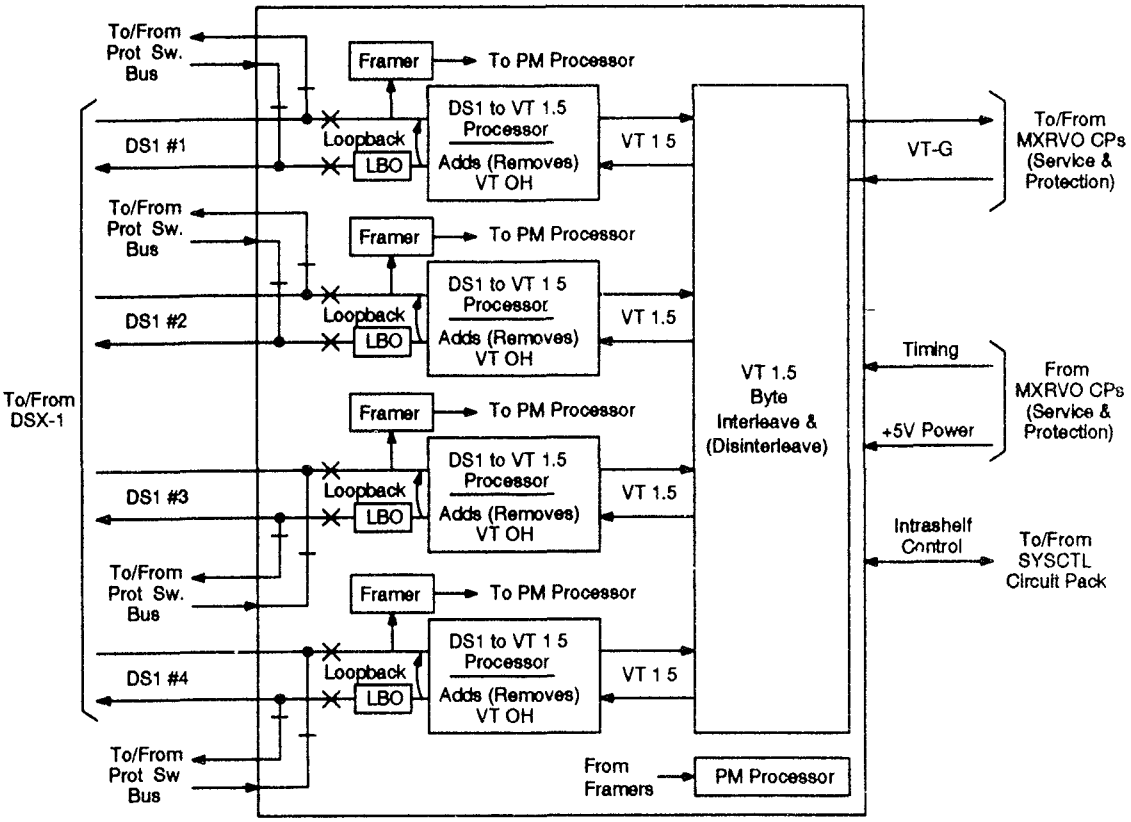


Figure 7-17. DS1PM Circuit Pack Block Diagram

Control Circuitry

The DS1PM circuit pack interfaces with the SYSCTL over the intrashelf control bus. Redundancy in the intrashelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The DS1PM provides maintenance elements for reporting the status of the circuit pack and the incoming VT1.5 and DS1 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the DS1PM responds to control signals from the SYSCTL [such as FAULT light-emitting diode (LED) control]. The PM processor collects information from the framing circuitry and generates DS1 PM parameters which are sent to the SYSCTL. The framer circuit acquires frame information (either SF or ESF) from the DS1 signal and sends the information to the PM processor. The PM processor then generates near-end and far-end (ESF only) DS1 PM parameters. When provisioned for DS1 clear channel, no PM path parameters are generated.

Timing Circuitry

The timing distribution to the DS1PM contains ten timing signals: two high-speed clocks (active and standby), four VT-G clocks (two active and two standby), and four frame sync signals (two active and two standby).

The DS1PM receives from the MXRVO a synchronous transport signal (STS-1) rate high-speed clock that provides the frequency reference for the desynchronizing phase-locked loop (PLL). This high-speed reference clock is also used to synthesize the DS1 rate AIS clock source for the DS1 devices and to provide a DS1 test signal.

The DS1PM uses the VT-G clocks (6.912 MHz) and the frame sync signals it receives from the MXRVO to clock VT-G data to/from the MXRVO.

Protection Circuitry

Optional 1x7 revertive DS1PM circuit pack protection is provided and this protection is independent of the MXRVO circuit pack(s). The DS1PM protection switch points are implemented with on-board relays on the DSX-1 side and with logic selectors at the VT-G level on the active and standby MXRVO circuit packs. The SYSCTL controls these relays through two serial interfaces so that a failure of one serial interface to the DS1PM does not prevent control of the relays. If +5 V power on the DS1PM fails, the relays default to the protection state. If the SYSCTL is removed, the relays remain in their current state.

Shorting contacts are provided in the DS1PM backplane connector so that when the circuit pack is removed, the DSX-1 cable pairs short through to the protection bus.

CAUTION:
Unused low-speed interface slots within a partially equipped group must be equipped with 177A Retainer cards if DS1PM protection is used. Failure to do so may result in corrupted transmission. The BBF3 DS1PM circuit pack can be mixed with the BBF1/1B. If mixed, the protection circuit pack must be a BBF3 DS1PM.

When a DS1PM circuit pack is inserted, the relays are in the protection state until the SYSCTL determines that the circuit pack is good.

Fault Detection Circuitry

The DS1PM circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the DS1PM circuit pack is inserted or recovers from a transient failure. The incoming DS1 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-5}. Incoming VT1.5 signals are monitored for VT AIS, VT LOP, and yellow.

Loopbacks

The DS1PM circuit pack provides one DS1 loopback for each DS1 low-speed interface. The loopback is implemented inside the MUX/DEMUX/DESYNC device and bridges the desynchronizer output signal (transmitted towards the DSX-1) back into the DS1 synchronizer input. When the loopback is operated, the DS1 interface device forces AIS towards the DSX-1. The loopback is controlled by the SYSCTL via the intrashelf control bus.

Performance Monitoring

The DS1PM circuit pack provides PM circuitry for the following performance parameters:

- VT path parameters derived from V5 coding violations
- DS1 PM derived from SF/ESF frame format depending on provisioning.

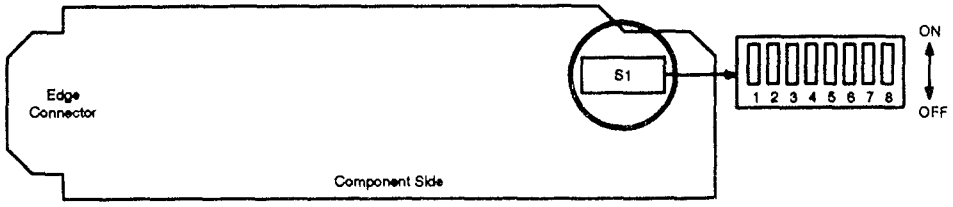
Power Circuitry

The MXRVO circuit packs supply +5 V power to the DS1PM circuit packs in the corresponding DS1PM circuit pack groups. These inputs are diode ORed and the output is fused and then filtered before it is used to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

CAUTION:
When a muldem is equipped with DS1PM circuit packs, the associated function unit must be equipped with two MXRVO circuit packs.

DS1PM Hardware Settings

The line coding and line build out (LBO) are switch settable. Other parameters are provisionable through the CIT. The locations of the DS1PM circuit pack option switches are shown in Figure 7-18.



Note: The switches are set by moving the slide toward the desired position.

DS1PM Cable LBO Settings

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 KHz	DIP Switch Settings		
			S1-1	S1-2	S1-3
0 to 133*	0 to 90*	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

* Minimum of 30 feet required to meet EMI requirements.

DS1 Line Code Settings

Line Code Format	DIP Switch Settings			
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)
B8ZS	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON

Notes:
1. Switch section 8 (S1-8) is unused and ignored by the system.
2. Line code is software overrideable.

Figure 7-18. BBF3 DS1PM Option Switches

DS1PM Quick Reference Summary

Transmit Functions

Major transmit functions of the DS1PM circuit pack are as follows:

(a) Receives four AMI or B8ZS encoded DS1 signals from a DSX-1

(b) Recovers DS1 clock and NRZ data from each DS1 signal

(c) Synchronizes and maps each data signal to a VT1.5 synchronous payload envelope (SPE)

(d) Inserts VT path overhead

(e) Multiplexes four VT1.5 SPEs to a byte-interleaved VT-G signal

(f) Provides the VT-G signal to a MXRVO circuit pack.

Receive Functions

Major receive functions of the DS1PM circuit pack are as follows:

(a) Receives a SONET VT-G clock and frame synchronizing signals from its associated MXRVO

(b) Demultiplexes the VT-G into four VT1.5 signals

(c) Terminates VT path and the embedded DS1 signal from each VT1.5 SPE

(d) Desynchronizes the DS1 signals

(e) Encodes each DS1 signal into either AMI or B8ZS format

(f) Preequalizes (with line build out) each DS1 and provides them to a DSX-1 as bipolar signals.

Control Functions

The major control functions of the DS1PM circuit pack are as follows:

(a) Protection switching for MXRVO circuit pack protection

(b) VT path overhead processing

(c) Internal fault detection

(d) Inventory information (*CLEI* code, date of manufacture, etc.)

(e) Monitors a DS1 signal with SF or ESF frame format and generates PM data.

Maintenance Signal Functions

The major maintenance signal functions are as follows:

(a) Monitors DS1 signal for near-end and far-end performance

(b) Detects VT path AIS

(c) Inserts DS1 AIS toward fiber and toward DSX-1

(d) Inserts and detects VT path yellow signal.

Edge Connector Inputs/Outputs

Table 7-5 describes the DS1PM input/output (I/O) pins.

Table 7-5. DS1PM I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
DSXO1T	209		TVTCSP	316	
DSXO1R	208		TVTCSN	315	
DSXO2T	207		TVTFMS	313	
DSXO2R	206		TVTDAS	311	
DSXO3T	205		RVTCSP	016	VT-G Signals
DSXO3R	204		RVTCSN	017	(Service)
DSXO4T	203		RVTFMS	014	
DSXO4R	202	DS1 Interface	RVTDAS	013	
DSXI1T	217		DC52SP	118	
DSXI1R	216		DC52SN	018	
DSXI2T	215		TVTCPP	317	
DSXI2R	214		TVTCPN	318	
DSXI3T	213		TVTFMP	312	
DSXI3R	212		TVTDAP	310	
DSXI4T	211		RVTCPP	219	VT-G Signals
DSXI4R	210		RVTCPN	218	(Protection)
PSXO1T	109		RVTFMP	015	
PSXO1R	108		RVTDAP	012	
PSXO2T	107		DC52PP	119	
PSXO2R	106		DC52PN	019	
PSXO3T	105		LSICKP	307	
PSXO3R	104		LSICKN	306	
PSXO4T	103		LSICDP	010	
PSXO4R	102	DS1 Protection	LSICDN	009	
PSXI1T	117		LSIRDP	008	
PSXI1R	116		LSIRDN	007	
PSXI2T	115		CSR	200	Control
PSXI2R	114		BMPA11	303	
PSXI3T	113		BMPA10	304	
PSXI3R	112		BMPA9	305	
PSXI4T	111		BS1	302	
PSXI4R	110		BS2	201	
+5VS	301	Power	BS3	101	
+5VP	001		IICSDA	003	
ESDGRD	100	ESD Protection	IICSCL	004	
GRD	011				
GRD	314	Ground			
GRD	300				
GRD	002				

177A Retainer Card Description

Purpose of Card

To ensure proper operation of DS1/DS1PM circuit pack protection switching, the 177A Retainer card (Figure 7-19) must be installed in all unused slots within a low-speed group that is partially equipped with DS1/DS1PM circuit packs.

CAUTION:
Unused low-speed interface slots within a partially equipped group must be equipped with 177A Retainer cards if DS1 protection is used. Failure to do so may result in corrupted transmission.

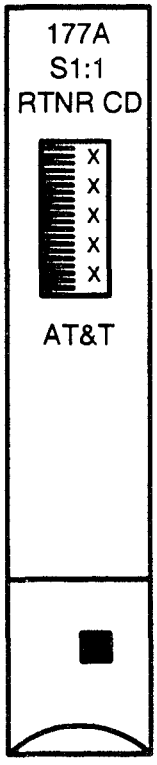


Figure 7-19. 177A Retainer Card

BBG2 MXRVO Circuit Pack Description

Purpose of Circuit

The virtual tributary to optical multiplexer (MXRVO) circuit pack interfaces between the DS1 and OLIU circuit packs.

MRXVO Faceplate Indicators

The MXRVO circuit pack faceplate indicators are shown in Figure 7-20.

The red FAULT LED lights on detection of circuit pack hardware failure.

The green ACTIVE LED lights when the circuit pack is active (carrying service).



Figure 7-20. BBG2 MXRVO Circuit Pack

General Description of Operation

The MXRVO circuit pack accepts eight VT-G signals from DS1 circuit packs, selects seven, combines them to form an STS-1 signal, inserts STS-1 path overhead, and sends the resulting STS-1 signal to active and standby OLIUs.

The MXRVO selects one of two received STS-1 signals from the OLIUs, terminates STS-1 path overhead, and demultiplexes the STS-1 into seven VT-G signals.

The MXRVO interfaces with the OLIU at the STS-1 rate, to eight low-speed DS1 circuit packs at the VT-G rate, and with the SYSCTL circuit pack.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. In the transmit direction (from the DS1 low-speed packs), the VT-G signals from each DS1 are combined into an STS-1 signal. (See Figure 7-21.) The STS-1 path overhead and pointer are inserted, and the signal is transmitted to the OLIU.

Receive Direction. In the receive direction (from the OLIU), the STS-1 path is terminated. Then, the STS-1 signal is split into seven VT-G signals for transmission to the DS1 circuit packs.

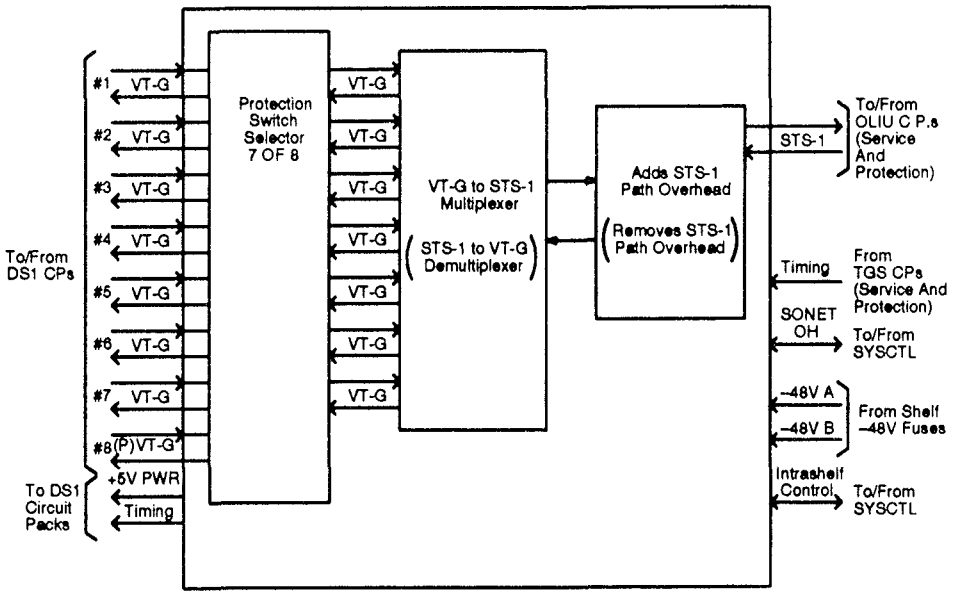


Figure 7-21. BBG2 MXRVO Circuit Pack Block Diagram

Control Circuitry

The MXRVO circuit pack interfaces with the system controller (SYSCTL) via the intrashelf control bus. The MXRVO provides maintenance elements for reporting the status of the circuit pack and the incoming STS-1 and VT-G signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the MXRVO responds to control signals from the SYSCTL (such as ACTIVE and FAULT LED controls).

Timing Circuitry

The MXRVO receives STS-1 timing signals which are traceable to the STS-1 clocks generated by the TGS circuit packs.

The MXRVO can select between the supplied timing signals as requested by the SYSCTL via the intrashelf control bus. The selected timing signals are used to time both the receive and transmit directions of the MXRVO.

Protection Circuitry

The MXRVO protection switch points reside on the OLIU and on each low-speed circuit pack for the STS-1 and VT-G signals, respectively. Optional 1x1 nonrevertive MRXVO circuit pack protection is provided and is independent of the OLIU and low-speed DS1 circuit packs.

The MXRVO provides protection switching for the VT-G side of the low-speed circuit packs. The MXRVO can be requested by the SYSCTL through the intrashelf control bus to replace any of the seven service VT-G inputs with the protection VT-G input. The MXRVO can be requested by the SYSCTL to bridge any of the seven VT-G service outputs to the protection output.

The MXRVO provides SYSCTL-controlled selectors for the STS-1 side of the Main optical line unit (OLIU) protection switch.

The MXRVO provides selectors for an STS-1 timing switch. The timing switch may be performed autonomously by the MXRVO based on the quality of the received timing signals or by the SYSCTL.

Fault Detection Circuitry

The MXRVO circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and any errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the MXRVO circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The MXRVO circuit pack provides PM circuitry for STS path parameters derived from B3 coding violations.

Power Circuitry

The MXRVO provides power to the corresponding DS1 low-speed circuit packs associated with the function unit group that the MXRVO is in. It receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion into a +5 volt source for use by the MXRVO and the low-speed DS1 circuit packs. A failure of the fuse or converter causes the red FAULT LED to light.

MXRVO Quick Reference Summary

Transmit Functions

The major transmit functions of the MXRVO are as follows:

(a) Selects and multiplexes seven VT-G channels into one STS-1 synchronous payload envelope (SPE)

(b) Adds STS-1 path overhead

(c) Provides STS-1 signal to Main OLIU circuit packs.

Receive Functions

The major receive functions of the MXRVO are as follows:

(a) Terminates STS-1 path

(b) Demultiplexes the STS-1 SPE into seven VT-G signals

(c) Supplies the seven VT-G signals to the DS1 circuit packs.

(d) Provides timing signals to DS1 circuit packs.

Control Functions

Major control functions are as follows:

(a) STS-1 path overhead processing

(b) Protection switching for OLIU circuit pack protection

(c) Protection switching for DS1 circuit pack protection.

(d) Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

(a) Detects STS-1 path AIS coming from the fiber

(b) Inserts VT path AIS

(c) Inserts and detects STS-1 path yellow signals

(d) Inserts VT path unequipped signals.

Edge Connector Inputs/Outputs

Table 7-6 describes the MXRVO I/O pins.

Table 7-6. MXRVO I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
TDC1SP	015		MCLKSP	024	
TDC1SN	115		MCLKSN	124	
TDC1PP	215		MCLKPP	025	
TDC1PN	315	STS-1 Signals	MCLKPN	125	Timing Signals
RDC1SP	037		FSYNSP	224	
RDC1SN	137		FSYNSN	324	
RDC1PP	237		FSYNPP	225	
RDC1PN	337		FSYNPN	325	
TVTD1	011		LSICKP	205	
TVTD2	111		LSICKN	305	
TVTD3	010		LSICDP	206	
TVTD4	110		LSICDN	306	
TVTCAP	007		LSIRDP	006	
TVTCAN	107		LSIRDN	106	
TVTFMA	307		CSR	104	Control Signals
TVTD5	046		BMPA11	103	
TVTD6	146		BMPA10	203	
TVTD7	045		BMPA9	303	
TVTDP	145		BS1	003	
TVTCBP	042		BS2	004	
TVTCBN	142		BS3	005	
TVTFMB	342	VT-G Signals	IICSDA	304	
RVTD1	210		IICSCL	204	
RVTD2	310		ROHCK	139	
RVTD3	209		ROHFR	239	
RVTD4	309		ROHDA	339	Overhead Channel
RVTCBP	243		TOHCK	040	
RVTCBN	343		TOHFR	140	
RVTFMB	242		TOHDA	240	
RVTD5	245		-48VA1	300	
RVTD6	345		-48VA2	200	
RVTD7	244		-48VB1	100	Power
RVTDP	344		-48VB2	001	
RVTCAP	208		-48VRT	301	
DC52AP	008				
DC52AN	108				
DC52BP	043				
DC52BN	143				

Table 7-6. MXRVO I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
+5V	009	Power	GRD	102	
+5V	109		GRD	202	
+5V	044		GRD	013	
+5V	144		GRD	113	
+5V	211		GRD	213	
+5V	246		GRD	313	
ESDGRD	002	ESD ground	GRD	121	Ground
GRD	221		GRD	235	
GRD	321		GRD	335	
GRD	029		GRD	047	
GRD	129		GRD	147	
GRD	021	Ground	GRD	247	
GRD	229		GRD	347	
GRD	329		GRD	148	
GRD	035		GRD	248	
GRD	135		GRD	302	

21D/21D-U OLIU Circuit Pack Description

Purpose of Circuit

The 21D/21D-U optical line interface unit (OLIU) circuit pack is used to interconnect colocated DDM-2000 OC-3 and OC-12 shelves at the OC-3 rate. The 21D/21D-U OLIU circuit pack performs the optical/electrical conversion between the optical interconnect signal level 3 (IS-3) and STS-3 signals. The 21D/21D-U OLIU circuit pack also does multiplexing/demultiplexing between STS-3 and three STS-1 signals and SONET transport overhead access. It also provides routing of the STS-1s between the IS-3 interface and other Main and function unit slots in the shelf.

21D/21D-U OLIU Faceplate Indicators

The 21D/21D-U OLIU circuit pack faceplate indicators are shown in Figure 7-22. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash On and Off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

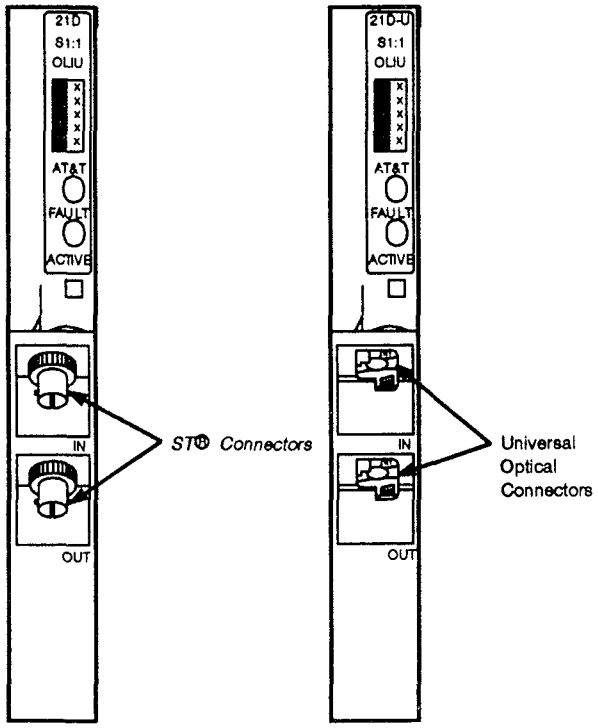


Figure 7-22. 21D and 21D-U OLIU Circuit Pack

General Description of Operation

The 21D/21D-U OLIU circuit pack multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives an LED transmitter to create the IS-3 output.

The received IS-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. The STS-1 signals go through a pointer processor to guarantee frame alignment to the local system clock before being routed to the other Main and function unit slots.

The 21D/21D-U OLIU circuit pack provides timing signals to and receives timing signals from the TGS circuit packs.

Fiber access for the 21D OLIU is via a pair of *ST*® lightguide cable connectors from the 21D OLIU circuit pack faceplate. A faceplate-mounted universal optical connector allows the 21D-U OLIU to accept fiber terminated with *ST*, SC, or FC connectors. The 21D-U OLIU comes with a 0 dB *ST* buildout. Various combinations of buildouts and connectors are also available. See Section 10, "Technical Specifications" for a list of universal buildout attenuators. The 21D/21D-U OLIU circuit pack provides cost effective interconnect for intraoffice applications and is used only for DDM-2000 OC-3 and OC-12 interworking over multimode fiber.

Detailed Description of Operation

Figure 7-23 is a block diagram of the 21D/21D-U OLIU circuit pack.

Transmission Circuitry

Transmit Direction. The STS-1 router selects three of the STS-1 signals received from other Main and function unit slots and sends them to the multiplexer. The multiplexer circuitry takes the three STS-1 signals from the output of the router, adds SONET transport overhead, then byte-interleaves and scrambles the signal in a frame synchronous scrambler. The output from the multiplexer is in the STS-3 format and is used to amplitude modulate the LED transmitter, which converts the electrical signal to an NRZ-encoded IS-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded IS-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes SONET transport overhead.

The overhead information is sent to the SYSCTL via the intrashelf control bus and the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the pointer processor which performs pointer interpretation and generation on each received STS-1 using the local timing signals. The output of the pointer processor is three STS-1 signals, frame synchronous to each other. The STS-1 router sends each of the three STS-1 signals to the appropriate Main or function unit slots.

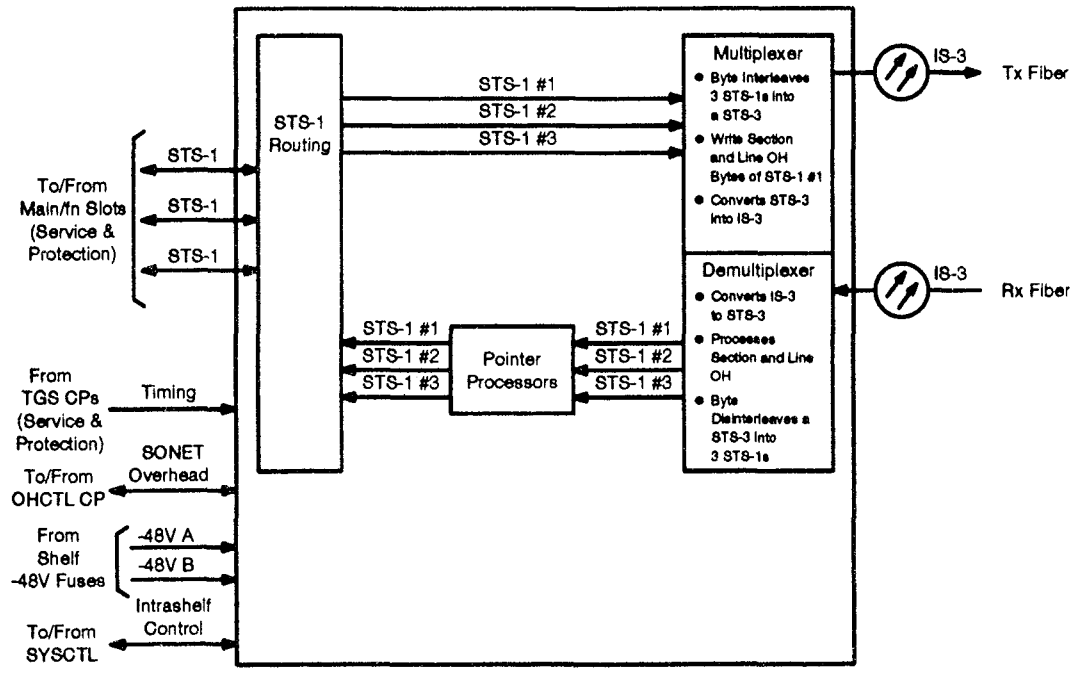


Figure 7-23. 21D/21D-U OLIU Circuit Pack Block Diagram

Control Circuitry

The 21D/21D-U OLIU circuit pack interfaces with the system controller (SYSCTL) and with the overhead controller (OHCTL) circuit packs.

The 21D/21D-U OLIU circuit pack provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 21D/21D-U OLIU circuit pack responds to control signals from the SYSCTL such as STS-1 routing, protection switching, and LED control commands.

The 21D/21D-U OLIU circuit pack accesses the SONET transport overhead and routes it via the transport overhead channel interface to the AUXCTL slot and/or to the SYSCTL. The transport overhead is routed from the Main slots to both the AUXCTL and SYSCTL slots and from the function unit slots to the AUXCTL slot.

Timing Circuitry

Each TGS circuit pack sends timing signals to each OLIU. Each OLIU monitors the timing inputs from both TGS circuit packs. The 21D/21D-U OLIU normally selects the timing signals from the active TGS. Each OLIU provides timing signals derived from the incoming optical signal to both TGS circuit packs for loop timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 21D/21D-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 21D/21D-U OLIU circuit pack is protection switched with the optical line.

The 21D/21D-U OLIU circuit pack interfaces with STS-1 signals from the circuit packs in the Main and function unit slots and selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 21D/21D-U OLIU provides selectors for timing signals from the TGS circuit packs. The 21D/21D-U OLIU monitors these inputs and can autonomously select either one. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 21D/21D-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The 21D/21D-U OLIU provides PM circuitry for the following performance parameters:

- Section severely errored frame seconds (SEFS) count
- Line parameters based on B2 coding violations.

Power Circuitry

Power for the 21D/21D-U OLIU circuit pack is provided by a DC-to-DC converter located on the circuit pack. The converter supplies +5 volts and –5.2 volts. Both A and B –48 volt backplane busses supply power to the converter through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converter causes the red FAULT LED to light.

21D/21D-U OLIU Quick Reference Summary

Transmit Functions

The following are the major transmit functions of the 21D/21D-U OLIU circuit pack:

(a) Selects STS-1 inputs from MXRVO, DS3, or other OLIU circuit packs

(b) Provides STS-1 signal cross-connections

(c) Adds SONET transport overhead

(d) Byte-interleaves and scrambles the three selected STS-1 signals to an STS-3 signal

(e) Converts the STS-3 electrical signal to an IS-3 optical signal and transmits it over the fiber.

Receive Functions

The following are major receive functions of the 21D/21D-U OLIU circuit pack:

(a) Receives an IS-3 optical signal and converts it to an electrical STS-3 signal

(b) Extracts STS-3 clock and retimes the received data

(c) Demultiplexes the STS-3 signal into three STS-1 signals

(d) Extracts transport overhead

(e) Processes the STS-1 pointers and frame-synchronizes the STS-1 signals

(f) Provides STS-1 signal cross-connections

(g) Processes the received clock and provides a reference clock to the TGS circuit packs.

Control Functions

The following are the major control functions of the 21D/21D-U OLIU circuit pack:

(a) Switches protection for the optical line and DS3, MXRVO, and TGS circuit packs

(b) Processes transport overhead

(c) Stores inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The following are the major maintenance signal functions of the 21D/21D-U OLIU circuit pack:

(a) Inserts and detects STS-1 path AIS

(b) Inserts and detects SONET line AIS and inserts and detects line far-end-receive failure (FERF).

(c) Inserts STS-1 path unequipped signal.

Edge Connector Inputs/Outputs

Table 7-7 describes the 21D/21D-U OLIU I/O pins.

Table 7-7. 21D/21D-U OLIU I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
TDA1SP	027		RDC1SP	015	
TDA1SN	127		RDC1SN	115	
TDA2SP	026		RDC2SP	014	
TDA2SN	126		RDC2SN	114	
TDA1PP	227		RDC3SP	012	STS-1 Signals
TDA1PN	327		RDC3SN	112	
TDA2PP	226		RDC1PP	215	
TDA2PN	326		RDC1PN	315	
TDB1SP	031		RDC2PP	214	
TDB1SN	131		RDC2PN	314	
TDB2SP	030		RDC3PP	212	
TDB2SN	130		RDC3PN	312	
TDB1PP	231	STS-1 Signals	TOHCK	040	
TDB1PN	331		TOHFR	140	
TDB2PP	230		TOHDA	240	SONET Overhead
TDB2PN	330		ROHCK	139	
TDC1SP	037		ROHFR	239	
TDC1SN	137		ROHDA	339	
TDC2SP	036		MCLKSP	024	
TDC2SN	136		MCLKSN	124	
TDC3SP	034		FSYNSP	224	
TDC3SN	134		FSYNSN	324	
TDC1PP	237		LTCKS	341	Timing
TDC1PN	337		LTCKP	241	
TDC2PP	236		MCLKPP	025	
TDC2PN	336		MCLKPN	125	
TDC3PP	234		FSYNPP	225	
TDC3PN	334		FSYNPN	325	
RDA1SP	023		LSICKP	205	
RDA1SN	123		LSICKN	305	
RDA2SP	022		LSICDP	206	
RDA2SN	122		LSICDN	306	
RDA1PP	223		LSIRDP	006	
RDA1PN	323		LSIRDN	106	
RDA2PP	222		CSR	104	Control
RDA2PN	322		BMPA11	103	
RDB1SP	019		BMPA10	203	
RDB1SN	119		BMPA9	303	
RDB2SP	018		BS1	003	
RDB2SN	118		BS2	004	
RDB1PP	219		BS3	005	
RDB1PN	319		IICSDA	304	
RDB2PP	218		IICSDL	204	
RDB2PN	318		SLOTID	105	
-	-		ON/OFF	041	

Table 7-7. 21D/21D-U OLIU I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
-48VA1	300		GRD	321	
-48VA2	200		GRD	029	
-48VB1	001	Power	GRD	129	
-48VB2	100		GRD	229	
-48VRT	301		GRD	329	
ESDGRD	002	ESD Protection	GRD	035	Ground
GRD	102		GRD	135	
GRD	202		GRD	235	
GRD	302		GRD	335	
GRD	013		GRD	047	
GRD	113	Ground	GRD	147	
GRD	213		GRD	247	
GRD	313		GRD	347	
GRD	021		GRD	148	
GRD	121		GRD	248	
GRD	221				

21G/21G-U OLIU Circuit Pack Description

Purpose of Circuit

The 21G/21G-U optical line interface unit (OLIU) circuit pack performs the optical/electrical conversion between the optical carrier level 3 (OC-3) and STS-3 signals, multiplexing/demultiplexing between STS-3 and three STS-1 signals, and SONET transport overhead access. The 21G/21G-U OLIU circuit pack also provides routing of the STS-1s between the OC-3 interface and other Main and function unit slots in the shelf and will support the STS-1 add/drop feature.

21G/21G-U OLIU Faceplate Indicators

The 21G/21G-U OLIU circuit pack faceplate indicators are shown in Figure 7-24. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash On and Off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

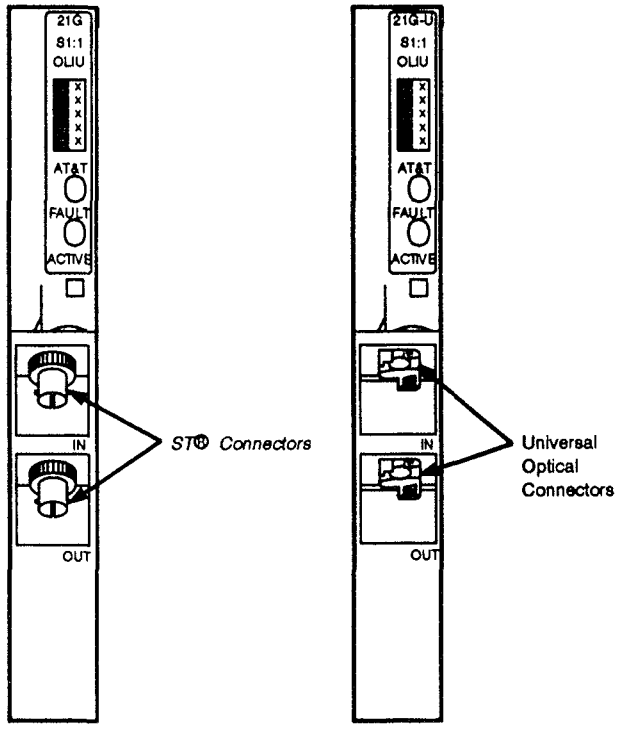


Figure 7-24. 21G and 21G-U OLIU Circuit Pack

General Description of Operation

The 21G/21G-U OLIU multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives the laser transmitter to create the OC-3 output.

The received OC-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. The STS-1 signals go through a pointer processor to guarantee frame alignment to the local system clock before being routed to the other Main and function unit slots.

The 21G/21G-U OLIU provides timing signals to and receives timing signals from the TGS circuit packs.

Fiber access for the 21G OLIU is via a pair of *ST* lightguide cable connectors from the OLIU faceplate. A faceplate-mounted universal optical connector allows the 21G-U OLIU to accept fiber terminated with *ST*, SC, or FC connectors. Various combinations of buildouts and connectors are also available. See Section 10, "Technical Specifications" for a list of universal buildout attenuators. The 21G/21G-U OLIU photonics comply with SONET long-reach specifications. While single-mode fiber is suggested for optimum performance, multimode facilities are also supported.

Detailed Description of Operation

Figure 7-25 is a block diagram of the 21G/21G-U OLIU.

Transmission Circuitry

Transmit Direction. The STS-1 router selects three of the STS-1 signals received from other Main and function unit slots and sends them to the multiplexer. The multiplexer circuitry takes the three STS-1 signals from the output of the router, adds SONET transport overhead, then byte-interleaves and scrambles the signal in a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the laser transmitter, which converts the electrical signal to an NRZ-encoded SONET compatible OC-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes SONET transport overhead. The overhead information is sent to the SYSCTL pack via the intrashelf control bus and the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the pointer processor which performs pointer interpretation and generation on each received STS-1 using the local timing signals. The output of the pointer processor is three STS-1 signals, frame synchronous to each other. The STS-1 router sends each of the three STS-1 signals to the appropriate Main or function unit slots.

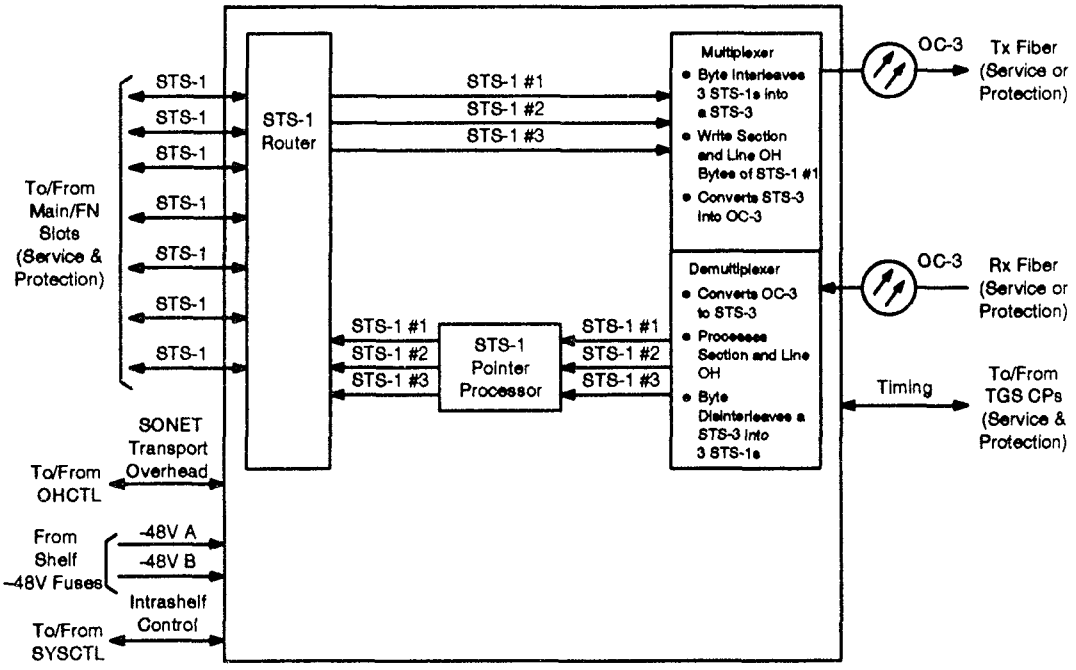


Figure 7-25. 21G/21G-U OLIU Circuit Pack Block Diagram

Control Circuitry

The 21G/21G-U OLIU circuit pack interfaces with the system controller (SYSCTL) and with the overhead controller (OHCTL) circuit packs.

The 21G/21G-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the OLIU responds to control signals from the SYSCTL such as STS-1 routing, protection switching, and LED control commands.

The 21G/21G-U OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the AUXCTL slot and/or to the SYSCTL. The transport overhead is routed from the Main slots to both the AUXCTL and SYSCTL slots and from the function unit slots to the AUXCTL slot.

Timing Circuitry

Each TGS circuit pack sends timing signals to each OLIU. Each OLIU monitors the timing inputs from both TGS circuit packs. The OLIU normally selects the timing signals from the active TGS circuit pack. Each OLIU provides timing signals derived from the incoming optical signal to both TGS circuit packs for loop timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 21G/21G-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 21G/21G-U OLIU circuit pack is protection switched with the optical line.

The 21G/21G-U OLIU interfaces with STS-1 signals from the circuit packs in the Main and function unit slots and selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 21G/21G-U OLIU provides selectors for timing signals from the TGS circuit packs, monitors these inputs, and autonomously selects either one. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 21G/21G-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the 21G/21G-U OLIU circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The 21G/21G-U OLIU provides PM circuitry for the following performance parameters:

- Laser bias current threshold
- Transmit optical power threshold
- Section severely errored frame seconds (SEFS) count
- Line parameters derived from B2 coding violations.

Power Circuitry

Power for the 21G/21G-U OLIU circuit pack is provided by two DC-to-DC converters located on the 21G/21G-U OLIU circuit pack. One converter supplies +5 volts and the other supplies –5.2 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or either converter causes the red FAULT LED to light.

21G/21G-U OLIU Hardware Settings

The location of the 21G/21G-U OLIU circuit pack optical power output level switch is shown in Figure 7-26. This switch allows the 21G/21G-U OLIU to be looped back without an external optical attenuator cable. The optical power output level switch in the LOW POWER position attenuates the transmit optical power by 5 dB.

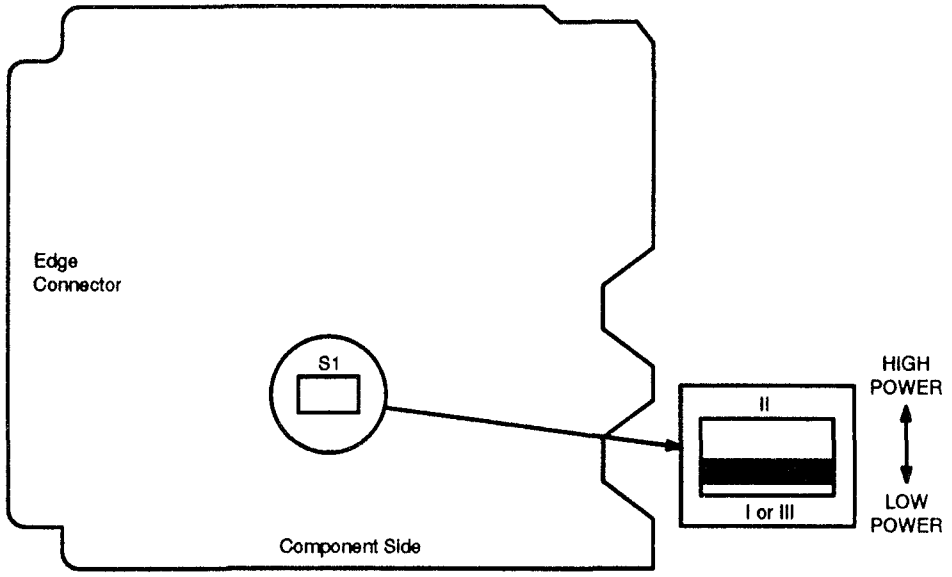


Figure 7-26. 21G/21G-U OLIU Output Level Switch

21G/21G-U OLIU Quick Reference Summary

Transmit Functions

The following are the major transmit functions of the 21G/21G-U OLIU circuit pack:

(a) Selects STS-1 inputs from MXRVO, DS3, or other OLIU circuit packs

(b) Provides STS-1 signal cross-connections

(c) Adds SONET transport overhead

(d) Byte-interleaves and scrambles the three selected STS-1 signals to an STS-3 signal

(e) Converts the STS-3 electrical signal to an optical signal and transmits it over the fiber

(f) Monitors laser bias and output power.

Receive Functions

The following are major receive functions of the 21G/21G-U OLIU circuit pack:

(a) Receives an optical signal and converts it to an electrical STS-3 signal

(b) Extracts STS-3 clock and retimes the received data

(c) Demultiplexes the STS-3 signal into three STS-1 signals

(d) Extracts transport overhead

(e) Processes the STS-1 pointers and frame-synchronizes the STS-1 signals

(f) Provides STS-1 signal cross-connections

(g) Processes the received clock and provides a reference clock to the TGS circuit packs.

Control Functions

The following are the major control functions of the 21G/21G-U OLIU circuit pack:

(a) Switches protection for the optical line and DS3, MXRVO, and TGS circuit packs

(b) Processes transport overhead

(c) Stores inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The following are the major maintenance signal functions of the 21G/21G-U OLIU circuit pack:

(a) Inserts and detects STS-1 path AIS

(b) Inserts and detects SONET line AIS and inserts and detects line far-end-receive failure (FERF)

(c) Inserts STS-1 path unequipped signal.

Edge Connector Inputs/Outputs

Table 7-8 describes the 21G/21G-U OLIU I/O pins.

Table 7-8. 21G/21G-U OLIU I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
TDA1SP	027		RDC1SP	015	
TDA1SN	127		RDC1SN	115	
TDA2SP	026		RDC2SP	014	
TDA2SN	126		RDC2SN	114	
TDA1PP	227		RDC3SP	012	STS-1 Signals
TDA1PN	327		RDC3SN	112	
TDA2PP	226		RDC1PP	215	
TDA2PN	326		RDC1PN	315	
TDB1SP	031		RDC2PP	214	
TDB1SN	131		RDC2PN	314	
TDB2SP	030		RDC3PP	212	
TDB2SN	130		RDC3PN	312	
TDB1PP	231	STS-1 Signals	TOHCK	040	
TDB1PN	331		TOHFR	140	
TDB2PP	230		TOHDA	240	SONET Overhead
TDB2PN	330		ROHCK	139	
TDC1SP	037		ROHFR	239	
TDC1SN	137		ROHDA	339	
TDC2SP	036		MCLKSP	024	
TDC2SN	136		MCLKSN	124	
TDC3SP	034		FSYNSP	224	
TDC3SN	134		FSYNSN	324	
TDC1PP	237		LTCKS	341	Timing
TDC1PN	337		LTCKP	241	
TDC2PP	236		MCLKPP	025	
TDC2PN	336		MCLKPN	125	
TDC3PP	234		FSYNPP	225	
TDC3PN	334		FSYNPN	325	
RDA1SP	023		LSICKP	205	
RDA1SN	123		LSICKN	305	
RDA2SP	022		LSICDP	206	
RDA2SN	122		LSICDN	306	
RDA1PP	223		LSIRDP	006	
RDA1PN	323		LSIRDN	106	
RDA2PP	222		CSR	104	Control
RDA2PN	322		BMPA11	103	
RDB1SP	019		BMPA10	203	
RDB1SN	119		BMPA9	303	
RDB2SP	018		BS1	003	
RDB2SN	118		BS2	004	
RDB1PP	219		BS3	005	
RDB1PN	319		IICSDA	304	
RDB2PP	218		IICSDL	204	
RDB2PN	318		SLOTID	105	
-	-		ON/OFF	041	

Table 7-8. 21G/21G-U OLIU I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
-48VA1	300		GRD	321	
-48VA2	200		GRD	029	
-48VB1	001	Power	GRD	129	
-48VB2	100		GRD	229	
-48VRT	301		GRD	329	
ESDGRD	002	ESD Protection	GRD	035	Ground
GRD	102		GRD	135	
GRD	202		GRD	235	
GRD	302		GRD	335	
GRD	013		GRD	047	
GRD	113	Ground	GRD	147	
GRD	213		GRD	247	
GRD	313		GRD	347	
GRD	021		GRD	148	
GRD	121		GRD	248	
GRD	221				

22F OLIU Circuit Pack Description

Purpose of Circuit

The 22F OLIU circuit pack performs the optical/electrical conversion between the optical carrier level 3 (OC-3) and STS-3 signals, multiplexing between STS-3 and three STS-1 signals and SONET transport overhead access. This circuit pack also provides routing of the STS-1s between the OC-3 interface and other Main and function unit slots in the shelf and DS1/DS3 add/drop and ring capability. When used to perform DS1/DS3 add/drop, STS-1 path overhead access is also provided.

22F OLIU Faceplate Indicators

The 22F OLIU circuit pack faceplate indicators are shown in Figure 7-27.

The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash on and off.

The green ACTIVE LED lights when the circuit pack is active (carrying service).

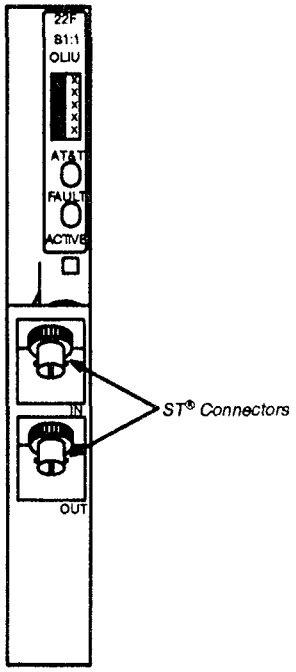


Figure 7-27. 22F OLIU Circuit Pack

General Description of Operation

The 22F OLIU multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives the laser transmitter to create the OC-3 output.

The received OC-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed into three STS-1 signals, and transport/path overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on board. The STS-1 signals go through a pointer processor to guarantee STS-1 frame alignment to the local system clock before being routed to the other Main and function unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a VT1.5 cross-connection.

Each 22F OLIU provides timing signals to and receives timing signals from the TGS circuit packs.

Fiber access is via a pair of *ST* lightguide cable connectors from the OLIU faceplate. The 22F OLIU photonics comply with SONET intermediate-reach specifications. While single-mode fiber is suggested for optimum performance, multimode facilities are also supported as long as a single-mode jumper is placed between the 22F OLIU optical output connector and the multimode fiber.

Detailed Description of Operation

Figure 7-28 is a block diagram of the 22F OLIU.

Transmission Circuitry

STS-1 Router and VT1.5 Cross-Connect. The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

Transmit Direction. The STS-1 router selects three of the STS-1 signals directly from the other Main and function unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the multiplexer. The multiplexer takes the three STS-1 signals, adds SONET transport overhead, then byte-interleaves and scrambles the signal with a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the laser transmitter, converting the electrical signal to an NRZ-encoded SONET compatible OC-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes OC-3 transport overhead. The overhead information is sent to the SYSCTL circuit pack via the intrashelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the STS-1 pointer processor is three STS-1 signals, frame synchronous to each other, which are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends each of the three STS-1 signals to the appropriate Main or function unit slots.

Control Circuitry

The 22F OLIU circuit pack interfaces with the BBG5 system controller (SYSCTL) and with the overhead controller (OHCTL) circuit packs.

The 22F OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 22F OLIU responds to control signals from the SYSCTL such as STS-1 routing, VT1.5 routing, protection switching, and LED control commands.

The 22F OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the OHCTL.

The 22F OLIU accesses the STS-1 path overhead and routes it via the intrashelf control bus to the SYSCTL circuit pack.

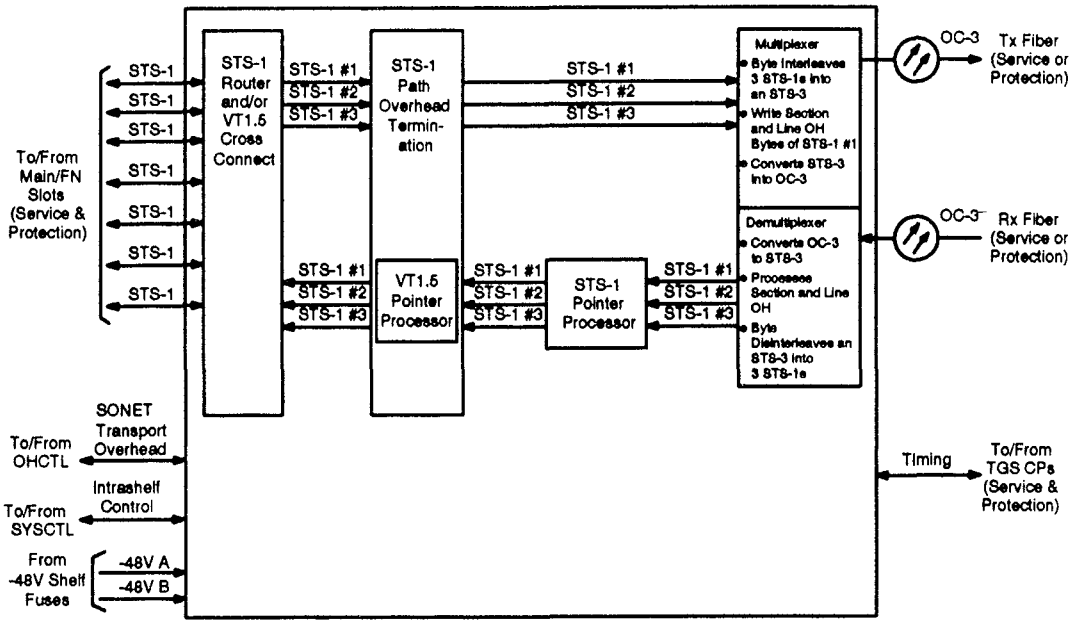


Figure 7-28. 22F OLIU Circuit Pack Block Diagram

Timing Circuitry

Each TGS circuit pack sends timing signals to each 22F OLIU. Each 22F OLIU monitors the timing inputs from both TGS circuit packs. The 22F OLIU normally selects the timing signals from the TGS selected by the system controller. Each 22F OLIU provides timing signals derived from the incoming optical signal to both TGS circuit packs for loop timing and DS1 output (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 22F OLIU is protection switched by the SYSCTL in response to an external command, incoming optical signal failure, or internal equipment fault. The 22F OLIU circuit pack is protection switched with the OC-3 line.

The 22F OLIU interfaces with STS-1 signals from the circuit packs in the Main and function unit slots. It selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 22F OLIU provides selectors for timing signals from the TGS circuit packs, monitors these inputs, and autonomously selects either TGS circuit pack. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 22F OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The 22F OLIU provides PM circuitry for the following performance parameters:

- Section severely errored frame seconds (SEFS) count
- Line parameters derived from B2 coding violations
- STS-1 path parameters derived from B3 coding violations.

Power Circuitry

Power for the 22F OLIU circuit pack is provided by two DC-to-DC converters located on the 22F OLIU circuit pack. One converter supplies +5 volts and the other supplies –5.2 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or either converter causes the red FAULT LED to light.

22F OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 22F OLIU circuit pack are as follows:

(a) Selects STS-1 inputs from MXRVO, DS3, or other OLIU circuit packs

(b) Provides STS-1/VT1.5 signal cross-connections

(c) Adds SONET transport overhead and, if VT1.5 cross-connected, adds path overhead

(d) Byte-interleaves and scrambles the three selected STS-1 signals to produce an STS-3 signal

(e) Uses a laser transmitter to produce a SONET standard OC-3 optical signal from an STS-3 electrical signal.

Receive Functions

The following are major receive functions of the 22F OLIU circuit pack:

(a) Receives a SONET standard OC-3 optical signal and converts it to an electrical STS-3 signal

(b) Extracts STS-3 clock and retimes the received data

(c) Demultiplexes the STS-3 signal into three STS-1 signals

(d) Extracts transport overhead and, if VT1.5 cross-connected, extracts path overhead

(e) Processes the STS-1 pointer and frame-synchronizes the STS-1 signals

(f) Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signal, if VT1.5 cross-connected

(g) Provides STS-1/VT1.5 signal cross-connections

(h) Processes the received clock and provides a reference clock to the TGS circuit packs.

Control Functions

The major control functions are as follows:

(a) Switches protection for OC-3 line and DS3, MXRVO, other OLIU, and TGS circuit packs

(b) Processes transport and path overhead

(c) Stores inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

(a) Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS, if VT1.5 cross-connected

(b) Inserts and detects OC-3 line AIS

(c) Inserts STS-1 path unequipped signal

(d) Inserts and detects line far-end-receive failure (FERF)

(e) Inserts and detects STS-1 path yellow, if VT1.5 cross-connected.

Edge Connector Inputs/Outputs

Table 7-9 describes the 22F OLIU I/O pins.

Table 7-9. 22F OLIU I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
TDA1SP	027		RDC1SP	015	
TDA1SN	127		RDC1SN	115	
TDA2SP	026		RDC2SP	014	
TDA2SN	126		RDC2SN	114	
TDA1PP	227		RDC3SP	012	STS-1 Signals
TDA1PN	327		RDC3SN	112	
TDA2PP	226		RDC1PP	215	
TDA2PN	326		RDC1PN	315	
TDB1SP	031		RDC2PP	214	
TDB1SN	131		RDC2PN	314	
TDB2SP	030		RDC3PP	212	
TDB2SN	130		RDC3PN	312	
TDB1PP	231	STS-1 Signals	RN1RIP	238	
TDB1PN	331		RN1RIN	338	
TDB2PP	230		RN2RIP	228	
TDB2PN	330		RN2RIN	328	
TDC1SP	037		RN3RIP	220	
TDC1SN	137		RN3RIN	320	
TDC2SP	036		RN1TOP	038	
TDC2SN	136		RN1TON	138	
TDC3SP	034		RN2TOP	028	
TDC3SN	134		RN2TON	128	
TDC1PP	237		RN3TOP	020	
TDC1PN	337		RN3TON	120	
TDC2PP	236		TOHCK	040	
TDC2PN	336		TOHFR	140	
TDC3PP	234		TOHDA	240	
TDC3PN	334		ROHCK	139	
RDA1SP	023		ROHFR	239	
RDA1SN	123		ROHDA	339	
RDA2SP	022		RPH1CK	333	
RDA2SN	122		RPH1FR	233	
RDA1PP	223		RPH1DA	133	
RDA1PN	323		TPH1CK	033	SONET Overhead
RDA2PP	222		TPH1FR	039	
PDA2PN	322		TPH1DA	340	
RDB1SP	019		RPH2CK	117	
RDB1SN	119		RPH2FR	017	
RDB2SP	018		RPH2DA	032	
RDB2SN	118		TPH2CK	132	
RDB1PP	219		TPH2FR	232	
RDB1PN	319		TPH2DA	332	
RDB2PP	218		RPH3CK	016	
RDB2PN	318		RPH3FR	116	

Table 7-9. 22F OLIU I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
RPH3DA	216	SONET Overhead	-48VA1	300	Power
TPH3CK	316		-48VA2	200	
TPH3FR	317		-48VB1	001	
TPH3DA	217		-48VB2	100	
MCLKSP	024	Timing	-48VRT	301	
MCLKSN	124		ESDGRD	002	ESD Protection
FSYNSP	224		GRD	102	Ground
FSYNSN	324		GRD	202	
LTCKS	341		GRD	302	
LTCKP	241		GRD	013	
MCLKPP	025		GRD	113	
MCLKPN	125		GRD	213	
FSYNPP	225		GRD	313	
FSYNPN	325		GRD	021	
LSICKP	205	Control	GRD	121	
LSICKN	305		GRD	221	
LSICDP	206		GRD	321	
LSICDN	306		GRD	029	
LSIRDP	006		GRD	129	
LSIRDN	106		GRD	229	
CSR	104		GRD	329	
BMPA12	311		GRD	035	
BMPA11	103		GRD	135	
BMPA10	203		GRD	235	
BMPA9	303		GRD	335	
BS1	003		GRD	047	
BS2	004		GRD	147	
BS3	005		GRD	247	
IICSDA	304		GRD	347	
IICSDL	204		GRD	148	
DLY	105		GRD	248	
22FTP11	141				
22FTP10	346				
ON/OFF	041				
22FTSTON	210				

22D-U OLIU Circuit Pack Description

Purpose of Circuit

The 22D-U optical line interface unit (OLIU) circuit pack is used to interconnect colocated DDM-2000 OC-3 and OC-12 shelves or *SLC*®-2000 at the OC-3 rate. The 22D-U OLIU circuit pack performs the optical/electrical conversion between the optical interconnect signal level 3 (IS-3) and STS-3 signals. The 22D-U OLIU circuit pack also does multiplexing/demultiplexing between STS-3 and three STS-1 signals and SONET transport overhead access. It also provides routing of the STS-1s between the IS-3 interface and other Main and Function Unit slots in the shelf.

22D-U OLIU Faceplate Indicators

The 22D-U OLIU circuit pack faceplate indicators are shown in Figure 7-29. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash On and Off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

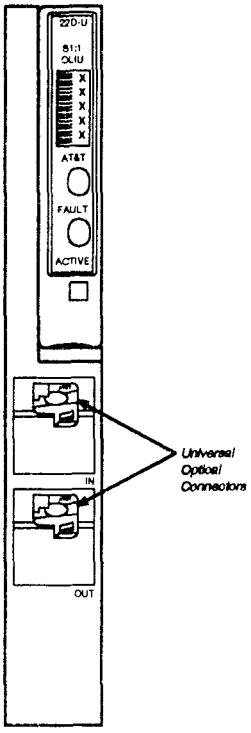


Figure 7-29. 22D-U OLIU Circuit Pack

A faceplate-mounted universal optical connector allows the 22D-U OLIU to accept fiber terminated with *ST*, SC, or FC connectors. The 22D-U OLIU comes with a 0 dB *ST* buildout. Various combinations of buildouts and connectors are also available. See Section 10, "Technical Specifications" for a list of universal buildout attenuators. A 10 dB attenuator is required for loopback testing. The 22D-U OLIU circuit pack provides cost effective interconnect for intraoffice applications and is used only for DDM-2000 OC-3 and OC-12 or *SLC*-2000 interworking over multimode fiber.

General Description of Operation

The 22D-U OLIU circuit pack multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives an LED transmitter to create the IS-3 output.

The received IS-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. The STS-1 signals go through a pointer processor to guarantee frame alignment to the local system clock before being routed to the other Main and Function Unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a VT1.5 cross-connection.

The 22D-U OLIU circuit pack provides timing signals to and receives timing signals from the TGS circuit packs.

Detailed Description of Operation

Figure 7-30 is a block diagram of the 22D-U OLIU circuit pack.

The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

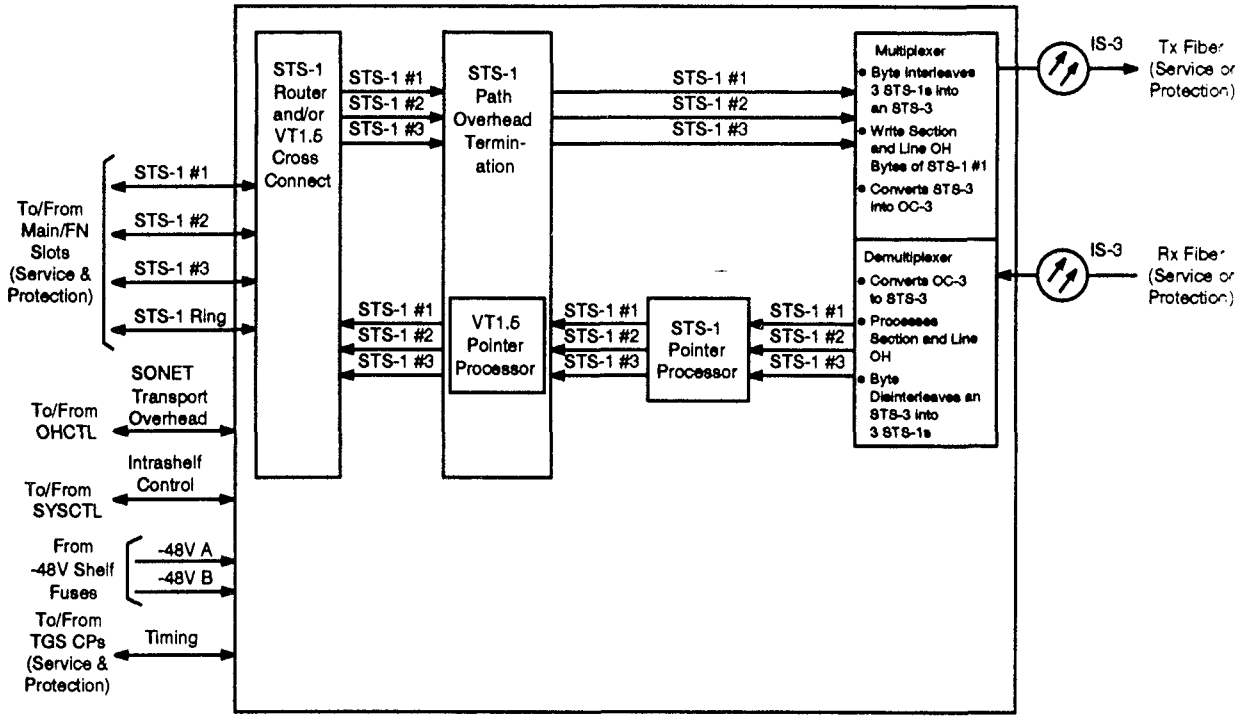


Figure 7-30. 22D-U OLIU Circuit Pack Block Diagram

Transmit Direction. The STS-1 router selects three of the STS-1 signals directly from the other Main and Function Unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the multiplexer. The multiplexer takes the three STS-1 signals, adds SONET transport overhead, then byte-interleaves and scrambles the signal with a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the LED transmitter, converting the electrical signal to an NRZ-encoded SONET compatible IS-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded IS-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes transport overhead. The overhead information is sent to the SYSCTL circuit pack via the intrashelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the STS-1 pointer processor is three STS-1 signals, frame synchronous to each other, which are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends each of the three STS-1 signals to the appropriate Main or Function Unit slots.

Control Circuitry

The 22D-U OLIU circuit pack interfaces with the system controller (SYSCTL) and with the overhead controller (OHCTL) circuit packs.

The 22D-U OLIU circuit pack provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 22D-U OLIU circuit pack responds to control signals from the SYSCTL such as STS-1 routing, protection switching, and LED control commands.

The 22D-U OLIU circuit pack accesses the SONET transport overhead and routes it via the transport overhead channel interface to the AUXCTL slot and/or to the SYSCTL. The transport overhead is routed from the Main slots to both the

AUXCTL and SYSCTL slots and from the Function Unit slots to the AUXCTL slot.

Timing Circuitry

Each TGS circuit pack sends timing signals to each OLIU. Each OLIU monitors the timing inputs from both TGS circuit packs. The 22D-U OLIU normally selects the timing signals from the active TGS. Each OLIU provides timing signals derived from the incoming optical signal to both TGS circuit packs for loop timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 22D-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 22D-U OLIU circuit pack is protection switched with the optical line.

The 22D-U OLIU circuit pack interfaces with STS-1 signals from the circuit packs in the Main and Function Unit slots and selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 22D-U OLIU provides selectors for timing signals from the TGS circuit packs. The 22D-U OLIU monitors these inputs and can autonomously select either one. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 22D-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 22D-U OLIU has VT signal degrade protection switching (Release 7.0) and STS signal degrade protection switching (Release 7.1 and later releases) capabilities.

Performance Monitoring

The 22D-U OLIU provides PM circuitry for the following performance parameters:

- Section severely errored frame seconds (SEFS) count
- Line parameters based on B2 coding violations.

Power Circuitry

Power for the 22D-U OLIU circuit pack is provided by a DC-to-DC converter located on the circuit pack. The converter supplies +5 volts and –5.2 volts. Both A and B –48 volt backplane busses supply power to the converter through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converter causes the red FAULT LED to light.

22D-U OLIU Quick Reference Summary

Transmit Functions

The following are the major transmit functions of the 22D-U OLIU circuit pack:

(a) Selects STS-1 inputs from MXRVO, DS3, or other OLIU circuit packs

(b) Provides VT1.5/STS-1 signal cross-connections

(c) Adds SONET transport overhead and, if VT1.5 cross-connected, adds path overhead

(d) Byte-interleaves and scrambles the three selected STS-1 signals to produce an STS-3 signal

(e) Converts the STS-3 electrical signal to an IS-3 optical signal and transmits it over the fiber.

Receive Functions

The following are major receive functions of the 22D-U OLIU circuit pack:

(a) Receives an IS-3 optical signal and converts it to an electrical STS-3 signal

(b) Extracts STS-3 clock and retimes the received data

(c) Demultiplexes the STS-3 signal into three STS-1 signals

(d) Extracts transport overhead and, if VT1.5 cross-connected, extracts path overhead

(e) Processes the STS-1 pointers and frame-synchronizes the STS-1 signals

(f) Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signals, if VT1.5 cross-connected

(g) Provides STS-1 signal cross-connections

(h) Processes the received clock and provides a reference clock to the TGS circuit packs.

Control Functions

The following are the major control functions of the 22D-U OLIU circuit pack:

(a) Switches protection for the optical line and DS3, MXRVO, and TGS circuit packs

(b) Processes transport overhead

(c) Stores inventory information (*CLEI* code, date of manufacture, etc.)

(d) Supports VT (Release 7.0) and STS (Release 7.1 and later) signal degrade protection switching.

Maintenance Signal Functions

The following are the major maintenance signal functions of the 22D-U OLIU circuit pack:

(a) Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS, if VT1.5 cross-connected.

(b) Inserts and detects SONET line AIS and inserts and detects line far-end-receive failure (FERF).

(c) Inserts STS-1 path unequipped signal

(d) Inserts and detects STS-1 path yellow, if VT1.5 cross-connected

(e) Supports VT signal degrade protection switching (Release 7.0) and STS signal degrade protection switching (Release 7.1 and later releases).

Edge Connector Inputs/Outputs

Table 7-10 describes the 22D-U OLIU I/O pins.

Table 7-10. 22D-U OLIU I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
TDA1SP	027		RDC1SP	015	
TDA1SN	127		RDC1SN	115	
TDA2SP	026		RDC2SP	014	
TDA2SN	126		RDC2SN	114	
TDA1PP	227		RDC3SP	012	STS-1 Signals
TDA1PN	327		RDC3SN	112	
TDA2PP	226		RDC1PP	215	
TDA2PN	326		RDC1PN	315	
TDB1SP	031		RDC2PP	214	
TDB1SN	131		RDC2PN	314	
TDB2SP	030		RDC3PP	212	
TDB2SN	130		RDC3PN	312	
TDB1PP	231	STS-1 Signals	RN1RIP	238	
TDB1PN	331		RN1RIN	338	
TDB2PP	230		RN2RIP	228	
TDB2PN	330		RN2RIN	328	
TDC1SP	037		RN3RIP	220	
TDC1SN	137		RN3RIN	320	
TDC2SP	036		RN1TOP	038	
TDC2SN	136		RN1TON	138	
TDC3SP	034		RN2TOP	028	
TDC3SN	134		RN2TON	128	
TDC1PP	237		RN3TOP	020	
TDC1PN	337		RN3TON	120	
TDC2PP	236		TOHCK	040	
TDC2PN	336		TOHFR	140	
TDC3PP	234		TOHDA	240	
TDC3PN	334		ROHCK	139	
RDA1SP	023		ROHFR	239	
RDA1SN	123		ROHDA	339	
RDA2SP	022		RPH1CK	333	
RDA2SN	122		RPH1FR	233	
RDA1PP	223		RPH1DA	133	
RDA1PN	323		TPH1CK	033	SONET Overhead
RDA2PP	222		TPH1FR	039	
PDA2PN	322		TPH1DA	340	
RDB1SP	019		RPH2CK	117	
RDB1SN	119		RPH2FR	017	
RDB2SP	018		RPH2DA	032	
RDB2SN	118		TPH2CK	132	
RDB1PP	219		TPH2FR	232	
RDB1PN	319		TPH2DA	332	
RDB2PP	218		RPH3CK	016	
RDB2PN	318		RPH3FR	116	

Table 7-10. 22D-U OLIU I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
RPH3DA	216		-48VA1	300	
TPH3CK	316	SONET Overhead	-48VA2	200	
TPH3FR	317		-48VB1	001	Power
TPH3DA	217		-48VB2	100	
MCLKSP	024		-48VRT	301	
MCLKSN	124		ESDGRD	002	ESD Protection
FSYNSP	224		GRD	102	
FSYNSN	324		GRD	202	
LTCKS	341	Timing	GRD	302	
LTCKP	241		GRD	013	
MCLKPP	025		GRD	113	
MCLKPN	125		GRD	213	
FSYNPP	225		GRD	313	
FSYNPN	325		GRD	021	
LSICKP	205		GRD	121	
LSICKN	305		GRD	221	
LSICDP	206		GRD	321	Ground
LSICDN	306		GRD	029	
LSIRDP	006		GRD	129	
LSIRDN	106		GRD	229	
CSR	104	Control	GRD	329	
BMPA12	311		GRD	035	
BMPA11	103		GRD	135	
BMPA10	203		GRD	235	
BMPA9	303		GRD	335	
BS1	003		GRD	047	
BS2	004		GRD	147	
BS3	005		GRD	247	
IICSDA	304		GRD	347	
IICSDL	204		GRD	148	
DLY	105		GRD	248	
22FTP11	141				
22FTP10	346				
ON/OFF	041				
22FTSTON	210				

22G-U/22G2-U OLIU Circuit Pack Description

Purpose of Circuit

The 22G-U/22G2-U OLIU circuit pack performs the optical/electrical conversion between the optical carrier level 3 (OC-3) and STS-3 signals, multiplexing between STS-3 and three STS-1 signals and SONET transport overhead access. The 22G-U/22G2-U OLIU also provides routing of the STS-1s between the OC-3 interface and other Main and Function Unit slots in the shelf as well as VT1.5/STS-1 add/drop and ring capabilities. When used to perform VT1.5 add/drop or ring capabilities, STS-1 path overhead access is also provided. The 22G2-U OLIU is the same as the 22G-U OLIU but, has improved receiver overload sensitivity, eliminating the need for an external attenuator for loopback testing. The 22G2-U can be used in place of the 22G-U in all applications.

22G-U/22G2-U OLIU Faceplate Indicators

The 22G-U OLIU circuit pack faceplate indicators are shown in Figure 7-31.

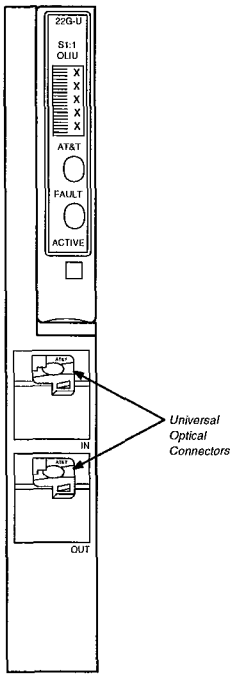


Figure 7-31. 22G-U OLIU Circuit Pack

The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

A faceplate-mounted universal optical connector allows the 22G-U/22G2-U OLIU to accept fiber terminated with *ST*, SC, or FC connectors. The 22G-U OLIU comes with a 0 dB *ST* buildout. A 10 dB attenuator is required for loopback testing. The 22G-U/22G2-U OLIU operates over single mode fiber. Various combinations of buildout attenuators and connectors are also available. See Section 10, "Technical Specifications" for a list of universal buildout attenuators.

General Description of Operation

The 22G-U/22G2-U OLIU multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives the laser transmitter to create the OC-3 output.

The received OC-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed into three STS-1 signals, and transport/path overhead is accessed. Some of the overhead (for example, section data communications channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on board. The STS-1 signals go through a pointer processor to guarantee STS-1 frame alignment to the local system clock before being routed to the other Main and Function Unit slots.

If an incoming STS-1 signal from the fiber is to be VT1.5 cross-connected, VT1.5 pointer-processing is performed on this pack and STS-1 path overhead termination is performed on these signals. All signals entering this pack from either the backplane or from the optical interface may be routed as STS-1s. If appropriate, VT1.5 routings may be established between STS-1s using a limited VT1.5 cross-connection.

Each 22G-U/22G2-U OLIU provides timing signals to and receives timing signals from the TGS circuit packs.

Detailed Description of Operation

Figure 7-32 is a block diagram of the 22G-U/22G2-U OLIU.

Transmission Circuitry

STS-1 Router and VT1.5 Cross-Connect. The STS-1 router is used to select STS-1s for both the transmit and receive directions. All incoming STS-1s are fed to the limited VT1.5 cross-connect. Outgoing STS-1s may be sourced by this VT1.5 cross-connect or sourced directly by an STS-1 input.

Transmit Direction. The STS-1 router selects three of the STS-1 signals directly from the other Main and Function Unit slots or from the VT1.5 cross-connect. SONET path overhead is then added to STS-1s sourced by the VT1.5 cross-connect before the signals are sent to the multiplexer. The multiplexer takes the three STS-1 signals, adds SONET transport overhead, then byte-interleaves and scrambles the signal with a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the laser transmitter, converting the electrical signal to an NRZ-encoded SONET compatible OC-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes OC-3 transport overhead. The overhead information is sent to the SYSCTL circuit pack via the intrashelf control bus and to the OHCTL circuit pack by the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the STS-1 pointer processor which performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the STS-1 pointer processor is three STS-1 signals, frame synchronous to each other, which are sent to the VT1.5 pointer processor. VT1.5 pointer processing is performed on each STS-1 that is to be VT1.5 cross-connected. STS-1 path overhead termination is also done on these VT1.5 based signals. STS-1s that do not require VT1.5 cross-connections are passed through without VT1.5 pointer processing or STS-1 path overhead termination. The output from the VT1.5 pointer processor is sent to the STS-1/VT1.5 router. The router cross-connects the appropriate VT1.5 tributaries and sends each of the three STS-1 signals to the appropriate Main or Function Unit slots.

Control Circuitry

The 22G-U/22G2-U OLIU circuit pack interfaces with the BBG5 system controller (SYSCTL) and with the overhead controller (OHCTL) circuit packs.

The 22G-U/22G2-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 22G-U/22G2-U OLIU responds to control signals from the SYSCTL such as STS-1 routing, VT1.5 routing, protection switching, and LED control commands.

The 22G-U/22G2-U OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the OHCTL.

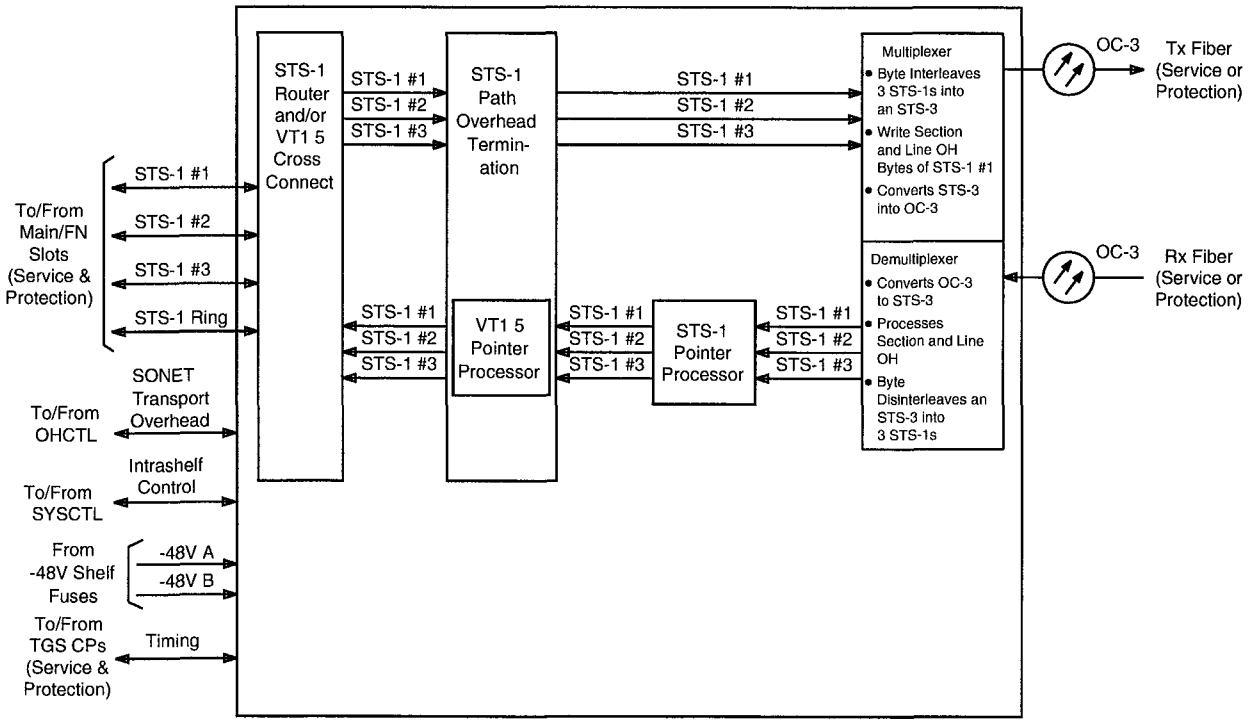


Figure 7-32. 22G-U/22G2-U OLIU Circuit Pack Block Diagram

The 22G-U/22G2-U OLIU accesses the STS-1 path overhead and routes it via the intrashelf control bus to the SYSCTL circuit pack.

Timing Circuitry

Each TGS circuit pack sends timing signals to each 22G-U/22G2-U OLIU. Each 22G-U/22G2-U OLIU monitors the timing inputs from both TGS circuit packs. The 22G-U/22G2-U OLIU normally selects the timing signals from the TGS selected by the system controller. Each 22G-U/22G2-U OLIU provides timing signals derived from the incoming optical signal to both TGS circuit packs for loop timing and DS1 output (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 22G-U/22G2-U OLIU is protection switched by the SYSCTL in response to an external command, incoming optical signal failure, or internal equipment fault. The 22G-U/22G2-U OLIU circuit pack is protection switched with the OC-3 line.

The 22G-U/22G2-U OLIU interfaces with STS-1 signals from the circuit packs in the Main and Function Unit slots. It selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 22G-U/22G2-U OLIU provides selectors for timing signals from the TGS circuit packs, monitors these inputs, and autonomously selects either TGS circuit pack. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 22G-U/22G2-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the OLIU circuit pack is inserted or recovers from a transient failure.

The 22G-U/22G2-U OLIU has VT signal degrade protection switching (Release 7.0) and STS signal degrade protection switching (Release 7.1 and later releases) capabilities.

Performance Monitoring

The 22G-U/22G2-U OLIU provides PM circuitry for the following performance parameters:

- Section severely errored frame seconds (SEFS) count
- Line coding violation counts
- STS-1 path coding violation counts.

Power Circuitry

Power for the 22G-U/22G2-U OLIU circuit pack is provided by two DC-to-DC converters located on the 22G-U/22G2-U OLIU circuit pack. The converters supply +5 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or converters causes the red FAULT LED to light.

22G-U/22G2-U OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 22G-U/22G2-U OLIU circuit pack are as follows:

(a) Selects STS-1 inputs from MXRVO, DS3, or other OLIU circuit packs

(b) Provides VT1.5/STS-1 signal cross-connections

(c) Adds SONET transport overhead and, if VT1.5 cross-connected, adds path overhead

(d) Byte-interleaves and scrambles the three selected STS-1 signals to produce an STS-3 signal

(e) Uses a laser transmitter to produce a SONET standard OC-3 optical signal from an STS-3 electrical signal.

Receive Functions

The following are major receive functions of the 22G-U/22G2-U OLIU circuit pack:

(a) Receives a SONET standard OC-3 optical signal and converts it to an electrical STS-3 signal

(b) Extracts STS-3 clock and retimes the received data

(c) Demultiplexes the STS-3 signal into three STS-1 signals

(d) Extracts transport overhead and, if VT1.5 cross-connected, extracts path overhead

(e) Processes the STS-1 pointer and frame-synchronizes the STS-1 signals

(f) Processes the VT1.5 pointers and frame-synchronizes the VT1.5 signal, if VT1.5 cross-connected

(g) Provides VT1.5/STS-1 signal cross-connections

(h) Processes the received clock and provides a reference clock to the TGS circuit packs.

Control Functions

The major control functions are as follows:

(a) Switches protection for OC-3 line and DS3, MXRVO, other OLIU, and TGS circuit packs

(b) Processes transport and path overhead

(c) Stores inventory information (*CLEI* code, date of manufacture, etc.)

(d) Supports VT (Release 7.0) and STS (Release 7.1 and later) signal degrade protection switching.

Maintenance Signal Functions

The major maintenance signal functions are as follows:

(a) Inserts and detects STS-1 path AIS or inserts and detects VT1.5 path AIS, if VT1.5 cross-connected

(b) Inserts and detects OC-3 line AIS

(c) Inserts STS-1 path unequipped signal

(d) Inserts and detects line far-end-receive failure (FERF)

(e) Inserts and detects STS-1 path yellow, if VT1.5 cross-connected.

Edge Connector Inputs/Outputs

Table 7-11 describes the 22G-U/22G2-U OLIU I/O pins.

Table 7-11. 22G-U/22G2-U OLIU I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
TDA1SP	027		RDC1SP	015	
TDA1SN	127		RDC1SN	115	
TDA2SP	026		RDC2SP	014	
TDA2SN	126		RDC2SN	114	
TDA1PP	227		RDC3SP	012	STS-1 Signals
TDA1PN	327		RDC3SN	112	
TDA2PP	226		RDC1PP	215	
TDA2PN	326		RDC1PN	315	
TDB1SP	031		RDC2PP	214	
TDB1SN	131		RDC2PN	314	
TDB2SP	030		RDC3PP	212	
TDB2SN	130		RDC3PN	312	
TDB1PP	231	STS-1 Signals	RN1RIP	238	
TDB1PN	331		RN1RIN	338	
TDB2PP	230		RN2RIP	228	
TDB2PN	330		RN2RIN	328	
TDC1SP	037		RN3RIP	220	
TDC1SN	137		RN3RIN	320	
TDC2SP	036		RN1TOP	038	
TDC2SN	136		RN1TON	138	
TDC3SP	034		RN2TOP	028	
TDC3SN	134		RN2TON	128	
TDC1PP	237		RN3TOP	020	
TDC1PN	337		RN3TON	120	
TDC2PP	236		TOHCK	040	
TDC2PN	336		TOHFR	140	
TDC3PP	234		TOHDA	240	
TDC3PN	334		ROHCK	139	
RDA1SP	023		ROHFR	239	
RDA1SN	123		ROHDA	339	
RDA2SP	022		RPH1CK	333	
RDA2SN	122		RPH1FR	233	
RDA1PP	223		RPH1DA	133	
RDA1PN	323		TPH1CK	033	SONET Overhead
RDA2PP	222		TPH1FR	039	
PDA2PN	322		TPH1DA	340	
RDB1SP	019		RPH2CK	117	
RDB1SN	119		RPH2FR	017	
RDB2SP	018		RPH2DA	032	
RDB2SN	118		TPH2CK	132	
RDB1PP	219		TPH2FR	232	
RDB1PN	319		TPH2DA	332	
RDB2PP	218		RPH3CK	016	
RDB2PN	318		RPH3FR	116	

Table 7-11. 22G-U/22G2-U OLIU I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
RPH3DA	216		-48VA1	300	
TPH3CK	316	SONET Overhead	-48VA2	200	
TPH3FR	317		-48VB1	001	Power
TPH3DA	217		-48VB2	100	
MCLKSP	024		-48VRT	301	
MCLKSN	124		ESDGRD	002	ESD Protection
FSYNSP	224		GRD	102	
FSYNSN	324		GRD	202	
LTCKS	341	Timing	GRD	302	
LTCKP	241		GRD	013	
MCLKPP	025		GRD	113	
MCLKPN	125		GRD	213	
FSYNPP	225		GRD	313	
FSYNPN	325		GRD	021	
LSICKP	205		GRD	121	
LSICKN	305		GRD	221	
LSICDP	206		GRD	321	Ground
LSICDN	306		GRD	029	
LSIRDP	006		GRD	129	
LSIRDN	106		GRD	229	
CSR	104	Control	GRD	329	
BMPA12	311		GRD	035	
BMPA11	103		GRD	135	
BMPA10	203		GRD	235	
BMPA9	303		GRD	335	
BS1	003		GRD	047	
BS2	004		GRD	147	
BS3	005		GRD	247	
IICSDA	304		GRD	347	
IICSDL	204		GRD	148	
DLY	105		GRD	248	
22FTP11	141				
22FTP10	346				
ON/OFF	041				
22FTSTON	210				

BBG4 DS3 Circuit Pack Description

Purpose of Circuit

The DS3 circuit pack provides a low-speed interface between asynchronous DS3-rate signals and SONET STS-1 signals.

DS3 Faceplate Indicators

The DS3 circuit pack faceplate indicators are shown in Figure 7-33.

The red FAULT LED lights by the SYSCTL on detection of DS3 circuit pack failure. In the event of an incoming signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).



Figure 7-33. BBG4 DS3 Circuit Pack

General Description of Operation

The DS3 circuit pack provides bidirectional transport of one DS3 signal through DDM-2000 OC-3 in either clear channel (CC) mode, violation monitor and removal (VMR) mode, or violation monitor (VM) mode, by mapping the DS3 into an STS-1 signal. The DS3 performs maintenance and provisioning functions associated with the STS-1 and DS3 signals and provides access to the STS-1 path overhead. It interfaces to the OLIU at the STS-1 rate, to the DSX-3, and to the SYSCTL and receives timing signals traceable to the TGS circuit pack. When provisioned for the clear channel mode, the DS3 can transport any DS3 rate signal that meets specified electrical interface requirements. When provisioned for the VMR or VM mode, the DS3 signal must meet both electrical and DS3 frame format requirements.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-34 provides an overall block diagram of the DS3 circuit pack. The transmit direction is the direction towards the STS-1 signal, and receive direction refers to the direction towards the DSX-3. In the transmit direction, the DS3 receives an incoming bipolar 3-zero substitution (B3ZS) encoded DS3 signal from the DSX-3. A closed protection relay contact routes the DS3 to a circuit that splits the signal and sends one output to the companion (standby) circuit pack and the other to its own receiver. The DS3 receiver performs equalization and clock recovery. The MUX circuitry performs B3ZS decoding and optional automatic AIS insertion. The DS3 signal is then synchronized to the STS-1 payload rate, STS-1 path overhead is inserted, and an STS-1 rate signal is transmitted to an OLIU pair.

Receive Direction. The DS3 receives STS-1 data from both the active and standby OLIUs, selects one STS-1, performs pointer interpretation, processes and removes the path overhead, desynchronizes the embedded DS3, provides a provisionable VMR function, and then B3ZS encodes the signal for transmission to the DSX-3. A jumper allows the user to insert or remove an LBO network (225 ft. of 734A-type cable equivalent) to provide the required signal level and shape at the DSX-3.

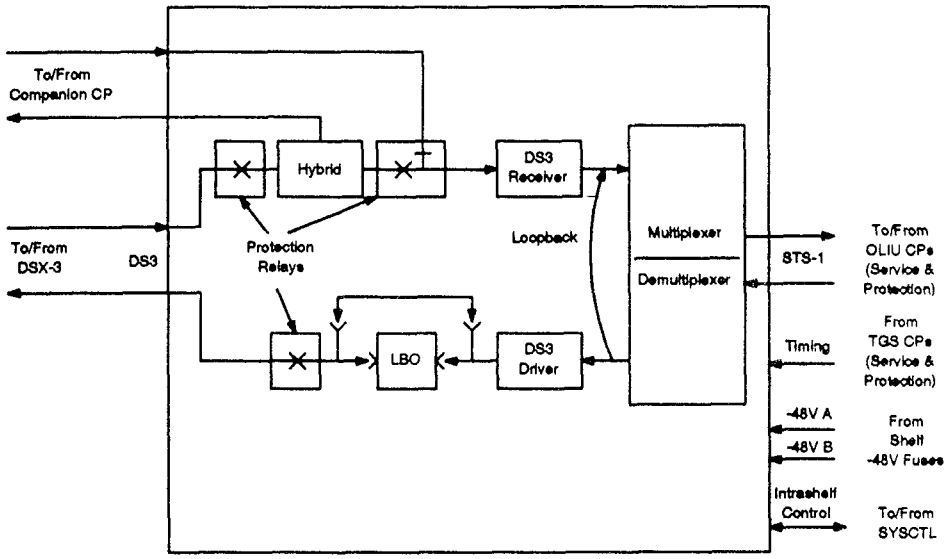


Figure 7-34. BBG4 DS3 Circuit Pack Block Diagram

Before the DS3 signal is B3ZS-encoded, a VMR function can be provisioned via the control circuitry for one of three possible modes. These three modes are as follows:

- Violation monitoring and removal with DS3 AIS insertion - default (VMR)
- Violation monitoring without removal of violations but with AIS insertion (VM)
- No violation monitoring clear channel (CC) mode with options for
  - — AIS insertion
  - — No AIS insertion.

Control Circuitry

The DS3 circuit pack interfaces with the system controller (SYSCTL) via the intrashelf control bus. Redundancy in the intrashelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The DS3 provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and DS3 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the DS3 responds to control signals from the SYSCTL (such as active and fault LED controls).

Timing Circuitry

The DS3 derives its timing information from the recovered DS3 clock from the DSX-3 incoming signal. In the transmit direction, a 44.736 MHz clock is recovered from the incoming DS3 signal and is used to recover DS3 data. In the receive direction, a smoothed 44.736 MHz clock is generated by a phase-locked loop to accompany the DS3 signal extracted from the STS-1 payload.

In addition to the recovered DS3 clock, the DS3 circuit pack requires STS-1 timing supplied, via the circuit pack edge connector, from the backplane.

Protection Circuitry

Optional 1x1 nonrevertive DS3 circuit pack protection is provided. Switch points for the STS-1 side of the DS3 are located on the OLIU circuit packs. Switch points for the DS3 side are implemented with relays on the DS3 circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL via the control interfaces. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the DS3 side, a single DS3 input from a DSX-3 is sent to both the active and standby DS3 circuit packs. Only the active unit selects the DS3 input. The SYSCTL supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the DS3 input signal and sends it to the standby unit and to its own receiver. To implement a protection switch on the DS3 side, the SYSCTL switches the relays on each unit to their opposite state.

When a DS3 is removed, shorting contacts on the backplane connector operate so that the DS3 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

The DS3 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the DS3 circuit pack is inserted or recovers from a transient failure.

The incoming DS3 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-6}. Incoming STS-1 signals are monitored for STS AIS, STS LOP, and yellow and are also monitored for DS3 OOF and AIS.

Loopbacks

One loopback is provided on the DS3. This loopback bridges the DS3 desynchronizer output signal (transmitted towards the DSX-3) back into the DS3 synchronizer input. Operation of the loopback does not affect the signal transmitted to the DSX-3. The loopback is controlled by the SYSCTL through the intrashelf control bus.

Performance Monitoring

The DS3 circuit pack provides PM circuitry for the following performance parameters:

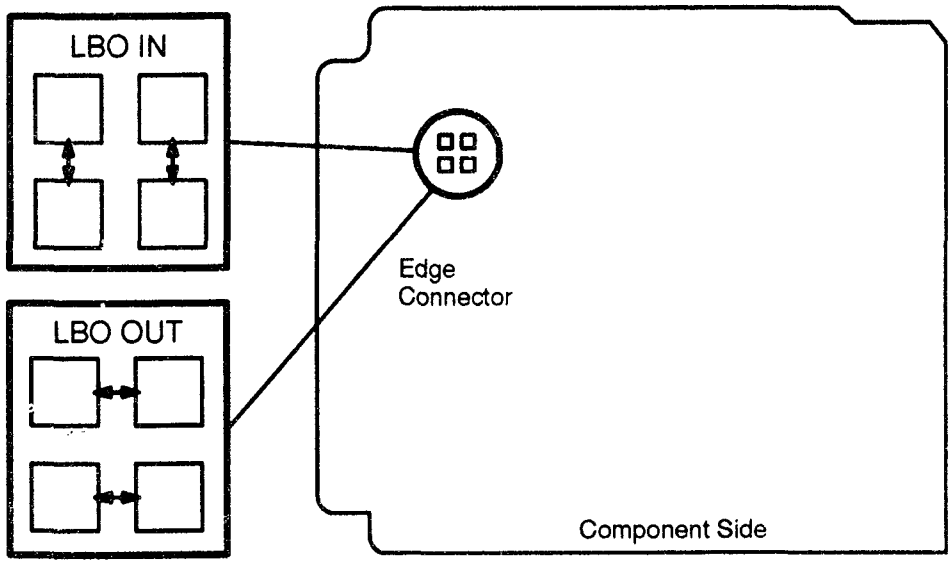
- STS path parameters derived from B3 coding violations
- DS3 path parameters derived from P-bit coding violations.

Power Circuitry

The DS3 circuit pack receives two sources of –48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

DS3 Hardware Settings

The location of the DS3 circuit pack line build-out jumpers is shown in Figure 7-35. The DS3 line build-out settings are shown in the table.



DS3 LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	--
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

Figure 7-35. BBG4 DS3 Line Build-Out Jumpers

DS3 Quick Reference Summary

Transmit Functions

The DS3 transmit functions are as follows:

(a) Receives a B3ZS-encoded DS3 signal from a DSX-3

(b) Recovers DS3 clock and NRZ data

(c) Synchronizes the data signal to STS-1 signal rate

(d) Inserts STS-1 path overhead

(e) Provides the STS-1 signal to the OLIU circuit packs.

Receive Functions

The following receive functions are performed by the DS3 circuit pack:

(a) Desynchronizes the incoming STS-1 signal

(b) Terminates the STS-1 path

(c) Optionally checks and/or corrects P-bit parity errors

(d) B3ZS encodes the outgoing DS3 signal

(e) Preequalizes the DS3 signal (with line build-out) and transmits it to a DSX-3.

Control Functions

The major control functions are as follows:

(a) Protection switching for OLIU and DS3 circuit packs

(b) STS-1 path overhead processing

(c) Internal fault detection

(d) Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

(a) Detects STS-1 path AIS coming from the fiber

(b) Detects STS-1 path unequipped signal coming from the fiber

(c) Inserts DS3 AIS toward the fiber and DSX-3

(d) Detects DS3 AIS coming from the fiber

(e) Inserts and detects STS-1 path yellow signal to/from the fiber.

Edge Connector Inputs/Outputs

Table 7-12 describes the DS3 I/O pins.

Table 7-12. DS3 I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
DSX3I	048	DSX-3 Interface	FSYNSP	224	
PDSX3I	149		FSYNSN	324	Timing Signals
DSX3O	348	Companion DS3 CP	FSYNPP	225	
PDSX3O	249		FSYNPN	325	
TDC1SP	015		–48VA1	300	
TDC1SN	115		–48VA2	200	
TDC1PP	215		–48VB1	100	Power
TDC1PN	315		–48VB2	001	
RDC1SP	037	STS-1	–48VRT	301	
RDC1SN	137	Interface	ESDGRD	002	ESD Protection
RDC1PP	237		GRD	102	
RDC1PN	337		GRD	202	
LSICKP	205		GRD	302	
LSICKN	305		GRD	013	
LSICDP	206		GRD	113	
LSICDN	306		GRD	213	
LSIRDP	006		GRD	313	
LSIRDN	106		GRD	021	
CSR	104	Control Interface	GRD	121	
BMPA11	103		GRD	221	
BMPA10	203		GRD	321	
BMPA9	303		GRD	029	Ground
BS1	003		GRD	129	
BS2	004		GRD	229	
BS3	005		GRD	329	
IICSDA	304		GRD	035	
IICSCL	204		GRD	135	
TOHCK	040		GRD	235	
TOHFR	140		GRD	335	
TOHDA	240	SONET Overhead	GRD	047	
ROHCK	139		GRD	147	
ROHFR	239		GRD	148	
ROHDA	339		GRD	247	
MCLKSP	024		GRD	248	
MCLKSN	124	Timing Signals	GRD	347	
MCLKPP	025				
MCLKPN	125				

BBG4B DS3 Circuit Pack Description

Purpose of Circuit

The BBG4B DS3 circuit pack provides a low-speed interface between asynchronous DS3-rate signals and SONET STS-1 signals. The BBG4B DS3 provides the same functions as the BBG4 DS3 and can be used in place of the BBG4 DS3 in all applications. In addition, the BBG4B DS3 has enhanced DS3 performance monitoring capabilities.

The BBG4B DS3 circuit pack faceplate indicators are shown in Figure 7-36.

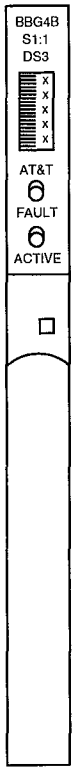


Figure 7-36. BBG4B DS3 Circuit Pack

The red FAULT LED lights by the SYSCTL on detection of BBG4B DS3 circuit pack failure. In the event of an incoming signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

General Description of Operation

The BBG4B DS3 circuit pack provides bidirectional transport of one DS3 signal through DDM-2000 OC-3 in either clear channel (CC) mode, violation monitor and removal (VMR) mode, or violation monitor (VM) mode, by mapping the DS3 into an STS-1 signal. The BBG4B DS3 performs maintenance and provisioning functions associated with the STS-1 and DS3 signals and provides access to the STS-1 path overhead. It interfaces to the OLIU at the STS-1 rate, to the DSX-3, and to the SYSCTL and receives timing signals traceable to the TGS circuit pack. When provisioned for the clear channel mode, the DS3 can transport any DS3 rate signal that meets specified electrical interface requirements. When provisioned for the VMR or VM mode, the DS3 signal must meet both electrical and DS3 frame format requirements.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-37 provides an overall block diagram of the BBG4B DS3 circuit pack. The transmit direction is the direction towards the STS-1 signal, and receive direction refers to the direction towards the DSX-3. In the transmit direction, the BBG4B DS3 receives an incoming bipolar 3-zero substitution (B3ZS) encoded DS3 signal from the DSX-3. A closed protection relay contact routes the DS3 to a circuit that splits the signal and sends one output to the companion (standby) circuit pack and the other to its own receiver. The BBG4B DS3 receiver performs equalization and clock recovery. The MUX circuitry performs B3ZS decoding, optional automatic DS3 AIS insertion, and a provisionable VMR function, then synchronizes and maps the DS3 to the STS-1 rate. The DS3 signal is then synchronized to the STS-1 payload rate, STS-1 path overhead is inserted, and an STS-1 rate signal is transmitted to an OLIU pair.

Receive Direction. The BBG4B DS3 receives STS-1 data from both the active and standby OLIUs, selects one STS-1, performs pointer interpretation, processes and removes the path overhead, desynchronizes the embedded DS3, provides a provisionable VMR function, and then B3ZS encodes the signal for transmission to the DSX-3. A jumper allows the user to insert or remove an LBO network (225 ft. of 734A-type cable equivalent) to provide the required signal level and shape at the DSX-3.

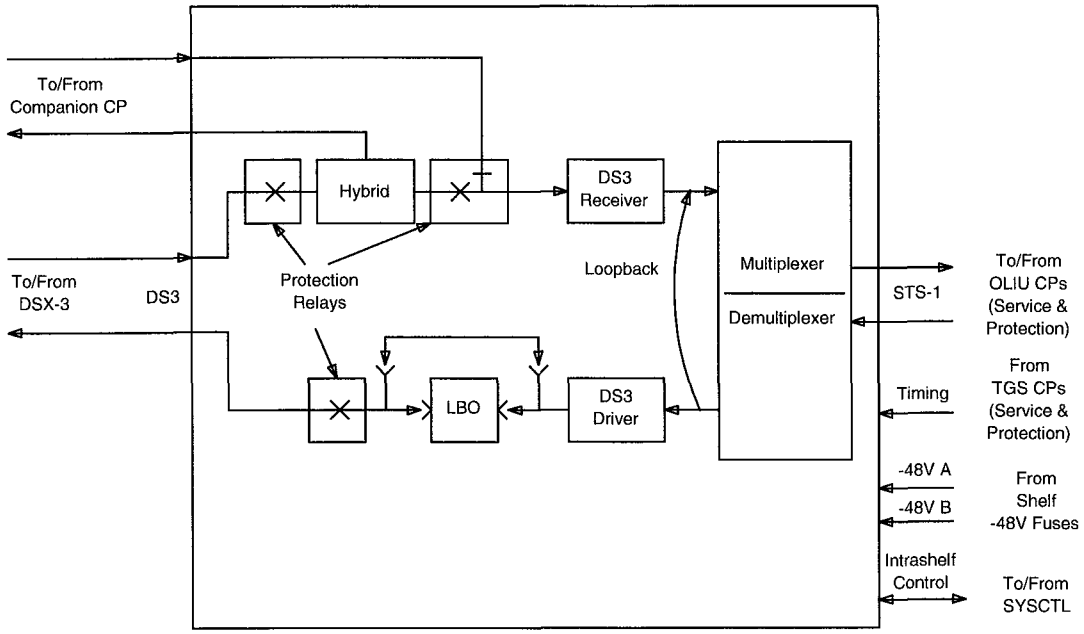


Figure 7-37. BBG4B DS3 Circuit Pack Block Diagram

VMR Function

Before the DS3 signal is B3ZS-encoded (receive) or decoded (transmit), a VMR function can be provisioned via the control circuitry for one of three possible modes. These three modes are as follows:

- Violation monitoring and removal with DS3 AIS insertion - default (VMR)
- Violation monitoring without removal of violations but with AIS insertion (VM)
- No violation monitoring clear channel (CC) mode with options for
  - — AIS insertion
  - — No AIS insertion.

Control Circuitry

The BBG4B DS3 circuit pack interfaces with the system controller (SYSCTL) via the intrashelf control bus. Redundancy in the intrashelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The BBG4B DS3 provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and DS3 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the BBG4B DS3 responds to control signals from the SYSCTL (such as active and fault LED controls).

Timing Circuitry

The BBG4B DS3 derives its timing information from the recovered DS3 clock from the DSX-3 incoming signal. In the transmit direction, a 44.736 MHz clock is recovered from the incoming DS3 signal and is used to recover DS3 data. In the receive direction, a smoothed 44.736 MHz clock is generated by a phase-locked loop to accompany the DS3 signal extracted from the STS-1 payload.

In addition to the recovered DS3 clock, the BBG4B DS3 circuit pack requires STS-1 timing supplied, via the circuit pack edge connector, from the backplane.

Protection Circuitry

Optional 1x1 nonrevertive BBG4B DS3 circuit pack protection is provided. Switch points for the STS-1 side of the DS3 are located on the OLIU circuit packs. Switch points for the DS3 side are implemented with relays on the BBG4B DS3 circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL via the control interfaces. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the DS3 side, a single DS3 input from a DSX-3 is sent to both the active and standby BBG4B DS3 circuit packs. Only the active unit selects the DS3 input. The SYSCTL supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the DS3 input signal and sends it to the standby unit and to its own receiver. To implement a protection switch on the DS3 side, the SYSCTL switches the relays on each unit to their opposite state.

When a BBG4B DS3 is removed, shorting contacts on the backplane connector operate so that the DS3 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

The BBG4B DS3 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the BBG4B DS3 circuit pack is inserted or recovers from a transient failure.

The incoming DS3 signal is monitored for bipolar threshold crossings in excess of 10^{-3} or 10^{-6}. Incoming STS-1 signals are monitored for STS AIS, STS LOP, and yellow and are also monitored for DS3 OOF and AIS.

Loopbacks

Two loopbacks are provided on the BBG4B DS3. The terminal loopback bridges the DS3 desynchronizer output signal (transmitted towards the DSX-3) back into the DS3 synchronizer input. Operation of the loopback does not affect the signal transmitted to the DSX-3. The facility loopback bridges the STS-1 output signal to the OLIU back towards the DSX-3. Operation of this loopback does not affect the signal transmitted to the fiber. Both loopbacks are controlled by the SYSCTL through the intrashelf control bus.

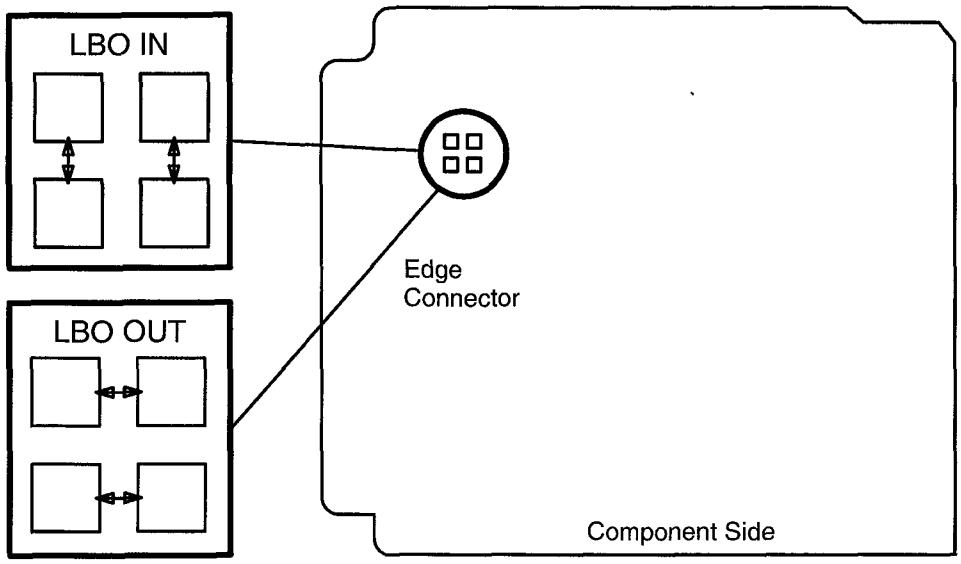
Performance Monitoring

The BBG4B DS3 circuit pack provides PM circuitry for the following performance parameters:

- STS path parameters derived from B3 coding violations
- DS3 path parameters derived from P-bit coding violations
- DS3 path parameters derived from frame and multiframe (F&M) bit errors
- DS3 line errored seconds based on B3ZS violations
- DS3 P-bit and F&M bit performance monitoring for both directions of transmission
- Optional C-bit parity performance monitoring for both directions of transmission. Requires software upgrade to Release 8.0 and later releases.

BBG4B DS3 Hardware Settings

The location of the BBG4B DS3 circuit pack line build-out jumpers is shown in Figure 7-38. The BBG4B DS3 line build-out settings are shown in the table.



BBG4B DS3 LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	- -
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

Figure 7-38. BBG4B DS3 Line Build-Out Jumpers

Power Circuitry

The BBG4B DS3 circuit pack receives two sources of –48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG4B DS3 Quick Reference Summary

Transmit Functions

The BBG4B DS3 transmit functions are as follows:

(a) Receives a B3ZS-encoded DS3 signal from a DSX-3

(b) Recovers DS3 clock and NRZ data

(c) Optionally checks and/or corrects P-bit parity errors

(d) Synchronizes the data signal to STS-1 signal rate

(e) Inserts STS-1 path overhead

(f) Provides the STS-1 signal to the OLIU circuit packs.

Receive Functions

The following receive functions are performed by the BBG4B DS3 circuit pack:

(a) Desynchronizes the incoming STS-1 signal

(b) Terminates the STS-1 path

(c) Optionally checks and/or corrects P-bit parity errors

(d) B3ZS encodes the outgoing DS3 signal

(e) Preequalizes the DS3 signal (with line build-out) and transmits it to a DSX-3.

Control Functions

The major control functions are as follows:

(a) Protection switching for OLIU and BBG4B DS3 circuit packs

(b) STS-1 path overhead processing

(c) Internal fault detection

(d) Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

(a) Detects STS-1 path AIS coming from the fiber

(b) Detects STS-1 path unequipped signal coming from the fiber

(c) Inserts DS3 AIS toward the fiber and DSX-3

(d) Detects DS3 AIS coming from the fiber

(e) Inserts and detects STS-1 path yellow signal to/from the fiber

(f) Detects DS3 AIS from the DSX-3

(g) Detects DS3 OOF from the fiber

(h) Detects DS3 OOF from the DSX-3

(i) Detects DS3 B3ZS violation threshold crossings from the DSX-3.

Edge Connector Inputs/Outputs

Table 7-13 describes the BBG4B DS3 I/O pins.

Table 7-13. BBG4B DS3 I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
DSX3I	048	DSX-3 Interface	FSYNSP	224	Timing Signals
PDSX3I	149		FSYNSN	324	
DSX3O	348	Companion DS3 CP	FSYNPP	225	
PDSX3O	249		FSYNPN	325	
TDC1SP	015	STS-1 Interface	–48VA1	300	Power
TDC1SN	115		–48VA2	200	
TDC1PP	215		–48VB1	100	
TDC1PN	315		–48VB2	001	
RDC1SP	037		–48VRT	301	
RDC1SN	137		ESDGRD	002	ESD Protection
RDC1PP	237		GRD	102	Ground
RDC1PN	337		GRD	202	
LSICKP	205	Control Interface	GRD	302	
LSICKN	305		GRD	013	
LSICDP	206		GRD	113	
LSICDN	306		GRD	213	
LSIRDP	006		GRD	313	
LSIRDN	106		GRD	021	
CSR	104		GRD	121	
BMPA11	103		GRD	221	
BMPA10	203		GRD	321	
BMPA9	303		GRD	029	
BS1	003		GRD	129	
BS2	004		GRD	229	
BS3	005		GRD	329	
IICSDA	304		GRD	035	
IICSCL	204		GRD	135	
TOHCK	040	SONET Overhead	GRD	235	
TOHFR	140		GRD	335	
TOHDA	240		GRD	047	
ROHCK	139		GRD	147	
ROHFR	239		GRD	148	
ROHDA	339		GRD	247	
MCLKSP	024	Timing Signals	GRD	248	
MCLKSN	124		GRD	347	
MCLKPP	025				
MCLKPN	125				

BBG6 STS1E Circuit Pack Description

Purpose of Circuit

The STS1E circuit pack provides an interface between EC-1 and DS1-rate (high-speed) or EC-1 and OC-3-rate (low-speed) applications.

STS1E Faceplate Indicators

The STS1E circuit pack faceplate indicators are shown in Figure 7-39.

The red FAULT LED is lighted by the SYSCTL on detection of STS1E circuit pack failure. In the event of an incoming signal failure, this LED flashes on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

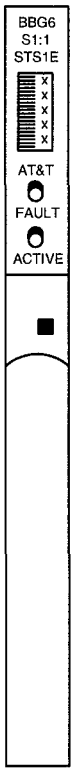


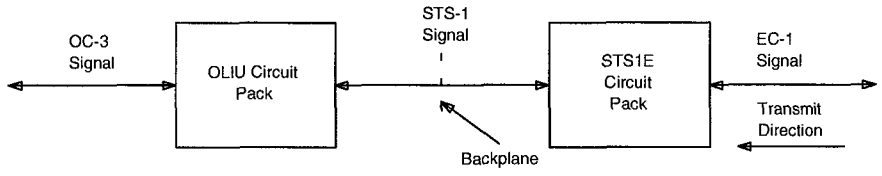
Figure 7-39. BBG6 STS1E Circuit Pack

General Description of Operation

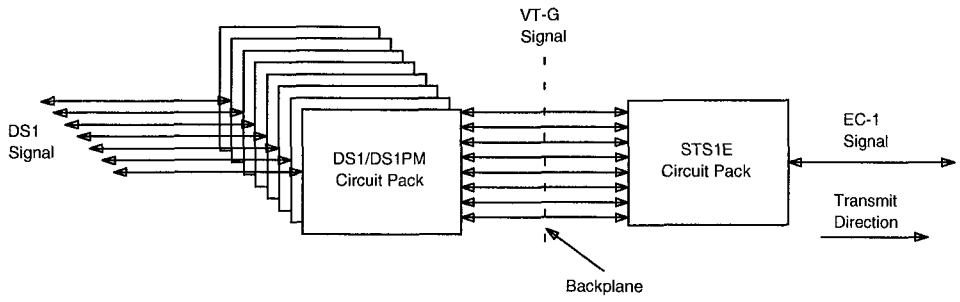
The STS1E circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 OC-3 Multiplexer and has two operating modes, EC-1 high-speed (Figure 7-40a) and EC-1 low-speed (Figure 7-40b).

In the high-speed mode, the STS1E circuit pack interfaces with the DS1/DS1PM circuit pack at the VT-G rate (6.192 Mb/s). In the low-speed mode, the STS1E circuit pack interfaces with the OLIU circuit pack at the STS-1 rate (51.84 Mb/s).

The STS1E circuit pack interfaces with the SYSCTL for maintenance, provisioning, and performance monitoring functions and interfaces to the TGS circuit pack for timing.

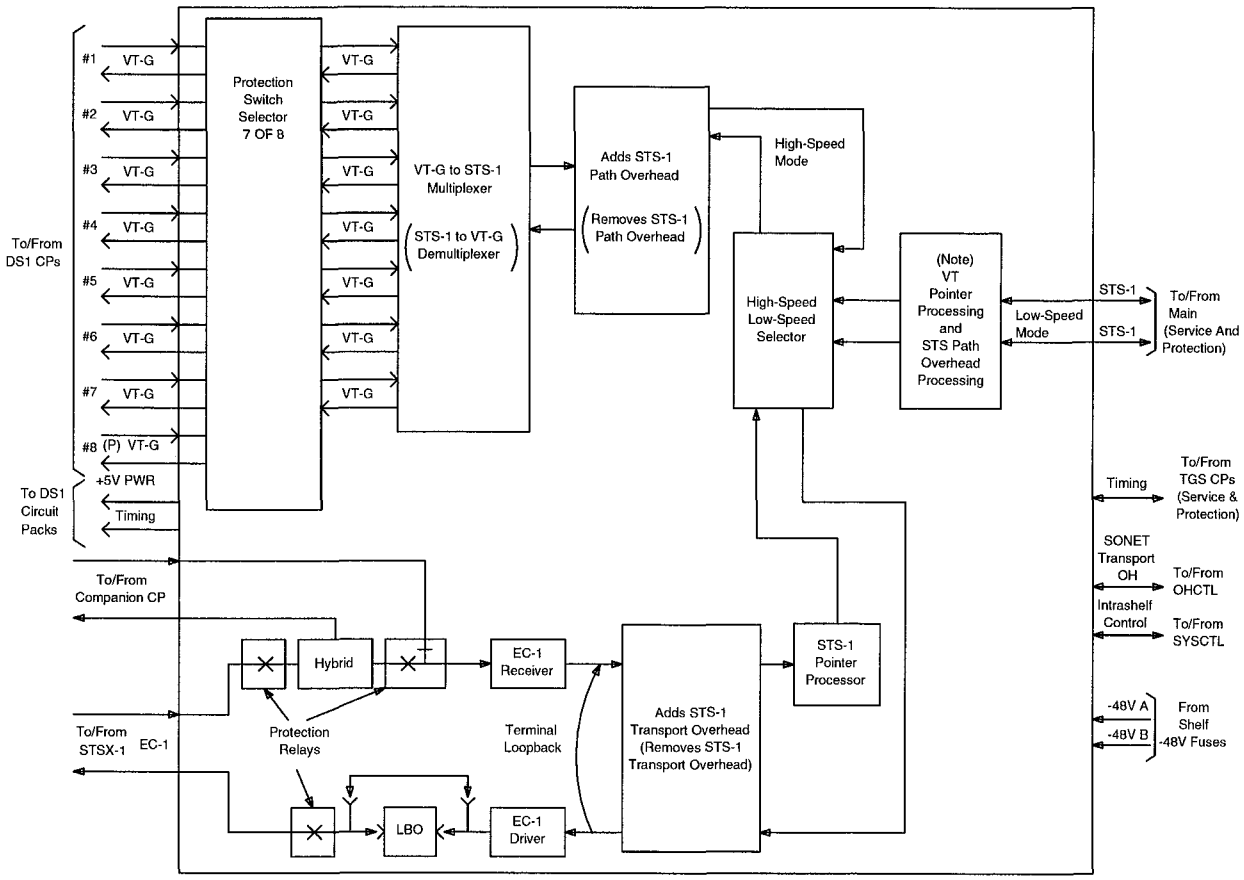


(a) Low-Speed Application



(b) High-Speed Application

Figure 7-40. STS1E Circuit Pack Low-Speed and High-Speed Modes



Note: Applicable in the low-speed mode with VT cross-connects

Figure 7-41. BBG6 STS1E Circuit Pack Block Diagram

Detailed Description of Operation

Figure 7-41 is a block diagram of the STS1E circuit pack. The STS1E circuit pack has two modes of operation determined by the setting of a hardware switch, VT-G to and from EC-1 (high-speed mode) or STS-1 to and from EC-1 (low-speed mode).

In the high-speed mode, the STS1E circuit pack receives eight incoming VT-G channels (seven service and one protection) from the eight low-speed DS1/DS1PM circuit packs and selects seven channels. These seven channels, along with STS-1 path overhead, transport overhead, a valid STS-1 pointer, and parity are byte-interleaved into an STS-1 formatted signal and transmitted as an EC-1 signal. In the receive direction, the incoming EC-1 signal is demultiplexed into seven VT-G signals.

In the low-speed mode, the STS1E circuit pack selects an STS-1 signal, either service or protection, from the OLIU circuit pack backplane and sends the signal to the EC-1 interface (receive direction). In the transmit direction, the incoming EC-1 signal is processed and routed to the backplane as an STS-1 signal.

In the low-speed mode, the STS1E circuit pack can be configured for a VT-based STS-1. In this case, the STS-1 path overhead (POH) for the EC-1 is terminated. For non-VT-based STS-1s, the STS-1 path is sent through the STS1E circuit pack unaffected.

Regardless of the operating mode, the STS1E circuit pack:

- Inserts transport overhead
- Provides scrambling and descrambling
- Provides B3ZS encoding and decoding
- Provides waveshaping
- Provides optional line build-out (LBO) for transmission to the STSX-1.

Control Circuitry

The STS1E circuit pack interfaces with the system controller (SYSCTL) and overhead controller (OHCTL) circuit packs.

The SYSCTL receives maintenance elements for reporting the status of the circuit pack, the status of the incoming signal, and inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used for fault detection and isolation. Conversely, the STS1E circuit pack responds to signals from the SYSCTL including protection switching and LED control commands.

The STS1E circuit pack accesses the SONET transport overhead and routes it via the transport overhead channel interface to the OHCTL.

Timing Circuitry

The STS1E circuit pack receives timing signals which are traceable to the clocks generated by the TGS circuit packs.

The STS1E circuit pack can select between the supplied timing signals as requested by the SYSCTL via the intrashelf control bus. The selected timing signals are used to time both the receive and transmit directions of the STS1E circuit pack. In addition, in the high-speed mode, the STS1E circuit pack can provide timing signals derived from the incoming EC-1 signal to both TGS circuit packs for loop timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1x1 nonrevertive STS1E circuit pack protection is provided.

In the high-speed mode, the STS1E provides protection switching for the VT-G side of the low-speed circuit packs. The STS1E can be requested by the SYSCTL through the intrashelf control bus to replace any of the seven service VT-G inputs with the protection VT-G input. The STS1E can be requested by the SYSCTL to bridge any of the seven VT-G service outputs to the protection output. In the low-speed mode, the STS1E provides SYSCTL-controlled selectors for the STS-1 side of the Main OLIU protection switch.

STS1E circuit pack protection switch points for the STS-1 side are located on the OLIU circuit packs. Switch points for the EC-1 side are implemented with relays on the STS1E circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL via the control interface. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the EC-1 side, a single STS-1 input from an STSX-1 is sent to both the active and standby STS1E circuit packs. Only the active unit selects the STS-1 input. The SYSCTL supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the STS-1 input signal and sends it to the standby unit and to its own receiver. To implement a protection switch on the EC-1 side, the SYSCTL switches the relays on each unit to their opposite state.

When an STS1E is removed, shorting contacts on the backplane connector operate so that the STS-1 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

The STS1E circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the STS1E circuit pack is inserted or recovers from a transient failure.

Loopbacks

One loopback is provided on the STS1E circuit pack. This terminal loopback loops the EC-1 output signal transmitted towards the STSX-1 back into the STSX-1 transport overhead processor input.

Performance Monitoring

The STS1E provides PM circuitry for the following performance parameters:

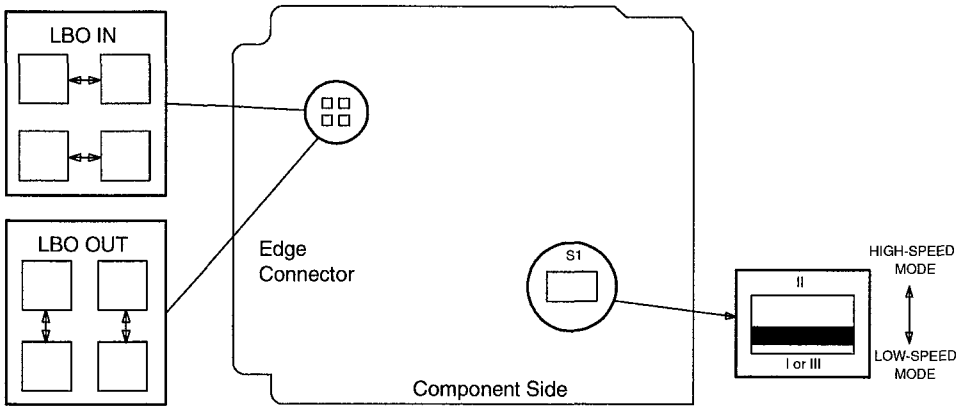
- Line parameters derived from B2 coding violations
- STS-1 parameters derived from B3 coding violations.

Power Circuitry

The STS1E receives two sources of –48 volts that are diode ORed, fused, and filtered before being converted to +5 volts to power the circuit pack and +5.3 volts to power the DS1/DS1PM circuit packs in the low-speed slots.

STS1E Hardware Settings

The location of the STS1E circuit pack line build-out jumpers and mode switch are shown in Figure 7-42. The STS1E line build-out settings are shown in the table.



STS1E LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	- -
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

Figure 7-42. BBG6 STS1E Line Build-Out Jumpers and Mode Switch

STS1E Quick Reference Summary

Transmit Functions (High-Speed Mode)

The STS1E transmit (high-speed mode) functions are as follows:

(a) Selects VT-Gs from DS1/DS1PM circuit packs, multiplexes VT-Gs with protection selection into a synchronous payload envelope (SPE), and adds STS-1 path overhead

(b) Adds SONET transport overhead, B3ZS encodes and scrambles data, converts to bipolar format, and sends it to the STSX-1.

Transmit Functions (Low-Speed Mode)

The STS1E transmit (low-speed mode) functions are as follows:

(a) Receives B3ZS-encoded and scrambled EC-1 (STS-1) signal from STSX-1

(b) B3ZS decodes and descrambles the signal and removes transport overhead

(c) Processes STS-1 pointers and frame synchronizes the signal

(d) Optionally provides 6.48 Mb/s reference clock for TGS circuit packs

(e) Terminates STS-1 path (VT-based only).

Receive Functions (High-Speed Mode)

The STS1E receive functions (high-speed mode) are as follows:

(a) Receives B3ZS-encoded and scrambled EC-1 signal from STSX-1

(b) B3ZS decodes and descrambles signal and removes transport overhead

(c) Processes STS-1 pointers and frame synchronizes the STS-1 signal

(d) Optionally provides 6.48 Mb/s reference clock for TGS circuit packs

(e) Terminates STS-1 path

(f) Demultiplexes the SPE into seven VT-G signals and supplies VT-G signals to the DS1/DS1PM circuit packs.

Receive Functions (Low-Speed Mode)

The STS1E receive (low-speed mode) functions are as follows:

(a) Selects an STS-1 input from the OLIU circuit pack and adds transport overhead

(b) B3ZS encodes and scrambles data, converts to bipolar format, and sends it to the STSX-1.

Control Functions

The major control functions are as follows:

(a) STS-1 path overhead processing

(b) Protection switching for OLIU and DS1/DS1PM circuit packs

(c) Protection switching for TGS circuit packs

(d) Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions (High-Speed Mode)

The STS1E major maintenance signal functions (high-speed mode) are as follows:

(a) Detects STS-1 path AIS

(b) Detects VT1.5 path AIS

(c) Detects STS-1 LOP

(d) Detects VT LOP

(e) Inserts VT path AIS

(f) Inserts STS-1 path unequipped signal

(g) Inserts and detects EC-1 line AIS

(h) Inserts and detects line FERF

(i) Inserts and detects STS-1 path yellow signal.

Maintenance Signal Functions (Low-Speed Mode)

The major maintenance signal functions (low-speed mode) are as follows:

(a) Detects STS-1 path AIS (VT cross-connected)

(b) Detects STS-1 LOP

(c) Detects VT LOP (VT cross-connected)

(d) Inserts VT path AIS (VT cross-connected)

(e) Inserts STS path AIS (STS cross-connected)

(f) Inserts STS-1 path unequipped signal

(g) Inserts and detects EC-1 line AIS

(h) Inserts and detects line FERF

(i) Inserts and detects STS-1 path yellow signal (VT cross-connected).

Edge Connector Inputs/Outputs

Table 7-14 describes the STS1E I/O pins.

Table 7-14. STS1E I/O Connections

Name	Pin No.	Function	Name	Pin No.	Function
TDC1SP	015		MCLKSP	024	
TDC1SN	115		MCLKSN	124	
TDC1PP	215		MCLKPP	025	
TDC1PN	315	Main/Protection	MCLKPN	125	Timing Signals
RDC1SP	037	OLIU Interface	FSYNSP	224	
RDC1SN	137		FSYNSN	324	
RDC1PP	237		FSYNPP	225	
RDC1PN	337		FSYNPN	325	
TVTD1	011		LTCKS	341	
TVTD2	111		LTCKP	241	
TVTD3	010		LSICKP	205	
TVTD4	110		LSICKN	305	
TVTCAP	007		LSICDP	206	
TVTCAN	107		LSICDN	306	
TVTFMA	307		LSIRDP	006	Control Interface
TVTD5	046		LSIRDN	106	
TVTD6	146		CSR	104	
TVTD7	045		BMPA11	103	
TVTDP	145		BMPA10	203	
TVTCBP	042		BMPA9	303	
TVTCBN	142		BS1	003	
TVTFMB	342	VT-G Interface	BS2	004	
RVTD1	210		BS3	005	
RVTD2	310		IICSDA	304	
RVTD3	209		IICSCL	204	
RVTD4	309		ON/OFF	041	
RVTCBP	243		ROHCK	139	
RVTCBN	343		ROHFR	239	
RVTFMB	242		ROHDA	339	SONET Overhead
RVTD5	245		TOHCK	040	
RVTD6	345		TOHFR	140	
RVTD7	244		TOHDA	240	
RVTDP	344		STS1XI	048	
RVTCAP	208		PSTS1XI	149	STSX-1 Interface
RVTCAN	308		STS1XO	348	
RVTFMA	207		PSTS1XO	249	
DC52AP	008		-48VA1	300	
DC52AN	108		-48VA2	200	Power
DC52BP	043		-48VB1	100	
DC52BN	143		-48VB2	001	

Table 7-14. STS1E I/O Connections (Contd)

Name	Pin No.	Function	Name	Pin No.	Function
-48VRTN	301		GRD	302	
+5DS1V	009	Power	GRD	102	
+5DS1V	109		GRD	202	
+5DS1V	044		GRD	013	
+5DS1V	144		GRD	113	
+5DS1V	211		GRD	213	
+5DS1V	246		GRD	313	
ESDGRD	002	ESD protection	GRD	121	Ground
GRD	221		GRD	235	
GRD	321		GRD	335	
GRD	029		GRD	047	
GRD	129		GRD	147	
GRD	021	Ground	GRD	247	
GRD	229		GRD	347	
GRD	329		GRD	148	
GRD	035		GRD	248	
GRD	135				

Administration and Provisioning

8

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Administration and Provisioning

8

Overview

This section describes the administration and provisioning features of the DDM-2000 OC-3 Multiplexer. The following topics are described in addition to the administration and provisioning features:

- Multiplexing and mapping
- Cross-connection provisioning for linear and ring networks
- Listing of provisionable parameters with their ranges and default values.

Administration

Version Recognition

The DDM-2000 OC-3 Multiplexer provides automatic version recognition of all hardware, firmware, and software installed in the system. Each circuit pack *CLEI** code, equipment catalog item (ECI) code, apparatus code and series number, and serial number is stored on the circuit pack and is accessible by the system controller via the craft interface terminal (CIT). Circuit packs with socketed devices also report those devices and program identification (PID) codes. The system controller also reports the software version for the system. Refer to the `rtrv-eqpt` command in Section 11, "Commands and Reports."

* COMMON LANGUAGE is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

Security

DDM-2000 OC-3 Multiplexers Release 3 and later provide security capabilities to protect against unauthorized access to the system through the CIT and data communications channel (DCC) interfaces. Security over the TL1/X.25 interface is provided in Release 6.1 and later releases. When security is enabled (default is disabled for the CIT and DCC and always enabled for TL1/X.25), three types of users are allowed access to the system with a valid login and password:

- Privileged users can execute all commands
- General users can execute any commands not restricted to privileged users
- Reports-only users (Release 5.1 and later) can only execute commands that retrieve reports from the system.

When the system is first initialized, two default logins and passwords are provided which must be changed by a privileged user before security is enabled. At initialization, privileged users are those users who use the default logins and passwords. Replacement of the SYSCTL circuit pack causes the system to default back to the default logins and passwords. Up to 10 (Release 3.0) or 50 (Release 5.1 and later) logins and passwords can be added, deleted, and changed by two authorized privileged users. Login and password security can be enabled or disabled. Timeouts can be provisioned independently for front and rear access CIT interfaces and the synchronous optical network (SONET) section DCC. Timeout is disabled on the TL1/X.25 interface. For more information on provisioning, see System Turnup/Circuit Order in the TOP section of this manual (Volume II).

Authorized privileged users can establish general user and reports-only user logins using the **`set-lgn`** command.

The following commands are restricted to privileged users over the CIT and DCC interfaces. See AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide* for TL1/X.25 command access priviliges.

- **`init-sys`**—Initialize System
- **`rtrv-lgn`**—Retrieve Login
- **`set-feat`**—Set Features; Release 5.1 and later.
- **`set-fecom`**—Set Far-End Communications
- **`set-lgn`**—Set Login
- **`set-secu`**—Set Security

When security is enabled, the following commands become restricted to privileged users only:

- `dlt-tadrmap`—Delete target identifier (TID) Address Map (Release 6 and later)
- `ent-ulsdcc`—Enter Upper Layer Section DCC (Release 6 and later)
- `init-pm`—Initialize Performance Monitoring
- `ins-prog`—Install Program
- `cpy-prog`—Copy Program (Release 6.2 and later)
- `reset`—System Reset
- `set-date`—Set network element (NE) Date and time
- `set-ne`—Set NE name.

Reports-only users can execute the following commands: `?` (help), `logout`, `rlgn`, `set-passwd` (their own), `toggle`, and all `rtrv` commands except, `rtrv-lgn`.

For details on these and other commands, see Section 11, "Commands and Reports."

Software Upgrades

The DDM-2000 OC-3 Multiplexer provides an in-service software installation capability to update the generic program in local and remote systems. Upgrades are distributed on *MS-DOS** formatted diskettes, containing the new software and an installation program. These software upgrades are the primary mechanism to add new feature enhancements to the in-service DDM-2000 OC-3 network.

For Release 6.1 and later linear releases and 7.0 and later ring releases,, the `ins-prog` command supports software installation from a personal computer and the `cpy-prog` command supports software installation from one shelf to another shelf.

For details on these and other commands, see Section 11, "Commands and Reports."

* Registered trademark of Microsoft Corporation.

Remote upgrades to Open Systems Interconnection (OSI) releases from pre-OSI releases are not allowed. Refer to the `ins-prog` command in Section 11, "Commands and Reports" and to "Install New Generic Program" in the TOP section of this manual (Volume II). For more information on software upgrade compatibility, refer to "Inservice Upgrades" in Section 9, "Maintenance Description" and the TOP section of this manual (Volume II).

Software Compatibility

DDM-2000 OC-3 and OC-12 Multiplexers connected in the same maintenance subnetwork must be running compatible software. For more information on software compatibility, refer to the software compatibility tables in Section 9, "Maintenance Description."

Controller Maintenance and Memory Administration

Controller Maintenance

The controller for the DDM-2000 OC-3 Multiplexer consists of the system controller (SYSCTL) and overhead controller (OHCTL) circuit packs. The SYSCTL circuit pack provides CIT interfaces and telemetry byte-oriented serial (TBOS) interfaces and coordinates protection switching, as well as all shelf maintenance and provisioning activities. The OHCTL circuit pack provides an X.25/transaction language 1 (TL1) interface and a communications interface to remote shelves via the DCC bytes in the OC-N section overhead. Both circuit packs have a processor and both have volatile random access memory (RAM) and nonvolatile memory.

The DDM-2000 OC-3 Multiplexer is designed so that SYSCTL failures do not affect transmission. That is, no hits or errors will occur on any traffic as a result of a SYSCTL circuit pack failure. A SYSCTL failure does result in the loss of automatic protection switching. However, if a transmission circuit pack fails before a SYSCTL failure, the protection switch will remain effective during the SYSCTL failure and service is preserved. This means that if an active transmission circuit pack should fail while the SYSCTL is failed, a protection switch cannot be done and service carried by the failed circuit pack will be affected.

Memory Administration

All transmission affecting parameters that are set by software, such as bipolar 8-zero substitution/alternate mark inversion (B8ZS/AMI) encoding on DS1 interfaces and STS-1/VT cross-connect assignments, are stored in nonvolatile memory on the SYSCTL circuit pack and on the appropriate transmission circuit packs. When the shelf is powered up or the SYSCTL circuit pack is replaced, the provisioning values are automatically uploaded to the SYSCTL. When a transmission circuit pack is replaced, provisioning data stored on the SYSCTL is automatically downloaded to the replacement circuit pack. Manual action is not required to maintain system provisioning after a circuit pack is replaced.

Certain non-service-affecting provisioned data such as alarm delay and target identifier (TID) are stored only on the SYSCTL circuit pack. This means that when a SYSCTL circuit pack is replaced, the new SYSTCL circuit pack should be initialized by pressing the INIT button during the 10-second interval while the CR alarm LED is flashing after the SYSCTL circuit pack is inserted. This action is the same as entering the `init-sys:sysctl` command which sets the SYSCTL circuit pack parameters to their default values. Refer to the `init-sys` command in Section 11, "Commands and Reports" and to "Install or Replace SYSCTL" in the TOP section of this manual (Volume II). If parameters other than the default values are needed, the values must be entered using the CIT. If the INIT function is not performed, whatever values that are stored in nonvolatile memory on the new SYSCTL circuit pack are used. Failure to follow the proper procedure may not cause transmission errors or loss of service but could affect maintenance. For example, an incorrect or duplicate TID could produce confusing TL1 reports to the operations system (OS).

System Backup and Restoral

The SNC-2000 cPro Graphical User Interface and Provisioning Tool includes a backup and restoral feature to protect provisioning information in ring networks. This feature saves a copy of a node's provisionable parameters so they can be restored at a later date, if necessary.

The feature provides backup and restoral for:

- Cross-connections
- DS1 port options
- DS3 port options
- EC-1 port options
- OC-3 line options.

See the SNC-2000 cPro Graphical User Interface and Provisioning Tool on-line user's guide for more information on this feature.

Service Affecting Actions

Although the DDM-2000 OC-3 Multiplexer is designed to minimize loss of service due to equipment failure or human action, there are certain controller related actions that can cause a loss of provisioning data and possibly loss of service. These actions include:

- Replacing a transmission circuit pack when the SYSCTL is failed or removed can result in a loss of provisioning data and loss of service
- Replacing a transmission circuit pack in a shelf without power can result in a loss of provisioning data. Loss of service may continue on channels associated with the replaced circuit pack after the shelf is powered up.
- Executing the command `init-sys:all` sets all provisioning data, including cross-connect provisioning to default values. This causes loss of service on any channel connected with nondefault cross-connections.
- Failing to disable the SYSCTL circuit pack before it is removed in accordance with TOP procedures. Failure to follow the procedure could result in a protection switch; however, no loss of service occurs. Refer to the "Install or Replace SYSCTL" procedure in the TOP section of this manual (Volume II).
- Provisioning data is maintained through a software download to the SYSCTL. Replacing the SYSCTL circuit pack with incompatible software and intentionally overriding the software check could result in a loss of data.

Multiplexing and Mapping

The following paragraphs describe DS1 to OC-3, DS3 to OC-3, EC-1 to OC-3, OC-3 to OC-3, OC-3c to OC-3c (optional) and DS1 to EC-1 multiplexing and mapping.

DS1 to OC-3

The DDM-2000 OC-3 Multiplexer uses the floating virtual tributary (VT) mode, asynchronous mapping for clear channel DS1 transport. Each DS1 signal is mapped to a VT1.5 signal; four VT1.5s are byte-interleaved to form a VT-G signal; and seven VT-Gs are multiplexed to a VT-structured STS-1 signal. The STS-1 signals are byte-interleaved to create an STS-3 signal. Table 8-1 shows the default mapping of DS1s to VT1.5s in the OC-3 signal on the DDM-2000 OC-3 Multiplexer. In default mapping there is a direct relationship between physical low-speed slot and port on that slot and the VT1.5 time slot within the OC-3. For point-to-point networks, this default mapping allows straightforward network administration because a circuit entering on a slot and port on one shelf, for example a-1-1, will always leave on a different shelf but will use the same slot and port position a-1-1. Default mapping can be overriden using the `ent-`

`crs-vt1` and `ent-crs-sts1` commands. See Section 11, "Commands and Reports" for more information on these commands.

In the opposite direction, a received OC-3 is converted back to the electrical STS-3 and demultiplexed to three STS-1 signals. Each STS-1 is demultiplexed to seven VT-Gs; each VT-G is separated into four VT1.5s; and a DS1 signal is extracted from each VT1.5.

In Table 8-1, each DS-1 port address identifies a location — a VT-G in an STS-1 — a VT1.5 in a VT-G. For example:

a-1-1, a-1-2, a-1-3...
b-1-1, b-1-2, b-1-3...
c-1-1, c-1-2, c-1-3...

OC-3 signals contain a maximum of three STS-1s. All "a" location ports are associated with STS-1 number 1, "b" location ports are associated with STS-1 number 2, and "c" location ports are associated with STS-1 number 3. The mapping of a DS-1 to an OC-3 signal requires the port address being connected with a time slot in the optical line interface unit (OLIU) circuit pack. Optical time slots identify the location — STS-1 in the OC-3 — VT-G in the STS-1 — VT1.5 in the VT-G. Some examples of time slot identifications are:

m-1-1-1, m-2-1-3
a-1-1-3, b-3-1-4

Some examples of DS1 to OC-3 mapping using VT1.5 cross-connections are:

a-1-1 to m-1-1-1
b-1-3 to m-1-5-3
c-4-4 to m-3-4-4

Table 8-1. Default DS1 to VT1.5 Mapping

DS1 Port Address	VT1.5 within STS-1	VT1.5 within VT-G	VT-G within STS-1	STS-1 within OC-3
a-1-1	1	1	1	1
a-1-2	8	2	1	1
a-1-3	15	3	1	1
a-1-4	22	4	1	1
a-2-1	2	1	2	1
a-2-2	9	2	2	1
a-2-3	16	3	2	1
a-2-4	23	4	2	1
a-3-1	3	1	3	1
a-3-2	10	2	3	1
a-3-3	17	3	3	1
a-3-4	24	4	3	1
a-4-1	4	1	4	1
a-4-2	11	2	4	1
a-4-3	18	3	4	1
a-4-4	25	4	4	1
a-5-1	5	1	5	1
a-5-2	12	2	5	1
a-5-3	19	3	5	1
a-5-4	26	4	5	1
a-6-1	6	1	6	1
a-6-2	13	2	6	1
a-6-3	20	3	6	1
a-6-4	27	4	6	1
a-7-1	7	1	7	1
a-7-2	14	2	7	1
a-7-3	21	3	7	1
a-7-4	28	4	7	1
b-1-1	1	1	1	2
b-1-2	8	2	1	2
b-1-3	15	3	1	2
b-1-4	22	4	1	2
b-2-1	2	1	2	2
b-2-2	9	2	2	2
b-2-3	16	3	2	2
b-2-4	23	4	2	2
b-3-1	3	1	3	2
b-3-2	10	2	3	2
b-3-3	17	3	3	2
b-3-4	24	4	3	2
b-4-1	4	1	4	2
b-4-2	11	2	4	2

Table 8-1. Default DS1 to VT1.5 Mapping (Contd)

DS1 Port Address	VT1.5 within STS-1	VT1.5 within VT-G	VT-G within STS-1	STS-1 within OC-3
b-4-3	18	3	4	2
b-4-4	25	4	4	2
b-5-1	5	1	5	2
b-5-2	12	2	5	2
b-5-3	19	3	5	2
b-5-4	26	4	5	2
b-6-1	6	1	6	2
b-6-2	13	2	6	2
b-6-3	20	3	6	2
b-6-4	27	4	6	2
b-7-1	7	1	7	2
b-7-2	14	2	7	2
b-7-3	21	3	7	2
b-7-4	28	4	7	2
c-1-1	1	1	1	3
c-1-2	8	2	1	3
c-1-3	15	3	1	3
c-1-4	22	4	1	3
c-2-1	2	1	2	3
c-2-2	9	2	2	3
c-2-3	16	3	2	3
c-2-4	23	4	2	3
c-3-1	3	1	3	3
c-3-2	10	2	3	3
c-3-3	17	3	3	3
c-3-4	24	4	3	3
c-4-1	4	1	4	3
c-4-2	11	2	4	3
c-4-3	18	3	4	3
c-4-4	25	4	4	3
c-5-1	5	1	5	3
c-5-2	12	2	5	3
c-5-3	19	3	5	3
c-5-4	26	4	5	3
c-6-1	6	1	6	3
c-6-2	13	2	6	3
c-6-3	20	3	6	3
c-6-4	27	4	6	3
c-7-1	7	1	7	3
c-7-2	14	2	7	3
c-7-3	21	3	7	3
c-7-4	28	4	7	3

DS3 to OC-3

The DS3 interface maps directly to the STS-1 via the asynchronous mapping. These three internal STS-1 signals are multiplexed to an STS-3 and converted to the optical OC-3.

In the opposite direction, a received OC-3 is converted back to the electrical STS-3 and demultiplexed to three STS-1 signals. A DS3 signal is recovered directly from its STS-1.

The DS3 signal maps directly into the STS-1 payload. The DS3 location is mapped into the STS-1 in the OC-3. For example:

a to m-1
b to m-2
c to m-3
b to c-2

EC-1 to OC-3

The STS1E low-speed interface receives an EC-1 signal from the backplane coaxial connector which is then routed as an internal STS-1. This signal can be STS-1 or VT1.5 cross-connected to the OC-3 interface. At the OC-3 interface, these three internal STS-1 signals are multiplexed into an STS-3 and converted to an optical OC-3 signal.

In the opposite direction, a received OC-3 is converted into an electrical STS-3 and demultiplexed. After either STS-1 or VT1.5 cross-connections, the resulting STS-1 internal signal is converted to an EC-1 signal by the STS1E interface. The STS1E interface can support both STS-1 and VT1.5 cross-connections. The following are examples of STS-1 cross-connections:

a to m-1
b to m-3
c to m-2

The following are examples of VT1.5 cross-connections:

a-1-1 to m-1-1-1
a-7-4 to m-1-1-2
b-1-1 to m-2-1-1

OC-3 to OC-3

From each received OC-3 signal, an STS-3 signal is recovered. The STS-3 is demultiplexed to three STS-1s, and the STS-1s are routed to other OC-3 interfaces as provisioned. Three STS-1s are multiplexed to an STS-3, converted to an OC-3, and transmitted over the fiber.

OC-3 to OC-3 cross-connections can be done at the STS-1 level or at the individual VT-1.5 (DS1 time slots) level. Example STS-1 cross-connections are:

m-1 to c-1
m-2 to c-2
m-3 to c-3

The following are some examples of VT1.5 time slot cross-connections for OC-3 to OC-3. These are representative of "pass through" traffic in a DS1 hub network:

m-1-1-1 to c-1-1-1
m-3-1-4 to c-3-1-4
m-1-3-2 to b-1-3-2

OC-3c to OC-3c (Optional Feature)

This application is a feature package option which must be enabled using the `set-feat` command. The shelf must be provisioned to accept OC-3c signals by setting the concatenation mode to **enabled** using the `set-oc3` command. Once enabled and provisioned, the 21G (or 21D) OLIU functions the same as other applications.

An incoming OC-3c signal from the Main 21G OLIU interface is demultiplexed into three STS-1s. However, these STS-1s are treated in the concatenated mode. These signals are sent to the 21G OLIU interface in Function Unit C slots where they are multiplexed into an STS-3c and converted back to an OC-3c signal. OC-3c to OC-3c cross-connections are done at the STS-1 level. The only valid cross-connections are:

m-1 to c-1
m-2 to c-2
m-3 to c-3

DS1 to EC-1

No manual cross-connections are needed or supported. Default cross-connections are automatically created based on circuit pack equipage. Each DS1 signal is mapped to a VT1.5 signal, four VT1.5 signals are byte-interleaved to form a VT-G signal, and seven VT-G signals are byte-interleaved to create a VT-structured STS-1 signal. The STS-1 signal is converted to the standard electrical characteristics of EC-1. This EC-1 signal is managed by the STS1E high-speed interface.

Provisioning

General

The DDM-2000 OC-3 Multiplexer allows the user to customize many system characteristics through its provisioning features. Provisioning parameters are set by a combination of on-board switches and software control.

Parameters likely to vary from installation to installation and parameters that will not change in service (for example, DS1 and DS3 line buildouts) are set with on-board switches. This allows installations to be performed without a CIT using default provisioning values and switch settings. Other parameters that require a wide range of options or in-service changes are set under software control. For example, performance-monitoring thresholds can be customized for each installation using the CIT.

Default Provisioning

Installation provisioning is minimized with default values set in the factory. Each parameter is given a default. The defaults for software parameters are maintained in the SYSCTL circuit pack. All provisioning data is stored in nonvolatile memory to prevent data loss during power failures.

Remote Provisioning

Software control of many provisioning parameters allows remote provisioning of the DDM-2000 OC-3 Multiplexer. This feature is provided especially for parameters likely to change in service, in support of centralized operations practices.

Automatic Provisioning

Circuit Pack Replacement

Replacement of a failed circuit pack is simplified by automatic provisioning of the current circuit pack values. The SYSCTL circuit pack maintains a provisioning map of the entire shelf, so when a transmission or synchronization circuit pack is replaced, the SYSCTL circuit pack automatically downloads values to the new circuit pack. If the SYSCTL circuit pack is ever replaced, provisioning data, except for the line buildout (LBO) settings, from every other circuit pack in the shelf is automatically uploaded to the nonvolatile memory of the new SYSCTL circuit pack.

Feature Packaging Provisioning

Certain software features are available only through a special licensing agreement with AT&T.

- VT performance monitoring (Release 6.0 and later linear releases and 7.0 and later ring releases)
- DS1 performance monitoring (Release 6.0 and later linear releases and Release 5.1 and later ring releases)
- OC-3c (Release 6.0 and later linear releases).

are enabled by privileged user logins according to the licensing agreement, using the `set-feat` command and can be reviewed using the `rtrv-feat` command. These features are optional and may not be active on all systems. For details on these and other commands, refer to Section 11, "Commands and Reports."

Open Systems Interconnection Provisioning

DDM-2000 OC-3 Release 6.0 and later linear releases and Release 7.0 and later ring releases support OSI interworking between DDM-2000 OC-3 and OC-12 Multiplexers (Release 2.0 and later). In a given maintenance subnetwork, the network elements (NEs) on each side of an optical span must have their "user-side/network-side" (OSI terminology) parameters set to opposite values using S2 on the OHCTL circuit pack. Local procedures should determine the "user" and "network" side of a span. For example, the CO terminal can be designated the network side and the RT site the user side. It does not matter as long as the two sides are opposite values. In a maintenance subnetwork, one and only one shelf **must** be provisioned as a gateway network element (GNE) by setting its GNE parameter to "yes". The GNE parameter must be set to "yes" to enable the TL1/X.25 interface and provide proper DCC communications. Provisioning the shelf as a GNE also designates the shelf as a directory services network element (DSNE) for the maintenance subnetwork. The DSNE provides directory service

(target identification to network service access point network address translation) for all NEs in a maintenance subnetwork. See the OHCTL circuit Description in Section 7, "Circuit Pack Descriptions" and the TOP section of this manual (Volume II) for OSI provisioning procedures.

The network service access point (NSAP) is a multiple part address that uniquely identifies a NE for OSI interworking purposes. A unique NSAP is programmed into the OHCTL (Series 2:3 and later; see "OSI Upgrades" in Section 9, Maintenance Description) circuit pack at the factory. This default NSAP value is adequate to operate current networks. NSAP provisioning, using the **ent-ulsdcc** command, will be used as part of future upgrade procedures. See the **ent-ulsdcc** command in Section 11, "Commands and Reports" for more information on NSAP provisioning.

When a NE is removed from a maintenance subnetwork, either by physically removing it or disabling the SONET DCC, the **dlt-tadrmap** command should be used to remove the NE from the maintenance subnetwork data base so alarms can be cleared.

DCC Provisioning

The data communications channel (DCC) uses the SONET overhead to communicate between Network Elements. In linear systems, there is one DCC for the Main slot pair and one DCC for each of the Function Unit (FN) slot pairs. The DCC follows the active SONET transmission line. In ring systems, there is one DCC for the "m1" ring and another DCC for the "m2" ring. The FN slot pairs in ring systems have one DCC each except for FN-A, which does not support OLIUs or a DCC. When Network Elements are interconnected to form subnetworks with DCC connectivity, each DCC expects to be connected to a distinct DCC at the far end. This is the normal, default situation.

In Release 7.1 a new application is supported where the DCC for "m1" and the DCC for "m2" are connected to the identical DCC of a Function Unit of an OC-12 Release 3.1 system. This application is called "Dual 0x1" on the OC-12 side. Because the OC-12 system in this release does not support two distinct DCCs in each Function Unit, the OC-3 shelf for this application must be provisioned to work with DCC communications that are identical on ring "m1" and ring "m2". The DCCMode parameter of the **set-ne** command is available in Release 7.1 and later ring releases for this situation. The parameter has the following values:

`distinct` — The shelf is part of a normal path switched ring network. The DCCs for ring "m1" and ring "m2" are distinct and will have different messages on each DCC. This is the default for ring software.

`identical` — The shelf is connected to an OC-12 Release 3.1 dual 0x1 OC-12 network. The DCCs for ring "m1" and ring "m2" are connected to a single DCC on a selected OC-12 function unit, which sends identical messages to each ring.

Port State Provisioning

Port state provisioning is a feature provided on DDM-2000 OC-3 Multiplexers that suppresses alarm reporting and performance monitoring by supporting multiple states (automatic, in-service, and not-monitored) for low speed ports (DS1, DS3, and EC-1).

Ports without signals (undriven) are in the automatic state until changed to the in-service state when a signal is present. The `set-state-t1`, `set-state-t3`, and `set-state-ec1` commands allow a user to change the state of a port to the not monitored state or from the not monitored state to the automatic state. The `rtrv-state-eqpt`, `rtrv-t1`, `rtrv-t3`, and `rtrv-ec1` commands allow a user to retrieve current port states. The `upd` command allows a user to change the port state of all undriven ports from in-service to automatic.

Channel State Provisioning

Channel state provisioning is a feature provided on DDM-2000 OC-3 Multiplexers (Release 6.2 and later linear releases and 7.1 and later ring releases) that suppresses reporting of alarms and events for VT1.5 and STS-1 channels during provisioning by supporting multiple states at the OC-3 and EC-1 ports (automatic, in-service, and not-monitored) for these channels. The `rtrv-state-eqpt`, `rtrv-t1`, `rtrv-t3`, and `rtrv-ec1` commands allow a user to retrieve current channel states.

While an end-to-end circuit is being set up, particularly during VT1.5 or STS-1 cross-connection provisioning, transient maintenance signals may result. Without automatic channel state provisioning, these are reported as alarms or events. The technicians are expected to ignore these transient alarms and initiate corrective action only if the alarms persist after the provisioning is completed. To avoid the confusion created by this, DDM-2000 OC-3 Multiplexers provide automatic channel state provisioning.

A VT1.5 or STS-1 channel stays in the default automatic (AUTO) state until a valid signal (a framed non-AIS or non-LOP signal) is received on that channel. While in AUTO state, no alarms or events are reported on the channel by the DDM-2000 Multiplexer. On receiving a valid signal, which occurs when the end-to-end circuit is completely provisioned, the channel automatically changes to the in-service (IS) state, and normal alarm and event reporting starts. An additional state, not monitored (NMON), is also supported in which alarm and event reporting is suppressed regardless of the validity of the signal being received on the channel. Like the port state provisioning capability provided for DS1, DS3, and EC-1 ports, the user can use CIT or TL1 commands to manually change a channel from IS or AUTO to NMON, and from NMON to AUTO.

A direct change from NMON to IS is not allowed. See the `set-state-sts1`, `set-state-vt1`, `rtrv-state-sts1`, `rtrv-state-vt1` and `upd` commands.

Cross-Connection Provisioning

The DDM-2000 OC-3 Multiplexer can be provisioned for cross-connect routing of signals. In some applications, such as linear add/drop, drop, or hubbing, STS-1 or VT1.5 signal cross-connections may be established to route traffic in a specific manner. All cross-connections are bidirectional. Any STS-1 or VT1.5 signal may be cross-connected to a like signal with an available time slot, with some restrictions. Any STS-1 or VT1.5 signal between the Main slot and any Function Unit slot may be cross-connected. Also, any STS-1 or VT1.5 channel in Function Units A or B may be cross-connected to any available time slots in Function Unit C when Function Unit C is equipped with OLIUs. However, Function Unit A cannot be cross-connected to Function Unit B.

In ring applications, STS-1 and VT1.5 signals may be cross-connected in several ways also. For bidirectional drop services the normal (default) "two-way" cross-connection is used to connect a like signal in the high-speed Main slot to any available time slot in any Function Unit equipped with low-speed STS1E, DS3 or DS1 circuit packs. For bidirectional hub applications at a ring node, the normal (default) "two-way" cross-connection is used to connect a like signal in the high-speed Main slot to any available time slot in either the B or C Function Unit, which has been equipped with OLIU circuit packs. The bidirectional pass through service is used to connect the high-speed signal from one side of the ring to the other side. Both rings are properly connected using a single "two-way" (`ent-crs`) command. The high-speed time slot entering must be the same leaving in pass through connections.

The "drop and continue" service provides in a single command (`ent-crs`), the proper bidirectional cross-connection to "drop" a copy of the high-speed signal in the Main slot to any available time slot in any Function Unit and to "continue" the signal on the high-speed channel to the next node. The same command also properly drops the signal from the opposite ring direction.

The DDM-2000 OC-3 Multiplexer has two cross-connect modes of operation, default and manual. On linear systems, this mode is "default" and can be provisioned to "manual." On ring systems, this mode is "manual" and cannot be changed. The cross-connect mode may be changed using the `set-ne` command and selecting the required `crs` mode. The cross-connect mode may be verified with the `rtrv-ne` command. Any cross-connect command may be implemented at each individual site in a network through the CIT connection, or at any site via a remote login session from any other site.

Linear Application Default Cross-Connection Mode

In the default cross-connection mode, STS-1 cross-connections are automatically set up. The default cross-connections are determined according to the circuit pack equipage of the DDM-2000 OC-3 Multiplexer. No VT1.5 cross-connections are made in the default mode. If slots are unequipped, then no cross-connection is made.

For some applications, such as a point-to-point configuration, the default mode may provide all the necessary cross-connections required.

DDM-2000 linear systems support a fixed mapping between STS-1 signals embedded in the OC-3 line signal and the STS-1s associated with signals dropped on the shelf. This "default" STS-1 signal mapping is shown in Table 8-2. When the `crs` parameter is "default," attempts to enter or delete cross-connections are denied. When the value of the `crs` parameter is "manual," cross-connections are not created or deleted automatically. Even if a circuit pack is inserted into an empty slot, the system waits for the user to provision the cross-connection before the port is put into service. Likewise, a circuit pack (CP) cannot be removed until the cross-connection to the circuit pack is deleted.

Table 8-2. DDM-2000 OC-3 Default STS-1 Cross-Connections (Termination)

From		To	"To" CP Type (Note)	CIT Command
m-1	<-->	a	MXRVO, STS1E, DS3	-not required-
m-2	<-->	b	MXRVO, STS1E, DS3	-not required-
m-3	<-->	c	MXRVO, STS1E, DS3	-not required-
m-1	<-->	a-1	OLIU	-not required-
m-2	<-->	b-2	OLIU	-not required-
m-3	<-->	c-3	OLIU	-not required-

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Manual Cross-Connections

If the default cross-connections do not provide the necessary connections, then a manual cross-connection mode may be selected by entering the `set-ne` command and changing the `crs` parameter to manual. In the manual cross-connections mode, the cross-connections can be changed using the following commands:

- `ent-crs-sts1` (Enter Cross-Connection STS-1) - This command creates STS-1 signal cross-connections.
- `dlt-crs-sts1` (Delete Cross-Connection STS-1) - This command deletes STS-1 signal cross-connections.
- `ent-crs-vt1` (Enter Cross-Connection VT1.5) - This command creates VT1.5 signal cross-connections. 22-type OLIU circuit packs must be used to establish VT1.5 cross-connections.
- `dlt-crs-vt1` (Delete Cross-Connection VT1.5) - This command deletes VT1.5 signal cross-connections.
- `cnvt-crs` (Convert Cross-Connection) - In linear systems, this command converts an existing STS-1 cross-connection to 28 individual VT1.5 cross-connections with the same endpoints as the STS-1 cross-connection. VT1.5 signals carried within the original STS-1 appear in the same time slots in the upstream or downstream DDM-2000 OC-3 before and after the conversion takes place. 22-type OLIU circuit packs must be used to convert cross-connections.

The `cnvt-crs` command has the unique ability to convert an existing STS-1 signal into its component 28 VT1.5 signals. This conversion enables an easy upgrade of existing STS-1 drop networks to DS1 add/drop networks. No inverse capability is available to convert 28 VT1.5 signals back to a single STS-1 cross-connection. This command is available on linear systems.

DDM-2000 OC-3 linear and ring systems provide flexible routing of STS-1 and VT1.5 signals between high speed and function unit interfaces for ring, hubbing and add/drop applications. These "manual" cross-connections are entered using the CIT and are shown in Tables 8-3 through 8-12. The `crs` parameter must be set to "manual" to enter flexible STS-1 and VT1.5 cross-connections.

Tables 8-3 through Tables 8-12 list the various type cross-connections supported. After the tables are descriptions of applications and the types of cross-connections each application requires.

Table 8-3. DDM-2000 OC-3 Manual STS-1 Cross Connections (Termination/Drop)

From		To	"To" CP Type (Note)	Example Command
m-{1-3}	<-->	a	MXRVO, STS1E, DS3	ent-crs-sts1:m-1,a
m-{1-3}	<-->	b	MXRVO, STS1E, DS3	ent-crs-sts1:m-2,b
m-{1-3}	<-->	c	MXRVO, STS1E, DS3	ent-crs-sts1:m-3,c

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Table 8-4. DDM-2000 OC-3 Manual STS-1 Cross-Connections (Hub/Drop)

From		To	"To" CP Type	Example Command
m-{1-3}	<-->	a-{1,2}	OLIU	ent-crs-sts1:m-1,a-1
m-{1-3}	<-->	b-{1,2}	OLIU	ent-crs-sts1:m-2,b-2
m-{1-3}	<-->	c-{1-3}	OLIU	ent-crs-sts1:m-3,c-3

Table 8-5. DDM-2000 OC-3 Manual STS-1 Cross-Connections (Add)

From		To	"From" CP Type (Note)	Example Command
a	<-->	c-{1-3}	MXRVO, STS1E, DS3	ent-crs-sts1:a,c-1
b	<-->	c-{1-3}	MXRVO, STS1E, DS3	ent-crs-sts1:b,c-3
a-{1,2}	<-->	c-{1-3}	OLIU	ent-crs-sts1:a-1,c-1
b-{1,2}	<-->	c-{1-3}	OLIU	ent-crs-sts1:b-1,c-1

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Table 8-6. DDM-2000 OC-3 Manual STS-1 Cross-Connections (Rings Pass Through)

From		To	"To" CP Type	Example Command
m-1	<-->	m-1	OLIU	ent-crs-sts1:m-1,m-1
m-2	<-->	m-2	OLIU	ent-crs-sts1:m-2,m-2
m-3	<-->	m-3	OLIU	ent-crs-sts1:m-3,m-3

Note: Address on the left side MUST BE identical to the address on the right side. There is no interchange function for "pass through" signals.

Table 8-7. DDM-2000 OC-3 Manual STS-1 Cross-Connections (Rings Drop and Continue)

From		To	"To" CP Type	Example Command
m-{1-3}	<-->	a	STS1E	ent-crs-sts1:m-1,a:cct=dc,ring=m1
m-{1-3}	<-->	b	STS1E	ent-crs-sts1:m-2,b:cct=dc,ring=m1
m-{1-3}	<-->	c	STS1E	ent-crs-sts1:m-3,c:cct=dc,ring=m2

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections. The "ring" parameter defines the ring carrying the continue signal. This ring directly connects to the other drop and continue shelf.

Table 8-8. DDM-2000 OC-3 Manual VT1.5 Cross Connections (Termination/Drop)

From		To	"To" CP Type (Note)	Example Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1-7}-{1-4}	MXRVO, STS1E	ent-crs-vt1:m-1-1-1,a-1-1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1-7}-{1-4}	MXRVO, STS1E	ent-crs-vt1:m-2-3-4,b-3-4
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-7}-{1-4}	MXRVO, STS1E	ent-crs-vt1:m-3-3-3,c-3-3

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Table 8-9. DDM-2000 OC-3 Manual VT1.5 Cross-Connections (Hub/Drop)

From		To	"To" CP Type	Example Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1,2}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-1-1-1,a-1-1-1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1,2}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-2-2-2,b-2-2-2
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-3-3-3,c-3-3-3

Table 8-10. DDM-2000 OC-3 Manual VT1.5 Cross-Connections (Add)

From		To	"From" CP Type (Note)	Example Command
a-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	MXRVO, STS1E	ent-crs-vt1:a-1-1,c-1-1-1
b-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	MXRVO, STS1E	ent-crs-vt1:b-2-2,c-2-2-2
a-{1,2}-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	OLIU	ent-crs-vt1:a-2-2-2,c-2-2-2
b-{1,2}-{1-7}-{1-4}	<-->	c-{1-3}-{1-7}-{1-4}	OLIU	ent-crs-vt1:b-2-2-2,c-3-3-3

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections.

Table 8-11. DDM-2000 OC-3 Manual VT1.5 Cross-Connections (Pass Through)

From		To	"To" CP Type (Note)	Example Command
m-1-{1-7}-{1-4}	<-->	m-1-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-1-1-2,m-1-1-2
m-2-{1-7}-{1-4}	<-->	m-2-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-2-3-4,m-2-3-4
m-3-{1-7}-{1-4}	<-->	m-3-{1-7}-{1-4}	OLIU	ent-crs-vt1:m-3-5-3,m-3-5-3

Note: Address on the left side MUST BE identical to the address on the right side. There is no interchange function for "pass through" signals.

Table 8-12. DDM-2000 OC-3 Manual VT1.5 Cross Connections (Rings Drop and Continue)

From		To	"To" CP Type (Note)	Example Command
m-{1-3}-{1-7}-{1-4}	<-->	a-{1-7}-{1-4}	STS1E	ent-crs-vt1:m-1-1-1,a-1-1:cct=dc,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	b-{1-7}-{1-4}	STS1E	ent-crs-vt1:m-2-3-4,b-3-4:cct=dc,ring=m1
m-{1-3}-{1-7}-{1-4}	<-->	c-{1-7}-{1-4}	STS1E	ent-crs-vt1:m-3-3-3,c-3-3:cct=dc,ring=m2

Note: The STS1E circuit pack hardware switch must be set to "low-speed" to support cross-connections. The "ring" parameter defines the ring carrying the continue signal. This ring directly connects to the other drop and continue shelf.

Optical Point-to-Point Application

This is a linear application with two NEs. Valid mapping is provided by termination cross-connections. Either "default" or "manual" mode is supported per shelf. DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the `crs` mode is "manual".

Optical Drop Application

This is a linear application with multiple NEs in a chain. Function unit "C" of intermediate nodes is equipped with OLIUs to transport signals to the next NE. Valid mapping is provided by termination and drop cross-connections. Either "default" or "manual" mode is supported per shelf. Intermediate drop nodes may require "manual" cross-connections. DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the `crs` mode is "manual".

Optical Hubbing Application

This is a linear application with multiple NEs in a hub/chain. Hub NEs Function units can be equipped with OLIUs to transport signals to the next NE. Valid mapping is provided by termination, hub, and drop cross-connections. Either "default" or "manual" mode is supported per shelf. Intermediate hub nodes may require "manual" cross-connections. DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the `crs` mode is "manual".

Optical Add/Drop Application

This is a linear application with multiple NEs in a chain. Function unit "C" of intermediate nodes is equipped with OLIUs to transport signals to the next NE. Valid mapping is provided by termination, add, and drop cross-connections. Either "default" or "manual" mode is supported per shelf.

Intermediate drop nodes may require "manual" cross-connections. Intermediate add/drop nodes require "manual" cross-connections and an OLIU circuit pack, a 22-type, that supports add/drop cross-connections.

DS1 services are supported either by STS-1 signal mapping to 28 VT1.5 signals as described under default cross-connections or by manual VT cross-connections. VT cross-connections are allowed only if the OLIU circuit pack is a 22-type and the `crs` mode is "manual".

Electrical EC-1 Multiplexer Application

This is an application with one NE. Valid coss-connections are provided by the shelf and depend on the equipage. DS1 services are supported by EC-1 (STS-1) signal mapping to 28 VT1.5 signals as described under default cross-connections. The STS1E circuit pack must be hardware-provisioned for the "high-speed" mode.

OC-3 Path Protected Ring Application

This is a path protected ring application with multiple NEs in a two fiber ring. The main optical units of each node in the ring are equipped with ring OLIU circuit packs, the 22-type, to transport signals to the next NE as well as drop signals at the NE. Valid mapping is provided by termination, and pass through cross-connections. Only the "manual" cross-connect mode is supported.

OC-3 Path Protected Ring Drop and Continue Application

This is a path protected ring application with multiple NEs in a two fiber ring. All but two nodes are normal ring application nodes. (See previous application.) Two nodes are defined to be the drop and continue nodes and are neighbors. They function to provide two copies of each service on the ring to another ring (dual ring interworking) or to wire centers (dual wire center service). Special drop and continue cross-connections are used to support this feature. The STS1E low-speed circuit pack is used to transport traffic between rings or to the wire centers. This feature provides node failure survival functionality. These two special nodes can also provide normal ring functionality at the same time.

OC-3 Path Protected Ring Optical Extension Application

This is a path protected ring application with multiple NEs in a two fiber ring and OLIU circuit packs in Function Unit B and/or C of a NE. This application allows services to exit the ring on OC-3 interfaces to other NEs. Mixed network topologies (ring and linear) are possible but require compatibility between the ring and linear software releases. See the software compatibility tables in Section 9, "Maintenance Description".

Manual Cross-Connection Procedure

The DDM-2000 OC-3 system has a per shelf parameter called `crs`, which determines if the shelf uses automatic "default" STS-1 signal routing or requires the user to enter and delete all cross-connections. Manual mode (`crs=manual`) disables the "default" routing and unlocks the cross-connect table for editing by the user.

The following procedure reprovisions linear systems from default to manual.

a. From the CIT issue the command `set-ne:crs=manual;` to put the shelf into "manual" mode. On linear systems, any existing "default" cross-connections" made by the shelf will still be active but are now "manual."

b. All cross-connections entered by the user are "manual" connections and must be deleted by the user to change service.

c. All commands to change signal routings (enter or delete) may be service affecting. A warning and confirmation for the request is issued as explained in Section 11, "Commands and Reports" for the `ent-crs` and `dlt-crs` commands.

d. Manual routing requires that slots be equipped. The `ent-crs` routing command will check if the slot is equipped and display an error message denying illegal requests.

e. Manual routing requires that slots be equipped. Therefore, if the last circuit pack of a protected pair is removed from the slot even if there is no signal on the circuit pack, the action is alarmed. The "Update" command will be denied. The manual routing must be deleted before the circuit pack can be removed and the slot become unequipped using the "Update" command.

f. The `rtrv-crs` commands display the cross-connect routing table.

g. In Function slots A, B, and C more than one STS-1 signal or 28 VT1.5 signals can be manually routed to them. This is invalid for MXRVO, STS1E, and DS3 circuit packs. If a routing command is issued and the circuit pack type is wrong, the command is denied.

h. In linear systems, to put the shelf back into "default" cross-connect mode requires that the existing cross-connections be STS-1 and be valid defaults. See Table 8-2. The user is required to reset the cross-connections to meet these rules. If the cross-connect table is not valid, the `set-ne:crs=default;` command is denied.

Manual Cross-Connection Restrictions

Restrictions on manual cross-connections include the following:

- All VT-1.5 cross-connections (`ent-crs-vt1`) are done via the OLIU circuit packs in the Main slots. The OLIU circuit packs must be 22F or 22G-U.
- Time slots in Function Units A and B cannot be cross-connected to each other.
- When Function Units A and B are equipped with OLIUs, they can only carry two STS-1 or 56 VT1.5 signals. They cannot be cross-connected with Main or Function Unit C to carry three STS-1 or 84 VT1.5 signals.
- A cross-connection cannot be made to a slot that is in the unequipped state. Also, a cross-connection may not be made with any signal where a cross-connection already exists. The existing cross-connection must be deleted before a new cross-connection can be entered.
- If the system is equipped with OLIUs in Function Unit A and/or B, only one STS-1 signal per function unit is allowed to be connected (added) to Function Unit C.
- For VT1.5 cross-connections, all drop and continue cross-connections on a shelf must be entered into the same ring.
- For ring applications, use the following rules to establish cross-connections in each ring:
  a. All drop connections (including DRI, if present) from the same ring must be provisioned the same, either all VT1.5 or all STS-1.
  b. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, the cross-connection may be provisioned as either a pass through STS-1 or VT1.5. However, if you anticipate dropping VTs from the pass through node you should provision the pass throughs as VT cross-connections. DDM-2000 OC-3 Releases 7.0 and earlier do not support the command (`cnvt-crs`) for converting an STS to a VT cross-connect. Also, provisioning now as a VT cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT cross-connects to drop DS1s at a later time.
  c. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

To do a cross-connection successfully, proper addressing of cross-connect points is necessary. Figure 8-1 shows an example site and STS-1 addresses. For a complete list of valid addresses, refer to Tables 8-2 through 8-12.

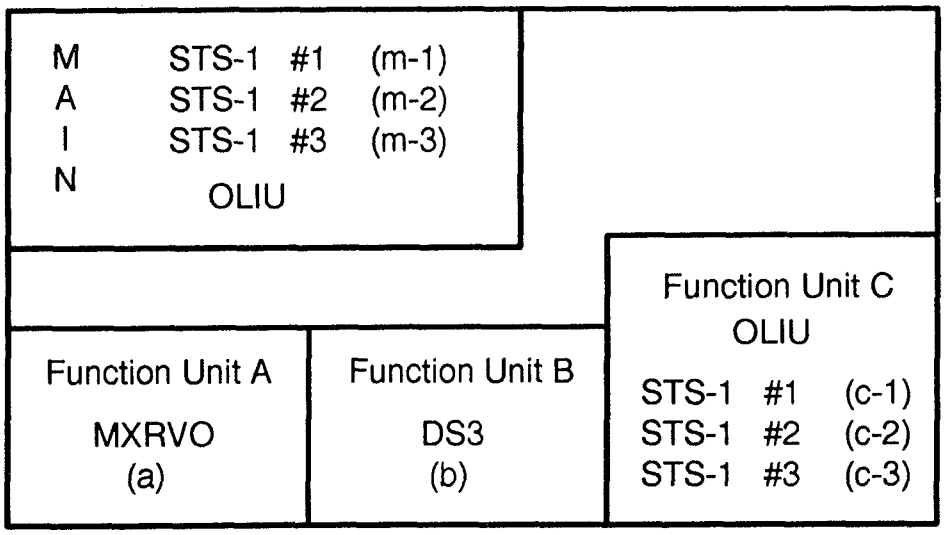


Figure 8-1. Example Site and STS-1 Addresses

Linear Network Cross-Connection Example

The following paragraphs describe a linear network example configuration, explain the default cross-connections, and describe how to create and delete manual cross-connections. The example configuration is a linear network with four sites. For the purposes of this example, it is assumed that each shelf has recently been installed and all shelves are in the default cross-connect mode. Figure 8-2 shows the four sites with dashed lines indicating the default STS-1 cross-connections.

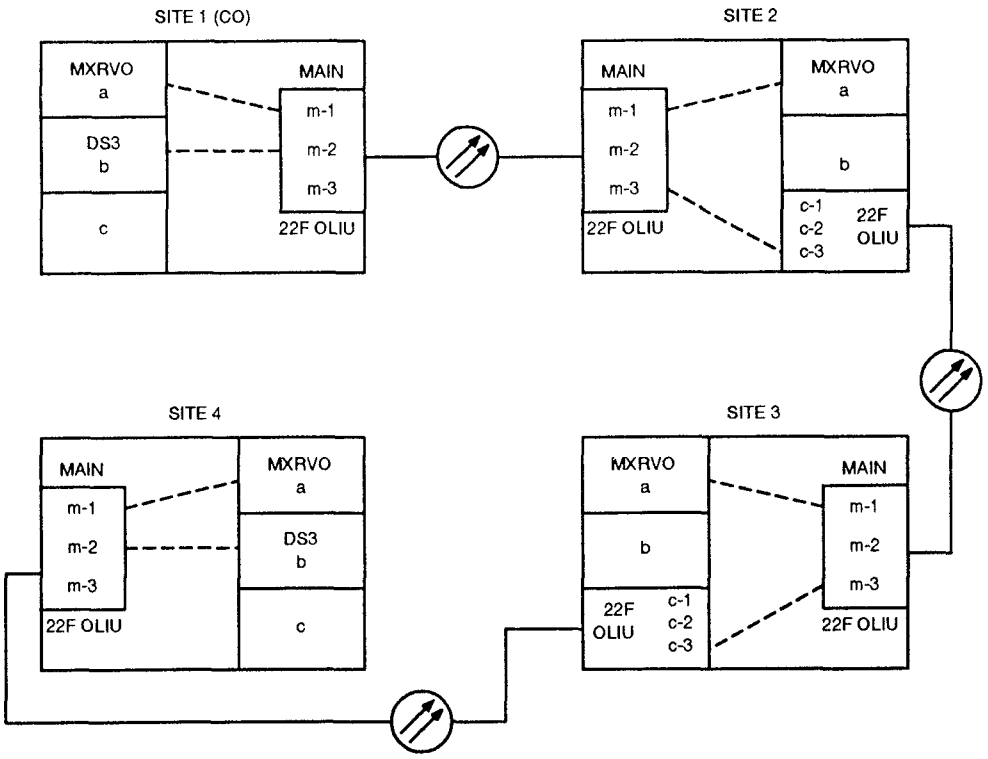


Figure 8-2. Linear Network Example Configuration

Initially, Site 1 (a central office) is equipped with 22-type OLIU circuit packs in the Main slots, MXRVO and DS1 circuit packs in Function Unit A, a DS3 circuit pack in Function Unit B, and no equipment in Function Unit C. Sites 2 and 3 are equipped with 22-type OLIU circuit packs in the Main and Function Unit C slots, and MXRVO and DS1 circuit packs in Function Unit A. Function Unit B at Sites 2 and 3 are unequipped. Site 4 has 22-type OLIU circuit packs in the Main slot, MXRVO and DS1 circuit packs in Function Unit A, DS3 circuit packs in Function Unit B, and no equipment in Function Unit C. Note that in this example default configuration there is no way to support service for the DS3 port in Function Unit B of Site 1 or Site 4 or the MXRVO at Site 3 as currently equipped.

A user may want to route a DS3 signal from Site 1 Function Unit B through to Site 4 Function Unit B and may want to assign a DS1 from Site 1 Function Unit A to DS1 ports in Function Unit A of Sites 2, 3, and 4. These cross-connections are not set up by the default cross-connections at all the sites, so the manual cross-connect mode must be selected to change the cross-connections. At Site 1, the default cross-connections support the necessary signal routing. At Site 2, however, the cross-connections must be changed. The manual cross-connect mode should be selected at Site 2 and the `ent-crs-sts1:m-2,c-2` command should be used to connect `m-2` to `c-2`. Also, since STS-1 #3 (`m-3`) is not carrying service, that cross-connection can be deleted with the `dlt-crs-sts1:m-3,c-3` command. The same cross-connections that were entered and deleted at Site 2 should be entered and deleted for Site 3. At Site 4, the default cross-connections support the necessary connections. Figure 8-3 shows the new cross-connections for these four sites after the first series of cross-connect commands with DS3 service established between Site 1 and Site 4.

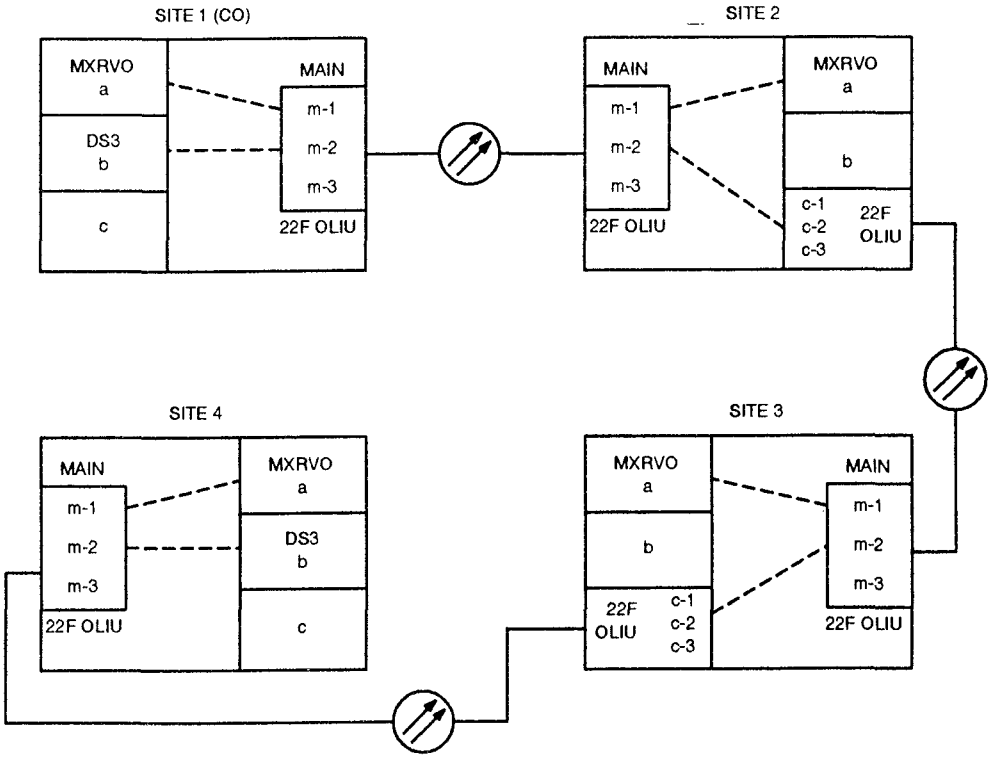


Figure 8-3. Configuration After First Series of Cross-Connect Commands

If a user wants to assign all DS1 traffic in Site 1 Function Unit A to DS1 ports in Site 4 Function Unit A, the cross-connections must be changed further to accommodate this routing. At Site 1, the cross-connection already exists to support this routing. At Site 2, the cross-connections must be changed. The necessary cross-connection is `m-1` to `c-1`, but a cross-connection on `m-1` already exists. Since Site 2 is already in the manual cross-connect mode (from the earlier cross-connection changes), the user would use the `dlt-crs-sts1:m-1,a` command to delete the `m-1` to `a` cross-connection. Then use the `ent-crs-sts1:m-1,c-1` command to enter the `m-1` to `c-1` cross-connection. Again, the same cross-connections that were entered and deleted at Site 2 should be repeated at Site 3. At Site 4, the preexisting cross-connections support the routing. Figure 8-4 shows the new cross-connections for these four sites after the second series of cross-connect commands with DS1 service established between Site 1 and Site 4.

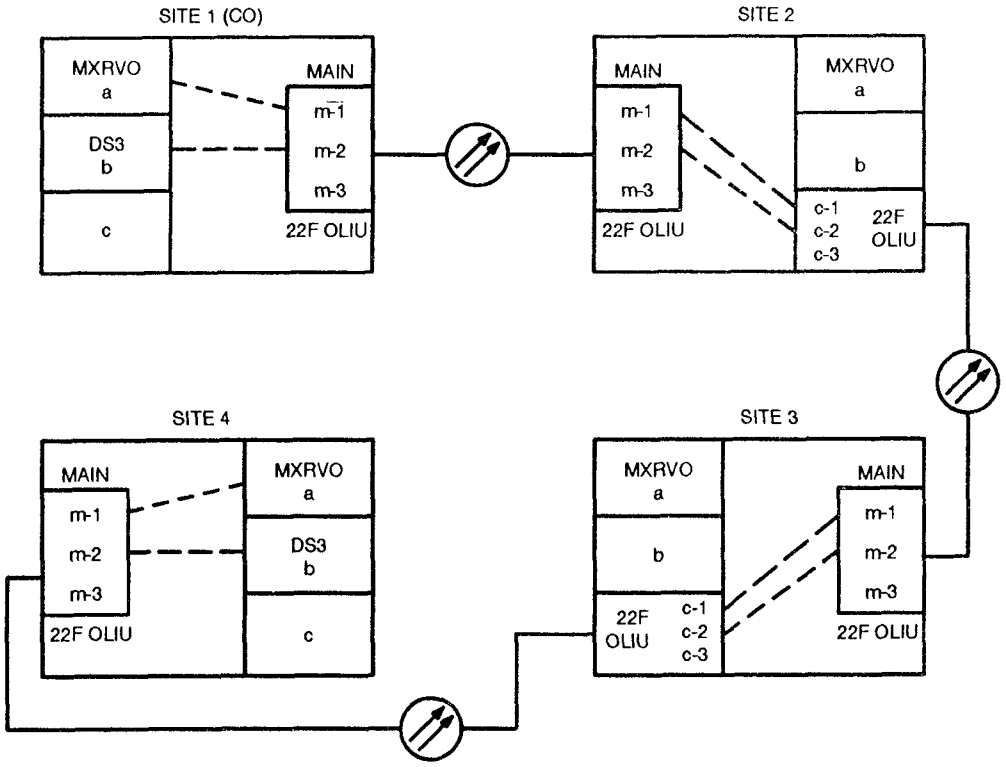


Figure 8-4. Configuration After Second Series of Cross-Connect Commands

Finally, a user may want to carry DS1 traffic from Site 1 to Sites 2 and 3, drop some VT1.5 traffic at Function Unit A at Sites 2 and 3, and continue some traffic through to Site 4. The cross-connections must be changed further to accommodate this routing. At Site 1, the existing cross-connections support the necessary connections. At Site 2, the cross-connections must be changed. First, the `cnvt-crs` command should be used on the `m-1` to `c-1` cross-connection to convert the STS-1 signal to 28 VT1.5 signals. Next, to drop some of the VT1.5 signals at Function Unit A, the user must first delete them from the main to fn-c, then create a cross-connection from the main to low-speed groups in fn-a. The user would want to use the `rtrv-crs-vtl` command to list the existing cross-connections. The following commands delete one VT group (4 VT1.5 signals) from the 28 VT1.5 signals between `m-1` and `c-1` and direct these four signals to Function Unit A:

```
dlt-crs-vtl:m-1-2-1,c-1-2-1

dlt-crs-vtl:m-1-2-2,c-1-2-2

dlt-crs-vtl:m-1-2-3,c-1-2-3

dlt-crs-vtl:m-1-2-4,c-1-2-4

ent-crs-vtl:m-1-2-all,a-2-all
```

The four VT1.5 cross-connections can be deleted individually, or can be deleted with one command, using the address `-all` to signify all four VT1.5 signals (`dlt-crs-vtl:m-1-2-all,c-1-2-all`). The remaining VT1.5 signals are still cross-connected from `m-1` to `c-1` and are sent through to the next site.

At Site 3, other cross-connections must be changed. First the `cnvt-crs` command should be used on the `m-1-` to `c-1` cross-connections to convert the STS-1 signal to 28 VT1.5 signals. Next, to drop some of the VT1.5 signals at Function Unit A, the user must first delete them from Main to Function Unit C, then create a cross-connection from Main to the low-speed group in Function Unit A.

The following commands delete one VT group (4 VT1.5 signals) from the 28 VT1.5 signals between `m-1` and `c-1` and direct these four signals to Function Unit A:

```
dlt-crs-vtl:m-1-3-all,c-1-3-all

ent-crs-vtl:m-1-3-all,a-3-all
```

Since Site 2 dropped some VT1.5 signals, the user can reuse the transmission capacity to add traffic at Site 3, sending it to Site 4:

```
dlt-crs-vt1:m-1-2-all,c-1-2-all
```

```
ent-crs-vt1:a-2-all,c-1-2-all
```

At Site 4, the previous cross-connections support the necessary routing.

Figure 8-5 shows the final configuration for these four sites with dotted lines showing the VT1.5 signals.

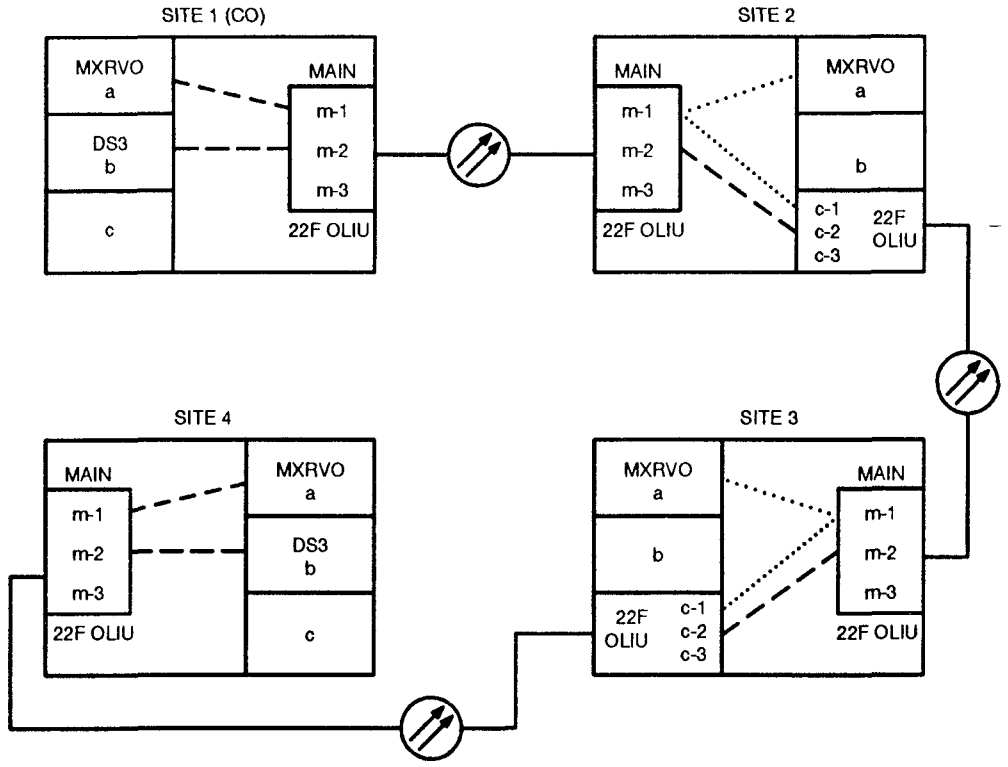


Figure 8-5. Final Configuration

Ring Cross-Connection Provisioning

For every DS1, VT1.5, STS-1, or DS3 transported through a ring network, a cross-connection is needed in every NE (node) on the ring. A "drop" cross-connection is needed at the nodes where service enters or exits the ring. A "pass through" cross-connection is needed at all other nodes (intermediate nodes) on the ring.

For the DDM-2000 OC-3 Multiplexer, cross-connections of both ring paths are entered with a single command entry per shelf. This minimizes the possibility of provisioning a circuit without a protection channel. A DDM-2000 OC-3 ring has 84 VT1.5 channels or 3 STS-1 channels. The ring channels are always carried within the 22-type OLIU circuit packs in the Main 1 and Main 2 slots. The VT1.5 ring channels are designated `m-{sts#}-{vtg#}-{vt#}`. The STS-1 channels are designated `m-{sts#}`. In cross-connection provisioning, there is no need to identify ring channels in Main 1 different from Main 2 because both rings are always provisioned with the same information.

At the entry and exit points, the VT channels are cross-connected to the low-speed ports (for example, `{ls group}-{slot#}-{port# on slot}, a-7-4`). These are called "drop" connections. For example, the command `ent-crs-vt1:m-2-6-4,a-1-3` connects the third low-speed port associated with slot 1 of low-speed group A to the fourth VT1.5 within the sixth VT group within the second STS-1 of both rings. Similarly, for STS-1 channels, the command `ent-crs-sts1:m-2,a` connects the DS3 or EC-1 port of Function Group A to the second STS-1 of both rings.

At the intermediate nodes, a pass through cross-connection establishes a cross-connect path on both rings. Pass through cross-connections are designated by using the same VT or STS-1 ring channel twice in the cross-connect address. For example, the single command `ent-crs-vt1:m-2-6-4:m-2-6-4` connects a pass through cross-connection both to and from the fourth VT1.5 within the sixth VT group within the second STS-1 of both the service and protection ring. Also note that, unlike linear networks that require 22-type OLIUs in both Main and Fn-C slots to create pass through connections, ring pass through cross-connections are made directly between both Main OLIUs.

Depending on local practice, work orders will normally identify the low-speed port designations at the entry and exit points in the network and the target identifiers (TIDs) of the NEs at these points. The work order may also designate the VT1.5 or STS-1 ring channel which will be used for this service. If the work order does not designate a ring channel to use, use the command `rtrv-crs-vt1;` or `rtrv-crs-sts1;` to identify all the ring channels that are currently unassigned. The work order also may not necessarily designate all the other NEs on the ring that need to be provisioned with pass through cross-connections. In this case, use the `rtrv-nmap` command to identify the TIDs for all the network elements in a ring.

Ring Network Cross-Connection Example

The following paragraphs describe a ring network example configuration and describe how to create manual cross-connections to establish the ring network. The example configuration is a ring network with two ring fibers and six nodes. Ring 1 carries ring traffic in the clockwise direction while Ring 2 carries ring traffic in the counterclockwise direction. For the purposes of this example, it is assumed that each shelf has recently been installed; equipped with 22-type OLIUs in the Main 1 and Main 2 slots, MXRVOs in the Function Unit slots, and DS1s in the Low-Speed Group slot; and all shelves are properly installed and provisioned. This example is for DS1 services. DS3 and EC-1 low-speed services can follow an equivalent procedure. See "System Turnup/Circuit Order" in the TOP section of this manual (Volume II). Figure 8-6 shows the six nodes with dashed lines indicating the cross-connections.

Ring configurations support manual VT1.5 or STS-1 cross-connections. Manual cross-connections must be made at **each** node in the network for each circuit being established. Drop cross-connections are made at the drop nodes where service enters or exits the node (Nodes 1 and 5) and pass through cross-connections are made at **each** intermediate node (Nodes 2, 3, 4, and 6).

The example is for DS1 services but can be used to STS-1 services if the Function Units are properly equipped with DS3 and or STS1E circuit packs. The STS1E circuit pack can support 28 VT cross-connections or one STS-1 cross-connection.

Pass through cross-connections should be established first to minimize alarms. The example assumes that the drop cross-connections are made after, but at the same time as, the pass through cross-connections are made. This is the preferred method since it assures that all cross-connections are associated with services.

An alternate method is also possible. Before service is established, all shelves can be defaulted to set up all pass through cross-connections in the ring. This method has the advantage of only having to delete pass through and establish drop cross-connections at the add/drop nodes. However, this method may introduce the possibility of affecting service when cross-connections are deleted. This is because it will not be possible to distinguish between pass through cross-connections that are in use carrying service from those that are available. Use of this default pass through provisioning method is only recommended if the accuracy of the cross-connection information on the work order is assured.

The following commands may be used to delete, enter, and retrieve cross-connections: `dlt-crs-vt1`, `ent-crs-vt1`, `rtrv-crs-vt1`, `dlt-crs-sts1`, `ent-crs-sts1`, and `rtrv-crs-sts1`. See Section 11, "Commands and Reports" for a description of these commands.

When compared to linear add/drop provisioning, the steps for ring cross-connect provisioning are simpler because the same ring channel designation is associated with the same service in every node on the ring. It is important that the pass through signal is assigned the same channel address for all nodes in the ring including the add/drop nodes `m-1-2-3` in the example.

Do the following procedure:

1. Using the work order, identify the TIDs of the entry and exit points on the ring (Nodes 1 and 5 in the example).
2. Determine if the work order is specifying use of a particular ring channel, (some work orders may abbreviate the `m-1-2-3` designation as `m123`). If the work order does not designate a VT1.5 ring channel to use, use the `rtrv-crs-vt1:all;` to identify all unused ring channels. The output report will show a dash in the Address 2 column for all unused channels. In the example, we will cross-connect a DS1 from Node 1 through the ring and drop the DS1 at Node 5 using `m-1-2-3`.
3. Log in or remote log in to all the TIDs that are not entry and exit points (intermediate nodes) and enter ring "pass through" cross-connections. At each intermediate node of the network, use the `ent-crs-vt1:` command to cross-connect the VT1.5 (DS1) channel time slots between Main 1 and Main 2. For example, to cross-connect the channel time slot associated with STS-1 #1 in VT group 2 DS1 port 3, use the `ent-crs-vt1:m-1-2-3,m-1-2-3)` command.

   ⇒ NOTE:
   Only one command is required to establish the pass through cross-connection on **both** rings (Main 1 to Main 2 for Ring 1 and Main 2 to Main 1 for Ring 2). Address 1 and address 2 must be the same.

4. Log in or remote log in to each drop node and enter the "drop" cross-connection. At both drop nodes of the DS1 circuit being established, use the `ent-crs-vt1:` command to cross-connect the VT1.5 (DS1) channel time slot to the proper group, slot and port. For example, `ent-crs-vt1:m-1-2-3,a-2-3`

   ⇒ NOTE:
   Only one command is required to establish the drop cross-connections on **both** rings between Main and Fn-A. At exit nodes, assuming normal operation, the same signal is present on both rings. The 22-type OLIU monitors the input from each ring and selects one to drop to Fn-A.

5. Status and alarm conditions can be present during the provisioning operation, but will clear once the last ring cross-connection for this DS1 service is completed. If they do not, the `rtrv-alm;` and `rtrv-crs-vt1;` commands can be used to isolate the problem. See the TOP section of this manual (Volume II).

6. Log in or remote log in to all the nodes and verify appropriate drop or pass through ring cross-connections.

7. Test both paths around the ring. Since DDM-2000 OC-3 uses non-revertive path switching to minimize the number of hits on services, the initial path selection is arbitrary. Use `rtrv-state-path` and `sw-path-vt1` commands to test both ring paths around the ring network at the drop nodes of the new service. The `sw-path-vt1` command should be limited to the addresses that are being tested. For the example, the commands are `sw-path-vt1:m1-1-2-3` and `sw-path-vt1:m2-1-2-3`.

   The `rtrv-state-path` and `sw-path-vt1` commands use a slightly different VT1.5 ring channel designations from the cross-connect designations because these commands need to identify which of the two paths around the ring is currently active. If the ring path and selected VT1.5 channel are being received on Main 1, the active ring channel designation for the `rtrv-state-path` and `sw-path-vt1` commands will be `m1-1-2-3`, where the `m1` is the path received on Main 1. If the ring path and selected VT1.5 channel are being received on Main 2, the ring channel designation for the `rtrv-state-path` and the `sw-path-vt1` commands will be `m2-1-2-3`, where the `m2` is the path received on Main 2. The DDM-2000 OC-3 allows a per path designation on the `switch-path-vt` command. This assures that only the new DS1 service being provisioned will be subject to protection switch hits. If this is not the first DS1 service being added to the ring, it is strongly recommended that the pulling of circuit packs or fibers to test the protection path not be done since it would subject existing DS1 services to protection switch hits.

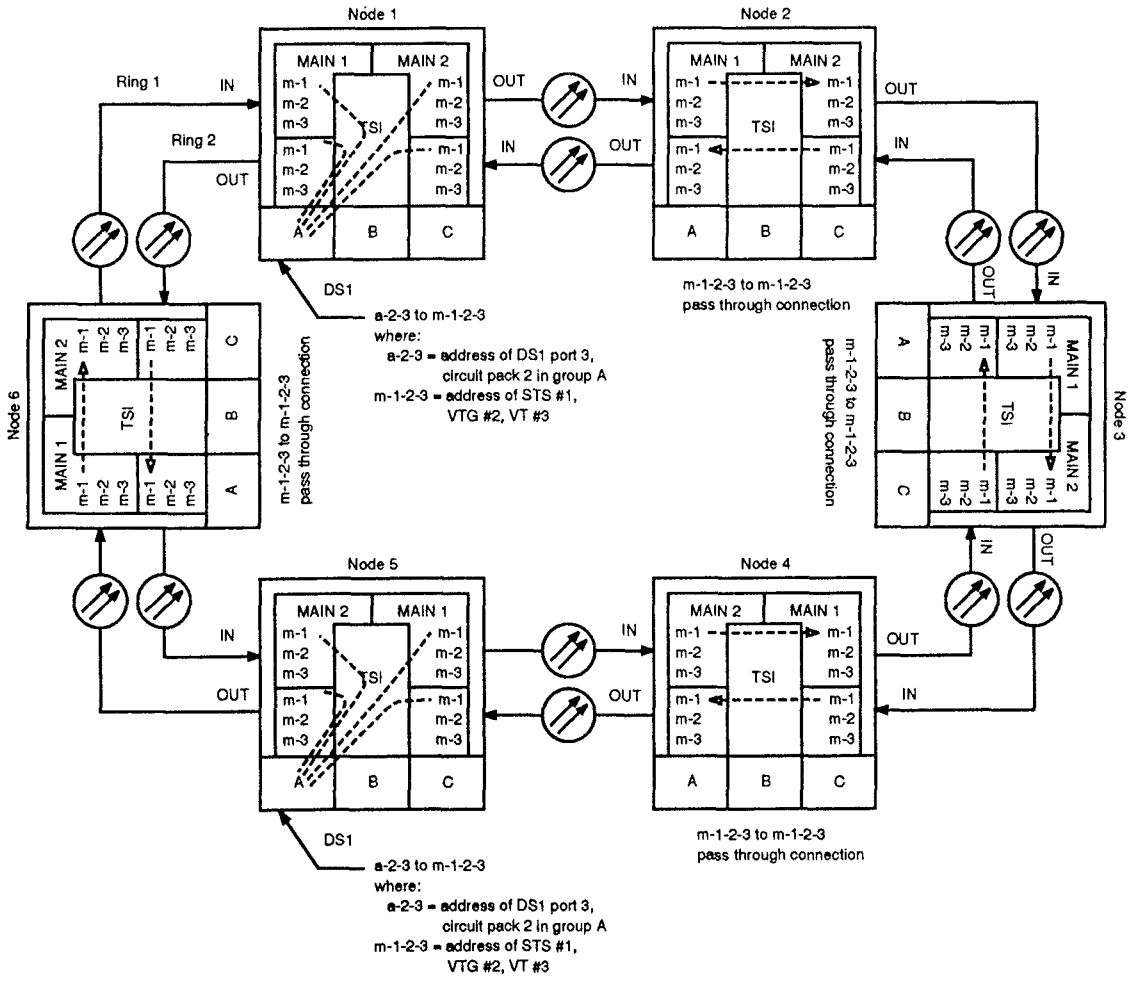


Figure 8-6. Example Ring Configuration Cross-Connections

DS3/EC-1 Ring Network Cross-Connection Example

DS3/EC-1 ring network provisioning follows the same procedure as the DS1 ring provisioning example except that Function Unit B is involved. For example, in Figure 8-6, replacing the MXRVO and DS1 circuit packs at Node 1, Function Unit B, and at Node 6, Function Unit B with DS3 or STS1E circuit packs, converts the figure to a DS3 path protected ring. The following cross-connections would then be made.

Node	Cross-Connection
2, 3, 4, and 5	ent-crs-sts1:m-2,m-2
1	ent-crs-sts1:m-2,b
6	ent-crs-sts1:m-2,b

Ring Drop and Continue Cross-Connection Provisioning

All the information on "Ring Cross-Connection Provisioning" applies to "Ring Drop and Continue Cross-Connection Provisioning". Please review "Ring Cross-Connection Provisioning" as that information is not repeated here. Only the new provisioning information is presented here. This information applies to both STS-1 and VT1.5 traffic. Only the cross-connection addresses are different. A mixed traffic ring of STS-1 and VT1.5 drop and continue services is supported.

Two nodes are defined to be drop and continue nodes in a ring maintenance subnetwork and are the exit points where "two" copies of the same service are available. By making two copies of the same service available at two nodes, the network is protected from failure of a node (for example, a CO) that affects all traffic on the ring. For rings that carry drop and continue services, the drop and continue nodes are neighbors and all "drop and continue" traffic must be continued on the ring connecting the two nodes.

In Figure 8-7 (one half of a drop and continue dual ring interworking application) CO 1 and CO 2 are drop and continue nodes. Traffic continued at CO 1 uses Ring 1 which is the fiber connecting CO 1 to CO 2. Likewise, continued traffic at CO 2 used Ring 2, which is the fiber connecting CO 2 to CO 1.

When a new service is added to the ring, use the normal procedures to add service to all nodes of a ring except to the drop and continue nodes. Before a drop and continue cross-connection can be made to a low-speed Function Unit, the slots must be equipped with STS1E low-speed, or in Release 7.2 and later ring releases, 22-type OLIU circuit packs. These circuit pack types are the interface for drop and continue applications. The cross-connection command for drop and continue at CO 1 (see Figure 8-7) has two new parameters. They are cross-connection type (**cct**) and ring identification (**ring**). The **cct** is **dc** for drop and continue. The parameter **ring** for the **ent-crs-sts1** or **ent-crs-vt1** command defines the direction of the continued signal. The counterclockwise ring is called **m2** because it is always connected to main-2 OLIU. Similarly, the clockwise ring is called **m1** because it is always connected to main-1 OLIU. At CO 1 the parameter for **ring** is **m2**, which means to continue the signal on Ring 2 toward CO 2. For VT1.5 cross-connections, once the first VT drop and continue cross-connection defines the ring direction, all other VT drop and continue cross-connections at that node are forced to use that ring rotation.

Similarly at CO 2, the other drop and continue node, the cross-connection command requires the same two parameters. The **cct** parameter is **dc** and the value for **ring** is **m1**, which means to continue the signal on Ring 1 toward CO 1.

In this drop and continue example, there may be other nodes, with VT drop traffic, located between CO 1 and CO 2. This is permissible as long as you do not provision VT drop and continue cross-connections, for this traffic, at CO 1 and CO 2.

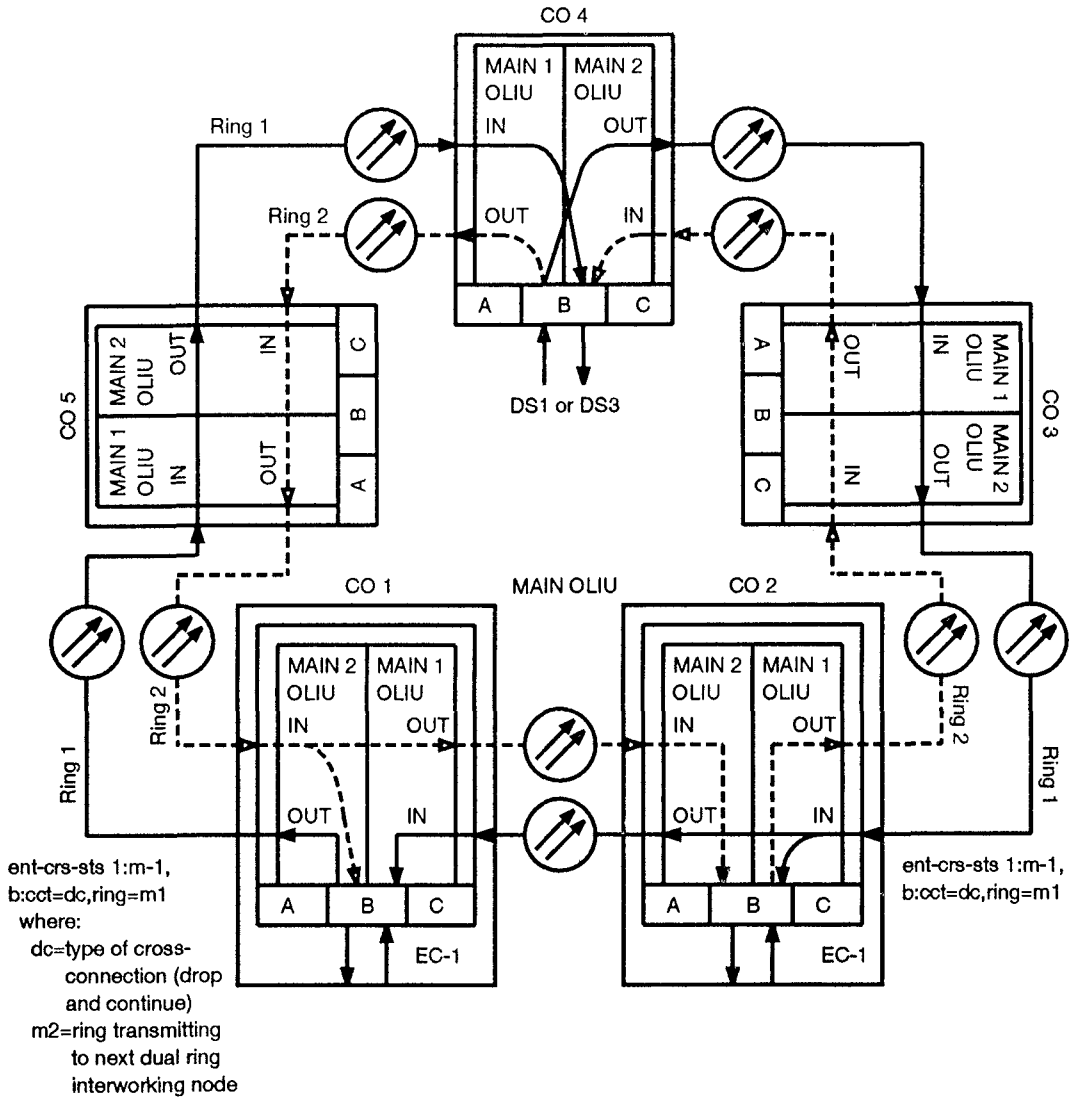


Figure 8-7. Drop and Continue Nodes

Ring Network Drop and Continue Cross-Connection Example

Figure 8-8 shows a dual ring interworking network.

1. The user wants to provision a fully protected service using drop and continue cross-connections in this dual ring topology. The service is a DS3 at RT2 (bottom node in figure) to CO 4 (top node in figure).
2. All nodes in both rings require 22-type OLIUs in the Main slots and all nodes require the same release of drop and continue ring software. The two terminating nodes (CO 4 and RT2) require low-speed DS3 circuit packs in a function unit as defined by the work order.
3. The site CO 1 has two NEs, one is part of the upper ring maintenance subnetwork and the other is a part of the lower maintenance subnetwork. They are connected by EC-1 signals provided by STS1E low-speed circuit packs. The figure shows these connections in Function Unit B of both NEs but any available Function Unit can be used.
4. Note in the figure the identification of Ring 1 (clockwise) and Ring 2 (counterclockwise). This identification is a key to correct provisioning and needs to checked before cross-connections are made.
5. The work order will specify the low-speed channel of the DS3 service, the available high-speed channel on the lower ring and the low-speed channel assigned at the drop and continue nodes. While it is not required by DDM-2000 that the low-speed channel of the drop and continue nodes be the same, it is recommended to simplify record keeping.
6. For this example, the cross-connections are:

   ent-crs-sts1:b,m-1 at RT2 (two-way drop)
   ent-crs-sts1:m-1,m-1 at RT3 and RT1 (pass through)
   ent-crs-sts1:m-1,b:cct=dc,ring=m1 at CO 1 (lower NE)
   ent-crs-sts1:m-1,b:cct=dc,ring=m2 at CO 2 (lower NE)

   The continued signal at CO 1 must be assigned to Ring 1 ("m1") and the continued signal at CO 2 must be assigned to Ring 2 ("m2").
7. In a similar manner the upper ring is provisioned according to the work order. The high-speed and low-speed addresses do not have to be the same as the ones used in the lower ring but they must follow the rules for rings, which is to assign a single high-speed channel to all nodes for this DS3 service.

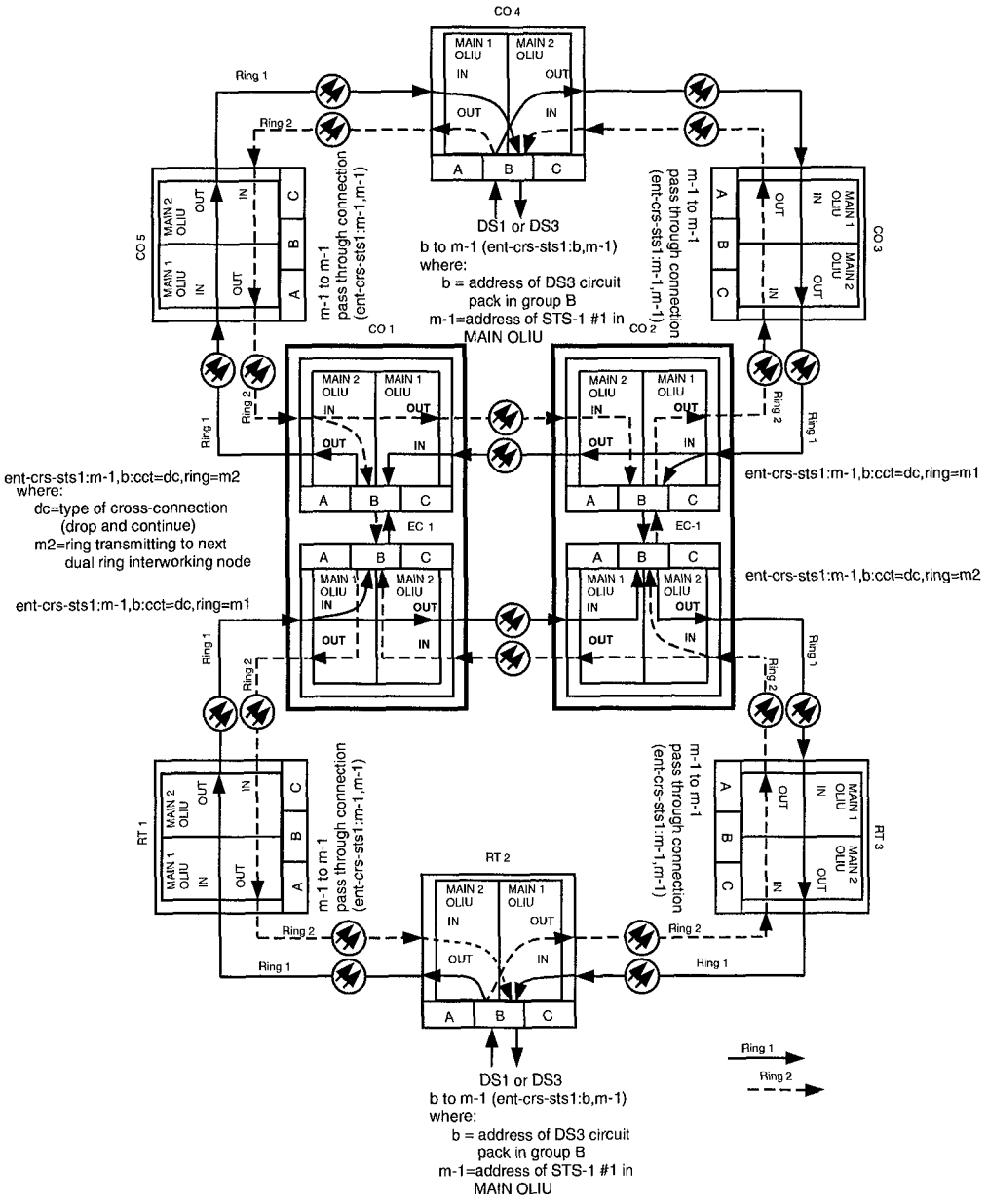


Figure 8-8. Example Dual Ring Configuration Cross-Connections

For this example, the cross-connections are:

ent-crs-sts1:m-1,b:cct=dc,ring=m2 at CO 1 (upper NE)
ent-crs-sts1:m-1,b:cct=dc,ring=m1 at CO 2 (upper NE)
ent-crs-sts1:m-1,m-1 at CO 3 and CO 5 (pass through)
ent-crs-sts1:b,m-1 at CO 4 (two-way drop)

The continued signal at CO 1 must be assigned to Ring 2 ("m2") and the continued signal at CO 2 must be assigned to Ring 1 ("m1").

8. Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 coss-connections. VT1.5 drop and continue services use the same procedure except that the addresses and channels used are VT. The interface between the two rings at the drop and continue nodes is still the STS1E circuit pack, which can support VT1.5 cross-connections as well as STS-1 cross-connections. See the TOP section of this manual (Volume II) for procedures.

OC-12 VT1.5 Path Switched Ring (Dual 0x1)

Figure 8-9 shows an example of an OC-12 VT1.5 path switched ring (dual 0x1) application. The figure is placed after the example explanation and can be removed for reference.

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

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

Some points to note for this application are:

- Dual 0x1 can be thought of as a "ring on ring" with many of the characteristics of a single ring.
- Pass through cross-connections may be required at the VT and STS level.
- The OC-3 ring can be composed of any three STSs in the OC-12.
- An OC-12 STS may be the first STS in one extension, the second STS in another, and the third STS in another.
- Along with the necessary cross-connections, the OC-3 shelf must be provisioned to recognize that the data communications channel (DCC) from the OC-12 shelf are not distinct but identical using the **`set-ne`** command. See "DCC Provisioning" in this section.

Example Cross-Connections

The OC-12 (STS level) cross-connections are:

- At CO: mb-1:a-3

  mb-1 is dropped to the third STS in the OC-3 between CO and CO-1.
- At RT1: mb-1:a-1

  mb-1 is dropped to the first STS in the OC-3 between RT1 and RT1-1.
- At RT2: mb-1:c-2

  mb-1 is dropped to the second STS in the OC-3 between RT2 and RT2-2.
- At RT3: mb-1:b-3

  mb-1 is dropped to the third STS in the OC-3 between RT3 and RT3-3.
- At RT4: mb-1:mb-

  mb-1 is passed through RT4 at the STS level.

These cross-connections can be thought of as establishing one STS of an OC-3 ring embedded in the OC-12 system. This is sometimes referred to as a "ring on ring." In the example, the OC-3 nodes are CO-1, RT1-1, RT2-2, and RT3-3. The STS itself traverses all nine nodes. An "ordinary" STS (for example, one that carries a DS3 from an originating node to a terminating node) can drop at only two locations (terminate in twoway at the source and destination) and pass through cross-connections are needed at the intermediate nodes. There can be multiple drop (ring 0x1) type cross-connections to optical extensions.

The VT cross-connections that follow drop or pass through individual VTs in the STSs. This is like an ordinary OC-3 ring, except that, the same OC-12 STS can be dropped to different STSs in the various OC-3s. In an ordinary ring, the same time slot (for example m-1-1-1) is used all the way around the ring. In a ring-on-ring application, the time slot identification can change in each extension. The same VTG/VT will be used but the STS can change.

The OC-3 (VT level) cross-connections are:

- At CO-1: a-1-4:m-3-2-1

  The first VT in the second VTG is unassigned between CO and CO-1. This slot will be used to transport the DS1 that will terminate on port a-1-4.

- At RT1-1: b-2-1:m-1-2-1

  The above DS1 will leave the system from port b-2-1 at RT1-1. The VTG/VT slot (-2-1) is set by the cross-connection at CO-1. Because OC-12 STS mb-1 is dropped to the first STS in this OC-3 extension (m-1), port b-2-1 is cross-connected to m-1-2-1.

- At RT2-2: m-2-2-1:m-2-2-1

  At RT2-2, time slot mb-1 is dropped to the second STS going to RT2-2 (m-2). The VT/VTG assignment remains -2-1. A VT pass through cross-connection is needed to enable future DS1s to be dropped at RT2-2. If drops will never be needed, pass through cross-connections can be used.

- At RT3-3: m-3-2-1:m-3-2-1

  The VT above must also be passed through RT3-3. As before, the VTG/VT is -2-1. The OC-12 time slot is dropped to the third STS in the OC-3 in this segment.

With these cross-connections, DS1s originating at any of the four OC-3 nodes can be terminated at any one of the others with VT cross-connections at those nodes only. The STS "pipe" is in place with the OC-12 cross-connections. As was the case with the example DS1, two VT drop cross-connections and two pass through cross-connections are needed.

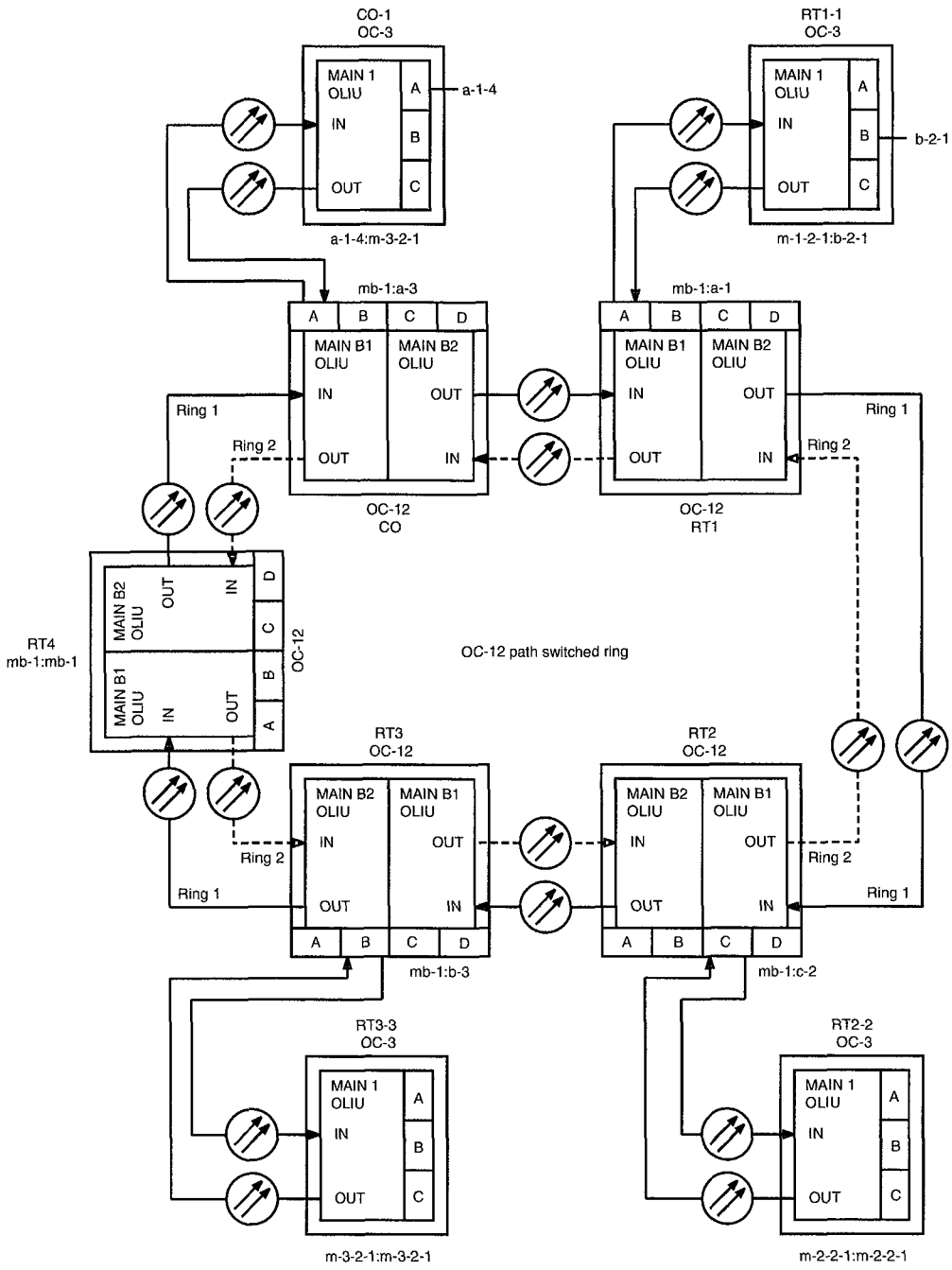


Figure 8-9. Example Dual 0x1 Configuration Cross-Connections

Switch Selectable Parameters

Table 8-13 describes the parameters provisionable via hardware switches. Refer to the command pages in Section 11, "Commands and Reports" for a complete explanation of parameters. Additional information on the site, shelf, and network ID parameters is provided in the "Identifiers" part immediately following Table 8-14.

CIT Selectable Parameters

Table 8-14 describes the parameters provisionable via the CIT. Refer to the command pages in Section 11, "Commands and Reports" for a complete explanation of parameters. Additional information on the target ID parameter is provided in the "Identifiers" part immediately following Table 8-14.

Table 8-13. Parameters Provisionable via Hardware Switches

Parameter	Range	Pack	Command (Note)
Site # (par. telem., 7 seg. LED)	1-8 or 1-32 ¶	SYSCTL	`rtrv-ne`
Shelf # in bay	1-8	SYSCTL	`rtrv-ne`
Network Element #	1-5	OHCTL	`rtrv-ne`
C/R (Command/Response DCC bits) for OSI applications (S2)	user,network	OHCTL	`rtrv-ne`
CO/RT select	RT, CO	SYSCTL	`rtrv-ne`
TBOS display number	1-8	SYSCTL	`rtrv-ne`
TBOS backup function	primary, secondary, normal, no TBOS	SYSCTL	`rtrv-ne`
TBOS termination	last, not last	SYSCTL	
Remote TBOS reporting	enabled, disabled	SYSCTL	`rtrv-ne`
Front CIT data rate	300, 1200, 2400, 4800, 9600, 19200 baud	SYSCTL	`rtrv-ne`
Rear CIT (modem) data rate	300, 1200, 2400, 4800, 9600, 19200 baud	SYSCTL	`rtrv-ne`
Power minor office alarm	minor, major	SYSCTL	`rtrv-ne`
Optical transmitter power	high, low	21G OLIU	`rtrv-oc3`
DS1 reference format§	SF, ESF	TGS	`rtrv-sync`
DS1 reference line coding§	AMI,B8ZS	TGS	`rtrv-sync`
Timing mode	free run, external DS1, loop timed	TGS	`rtrv-sync`
SYNC Output LBO ‡	5 settings (cable dependent)	TGS(BBF2B)	
DS1 Output	MULT/SYNC OUT	TGS(BBF2B)	`rtrv-sync`
DS1 line coding *	AMI, B8ZS	DS1	`rtrv-t1`
DS1 LBO†	5 settings (cable dependent)	DS1	
DS3 LBO†	2 settings (cable dependent)	DS3	
STS1E LBO†	2 settings (cable dependent)	STS1E	
STS1E pack type	high-speed, low-speed	STS1E	`rtrv-eqpt` `rtrv-ec1`

Note: Current switch settings except DS1 LBO, SYNC Output LBO, DS3 LBO, STS1E LBO, and TBOS termination can be reported using CIT.

* CIT can override switch settings. (Factory default is *noOverride*.) Parameter can be set for each port.

† Parameter can be set for each circuit pack.

‡ Operational only when in SYNC OUT mode.

§ For both DS1 in and out.

¶ 1-32 for Release 6.1 and later linear releases and Release 7.0 and later ring releases.

Table 8-14. Parameters Provisionable via the CIT

Parameter	Range	Default (Note 1)	Command (Note 2)
Date	current value	70-01-01	**set-date**
Time	current value	00:00:00	**set-date**
Target ID (system name)	20 characters	Site#NE#*	**set-ne**
GNE (7.1 and earlier)	yes, no	no ¶¶	**set-ne**
DSNE (7.2 and later)	yes, no	no ¶¶	**set-ne**
AGNE (7.2 and later)	yes, no	no	**set-ne**
Alarm group No. (7.2 and later)	1-255	255	**set-ne**
Cross-connect mode	default, manual	default	**set-ne**
DCC mode ¶¶¶	identical, distinct	distinct	**set-ne**
CIT page length	0 (pager off), 3-150 rows	24	**set-link**
PM thresholds	See Table 8-15	-	**set-pmthres**
Alarm holdoff delay	0-30 sec	2	**set-attr-alm**
Alarm clear delay	0-30 sec	15	**set-attr-alm**
OC3 degrade threshold	10^{-5}–10^{-9}	10^{-6}	**set-oc3**
Kbyte Messages (sync messaging)	enabled, disabled	enabled	**set-oc3**
Concatenation mode	enabled, disabled	disabled	**set-oc3**
STS-1 path signal degrade threshold†††	10^{-5}–10^{-9}	0 (disabled)	**set-sts1**
STS-1 channel state***	NMON, AUTO‡	AUTO	**set-state-sts1**
VT1.5 path signal degrade threshold‡‡‡	10^{-5}–10^{-8}	0 (disabled)	**set-vt1**
VT channel state***	NMON, AUTO‡	AUTO	**set-state-vt1**
DS3 VMR mode†	VMR, VM, clear channel	VMR	**set-t3†**
Clear channel DS3 AIS insertion†	yes, no	no	**set-t3†**
DS3 alarm level†	CR, MJ, MN, none	CR	**set-t3†**
DS3 failure threshold†	10^{-3},10^{-6} BER	10^{-3}	**set-t3†**
DS3 port state†	NMON, AUTO‡	AUTO	**set-state-t3†**
DS3 PM mode¶¶¶	off, on	on	**set-t3**
DS3 PM format ¶¶¶	Pbit, Fmbit	Pbit	**set-t3**
DS1 line coding†	AMI,B8ZS,noOverride§	noOverride	**set-t1†**
DS1 alarm level†	MJ, MN, none	none	**set-t1†**
DS1 AIS insertion†	yes, no	yes	**set-t1†**
DS1 failure threshold†	10^{-3},10^{-6} BER	10^{-3}	**set-t1†**
DS1 BPV to LOS†	yes,no	no	**set-t1†**
DS1 port state†	NMON, AUTO‡	AUTO	**set-state-t1†**
DS1 PM Mode†	off, on	off	**set-t1**
DS1 PM Format†	sf, esf, esfn	esf	**set-t1**
Environmental alarm level	CR, MJ, MN, none	MN	**set-attr-env**
Environmental alarm description	26 characters		**set-attr-env**
Control point description	26 characters		**set-attr-cont**
Far end communication **	enabled,disabled	enabled	**set-fecom****

See notes and footnotes at end of table.

Table 8-14. DDM-2000 Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
Set security **	enabled, disabled	disabled	**set-secu****
CIT security **	enabled, disabled	disabled	**set-secu****
CIT timeout (minutes) **	0-120	15	**set-secu****
DCC security **	enabled, disabled	disabled	**set-secu****
DCC timeout (minutes) **	0-120	15	**set-secu****
Sync Timing Source §§ ‡‡	main, fn-c,	main	**set-sync**
Sync Output Mode §§	¶ track, lock1, lock2	track	**set-sync**
Sync Timing Source †† ‡‡	main-1, main-2, fn-c	main-1	**set-sync**
SYNC mode switching	revertive, nonrevertive	revertive	**set-sync**
Auto. sync. reconfig.§§§	enabled, disabled	disabled	**set-sync**
EC-1 alarm level†	CR, MJ, MN, NA	CR	**set-ec1**
EC-1 degrade threshold†	10^{-5} to 10^{-9} BER	10^{-6}	**set-ec1**
EC-1 port state †	NMON, AUTO‡	AUTO	**set-ec1**
Feature Packaging ** VT PM, DS1 PM, or STS3c	enabled, disabled	disabled	**set-feat**
NSAP (Release 6.0 and later)			
OrganizationID (Operator ID)	6 hex digits	000000	**ent-ulsdcc**
Reserved (Reserved)	4 hex digits	0000	**ent-ulsdcc**
Routing Data (Domain/Area)	8 hex digits	00000000	**ent-ulsdcc**
X.25 packet size (7.2 and later)	128, 256	256	**set-x25**

Notes:

1. Default means factory default (the CIT prompts display current provisioned values).
2. To view the current values, precede these commands with **rtrv-** instead of **set-**.

* The # is the value set by the switches on the SYSCTL and OHCTL circuit packs.

† Parameter can be set for each port.

‡ AUTO means the port or channel is ready to be automatically provisioned via signal detection.

§ noOverride means read and use switch settings on circuit pack.

¶ Track means the source for timing will be selected from the active received OC-3 line specified.

** This command is available to privileged users only.

†† Release 5.1 (rings).

‡‡ Setting this parameter also affects DS1 output source and DS1 sync output mode. See **set-sync** command in Section 11, "Commands and Reports".

§§ Release 3.2 and later linear releases.

See additional footnotes on next page.

Table 8-14. DDM-2000 Parameters Provisionable Via the CIT (Contd)

¶¶ One and only one shelf in a subnetwork must be set to "yes" for proper DCC communications.

***
Parameters can be set for each channel. Release 6.2 and later linear releases, Release 7.1 and later ring releases.

†††
Release 7.1 and later ring releases. Requires 22D-U/22G-U/22G2-U OLIUs.

‡‡‡
Release 7.0 and later ring releases. Requires 22D-U/22G-U/22G2-U OLIUs.

§§§
Release 6.1 and later linear releases, Release 7.0 and later ring releases.

¶¶¶
Release 7.1 and later ring releases.

Identifiers

The following identifiers (ID) are used for the shelf, site, network element (NE), network services access point (NSAP) address, gateway network element (GNE), directory services network element (DSNE), and alarm group network element (AGNE).

- **Shelf ID:** The shelf ID is a switch settable parameter with values of from 1 to 8. The shelf ID provides a convenient way to log into a selected shelf in a bay using the CIT. Therefore, each shelf (OC-3 or OC-12) in a bay must be assigned a unique shelf ID. The recommended numbering is to start at the bottom of the bay and assign the bottom shelf with a shelf ID of 1 and work up to the top of the bay.
- **Site ID:** The site ID is a switch settable parameter with values of from 1 to 8 site addresses (1 to 32 for Release 6.1 and later linear releases and 7.0 and later ring releases). The site ID is displayed on the 7-segment display on the SYSCTL circuit pack to indicate to which site the USER panel alarm LEDs apply. For site IDs greater than eight, a dash is displayed on the 7-segment display. Although in later releases, more than 8 NEs are possible, only site addresses 1-8 are supported **prior** to OC-3 Release 6.1 (linear) and OC-3 Release 7.0 (ring). For releases prior to OC-3 Release 6.1 (linear) or Release 7.0 (rings), if more than 8 NEs are needed, you must use unique combinations of the Site and NE (OHCTL) settings to prevent duplicate site/NE settings in the same subnetwork. Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are not used prior to OC-3 Release 6.1 (R7.0) and must be set to the **ON** position.

  For Releases 6.1 and 7.0 only 10 site addresses (for 10 NEs) may be chosen out of the 32 possibilities (for example 1, 10, 20 and 30). For Release 7.1, 16 site addresses may be chosen; for Release 7.2, 24 site addresses may be chosen.

Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are used in conjunction with Switch 2, sections 1, 2, and 3 (**S2-1**, **S2-2**, and **S2-3**) to support the new site addresses. You should use unique combinations of the Site and NE (OHCTL) settings to prevent duplicate site/NE settings in the same subnetwork. The same site ID should be assigned to all shelves in the same bay or cabinet. It is recommended that the site ID be assigned consecutively starting at the central office (CO) site unless parallel telemetry is used. If parallel telemetry is used, the CO site should be assigned as site 7 and the remote sites should be assigned numbers 1 through 6. See the TOP section of Volume II for procedures on setting the Site ID.

- **Network Element ID:** The network element ID is a switch settable parameter with values of from 1 to 5. Network elements (DDM-2000 shelves) at a specific site that belong to the same subnetwork must be assigned a unique network element ID. The network element ID is combined with the site ID to form a default value for the TID. In an OC-3 or OC-12 only network, there will only be one shelf per subnetwork at each site. Therefore, all the shelves in the subnetwork could be assigned a network element ID of 1. In a mixed network, there may be up to five network elements per site that are part of the same subnetwork. In this case, each network element at the same site must be assigned a unique network element ID.

- **TID:** The target identifier (TID) is a 20-character parameter that is set through the CIT using the **`set-ne`** command. The TID is used in the **`rlgn`** command to identify an NE to which a remote login session is being established. The TID is also used by an OS such as Bellcore's Network Monitoring and Analysis (NMA) system to identify NEs using the TL1 message-based communications protocol.

  After the **`init-sys:all`** or **`init-sys:systcl`** command is entered, the system sets the TID to a default value obtained by combining the site ID with the NE ID. The TID must be unique among all NEs. The default TID may be changed using the **`set-ne`** command to a unique user-assigned value recognized by the NMA.

- **NSAP:** The network services access point (NSAP) is a multiple part address that uniquely identifies the NE. The NSAP is used for subnetwork communications using the OSI protocol. The NSAP is set to unique values assigned to control hardware at the factory and does not have to be modified by the user. The user can only modify the values defined by the **`ent-ulsdcc`** command. For Release 7.2, the Routing Domain and Area parameters must not be changed from their default values when interworking with FT-2000 OC-48 Lightwave Systems.

- **GNE:** For Release 7.1 and earlier release, in a subnetwork, one and only one shelf **must** be provisioned as a gateway network element (GNE) by setting its GNE parameter to "yes". The GNE parameter must be set to "yes" to enable the TL1/X.25 interface and provide proper DCC communications. Provisioning the shelf as a GNE also designates the shelf as a directory services network element (DSNE) for the subnetwork.

  The DSNE provides directory service (target identification to network service access point network address translation) for all NEs in a subnetwork.

  For Release 7.2, in a subnetwork (of all DDM-2000 systems), one or more NEs serving as GNEs are allowed. An NE is automatically provisioned as a GNE upon establishing an X.25 link to its X.25 interface. If interworking with FT-2000 OC-48 Lightwave System, one or more GNEs must be on the FT-2000 OC-48 Lightwave System ring since the FT-2000 OC-48 Lightwave System GNEs can handle larger packet sizes. For subnetworks having more than 16 NEs, the AGNE and GNE should be separate NEs.

- **DSNE:** For Release 7.2, in a subnetwork, one and only one shelf **must** be provisioned as a DSNE by setting its DSNE parameter to "yes" using the **`set-ne`** command. The DSNE parameter must be set to "yes" to provide proper DCC communications. The DSNE provides directory service (target identification to network service access point network address translation) for all NEs in a subnetwork.

- **AGNE:** For Release 7.2, in a subnetwork (either all DDM-2000s or mixed with FT-2000 OC-48 Lightwave Systems), a NE must be designated as a AGNE by setting its AGNE parameter to "yes" using the **`set-ne`** command. An AGNE is an NE in an alarm group, through which members of an alarm group exchange alarm and status information. By default all Release 7.2 NEs are in an alarm group. For subnetworks having more than 16 NEs, the AGNE and GNE should be separate NEs. The AGNE is a "collection point" and does not have to be a NE in a CO, for example.

Operations Interworking

Operations interworking provides the capability to access, operate, provision, and administer remote AT&T SONET network elements (NEs) from any location in a SONET subnetwork or from a centralized operations system.

Operations interworking is available among AT&T 2000 Product Family systems connected through the SONET DCC including:

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

The FT-2000 OC-48 Lightwave System equipped with Release 6.0.0 software supports operations interworking applications with DDM-2000 OC-3 Multiplexers.

Messages carried on the SONET section data communications channel (DCC) support the following interworking applications:

- Remote login
- Gateway network element (GNE) operation
- Remote network element status
- Remote software download and copy.

- **Remote login**: A user logged in locally to an FT-2000 OC-48 Lightwave System can remotely log in to a DDM-2000 OC-3 Multiplexer via the OC-3 DCC. However, a user logged in locally to a DDM-2000 OC-3 Multiplexer can not remotely log in to an FT-2000 OC-48 Lightwave System. A user logged in locally to a DDM-2000 OC-3 Multiplexer can remotely log in to another DDM-2000 OC-3 Multiplexer through an FT-2000 OC-48 Lightwave System subnetwork.
- **Gateway network element operation**: One or more FT-2000 OC-48 Lightwave Systems can serve as an interface to the local X.25 message-based operations system for the DDM-2000 OC-3 Multiplexers through the OC-3 DCC. The gateway network element also serves as a single interface for all FT-2000 OC-48 Lightwave Systems in the same ring network and in the same subnetwork. In mixed networks, the GNE(s) must be FT-2000 OC-48 Lightwave System GNE(s). In DDM-2000 only networks, multiple GNEs are supported.
- **Remote network element status**: The FT-2000 OC-48 Lightwave System can receive and transport alarm and status information from other FT-2000 OC-48 Lightwave System nodes and DDM-2000 OC-3 Multiplexers that are in the same subnetwork. Within a subnetwork, network elements in the same alarm group (provisionable) exchange alarm and status information through at least one alarm gateway network element (AGNE). When an AGNE receives alarm and status information, it rebroadcasts the information to all the other network elements in the alarm group. An alarm group supports up to 32 network elements although DDM-2000 only subnetworks are limited to 24 NEs.

  The alarm and status information is reported using remote office alarms, far-end parallel telemetry, a far-end activity LED, and a network alarms report.

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

Alarm Groups

Prior to Release 7.2, when network sizes were smaller, every NE broadcast its network status to all other NEs. This status information included:

- Alarm/status level
- User panel condition
- ACO status
- TBOS status
- Parallel telemetry status
- Miscellaneous discrete information

An alarm group is a set of NEs that share status information between themselves. Alarm groups can be nodes in a ring, nodes of a linear extension, nodes of an OC-12 service, or any other logical grouping such as a maintenance group or geographical group. In DDM-2000 OC-3 Release 7.2, all NEs are defaulted into an alarm group (number 255). Users provision NEs into alarm groups by assigning each member an alarm group number to support operations interworking, large networks, and to avoid sending unnecessary information to every NE. For example, 24 NEs could be provisioned into three alarm groups each with eight NEs that share a community of interest.

All members of the same alarm group share NE status information but do not share information with other alarm groups. See the **`set-ne`** command in Section 11, "Commands and Reports" for information on provisioning alarm groups.

Depending on provisioning, a member of an alarm group can:

- Know the alarm/status of all members of the same alarm group and, if the NE is at the CO, activate audible office alarms for the alarm group.
- List a report of the alarm or status condition of other NEs in the group.

- Display composites of other member's user panel information. If the site identification of a remote NE is from 1 to 8, display the user panel status at the site instead of a composite display. As a feature, the same site/NE identification can appear more than once in a subnetwork, as long as, it is in different alarm groups. This supports creating large networks by interconnecting several small subnetworks without having to change the site/NE identification.
- Relay other members' parallel telemetry alarm/status closure states to the OS.
- Send and receive miscellaneous discrete alarm/status closure states to and from alarm group members at a CO.
- Send and receive ACO requests to and from members of the same alarm group with the same site number. This supports the ability for a user to activate ACO for a group of NEs having the same site number and subnetwork connectivity to another member NE in the group.

By default, all NEs belong to alarm group number "255" and, if not changed, NE status is sent to all NEs in the network. Those NEs provisioned to be at the CO can perform alarm activation functions.

Alarm Gateway Network Element

One NE in an alarm group must be provisioned as an alarm gateway network element (AGNE). The AGNE broadcasts NE status information to members of its alarm group. Considerations for choosing a NE as an AGNE include being central to the group to minimize communications links and being easily accessible for maintenance purposes. A backup AGNE can be provisioned and "shadow" the primary AGNE by sending duplicate status reports to members of the group. The disadvantage of a backup AGNE is in the costs associated with increased message traffic within the alarm group.

For subnetworks having more than 16 NEs, the AGNE and GNE should be separate NEs. The AGNE is a "collection point" and does not have to be a NE in a CO, for example.

Performance Monitoring Parameters

Table 8-15 describes the performance-monitoring parameters provisionable via the CIT.

Table 8-15. Performance Monitoring Parameters Provisionable via the CIT

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres-
OC-3 Optics	Optical Transmit Power* (21G/21G-U only)	-1 dB, -2 dB	-1 dB, -2 dB	sect
	Laser Bias Current* (21G/21G-U only)	enable/disable	enable/disable	sect
OC-3 Section	SE Frame Seconds (SEFS)	1-63[10]	1-4095[30]	sect
OC-3 Line	B2 Coding Violations (CV)	1-13841[1384]	1-1328736[132874]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	(1-255)[4]	line
EC-1 Line §	B2 Coding Violations (CV) EC-1	1-4613[461]	1-442848 [44285]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line
DS3 Path ¶	P-Bit Error Counts	1-4026[403]	1-386500[38650]	t3
	SE Frame Seconds (SEFS)	1-63[10]	1-4095[30]	t3
Enhanced DS3 Path for P-Bits and F&M-Bits from Fiber and DSX **	CV-P Coding Violations	1-16383[40]	1-1048575[3820]	t3
	ES-P Errored Seconds	1-900[25]	1-65535[250]	t3
	SES-P Severely Errored Seconds	1-63[4]	1-4095[40]	t3
	UAS-P Unavailable Seconds	1-63[10]	1-4095[10]	t3
	SEFS	1-63[2]	1-4095[8]	t3
DS3 Line ††	CV-L Coding Violations	1-16383[40]	1-1048575[3865]	t3
	Errored Seconds, Line (ES-L)	1-900[25]	1-65535[250]	t3
	Severely Errored Seconds, Line (SES-L)	1-63[4]	1-4095[40]	t3
STS-1 Path	B3 Coding Violations (CV)	1-4510[451]	1-432960 [43296]	sts1
	B3 Errored Seconds (ES)	1-900[40]	1-65535[900]	sts1
	B3 Errored SecondsType A (ESA)	1-900[30]	1-65535[90]	sts1
	B3 Errored SecondsType B (ESB)	1-900[30]	1-65535[90]	sts1
	B3 Severely Errored Seconds (SES)	1-63[20]	1-4095[60]	sts1
	B3 Unavailable Seconds (UAS)	1-63[30]	1-4095[90]	sts1

See footnotes at end of table.

Table 8-15. Performance Monitoring Parameters Provisionable Via the CIT (Contd)

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres
VT1.5 Path †	V5 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	vt1
	V5 Severely Errored Seconds (SES)	1-63[20]	1-4095 [60]	vt1
	V5 Unavailable Seconds (UAS)	1-63[30]	1-4095 [90]	vt1
DS-1 Path ‡	ES-P Errored Seconds	-	1-65535 [648]	t1
	SES-P Severely Errored Seconds	-	1-4095 [100]	t1
	UAS-P Unavailable Seconds	-	1-4095 [10]	t1
	ES-PFE Errored Seconds	-	1-65535 [648]	t1
	SES-PFE Severely Errored Seconds	-	1-4095 [100]	t1
	UAS-PFE Unavailable Seconds	-	1-4095 [10]	t1
	CV-P (SF) Coding Violations ††	-	1-1048575 [691]	t1
	CV-P (ESF) Coding Violations ††	-	1-1048575 [132960]	t1
	CV-PFE Coding Violations ††	-	1-1048575 [132960]	t1
DS-1 Line ††	ES-L Line Errored Seconds	-	1-65535 [648]	t1

* Threshold is set once for both current quarter hour and current day.

† Release 6.0 and later linear releases, Release 7.0 and later ring releases (feature package option).

‡ Release 5.1 and later ring releases and Release 6.0 and later linear releases (feature package option).

§ Release 5.1 and later ring releases and Release 6.0 and later linear releases.

¶ Prior to Release 7.1.

**
From the fiber Release 7.1 and later releases; from the fiber and DSX Release 7.2 and later releases.

††
Release 7.2 and later releases.

Maintenance Description

9

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Maintenance Description

9

Overview

This section defines the "maintenance philosophy" outlining the various features available to monitor and maintain the DDM-2000 OC-3 Multiplexer. Specific trouble clearing and maintenance procedures are provided in the operation and maintenance (TOP) section of this manual (Volume II).

Three-Tiered Operations

Figure 9-1 shows the three-tiered operations procedures for the DDM-2000 OC-3 Multiplexer. The DDM-2000 OC-3 Multiplexer operations procedures are built on three levels of system information and control, spanning operations needs from summary-level status to detailed reporting.

The first operations tier consists of light-emitting diodes (LEDs) and pushbuttons on the user panel and circuit pack faceplates. These allow routine tasks to be performed without a craft interface terminal (CIT) or any test equipment. The user panel provides system-level alarm and status information for both the local and remote terminals. The circuit pack faceplate FAULT LEDs allow fast and easy fault isolation to a particular circuit pack.

The second operations tier provides access to DDM-2000 OC-3 Multiplexer operations from a CIT over an EIA-232-D interface. System details that can not be obtained from the first operations tier alone can be obtained over the CIT interface. A VT-100 compatible terminal or terminal emulator software running on a personal computer (PC) can be used as a CIT. Command and prompt modes are available with extensive on-line help features. The CIT interface supports operations, administration, provisioning, and maintenance activities such as performance monitoring, on any and all network elements in the SONET

subnetwork from a single DDM-2000. An optional graphical user interface (SNC-2000 CPro) tool is also available.

Using the graphical user interface tool, which runs on an *MS-DOS** PC, a user can take advantage of the graphics to do many provisioning related activities.

The third operations tier consists of the remote OS interfaces. These OS interfaces include parallel telemetry, telemetry byte-oriented serial (TBOS), and TL1/X.25 interfaces.

Parallel telemetry consists of individual closures that can be remoted to an operations center. These closures provide information on alarm status, fault location, transmission signal failure indications, and user definable miscellaneous discretes. These are not "dry" contact closures. They can handle only a limited amount of current and are polarized to operate with the proper voltage polarity. TBOS offers more information over its 2400 b/s RS-422 interface. The TBOS interface offers eight displays with one display dedicated to each shelf in a DDM-2000 subnetwork. Each display provides 63 information points (DDM-2000 OC-3 and OC-12 to OS) and 64 control points (OS to DDM-2000 OC-3 and OC-12).

The DDM-2000 OC-3 and OC-12 Multiplexers support a full-featured TL1/X.25 interface to multiple OSs. The DDM-2000 OC-3 and OC-12 Multiplexers support alarm surveillance and performance monitoring with OSs such as AT&T's TRANSVU II or Bellcore's Network Monitoring and Analysis (NMA) OS.

The DDM-2000 OC-3 Multiplexers support automated service provisioning with memory administration such as Bellcore's Operations System Intelligent Network Element (OPS/INE) or Raynet's RIDES OS. The DDM-2000 OC-3 Multiplexers also support remote recovery and control functions, installation provisioning, and security over the TL1/X.25 link. The TL1/X.25 interface provides significantly more detailed information, such as identifying specific circuit packs and facilities, and control capabilities than the parallel telemetry or TBOS interfaces.

The *SLC*®-2000 Access System supports the same X.25 interface and TL1 message set as the DDM-2000 OC-3 Multiplexer. Newer releases of the *SLC*-2000 Access System add digital loop carrier (DLC) specific functionality in the existing messages (for example, for DLC related alarms) and in addition support DLC specific commands (for example, DS0 level provisioning). See AT&T 363-208-000, *SLC-2000 Access System, Applications, Planning, and Ordering Guide*, for more information.

* Registered trademark of Microsoft Corporation.

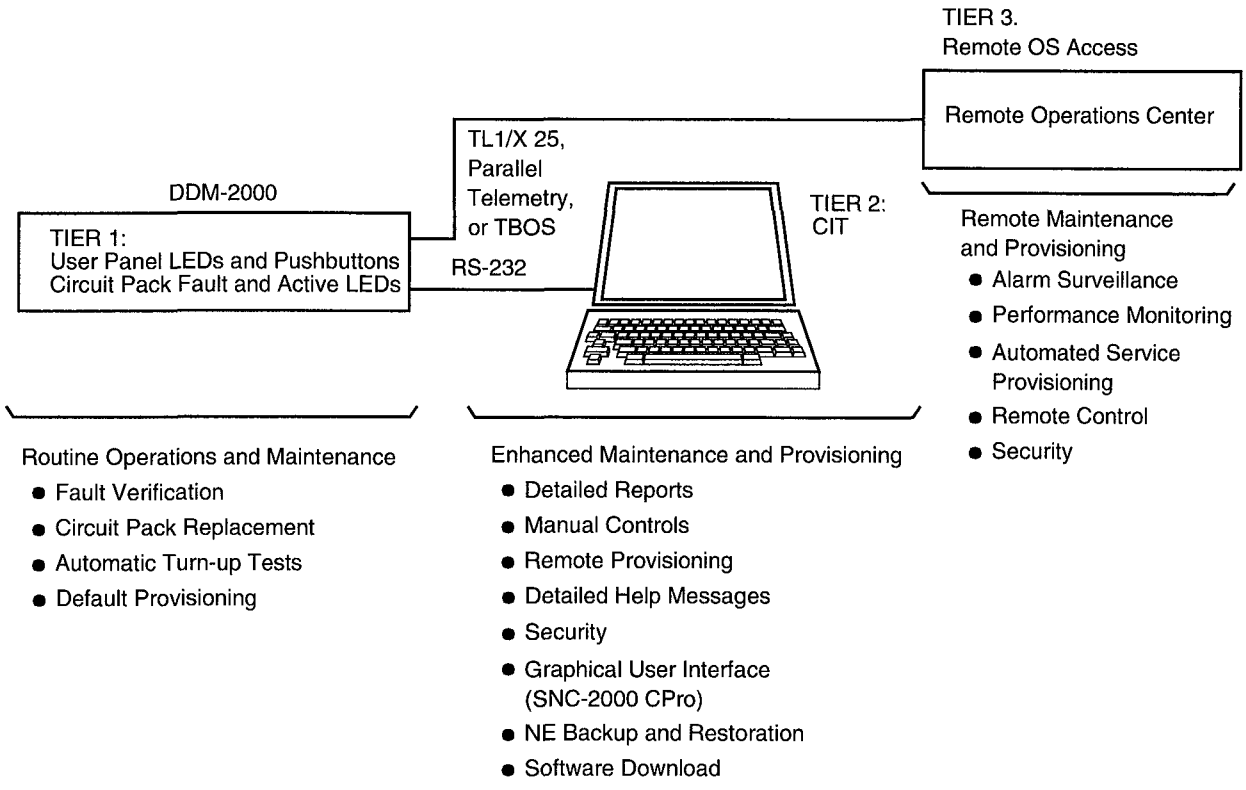


Figure 9-1. Three-Tiered Operations

Single-Ended Maintenance Philosophy

As a loop-optimized product, the DDM-2000 OC-3 Multiplexer allows operation and maintenance of all remote systems in an OC-3 or OC-3/OC-12 Multiplexer subnetwork from the central office shelf. A subnetwork consists of DDM-2000 systems interconnected by optical lines with the synchronous optical network (SONET) data communications channel (DCC) enabled. Similarly, a technician working at a remote site can gain access to the central office shelf associated with that DDM-2000 OC-3 Multiplexer, as well as with other remote sites in the same subnetwork. The DDM-2000 OC-3 Multiplexer uses the SONET DCC to provide craft interface terminal remote access, user panel remote access, and operations system remote access. Release 6.0 of the DDM-2000 OC-3 Multiplexer introduces the international standards organization (ISO) compliant open systems interconnection (OSI) protocol for communicating between DDM-2000 shelves over the DCC.

Single-Ended Operations

Figure 9-2 shows the single-ended operations (SEO) capability that provides remote access to all DDM-2000 systems in a network from a single location. This minimizes technician travel because most maintenance, provisioning, and administration can be performed on the entire subnetwork by accessing any DDM-2000 Multiplexer in the subnetwork. The SEO capability is provided by the DDM-2000 Multiplexers regardless of the subnetwork topology. The SEO capability is supported for point-to-point, hubbing, rings, and rings with optical extensions topologies. The SEO capability can be disabled between DDM-2000 shelves to create network maintenance boundaries (for example, interoffice applications) or for security reasons.

The single-ended maintenance philosophy is supported in subnetworks with mixed AT&T 2000 Product Family systems. Single-ended operations are supported between DDM-2000 and *SLC*-2000 systems. Single-ended operations between DDM-2000 and FT-2000 or DACS IV-2000 systems requires DCC connectivity. See Section 3, "Applications" and Section 8, "Administration and Provisioning" for more information on operations interworking applications.

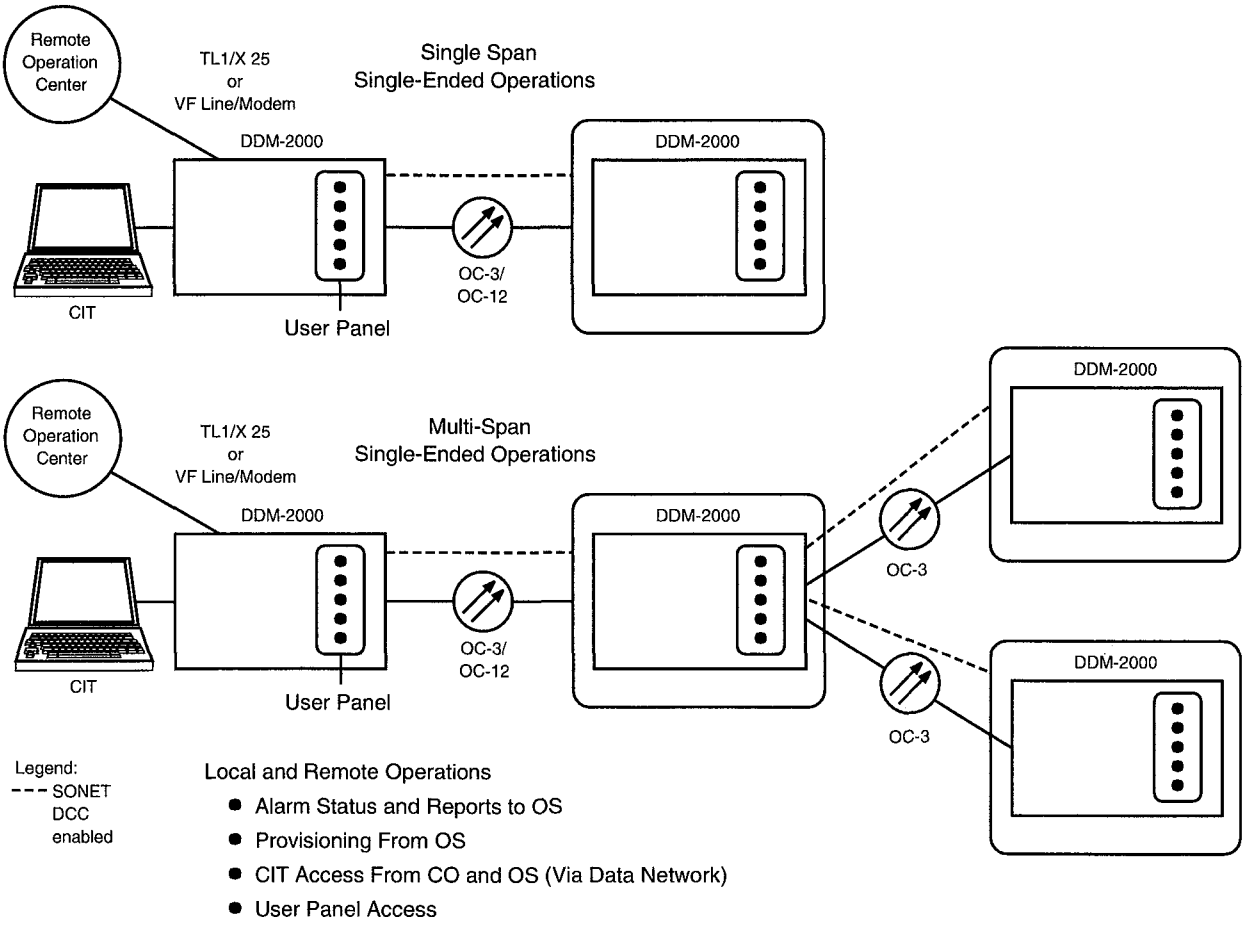


Figure 9-2. Single-Ended Operations

Tables 9-1 and 9-2 list the maximum number of DDM-2000 OC-3/OC-12 network elements (NEs) that each software release can support in a single subnetwork. In a mixed OC-3/OC-12 network, each NE counts as one. Larger networks may be supported for particular applications or with new software releases should subnetwork growth be a concern. Also, there is no limitation on the size of the networks formed by partioning a large network into a number of smaller maintenance subnetworks by disabling the DCC on the appropriate OC-N interfaces. Software upgrades and DCC partioning can be done inservice without affecting traffic. If larger maintenance subnetworks are needed, contact your AT&T account manager.

In OC-3 Release 6.0 (linear) and Release 7.0 (ring) and OC-12 Release 2.1 (linear) and 3.0 (ring) and earlier releases, the Site ID range is from 1 to 8. If the subnetwork has more than 8 NEs, See Section 8, "Administration and Provisioning," for information on assigning Site IDs and NE IDs. Note that the DDM-2000 OC-3/OC-12 user panel Far-End alarm display feature combines the alarms of all NEs that have a Site ID number greater than 8 into a single alarm summary.

Table 9-1. OC-3 Multiplexer — Maximum Number of NEs in a Maintenance Subnetwork

Releases	Linear					Ring			
	R2.1.n	R3.x.n	R6.0.n	R6.1.n	R6.2.n	R5.1.n	R7.0.n	7.1.n	7.2.n
Number of NEs	5	8	10	10	10	12	10	16	24

Table 9-2. OC-12 Multiplexer — Maximum Number of NEs in a Maintenance Subnetwork

Releases	Linear					Ring	
	R1.1.n	R1.2.n	R2.0.n	R2.1.n	R2.2.n	R3.0.n	R3.1.n
Number of NEs	10	10	10	10	10	10	16

Inservice Upgrades

Software Upgrades

Table 9-3 lists the current software releases of the DDM-2000 OC-3 Multiplexer that can be directly upgraded inservice. Specific procedures for upgrades including upgrades to Release 5.1 and 6.0 are provided in the TOP section of this manual (Volume II).

Table 9-3. DDM-2000 OC-3 Inservice Upgrade Compatibility (Note)

	Upgrade to*										
Current Release	2.1.n	3.0.n	3.1.n	3.2.n	5.1.n	6.0.n	6.1.n	6.2.n	7.0.n	7.1.n	7.2.n
2.1.n (Linear)	X	NA	U	U	I	S	S	S	I	I	I
3.0.n (Linear)	NA	X	X	U	I	S	S	S	I	I	I
3.1.n (Linear)	NA	NA	X	X	C	S	S	S	C,S	C,S	C,S
3.2.n (Linear)	NA	NA	NA	X	C	S	S	S	C,S	C,S	C,S
5.1.n (Ring)	NA	NA	NA	NA	X	NA	NA	NA	S	S	S
6.0.n (Linear)	NA	NA	NA	NA	NA	X	U	U	C	C	C
6.1.n (Linear)	NA	NA	NA	NA	C	NA	X	X	C	C	C
6.2.n (Linear)	NA	NA	NA	NA	C	NA	NA	X	C	C	C
7.0.n (Ring)	NA	NA	NA	NA	NA	NA	NA	NA	X	X	U
7.1.n (Ring)	NA	NA	NA	NA	NA	NA	NA	NA	NA	X	U
7.2.n (Ring)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	X

Note

All DDM-2000 OC-3 shelves in a subnetwork should be using the same version of software. "n" is the latest point release available.

X Requires local or remote software download only to upgrade the system.

U Requires an upgrade procedure with software download to upgrade the system. Additional changes to software and equipment provisioning may be needed to use features of the new release. See TOP section of this manual (Volume II) for upgrade procedures.

C Requires an upgrade procedure with on-site equipment/fiber changes as well as software download to upgrade the system. Additional changes to software and equipment provisioning may be needed to use features of the new release. See TOP section of this manual (Volume II) for upgrade procedures.

I Upgrade to 3.1 or 3.2 required first before upgrading to desired release.

NA Not Applicable. If an NA conversion is required, contact your local technical support organization.

S Remote upgrades from pre-OSI releases to OSI releases, are not allowed. OSI upgrades require setting of NSAP address via hardware switches on OHCTL. See TOP section of this manual (Volume II) for upgrade procedures.

* When doing an upgrade, it is recommended that the latest point release of software be used, if possible.

Application Upgrades

Table 9-4 lists the applications that can be upgraded inservice and the required software releases. See Table 9-3 for more information and the TOP section of this manual (Volume II) for upgrade procedures.

Table 9-4. DDM-2000 OC-3 Inservice Upgrades

Application	Linear				Ring			
	R2.1	R3.1	R3.2	R6.x	R5.1	7.0	7.1	7.2
Point-to-Point to Hub	Yes	Yes	Yes	Yes	-	-	-	-
Point-to-Point to A/D	-	Yes	Yes	Yes	-	-	-	-
Hub to A/D	-	Yes	Yes	Yes	-	-	-	-
Point-to-Point to Ring	-	-	-	-	Yes	Yes	Yes	Yes
OC-3 P-P to OC-12 P-P	-	Yes	Yes	Yes	-	-	-	-
OC-3 Hub to OC-12 Hub	-	Yes	Yes	Yes	-	-	-	-
OC-3 Ring to OC-12 Ring	-	-	-	-	-	-	Yes*	Yes†

* Requires OC-12 Release 3.1 software.

† Requires OC-12 Release 5.0 software.

For Releases 5.1 and 7.x ring releases, the BBG7 overhead controller (OHCTL) circuit pack must be Series 2:4A or later.

If you have BBG7 OHCTL circuit packs with earlier vintages than series S2:4A and you plan to upgrade to ring releases, you should upgrade the BBG7 OHCTL circuit packs by sending the circuit packs to:

AT&T Network Systems
Merrimack Valley Works
1600 Osgood Street
North Andover, Massachusetts 01845

With a repair order that states:

"Modification per CCN31066-MV"

OSI Upgrades

For Release 6.0 and later OSI linear releases, the electrically erasable programmable read-only memory (EEPROM) on the BBG7 OHCTL circuit pack must contain a factory-programmed unique sequence number which is used as

part of the network services access point (NSAP) address for the shelf. BBG7 OHCTL circuit packs with series number S2:3 and higher have the EEPROM properly programmed. A part of the NSAP address can be provisioned with the **ent-ulsdcc** and **rtrv-ulsdcc** commands; however, user provisioning of the NSAP is not required since the factory provides a unique NSAP address for each OHCTL.

NOTE:
For remote upgrades from Release 6.0 to other linear OSI releases, a special procedure is required. See the TOP section of this manual (Volume II).

NOTE:
If you download Release 6.0 and later releases to a system that has an OHCTL circuit pack with an earlier series number than S2:3, at the completion of the download, the 7-segment LED on the system controller (SYSCTL) circuit pack will display an "E". If this happens, the system software is completely inoperable. That is, there will be no alarm reporting, no protection switching, and no CIT communications.

If this occurs, there are two things that can be done to make the system operational:

1. Replace the OHCTL circuit pack with one of the proper series and repeat the download. This may have to be done with a forced download through the front CIT interface. See the TOP section of this manual (Volume II) for information and procedure for doing a forced download.
2. If an OHCTL circuit pack of the proper series is not available, a forced download with the pre-OSI software must be done. Note, however, that pre-OSI and OSI software releases are not compatible. That is, in order for the system to work properly, all shelves in the subnetwork must be running either pre-OSI or OSI software. If pre-OSI and OSI software are mixed in the same subnetwork, there will be no alarm reporting, no protection switching, and no CIT communications.

For Releases prior to 7.2, if the shelves are using OSI software, one shelf and only one shelf in the subnetwork must be provisioned as a gateway network element (GNE) directory services network element (DSNE) using the **set-ne** command. See Section 7, "Circuit Pack Descriptions", for S2 settings and the TOP section of this manual (Volume II) for provisioning procedures.

DDM-2000 OC-3 and OC-12 Software Compatibility

Table 9-5 lists the software compatibility within a subnetwork for the DDM-2000 OC-3 and OC-12 Multiplexers. All configurations listed support SEO. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-5. DDM-2000 OC-3 and OC-12 Software Compatibility (Note)

OC-3 Release	OC-12 Release	Interconnection Method	Notes
3.1.n	1.1.n	22-type† or 21G/21G-U OLIU	Supports OC-3/OC-12 interworking
3.2.n	1.2.n	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	21D/21D-U OLIU may be used for short reach interconnections.
6.0.n	2.0.n	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	Supports OSI interworking.
6.x.n§	2.x.n§	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	Supports OSI interworking.
7.x.n *	2.1.n, 2.2.n	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	Supports OC-3/IS-3 optical extensions from OC-3 rings.
7.1 *	3.1.	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	Supports OC-12 VT1.5 path switched ring (dual 0x1).
7.2 *	5.0.	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	Supports DCC connectivity

Note: All NEs in a ring network, which may be part of a larger network, must be running the same software. Similarly, all NEs in a linear network, which may be part of a larger network, must be running the same software. For example, in a Release 7 OC-3 ring, you can't have some nodes running 7.0.n while others are running 7.1.n. In a subnetwork, which may consist of a mixture of ring and linear networks, all NEs must be running compatible software according to the table. "x" is any point release and "n" is the latest maintenance release available.

* 22-type OLIUs must be used in DDM-2000 OC-3 ring shelves in Main and Function Unit slots for optical extensions. 21-type OLIUs used in OC-12.

† The 22-type OLIUs can only be used in the DDM-2000 OC-3 shelf in place of the 21G/21G-U OLIU in Release 3.1 and later. The 22-type OLIUs cannot be used in the DDM-2000 OC-12 shelf.

‡ The 21D/21D-U OLIU can be used in the DDM-2000 OC-3 shelf in place of the 21G/21G-U OLIU for short reach applications in Release 3.2 and later. The 21D/21D-U OLIU can be used in the DDM-2000 OC-12 shelf in place of the 21G/21G-U OLIU for short reach applications in Release 1.2 and later.

§ "x" can be either 1 or 2.

Table 9-6 lists the ring and linear software compatibility for the DDM-2000 OC-3 Multiplexers. All configurations listed support SEO. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-6. DDM-2000 OC-3 Ring and Linear Software Compatibility

OC-3 Ring Release	OC-3 Linear Release	Interconnection Method	Notes
7.0.n* and 7.1.n*	6.1.n and 6.2.n	22-type OLIU	Supports OC-3/IS-3 interworking between OC-3 ring and linear networks.
7.2.n *	8.0.n	22-type OLIU	Supports DCC connectivity

* Requires 22-type OLIUs in Main and Function Unit slots for DDM-2000 OC-3 ring shelves.

Table 9-7 lists the dual ring interworking (DRI) software compatibility for the DDM-2000 OC-3 Multiplexer for both EC-1 and OC-3 interfaces. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-7. DDM-2000 OC-3 Multiplexer DRI Software Compatibility

OC-3	OC-12 and FT-2000	Notes
Release 7.x	OC-12 Release 3.x and 5.0 FT-2000 Releases 4.1, 5.0, and 6.0	EC-1 interfaces. No DCC connectivity.
Release 7.2	OC-12 Release 5.0	OC-3 interfaces. DCC connectivity.
Release 7.2	FT-2000 Release 5.0	OC-3 interfaces. No DCC connectivity.
Release 7.2 *	FT-2000 Release 6.0 *	OC-3 interfaces. DCC connectivity.

* These software releases are also compatible when connected together using OC-3 ring (0X1) interfaces as shown in Figure 2-32.

Maintenance Signaling

The DDM-2000 OC-3 Multiplexer provides maintenance signaling compliant with the SONET standard (ANSI* T1.105). The DDM-2000 OC-3 Multiplexer generates and detects the following alarm indication signals (AISs), which notify downstream equipment that a failure has been detected and alarmed by some upstream equipment:

- SONET line AIS
- STS-1 path AIS
- Virtual tributary (VT) path AIS
- DS3 AIS
- DS1 AIS (generated, not reported).

The DDM-2000 OC-3 Multiplexer also generates and detects the following signals, which notify upstream equipment of a failure detected downstream:

- Line far-end-receive failure (FERF)
- STS-1 path yellow and VT path yellow.
- An STS-1/VT AIS signal is inserted on paths that are not cross-connected.

Figure 9-3 is an example of the AIS, yellow, and FERF signals generated in response to an unprotected incoming OC-3 line failure.

Non-Ring Applications

Figures 9-4 through 9-7 illustrate the maintenance signals used by the DDM-2000 OC-3 Multiplexer. In these figures, the labels on the arrows pointing into the DDM-2000 OC-3 Multiplexer indicate the maintenance signals and failure conditions recognized by the DDM-2000 OC-3 Multiplexer. The labels on the arrows pointing out of the DDM-2000 OC-3 Multiplexer indicate the signals generated by the DDM-2000 OC-3 Multiplexer in response to the indicated incoming signals or failure conditions. The Xs indicate points of failure, either within the DDM-2000 OC-3 Multiplexer or in upstream equipment. Unlabeled arrows indicate normal transmission except for OC-3 line AIS, maintenance signaling is in response to unprotected failures.

The DS1, DS3, EC-1, STS, and VT interfaces in Figures 9-4 though 9-6 are cross-connected to Function Unit slots. The DS1, DS3, EC-1, STS, and VT interfaces in Figures 9-7 though 9-9 are cross-connected to Main OLIUs.

* Registered trademark of American National Standards Institute.

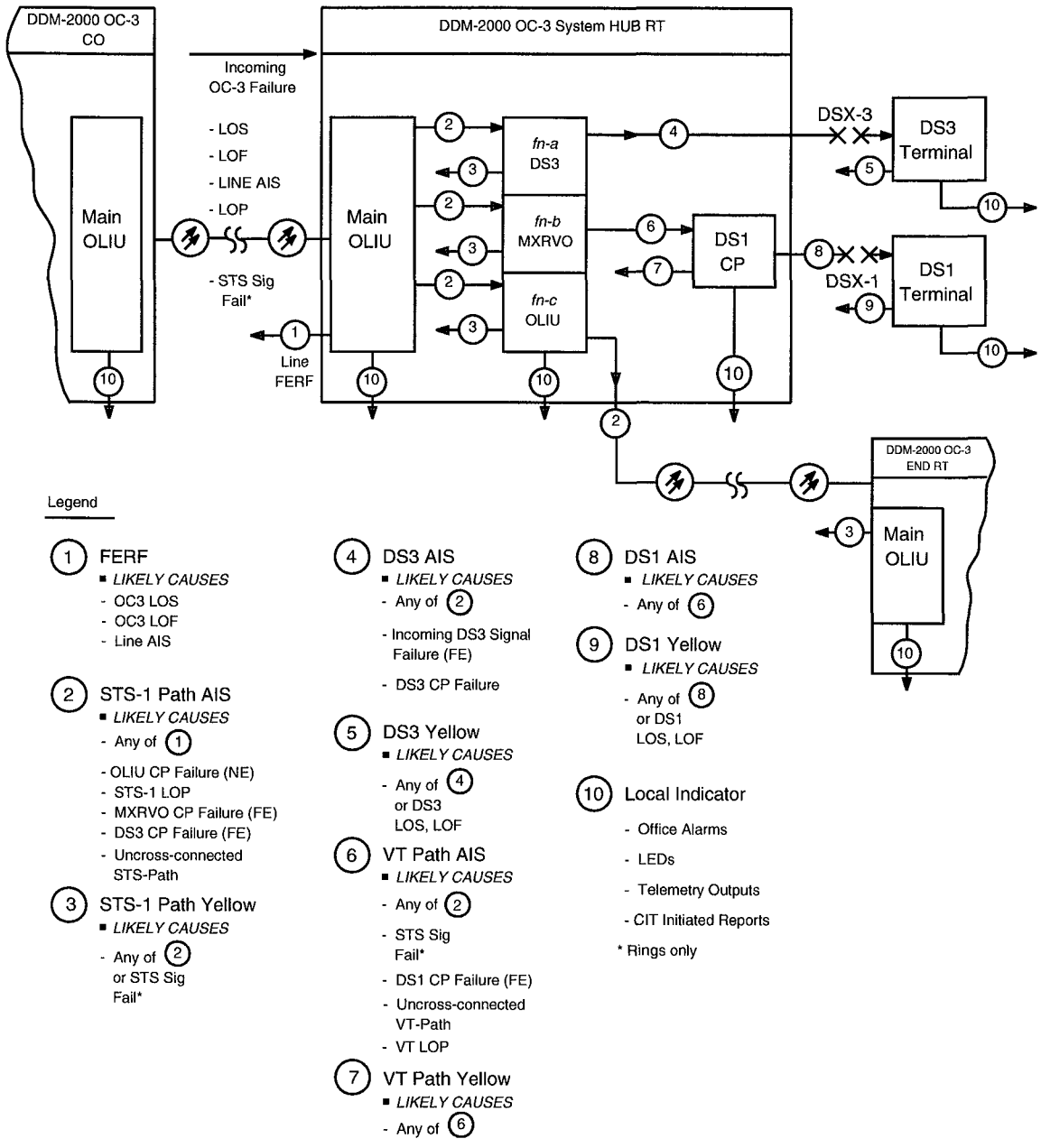


Figure 9-3. Example of Maintenance Signals as a Result of Unprotected Incoming OC-3 Failure

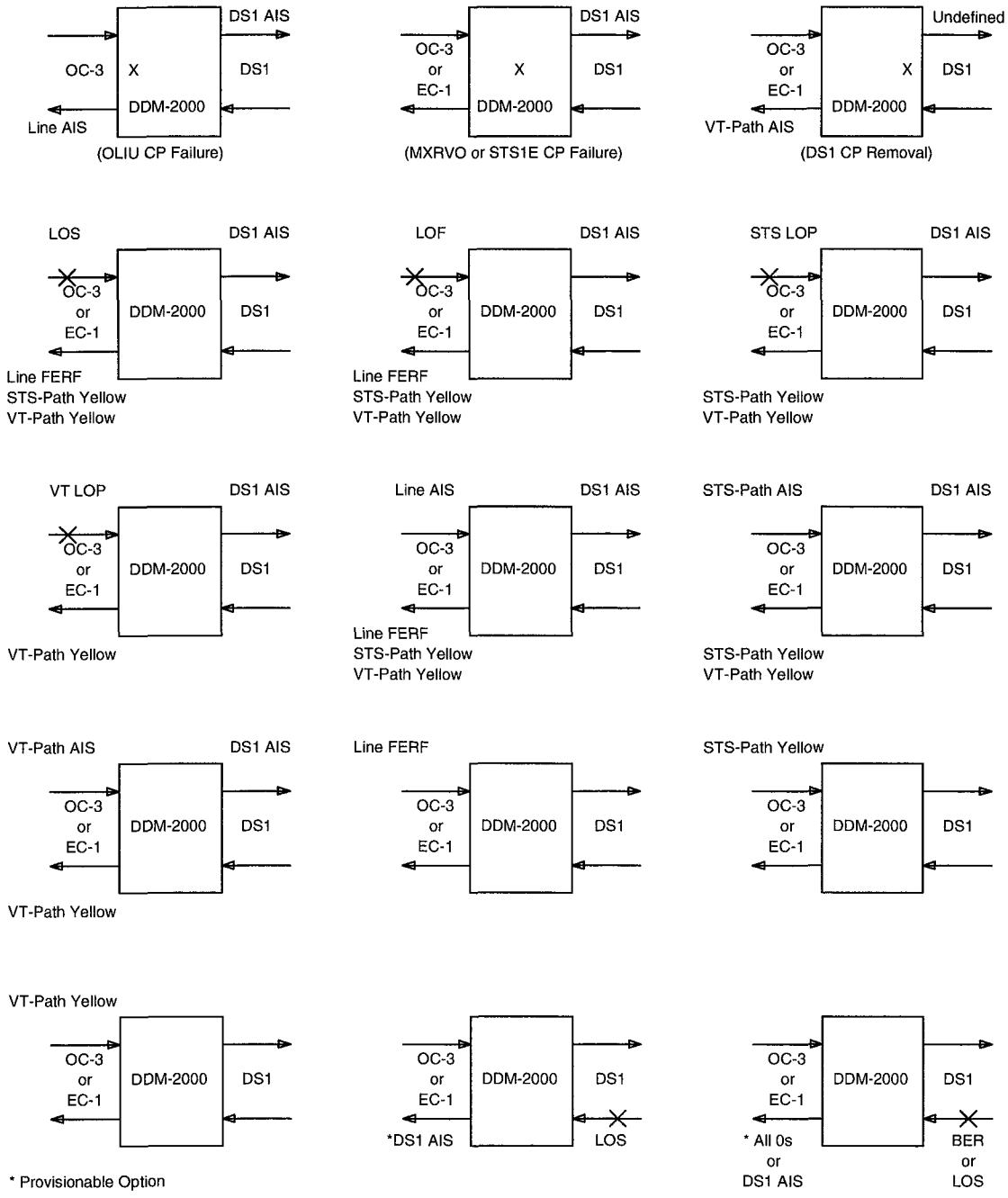


Figure 9-4. DS1 Maintenance Signaling — Non-Ring Application

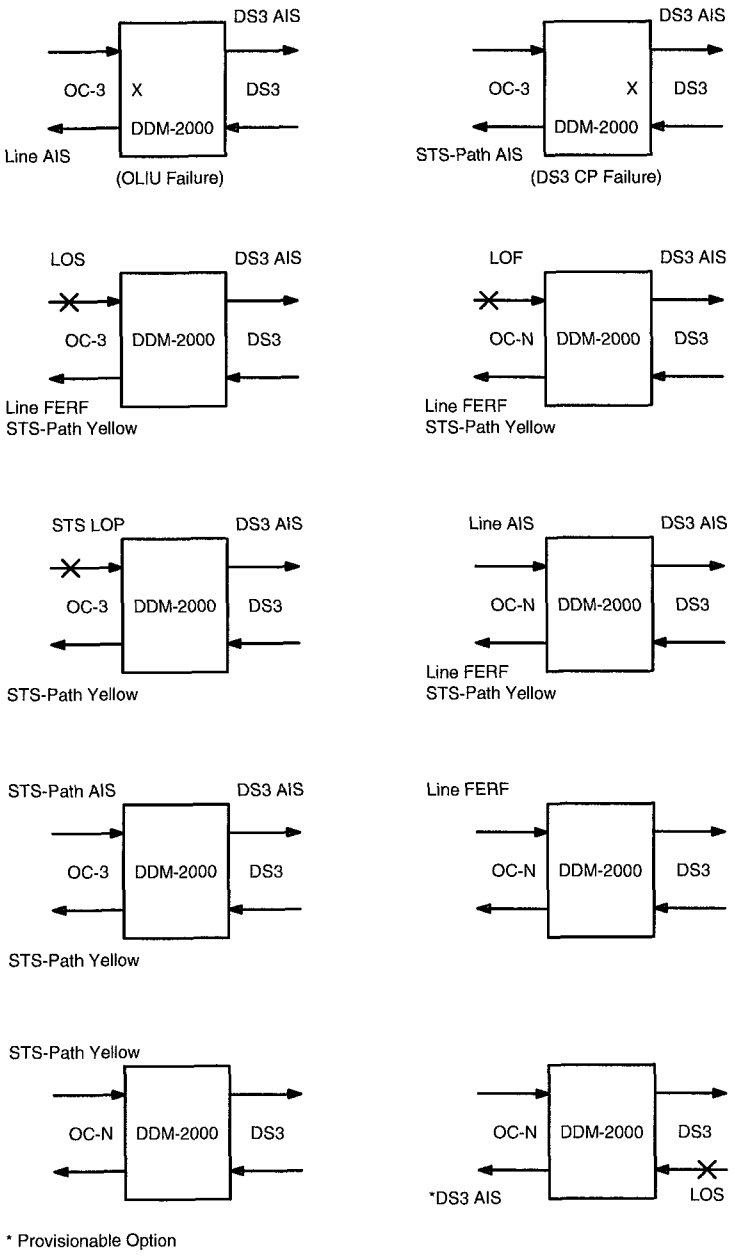
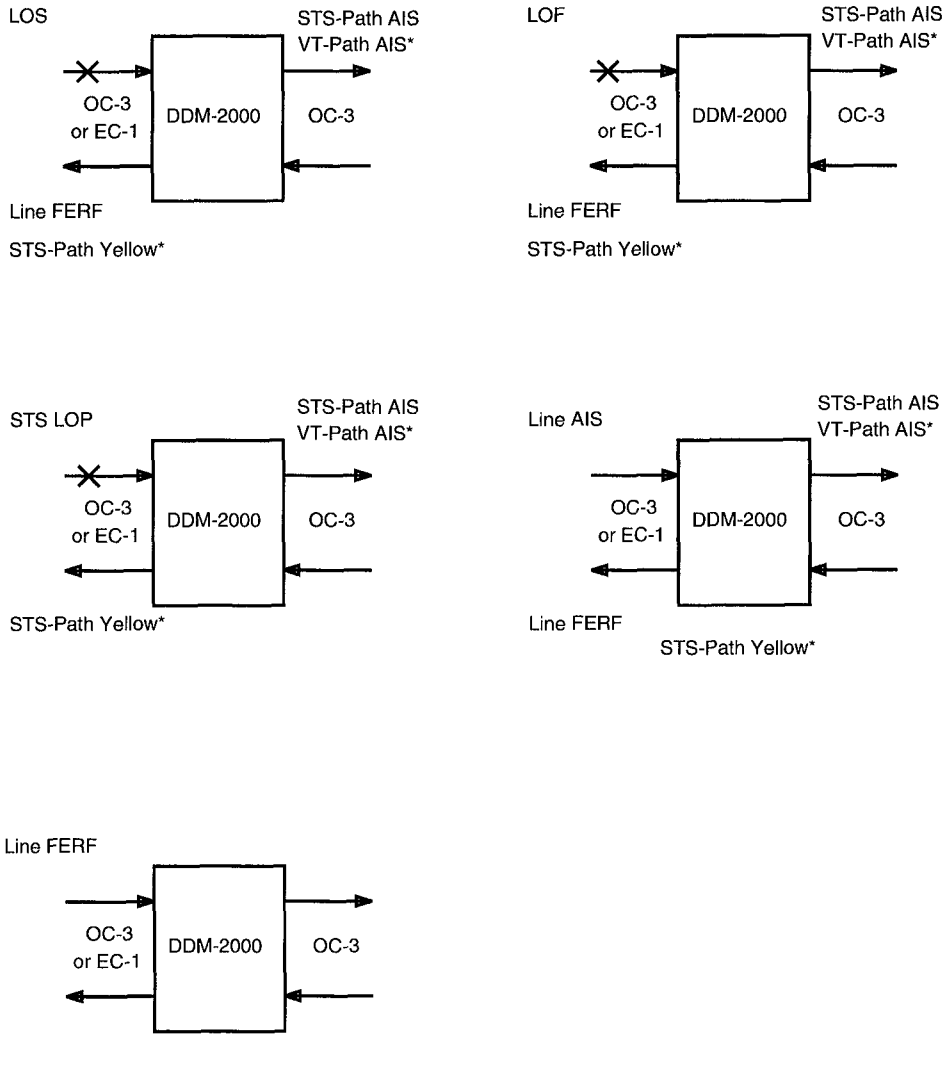


Figure 9-5. DS3 Maintenance Signaling — Non-Ring Application



* VT-Path AIS and STS-Path Yellow are sent when shelf is equipped with 22F OLIU or STS1E provisioned for the VT-1 5 cross-connect mode

Figure 9-6. OC-3 or EC-1 Line Maintenance Signaling — Non-Ring Application

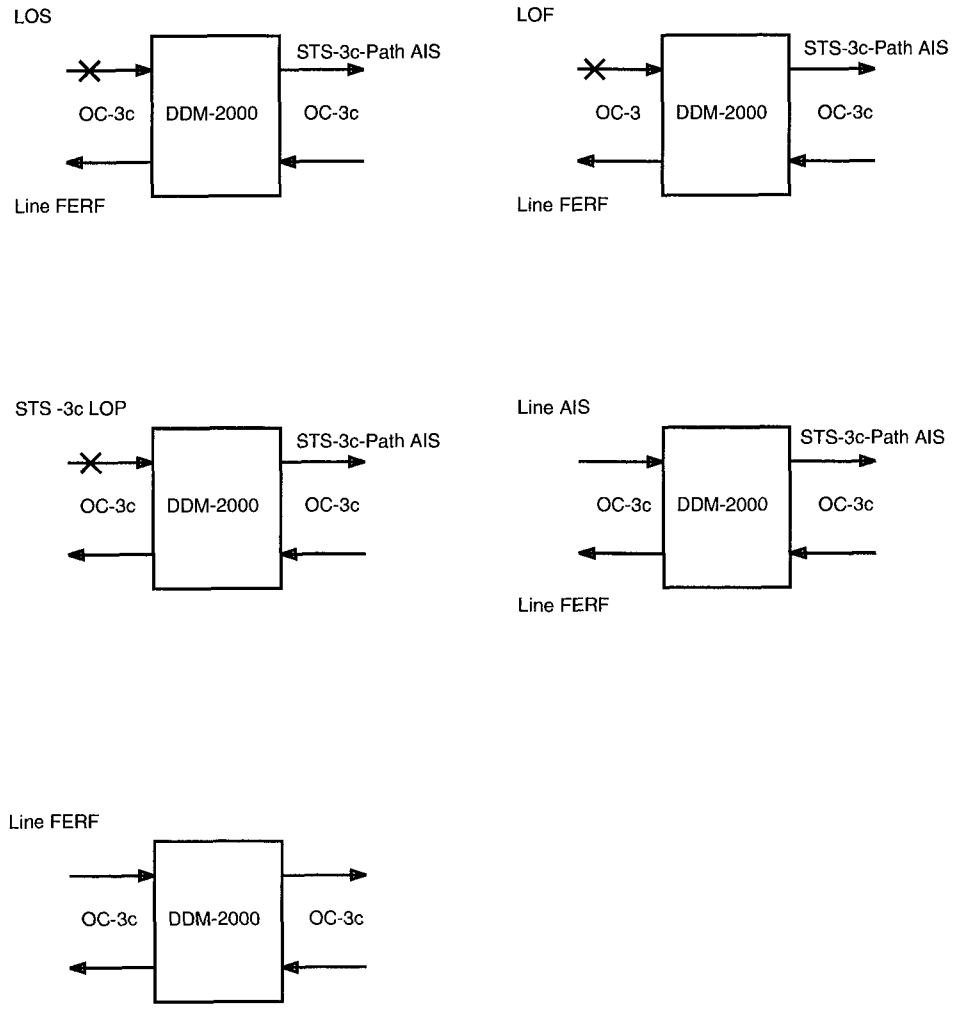


Figure 9-7. OC-3c (STS-3c) Line Maintenance Signaling — Non-Ring Application

Ring Applications

Figure 9-8 shows the maintenance signals used by the DDM-2000 OC-3 Multiplexer in a VT path switched ring application.

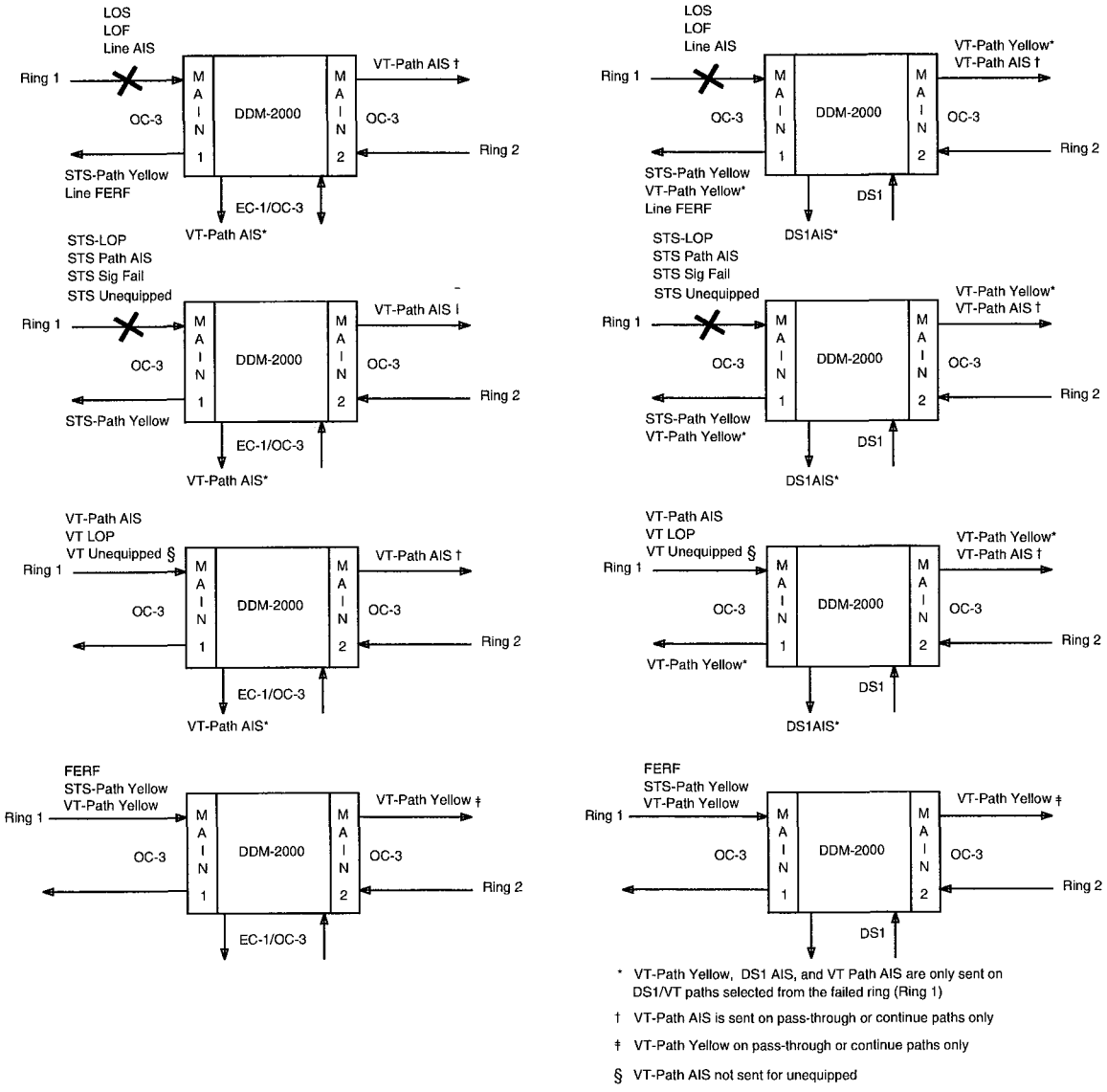
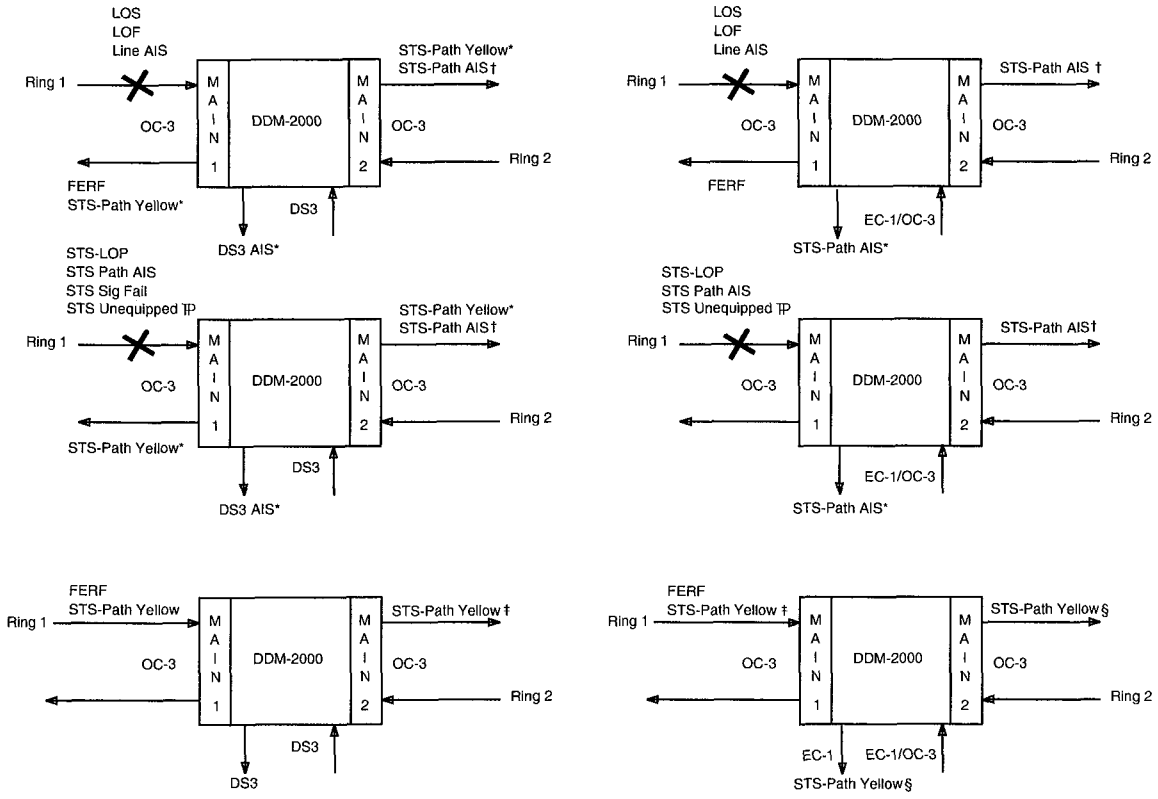


Figure 9-8. Maintenance Signaling — VT Ring Application

Figure 9-9 shows the maintenance signals used by the DDM-2000 OC-3 Multiplexer in an STS path switched ring application.



* STS-Path Yellow, STS-Path AIS and DS3 AIS are only sent on STS-1 paths selected from the failed ring (Ring 1)

† STS-Path AIS is sent on pass-through or continue paths only

‡ STS-Path Yellow appears on pass-through or continue paths only

§ STS-Path Yellow is passed to the EC-1/OC-3 or OC-3 interface depending on whether the STS-1 path is a drop or pass-through connection
For drop and continue applications, the STS-Path Yellow is passed to both the EC-1/OC-3 (drop) and the OC-3 (ring) interfaces

℻ STS-Path AIS not sent for STS Unequipped

Figure 9-9. Maintenance Signaling — STS Ring Application

Fault Detection, Isolation, and Reporting

Detection

The DDM-2000 OC-3 Multiplexer continuously monitors all circuit packs and incoming signals for faults. Incoming SONET signals are monitored for loss of signal (LOS), loss of frame (LOF), loss of pointer (LOP), and bit error ratio (BER) thresholds, and for the maintenance signals described above. Incoming DS1 and DS3 signals are monitored for LOS and BER thresholds. The BER thresholds for DS1 are based on bipolar 8-zero substitution (B8ZS) or alternate mark inversion (AMI) violations depending on line coding. The BER thresholds for DS3 are based on bipolar 3-zero substitution (B3ZS) coding violations. The DS3 signals received from the fiber are monitored for AIS and out-of-frame (OOF) conditions, unless they are provisioned for clear channel mode. DS1 timing references are monitored for AIS, BER, excessive out-of-frame (EOOF), LOF, LOS, and out-of-lock (OOL) conditions.

Isolation

When a fault is detected, the DDM-2000 OC-3 Multiplexer uses automatic diagnostics to isolate the fault to a particular signal or circuit pack.

Reporting

The system automatically and autonomously reports all alarm and status conditions through the appropriate user panel and equipment indicators, office alarm relays, telemetry interfaces, and through the TL1/X.25 interface. The system stores a record of all fault conditions and reports them on demand through the CIT and the TL1/X.25 interface. The DDM-2000 OC-3 Multiplexer also stores a history of the past 500 (60 in Releases 2 and 3) alarm and status conditions and CIT events and reports them on demand through the CIT interface. Each event is real time and date stamped.

If the diagnostic determines that a circuit pack has failed, the red FAULT LED on that circuit pack is turned on. If an incoming electrical signal from the DSX fails, the red FAULT LED on the affected circuit pack flashes on and off in one-second intervals. A failed incoming optical signal has the same effect.

The DDM-2000 OC-3 Multiplexer provides alarm holdoff and clear delays. The alarm holdoff delays prevent transient failures from causing unnecessary maintenance activity. The office alarms are not activated and the operations systems are not notified through the telemetry interfaces until a failure lasts at least as long as the alarm holdoff delay. Alarm clear delays prevent premature clearing of alarms. Alarm indications are not cleared until a fault condition has been clear for at least as long as the alarm clear delay. Incoming signal failure

conditions, AIS, and FERF signals are subject to the provisionable holdoff delay and a fixed 15-second clear delay. Yellow signals are not subject to holdoff or clear delays. Circuit pack failures (except control circuit pack failures) are subject to the provisionable holdoff and clear delays. Refer to the **`set-attr-alm`** and **`rtrv-attr-alm`** commands in Section 11, "Commands and Reports."

Protection Switching

The DDM-2000 OC-3 Multiplexer provides equipment protection switching of all transmission and synchronization circuit packs, and SONET standard line protection switching for OC-3 lines. Installation of protection equipment is optional. Protection switches are caused by automatically detected faults in the circuit packs or OC-3 lines, and by external commands from a CIT or telemetry byte-oriented serial (TBOS) interface. Refer to the **`switch-line`**, **`switch-fn`**, **`switch-ls`**, and **`switch-sync`** commands in Section 11, "Commands and Reports." The **`switch-line`** command is not applicable to OC-3 lines configured for path switched rings or to EC-1 interfaces. For path switched rings, path protection switching is used. Refer to "Path Protection Switching (Path Switched Rings)" paragraphs in this section and the **`switch-path-vt1`** or **`switch-path-sts1`** commands in Section 11, "Commands and Reports."

Automatic Line Protection

The DDM-2000 OC-3 Multiplexer uses optional SONET 1+1 unidirectional, nonrevertive automatic line protection switch (APS) procedures. This means that after a cut service fiber is repaired, a location **does not** switch back (revert) and select the service set as its active fiber/OLIU set. Line switching is not applicable to OC-3 lines in a path switched ring or to EC-1 interfaces.

Status of ACTIVE LED on OLIUs

Figure 9-10 illustrates examples of unidirectional and nonrevertive line protection switches. Note the squares at locations A and C. Each square represents the transmit or receive section of an OLIU. Figures 9-10(a) and 9-10(b) are associated with the Service (S) OLIU and Figures 9-10(d) and 9-10(e) with the Protection (P) OLIU. Four optical fibers are associated with the Service and Protection OLIUs that interconnect the OLIUs at locations A and C. The two fibers connecting the Service OLIUs are the service fibers and the two fibers connecting the Protection OLIUs are the protection fibers. Fibers and OLIUs shown in **bold** are active and carrying service.

In Figure 9-10(a), transmitted optical signals in each direction are permanently bridged to the service and protection fibers. The same signal is transmitted on both fibers. Each service and protection fiber and its associated OLIU are monitored as a set. The fiber/OLIU set selected by the receiving location is the active set and the ACTIVE LED, which in this figure is on the service OLIU circuit

packs, is lighted. The fiber/OLIU set not selected is the standby set and the ACTIVE LED on its corresponding OLIU is not lighted.

Contrary to other transmission circuit packs, ACTIVE LEDs on both OLIUs may be lighted at the same time on the same shelf. For example, in Figure 9-10(b) the receive fiber going to location C has been cut. Location C selects the protection fiber/OLIU set as active, resulting in the lighting of ACTIVE LEDs on both the OLIUs at location C. Location A did not switch to its protection set but continues to remain on the service set. This example illustrates the SONET standard of unidirectional APS. Since each location sends APS information to the other end, both ACTIVE LEDs on the OLIUs at location A are also lighted.

After the cut service fiber is repaired, location C **does not** switch back (revert) and select the service set as its active fiber/OLIU set. This example, Figure 9-10(c), illustrates the SONET standard of nonrevertive APS.

Figures 9-10(d) and 9-10(e) illustrate a second fiber failure and the resulting changes to the active OLIUs thus showing that both protection sets could be active and carrying service.

APS Initiation Criteria

The APS is initiated by signal fail and signal degrade conditions on the received optical signal. The BER of the received optical signal is calculated from violations in the SONET line overhead B2 parity bytes. Signal fail is declared for:

- Incoming loss of signal (LOS)
- Loss of frame (LOF)
- Line AIS
- BER exceeding 10^{-3}

A BER exceeding a provisionable 10^{-5} to 10^{-9} threshold causes the signal degrade condition. An APS is completed within 60 milliseconds of the beginning of a hard failure such as a fiber cut.
The DDM-2000 OC-3 Multiplexer APS is "span independent." In multispan applications, such as hubbing, an automatic or manual protection switch on one span does not cause a protection switch on any other span.

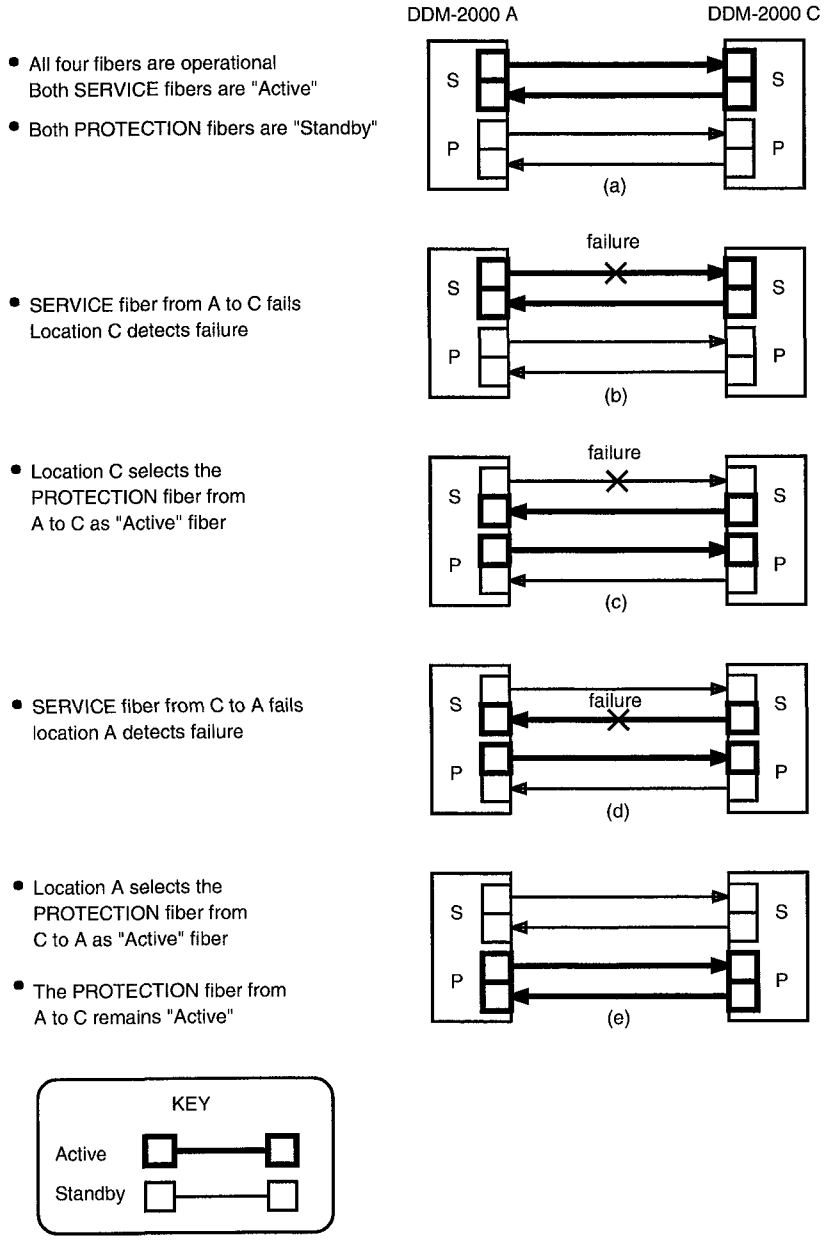


Figure 9-10. Unidirectional Line Protection Switching

Path Protection Switching (Path Switched Rings)

The path switched ring application is based on the Bellcore TR-TSY-000496 path protection switching scheme. The DDM-2000 OC-3 Multiplexer must be equipped with 22-type OLIUs in the Main slots for ring applications.

The path protection switched ring has two single-fiber counter-rotating rings as shown in Figure 9-11. This architecture has distinct advantages over a linear architecture. Each node on the ring terminates four fibers: a transmit and receive fiber in each direction. Eight fibers are needed to connect the same network element in a nonterminal position of a linear add/drop 1+1 protected arrangement: two transmit and two receive in each direction, without providing the same level of protection that the ring provides. The architecture of the ring is designed to protect against any single point of failure, including a node failure, single fiber cut, or dual fiber cut. Node failure or dual fiber failure in a linear network affects traffic to all downstream nodes. A node failure in a ring only affects traffic dropped at the failed node.

The signal that enters the ring is protected on a SONET path basis as switching is performed independently for each path. Because of the ring's unidirectional operation, time slots must be reserved all the way around the ring for all ring traffic, limiting the capacity of the ring to the OC-N line rate. DDM-2000 OC-3 can provide both VT1.5 and/or STS-1 path protection, and DDM-2000 OC-12 can provide STS-1 path protection. A single DDM-2000 OC-3 shelf can support a mix of STS-1 and VT1.5 path switched rings. VT1.5 path protection is available at the OC-12 rate by using DDM-2000 OC-3 systems colocated with a DDM-2000 OC-12 system.

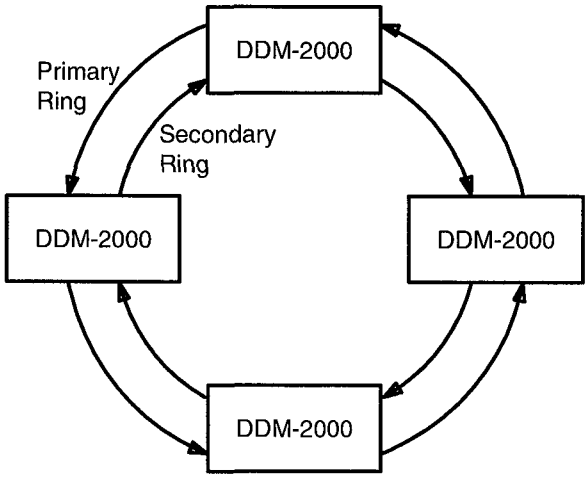


Figure 9-11. Two-Fiber Unidirectional Ring

Path Protection Scheme

Path protection rings feed a SONET payload (STS or VT) from the ring entry point, simultaneously in both rotations of the ring, to the signal's ring drop or exit point as shown by traffic AC and CA in Figure 9-12a. This duplication of the signal that enters the ring is called a "head-end bridge." The node that drops the signal from the ring monitors both ring rotations and is responsible for selecting the signal that has the highest quality based on LOS/LOF, path alarm indication signal (AIS), and path bit error rate (BER) performance. This function at the ring exit point is called a "tail-end switch." Release 5.1 and 7 provide nonrevertive switching on pass-through paths, all detected hard failures (LOS, LOF, LOP, line AIS, STS-1 path AIS, or STS-1 path signal failure based on BER for path protected rings) results in AIS insertion in the outgoing signals. This allows the drop node to detect path failures and to select the good path.

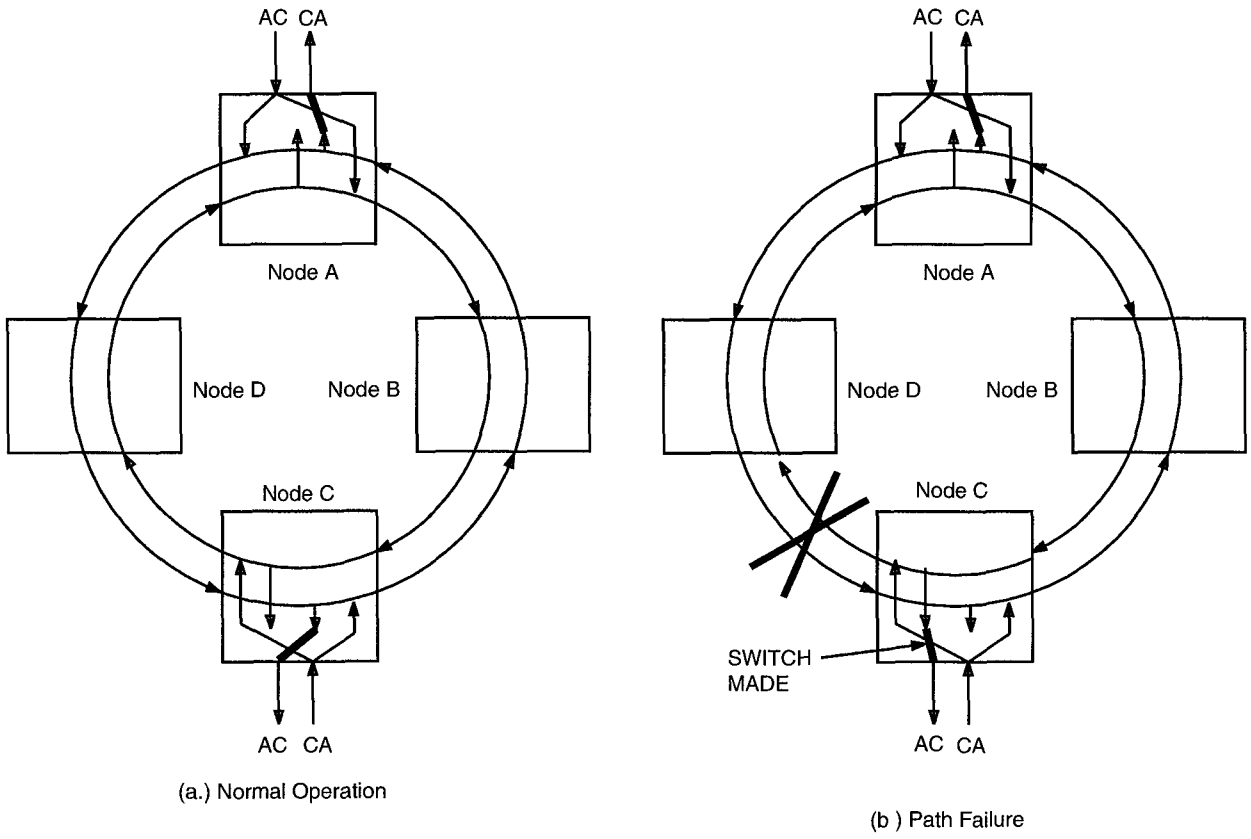


Figure 9-12. Path Protection Switching

In Release 7.0 and later, the user can set a VT1.5 signal degrade threshold using the **set-vt1** and **rtrv-vt1** commands at a **drop** node on a VT path protected ring if the node is equipped with 22D-U or 22G-U/22G2-U OLIUs in the Main slots. Similarly, in Release 7.1 and later, the user can set an STS-1 signal degrade threshold using the **set-sts1** and **rtrv-sts1** commands at a **drop** node on an STS path protected ring if the node is equipped with 22D-U or 22G-U/22G2-U OLIUs in the Main slots.

Under normal conditions, both incoming SONET path signals to the switch selection point are of high quality, and the signal can be selected from either ring. A failure or a transmission degradation on one of the rings requires that the other ring path be selected, and requirements specify that this path selection must occur within 60 milliseconds after a hard failure condition. Figure 9-12b shows how traffic is switched when a dual-fiber cut occurs. Release 5.1 and later ring releases provide nonrevertive switching to minimize the impact on critical customer services by giving the service provider control when, and if, the critical service should revert to a particular ring. A manual path protection switching command allows switching back to the original path for ease of ring maintenance. Refer to the **switch-path-vt1** or **switch-path-sts1** commands in Section 11, "Commands and Reports."

Dual Ring Interworking

The DDM-2000 OC-3 Multiplexers support dual ring interworking (DRI) which provides end-to-end protection from loss of service on traffic traveling over interconnected rings. This is achieved by connecting the two rings at two dual-homing offices and by provisioning the multiplexers at these nodes to "drop and continue" all necessary paths. This provides a redundant path in case of a catastrophic failure at one of the two DRI offices or one of the nodes in each DRI office. The end nodes perform standard path protection switching on the signals from these two redundant paths.

Dual Ring Interworking Path Protection Scheme

Figure 9-13 shows DRI path protection switching. Note that the upper ring could be an FT-2000 OC-48 Lightwave System bidirectional line switched ring. In the receive direction, a DRI node that passes a signal between rings performs two steps:

1. VT1.5 and/or STS-1 signals to be passed between rings are "dropped and continued". This means the signal is dropped at that node and simultaneously copied into the OC-3 signal in the outgoing direction of the same ring rotation.
2. The VT1.5 and/or STS-1 signal that was dropped in Step 1 and the corresponding VT1.5 and/or STS-1 signal incoming from the other ring direction are compared and the signal with the highest quality is selected as in single ring topologies.

In the transmit direction, a DRI node feeds VT1.5 or STS-1 signals in the direction opposite to the "continue" portion of the drop and continue signal (Step 1 previously) to only one rotation of the ring as shown in Figure 9-13. This routing is to only one rotation as distinguished from how an ordinary path switched ring bridges incoming low-speed traffic onto both rotations.

The drop and continue routing necessary for DRI is established with a cross-connection command.

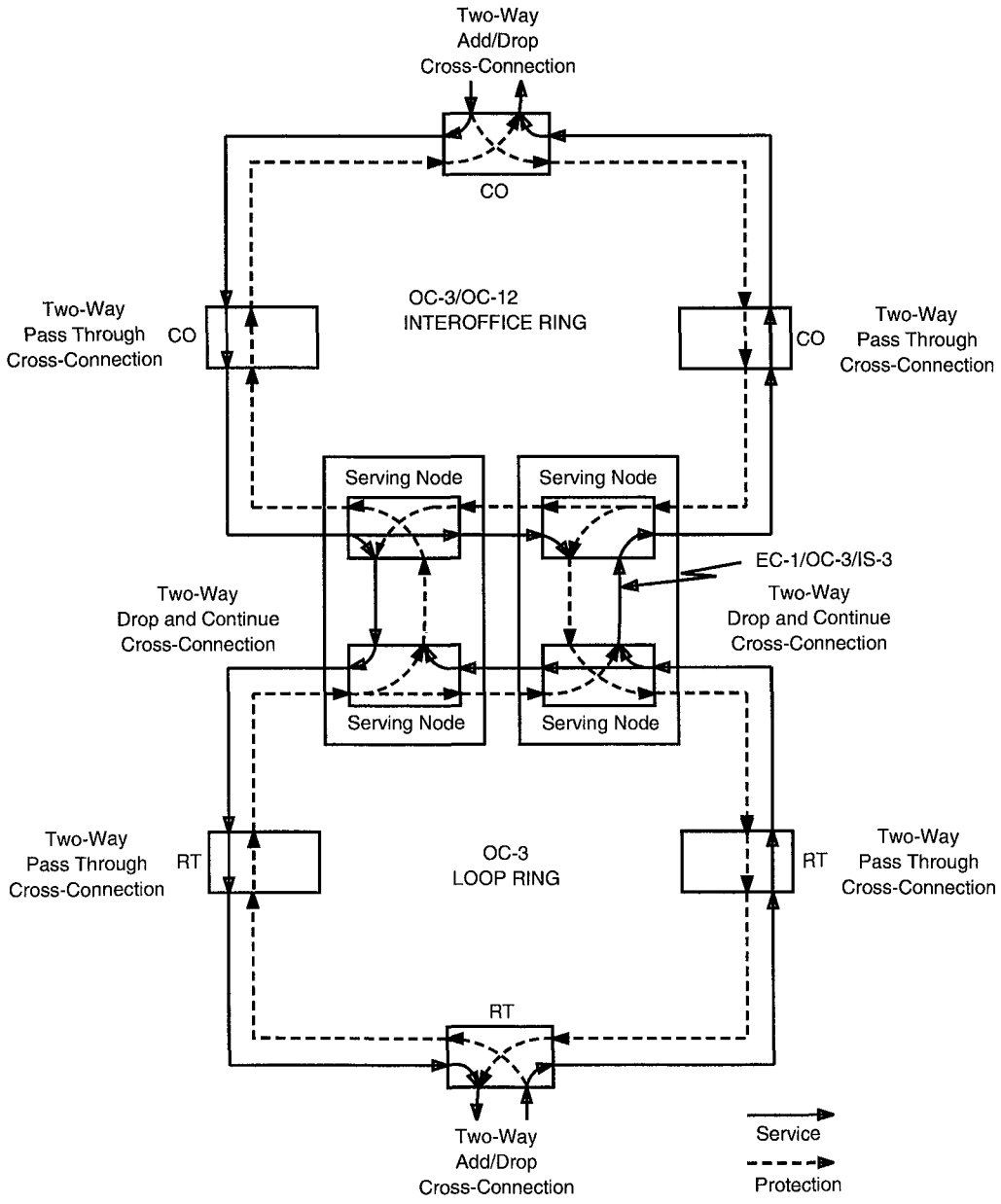


Figure 9-13. DRI Path Protection Switching

OC-12 VT1.5 Path Switched Ring (Dual 0x1)

The OC-12 VT1.5 path switched ring application, also called dual 0x1 operation, consists of an OC-3 ring shelf using Release 7.1 software with VT1.5 or STS path protection switching that connects to an OC-12 ring shelf having Release 3.1 software. The high speed signals from the OC-3 ring are sent as two copies (one clockwise, the other counter-clockwise) on the OC-12 ring to another OC-3 ring shelf. Switching is done at the OC-3 shelf. See Section 8, "Administration and Provisioning" for more information on this application.

Status of ACTIVE LED on Rings

In all ring applications, ACTIVE LEDs on each Main OLIU are always lighted because it is not known if a signal on that OLIU is currently being selected by a far-end network element.

Equipment Protection

The DS3, MXRVO, STS1E, and TGS circuit packs are 1×1 protected and use nonrevertive switching. Green ACTIVE LEDs are provided on the faceplates of these circuit packs to indicate which ones are active (carrying service).

The DS1 circuit packs are 1×7 protected and use revertive switching. To prevent frequent protection switches caused by intermittent failures of a DS1 circuit pack, the system provides an "automatic lock" feature. If four automatic protection switches are done on the same DS1 circuit pack within a 10-minute interval, traffic is automatically locked onto the protection DS1 circuit pack and the automatic lock is reported as a minor alarm. The automatic lock can be reset manually using the **`switch-ls`** command. It resets automatically at midnight or if the affected DS1 circuit pack is replaced. The DDM-2000 OC-3 Multiplexer supports unprotected equipment configurations.

Synchronization Reference Protection

In external timing and loop timing modes, the synchronization references are 1×1 protected. If neither reference is available, the system automatically switches to "holdover" timing mode. When the TGS is provisioned for synchronization messaging (Release 5.1 and later), the system can determine the quality of the loop timing references by reading the synchronization messages in the OC-3 transport overhead bytes. If the quality is not adequate, the TGS will switch to holdover until manually switched to a good reference.

If automatic synchronization reconfiguration is enabled the TGS will automatically select the highest quality reference. See "Synchronization Messaging" in Section 5, "Transmission and Synchronization Interfaces" and the **set-sync** command in Section 11, "Commands and Reports".

The system can be provisioned to revertive or nonrevertive timing mode switching. The default is revertive. If provisioned for revertive mode switching, the system automatically switches from holdover mode to the provisioned timing mode (external timing or loop timing) when an unprotected timing reference failure clears. If provisioned for nonrevertive mode switching, the system must be manually switched from holdover mode to the provisioned timing mode (external timing or loop timing) when an unprotected timing reference failure clears. Refer to the **rtrv-sync**, **set-sync**, and **switch-sync** commands in Section 11, "Commands and Reports."

Loopbacks

The DDM-2000 OC-3 Multiplexer allows technicians to set up loopbacks on all low- and high-speed interfaces. Low-speed DS1, DS3, and EC-1 (Release 5.1, 6.0, and later releases) electronic loopbacks, directed toward the high-speed OC-3, can be individually controlled from the CIT. Active electronic loopbacks are noted by the user panel's abnormal (ABN) indicator and in the alarm and status report. Refer to the **opr-lpbk** and **rls-lpbk** commands in Section 11, "Commands and Reports."

Front access to the OLIU optical connectors allows an easy manual OC-3 optical loopback. This loopback is set up by connecting a fiber jumper from the OLIU output to its input. An optical attenuator is required for this loopback if the 22G-U OLIU is used. Other types of OLIUs do not require attenuators for this loopback. The optical output power switch on the 21G/21G-U OLIU circuit pack should be set for low output power to prevent receiver overload when an optical loopback is set up.

Tests

Transmission Tests

Technicians can use DDM-2000 OC-3 Multiplexer internal testing capabilities for installation and manual troubleshooting. DS1 and DS3 test signal generators and detectors are integrated in the system, eliminating the need for external test equipment to do DS1/DS3 transmission testing.

The DDM-2000 OC-3 Multiplexer lets technicians test specific signals and system components. For example, technicians can manually enable the integrated test signal generators and detectors for a DS1 or DS3 low-speed interface. These signal tests can be run selectively in the multiplex or demultiplex direction. Refer to the **test-trmsn** commands in Section 11, "Commands and Reports."

Auto Turnup Tests

Automatic turnup tests are mechanisms that allow rapid turnup of DDM-2000 OC-3 systems without the use of external test equipment.

Automatic turnup tests are not currently available for path switched ring applications but software for any nonring release can be used to perform local equipment and local wiring cross-connect tests. Manual automatic turnup tests can be done using the procedures listed in the TOP section of this manual (Volume II).

The installation tests can be controlled via either the user panel or the CIT. Three different turnup procedures are provided and should be done in the order listed:

1. Local Equipment Test — The local equipment test verifies the integrity of the transmission and synchronization circuit packs and the OC-3 backplane. In the test, high-speed signals are looped back (manual optical loopback or EC-1 electrical loopback) towards the low-speed interfaces. See Figure 9-14.
2. Local Wiring Cross-Connect Test — The local wiring cross-connect test verifies the integrity of the cross-connect or wiring that is established. This assumes local equipment tests have been performed and any problems or failures have been corrected before this test is done. In the test, all low-speed signals are looped back (manual loopbacks at the STSX or DSX). See Figure 9-15.
3. Optical Span Test — The optical span test verifies the end-to-end transmission across an optical span. In this test, the OC-3 signals are monitored at both ends of the optical span and the results reported back on the same line using the line overhead. Loopbacks are not required. See Figure 9-16.

Each of the tests described above returns a good/fail result. If any circuit pack failures are detected during the tests, the FAULT indicator on the failed circuit packs are lighted. If the wiring to the cross-connect panel is defective, the red FAULT indicators on the low-speed circuit packs that detect incoming signal failures blink for 1 minute. If the test passes, the green ACO indicator on the user panel is lighted. Good/fail is also reported to the CIT at the end of the test. Refer to the **test-auto** command in Section 11, "Commands and Reports."

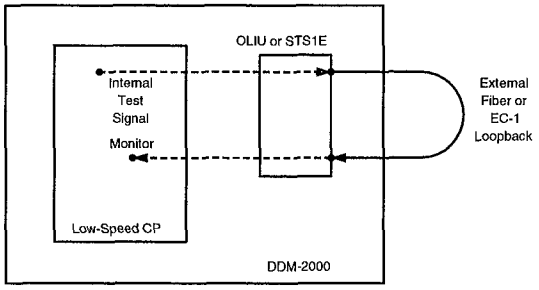


Figure 9-14. Local Equipment Test

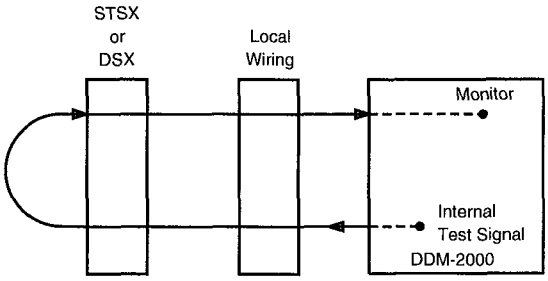


Figure 9-15. Local Wiring Cross-Connect Test

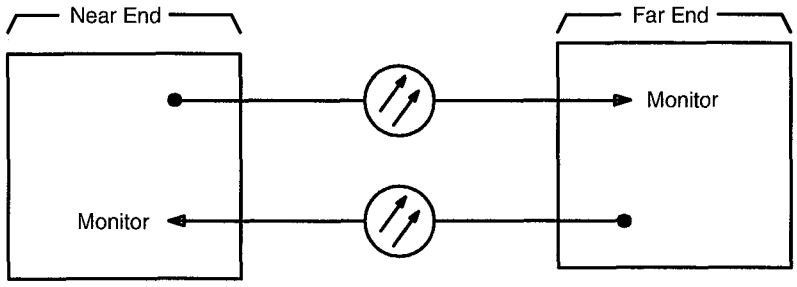


Figure 9-16. Optical Span Test

Operations Interface Tests

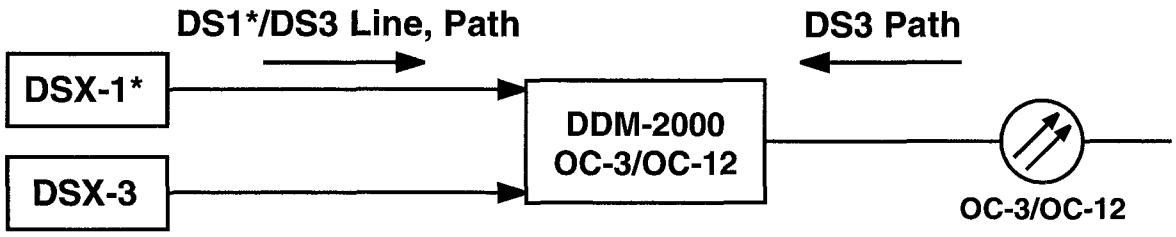
The DDM-2000 OC-3 Multiplexer provides tests for LED indicators, parallel telemetry and TBOS interfaces, office alarms, and the system controller. Refer to the **`test-led`**, **`test-tlm-par`**, **`test-tlm-ser`**, **`test-alm`**, and **`test-sysctl`** commands in Section 11, "Commands and Reports."

Performance Monitoring

The DDM-2000 OC-3 Multiplexer uses performance monitoring (PM) to support proactive maintenance of the network and tariffed service performance verification. Proactive maintenance refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending hard or soft failure. Hard and soft failures result in reactive maintenance.

Proactive maintenance consists of monitoring performance parameters associated with the SONET sections, lines, and paths within the SONET network. Table 9-8 lists the SONET performance parameters monitored by DDM-2000 systems. These parameters are thresholded to indicate degraded performance. When a performance-monitoring threshold is crossed, it is reported to the operations system connected to an X.25 or TBOS link as a threshold crossing alert (TCA). For an X.25 link, all threshold crossings associated with a particular path can be correlated, and the likely source of the degradation can be identified. For a TBOS link, all threshold crossings are indicated by a single point.

Figure 9-17 shows DS1/DS3 line and path and DS3 path performance monitoring.



*** OC-3 Shelves Only.**

Figure 9-17. DS1/DS3 Line and Path and DS3 Path Performance Monitoring

The following are definitions and explanations for the terms used in the figure:

- Line — A line is a physical transport vehicle that provides the means of moving digital information between two points in a network. The line is characterized by a metallic transmission medium and its specific coding type. A line is bounded by its two end points, known as line terminations. A line termination is the point where the electrical, bipolar line signal is generated and transmitted, or received and decoded.
  - DS1 — In DDM-2000 OC-3 Release 7.2, and later releases, DS1 line for alternate mark inversion (AMI) or bipolar 8-zero substitution (B8ZS) coding is monitored and the errored second (ES-L) data is displayed for the incoming signal from the DSX-1.
  - DS3 — In DDM-2000 OC-3 Release 7.2, OC-12 Release 5.0, and later releases, DS3 line for bipolar 3-zero substitution (B3ZS) coding is monitored and the data is displayed in CV-L, ES-L, and SES-L registers for the incoming signal from the DSX-3.
- Path — A path is a framed digital stream between two points in a network and represents digital signal transport at a specified rate, independent of the equipment and media providing the physical means of transporting the signal. A path is defined by its two end points, called path terminations, where its frame structure is generated and decoded. A path may be carried wholly within one transport segment (line), or it may span a sequential arrangement of two or more transport segments.

— DS1 — In DDM-2000 OC-3 Release 5.1 and later releases, DS1 near-end path is monitored for SF framing and both near-end and far-end paths are monitored for ESF framing. The data is displayed in ES-P, SES-P, and UAS-P categories. In Release 7.2 and later releases, CV-P is also displayed.

— DS3 — In DDM-2000 OC-3 Release 7.1, OC-12 Release 3.1, and later releases, DS3 path incoming from the fiber (high speed side) is monitored for both P-bits and F&M bits and the data is displayed in CV-P, ES-P, SES-P, and UAS-P registers. In addition, severely errored frame second (SEFS) is also monitored and displayed.

  In DDM-2000 OC-3 Release 7.2, OC-12 Release 5.0, and later releases, DS3 path incoming from the DSX-3 (low speed side) is also monitored, in addition to monitoring the path from the fiber, for both P-bits and F&M bits. The same registers are also displayed for the data from the DSX-3.

  In DDM-2000 OC-3 Releases 8.0 and 9.0, OC-12 Release 5.0, and later releases, DS3 path from both the fiber and the DSX-3 are monitored for C-Bits and are displayed in the same registers as above. The far-end data (FEBE bits) is monitored and displayed as well.

VT Performance Monitoring

VT performance monitoring (Releases 6.0 and 7.0) provides performance monitoring of the V5 byte for errored seconds, severely errored seconds, and unavailable seconds. VT performance monitoring is a feature package option of Release 6.0 and later releases that requires feature package software licensed by AT&T and the use of the **`set-feat`** command to enable the feature.

The counts are retrieved using the **`rtrv-pm-vt1`** command by the message-based operations system or through the CIT to determine if the service is operating within tariffed limits.

DS1 Performance Monitoring

DS1 performance monitoring is a feature package option of Releases 5.1 and later releases that requires feature package software licensed by AT&T and the use of the **`set-feat`** command to enable the feature. DS1 performance monitoring measures near-end performance and extended superframe format far-end performance report of the incoming DS1, allowing service providers to determine the end-to-end performance of a DS1 signal. Tariffed service verification consists of monitoring performance parameters that can be associated with the customer's end-to-end service. The DDM-2000 OC-3 Multiplexer provides this capability for DS1 services with the DS1 performance

monitoring feature. Based on the American National Standards Institute *ANSI* T1.403 extended superframe format (ESF), this capability retrieves performance report messages written into the ESF data link by the customer's terminal equipment.

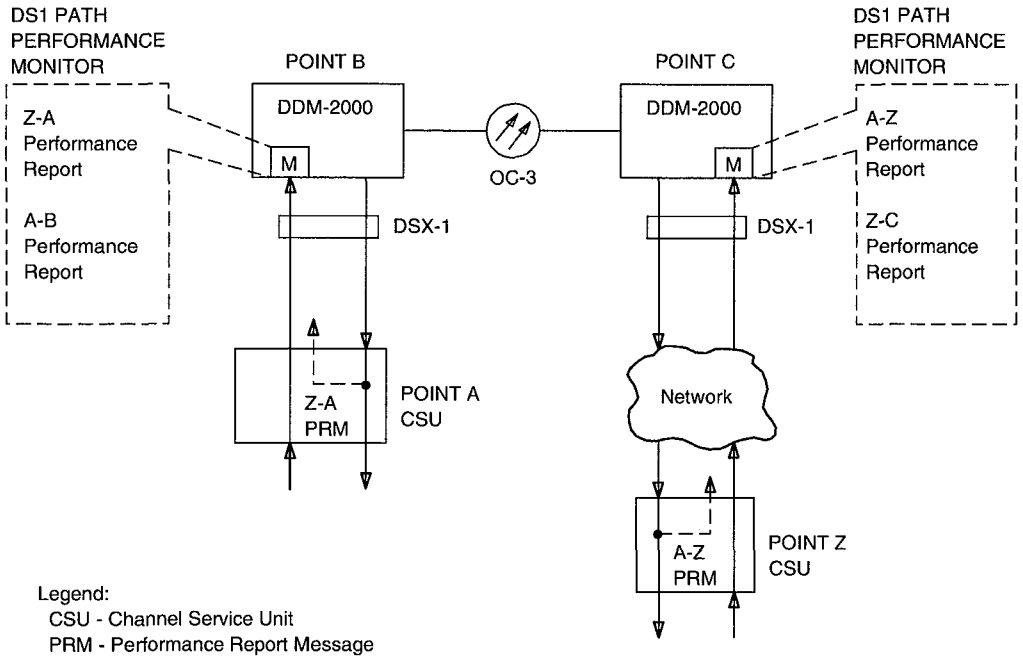


Figure 9-18. DDM-2000 OC-3 Multiplexer DS1 Path Performance Monitoring

From these messages, the DDM-2000 OC-3 Multiplexer can determine and report the end-to-end error performance of the entire DS1 link *as seen by the customer*. These parameters, listed in Table 9-8, are thresholded and reported to indicate degraded performance. The counts are retrieved using the **`rtrv-pm-t1`** command by the message-based operations system to determine if the service is operating within tariffed limits.

Application of the OC-3 DS1 performance monitoring feature for tariffed service verification is shown in Figure 9-18. Figure 9-18 shows an ANSI T1.403 ESF format DS1 service carried between points A and Z, using a DDM-2000 OC-3 system and terminated at the customer's premises with channel service units (CSUs). At the "A" end, the received error performance (Z - A) is detected and written by the customer's CSU onto the outgoing (A - Z) ESF data link, as shown by the dashed lines, as a performance report message (PRM). The DS1PM circuit pack interfacing the A end reads the incoming DS1 signal's PRM (received from the customer's premises) and reports the Z - A performance. Likewise, the OC-3 system interfacing the Z end reports the A - Z performance by reading the PRM from the customer's "Z" CSU. By reviewing the data from each OC-3 system, the service provider can determine the complete end-to-end performance (A - Z and Z - A) of the customer's service.

Additionally, each DS1PM circuit pack measures the near-end performance of the incoming DS1, allowing the service provider to determine if a good DS1 signal was received from the customer before transporting it through the network. This information can then aid in sectionalizing any reported performance problems. The DS1PM circuit pack can also provide this same near-end information for superframe (SF) formatted (sometimes known as "D4 framing") DS1 services, but complete end-to-end performance verification is limited due to the lack of the PRM in the SF format.

The DDM-2000 OC-3 Multiplexer, Release 7.2 (rings) provide the following DS1 enhancements:

- DS1 Line
  - — Reporting line errored seconds (ESL) on the incoming DS1 bipolar/B8ZS violations from the DSX-1.
- DS1 Path
  - — Including CVP and CVP (FE) daily counts in the DS1 path PM report.

Table 9-8. Performance Monitoring Parameters

Facility	Measured Parameter
OC-3 Optics	Laser Bias Current * Laser Transmit Power *
OC-3 Section	Severely Errored Frame Seconds (SEFS)
EC-1 Line	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS)
OC-3 Line	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS) Line Protection Switch Counts (PSC-L)
STS-1 Path	B3 Coding Violations (CV) B3 Errored Seconds (ES) B3 Errored Seconds Type A (ESA) B3 Errored Seconds Type B (ESB) B3 Severely Errored Seconds (SES) B3 Unavailable Seconds (UAS)
VT Path	V5 Errored Seconds (ES) V5 Severely Errored Seconds (SES) V5 Unavailable Seconds (UAS)

See footnotes at end of table.

Table 9-8. Performance Monitoring Parameters (Contd)

Facility	Measured Parameter
DS3 Path	P-Bit Coding Violations Severely Errored Frame Seconds (SEFS)
Enhanced DS3 Path for both P-Bit and F&M Bits (From Fiber Only)	CV-P Coding Violations § Severely Errored Frame Seconds (SEFS) § ES-P Errored Seconds § SES-P Severely Errored Seconds § UAS-P Unavailable Seconds §
Enhanced DS3 Path for P-Bit and F&M Bits (From Fiber and DSX)	CV-P Coding Violations ¶ Severely Errored Frame Seconds (SEFS) ¶ ES-P Errored Seconds ¶ SES-P Severely Errored Seconds ¶ UAS-P Unavailable Seconds ¶
DS3 Line	Line Coding Violations (CVL) ¶ Errored Seconds (ESL) ¶ Severely Errored Seconds (SESL) ¶
DS1 Path	Errored Seconds, Path (ESP) ‡ Errored Seconds, Path Far-end (ESPFE) ‡ Severely Errored Seconds, Path (SESP) ‡ Severely Errored Seconds, Path Far-end (SESPFE) ‡ Unavailable Seconds, Path (UASP) ‡ Unavailable Seconds, Path Far-end (UASPFE) ‡
Enhanced DS1 Path	Coding Violations, Path (CVP) * * ‡ Coding Violations, Path Far-end (CVPFE) * * ‡
DS1 Line	Errored Seconds, Line (ESL) **

* 21G-U OLIU only.

† 23G/23G-U and 23H/23H-U OLIUs only.

‡ Current and previous day parameters only.

§ Release 7.1 and later.

¶ Release 7.2 and later. Requires BBG4B.

**
Release 7.2 and later.

DS3 Performance Monitoring

Enhanced DS3 Performance Monitoring

DDM-2000 OC-3 Release 7.1 and later releases provide two DS3 path PM options: enhanced P-bit (parity bit) and adjusted F&M bit (frame and multiframe bit). The options are selected using a command that also sets the PM mode to "on" (default) or "off", which enables or disables the monitoring and reporting of DS3 path PM data. See Table 9-8.

Enhanced P-Bit

When provisioned for P-bit, the system calculates and provides counts of DS3 P-bit coding violations (CV), errored seconds (ES), severely errored seconds (SES), and unavailable seconds (UAS) incoming from the fiber. Quarter-hour and current day registers are provided with provisionable threshold crossing alerts (TCAs) on a per shelf basis. Severely errored frame seconds (SEFS) are also monitored.

Because P-bits can be corrected at nodes provisioned for VMR along a DS3 path, the DS3 P-bit PM data may not provide a complete report of the end-to-end DS3 path errors.

Adjusted F&M Bit

Adjusted F&M bit performance monitoring provides an alternative method for determining and accumulating DS3 path performance data based on an error estimation technique using errors on the F&M framing bits to approximate the actual error counts in the DS3 path payload. F&M bits are not corrected at nodes provisioned for VMR along a DS3 path. When provisioned for adjusted F&M bit, the system calculates and provides estimated counts of DS3 adjusted F&M bit coding violations (CV), errored seconds (ES), severely errored seconds (SES), and unavailable seconds (UAS) incoming from the fiber. Quarter-hour and current day registers are provided with provisionable threshold crossing alerts (TCAs) on a per shelf basis. Severely errored frame seconds (SEFS) are also monitored.

The DDM-2000 OC-3 Multiplexer, Release 7.2 (rings), features enhanced DS3 performance monitoring using the new BBG4B circuit pack. These enhancements are:

- DS3 P-Bit and adjusted F&M bit PM from the DSX-3.
  - — Incoming CV, ES, SES, UAS, and SEFS from the DSX, in addition to the same data from the fiber, are calculated and reported.
- DS3 Line
  - — Monitoring and reporting of CVL, ESL, and SESL on incoming DS3 B3ZS data from the DSX3.

— Provisionable bit error ratios (TCAs) for all new DS3 line parameters. For CVL parameters, bit errors can also be provisioned in ratios such as 10^{-7}, 10^{-8}, and 10^{-9}.

Performance Parameters

Table 9-8 lists the performance parameters monitored by the DDM-2000 OC-3 Multiplexer. The collection of performance parameters depends directly on slot state transitions, port states, and cross-connections.

Optical Parameters

Performance Monitoring Enabling

Collection of optical parameters are initiated when a slot is equipped with an OLIU circuit pack. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Laser Bias Current

The laser bias current is monitored continuously to detect degraded performance of the laser. A threshold-crossing alert is generated if the laser bias current exceeds a fixed threshold of 1.5 times the nominal value. Laser bias current is monitored independently for service and protection optical facilities. This parameter is monitored only by the 21G/21G-U OLIU.

Optical Transmit Power

The optical transmit power is monitored continuously to detect degraded performance of the laser. Threshold-crossing alerts are generated if the optical transmit power falls below fixed thresholds of –1 dB and –2 dB. Optical transmit power is monitored independently for service and protection optical facilities. This parameter is monitored only by the 21G/21G-U OLIU.

OC-3 Section Parameters

Performance Monitoring Enabling

Collection of section parameters for OC-3 interfaces are initiated when a slot is equipped with an OLIU circuit pack. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Severely Errored Frame Seconds (SEFS)

This parameter counts the number of seconds during which an out-of-frame, loss-of-signal, or OLIU circuit pack failure occurred. SEFSs are counted and thresholded independently for the service and the protection lines.

OC-3/EC-1 Line Parameters

Performance Monitoring Enabling

Collection of line parameters for OC-3 interfaces are initiated when a slot is equipped with an OLIU circuit pack. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the OLIU is removed and the **`update`** command or the UPD/INIT button is pressed.

Collection of line parameters for an EC-1 high speed interface is initiated when the slot is equipped with an STS1E circuit pack set for high speed.

Collection of line parameters for EC-1 low-speed interfaces are initiated when a slot is equipped with an STS1E circuit pack set for low-speed and the port is in the in service (IS) state. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the input signal is removed and the **`update`** command or the UPD/INIT button is pressed. Alternatively, the EC-1 low-speed line parameters can be disabled by setting the EC-1 port state to not monitored (NMON) using the **`set-state-ec1`** command.

Line Coding Violations (B2 Parity)

To monitor the performance of the OC-3 (or EC-1) line, the line BIP-8 (B2 parity) is calculated, written, and checked for errors. The line B2 parity violation counter is incremented for each line BIP error detected. Each line BIP-8 can detect up to eight errors per STS-1 frame. The contents of the three line B2 parity violation counters associated with the OC-3 line are added to form a composite B2 parity violation count. Coding violations are not counted during seconds that contain a line AIS, loss of signal, loss of frame, or during an unavailable second (UAS). The B2 parity violations are counted and thresholded independently for the service and protection lines.

Errored Seconds

An "errored second" is a second in which one or more B2 parity violations are detected. An errored second "type A" is a second in which exactly one B2 parity violation is detected. An errored second "type B" is a second in which more than one and less than 32 for OC-3 or, 12 for EC-1, B2 parity violations are detected. Seconds that are unavailable seconds are not counted as errored seconds. A second that contains a line AIS, loss of signal, loss of frame or is an unavailable second is not counted as a type A or type B errored second. All three of these parameters are counted and thresholded independently for the service and protection lines.

Severely Errored Seconds

A severely errored second is a second in which 32 or more for OC-3 or, 12 or more for EC-1, B2 parity violations are detected or one in which a loss of signal, loss of frame or line AIS occurs. An unavailable second is not counted as a severely errored second. Severely errored seconds are counted and thresholded independently for the service and protection lines.

Unavailable Seconds

An unavailable second is a second during which the OC-3 line is "unavailable." A line is considered "unavailable" from the beginning of X consecutive severely errored seconds until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the line signal failure. Y is equal to 10 seconds of no severely errored seconds or line signal failure. Unavailable seconds are counted and thresholded independently for OC-3 interface service and protection lines.

Line Protection Switch Counts

Line protection switch counts is the count of the number of protection switches FROM the working OC-3 interface line. The count is independently counted and thresholded for both the service and the protection line.

STS-1 Path Parameters

Performance Monitoring Enabling

- OC-3 Interfaces

  Collection of STS-1 path parameters depends on the application. For systems using default STS-1 cross-connections, monitoring is initiated only when either slot pair is equipped with a DS3 or MXRVO circuit pack. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the DS3 or MXRVO is removed and the **`update`** command or the UPD/INIT button is pressed.

For systems using manual STS-1 cross-connections, monitoring is initiated only when an STS-1 cross-connection is made to a DS3 or MXRVO circuit pack and the channel is in the IS state. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the STS-1 cross-connection is deleted. Removal of a circuit pack without removal of the cross-connection are reported as "unavailable time."

For systems using manual VT1.5 cross-connections, monitoring is initiated only when the first VT1.5 cross-connection associated with that STS-1 signal is made and the VT channel is in the IS state. This applies to STS-1 paths on both OLIU and STS1E low-speed circuit packs. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the last VT1.5 signal associated with that STS-1 cross-connection is deleted.

- EC-1 Low-Speed Interfaces

  For EC-1 low-speed interfaces, collection of STS-1 path parameters are initiated only when a slot is equipped with an STS1E circuit pack set for low-speed and a VT1.5 cross-connection is made.

- EC-1 High Speed Interfaces

  For EC-1 high-speed interfaces, collection of STS-1 path parameters are initiated only when a slot is equipped with an STS1E circuit pack set for high speed.

STS-1 Path Coding Violations (B3 Parity)

To monitor the performance of the STS-1 path, the "B3" byte in the STS-1 path overhead is written when the path is originated and checked for errors when the path is terminated. The B3 coding violation counter is incremented for each error detected. Up to eight errors per STS-1 frame can be detected in each STS-1 synchronous payload envelope (SPE). B3 coding violations are counted and thresholded separately for each STS-1 path terminated by the system. Coding violations are not counted during seconds that contain a line AIS, loss of signal, loss of frame, loss of pointer, STS path AIS, or during an unavailable second (UAS).

Errored Seconds

An "errored second" is a second in which one or more B3 parity violations are detected. Seconds that are unavailable seconds are not counted as errored seconds. An errored second "type A" is a second in which exactly one B3 parity violation is detected. An errored second "type B" is a second in which more than one and less than nine B3 parity violations are detected. All three of these parameters are counted and thresholded independently for each STS-1 path terminated by the system.

Severely Errored Seconds

A severely errored second is a second in which nine or more B3 parity violations are detected. Severely errored seconds are counted and thresholded separately for each STS-1 path terminated by the system. An unavailable second is not counted as a severely errored second.

Unavailable Seconds

An STS-1 path is considered "unavailable" from the beginning of X consecutive severely errored seconds until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the STS signal failure. Y is equal to 10 seconds of no severely errored seconds or STS signal failure. If there is an unprotected STS-1 path terminating equipment failure (STS1E, MXRVO, DS3, or OLIU), unavailable seconds are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery.

VT1.5 Path Parameters

Performance Monitoring Enabling

- EC-1 High Speed Interfaces

  For EC-1 high-speed, VT1.5 monitoring is initiated when a DS1 slot is equipped with a DS1 or DS1PM circuit pack (assuming an associated STS1E circuit pack set for high speed is present). Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the DS1 or DS1PM circuit packs are removed and the **update** command or the UPD/INIT button is pressed.

- OC-3 Interfaces

  VT1.5 monitoring is initiated when the associated VT1.5 or STS-1 cross-connection is made to a DS1 or DS1PM circuit pack. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the VT1.5 or STS-1 cross-connection is deleted.

Errored Seconds

An "errored second" is a second that is not an "unavailable second" in which one or more V5 parity violations or an AIS or LOP is detected. This parameter is counted and thresholded independently for each VT1.5 path terminated by the system.

Severely Errored Seconds

A "severely errored" second is a second that is not an "unavailable second" in which four or more V5 violations or an AIS or LOP is detected. Severely errored seconds are counted and thresholded separately for each VT1.5 path terminated by the system.

Unavailable Seconds

A VT1.5 path is considered "unavailable" from the beginning of X consecutive severely errored seconds until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the VT signal failure. Y is equal to 10 seconds of no severely errored seconds or VT signal failure. If there is an unprotected VT path terminating equipment failure, unavailable seconds are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery.

DS1 Path Parameters

Performance Monitoring Enabling

Collection of DS1 path parameters are initiated only when a slot is equipped with a DS1PM circuit pack (assuming associated MXRVO or STS1E circuit packs are present), the DS1 port is in the IS or NMON state, and the DS1 port is provisioned for performance monitoring. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the input signal to the DS1 interface is removed and the **`update`** command or the UPD/INIT button is pressed. Alternatively, the DS1 path parameter can be disabled by setting the DS1 port to turn off DS1PM by using the **`set-t1`** command.

Errored Seconds

An "errored second" for a DS1 SF format is a second in which one or more FEs, or a DS1 AIS, or a DS1 OOF is detected. A near-end "errored second" for a DS1 ESF path is a second in which one or more CRC-6 violations, or a DS1 AIS, or OOF is detected. Errored seconds are not counted during "unavailable seconds". For a DS1 path with the ESF format, the far-end "errored seconds" values are obtained from the performance report message (PRM) in the DS1 ESF data link.

Severely Errored Second

For the DS1 SF format, a "severely errored second" is a second in which eight or more FEs are detected, or an OOF, or DS1 AIS is detected. For the DS1 ESF format, a near-end severely errored second is a second in which 320 or more CRC-6 violations, or a DS1 AIS, or DS1 OOF are detected. For a DS1 path with the ESF format, the far-end "severely errored seconds" values are obtained from the PRM in the DS1 ESF data link. Severely errored seconds are not counted during "unavailable seconds". For a DS1 path with ESF format, the far-end "severely errored seconds" values are obtained from the PRM.

Unavailable Seconds

A DS1 path is considered "unavailable" from the beginning of 10 consecutive severely errored seconds until the beginning of 10 consecutive seconds, none of which is severely errored. If there is a DS1 pack failure then unavailable seconds are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. Unavailable seconds are counted and thresholded separately for each DS1 path monitored by the system.

For a DS1 path with ESF format, the far-end "unavailable second" performance is obtained from the PRM.

CV-P Coding Violations

This indicates the number of DS1 near-end path coding violations during the data collection interval. For a DS1 in SF format, this is a count of framing bit errors. For a DS1 in ESF format, this is a count of CRC-6 bit errors.

CV-PFE Coding Violations

This indicates the number of DS1 far-end path coding violations during the data collection interval. This parameter is only applicable to a DS1 signal in ESF format. This is a count of CRC-6 bit errors as reported in the G bits of the PRM.

DS1 Line Parameters

ES-L Errored Seconds

This parameter is a count of seconds containing one or more bipolar violations (for both AMI and B8ZS types of coding), or one or more loss of signal defects from the DSX-1.

DS3 Parameters

Performance Monitoring Enabling

Collection of DS3 path parameters are initiated only when a slot is equipped with a DS3 circuit pack, the port is in the IS or NMON state, the DS3 port is provisioned for P-Bit violation monitoring (VM mode) or P-Bit violation monitoring and removal (VMR mode), and a default or manual STS-1 cross-connection is present. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the input signal to the DS3 interface is removed and the **update** command or the UPD/INIT button is pressed (transitioning to the AUTO state). Alternatively, the DS3 path parameter can be disabled by setting the DS3 port to the clear channel mode (CC) using the **set-t3** command. For Release 7.1 and later releases, the PM mode parameter should be set to "on" (default) using the **set-t3** command to start PM data monitoring and reporting.

DS3 Performance Monitoring

The DS3 performance monitoring is enabled as specified in Table 9-9.

Table 9-9. DS3 Performance Monitoring Enabling

DS3 Port State	Mode		
	VMR	VM	CC
IS (In Service)	Yes	Yes	No
AUTO	No	No	No
NMON (Not Monitored)	Yes	Yes	No

DS3 Path

P-Bit Coding Violations

This parameter is a count of the number of P-bit parity errors in the DS3 signal received from the fiber. To detect degradation of the signal incoming from the fiber, P-bit errors are counted and thresholded independently for all DS3 interfaces provisioned in violation monitor (VM) or violation monitor and removal (VMR) mode. By provisioning all network elements in the DS3 path to the VM mode, P-bit coding violations can be used as a DS3 path performance parameter.

CV-P Coding Violations

CV-P coding violations are a count of the number of P-bit or adjusted F&M bit parity errors in the DS3 signal received from the fiber and the DSX-3. To detect degradation of the signal, these errors are counted and thresholded independently for all DS3 interfaces provisioned in violation monitor (VM) or violation monitor and removal (VMR) mode. By provisioning all network elements in the DS3 path to the VM mode, coding violations can be used as a DS3 path performance parameter when the P-bit option is selected. When the F&M-bit option is selected, network elements could be provisioned in VMR or VM mode. See Table 9-10.

Errored Seconds (ES-P)

An "errored second" is a second in which one or more DS3 P-bit or adjusted F&M-bit coding violations are detected. Errored seconds are not counted during "unavailable seconds." Errored seconds are counted and thresholded independently for each DS3 path terminated by the system.

Severely Errored Seconds (SES-P)

A "severely errored second" is a second in which 44 or more DS3 P-bit or adjusted F&M-bit coding violations are detected. Severely errored seconds are not counted during "unavailable seconds." Severely errored seconds are counted and thresholded independently for each DS3 path terminated by the system.

Unavailable Seconds (UAS-P)

An "unavailable second" is a second during which the DS3 path is "unavailable." A DS3 path is considered "unavailable" from the beginning of X consecutive severely errored seconds until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the DS3 signal failure. Y is equal to 10 seconds of no severely errored seconds or DS3 signal failures. If there is an unprotected DS3 circuit pack failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. Unavailable seconds are counted and thresholded independently for each DS3 path terminated by the system. This applies to P-bit and adjusted F&M bit options.

Severely Errored Frame Seconds (SEFS)

Severely errored frame seconds are a count of the number of seconds during which an out-of-frame or alarm indication signal (AIS) condition exists for a DS3 signal received from the fiber or the DSX-3, or during an unprotected DS3 circuit pack failure. SEFSs are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode.

DS3 Line

CV-L Coding Violations

This parameter is a count of B3ZS bipolar violations (BPV) occurring over the accumulation period. BPVs that are part of the zero substitution code are excluded.

ES-L Errored Seconds

This parameter is a count of seconds containing one or more BPVs, or one or more loss of signal (from the DSX-3) defects.

SES-L Severely Errored Seconds

This parameter is a count of seconds during which BPVs exceed 44, or one or more loss of signal defects occur.

Table 9-10. Enhanced DS3 Performance Monitoring Modes

Mode	PM Option	Monitor P-Bits	Monitor F&M Bits	Correct P-Bits	Correct F&M Bits	Monitor Line PM
VMR	P-bit	Yes	No	Yes	No	Yes
VMR	F&M-bit	No	Yes	Yes	No	Yes
VM	P-bit	Yes	No	No	No	Yes
VM	F&M-bit	No	Yes	No	No	Yes
CC	P-bit	No	No	No	No	Yes
CC	F&M-bit	No	No	No	No	Yes

Performance Monitoring Data Storage and Reports

The DDM-2000 OC-3 Multiplexer provides current quarter-hour and current day registers for all accumulated performance parameters. Current quarter-hour and previous quarter-hour registers for the preceding 8 hours also are provided for all accumulated performance parameters except DS1 parameters.

The DDM-2000 OC-3 Multiplexer has the capability to initialize the current registers through the CIT locally or remotely at any time, as well as to report the contents of any register at any time. Refer to the **`init-pm`**, **`rtrv-pm-line`**, **`rtrv-pm-sect`**, **`rtrv-pm-sts1`**, **`rtrv-pm-t3`**, and **`rtrv-pm-tca`** commands in Section 11, "Commands and Reports."

Performance Monitoring During Failed Conditions

When the DDM-2000 OC-3 Multiplexer detects a trouble condition, the system stops accumulating affected performance parameters. Parameters that continue to provide useful information are accumulated during the trouble condition.

Performance Parameter Thresholds

The DDM-2000 OC-3 Multiplexer provides performance thresholds to alert maintenance staff of degraded transmission. Whenever the threshold for a parameter is exceeded, the DDM-2000 OC-3 Multiplexer generates a threshold-crossing alert (TCA) to alert the OS (via the TBOS or TL1/X.25 interface) to the condition. A summary of all TCAs is available in the performance monitoring TCA summary report. Current quarter-hour and current day thresholds for each parameter are provisionable, via the CIT, on a per shelf basis. Therefore, if values other than the defaults are to be used, only one value needs to be set for each parameter. Generation of TCAs can be disabled independently for each performance parameter. Performance data is still collected if thresholding is disabled. Refer to the **`rtrv-pmthres-line`**, **`rtrv-pmthres-sect`**, **`rtrv-pmthres-sts1`**, **`rtrv-pmthres-t3`** **`set-pmthres-line`**, **`set-pmthres-sect`**, **`set-pmthres-sts1`**, **`set-pmthres-t3`**, **`rtrv-pm-tca`**, **`rtrv-pmthres-vt1`**, **`rtrv-pmthres-t1`**, **`set-pmthres-vt1`**, and **`set-pmthres-t1`** commands in Section 11, "Commands and Reports."

TCA Transmission to OS

To trigger proactive maintenance activity at the OS, each DDM-2000 OC-3 Multiplexer TBOS display contains one summary level performance monitoring TCA point. When the TL1/X.25 interface to the network monitoring and analysis (NMA) operations system is used, threshold crossings are reported to NMA via **REPT-EVT** messages.

Reports

This section provides information in reports available through the CIT. For reports available through the X.25 link, refer to AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide.*

Alarms and Status Report

The system provides a report that lists all active alarm and status conditions. The identity of the condition (circuit pack failure, incoming OC-3 signal failure, etc.) is included in the report along with a time stamp indicating when the condition was detected.

See the **rtrv-alm** command in Section 11, "Commands and Reports" for a complete list of the alarm and status conditions that are reported by the system.

Provisioning Reports

Provisioning reports list the current state of all provisionable options in the system. See the **rtrv-attr-alm**, **rtrv-attr-cont**, **rtrv-attr-env**, **rtrv-crs-sts1**, **rtrv-crs-vt1**, **rtrv-fecom**, **rtrv-lgn**, **rtrv-link**, **rtrv-ne**, **rtrv-oc3**, **rtrv-pmthres-line**, **rtrv-pmthres-sect**, **rtrv-pmthres-sts1**, **rtrv-pmthres-t1**, **rtrv-pmthres-t3**, **rtrv-pmthres-vt**, **rtrv-secu**, **rtrv-state**, **rtrv-state-equip**, **rtrv-state-path**, **rtrv-state-ec1**, **rtrv-state-sts1**, **rtrv-sts1**, **rtrv-sync**, **rtrv-t1**, **rtrv-t3**, **rtrv-ulsdcc**, **rtrv-state-vt1** and **rtrv-vt1** commands in Section 11, "Commands and Reports."

Performance Monitoring Reports

TCA Summary Report

The TCA summary report lists the sum of the number of threshold crossings within the last 8 hours for quarter-hour thresholds and the number of threshold-crossings for the current day and current quarter hour for daily thresholds. This snapshot provides an overall view of system performance. If there are TCAs identified, it identifies which performance status report to look at for a detailed view of those parameters. See the **rtrv-pm-tca**, command in Section 11, "Commands and Reports."

Performance Status Reports

The system provides reports that contain a snapshot of all current and previous performance monitoring registers. The time at which registers were last reinitialized is included. The option to display a specified subset of parameters (for example, line parameters only, data for only one OC-3 line or DS3 port, etc.) is also provided. See the **rtrv-pm-sect**, **rtrv-pm-line**, **rtrv-pm-sts1**, **rtrv-pm-vt1**, **rtrv-pm-t1**, and **rtrv-pm-t3** commands in Section 11, "Commands and Reports." Equivalent reporting information is available through TL1/X.25 commands. Refer to AT&T 824-102-148, *2000 Family of Products Operations Systems Engineering Guide.*

Maintenance History Report

A maintenance history report containing the past 500 (60 in Releases 2.0 and 3.0) alarm, status, protection switching, and CIT (for example, provisioning, loopback request, manual protection, etc.) events is provided. This summary contains real time and date stamps indicating when each condition was detected and when it cleared; CIT events contain a time stamp indicating when the command was entered. Alarm and status entries in the retrieve history report are not subject to holdoff and clear delay. See the **rtrv-hsty** command in Section 11, "Commands and Reports."

State Report

The state report lists the state of all slots and low-speed ports on the system. DS1, DS3, and EC-1 ports can be in the AUTO (available for automatic provisioning), IS (in service), or NMON (not monitored) states. When a good signal from the DSX is detected, a port in the AUTO state automatically transitions to the IS state and is monitored for failures. When a port is in the NMON state, the signal coming from the DSX is not monitored. This report also includes the protection switching state ("active" or "standby") and protection switching priority of all protected lines and equipment in the system. See the **rtrv-state** command in Section 11, "Commands and Reports."

Path State Report

This report is applicable to Release 5.1 and later ring releases. The report lists each STS-1 and VT1.5 active and standby path in a path switched ring configuration. The active paths are identified and the protection switching status of each path is provided. See the **rtrv-state-path** command in Section 11, "Commands and Reports."

Equipment Report

This report displays the equipage and version information for one or more slots. Refer to the **rtrv-eqpt** command in Section 11, "Commands and Reports."

Network Map Report

This report shows the names ("Target Identifiers," or "TIDs") of other DDM-2000 systems in the subnetwork and the gateway network element (GNE) for the subnetwork. Refer to the **rtrv-nmap** (**rtrv-map-networks** for Release 7.2 and later) command in Section 11, "Commands and Reports."

Technical Specifications

10

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Technical Specifications

10

Overview

This section contains the technical specifications for the DDM-2000 OC-3 Multiplexer.

External Transmission Interfaces

The DDM-2000 OC-3 Multiplexer transmission interfaces adhere to industry standards as listed in Table 10-1.

Table 10-1. Transmission Interface Standards

Interface	Standard	Comments
DS1 low-speed	CB-119, *ANSI** T1.102-1993	B8ZS/AMI option
	TR-499, Iss. 5, *ANSI* T1.403-1989	SF, ESF
DS3 low-speed	CB-119, *ANSI* T1.102-1993, TR-499, Iss. 5	VMR, VM, or clear channel
OC-3	*ANSI* T1.106/88, *ANSI* T1.105/91, TR-253, Iss. 2, TR-496, Iss. 3	—
EC-1	*ANSI* T1.102-1993 & TR-253, Iss. 2	—

* Registered trademark of American National Standards Institute.

Electrical Interfaces

The DDM-2000 OC-3 Multiplexer supports DS1 electrical, DS3 electrical, and EC-1 electrical high-speed (Release 6.0) and low-speed (Releases 5.1 and 6.0) interfaces.

DS1 Low-Speed (BBF1B)

- Electrical Specification

  The DS1 low-speed interface transmits and receives a standard electrical DS1 signal as specified in *ANSI** T1.102-1993 (draft), Section 2 (1.544 Mb/s nominal rate, DSX-1 interconnect specification). Line coding is provisionable to alternate mark inversion (AMI) with or without bipolar 8-zero substitution (B8ZS). Line buildout is provisionable as follows:

  — 613C (22 gauge): 30 to 655 ft.

  — 1249-C (26 gauge): 30 to 450 ft.

- Format Specification

  The DS1 low-speed interface provides clear channel transport of any DSX-1 compatible signal. There are no format constraints on this interface.

- Alarm Thresholding

  The following parameters are monitored at the DS1 interface:

  — Loss of signal

  — Line coding violations.

* Registered trademark of American National Standards Institute.

The alarm level for each of the monitored parameters can be provisioned to critical (CR), major (MJ), minor (MN), or status. B8ZS and AMI coding violation failure thresholds are user settable to 10^{-3} or 10^{-6} bit error ratio (BER).

DS1PM Low-Speed (BBF3)

- Electrical Specification

The DS1PM low-speed interface transmits and receives a standard electrical DS1 signal as specified in *ANSI* T1.102-1993, Section 2 (1.544 Mb/s nominal rate, DSX-1 interconnect specification). Line coding is provisionable to AMI with or without B8ZS. Line buildout is provisionable as follows:

— 613C (22 gauge): 30 to 655 ft.

— 1249-C (26 gauge): 30 to 450 ft.

- Format Specification

The DS1PM low-speed interface can be provisioned for the following DS1 formats: clear channel (default), superframe (SF) as specified in *ANSI* T1.403-1989, or extended superframe (ESF) as specified in *ANSI* T1.403-1989. In the case of SF or ESF format selections, DS1 performance information is collected by monitoring the associated DS1 framing format.

- Alarm Thresholding

The following parameters are monitored at the DS1PM interface:

— Loss of signal

— Line coding violations.

The alarm level for each of the monitored parameters can be provisioned to CR, MJ, MN, or status. B8ZS and AMI coding violation failure thresholds are user settable to 10^{-3} or 10^{-6}.

- Performance Monitoring (see Table 10-14)

— DS1 Path
Errored Seconds

An "errored second" for a DS1 SF format is a second in which one or more FEs, or a DS1 AIS, or a DS1 OOF is detected. A near-end "errored second" for a DS1 ESF path is a second in which one or more CRC-6 violations, or a DS1 AIS, or OOF is detected. Errored seconds are not counted during "unavailable seconds". For a DS1 path with the ESF format, the far-end "errored seconds" values are obtained from the performance report message (PRM) in the ESF data link.

— Severely Errored Second

For the DS1 SF format, a "severely errored second" is a second in which eight or more FEs are detected, or an OOF, or DS1 AIS is detected. For the DS1 ESF format, a near-end severely errored second is a second in which 320 or more CRC-6 violations, or a DS1 AIS, or DS1 OOF are detected. For a DS1 path with the ESF format, the far-end "severely errored seconds" values are obtained from the PRM in the DS1 ESF data link. Severely errored seconds are not counted during "unavailable seconds". For a DS1 path with ESF format, the far-end "severely errored seconds" values are obtained from the PRM.

— Unavailable Seconds

A DS1 path is considered "unavailable" from the beginning of 10 consecutive severely errored seconds until the beginning of 10 consecutive seconds, none of which is severely errored. If there is a DS1 pack failure then unavailable seconds are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. Unavailable seconds are counted and thresholded separately for each DS1 path monitored by the system.

For a DS1 path with ESF format, the far-end "unavailable second" performance is obtained from the PRM.

— CV-P Coding Violations (Release 7.2 and later)

This indicates the number of DS1 near-end path coding violations during the data collection interval. For a DS1 in SF format, this is a count of framing bit errors. For a DS1 in ESF format, this is a count of CRC-6 bit errors.

— CV-PFE Coding Violations (Release 7.2 and later)

This indicates the number of DS1 far-end path coding violations during the data collection interval. This parameter is only applicable to a DS1 signal in ESF format. This is a count of CRC-6 bit errors as reported in the G bits of the PRM.

— DS1 Line Parameters
ES-L Errored Seconds (Release 7.2 and later)

This parameter is a count of seconds containing one or more bipolar violations (for both AMI and B8ZS types of coding), or one or more loss of signal defects from the DSX-1.

DS3 Low-Speed (BBG4/4B)

- Electrical Specification

  The low-speed DS3 interface transmits/receives a standard electrical DS3 signal as specified in *ANSI* T1.102-1993, Section 5 [44.736 Mb/s rate, DSX-3 interconnect specification, bipolar 3-zero substitution (B3ZS) encoding]. However, the signal does not have to contain a standard DS3 frame.

  Line buildout is provisionable as follows:

  — 734A/D: 0 to 450 ft.

  — Mini-coax (KS-19224, L2): 0 to 150 ft.

  — 735A: 0 to 250 ft.

- Format Specification

  The DS3 low-speed interface provides clear channel transport of any DSX-3 compatible signal (M13 mode, framed clear channel, unframed clear channel). Thus, there are no format requirements on this interface.

- Alarm Thresholding

  The following parameters are monitored at the DS3 interface to the DSX-3:

  — Loss of signal

  — Line coding violations.

  The alarm level for each of the monitored parameters can be provisioned to CR, MJ, MN, or status. B3ZS coding violation failure threshold is user settable to 10^{-3} or 10^{-6} BER.

- Performance Monitoring (see Table 10-14)

  — DS3 parity errors (P-Bits)

  — Severely errored frame seconds.

Table 10-2. DS3 Interface Modes

	Monitor P-Bits	Correct P-Bits
VMR mode	Yes	Yes
VM mode	Yes	No
CC mode	No	No

If provisioned in the VMR or VM modes (Table 10-2), DS3 P-bit violations and severely errored frame seconds are counted and the counts are thresholded to flag detected performance degradation of the DS3 signal incoming from the fiber.

- Enhanced DS3 Performance Monitoring (see Table 10-14)

  — CV-P Coding Violations

  These errors are counted and thresholded independently for all DS3 interfaces provisioned in violation monitor (VM) or violation monitor and removal (VMR) mode. When the F&M bit option is selected, network elements could be provisioned in VMR or VM mode. See Table 10-3.

Table 10-3. Enhanced DS3 Performance Monitoring Modes

Mode	PM Option	Monitor P-Bits	Monitor F&M Bits	Correct P-Bits	Correct F&M Bits	Monitor Line PM
VMR	P-bit	Yes	No	Yes	No	Yes
VMR	F&M-bit	No	Yes	Yes	No	Yes
VM	P-bit	Yes	No	No	No	Yes
VM	F&M-bit	No	Yes	No	No	Yes
CC	P-bit	No	No	No	No	Yes
CC	F&M-bit	No	No	No	No	Yes

  — Errored Seconds (ES-P)

  Errored seconds are not counted during "unavailable seconds." Errored seconds are counted and thresholded independently for each DS3 path terminated by the system.

  — Severely Errored Seconds (SES-P)

  A "severely errored second" is a second in which 44 or more DS3 P-bit, or adjusted F&M bit coding violations are detected. Severely errored seconds are not counted during "unavailable seconds." Severely errored seconds are counted and thresholded independently for each DS3 path terminated by the system.

  — Unavailable Seconds (UAS-P)

  An "unavailable second" is a second during which the DS3 path is "unavailable." A DS3 path is considered "unavailable" from the beginning of X consecutive severely errored seconds until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the DS3 signal failure. Y is equal to 10 seconds of no severely errored seconds or DS3 signal failures. If there is an unprotected DS3 circuit

pack failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. Unavailable seconds are counted and thresholded independently for each DS3 path terminated by the system.

— Severely Errored Frame Seconds (SEFS)

Severely errored frame seconds are a count of the number of seconds during which an out-of-frame or alarm indication signal (AIS) condition exists for a DS3 signal received from the fiber or the DSX-3, or during an unprotected DS3 circuit pack failure. SEFSs are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode.

— CV-L Coding Violations (Release 7.2 and later)

This parameter is a count of B3ZS bipolar violations (BPV) occurring over the accumulation period. BPVs that are part of the zero substitution code are excluded.

— ES-L Errored Seconds (Release 7.2 and later)

This parameter is a count of seconds containing one or more BPVs, or one or more loss of signal (from the DSX-3) defects.

— SES-L Severely Errored Seconds (Release 7.2 and later)

This parameter is a count of seconds during which BPVs exceed 44, or one or more loss of signal defects occur.

EC-1 High-Speed and Low-Speed (BBG6)

■ Electrical Specification

The EC-1 high-speed and low-speed interface transmits and receives a standard electrical EC-1 signal as specified in *ANSI* T1.102-1993 [51.844 Mb/s rate, STSX-1 interconnect specification, bipolar 3-zero substitution (B3ZS) encoded and scrambled].

Line buildout is provisionable as follows:

— 734A/D: 0 to 450 ft.

— Mini-Coax (KS-19224, L2): 0 to 150 ft.

— 735A: 0 to 250 ft.

- Format Specification

  The EC-1 high-speed port interfaces with an EC-1 signal compatible with the electrical STS-1 interface specification in ANSI T1.102 and containing a VT1.5 structured STS-1 with an asynchronous DS1 mapping. The EC-1 high-speed interface provides both line and STS-1 path termination functions.

  The EC-1 low-speed interface provides clear channel transport of any STS-1 signal compatible with the electrical STS-1 interface specification in ANSI T1.102. The EC-1 low-speed port can be provisioned to provide the path termination functions for a VT1.5 structured STS-1 with an asynchronous DS1 mapping.

- Alarm Thresholding

  The following parameters are monitored at the EC-1 interface to the STSX-1:

  — Loss of signal

  — Loss of frame

  — Loss of pointer

  — Line alarm indication signal (AIS)

  — B2 thresholding signal fail

  — B2 thresholding signal degrade.

  The alarm level for each of the monitored parameters can be provisioned for CR, MJ, MN, or status. B2 signal degrade thresholds are user settable in the range from 10^{-6} to 10^{-9} BER.

- Performance Monitoring (see Table 10-14)

  — EC-1 line performance monitoring.

Optical Interfaces

The DDM-2000 OC-3 Multiplexer supports two OC-3 high-speed interfaces that are synchronous optical network (SONET) compliant: the 21G/21G-U and 22F optical line interface units (OLIUs). The DDM-2000 OC-3 Multiplexer also supports a long-reach OC-3 interface: the 22G-U/22G2-U OLIU. In addition, the DDM-2000 OC-3 Multiplexer supports two optical interconnect signal level 3 (IS-3) low-speed interfaces: the 21D/21D-U and 22D-U OLIUs. The nominal OC-3 and IS-3 line rates are 155.520 Mb/s.

Lightguide Jumpers

The DDM-2000 OC-3 lightguide interface uses both single-mode and multimode jumpers for connecting to and from the outside plant *LGX*® panel and the DDM-2000 OC-3.

When the outside plant lightguide is multimode, a single-mode or multimode jumper can be used between the *LGX* panel and the DDM-2000 OC-3 on the transmit (OUT) side. Multimode must be used on the receive (IN) side of all OLIUs.

When the outside plant lightguide is single-mode, a single-mode jumper must be used for the transmit side and either single-mode or multimode jumpers can be used for the receive side of all OLIUs.

Regardless of the type of fiber in the outside plant, the 21D/21D-U and 22D-U OLIUs, used for intershelf OC-3/OC-12 interconnection, must use multimode jumpers on the transmit side.

Lightguide jumpers can be ordered from AT&T. See AT&T 363-206-200, *DDM-2000 Multiplexer Applications, Planning, and Ordering Guide*, for ordering information.

Long Reach OC-3 Interface (21G/21G-U OLIU)

- Optical Specification

  The 21G/21G-U OLIU photonics meet or exceed SONET long reach specifications (TR 253 - LR-1 MLM category). The multilongitudinal mode laser transmitter supplies a non-return-to-zero (NRZ) coded signal. The positive intrinsic negative field effect transistor (PINFET) receiver allows direct optical loopback without the use of an external attenuator when the TRANSMIT POWER switch is on the low setting.

  The 21G/21G-U OLIU long reach OC-3 interface supports span lengths up to 55 km, assuming 0.45 dB/km single-mode fiber (including splices) and the span engineering rules outlined in Table 10-5. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Tables 10-4, 10-5, and 10-8 provide detailed specifications and link budget information for the 21G/21G-U OLIU.

- Alarm Thresholding

  The following parameters are monitored at the OC-3 interface.

  — Loss of signal

  — Loss of frame

- — Loss of pointer
- — Line AIS
- — B2 thresholding signal fail
- — B2 thresholding signal degrade.

B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.

- Performance Monitoring (see Table 10-14)
  - — Section severely errored frame seconds (SEFS)
  - — Line parameter B2
  - — Laser bias current
  - — Transmit power
  - — Receive power.

Intermediate Reach OC-3 Interface (22F OLIU)

- Optical Specification

  The 22F OLIU photonics meet or exceed SONET intermediate reach specifications (TR 253 - IR-1 MLM category). The multilongitudinal mode laser transmitter supplies an NRZ-coded signal. The PINFET receiver allows direct optical loopback without the use of an external attenuator.

  The 22F OLIU intermediate reach OC-3 interface supports span lengths up to 33 km, assuming 0.45 dB/km single-mode fiber and the span engineering rules outlined in Table 10-7. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Tables 10-6, 10-7, and 10-8 provide detailed specifications and link budget information for the 22F OLIU.

- Alarm Thresholding

  The following parameters are monitored at the OC-3 interface.

  - — Loss of signal
  - — Loss of frame
  - — Loss of pointer
  - — Line AIS
  - — B2 thresholding signal fail
  - — B2 thresholding signal degrade.

B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.

- Performance Monitoring (see Table 10-14)
  - — Section SEFS
  - — Line parameter B2.

Long Reach OC-3 Interface (22G-U/22G2-U OLIU)

- Optical Specification

  The multilongitudinal mode laser transmitter supplies an NRZ-coded signal. For direct optical loopbacks (22G-U only), at least 7.0 dB (use 10 dB attenuator, see Table 10-12) of attenuation is needed.

  The 22G-U/22G2-U OLIU long reach OC-3 interface supports span lengths up to 51 km, assuming 0.45 dB/km single-mode fiber and the span engineering rules outlined in Table 10-7. Transmit and receive powers are referenced to Points S and R as shown in Figure 10-1. Tables 10-6, 10-7, and 10-8 provide detailed specifications and link budget information for the 22G-U/22G2-U OLIU.

- Alarm Thresholding

  The following parameters are monitored at the OC-3 interface.
  - — Loss of signal
  - — Loss of frame
  - — Loss of pointer
  - — Line AIS
  - — B2 thresholding signal fail
  - — B2 thresholding signal degrade.

  B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.

- Performance Monitoring (see Table 10-14)
  - — Section SEFS
  - — Line parameter B2.

Intraoffice (IS-3) OC-3 Rate Interface (21D/21D-U and 22D-U OLIUs)

- Optical Specification

  The 21D/21D-U and 22D-U OLIUs are low-cost optical interface used to interconnect between the DDM-2000 OC-3 and OC-12 Multiplexers. The nominal line rate is 155.520 Mb/s. The LED transmitter supplies an NRZ-coded signal.

  Tables 10-4, 10-5, and 10-8 provide detailed specifications and link budget information for the 21D/21D-U and 22D-U OLIUs.

- Alarm Thresholding

  The following parameters are monitored at the OC-3 interface.

  — Loss of signal

  — Loss of frame

  — Loss of pointer

  — Line AIS

  — B2 thresholding signal fail

  — B2 thresholding signal degrade.

  B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.

- Performance Monitoring (see Table 10-14)

  — Section SEFS

  — B2 parameters.

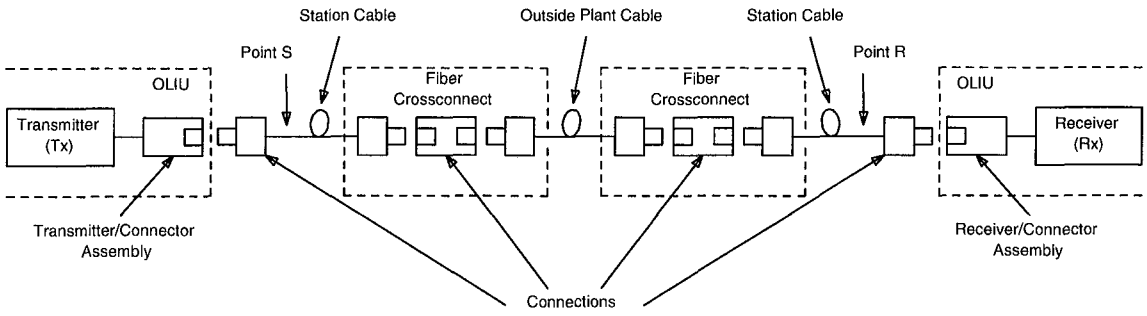


Figure 10-1. Optical System Interfaces (Points S and R)

Table 10-4 lists the 21G/21G-U and 21D/21D-U/22D-U OLIU specifications.

Table 10-4. 21G/21G-U and 21D/21D-U/22D-U OLIU Specifications

System Information:		
Terminal Equipment Identification	21G/21G-U OLIU	21D/21D-U/22D-U OLIU *
Optical Line Rate (Mb/s)	155.520 Mb/s	155.520 Mb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1310 nm	1310 nm
Performance	SONET LR-1 MLM (Long Reach)	Not applicable
Transmitter Information:		
Optical Device Temperature Controller	TEC	No TEC
FDA Classification	Class I	Class I
Optical Source	InGaAsP Laser, MLM Structure	LED
Faceplate Optical Connector	AT&T ST® C3000-A-2 (21G) UOC buildout assembly * (21G-U) Single Mode	AT&T *ST* C2000-A-2 (21D) UOC buildout assembly * (21D-U, 22D-U) Multimode/
Receiver Information:		
Optical Device Temperature Controller	None	None
Optical Detector	InGaAsP PIN	InGaAsP PIN
Faceplate Optical Connector	*ST* C2000-A-2 (21G) UOC buildout assembly * (21G-U) Multimode	AT&T *ST* C2000-A-2 (21D) UOC buildout assembly * (21D-U, 22D-U) Multimode

* The universal optical connector (UOC) buildout assembly consists of a faceplate-mounted block assembly and either 0 dB, 5 dB, 10 dB, or 15 dB buildout in either *ST*, SC, or FC-type connectors.

Table 10-5. 21G/21G-U and 21D/21D-U/22D-U OLIU Link Budgets (Note 1)

Parameter	21G/21G-U		21D/21D-U/22D-U
	Tx High (Note 2)	Tx Low	
Minimum Wavelength (λ_{Tmin})	1282/1280* nm	1282/1280* nm	1270/1260* nm
Maximum Wavelength (λ_{Tmax})	1325/1335* nm	1325/1335* nm	1380 nm
Spectral Width ($\delta\lambda_{rms}$)	4.0 nm	4.0 nm	170 nm ¶¶
Maximum Transmitter Power† (P_{Tmax})	–2.5 dBm	–7.5 dBm	–14.0 dBm
Minimum Transmitter Power (P_{Tmin})	–5.0 dBm	–11.4 dBm	–18.8/–21.8 dBm
Maximum Received Power (P_{Rmax})	–7.0 dBm	–7.0 dBm	–14.0 dBm
Receiver Sensitivity (P_{Rmin})	–34.0 dBm	–34.0 dBm	–33.8/–31.8* dBm
Minimum System Gain (S-R)‡	29.0 dB	22.6 dB	15/10.0* dB
Optical Path Penalty (P_O)§	1.0 dB	1.0 dB	1.6 dB
Connector Loss¶	1.5 dB	1.5 dB	1.5 dB
Unallocated Margin**	1.5 dB	1.5 dB	2.0 dB
Minimum Loss Budget	4.5 dB††	0.0 dB	0.0 dB
Maximum Loss Budget‡‡	**25.0 dB**	**18.6 dB**	**9.9/4.9* dB**
Maximum Span Length§§	55 km	41 km	(Note 3)

Notes:

1. All terminology is consistent with TR-253, Iss. 2. All specifications for 21G/21G-U OLIU meets or exceeds long reach (LR) values described in TR-253, Iss. 2.
2. The High/Low transmitted power switch on the 21G/21G-U OLIU circuit pack allows for loopbacks or small outside plant (OSP) budgets without external attenuators.
3. Multimode only. See Table 10-8.

* When two numbers are given, the number before the slash is the specification for operating under controlled environmental conditions. The number following the slash is the specification for uncontrolled environmental conditions. If only one number is given, it applies to both controlled and uncontrolled environmental conditions.

† Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.

‡ The minimum system gain for the DDM-2000 already takes into account aging, temperature, and manufacturing tolerances as these figures are built into the minimum transmitter power. The DDM-2000 system gain can, thus, not be directly compared with the DDM-1000 system gain because the DDM-1000 system gain does not include all of these effects. A similar penalty, called eye margin, is subtracted from the DDM-1000 loss budget after the value of system gain is determined.

Table 10-5. 21G/21G-U and 21D/21D-U/22D-U OLIU Link Budgets (Contd)

§ Optical path penalty includes effects of dispersion, reflection and jitter that occur on the optical path.

¶ One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.

** Unallocated margin, or safety margin, is typically specified from 0 dB to 3 dB.

†† If the loss budget is less than 6.0 dB, use low power. Includes a 1.5 dB safety margin.

‡‡ Budget available for both station and transmission cable and splices.

§§ Attenuation and dispersion can be the limiting factors in span length. For OC-3 single-mode fiber systems, dispersion is not a factor and all applications are attenuation limited. For OC-12 systems, the maximum distance could be either attenuation limited or dispersion limited. The limits must be calculated based on both factors and the lesser of the two defines the actual maximum span length. A rough rule of thumb for attenuation-limited systems is 0.45 dB/km. This estimate includes typical cable loss (0.4 dB/km) and splice loss (0.2 dB per splice, 11 total splices) associated with single-mode fiber.

Maximum span length can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

¶¶ Full width at half maximum (FWHM) spectral width.

Table 10-6 lists the 22F, 22G-U, and 22G2-U OLIU specifications.

Table 10-6. 22F and 22G-U/22G2-U OLIU Specifications

System Information:		
Terminal Equipment Identification	22F OLIU	22G-U/22G2-U OLIU
Optical Line Rate (Mb/s)	155.520 Mb/s	155.520 Mb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1310 nm	1310 nm
Performance	SONET IR-1 MLM (Intermediate Reach)	Not applicable
Transmitter Information:		
Optical Device Temperature Controller	No TEC	No TEC
FDA Classification	Class I	Class I
Optical Source	InGaAsP Laser, MLM Structure	InGaAsP Laser, MLM Structure
Faceplate Optical Connector	AT&T ST (Integral to transmitter) Single Mode	UOC buildout assembly * Single Mode
Receiver Information:		
Optical Device Temperature Controller	None	None
Optical Detector	InGaAsP PIN	InGaAsP PIN (22G-U) InGaAs PIN (22G2-U)
Faceplate Optical Connector	AT&T *ST* C2000-A-2 Multimode	UOC buildout assembly * Multimode

* The universal optical connector (UOC) buildout assembly consists of a faceplate-mounted block assembly and either 0 dB, 5 dB, 10 dB, or 15 dB buildout in either *ST*, SC, or FC-type connectors.

Table 10-7. 22F and 22G-U/22G2-U OLIU Link Budgets (Note 1)

Parameter	22F	22G-U	22G2-U
Minimum Wavelength (λ_{Tmin})	1260 nm	1272 nm	1272 nm
Maximum Wavelength (λ_{Tmax})	1360 nm	1350 nm	1350 nm
Spectral Width ($\delta\lambda_{rms}$)	7.7 nm	3.0 nm	3.0 nm
Maximum Transmitter Power† (P_{Tmax})	–8.0 dBm	0.0 dBm	0.0 dBm
Minimum Transmitter Power (P_{Tmin})	–15.0 dBm	–7.0 dBm	–7.0 dBm
Maximum Received Power (P_{Rmax})	–7.0 dBm	–7.0 dBm	0.0 dBm
Receiver Sensitivity (P_{Rmin})	–34.0 dBm	–34.0 dBm	–34.0 dBm
Minimum System Gain (S-R)‡	19.0 dB	27.0 dB	27.0 dB
Optical Path Penalty (P_O)§	1.0 dB	1.0 dB	1.0 dB
Connector Loss¶	1.5 dB	1.5 dB	1.5 dB
Unallocated Margin**	1.5 dB	1.5 dB	1.5 dB
Minimum Loss Budget	0.0 dB	7.0 dB	0.0 dB
Maximum Loss Budget‡‡	**15.0 dB**	**23.0 dB**	**23.0 dB**
Maximum Span Length§§	33 km	51 km	51 km

Notes:

1. All terminology is consistent with TR-253, Iss. 2. All specifications for the 22F OLIU meet or exceeds intermediate reach (IR) values described in TR-253, Iss. 2.

† Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.

‡ The minimum system gain for the DDM-2000 already takes into account aging, temperature, and manufacturing tolerances as these figures are built into the minimum transmitter power. The DDM-2000 system gain can, thus, not be directly compared with the DDM-1000 system gain because the DDM-1000 system gain does not include all of these effects. A similar penalty, called eye margin, is subtracted from the DDM-1000 loss budget after the value of system gain is determined.

Table 10-7. 22F and 22G-U/22G2-U OLIU Link Budgets (Contd)

§ Optical path penalty includes effects of dispersion, reflection and jitter that occur on the optical path.

¶ One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.

** Unallocated margin, or safety margin, is typically specified from 0 dB to 3 dB.

‡‡ Budget available for both station and transmission cable and splices.

§§ Attenuation and dispersion can be the limiting factors in span length. For OC-3 single-mode fiber systems, dispersion is not a factor and all applications are attenuation limited. For OC-12 systems, the maximum distance could be either attenuation limited or dispersion limited. The limits must be calculated based on both factors and the lesser of the two defines the actual maximum span length. A rough rule of thumb for attenuation-limited systems is 0.45 dB/km. This estimate includes typical cable loss (0.4 dB/km) and splice loss (0.2 dB per splice, 11 total splices) associated with single-mode fiber.

Maximum span length can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

Table 10-8. OC-3 OLIU Link Budget — Multimode Operation

	Maximum Span Length (km)		
Fiber Bandwidth	**21G/21G-U (Note 1)**	**22F (Note 2)**	**21D/21D-U/22D-U (Note 3)**
1000 MHz-km	6.5	6.5	3.6/3.4
800 MHz-km	5.1	5.1	3.4/3.3
500 MHz-km	3.1	3.1	2.7
300 MHz-km	1.8	1.8	1.9

Notes:

1. Maximum 21G/21G-U MM Link Budget (dB) for multimode operation is 22.0 dB for high power and 15.6 dB for low power.
2. Maximum 22F MM Link Budget (dB) for multimode operation is 12.0 dB
3. When two numbers are given, the number before the slash is the specification for operating under controlled environmental conditions. The number following the slash is the specification for uncontrolled environmental conditions. If only one number is given, it applies to both controlled and uncontrolled environmental conditions.

The system is dispersion limited for all the fiber bandwidths listed in Table 10-8.

Multimode fiber operation on the DDM-2000 OC-3 Multiplexer requires a minimum exit bandwidth of 120 MHz to ensure that dispersion loss is kept below acceptable levels. If the fiber is already installed and the exit bandwidth is measured to be 120 MHz or greater, then the maximum link budget values (See Notes 1 and 2) can be used to determine if the loss budget is sufficient for that fiber.

If planning a new fiber installation, the values at the end of the table, given for a number of commercially available fiber bandwidth-distance products, can be used. Fiber distances are calculated using the 120 MHz exit bandwidth limit; however, actual exit bandwidths may be higher for these distances due to the existence of splices. This may permit longer span lengths to be achieved, for the given fiber bandwidths, than those specified in the table. In this case, however, the span length can only be increased to the point where the system is loss limited as specified by the maximum multimode link budget given in the table (1 dB/km cable is assumed).

OC-3 Optical Interface Mixing

Mixing different OC-3 rate OLIUs at opposite ends of an optical link is often necessary for technical reasons or for convenience. The following information will aid in planning and engineering optical links having different types of OC-3 rate OLIUs at each end of the fiber. Table 10-9 details the minimum link budget necessary for each pairing of OC-3 rate OLIUs.

To use Table 10-9, locate the number at the intersection of the transmitter/receiver pair of interest. This number is the minimum attenuation necessary for proper operation of that transmitter/receiver pair. The link must have at least this much attenuation either from fiber loss, splice loss, connector loss, external attenuators, or a combination of these, or the receiver will be overdriven, and the link will not operate properly.

Table 10-9. OC-3 Rate OLIU Mixes - Minimum Link Budgets (dB)

	Receiver					
Transmitter	21G/21G-U	22F	22G-U*	22G2-U	21D/21D-U/ 22D-U (Ctrld. Env.)	21D/21D-U/ 22D-U (Unctrld. Env.)
21G/21G-U (high power)	4.5	4.5	4.5	0.0	11.5	11.5
21G/21G-U (low power)	0.0	0.0	0.0	0.0	6.5	6.5
22F	0.0	0.0	0.0	0.0	6.0	6.0
22G-U*	7.0	7.0	7.0	0.0	14.0	14.0
22G2-U	7.0	7.0	0.0	0.0	14.0	14.0
21D/21D-U/22D-U (ctrld. env.)	0.0	0.0	0.0	0.0	0.0	0.0
21D/21D-U/22D-U (unctrld. env.)	0.0	0.0	0.0	0.0	0.0	0.0

* The LAA10 FT-2000 OC-3 Optical Interface has the same optical loss budget as the 22G-U and therefore should follow the same optical mixing rules.

Note that the minimum link budget is not always symmetrical. A transmitter/receiver pair may have one minimum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) OLIU transmitting to a 21D/21D-U (controlled environment) OLIU has a minimum link budget of 6.5 dB. In the opposite direction, though, a 21D/21D-U (controlled environment) OLIU transmitting to a 21G/21G-U (low power) OLIU has a minimum link budget of 0.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs.

NOTE:
When using universal optical buildout attenuators for OLIUs equipped with Universal Optical Connectors (for example, 22G-U/22G2-U and 22D-U), the buildout must have the same type fiber on both sides, that is, single-mode to single-mode or multimode to multimode. The buildout must also match the mode of the fiber. Therefore, when a single-mode jumper is used, the buildout would be on the transmit side (OUT) of the OLIU and when a multimode jumper is used, the buildout would be on the receive side (IN) of the OLIU. When using in-line attenuators for non-U OLIUs, place the attenuator in the bay frame PANDUIT. Make sure that the mode type of the attenuator matches the mode of the fiber to ensure proper attenuation.

Table 10-10 details the maximum link budgets for each pairing of OC-3 rate OLIUs when operating on single-mode (SM) fiber. These numbers give the maximum attenuation acceptable for proper operation of each transmitter/receiver pair. The link must have no more than this much attenuation either from fiber loss, splice loss, connector loss, external attenuators or a combination of these or the link will not operate properly. The maximum link budgets for SM fiber were calculated using the following margins:

- Optical Path Penalty (dB) 1.0
- Connector Loss (dB) 1.5
- Unallocated Margin (dB) 1.5.

Table 10-10. OC-3 Rate OLIU Mixes - Maximum Link Budgets for SM Fiber (dB)

	Receiver				
Transmitter	21G/21G-U	22F	22G-U*/ 22G2-U	21D/21D-U/ 22D-U (Ctrld. Env.)	21D/21D-U 22D-U (Unctrld. Env.)
21G/21G-U (high power)	25.0	25.0	25.0	24.8	22.8
21G/21G-U (low power)	18.6	18.6	18.6	18.4	16.4
22F	15.0	15.0	15.0	14.8	12.8
22G-U*/22G2-U	23.0	23.0	23.0	22.8	20.8
21D/21D-U/22D-U (ctrld. env.)	n/a	n/a	n/a	n/a	n/a
21D/21D-U/22D-U (unctrld. env.)	n/a	n/a	n/a	n/a	n/a

* The LAA10 FT-2000 OC-3 Optical Interface has the same optical loss budget as the 22G-U and therefore should follow the same optical mixing rules.

NOTE:
The maximum link budget is not always symmetrical. A transmitter/receiver pair may have one maximum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) OLIU transmitting to a 22F OLIU has a maximum SM link budget of 18.6 dB. In the opposite direction, though, a 22F OLIU transmitting to a 21G/21G-U (low power) OLIU has a maximum SM link budget of 15.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs. Note also that 21D/21D-U and 22D-U OLIUs will not operate when transmitting into single-mode fiber.

Table 10-11 details the maximum link budgets for each pairing of OC-3 rate OLIUs when operating on multimode (MM) fiber. These numbers give the maximum attenuation acceptable for proper operation of each transmitter/receiver pair. The link must have no more than this much attenuation either from fiber loss, splice loss, connector loss, external attenuators or a combination of these or the link will not operate properly. The maximum link budgets for MM fiber were calculated using the following margins. The first column of margins applies to any link where there is at least one OC-3 OLIU (21G/21G-U, 22F or 22G-U/22G2-U). The second column of margins applies to links having two IS-3 (21D/21D-U or 22D-U) OLIUs.

	At Least One OC-3 OLIU	IS-3 OLIUs Only
MM Optical Path Penalty (dB)	4.0	1.6
Connector Loss (dB)	1.5	1.5
Unallocated Margin (dB)	1.5	2.0

NOTE:
The maximum link budget is not always symmetrical. A transmitter/receiver pair may have one maximum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) transmitting to a 22F has a maximum MM link budget of 15.6 dB. In the opposite direction, though, a 22F transmitting to a 21G/21G-U (low power) has a maximum SM link budget of 12.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs.

Table 10-11. OC-3 Rate OLIU Mixes - Maximum Link Budgets for MM Fiber (dB)

	Receiver				
Transmitter	21G/21G-U	22F	22G-U*/ 22G2-U	21D/21D-U/ 22D-U (Ctrld. Env.)	21D/21D-U/ 22D-U (Unctrld. Env.)
21G/21G-U (high power)	22.0	22.0	22.0	21.8	19.8
21G/21G-U (low power)	15.6	15.6	15.6	15.4	13.4
22F	12.0	12.0	12.0	11.8	9.8
22G-U*/22G2-U	20.0	20.0	20.0	19.8	17.8
21D/21D-U/22D-U (ctrld. env.)	8.2	8.2	8.2	9.9	7.9
21D/21D-U/22D-U (unctrld. env.)	5.2	5.2	5.2	6.9	4.9

* The LAA10 FT-2000 OC-3 Optical Interface has the same optical loss budget as the 22G-U/22G2-U and therefore should follow the same optical mixing rules.

Universal Optical Connector Attenuators

The 21D-U, 21G-U, 22D-U, and 22G-U/22G2-U circuit packs have a faceplate-mounted universal optical connector (UOC). This connector is a 2-part connector consisting of a faceplate-mounted block and an optical buildout. The faceplate block optionally supports an *ST*®, SC, or FC-type optical buildout.

A 0 dB *ST*-type connector is shipped as standard with each OLIU. Optional SC or FC 0 dB or attenuated buildouts can be ordered separately as listed in Table 10-11. Table 10-12 lists single-mode (SM) and multimode (MM) attenuated buildouts.

Table 10-12. Universal Buildout Attenuators

Description	Connection	Loss (dB)	Comcode
A3060 SC 0 dB buildout	SM-SM & MM-MM	0	106708951
A3060B1 SC 5 dB buildout	SM-SM	5	107406142
A3060D1 SC 10 dB buildout	SM-SM	10	107406159
A3060F1 SC 15 dB buildout	SM-SM	15	107406167
A3070 *ST* ® 0 dB buildout	SM-SM & MM-MM	0	106795354
A3070B1 *ST* ® 5 dB buildout	SM-SM	5	107406183
A3070D1 *ST* ® 10 dB buildout	SM-SM	10	107406191
A3070F1 *ST* ® 15 dB buildout	SM-SM	15	107406209
A3080 FC 0 dB buildout	SM-SM & MM-MM	0	106795404
A3080B1 FC 5 dB buildout	SM-SM	5	107406225
A3080D1 FC 10 dB buildout	SM-SM	10	107406233
A3080F1 FC 15 dB buildout	SM-SM	15	107406241
A2060B SC 5 dB buildout	MM-MM	5	106795271
A2060D SC 10 dB buildout	MM-MM	10	106795289
A2060F SC 15 dB buildout	MM-MM	15	106795297
A2070B *ST* ® 5 dB buildout	MM-MM	5	106795313
A2070D *ST* ® 10 dB buildout	MM-MM	10	106795321
A2070F *ST* ® 15 dB buildout	MM-MM	15	106795339

SONET Overhead Bytes

The DDM-2000 OC-3 Multiplexer does not use any reserved or unused bytes in the SONET format for proprietary end-to-end signaling. However, the reserved V4 byte in the VT1.5 superframe is used for internal fault detection in a DDM-2000 OC-3 Multiplexer shelf. This internal usage of the V4 byte may cause the value of the transmitted V4 byte to vary.

The DDM-2000 OC-3 Multiplexer does not depend on, and always ignores, the value of the V4 byte received from another DDM-2000 or other shelf with an OC-3 interface.

Performance

Wander/Jitter

- The OC-3 interface accommodates at least 10 microseconds of wander per 24-hour period without buffer overflow or depletion.
- For SONET optical interfaces, the maximum time interval error (MTIE) does not exceed 60 nanoseconds phase variation when timed with a wander-free reference
- Jitter transfer, tolerance, and generation requirements are met as specified in TR-253 and TR-499
- The SONET interfaces meet the T1.101 OC-N output short-term stability mask.

Signal Performance

The following specifications apply given the standard networks defined in TR-499, Issue 5.

- For systems interfacing at the DS1 rate, the number of errored seconds, during a 2-hour, 1-way loopback test, is less than 10.
- For systems interfacing at the DS3 rate, the number of errored seconds, during a 2-hour, 1-way loopback test, is less than 72.
- The bit error rate (BER) is less than 10^{-9} for both the DS1 and DS3 rates. Burst-errored seconds are excluded.
- The frequency of burst-errored seconds, other than those caused by protection switching induced by hard equipment failures, averages less than 4 per day.

Synchronization

Synchronous Timing Generator (BBF2/BBF2B)

The TGS circuit pack meets the specifications of TR-253, SONET Transport Systems Generic Criteria. The TGS circuit pack supports three timing modes:

- External timing: Locked to external Stratum 3 (±4.6 ppm) or better DS1 reference.
- Loop-timing: Locked to recovered clock from an OC-3 signal.
- Free-running: Timing derived from high-stability temperature-compensated voltage-controlled crystal oscillator (TCVCXO) with a long-term accuracy of ±15 ppm and temperature stability of ±8.8 ppm (–40°C to +75°C).

Holdover mode is entered on failure of external timing or loop-timing reference, providing a temperature stability of ±8.8 ppm (–40°C to +75°C). Holdover capability for 24 hours will be ±4.6 ppm.

The DS1 timing output used for network synchronization (BBF2B only) provides long-term accuracy traceable to the OC-3 signal.

SONET synchronization messaging is used to output DS1 alarm indication signal (AIS) when clock traceability is lost (Release 5.1 and later). Jitter on the DS1 output is less than 0.06 unit interval peak-to-peak.

Protection Switching

Linear Networks

Automatic line switches are initiated by signal fail and signal degrade conditions on the received OC-3 signal and are completed within 50 milliseconds of a signal failure. This signal's BER is calculated from violations of the SONET line overhead B2 parity bytes. Signal fail is declared for incoming loss of signal, loss of frame, line AIS, or a BER exceeding 10^{-3}, while a BER exceeding a provisionable threshold between 10^{-5} and 10^{-9} causes a signal degrade to be declared.

Ring Networks

Path protection rings feed a SONET payload [STS or virtual tributary (VT)] from the ring entry point, simultaneously in both rotations of the ring, to the signal's ring exit point. The node that terminates the signal from the ring monitors both ring rotations and is responsible for selecting the signal that has the highest quality based on loss of signal (LOS), path alarm indication signal (AIS), and path bit error rate (BER) performance. On pass-through paths, all detected hard failures (LOS, LOF, LOP, line AIS, STS-1 path AIS, or STS-1 path signal failure based on BER) result in VT AIS insertion in the outgoing signals. This allows the terminating node to be aware of the failure and to switch to protection. Protection switching is completed within 50 milliseconds of failure detection.

Under normal conditions, both incoming SONET path signals to the switch selection point are of high quality, and the signal can be selected from either ring. A failure or a transmission degradation on one of the rings requires that the other ring path be selected. The system provides nonrevertive switching to minimize the impact on critical customer services by giving the service provider control, when and if, the critical service should revert to a particular ring. A manual path protection switching command allows switching back to the original path for ease of ring maintenance.

Transient Performance

Power Loss Restart

After system shutdown due to power loss, the system will exhibit a 2-second error free transmission interval which begins within 1 minute of restoration of power.

Transmission Start-Up on Signal Application

The system, after having no signal applied for greater than 1 minute at the DSX-n interface, will exhibit a 2-second error free transmission interval which begins within 5 seconds of the reapplication of a signal.

Delay

Table 10-13 lists the worst-case measured 1-way transmission delay within a DDM-2000 OC-3 Multiplexer.

Table 10-13. DDM-2000 OC-3 Transmission Delay in Microseconds

Mode (High Speed)	Low Speed Interface			
	OC-3/EC-1 (STS-1) *	OC-3/EC-1 (VT) *	DS3	DS1
Terminal (OC-3)	7	27	7	40
EC-1	-	-	-	40
ADM (OC-3)	7	27	7	100
Ring (OC-3) †	7 †	27 †	7	100

* STS-1 or EC-1 cross-connected.

† Ring delay is based on high speed and low speed or between main-1 and main-2.

Performance Monitoring

Table 10-14 shows the provisionable range of the thresholds for monitored parameters and, in brackets, the default thresholds. Thresholding of any parameter(s) can be disabled.

Table 10-14. Performance Monitoring Parameters Provisionable via the CIT

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres-
OC-3 Optics	Optical Transmit Power* (21G/21G-U only)	-1 dB, -2 dB	-1 dB, -2 dB	sect
	Laser Bias Current* (21G/21G-U only)	enable/disable	enable/disable	sect
OC-3 Section	SE Frame Seconds (SEFS)	1-63[10]	1-4095[30]	sect
OC-3 Line	B2 Coding Violations (CV)	1-13841[1384]	1-1328736[132874]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	(1-255)[4]	line
EC-1 Line §	B2 Coding Violations (CV) EC-1	1-4613[461]	1-442848 [44285]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line
DS3 Path ¶	P-Bit Error Counts	1-4026[403]	1-386500[38650]	t3
	SE Frame Seconds (SEFS)	1-63[10]	1-4095[30]	t3
Enhanced DS3 Path for P-Bits and F&M-Bits from Fiber and DSX **	CV-P Coding Violations	1-16383[40]	1-1048575[3820]	t3
	ES-P Errored Seconds	1-900[25]	1-65535[250]	t3
	SES-P Severely Errored Seconds	1-63[4]	1-4095[40]	t3
	UAS-P Unavailable Seconds	1-63[10]	1-4095[10]	t3
	SEFS	1-63[2]	1-4095[8]	t3
DS3 Line ††	CV-L Coding Violations	1-16383[40]	1-1048575[3865]	t3
	Errored Seconds, Line (ES-L)	1-900[25]	1-65535[250]	t3
	Severely Errored Seconds, Line (SES-L)	1-63[4]	1-4095[40]	t3
STS-1 Path	B3 Coding Violations (CV)	1-4510[451]	1-432960 [43296]	sts1
	B3 Errored Seconds (ES)	1-900[40]	1-65535[900]	sts1
	B3 Errored SecondsType A (ESA)	1-900[30]	1-65535[90]	sts1
	B3 Errored SecondsType B (ESB)	1-900[30]	1-65535[90]	sts1
	B3 Severely Errored Seconds (SES)	1-63[20]	1-4095[60]	sts1
	B3 Unavailable Seconds (UAS)	1-63[30]	1-4095[90]	sts1

See footnotes at end of table.

Table 10-14. Performance Monitoring Parameters Provisionable Via the CIT (Contd)

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres
VT1.5 Path †	V5 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	vt1
	V5 Severely Errored Seconds (SES)	1-63[20]	1-4095 [60]	vt1
	V5 Unavailable Seconds (UAS)	1-63[30]	1-4095 [90]	vt1
DS-1 Path ‡	ES-P Errored Seconds	-	1-65535 [648]	t1
	SES-P Severely Errored Seconds	-	1-4095 [100]	t1
	UAS-P Unavailable Seconds	-	1-4095 [10]	t1
	ES-PFE Errored Seconds	-	1-65535 [648]	t1
	SES-PFE Severely Errored Seconds	-	1-4095 [100]	t1
	UAS-PFE Unavailable Seconds	-	1-4095 [10]	t1
	CV-P (SF) Coding Violations ††	-	1-1048575 [691]	t1
	CV-P (ESF) Coding Violations ††	-	1-1048575 [132960]	t1
	CV-PFE Coding Violations ††	-	1-1048575 [132960]	t1
DS-1 Line ††	ES-L Line Errored Seconds	-	1-65535 [648]	t1

* Threshold is set once for both current quarter hour and current day.

† Release 6.0 and later linear releases, Release 7.0 and later ring releases (feature package option).

‡ Release 5.1 and later ring releases and Release 6.0 and later linear releases (feature package option).

§ Release 5.1 and later ring releases and Release 6.0 and later linear releases.

¶ Prior to Release 7.1.

**
From the fiber Release 7.1 and later releases; from the fiber and DSX Release 7.2 and later releases.

††
Release 7.2 and later releases.

Operations Interfaces

This section presents the operation interfaces that are required to support technician access to the system and allow alarms and status information generated by the system to be reported. The local operations interfaces include the craft interface terminal (CIT) interface, the user panel, and the equipment indicators. The DDM-2000 OC-3 Multiplexer supports office alarms, parallel telemetry, user-definable miscellaneous discretes, serial (TBOS) telemetry interfaces, and TL1/X.25.

Craft Interface Terminal

The system provides two EIA-232-D compatible CIT interfaces—a front access interface, configured as data communications equipment (DCE), and a rear access CIT interface, configured as data terminal equipment (DTE), to allow a permanent modem connection without requiring a null modem. A null modem is required to connect an ASCII terminal to the DTE interface or a modem to the DCE interface. The CIT interfaces provide data rates of 300, 1200, 2400, 4800, 9600, and 19,200 baud.

Both CIT interfaces operate full duplex using 1 start bit, 8 data bits, and 1 stop bit. Table 10-15 describes the pins supported on the CIT interfaces.

Table 10-15. CIT Interface Pin Connections

EIA-232-D Pin	Front Access CIT (DCE)	Rear Access CIT (DTE)
Pin 2 - Circuit BA Transmitted Data	carries data from terminal to DDM-2000 OC-3	carries data from DDM-2000 OC-3 to modem or terminal
Pin 3 - Circuit BB Received Data	carries data from DDM-2000 OC-3 to terminal	carries data from modem or terminal to DDM-2000 OC-3
Pin 7 - Circuit AB Signal Ground	signal ground	signal ground
Pin 8 - Circuit CF Received Line Signal Detector	not used	indicates to DDM-2000 OC-3 that modem or terminal is connected
Pin 20 - Circuit CD DTE Ready	indicates to DDM-2000 OC-3 that modem or terminal is connected	indicates to modem or terminal that DDM-2000 OC-3 is connected (always ON when SYSCTL is powered)

A CIT is recommended for installation, maintenance, and administrative activities. A personal computer (PC) is required for software download and to run SNC-2000 CPro software. The DDM-2000 OC-3 Multiplexer CIT port (mounted on the user panel) is a standard EIA-232-D (supersedes RS-232C specification) interface configured as DCE for direct connection to a CIT. The CIT port will support rates of 300, 1200, 2400, 4800, 9600, and 19,200 baud and should be compatible with most *ANSI* 3.64 ASCII terminals; however, it is optimized for standard CIT screens with display areas of 24 lines by 72 (or more) columns. A pager function is included in the DDM-2000 OC-3 Multiplexer to accommodate screen lengths from 3 lines to 150 lines.

Those CITs compatible with DDM-1000 (see AT&T 363-206-100 for a list of DDM-1000 compatible terminals) should be directly compatible with the DDM-2000 OC-3 Multiplexer, although some may not be as convenient to use with the DDM-2000 OC-3 Multiplexer.

If the multishelf bus cables (ED-8C724-20, G354 or G356) are connected between shelves in a bay, a CIT may then be connected to the user panel CIT port on any shelf and may address any other shelf in that bay (as well as the remote terminal shelves associated with that shelf in the bay). Any terminal compatible with the *ANSI* 3.64 standard should be compatible with the DDM-2000 OC-3 Multiplexer. The following terminals have been tested with the DDM-2000 OC-3 Multiplexer:

AT&T 610 terminal	ADM 5A terminal
AT&T 615 terminal	*HP* † 2621 terminal
AT&T 630 terminal	*HP* 2623 terminal
AT&T 730 terminal	*DEC* ‡ VT100 terminal
AT&T 5425 terminal *	
Melard Access II - 80 terminal §	

* Was *Teletype*® 5425 or ATTIS 4425.

† Registered trademark of Hewlett-Packard Company.

‡ Trademark of Digital Equipment Corporation.

§ This terminal is a hand-held portable terminal advertised as "hardened" for the outside plant environment by the manufacturer.

Personal Computer Specifications

The selected personal computer (PC) used for software download should have:

- A minimum of 640K of random access memory (RAM)
- *MS-DOS** version 2.0 or newer
- Hard disk
- At least one floppy disk drive of 360K or larger capacity. Although software download can be done with either floppy or hard disk, a hard disk is preferred for its better performance. The disk requirement is met with most portable *MS-DOS* PCs with a single 3.5-inch disk (720K or larger capacity). An *MS-DOS* PC with a hard disk and either a 3.5-inch 720K or 5.25-inch 360K (or larger) floppy disk may also be used.

The PCs that have been tested with the DDM-2000 OC-3 Multiplexer include:

AT&T 6286 WGS computer †
AT&T 6312 WGS computer †
AT&T 6386 WGS computer †
AT&T 6300 Plus computer †
AT&T *Safari* ® computer †
Toshiba ‡ T1000 computer †
Toshiba T12000 computer †
IBM § XT computer †
HP 110 computer ¶
NCR ** 3170 computer

* Registered trademark of Microsoft Corporation.

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

‡ Registered trademark of Toshiba Corporation.

§ Registered trademark of International Business Machines Corporation.

¶ With terminal emulation software.

** Registered trademark of NCR corporation.

Compatible Modems

A compatible modem must meet the following minimum requirements:

- 300, 1200, 2400, 4800, 9600, or 19,200 baud
- Full duplex
- 8 data bits
- No parity bits
- 1 start bit
- 1 stop bit
- No flow control.

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

- AT&T *Paradyne*® 2224-CEO modem (at 1200 and 2400 baud)
- AT&T *Paradyne* 2224 modem (at 1200 and 2400 baud)
- AT&T *Paradyne* 4024 modem (at 1200 and 2400 baud)
- AT&T *Paradyne* 2296 modem (at 4800 and 9600 baud)
- Hayes *V-series*† Smartmodems
- *Penril** Alliance V.32 modem.

The *NCR* 3170 computer and the AT&T *Safari*® computer have a built-in modem and meet the modem requirements.

* Registered trademark of Penril Corporation.

† Trademark of Hayes Microcomputer Products, Inc.

SNC-2000 CPro Graphical User Interface and Provisioning Tool

The SNC-2000 CPro Graphical User Interface and Provisioning Tool is a *Microsoft Windows** based user interface that can optionally be used with the DDM-2000 OC-3 Multiplexer. The tool simplifies and mechanizes administration, maintenance, and provisioning operations for ring networks. A minimum platform configuration is:

- 386SX *IBM*-compatible desktop or laptop PC
- Disk drive — one 1.44 Megabyte (3.5 inch)
- Hard disk with at least 5 Megabytes of available space
- 8 Megabyte RAM
- *MS-DOS* operating system version 5.0 or later
- *Windows* version 3.1
- Serial port (EIA-232-D) — configured as COM1 or COM2
- Mouse
- VGA color monitor.

SNC-2000 CPro has been tested with AT&T, *NCR*, *IBM*, *NEC*‡, and *Gateway-2000*§ personal computers. SNC-2000 CPro has also been tested to work on a SUN¶ *SPARC*** station 10 workstation that has a SUNPC3.1 software environment setup on a PC emulator hardware and running *Windows* in the enhanced mode.

* Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation.

‡ NEC is a registered trademark of NEC Corporation.

§ Gateway 2000 is a trademark of Gateway 2000, Inc.

¶ SUN is a registered trademark of SUN Microsystems Inc.

** SPARC is a registered trademark of SPARC International, Inc., licensed exclusively to SUN Microsystems Inc.

User Panel

The user panel contains red LEDs for CR and MJ alarms, yellow LEDs for MN and PMN alarms, and for abnormal (ABN), far-end activity (FE-ACTY), and near end activity (NE-ACTY) status. These LEDs are used in conjunction with the far-end identification (FE-ID) 7-segment display on the front panel of the adjacent SYSCTL circuit pack to provide CIT-less single-ended operations.

A green PWR ON LED is lighted when the shelf is receiving –48 V power. A green ACO LED is lighted when the ACO function is active.

The FE SEL test, ACO/TEST, and UPD/INIT pushbuttons are provided to control system operation.

Equipment Indicators

A red LED FAULT indicator is provided on all circuit packs. A green LED ACTIVE indicator is provided on all 1x1 protected circuit packs to indicate which circuit packs are actively carrying traffic.

Office Alarms

The office alarms interface is a set of discrete relays that control office audible and visual alarms. Separate relays handle critical, major, and minor alarms. Each contact closure is rated at 1 A, 60 V maximum. The CR and MJ alarms can be wire-ORed. The critical alarm relays are fail safe against unprotected power failures.

Serial Telemetry

Serial telemetry is provided using the telemetry byte-oriented serial (TBOS) protocol. TBOS telemetry provides detailed alarm, status, and control (AS&C) information to and from a remote maintenance center via a 2400 baud RS-422 port. The AS&C TBOS link can be shared among multiple DDM-2000 OC-3 Multiplexer shelves. A TBOS link can support up to eight displays or four OC-3 point-to-point networks.

Parallel Telemetry

Parallel telemetry brings a minimum set of alarm and status information to an operations center. Four alarm closures indicate CR, MJ, MN, and PMN alarms.

The following status closures identify alarms as far-end or near-end and as failures on received OC-3 signals or incoming low-speed interfaces, and provide system identification when alarms are paralleled among several shelves in a bay.

- Near-end (NE) status
- Far-end (FE) status (six closures)
- Carrier line failure (CLF) status
- Incoming (INC) status
- System identification (SID) status
- ACO output (ACOO).

The parallel telemetry outputs tolerate –60 V maximum open circuit voltage and 35 mA maximum current. Transient voltages up to –135 V are tolerated for up to 1 ms. The parallel telemetry ACO input provides –48 V nominal (–60 V maximum) open circuit voltage and 2 mA maximum current.

The parallel telemetry output closures generated by the optoisolator require external voltage and ground to operate.

User-Definable Miscellaneous Discrete Environmental Alarms and Controls

The user-definable miscellaneous discrete environmental alarm and control interface allows the DDM-2000 OC-3 Multiplexer to monitor and control colocated equipment at the remote site. At the remote terminal (RT) site, 14 alarm or status environmental inputs can monitor environmental conditions (for example, open door, high temp); these inputs are activated by contact closures. A 15th environmental alarm or status input is provided to monitor the condition of the power shelf and fans at the RT site; this closure is activated by –48 V DC. Four environmental control outputs are provided to control external equipment (for example, pumps or generators). The miscellaneous discrete outputs (control outputs at an RT, alarm/status outputs at a CO) tolerate –60 V maximum open circuit voltage and 35 mA maximum current. Transient voltages up to –135 V are tolerated for up to 1 ms. The miscellaneous discrete inputs (control inputs at a CO, alarm/status inputs in an RT) provide –48 V nominal (–60 V maximum) open circuit voltage and 2 mA maximum current.

The miscellaneous discrete output closures generated by the optoisolator require external voltage and ground to operate.

Orderwire

The DDM-2000 OC-3 Multiplexer uses the E1 byte in the SONET overhead and provides a 64 Kb/s complementary metal oxide semiconductor (CMOS) or transistor-transistor logic (TTL) compatible interface to an external orderwire shelf to provide point-to-point voice communication between DDM-2000 OC-3 systems. The orderwire shelf must be installed within 3 feet of the DDM-2000 OC-3 Multiplexer to which it is connected.

The orderwire is available only between DDM-2000 OC-3 shelves connected to each other via OLIUs in the main slots. In multispan applications (for example, STS-1 drop or hubbing), orderwire communication is available only between the CO and the first RT.

Orderwire is not currently available in ring applications.

The DDM-2000 OC-3 Multiplexer system has been tested with the *DANTEL** Orderwire Assembly A18-04588-02.

TL1/X.25 Interface

The DDM-2000 OC-3 Multiplexer supports a TL1/X.25 interface for communication between local and remote DDM-2000s, and alarm surveillance and provisioning operations systems such as Bellcore's Network Monitoring and Analysis (NMA) and Operations Systems/Intelligent Network Element (OPS/INE) operations systems. The DDM-2000 OC-3 Multiplexer TL1/X.25 interface is based on Bellcore TR-TSY-000831, Issue 2. The DDM-2000 OC-3 Multiplexer supports three X.25 permanent virtual circuits (PVCs) and one switched virtual circuit (SVC) assigned as shown in Table 10-16.

Table 10-16. TL1/X.25 Interface — VC Assignments

PVC ID	SVC ID	Logical Group #	Logical Channel #	Use
1	-	0	1	Command/Response Messages
2	-	0	2	Autonomous Maintenance Messages and Command/Response* Messages
3 †	-	0	3	Autonomous Provisioning Messages (REPT DBCHG) and Command/Response Messages
-	1 ‡	0	16	Autonomous Maintenance and Provisioning Messages and Command/Response Messages

* Release 6.0 and later
† Release 6.1 (linear), 7.1 (rings), and later
‡ Release 6.2 (linear), 7.1 (rings), and later

* DANTEL is a registered trademark of Dantel, Inc.

At the packet layer, the DDM-2000 OC-3 Multiplexer is configured as a passive DTE with the following parameters as shown in Table 10-17.

Table 10-17. TL1/X.25 Interface — X.25 Packet Layer Parameters

Parameter	Value
Packet Size (Provisionable)	128 or 256 bytes
Window Size	2 packets
D bit support	NO
M bit support	YES

At the link layer, the DDM-2000 OC-3 Multiplexer uses the standard link access procedure "B" (LAPB) protocol with the following parameters as shown in Table 10-18.

Table 10-18. TL1/X.25 Interface — LAPB Link Layer Parameters

Parameter	Value
Maximum Frame Size	2104 bits
Module	8
Window Size	7 frames
n2	7 retries
T1	3 seconds
T3*	20 seconds

* Release 3.2 and later.

The DDM-2000 OC-3 Multiplexer uses synchronous, full duplex, continuous carrier communication. Data rates of 1200, 2400, 4800, 9600, and 19,200 baud are supported. The EIA-232-D interface is configured as DTE, using the pin connections specified in Table 10-19.

Table 10-19. TL1/X.25 Interface — EIA-232-D Pin Connections

Pin	Description
2	Transmitted Data
3	Received Data
4	Request to Send
5	Clear to Send
6	DCE Ready
7	Signal Ground
8	Received Line Signal Detector
15	Transmitter Signal Element Timing (DCE to DTE)
17	Receiver Signal Element Timing (DCE to DTE)
20	DTE Ready*

* DTE is always on when the DDM-2000 OC-3 Multiplexer is powered.

Physical Specifications

Shelf Physical Characteristics

- Dimensions: 8.5 in. H x 21.25 in. W x 12 in. D
- Weight (Max.): 44 lb. (20 kg)
- Appearance: Coordinated with other equipment in the AT&T 2000 Product Family.

Network Bay and Cabinet Mounting

The DDM-2000 OC-3 Multiplexer can be mounted in both ED-8C500 and ED-8C501 network bay frames. A maximum of six shelves may be mounted in a 7-foot bay. In addition to bay mounting, the DDM-2000 OC-3 Multiplexer can be packaged with other equipment in 80A, 80D, and 80E cabinets, 51A cabinets, 90-type business remote terminals, controlled environment vaults (CEVs), or huts.

NOTE:
The mounting brackets on the DDM-2000 OC-3, OC-12, heat baffle, and fan shelf are designed to allow for mounting in standard 23-inch wide network bay frames and 23-inch wide EIA-type bay frames.

Environmental Specifications

Temperature and Humidity

A DDM-2000 OC-3 Multiplexer shelf meets Bellcore Network Equipment Building System (NEBS) requirements * for use in central office environments without fans.

A fan shelf is required in uncontrolled environments or cabinet applications either above or below any DDM-2000 OC-3 shelf. Refer to ED-8C724-10, "Typical Bay Arrangements," for detailed information on placement of fans and heat baffles in typical bay arrangements.

The DDM-2000 OC-3 Multiplexer operates in uncontrolled environments at temperatures of –40°C to +75°C and humidity of 5 to 95 percent (noncondensing). Forced convection cooling (fans) is required when the air inlet temperature is above 50°C. The DDM-2000 OC-3 Multiplexer provides optional control and alarming of the 2-type fan units used in AT&T cabinets and alarming of the DDM-2000 fan shelf.

EMC Requirements

The DDM-2000 OC-3 Multiplexer has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residence is likely to cause harmful interference in which case the user will be required to correct the interference at the user's own expense.

* "*NEBS Generic Equipment Requirements*," TR-NWT-000063, Issue 4.

Earthquake Requirements

The DDM-2000 OC-3 Multiplexer meets the earthquake requirements defined in Bellcore TR-NWT-000063, Issue 4 and Pacific Bell Standard PBS-000-102PT. Installations in Zone 4 regions require the ED-8C800-50 or ED-8C801-50 bay frame. Drawing ED-8C800-70 provides ordering and engineering application information for these frames.

Fire Resistance

The DDM-2000 OC-3 Multiplexer meets the ignitability requirements specified in T1Y1.4/88-014. In addition, the DDM-2000 OC-3 Multiplexer meets the fire resistance requirements of *UL** 1459, 2nd Edition.

Underwriters Laboratories

The DDM-2000 OC-3 Multiplexer is *UL* recognized for restricted access installations in business and customer premises applications installed in accordance with Articles 110-16 and 110-17 of the *National Electric Code*†, *ANSI*/NFPA Number 70-87. Other installations exempt from the requirements of the *National Electric Code* may be engineered according to the accepted practices of the local telecommunications utility.

Canadian Standards Association

The DDM-2000 OC-3 Multiplexer has been certified by the Canadian Standards Association per standard C22.2 Number 225-M90.

* Registered trademark of Underwriters Laboratories Inc.

† Registered trademark of the National Fire Protection Association, Inc.

Power Requirements

Shelf Fuses

The two –48 V feeders (A and B) are required for each DDM-2000 OC-3 shelf. Shelf power is protected by 5-amp fuses provided with the shelf.

It is recommended that a supply of spare fuses be provided at DDM-2000 OC-3 Multiplexer locations. Fuses for the Group 1 shelf may be ordered through AT&T using COMCODE 405697442 or through Littlefuse, Inc., 800 East Northwest Highway, Des Plaines, IL 60016, or call 708-824-1188. Order: Fuse, 5-amp, Part No. 334005.

Fuses and a fuse extraction tool for the Group 3 shelf may be ordered through AT&T using COMCODE 406203976 for fuses and COMCODE 406420273 for the extraction tool or through SAN-O Industrial Corporation, 91-3 Colin Drive, Sherwood Corporation Center, Holbrook, NY 11741 or by calling 516-472-6666 and ordering.

Fuse, 5-amp, Part No. AX-1-5A or
Fuse Extraction Tool, Part No. F-0431.

Power Dissipation

Table 10-20 lists the power dissipation and current drains for the listed configurations.

Table 10-20. Power Dissipation and Current Drains

Configuration	Power Dissipation (Watts)	DC Current Drains (Amps)	
		List 1 (-48 V DC)	List 2 (-40 V DC)
OC-3 terminating shelf with 24 DS1 circuit packs (84 DS1s)	66	1.4	1.7
OC-3 terminating shelf with 24 DS1PM circuit packs (84 DS1s)	79	1.6	2.0
OC-3 terminating shelf with 6 DS3 circuit packs (3 DS3s)	58	1.2	1.5
OC-3 STS-1 add/drop shelf with 16 DS1 circuit packs (56 DS1s)	80	1.7	2.0
OC-3 hub shelf with 8 21G/21G-U OLIU circuit packs	100	2.1	2.5
OC-3 DS1 add/drop shelf with 16 DS1PM circuit packs (56 DS1s)	87	1.8	2.2
OC-3 DS1 add/drop shelf with 8 22F OLIU circuit packs	114	2.4	2.9
EC-1 electrical multiplexer shelf with 24 DS1 circuit packs (84 DS1s)	66	1.4	1.7
EC-1 electrical multiplexer shelf with 24 DS1PM circuit packs (84 DS1s)	73	1.5	1.8
OC-3 terminating shelf with 6 STS1E circuit packs (3 EC-1s)	60	1.3	1.5
OC-3 DS1 self-healing ring shelf with 24 DS1 circuit packs (84 DS1s)	73	1.5	1.8
OC-3 DS1 self-healing ring shelf with 24 DS1PM circuit packs (84 DS1s)	80	1.7	2.0
OC-3 self-healing ring shelf with 6 STS1E circuit packs (3 EC-1s)	63	1.3	1.6
OC-3 self-healing ring shelf with 2 OC-3 optical extensions (22G-U/22G2-U) and 8 DS1PM circuit packs (28 DS1s)	102	2.1	2.5
DDM-2000 Fan shelf	53	1.1	1.3

The following items should be noted:

- The DDM-2000 OC-3 shelf accommodates two –48 V power feeders ("A" and "B" office power feeders).
- Loss of one power feeder does not cause a loss of service.
- All supply voltages other than –48V required by DDM-2000 OC-3 Multiplexer are generated by DC-to-DC converters within the DDM-2000 OC-3 shelf.
- The DDM-2000 OC-3 Multiplexer meets all performance requirements when the DC input voltage varies between –40.0 V and –60.0 V.
- The DDM-2000 OC-3 Multiplexer tolerates DC input voltages between 0 V and –60 V without damage.
- The DDM-2000 OC-3 Multiplexer complies with electrical noise tolerance requirements in Section 13.2 of TR-TSY-000499.

CAUTION:
This information is for a typical application only. Consult 801-525-168, DDM-2000 Floor Plan Data Sheets and T82046-30, Power Systems DC Distribution Circuit for Digital Transmission System for proper engineering of battery plant and feeders.

DDM-2000 OC-3 Reliability

Summary

This section describes the Bellcore reliability requirements that apply to the DDM-2000 OC-3 Multiplexer and the calculations used to predict how the DDM-2000 OC-3 Multiplexer meets those standards.

The DDM-2000 OC-3 Multiplexer meets all the applicable Bellcore reliability requirements that cover transmission availability, operation system (OS) availability, optical module maintenance, and infant mortality. A summary of the reliability predictions and requirements is shown in Table 10-21. The applicable Bellcore requirements and objectives were clarified through interactions with Bellcore during their audit of the DDM-2000 OC-3 Multiplexer. The basis for these requirements comes from TA-TSY-000418, "*Generic Reliability Assurance Requirements for Fiber Optic Transport Systems.*" The method and assumptions used to calculate DDM-2000 OC-3 Multiplexer reliability predictions are described in the following paragraphs. Each paragraph is devoted to one of the reliability parameters which must meet a Bellcore requirement or objective.

Transmission Availability

Bellcore *requirements* state that the probability of a hardware caused outage on a two-way channel within a SONET multiplexer should be less than 1.75 minutes per year in a central office environment* and 5.25 minutes per year in a remote terminal environment.† Bellcore *objectives* for outages are 0.25 minutes per year for the central office‡ and 0.75 minutes per year for remote terminal environments.§

The outage requirements and objectives apply to any part of the product needed to process an incoming high-speed or low-speed signal (DS1 to OC-3 or OC-3 to DS1). An outage is defined, for this and all other outage requirements, as any 1-second interval with a bit error rate of 10^{-3} or worse.¶ The predicted hardware outages for various configurations of the DDM-2000 OC-3 system are given in Table 10-21.

* TA-NWT-000418, Issue 3, November 1991, p. 17.
† TA-NWT-000418, Issue 3, November 1991, p. 28.
‡ TA-NWT-000418, Issue 3, November 1991, p. 18.
§ TA-NWT-000418, Issue 3, November 1991, p. 28.
¶ TR-TSY-000009, Issue 1, May 1986, p. 4-11.

A Markov model was used to calculate the predicted system outage. The model assumes a mean time to repair of 2 hours for the CO environment and 4 hours for the RT environment. Individual circuit pack failure rates used in the model were calculated using the method described in TR-TSY-000332, Issue 4, "*Reliability Prediction Procedure for Electronic Equipment (RPP).*" A summary of the circuit pack and fan shelf failure rates is shown in Tables 10-22 and 10-23, respectively.

Operation System Interface Availability

The Bellcore objective states that the operation system (OS) outage should be less than 28 minutes per year (50 percent hardware, 50 percent software).* Therefore, the objective applies to the TBOS and TL1/X.25 interfaces. This objective applies to circuitry needed to maintain communication from the DDM-2000 OC-3 Multiplexer to the central office's telemetry equipment for access by an OS. Since the OS interface is used in the central office, the reliability model assumes the mean time to repair is 2 hours and the environmental factor is 1.0. Table 10-21 lists the predicted outages for the TBOS and TL1/X.25 interfaces.

Optical Module Maintenance Objective

According to Bellcore, the objective for mean time between failure (MTBF) of a 1-way regenerator is a minimum of 4 years†. A regenerator is defined as any circuit pack that performs the electrical-to-optical and optical-to-electrical conversion. Table 10-22 lists the failure rate and MTBFs of the OLIU circuit packs. All OLIU circuit packs meet Bellcore objectives.

Infant Mortality

Bellcore requires that the number of circuit pack failures in the first year of operation should not exceed 2.5 times the number of failures per year beyond the first year. The ratio of first year failures to failures in subsequent years is known as the infant mortality factor (IMF). The requirement is to have an IMF of less than 2.5‡.

AT&T places all DDM-2000 OC-3 Multiplexer circuit packs in an environmental stress-testing (EST) program. The purpose of the program is to eliminate early life failures, conduct failure mode analysis on defective circuit packs, and use corrective action to make the product more reliable. Based on field return data, the early life failures have been minimal and the infant mortality factor is below 2.5.

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* TA-NWT-000418, Issue 3, November 1991, p. 36.

† TA-NWT-000418, Issue 3, November 1991, p. 37.

‡ TA-NWT-000418, Issue 3, November 1991, p. 40.

DDM-2000 OC-3 System Reliability Predictions

Table 10-21. DDM-2000 OC-3 System Reliability Prediction (Note 1)

Application	Environment (Note 2)	Bellcore Criteria (Note 3) Requirement	Bellcore Criteria (Note 3) Objective	Prediction (Outage, min/yr)	MTBF Years (Note 4)
DS1 to OC-3	CO	1.75	0.25	0.098	1230
DS1 to OC-3	RT	5.25	0.75	0.297	802
DS3 to OC-3	CO	1.75	0.25	0.102	1180
DS3 to OC-3	RT	5.25	0.75	0.308	774
OC3 to OC-3	CO	1.75	0.25	0.0012	72,520
OC3 to OC-3	RT	5.25	0.75	0.0111	16,120
EC-1 to OC-3	CO	1.75	0.25	0.253	473
EC-1 to OC-3	RT	5.25	0.75	0.764	314
DS1 to EC-1	CO	1.75	0.25	0.324	370
DS1 to EC-1	RT	5.25	0.75	0.975	246
OS Interface TBOS	CO	-	14	5.1	23.5
OS Interface TL1/X.25	CO	-	14	7.1	16.9

Example:
The unavailability of one 2-way DS3 channel within one DDM-2000 OC-3 system configured to multiplex DS3 to OC-3, located in an uncontrolled environment, is 0.308 minutes per year (that is, fraction of time per year when the DS3 channel is unavailable). The mean time between outage of the DS3 channel is 774 years (that is, average length of time until a DS3 outage occurs).

Notes:

1. Hardware failure rates are calculated per the RPP method, TR-NWT-000332, Issue 4, "*Reliability Prediction Procedure.*"
2. The environmental factor for the CO = 1.0 and for the RT = 1.5, per TR-NWT-000332, Issue 4, "*Reliability Prediction Procedure.*"
3. Bellcore criteria (Outage Requirements and Objectives) is based on TA-TSY-000418, Issue 3, "*Generic Reliability Assurance Requirements for Fiber Optic Transport Systems.*" Outage is in minutes per year.
4. Mean time to repair is assumed to be 2 hours for CO and 4 hours for RT environments.

Table 10-22. DDM-2000 OC-3 Circuit Pack Reliability (Note 1)

Circuit Pack	CO		RT	
	FITS (Note 2)	MTBF (Years)	FITS (Note 2)	MTBF (Years)
BBF1(DS1)	745	153.23	1118	102.15
BBF1B (DS1)	1114	102.47	1671	68.32
BBF2 (TGS)	2739	41.68	4109	27.79
BBF2B (TGS)	2311	49.40	3467	32.93
BBF3 (DS1PM)	2156	52.95	3234	35.30
BBG2 (MXRVO)	902	126.56	1353	84.37
BBG4/BBG4B (DS3)	1556	73.36	2334	48.91
BBG5 (SYSCTL)	5284	21.60	7926	14.40
BBG6 (STS1E)	2193	52.05	3290	34.70
BBG7 (OHCTL)	3433	33.25	5150	22.17
21D/21D-U (IS-3 OLIU)	1599	71.39	2399	47.59
21G/21G-U (OLIU)	6348	17.98	9522	11.99
22F (OLIU)	3317	34.42	4976	22.94
22G-U/22G2-U (OLIU)	2880	39.64	4320	26.42
22D-U (IS-3 OLIU)	2388	47.80	3582	31.87

Notes:

1. Calculations are based on Bellcore RPP Issue 4 data. All KS and AT&T components considered as quality level III. All components evaluated at 40°C ambient and 50 percent electrical stress.
2. FITS is the number of failures per billion hours of operation (10^9).

Table 10-23. DDM-2000 Fan Shelf Steady State Failure Rates (Based on Bellcore RPP, Issue 4, Data)

DDM-2000 Fan Shelf	Failures /10^9 hrs. RPP Prediction	MTBF (years)
ED-8C733-30,G7 Fan Shelf	9879 *	11.56
ED-8C733-30,G6 Fan Unit	2000	57.08

* This includes failure rates for individual fan units.

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11

Overview

This section describes the command and report features of the American Standard Code for Information Interchange (ASCII) terminal interface to a DDM-2000 OC-3 Multiplexer. It provides detailed information about each command, as well as system report outputs and explanations.

Reason for Reissue

This section has been updated to include command information for OC-3 Release 7.2. Significant changes to this section are noted by change bars (|) in the right margin.

The new commands included in this section are **rtrv-map-network** and **rtrv-map-neighbor**.

In addition to the new commands, significant changes were made to the following commands: **dlt-tadrmap**, **reset**, **rtrv-ne**, **rtrv-pm-t1**, **rtrv-pm-t3**, **rtrv-pm-tca**, **rtrv-pmt-t1**, **rtrv-pmt-t3**, **rtrv-t3**, **set-ne**, **set-pmt-t1**, **set-pmt-t3**, and **set-t3**.

Command Page Format

This section includes DDM-2000 commands that are presented as one- or multiple-page entries in alphabetical order. The name of each command appears in the upper corners on each page.

Each entry is presented in a common format:

- The **NAME** part gives the name of the command and summarizes its function.
- The **INPUT FORMAT** part provides the syntax for each command. Each command starts with a command name followed by a colon. Parameters follow the colon. Optional parameters are enclosed in square brackets **[]**.
- The **DESCRIPTION** part provides detailed information about each command.
- The **RELATED COMMANDS** part identifies commands that affect or are affected by the named command or sets the conditions displayed by a report.

Entries which are to be typed exactly as shown are printed in **`bold type`**. System responses are printed in `courier type`. Descriptive names of entry values are shown in *`italic type`*.

Input Format

All commands have a common input format:

`command name`[:*`Address`*][:*`parameters`*];

`Address` identifies a slot, channel, or operations interface within the shelf. In commands which require them, addresses must appear immediately after the command name.

`Parameters` identifies a variable name assigned to some provisionable attribute of the command. The value of the parameter is defined on each command page.

Parameters are separated with commas (,). The parameters may be entered in any order, but they must be entered in the *`name=value`* format.

Brackets ([ ]) are not part of the command line. Parameters enclosed in brackets are optional. Default values are provided for these parameters.

Any command can be entered on a single line.

DDM-2000 is case insensitive. Commands may be entered in upper- and lower-case letters. Entries other than commands may be case sensitive (for example, passwords). DDM-2000 addresses and logins are sensitive to white space (that is, blanks between characters). For example, the address parameters "**m1-all**" and "**m1- all**" may be interpreted differently by DDM-2000. As a general rule, white space should not be included in commands.

Addresses

Table 11-1 specifies the valid addresses for slots, lines, ports, channels, paths, cross-connections, and operations interfaces. Where lists of items appear in braces { }, any one (and only one) of these items may be used to form the address.

Table 11-1. DDM-2000 OC-3 Address Table

Object	Entity	Address	Example
Slots	Entire system	all	all
	Main slot	main-{1,2,all}	main-all
	Function unit slot	fn-all fn-{a,b,c}-{1,2,all}	fn-all fn-b-all fn-c-1
	Function unit pair	fn-{a,b,c}	fn-a
	Low speed slot	ls-all ls-{a,b,c}-{1-8,all}	ls-all ls-b-2
	Timing slot	tg-{1,2,all}	tg-all
	Sys. control slot	sysctl	sysctl
	Aux. control slot	auxctl	auxctl
Lines	OC-3 line pair	all main,fn-{a,b,c,all}	all main
	OC-3 Line	all {main,fn-a,fn-b,fn-c}-{1,2,all} fn-all	all main-1 fn-c-2 fn-all
	EC-1 line	a,b,c,all	c
Ports	DS3 or EC-1 Port	a,b,c,all	a
	DS1 Port	{a,b,c,all*}-{1-7,all*}-{1-4,all}	all a-all b-2-all c-7-4
	DS1 Sync. Ref. Port	ref-{1,2}	ref-1
Channels	STS-1 Channel (within OC-3)	{m,c,all*}-{1-3,all}, {a,b}-{1,2,all} m{1,2}-{1-3,all} (Rings only)	m-3 a-2 m2-3
	STS-1 Channel for STS1E, MXVRO, or DS3	a,b,c,all	a
	VT1.5 Channel (within OC-3)	{m,c,all*}-{1-3,all*}-{1-7,all*}-{1-4,all} {a,b,all*}-{1,2,all*}-{1-7,all*}-{1-4,all} m{1,2}-{1-3,all*}-{1-7,all*}-{1-4,all} (Rings only)	m-1-2-1 b-2-7-4 m1-3-2-3
	VT1.5 Channel for DS1 or STS1E	{a,b,c,all*}-{1-7,all*}-{1-4,all}	a-1-2 b-7-4
STS-1 Cross-connections	Main port	m-{1-3,all}	m-3
	Function Unit (OC-3 OLIU)	{a,b}-{1,2,all} c-{1-3,all}	a-2 c-3
	Function Unit (MXRVO, STS1E, DS3)	{a,b,c}	b

* If `all` is chosen as any part of an address, no subsequent address fields should be defined.

Table continues on the following page.

Table 11-1. DDM-2000 OC-3 Address Table (Contd)

Object	Entity	Address	Example
VT1 5 Cross-connections	Main port	m-{1-3,all*}-{1-7,all*}-{1-4,all}	m-3-4-4
	DS1 Low Speed Port	{a,b,c}-{1-7,all*}-{1-4,all}	b-2-4
	Function Unit (OC-3 OLIU)	{a,b}-{1,2,all*}-{1-7,all*}-{1-4,all} {c}-{1-3,all*}-{1-7,all*}-{1-4,all}	b-1-1-4 c-3-7-1
Operation Interfaces	User Panel	userpanel	userpanel
	CIT	cit-{1,2,all}	cit-1
	Section Data Comm. Channel	dcc-{m,a,b,c,all} dcc-{m1,m2,b,c,all} (Rings only - fecom) dcc-{m,b,c,all (Rings security only)	dcc-m dcc-m1 dcc-m
	TBOS	tbos-1	tbos-1
	Parallel Telemetry	partlm	partlm
	X.25 Link	x25	x25
	Environmental Alarm Input	env-{1-15,all}	env-1
	Environmental Control Input	cont-{1-4,all}	cont-1

* If `all` is chosen as any part of an address, no subsequent address fields should be defined.

The 2000 Product Family includes many SONET products that are capable of interworking with each other. At times, references to other SONET products may appear in DDM-2000 reports. The following list shows standard abbreviations for the various members of the 2000 Product Family.

Complete Product name	Abbreviated Product Name
unknown	unknown†
DDM-2000 OC-3	DDM-OC3
DDM-2000 OC-12	DDM-OC12
DACS IV-2000	DACS-IV
FT-2000	FT-2000
SLC®-2000	SLC-2000
DDM-2000 FiberReach	FbrRch
Foreign	Foreign*

† This indicates that the type of product is unknown.

* This indicates that the product is not compatible with other SONET products.

Command Mode and Prompt Mode

There are two entry modes: command mode (no prompts) and prompt mode. In the command mode (the default), the command line and any user responses are terminated by the semicolon (;) or carriage return (<CR>).

The prompt mode is designed for users that are not familiar with DDM-2000. To enter the prompt mode, terminate any line with a carriage return (ENTER or RETURN key), dollar sign ($), or question mark (?). Prompts generally appear in the form:

```
Prompt Message [Default value]=
```

with the default value enclosed in square brackets ([..]). There are two types of default values:

1. **Static** default values, which assume the same value each time the command is invoked
2. **Current** default values, which reflect the most recent value entered into the system. In the case of an address containing the value "all", the prompt will display the value [CurrentValues]. When "Current Values" is selected, the current setting of that parameter is not changed.

To reenter the command mode from the prompt mode, answer the current prompt, then continue entering input on the same line after typing a comma (,). When the input is completed, terminating the command with a semicolon (;) will return the session to the command mode. If a command is terminated with a semicolon (;), the system will use default values for all optional parameters for which a value has not been given.

The **help** command provides in-context help during a dialog with DDM-2000. Help is provided automatically when an invalid input is entered and can also be requested anytime by typing "**?**".

Special Control Characters

- Backspace characters control H (^H), [BACK SPACE] key, and underscore (_) are used to erase character input.
- At sign (@) is used to erase an entire line of input.
- Question mark (?) is used to get help and to enter prompt mode at any time.
- Comma (,) is used to separate parameters from each other.
- Equal sign (=) is used to separate parameter names from parameter values.
- Control T (^T) is the **toggle** command. See the **toggle** command page for additional details.
- Carriage return ([ENTER] or [RETURN] key) and exclamation point (!) or dollar sign ($) are used to end a line of input.
- Semicolon (;) is used to end a command. The system will use default values for all optional parameters for which a value has not been given.
- CANcel, DELete, and CTRL-x are used to abort a command which has been entered but has not yet started to execute. All commands can be aborted anytime before the "In Progress...." message is printed. Test commands (except **test-sysctl**) can be aborted at any time during execution using these keys. Reports may be aborted at any time using these keys.
- Colon (:) is used to separate the command name, address, and parameters.

Paged Reports

Reports are paged. When the end of the page has been reached, the prompt "`more? [yes]=`" is displayed if more report text remains. Page length can be set with the **set-link** command.

Confirmation Requests

CAUTION:
Some commands can be service-affecting if their default parameters are ignored.

After all parameters have been entered, a caution message followed by the command name, the selected values of parameters, and the prompt "`Execute? (y/n) =`" is printed for Releases 3.1 and earlier. In Release 3.2 and later, the prompt "`Execute? (y/n or CANcel/DELete to quit) =`" is printed. To execute the command, enter "y" and carriage return. To change the value of any of the parameters, enter "n" and carriage return and you will be reprompted for all parameters. To abort the command, enter CANcel or DELete.

Output Descriptions

The output for most commands is described on the following manual pages. Refer to the "Detailed Alarm and History Reports" part of this section for more complete examples and explanations of the alarm and status report (**`rtrv-alm`**) and the history report (**`rtrv-hsty`**).

Alarm Level Prompt

When the system is ready to accept a new command, it prints the system prompt "<". If there is an active alarm or status condition, the level of the highest level active alarm in the system is printed before the "<". For example, the system prompt is "MN <" when a minor alarm condition exists in the system.

Security

The option of system security is provided for DDM-2000 OC-3 Release 3 and later. Two privileged user logins and a maximum of 50 nonprivileged user logins, consisting of general users and reports-only users, are available. Privileged users may set system security on each data communications channel (DCC) and craft interface terminal (CIT) interface (using the **`set-secu`** command) and assign login and password pairs to general users (using the **`set-lgn`** command). General users may execute commands that are not restricted to privileged users and obtain reports. Reports-only users (available in Release 5 and later) may only obtain reports and execute several basic commands.

When system security is enabled, all users are then required to enter a valid login and password pair to access the system.

The following commands are always restricted to privileged users only:

- **init-sys** (initialize system)
- **rtrv-lgn** (retrieve login)
- **set-fecom** (set far end communication)
- **set-lgn** (set login)
- **set-secu** (set security)
- **set-feat** (set feature)

When security is enabled on a system, the following commands become restricted to privileged users only:

- **dlt-tadrmap** (delete TID address map)
- **ent-ulsdcc** (enter upper layer section DCC)
- **init-pm** (initialize performance-monitoring)
- **ins-prog** (install program)
- **reset** (reset system software)
- **set-date** (set date)
- **set-ne** (set network element)

When security is enabled on a system, only the following commands may be executed by reports-only users:

- **?** (help)
- **logout** (logout)
- **rlgn** (remote login)
- **set-link** (set link)
- **set-passwd** (set password)
- **^T** (toggle)
- all **rtrv** commands except **rtrv-lgn**

Refer to the **set-secu** command for more details on system security.

Starting a CIT Session

Procedures in the "Operation and Maintenance" section of this manual describe how to "Connect a CIT and Establish a Session" with the DDM-2000.

SNC-2000 CPro

SNC-2000 CPro is a software package from AT&T to help users of DDM-2000 Multiplexer systems set up and use an advanced, yet simple, craft operations environment on a personal computer using *Microsoft Windows** 3.1 in the enhanced mode. SNC-2000 CPro provides the user with the normal CIT access to DDM-2000 as well as a mouse-driven graphical user interface (GUI). The user may issue commands to DDM-2000 by using the mouse to select items from a menu and/or objects from the graphics display.

CPro Release 1.0 supports OC-3 software releases. CPro Release 2.0 supports OC-3 and OC-12 software releases, as well as FT-2000 Release 5.0. CPro Release 2.1 includes all of the releases supported by 2.0 and FT-2000 Release 6.0. For complete information on SNC-2000 CPro, refer to AT&T 190-523-101, *SNC-2000 CPro User Manual.*

* Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation.

NAME

cnvt-crs: Convert Cross-Connection

INPUT FORMAT

cnvt-crs:*Address1*,*Address2*;

DESCRIPTION

CAUTION:
Execution of this command will affect service. This command should only be executed when existing STS-1 cross-connections are supporting either no services or DS1 services. Executing this command will cause a service interruption of approximately 25 milliseconds on associated DS1 services (and a 135 millisecond service interruption for Releases 3.2 and 6.0). Also, refer to the note below.

This command converts an existing STS-1 cross-connection to 28 individual VT1.5 cross-connections with the same endpoints. VT1.5 signals carried within the original STS-1 will appear in the same time slots in the upstream or downstream DDM-2000 multiplexers before and after the conversion takes place. This conversion enables an easy upgrade of existing STS-1 networks to DS1 networks. This command will reconfigure all hardware.

This command is available with OC-3 Release 3 and later linear releases and Release 7.1 and later ring releases. For ring releases where the cross-connection type (CrsType) is defined, the CrsType of all converted VT1.5 cross-connections will be the same as the CrsType of the STS-1 cross-connection before conversion. That is, if CrsType=dc for the STS-1 cross-connection, all VT1.5 cross-connections will be CrsType=dc also. 22-type OLIU circuit packs must be used to convert cross-connections.

The input parameters are:

Address1 and *Address2* These are the addresses of the two STS-1 channels that are currently cross-connected and will be converted to 28 VT1.5 cross-connections.
Valid STS-1 Addresses: **{a,b,c}, {m,c}-{1-3}, {a,b}-{1-2}**

NOTE:
No inverse capability is available to convert 28 VT1.5 cross-connections back to a single STS-1 cross-connections. In order to achieve this, the user must delete each of the 28 VT1.5 cross-connections using the **dlt-crs-vt1** command and then enter the STS-1 cross-connection using the **ent-crs-sts1** command.

In linear systems, if the cross-connect mode, set by the **set-ne** command, has a value of default, execution of this command will be denied with the following denial message:

```
SNVS
/*  Status, Not in Valid State  */
/*  System provisioned for default cross-connections. */
```

Address1 and *Address2* must match an existing STS-1 cross-connection or execution of the command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State  */
/*  The specified STS-1 cross-connection does not exist. */
```

The 22-type OLIU circuit packs must be used in the main slots of the shelf and function units must have circuit packs that support VT1.5 cross-connections (i.e. 22-type OLIUs, MXRVOs, or STS1Es). If a user attempts to execute this command with 21 type OLIUs in the main slots or if DS3s or 21 type OLIUs exist in the function unit addressed, the command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State  */
/*  Shelf is not equipped for VT connections. */
```

NOTE:
In OC-3 Release 6 and later, the word `Shelf` in the above denial message will be replaced by the actual *address* where the wrong type of circuit pack has been displayed.

If the convert cross-connection request is for a drop and continue connection and the Ring Identification of the STS-1 cross-connection does not agree with the assigned value for VT1.5 cross-connections (defined by the first VT1.5 drop and continue connection), the request is denied with the following message:

```
SNVS
/*  Status, Not in Valid State */
/*  Ring Identification already provisioned to be ring <value>. */
```

If a user attempts to execute this command on an EC-1 port that is in the NMON state, the command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State  */
/*  EC-1 port is in NMON state. */
```

After entering this command, the following confirmation is displayed. If fewer than 28 cross-connections are created, only the equipped slots will be shown in the *rtrv-crs-vt1* report.

```
/* CAUTION!  Execution of this command may affect service.
   This command will convert an existing STS-1 cross-connection into
   28 new VT1.5 cross-connections.  Proceed with EXTREME CAUTION!
   You have selected the cnvt-crs command with these parameters:

   Address1 = address
   Address2 = address          */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

dlt-crs-vt1

ent-crs-vt1

rtrv-crs-vt1

NAME

cpy-prog: Copy Program

INPUT FORMAT

cpy-prog:*TID;*

DESCRIPTION

CAUTION:
Normal alarming and protection switching are disabled for the selected DDM-2000 system while this command is used to copy program to a DDM-2000 system.

This command is available with OC-3 Release 6.2 and later.

This command copies the system controller program from the local network element to a remote network element. The controller program is copied directly from the local controller's memory to a remote controller's memory.

The local and remote systems must have DCC connectivity.

This command provides remote program copy capability from the local controller's memory to a remote controller's memory, just as the **ins-prog** command did in earlier releases. Remote program copy will no longer be supported by the **ins-prog** command, beginning with OC-3 Release 6.2.

The **ins-prog** command has been changed to support local program installation to a network element from a PC connected to the CIT port of the target system. For OC-3 Release 8.0 and later, the **ins-prog** command also supports a remote program installation to a DDM-2000 OC-3 or OC-12 from a PC connected to the CIT port of another DDM-2000 OC-12 or OC-3.

NOTE:
If security is enabled on any CIT or DCC port on a system, then this command is available to privileged users only for all CIT or DCC ports on the system. If security is not enabled on *all* systems in the network, users on unsecured systems will be able to copy controller program onto systems with security enabled.

The input parameter is:

TID The Target Identifier (system name) of the system into which the program will be loaded. TIDs are case insensitive.

If the command syntax is correct, the following message will be displayed:

```
/* Testing for program copy ... */
```

If the system name specified is the name of the local system instead of the remote system, the following error message will be displayed and the user will be asked to reenter the TID.

```
/* Invalid Target Identifier (TID) */
/* Enter the name (TID) of the far end system. */
TID=
```

If the system name specified is unknown to the local system, the following error message will be displayed and the user will be asked to reenter the TID.

```
/* Unknown Target Identifier (TID) */
/* Enter the name (TID) of the far end system. */
TID=
```

If the system name specified currently has a duplicate TID alarm condition, the following denial message will be displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* Duplicate Target Identifier. */
```

If a user attempts to copy program from one product type to another product type (for example, DDM-2000 OC-12 program into a DDM-2000 OC-3 system), the following denial message will be displayed:

```
SCSN
/* Status, invalid Command SequeNce */
/* Incompatible software. */
```

If the remote system has a communication failure or a "P" is displayed in the SYSCTL 7-segment LED display, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication failure. */
```

After testing for program copy, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will erase the current
   generic n.n.n at Target Identifier and replace it with
   generic m.m.m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful.
   This command will terminate any other active CIT sessions.
   This command will take time to install the new program.  Check the
   Software Release Description for the time estimates. */

Execute? (y/n or CANcel/DELete to quit) =
```

When this command is used to copy a new release of program that is significantly different than program currently running on the system, the following confirmation message will be displayed after testing for program copy:

```
/* Caution! Execution of this command will erase the current
   generic n.n.n at Target Identifier and replace it with
   generic m.m.m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful.
   This command will terminate any other active CIT sessions.
   This command will take time to install the new program.  Check the
   Software Release Description for the time estimates. */

/* Caution! Major changes exist between these two generics such
   that they may not be compatible.  Check the TOPS and program
   compatibility information for additional information or actions
   needed. */

Execute? (y/n or CANcel/DELete to quit) =
```

See "Install New Generic Program" in the TOP section (Volume 2) of this manual for complete instructions before using this command. Use the **rtrv-nmap** command to obtain the exact TID for the target system. The current program version may also be obtained from the initial screen when logged into the system with a craft interface terminal (CIT).

When the user gives a positive response to the confirmation message, the program copy begins and the following message is displayed:

```
In progress ..............................................
```

The number of dots and how fast they are displayed depend on the size of the program to be copied, number of DCC spans between the local and remote systems, and DCC traffic.

When the program has successfully been copied to the remote system, the following message is displayed:

```
/* Generic program m.m.m is copied. */
```

If the program copy fails, the following failure message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Program copy failed. Target Identifier
   will restart its current program, if possible.
   Before attempting another copy, check the User's Manual
   to review a list of possible problems and their solutions. */
```

RELATED COMMANDS

rtrv-eqpt

rtrv-nmap

ins-prog

NAME

dlt-crs-sts1: Delete Cross-Connection STS-1

INPUT FORMAT

dlt-crs-sts1:*Address1*,*Address2*[:*cct*=CrsType];

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command deletes STS-1 cross-connections.

NOTE:
In linear systems, this command can only be executed if the cross-connect mode is set to manual (**crs=***manual*) as provisioned by the **set-ne** command.

The input parameters are:

Address1 and *Address2* These are the addresses of the two STS-1 channels, or one STS-1 channel and one DS3/EC-1/OC-3 port or OC-1 line where the existing STS-1 cross-connection is to be deleted. In ring applications, pass-through connections are deleted by using the same address for *Address1* and *Address2*.
Valid OC-3 STS-1 Addresses:
{m,c}-{1-3}, {a,b,c}, {a,b}-{1-2}

cct CrsType specifies the cross-connection type. This parameter is available with Release 7.0 and later ring releases. The valid values are:

twoway Two-way applies to add/drop and pass-through cross-connections. This is the default value. Two-way connections are not allowed to function unit addresses equipped with 27-type OLIU interfaces.

dc Drop and continue connections support dual ring applications. Drop and continue connections are only allowed if the function unit address is equipped with the STS1E or OLIU low-speed circuit packs.

The *cct* parameter is an optional parameter if the cross-connection type to be deleted is **twoway**. The *cct* parameter is required for other CrsType values.

After entering this command, the following confirmation message is displayed:

```
/* Caution!  Execution of this command may affect service.
   You have selected the dlt-crs-sts1 command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value */

Execute? (y/n or CANcel/DELete to quit) =
```

Address1, *Address2*, and *CrsType* must match an existing STS-1 cross-connection, or execution of the command will complete with the following message:

```
/* The specified STS-1 cross-connection does not exist
   and cannot be deleted. */
```

In releases before R6.1 *Address1*, and *Address2* must match an existing STS-1 cross-connection, or execution of the command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State  */
/*  The specified STS-1 cross-connection does not exist. */
```

In linear systems, if the cross-connect mode is set to default (**crs=***default*), as provisioned by the **set-ne** command, this command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State */
/*  System provisioned for default cross-connections
    by the CrsMode parameter in the set-ne command. */
```

RELATED COMMANDS

ent-crs-sts1

rtrv-crs-sts1

rtrv-ne

set-ne

NAME

dlt-crs-vt1: Delete Cross-Connection VT-1.5

INPUT FORMAT

dlt-crs-vt1:*Address1*,*Address2*[:*cct*=CrsType];

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command deletes VT1.5 signal cross-connections within a DDM-2000 OC-3 system.

This command is available with OC-3 Release 3 software and later.

NOTE:
In linear systems this command can only be executed if the cross-connect mode is set to manual (**crs=***manual*) as set by the **set-ne** command.

The input parameters are:

Address1 and *Address2*

These are the addresses of the two VT1.5 channels, or one VT1.5 channel and one DS1 port, where existing cross-connections are to be deleted. In ring applications, pass-through connections are deleted by using the same address for *Address1* and *Address2*.

Valid Linear Addresses:
{m,c}-{1-3,all}-{1-7,all}-{1-4,all},
{a,b}-{1-2}-{1-7,all}-{1-4,all},
{a,b,c}-{1-7,all}-{1-4,all}

Valid Ring Addresses:
m-{1-3,all}-{1-7,all}-{1-4,all},
{a,b,c}-{1-7,all}-{1-4,all}

cct

CrsType specifies cross-connection type. This parameter is available with Release 7 and later ring releases.

In Release 7 or later ring releases, CrsType specifies whether the cross-connection is two-way or drop and continue. The valid values are:

twoway This is an optional parameter if the cross-connection to be deleted is **twoway** but is required for other CrsType values. Two-way applies to add/drop and pass-through cross-connections in both linear and ring applications. This is the default value. Two-way connections are not allowed to function unit addresses equipped with 27-type OLIU interfaces.

dc Drop and continue connections support dual ring applications. Drop and continue connections are only allowed if the function unit addressed is equipped with the STS1E or OLIU low-speed circuit packs.

If the address includes the value `all`, the value for *cct* applies to every cross-connection within the range of the addresses.

The *Address1*, *Address2* and *CrsType* parameters must match an existing VT1.5 cross-connection or execution of the command will complete with the following message:

```
/* The specified VT1.5 cross-connection does not exist
   and can not be deleted. */
```

For Releases 6.0 and earlier, the denial message is:

```
SNVS
/*  Status, Not in Valid State  */
/*  The specified VT1.5 cross-connection does not exist. */
```

In linear systems, if the cross-connect mode is set to default (**crs=***default*), as provisioned by the **set-ne** command, this command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State */
/*  System provisioned for default cross-connections
    by the CrsMode parameter in the set-ne command. */
```

If the cross-connection request address includes the value `all` and the addresses do not have a one-to-one relationship, this command will be denied with following denial message:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

If this command is entered with several addresses or an AID of `all` is used, and one or more of these addresses cannot be processed, the command will complete but the following message will be displayed:

```
/* The following cross-connections not processed.
   Cross-connect exists with different address:
   Address1  Address2
   Address1  Address2
      .         .
      .         .
      .         .    */
```

When *CrsType* is used and the command is entered with one or more addresses (or an AID of *all* is used) that cannot be processed, the command will complete but the following message will be displayed:

```
/* The following cross-connections were not processed
   because the address or cross-connection type did not match.
   Address1  Address2  CrsType
   Address1  Address2  CrsType
      .         .         .
      .         .         .      */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the dlt-crs-vt1 command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value */

Execute? (y/n or CANcel/DELete to quit) =
```

If this command is entered with `all` as part of the address, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
   Multiple cross-connections may be affected.
   You have selected the dlt-crs-vt1 command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

ent-crs-vt1

rtrv-crs-vt1

rtrv-ne

set-ne

NAME

dlt-tadrmap: Delete TID Address Map

INPUT FORMAT

dlt-tadrmap:**tid=***TID*;

DESCRIPTION

This command is used to remove an entry from the directory services network element (DSNE) network map. The DSNE is the gateway network element (**gne=**yes) where the network map, listing all active nodes in the network, is maintained.

When a node is removed from an OSI network, the DSNE must be updated to reflect that the node is no longer active. Entering this command at the DSNE will remove the obsolete node entry from the DSNE network map and from all **rtrv-nmap** (or **rtrv-map-network** in Release 7.2) reports at all nodes. This command will also remove any communication failure alarms related to removing the node from the network.

This command can only be executed at the DSNE and will only succeed if the communication status of the network element (NE) being deleted is "FAILED". The command **rtrv-nmap** (or **rtrv-map-network** in Release 7.2) may be used to list the communication status of a network element.

This command is available with OC-3 Release 6 software and later.

NOTE:
When security is enabled, this command is available to privileged users only.

The input parameter is:

tid TID (Target IDentifier) is a character string consisting of up to 20 alphabetic, numeric and hyphen characters. The TID identifies the network element to be removed from the DSNE's network map.

This command may only be executed at the DSNE. If a user attempts to execute this command at any other network element, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* This command can only be executed at GNE */
```

If the TID to be deleted is not listed in the DSNE network map, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System name does not exist. */
```

Only network elements whose communication status is "FAILED" may be removed from the network map. If a user attempts to remove a network element whose communication status is not "FAILED", the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Can only delete network elements with
   FAILED communication status. */
```

When more than one network element is defined as the GNE (DSNE in Release 7.2), an alarm will result. If a user attempts to remove a network element while the network has more than one GNE (DSNE in Release 7.2) defined, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Due to a network provisioning problem (duplicate GNE),
   this TID can not be deleted from the network map at this time. */
```

RELATED COMMANDS

rtrv-nmap

NAME

ent-crs-sts1: Enter Cross-Connection STS-1

INPUT FORMAT

ent-crs-sts1:*Address1*,*Address2*[:*cct*=CrsType][,*ring*=RingId];

DESCRIPTION

This command sets bidirectional STS-1 cross-connections between main and function unit slots and may be applied to OC-3 systems with various arrangements, including hubbing, add/drop, terminating STS-1, and rings.

All cross-connections are done via the OLIU circuit packs in the Main slots. In ring applications, 22-type OLIU circuit packs must be used to establish STS-1 cross-connections. In linear applications, 22-type, 21G, or 21D OLIU circuit packs may be used to establish STS-1 cross-connections. Additionally, in linear applications, cross-connections may only be entered if **crs=***manual*, as set by the **set-ne** command.

Figures 11-1, 11-2, and 11-3 show three sample cross-connections.

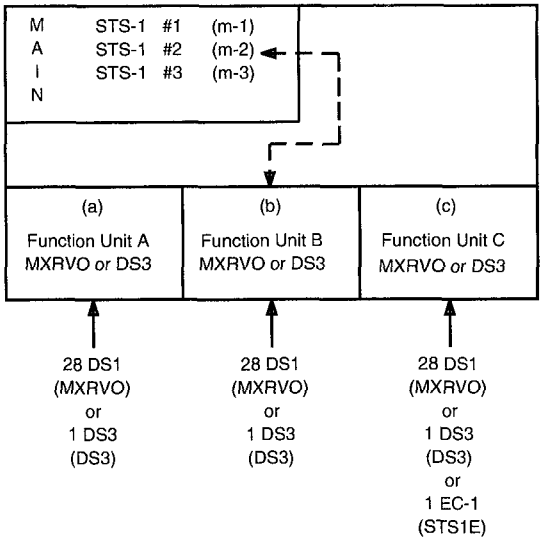


Figure 11-1. Terminating STS-1 m-2 to b

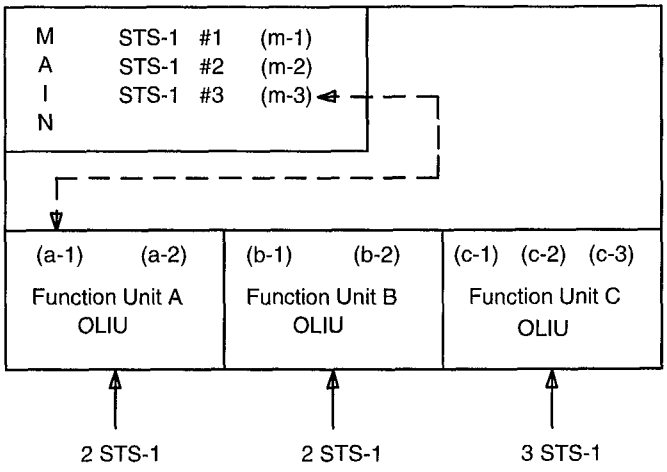


Figure 11-2. Hub Application m-3 to a-1

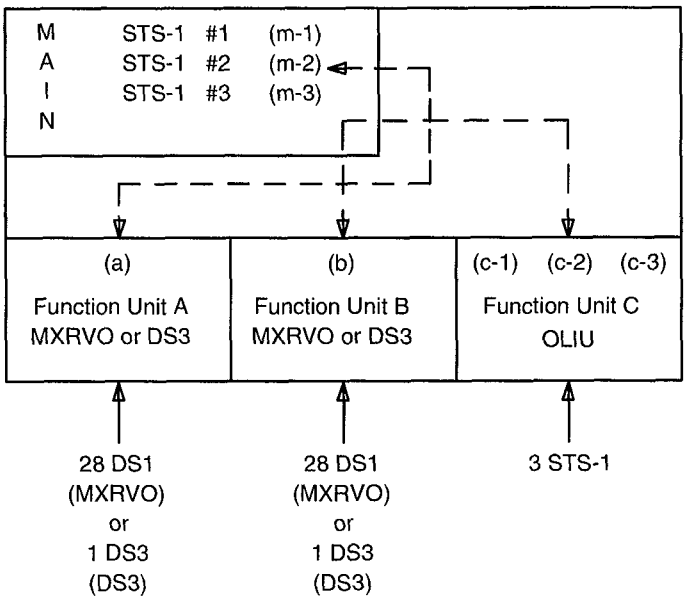


Figure 11-3. Add/Drop Application m-2 to a, c-2 to b

The input parameters are:

Address1 and *Address2*
These are the addresses of the two STS-1 channels or one STS-1 channel and one DS3/EC-1/OC-3/OC-1 port that are to be cross-connected. For STS-1 ring pass-through traffic, *Address1* and *Address2* must be the same time slot. Valid addresses are listed on the following pages.

NOTE:
All cross-connections are bidirectional.

cct CrsType specifies the cross-connection type. This parameter is available with Release 7.0 and later. The valid values are:

twoway Two-way cross-connections apply to add/drop and pass-through cross-connections. This is the default value.

dc Drop and continue cross-connections support dual ring applications. Drop and continue connections are only allowed if the function unit address is equipped with the STS1E or OLIU low-speed circuit packs.

ring This parameter is available with Release 7.0 and later ring releases. RingId is the ring identification for drop and continue connections and specifies which ring rotation will be continued as well as dropped at this network element. The valid values are:

m1 Ring **m1** is the ring that is received on the main-1 OLIU and is transmitted on the main-2 OLIU.

m2 Ring **m2** is the ring that is received on the main-2 OLIU and is transmitted on the main-1 OLIU.

If the CrsType is not **dc**, the RingId is not requested and is not displayed in confirmation messages. If the CrsType is not **dc**, and RingId is entered, the system will ignore any value entered for RingId.

In linear releases, shelves may be placed into the default or manual cross-connect mode using the **set-ne** command. If no cross-connect mode is specified, each shelf will be in default mode, which provides a fixed mapping between STS-1 signals embedded in the OC-3 line signal and the STS-1s associated with signals terminating on the shelf. When the manual cross-connect mode is selected, the cross-connect map may be changed by the user. All cross-connections must be entered by the user with this **ent-crs-sts1** command.

For STS-1 cross-connections, there is a one-to-one correspondence between the VT Group number and the low speed slot number. There is also a one-to-one correspondence between the VT number and the low speed port number.

Valid default and manual cross-connection addresses are listed on the following pages. To successfully perform any cross-connection, the user *must* equip the Main slots with 22-type, 21D, or 21G OLIU circuit packs. For additional examples and restrictions on cross-connections, refer to the "Cross-Connection Provisioning" information located in Section 8.

Default Linear Cross-Connect Addresses:

m-1 to a	Default when function group A is equipped with DS3, STS1E, or MXRVO circuit packs
m-2 to b	Default when function group B is equipped with DS3, STS1E, or MXRVO circuit packs
m-3 to c	Default when function group C is equipped with DS3, STS1E, or MXRVO circuit packs
m-1 to a-1	Default when function group A is equipped with OLIU circuit packs
m-2 to b-2	Default when function group B is equipped with OLIU circuit packs
m-3 to c-3	Default when function group C is equipped with OLIU circuit packs

In Release 2 only, where the **crs** parameter is not user-settable, the following manual cross-connections may be entered. Where items appear in braces { }, any one (and only one) of these items may be used to form the address.

Manual Linear Cross-Connect Addresses (Release 2 only):

m-1 to a	Allowed when function group A is equipped with DS3, STS1E, or MXRVO circuit packs
m-2 to b	Allowed when function group B is equipped with DS3, STS1E, or MXRVO circuit packs
m-3 to c	Allowed when function group C is equipped with DS3, STS1E, or MXRVO circuit packs
m-1 to a-1	Allowed when function group A is equipped with OLIU circuit packs
m-2 to b-2	Allowed when function group B is equipped with OLIU circuit packs
m-1 to c-1	
m-2 to c-2	
m-3 to c-3	Allowed when function group C is equipped with OLIU circuit packs

In linear Release 3 and later, manual cross-connections may be entered if the cross-connect mode is set to manual (**crs=***manual*), as provisioned by the **set-ne** command. Valid manual cross-connections are listed below. Where items appear in braces { }, any one (and only one) of these items may be used to form the address.

Manual Linear Cross-Connect Addresses:

m-{1-3} to {a,b,c}
Allowed when function groups A and/or B and/or C are equipped with DS3, STS1E, or MXRVO circuit packs

{a,b} to c-{1-3}
Allowed when function groups A and/or B are equipped with DS3, STS1E, or MXRVO and when function group C is equipped with OLIU circuit packs.

m-{1-3} to {a,b}-{1,2}
Allowed when function groups A and/or B are equipped with OLIU circuit packs

{a,b}-{1,2} to c-{1-3}
Allowed when function groups A or B and C are equipped with OLIU circuit packs. No more than 1 STS-1 channel may be routed between function groups A and C, and no more than 1 STS-1 channel may be routed between function groups B and C.

m-{1-3} to c-{1-3}
Allowed when function group C is equipped with OLIU circuit packs

In DDM-2000 OC-3 ring releases (Release 5 and later), the cross-connect mode is manual (**crs=***manual*). Valid manual cross-connections are listed below. Where items appear in braces { }, any one (and only one) of these items may be used to form the address.

Ring Cross-Connect Addresses:

m-{1-3} to {a,b,c}
Allowed when Main slots are equipped with 22-type OLIU circuit packs, and function groups A and/or B and/or C are equipped with DS3, STS1E, or MXRVO circuit packs

m-{1-3} to b-{1,2}
Allowed when Main slots are equipped with 22-type OLIU circuit packs, and function group B is equipped with 22-type circuit packs

m-{1-3} to c-{1-3}
Allowed when Main slots are equipped with 22-type circuit packs, and function group C is equipped with 22-type circuit packs

m-{1-3} to m-{1-3}
Allowed to cross-connect pass-through signals when Main slots are equipped with 22-type circuit packs. `Address1` and `Address2` must be the identical time slot.

If this command is invoked using addresses where active cross-connections already exist, the following denial message will be displayed:

```
SACC
/* Status, Already Cross-Connected */
/* Establishing new cross-connections requires that
   existing cross-connections associated with these
   addresses be deleted. */
```

If the cross-connection request includes an invalid circuit pack type, invalid port address, or specifies a cross-connection not supported by the system, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

In ring systems, if this command is issued and one of the MAIN slots is not equipped, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped */
```

In linear systems, if the cross-connect mode is set to default (**crs=***default*), as provisioned by the **set-ne** command, this command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State */
/*  System provisioned for default cross-connections
    by the CrsMode parameter in the set-ne command. */
```

After entering this command, the following confirmation message is displayed. The `RingId` parameter is displayed in the confirmation message only if the `CrsType` parameter is set to **`dc`**.

```
/* Caution!  Network cross-connections are affected by this command.
   You have selected the ent-crs-sts1 command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value
   RingId = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

dlt-crs-sts1

rtrv-crs-sts1

rtrv-ne

set-ne

NAME

ent-crs-vt1: Enter Cross-Connection VT-1.5

INPUT FORMAT

ent-crs-vt1:*Address1*,*Address2*[:*cct*=CrsType][,*ring*=RingId];

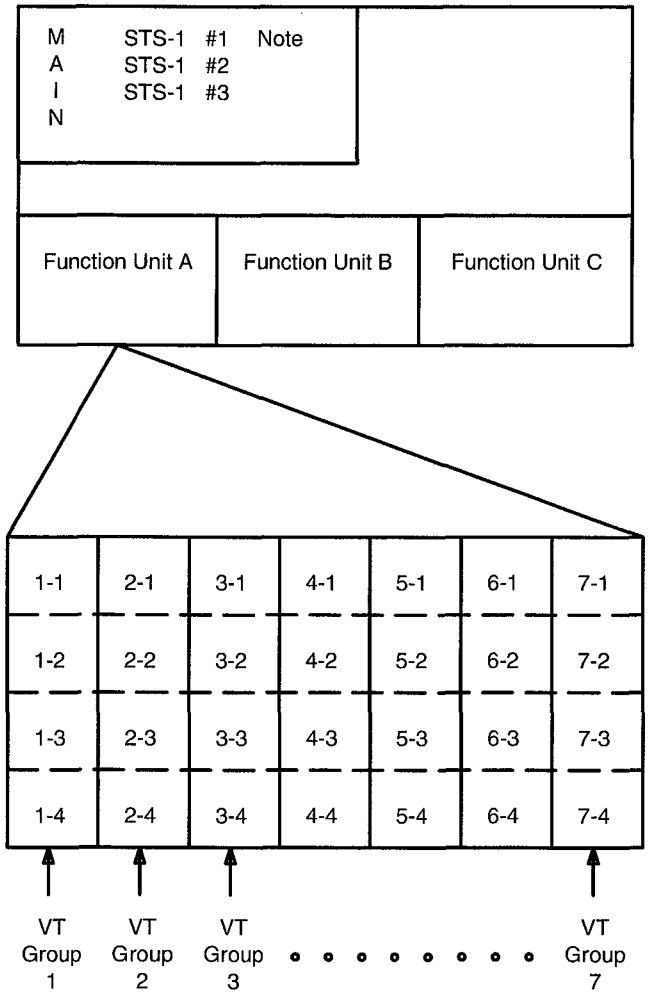
DESCRIPTION

This command sets bidirectional VT1.5 cross-connections among main and function unit slots and may be applied to OC-3 systems with various arrangements.

All cross-connections are done via the OLIU circuit packs in the Main slots. The 22-type OLIU circuit packs must be used to establish VT1.5 cross-connections. Additionally, in linear systems, cross-connections may only be entered if **crs=***manual*, as set by the **set-ne** command.

This command is available with OC-3 Release 3 software and later.

Figure 11-4 shows a DDM-2000 OC-3 shelf and highlights a function unit with 28 VT1.5 signals.



Note Each STS-1 signal contains 28 VT1 5 signals

Figure 11-4. DDM-2000 Shelf with VT1.5 Signals

As highlighted in Figure 11-9, each OC-3 signal contains 3 STS-1 signals. Each STS-1 signal contains 7 VT Groups of signals. Each VT Group contains 4 VT1.5 signals, and each VT1.5 signal corresponds to an individual DS1 port.

The input parameters are:

Address1 and *Address2*

These are the addresses of the two VT1.5 channels or one VT1.5 channel and one DS1 port that are to be cross-connected. For VT1.5 ring pass-through traffic, *Address1* and *Address2* must be the same. Valid addresses are listed on the following pages.

NOTE:
All cross-connections are bidirectional.

cct

CrsType specifies the cross-connection type. This parameter is available with Release 7.0 and later ring releases. The valid values are:

twoway Two-way applies to add/drop and pass-through cross-connections in both linear and ring applications. This is the default value.

dc Drop and continue connections support dual ring applications. Drop and continue connections are only allowed if the function unit address is equipped with the STS1E or OLIU low-speed interface.

If the value `all` is used in the address, the *cct* applies to every cross-connection within the range of the addresses.

ring

RingId is the ring identification for drop and continue and single 0x1 connections, and specifies which ring rotation will be continued as well as dropped at this network element. The valid values are:

m1 Ring **m1** is the ring that is received on the main-1 OLIU and is transmitted on the main-2 OLIU.

m2 Ring **m2** is the ring that is received on the main-2 OLIU and is transmitted on the main-1 OLIU.

For OC-3 Release 7 and later, all drop and continue cross-connections in a network element must be assigned to the same ring. The assigned value will be set to the ring specified in the first completed drop and continue cross-connection. If *cct* is set to **dc**, this parameter is only prompted for if this is the first assignment. The user may continue to enter the RingId value for other drop and continue connections but the value must agree with the value set by the first drop and continue connection. If the CrsType is not **dc**, the RingId is not prompted for and it is not displayed in confirmation messages. If the CrsType is not **dc** and RingId is entered anyway, the value entered for RingId is ignored.

Valid cross-connections are listed below. To successfully perform any cross-connection, the user *must* equip the Main slots with 22-type OLIU circuit packs. For linear systems, cross-connections may be entered if **crs=***manual*, as set by the **set-ne** command. Where items appear in braces { }, any one (and only one) of these items may be used to form the address. In Release 5 and later, **all** may be used as part of an address (allowed as indicated below) to cross-connect entire groups of signals. When **all** is used, no subsequent address fields should be defined.

Linear Cross-Connection Addresses:

m-{1-3}-{1-7,all}-{1-4,all} to {a,b,c}-{1-7,all}-{1-4,all}
Allowed when the addressed low speed (LS) port is equipped with a DS1 circuit pack or an STS1E (EC-1) low-speed circuit pack.

{a,b}-{1-7,all}-{1-4,all} to c-{1-3}-{1-7,all}-{1-4,all}
Allowed when the addressed low speed port in function groups A or B are equipped with DS1 or STS1E low-speed circuit packs, and when function group C is equipped with 22-type OLIU circuit packs.

{m,c}-{1-3}-{1-7,all}-{1-4,all} to {a,b}-{1,2}-{1-7,all}-{1-4,all}
Allowed when both addressed groups are equipped with 22-type or 22D OLIU circuit packs.

m-{1-3,all}-{1-7,all}-{1-4,all} to c-{1-3,all}-{1-7,all}-{1-4,all}
Allowed when function group C is equipped with 22-type OLIU circuit packs.

Ring Cross-Connection Addresses:

m-{1-3}-{1-7,all}-{1-4,all} to {a,b,c}-{1-7,all}-{1-4,all}
Allowed when the addressed low-speed (LS) port is equipped with a DS1, STS1E or OLIU low-speed circuit pack, and the Main slots are equipped with 22-type OLIU circuit packs.

m-{1-3,all}-{1-7,all}-{1-4,all} to m-{1-3,all}-{1-7,all}-{1-4,all}
For ring releases, when the Main slots are equipped with 22-type OLIUs, these addresses provide pass-through cross-connections. The two VT1.5 channel addresses must be the same.

m-{1-3}-{1-7,all}-{1-4,all} to b-{1,2}-{1-7,all}-{1-4,all}
Allowed when function group B is equipped with 22-type OLIU circuit packs.

m-{1-3,all}-{1-7,all}-{1-4,all} to c-{1-3,all}-{1-7,all}-{1-4,all}
Allowed when function group C is equipped with 22-type OLIU circuit packs.

If the cross-connection request includes an invalid circuit pack type, invalid port address, or specifies a cross-connection not supported by the system, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

If the cross-connection request includes `all` in the addresses and the addresses do not have a one-to-one relationship, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request. */
```

In linear releases, if the cross-connect mode is set to default (**crs=***default*), as provisioned by the **set-ne** command, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for default cross-connections
   by the CrsMode parameter in the set-ne command. */
```

In ring systems, if this command is issued and one of the main slots is not equipped, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped. */
```

If this command is invoked using addresses where active cross-connections already exist, the following denial message will be displayed:

```
SACC
/* Status, Already Cross-Connected */
/* Establishing new cross-connections requires that existing
   cross-connections associated with these addresses must
   be deleted first. */
```

If the cross-connect request is to an STS1E low-speed interface, the EC-1 port state cannot be NMON. If this condition occurs, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* EC-1 port is in NMON state. */
```

If this command is entered with several addresses (for example, when the address `all` is used), and one or more of these addresses are already cross-connected, the command will complete but send the following message indicating the requested cross-connections that could not be completed because of previously existing cross-connections:

```
/* The following cross-connections not processed.
   Cross-connect exists with different address:
   Address1  Address2
   Address1  Address2
      .         .
      .         .
      .         .    */
```

When the CrsType parameter is supported and the command is entered with several addresses (for example, when the address `all` is used), but one or more of these addresses is already cross-connected, the DDM-2000 response message will be:

```
/* The following cross-connections were not processed
   because the address or cross-connection type did not match
   Address1  Address2  CrsType
   Address1  Address2  CrsType
      .         .         .
      .         .         .
```

If the cross-connect request is for a drop and continue connection and the Ring Identification does not agree with the assigned value (defined by the first drop and continue connection), the request is denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Ring Identification already provisioned to be ring <value> */
```

After entering this command, the following confirmation message is displayed. If CrsType is not **dc**, RingId is not displayed in confirmation message:

```
/* Caution!  Network Cross-connections are affected by this command.
   You have selected the ent-crs-vt1 command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value
   RingId = value */

Execute? (y/n or CANcel/DELete to quit) =
```

If this command is entered with the parameter *all* as part of the address, the following confirmation message is displayed. If CrsType is not **dc**, RingId is not displayed in confirmation message:

```
/* Caution! Execution of this command may affect service.
   Multiple cross-connections may be affected.
   You have selected the ent-crs-vt1 command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value
   RingId = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

dlt-crs-vt1

rtrv-crs-vt1

rtrv-ne

set-ne

NAME

ent-ulsdcc: Enter Upper Layer Section DCC

INPUT FORMAT

ent-ulsdcc:[**L3org=***OrganizationID*][,**L3res=***Reserved*][,**L3rou=***RoutingData*];

DESCRIPTION

CAUTION:
Execution of this command with parameters other than the default values at the GNE/DSNE will disrupt DCC communications. Errors in provisioning this command could result in silent alarm failures. Command parameters should *only* be changed by users who intend to provision the SONET subnetwork and partition DCC communications.

This command provisions parameters of Layers 3 through 7 of the Open Systems Interconnection (OSI) 7-layer protocol stack. This stack refers to the OSI reference model which is a logical structure for network operations. This model defines a standard communication protocol between network elements as specified by the International Standards Organization (ISO).

This command is used to provision the user-settable fields of the Layer 3 network service access point (NSAP) address. The NSAP address is a 20-byte address required by OSI to provide unique identification within the OSI network. Each DDM-2000 is programmed with a unique NSAP address at the factory. For current software releases, only a single routing area can be supported and it is not possible to establish DCC connections between separate routing areas. Therefore, the default factory values are adequate to operate current networks. NSAP provisioning, using this command, will be used as part of future upgrade procedures. However, this command may be used now to change the user-settable portions of the NSAP to further uniquely identify the network element and to begin setting the addressing and routing structure of the SONET subnetwork. To facilitate future software upgrades, parameters should be set to the same values at each network element in the subnetwork.

This command is available with OC-3 Release 6 and later software.

NOTE:
If security is enabled, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

The input parameters are:

L3org OrganizationID is a 6-digit hexadecimal field used to provision into the NSAP address the allocated company code assigned by the ANSI-administered USA Registration Authority for OSI Organization Names. The original value for this parameter is 000000.

L3res Reserved is a 4-digit hexadecimal field that currently has not been assigned a specific purpose by the SONET standards. Users may populate this field to further uniquely identify the NSAP address. The original value for this parameter is 0000.

L3rou RoutingData is an 8-digit hexadecimal parameter that covers two logical fields of the NSAP address. They are:

`Routing Domain` This field identifies a unique routing domain within an administrative domain.

`Area` This field identifies the area within the routing domain to which the NSAP address belongs.

The original value for this parameter is 00000000.

If an incorrect number of digits is entered for a specific parameter, the following message is issued and the user is reprompted:

```
/* Invalid data entry
   Enter a <num> digit hexadecimal number */
```

The `<num>` specifies four, six, or eight digits, as required.

After entering this command, the following confirmation message is displayed:

```
/* Caution!  Network Element access is affected by this command.

   Caution! When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file.
   If possible, it will reinitialize the date and time with
   the far end via the DCC.  Otherwise, the
   date and time will assume default values.
   You have selected the ent-ulsdcc command with these parameters:

   L3org = xxxxxx
   L3res = xxxx
   L3rou = xxxxxxxx */
Execute?  (y/n or CANcel/DELete to quit) =
```

In OC-3 release 6.1 and all later releases, the above full confirmation message is displayed if a change is made to any of the three parameters.

If the user enters the same parameter values as currently defined, the system does not reset, and the following brief confirmation message is displayed:

```
/* Caution!  Network Element access is affected by this command.
   You have selected the ent-ulsdcc command with these parameters:

   L3org = xxxxxx
   L3res = xxxx
   L3rou = xxxxxxxx */
Execute?  (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-ulsdcc

NAME

help: Provide In-context Help

INPUT FORMAT

?

DESCRIPTION

Help (**?**) provides help within a craft dialog on the CIT. Help is provided automatically when an invalid input is entered and can also be requested at any time by typing "**?**". The "**?**" displays a help message and then displays another prompt.

The help message is either a description of format of the required entry or a menu of choices.

NAME

init-pm: Initialize Performance Monitoring

INPUT FORMAT

init-pm:reg=*Register*;

DESCRIPTION

This command initializes all current day and/or all current quarter-hour performance-monitoring storage registers. Registers for previous day and previous quarter-hours are not affected.

NOTE:
For OC-3 Release 5.1 and all later releases, if security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

The input parameter is:

reg Register is the class of registers to be initialized and may be one of the following:

- **day** Day registers
- **qh** Quarter-hour registers
- **all** Day and quarter-hour registers

RELATED COMMANDS

rtrv-pm-line

rtrv-pm-sect

rtrv-pm-sts1

rtrv-pm-t3

rtrv-pm-tca

NAME

init-sys: Initialize System.

INPUT FORMAT

init-sys:*Address*;

DESCRIPTION

⚠ **CAUTION:**
Execution of this command may affect service.
The command **init-sys:all** should NOT be used on an in-service system. This command should only be used at the end of installation, before system turnup.

This command initializes provisionable parameters to their default values. The time and date parameters are not affected by this command.

⇒ **NOTE:**
After entering the **init-sys** command, the system will show transient DCC failures that are recorded in the Alarm and History reports. This is a normal, expected system response.

The command **init-sys:all** should be used only at the end of installation before system turnup. The command **init-sys:sysctl** should only be used after a SYSCTL is replaced. To clear a system problem, the **reset** command should be used since it resets the system software without changing the provisioned parameters.

⇒ **NOTE:**
This command is available to privileged users only.

The input parameter is:

Address Address determines whether just system controller parameters are initialized, or whether all parameters on the entire system are initialized. Address may have the following values:

sysctl The address **sysctl** can be used after a system controller is replaced on an in-service system. It is the equivalent of pressing the UPD/INIT pushbutton within 10 seconds of the processor startup sequence (while the CR LED on the user panel is flashing). This command restores the following list of parameters to their default values. (NOTE: Parameters can be provisioned using the commands listed below the parameters).

Alarm delays
set-attr-alm

System name (TID) and GNE status
set-ne (BBG5 only)

NSAP
ent-ulsdcc (Release 6 and later)

Security
set-lgn (Release 3 and later)
set-passwd (Release 3 and later)
set-secu (Release 3 and later)

CIT link configuration
set-link

Protection Switching
(inhibit, forced, lockout, manual)
switch-fn
switch-line
switch-ls
switch-sync

Performance monitoring thresholds
set-pmthres-sect
set-pmthres-line
set-pmthres-t3
set-pmthres-sts1
set-pmthres-t1
set-pmthres-vt1

Synchronization Characteristics
set-sync

Environmental alarm names and alarm levels
set-attr-env

Environmental control names
set-attr-cont

Far end communications
set-fecom

all The address **all** is used only at the end of an installation before turning over the system. This ensures that all parameters in the system have the proper default values before any system-specific provisioning is done.

CAUTION:
The address **all** should NOT be used on an in-service system.

NOTE:
This command, **init-sys:all**, is available to privileged users only.

This parameter initializes all the parameters listed under **sysctl** PLUS the following:

Loopbacks
- **opr-lpbk-ec1** (Release 6 and later)
- **opr-lpbk-t1**
- **opr-lpbk-t3**

Cross-connections
- **dlt-crs-sts1**
- **dlt-crs-vt1** (Release 3 and later)
- **ent-crs-sts1**
- **ent-crs-vt1** (Release 3 and later)
- **set-ne** (Release 3 and later)

OC-3 signal degrade threshold
- **set-oc3**
- **set-ec1**
- **set-sts1** (Release 7.1 and later rings releases)
- **set-vt1** (Release 7.1 and later rings releases)

Signal failure thresholds
- **set-ec1** (Release 6 and later)
- **set-state-ec1** (Release 6 and later)
- **set-t1**
- **set-t3**

Protection Switching (manual)
- **switch-fn**
- **switch-line**
- **switch-ls**
- **switch-sync**

Feature Options
- **set-feat**

In addition to initializing parameters, entering the address **all** will clear all performance monitoring data and alarms. For failure conditions that still exist after parameters are initialized, the alarms will be redeclared. Time and date parameters are not affected by this command.

When the command **init-sys:sysctl** is entered, the following confirmation message will be displayed:

```
/* CAUTION!
   Execution of this command will set ALL parameters on the
   controller to their original default values.
   This may disrupt this system's operations interfaces.
   Refer to the DDM-2000 User/Service Manual before executing
   this command.

   Caution!  When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file,
   and reinitialize the date and time with the far end
   system.

   Proceed with EXTREME CAUTION!

   You have selected the init-sys command with these parameters:

   Address = sysctl */
Execute? (y/n or CANcel/DELete to quit) =
```

When the command **init-sys:sysctl** is entered using a software release without OSI communications, the following confirmation message will be displayed:

```
/* CAUTION!
   Execution of this command will set ALL parameters on the
   controller to their original default values and will
   cause the NE to restart its software.
   This may disrupt this system's operations interfaces.
   Refer to the DDM-2000 User/Service Manual before executing
   this command.

   Proceed with EXTREME CAUTION!

   You have selected the init-sys command with these parameters:

   Address=sysctl     */

Execute? (y/n or CANcel/DELete to quit) =
```

Entering the command **init-sys:all** will cause the following confirmation message to be displayed:

```
/* CAUTION!

   THIS COMMAND SHOULD NEVER BE EXECUTED ON AN IN-SERVICE SYSTEM!

   This command will set ALL parameters in the whole system
   to their original default values.
   This may result in a lengthy service outage and may disrupt
   this system's operations interfaces.

   Caution!  When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file,
   and reinitialize the date and time with the far end
   system.

   PROCEED WITH EXTREME CAUTION!

   You have selected the init-sys command with these parameters:

   Address = all */
Execute? (y/n or CANcel/DELete to quit) =
```

Entering the command **init-sys:all** using a software release without OSI communications will cause the following confirmation message to be displayed:

```
/* CAUTION!

   THIS COMMAND SHOULD NEVER BE EXECUTED ON AN IN-SERVICE SYSTEM!

   This command will set ALL parameters in the whole system
   to their original default values and will
   cause the system to restart its software.
   This may result in a lengthy service outage and may disrupt
   this system's operations interfaces.

   PROCEED WITH EXTREME CAUTION!

   You have selected the init-sys command with this parameter:

   Address=all  */

Execute? (y/n or CANcel/DELete to quit) =
```

NOTE:
Executing **init-sys:sysctl** may cause the system to respond with the following message: `Parameters set to default values.` This means that the circuit pack in a specified slot has failed or has been removed, and the parameters for ports associated with that slot have been set to their default values.

RELATED COMMANDS

reset

upd

NAME

ins-prog: Install Program

INPUT FORMAT

ins-prog:*TID;*

DESCRIPTION

CAUTION:
Normal alarming and protection switching are disabled for the *TID* specified while this command is in progress.

This command installs a new program into the system controller. For OC-3 Releases 6.2 and later, this command only supports a local program installation to a network element from a PC connected to the CIT port of the target system. In earlier releases, this command will also copy the system controller program from a local network element to a remote network element. This capability is now supported by the **cpy-prog** command.

NOTE:
For OC-3 Release 3 and later, if security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf. If security is not enabled on *all* shelves in the network, users on unsecured shelves will be able to install software that affects shelves with security enabled.

This command cannot be executed during a remote login session.

The input parameter is:

TID The Target Identifier (system name) of the shelf into which the program will be loaded.

NOTE:
For Release 2, TID must be entered in the correct case; "ABC", "Abc", and "abc" are different TIDs. TIDs for Release 3 and later are case insensitive.

If the command syntax is correct, the following message will be displayed:

```
/* Testing for program installation ... */
```

This command can only be completed successfully if it is executed from a CIT or modem port, but not if it is received over the DCC. This command cannot be executed during a remote login session. If this command is executed during a remote login session, the following message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* This command cannot be executed from within a rlgn session. */
```

If the system name specified is unknown to the local system, the following error message will be displayed and the user will be asked to reenter the TID.

```
/* Unknown Target Identifier (TID) */
/* Enter the name (TID) of the local or far end system. */
TID=
```

If the system name specified currently has a duplicate TID alarm condition, the following denial message will be displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* Duplicate Target Identifier. */
```

If this command is not executed from a PC, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* PC communication link could not be established.
   Please connect PC with program to be installed and start again. */
```

If this command is used to install program locally to a DDM-2000 but the PC contains DLC Subsystem program, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Incompatible program. */
```

If the communication link between the PC and the system that it connects to fails, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* PC communication link failure. */
```

If communication cannot be established when attempting to download software to a local site from a PC, the following message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication link cannot be established.
   Please connect PC with DDM-2000 upgrade
   program and start again. */
```

If a user attempts to download software that is incompatible with the shelf type (for example, DDM-2000 OC-12 software into a DDM-2000 OC-3 system), the following denial message will be displayed:

```
SCSN
/* Status, Invalid Command Sequence */
/* Incompatible shelf */
```

For OC-3 Release 6.0 and earlier, when this command is used to download software to a remote site after testing for program installation, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m.  If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any other active CIT sessions.
This command will take about 30 minutes to install the new program. */
Execute? (y/n or CANcel/DELete to quit) =
```

For OC-3 Release 6.0 and later, when this command is used to download software to a local site from a personal computer (PC), the following confirmation message will be displayed after testing for program installation:

```
/* Caution! Execution of this command will erase the current
generic n.n.n at Target Identifier and replace it with
generic m.m.m.  If this fails prior to completion,
the control system will likely become inoperable
until another install program attempt is successful.
This command will terminate any other active CIT sessions.
This command will take about 30 minutes to install the new program.
Check the Software Release Description for estimates at
9600 baud.
Lower data rates will take proportionally longer. */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-3 Release 7.0 and later, when this command is used to download a new release of software that is significantly different than software currently running on the remote system, or to download software to a local system from a personal computer (PC) where the software to be downloaded is significantly different than software currently running on the local system, the following confirmation message is displayed:

```
/* Caution! Execution of this command will erase the current
   generic n.n.n at Target Identifier and replace it with
   generic m.m.m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful.
   This command will terminate any other active CIT sessions.
   This command will take time to install the new program.  Check the
   Software Release Description for the time estimates. */

/* Caution! Major changes exist between these two generics such
   that they may not be compatible.  Check the TOPS and software
   compatibility information for additional information or actions
   needed. */

Execute? (y/n or CANcel/DELete to quit) =
```

When a user gives a positive response to the confirmation message, the following message is displayed:

```
In progress ..............................................
```

The number of dots and how fast they are displayed depend on the size of the program to be installed and the baud rate.

See "Install New Generic Program" in the TOP section (Volume 2) of this manual for complete instructions before using this command. Use the **rtrv-ne** or **rtrv-nmap** commands to obtain the exact TID for the system. The command **rtrv-eqpt** provides the current program version. The current program version may also be obtained from the initial screen and every report header line when logged into the system with a craft interface terminal (CIT). The current program version is also available on the user panel.

In Release 3 and later, each time a carriage return is entered, the system will also print a header line containing the TID and program version.

RELATED COMMANDS

rtrv-eqpt

rtrv-ne

NAME

logout: Terminate CIT Session

INPUT FORMAT

logout;

DESCRIPTION

This command terminates a user CIT session.

If this command is entered during a local session, it will terminate all sessions established by the user. If entered during a remote session, this command will terminate the remote session and return the user to the local session.

RELATED COMMANDS

rlgn

toggle

NAME

opr-aco: Operate Alarm Cutoff

INPUT FORMAT

```
opr-aco;
```

DESCRIPTION

This command silences the audible office alarms. Alarms remain silent until a new alarm condition arises.

If this command is executed while there is an active alarm condition in the system, it will:

- Silence active audible office alarms
- Light the ACO LED on the user panel
- Set the parallel telemetry ACO output point
- Clear all parallel telemetry outputs except the system ID and ACO outputs.

This command is equivalent to pushing the ACO button on the user panel, activating the TBOS ACO control point, or activating the parallel telemetry ACO input.

For any OC-3 or OC-12 shelf in an OC-3/OC-12 network that has co-located OC-3 and OC-12 shelves (same *site* switch settings), any one of the following actions will silence audible office alarms on all shelves at the same site:

- Depressing the ACO button
- Executing the OPR-ACO command
- Activating the parallel telemetry ACO input
- Setting the OC-3 TBOS ACO control point.

NAME

opr-lpbk-ec1: Operate-Loopback-EC1

INPUT FORMAT

opr-lpbk-ec1:*Address*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command executes a loopback on a low-speed STS1E interface towards the optical fiber. The loopback remains in place until it is released by the **rls-lpbk-ec1** command.

This command is available with OC-3 Release 6 (linear), Release 5.1 (rings), and later releases.

The input parameter is:

Address Address of EC-1 port(s) to be looped back.
Valid EC-1 Port Addresses: **{a,b,c,all}**

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the opr-lpbk-ec1 command with these parameters:

   Address=address */

Execute? (y/n or CANcel/DELete to quit) =
```

If the command cannot be completed due to hardware problems on the circuit pack, the following message is displayed:

```
/* Address CPname CP failed */
```

Address and *CPname* refer to the slot address and provisioned circuit pack type for the slot, respectively.

If a slot is determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Address not equipped for STS1E */
/* Enter low-speed EC-1 port address: {a,b,c,all} */
```

If the command cannot be completed due to hardware problems on the SYSCTL, the following message is displayed:

```
/* SYSCTL failed - no loopback established */
```

RELATED COMMANDS

rls-lpbk-ec1

NAME

opr-lpbk-t1: Operate-Loopback-T1

INPUT FORMAT

opr-lpbk-t1:*Address*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command executes a loopback on a DS1 port towards the optical fiber. The loopback remains in place until released by the **rls-lpbk-t1** command.

The input parameter is:

Address Address of DS1 port(s) to be looped back.
Valid Addresses: **all, {a,b,c}-{1-7,all}-{1-4,all}**

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the opr-lpbk-t1 command with these parameters:

   Address=address */

Execute? (y/n or CANcel/DELete to quit) =
```

If the command cannot be completed due to hardware problems on the circuit pack, the following message is displayed:

```
/* Address CPname CP failed */
```

Address and *CPname* refer to the slot address and provisioned circuit pack type for the slot, respectively.

If a slot is determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Address is not equipped  - no loopback established */
/* Enter DS1 port Address:   */
```

If the command cannot be completed due to hardware problems on the SYSCTL, the following message is displayed:

```
/* SYSCTL failed - no loopback established */
```

RELATED COMMANDS

rls-lpbk-t1

NAME

opr-lpbk-t3: Operate-Loopback-T3

INPUT FORMAT

opr-lpbk-t3:*Address*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command executes a loopback on a DS3 port towards the optical fiber. The loopback remains in place until released by the **rls-lpbk-t3** command.

The input parameter is:

Address Address of DS3 port(s) to be looped back.
Valid DS3 Port Addresses: **{a,b,c,all}**

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the opr-lpbk-t3 command with these parameters:

   Address=address */

Execute? (y/n or CANcel/DELete to quit) =
```

If the command cannot be completed due to hardware problems on the circuit pack, the following message is displayed:

```
/* Address CPname CP failed */
```

Address and *CPname* refer to the slot address and provisioned circuit pack type for the slot, respectively.

If a slot is determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Address not equipped for DS3 */
/* Enter DS3 port address:   */
```

If the command cannot be completed due to hardware problems on the SYSCTL, the following message is displayed:

```
/* SYSCTL failed - no loopback established */
```

RELATED COMMANDS

rls-lpbk-t3

NAME

reset: Reset the System Software Program

INPUT FORMAT

reset;

DESCRIPTION

CAUTION:
Execution of this command may affect performance-monitoring data.

This command resets the system software program. All history and performance-monitoring data are lost. All alarm information is lost and "rediscovered." The date and time are lost and either "rediscovered" from the far end (that is, from an incoming signal from Main 1 of the neighboring network element) or set to default. No provisioning information is lost or changed.

NOTE 1:
Unlike other commands, an abbreviated version of this command name may not be entered. The user must type the complete command name when entering this command, or the command request will be denied.

NOTE 2:
For OC-3 Release 5 and later, if security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

NOTE 3:
If a reset is done on any shelf, all adjacent shelves (shelves at the other ends of the optical interfaces that terminate on the shelf being reset) may show transient "section DCC channel failed" alarms. This is a normal system response.

NOTE 4:
The user should expect a delay of several minutes between the time when the command is executed and when the new date and time appear at the network element.

When input, this command displays the following confirmation message:

```
/* Caution! When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file.
   If possible, it will reinitialize the date and time with
   the far end system.
   You have selected the reset command. */

Execute? (y/n or CANcel/DELete to quit) =
```

During system startup after reset or other initialization, the user who is connected to a CIT port cannot log in. When the user presses RETURN, the following message is issued:

```
/*  System Initialization is in progress.
    Try to log in again later. */
```

NAME

rlgn: Remote Login

INPUT FORMAT

rlgn:*TID;*

DESCRIPTION

This command establishes a remote login session via the SONET DCC. Any network element (NE) which is part of the same maintenance subnetwork may be accessed with this command. Use the command **rtrv-nmap** for a list of valid NE TIDs.

The alarm and status report for the far end system is printed automatically when this command is executed. (See the RTRV-ALM table located at the end of this section.)

The input parameter is:

TID TID is the target identifier (system name) of the desired remote shelf.

If the command is successfully completed and security is enabled (in Release 3 and later) the user will be prompted for login and password, similar to a local login session.

NOTE:
A remote login session may be terminated unexpectedly if a user elsewhere in the network enables or disables DCC communications.

If a user attempts to login to a remote shelf where another remote session is already established, the following denial message will be displayed:

```
RNBY
/* Resource, Ne is BusY */
/* A remote session is not allowed.
   Try again later. */
```

If the far end is not communicating, the following denial message will be displayed:

```
/* No communication with the TID entered. */
```

If the far end communication request fails, the following denial message will be displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Far end communication failure. */
```

If a user is logged into a shelf and then tries to remote login to the same shelf, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Local session already established.
   A remoted login to this TID is not allowed. */
```

If a user has toggled back to the local NE after establishing a remote session and tries to return to the remote session using this command, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Remote session already established.
   A second remote session is not allowed. */
```

If an unknown TID is entered, the following message will be displayed and the user will be reprompted for the TID:

```
/* TID entered is not found. */
```

RELATED COMMANDS

logout

toggle

rtrv-nmap

NAME

rls-lpbk-ec1: Release-Loopback-EC1

INPUT FORMAT

rls-lpbk-ec1:*Address*;

DESCRIPTION

This command releases a previously established loopback on a low-speed STS1E interface.

This command is available with OC-3 Release 6 (linear), Release 5.1 (rings), and later releases.

The input parameter is:

Address Address of EC-1 port(s) where a loopback is to be released.
Valid EC-1 Port Addresses: **{a,b,c,all}**

RELATED COMMANDS

opr-lpbk-ec1

NAME

rls-lpbk-t1: Release-Loopback-T1

INPUT FORMAT

rls-lpbk-t1:*Address*;

DESCRIPTION

This command releases a previously established loopback on a DS1 port.

The input parameter is:

Address Address of DS1 port(s) where a loopback is to be released.
Valid Addresses: **all, {a,b,c,all}-{1-7,all}-{1-4,all}**

RELATED COMMANDS

opr-lpbk-t1

NAME

rls-lpbk-t3: Release-Loopback-T3

INPUT FORMAT

rls-lpbk-t3:*Address*;

DESCRIPTION

This command releases a loopback on a DS3 port previously established by an **opr-lpbk-t3** command.

The input parameter is:

Address Address of DS3 port(s) where a loopback is to be released.
Valid DS3 Port Addresses: **{a,b,c,all}**

RELATED COMMANDS

opr-lpbk-t3

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

rtrv-alm:[*Address*]:[**alm=***AlarmLevel*]; (Release 6.0 and earlier)
rtrv-alm[:alm=*AlarmLevel*]; (Release 6.1 and all later releases)

DESCRIPTION

This command displays a report of active alarm and status conditions. The report includes the source address of the alarm as well as date and time of the alarm, whether or not the condition is service-affecting, and a short description of the condition.

The input parameters are:

Address Address of one or more slots. The default is address is ***all***. In Releases 6.1 and later, this parameter is not used and all slots are always reported.
Valid Slot Addresses: **all, main-{1,2,all}, fn-all, fn-{a,b,c}-{1,2,all}, ls-all, tg-{1,2,all} ls-{a,b,c}-{1-8,all}, sysctl, auxctl, farend**

alm AlarmLevel for which a report is desired. This parameter may have one of the following values:

```
all (default)
cr
mj
mn
pmn
other (abnormal, ne-acty, status conditions)
```

Alarms are listed from greatest to least severity. Within a severity level, newer alarms are listed first.

NOTE:
Due to the large number of conditions reported, the RTRV-ALM report pages have been located at the end of this section for easier reference. Please refer to the RTRV-ALM table (Table 11-2) for a complete description of report outputs.

RELATED COMMANDS

rtrv-hsty

NAME

rtrv-attr-alm: Retrieve Attribute Alarm

INPUT FORMAT

rtrv-attr-alm;

DESCRIPTION

This command displays current alarm attributes, as set by the **set-attr-alm** command.

The output report appears as follows:

```
/* System Alarm Attributes Report
================================================================================
Alarm Delay (almdel)=almdel, Clear Delay (clrdel)=clrdel, PMN=pmn (hw)
*/
```

The output parameters are:

`Alarm Delay` This shows the alarm holdoff delay in seconds for incoming signal and equipment failures. This parameter is an integer with a range of 0 through 30.

`Clear Delay` This shows the alarm clear delay in seconds for equipment failures. This parameter is an integer with a range of 0 through 30.

`PMN` PMN is the office alarm level to be raised during a power minor alarm condition. The (hw) indicates that the alarm level (MJ or MN) is set by an option switch on the BBG5 SYSCTL circuit pack.

NOTE:
Incoming signal failure conditions, AIS, and FERF signals are subject to the provisionable alarm holdoff delay and a fixed 15-second clear delay. Yellow signals are not subject to holdoff or clear delays. Circuit pack failures (except control circuit pack failures) are subject to the provisionable alarm holdoff and clear delays.

RELATED COMMANDS

set-attr-alm

NAME

rtrv-attr-cont: Retrieve Attribute Control

INPUT FORMAT

rtrv-attr-cont[:*Address*];

DESCRIPTION

This command displays the provisioned name of miscellaneous discrete environmental control points, as set by the **set-attr-cont** command.

The input parameter is:

Address Address of the environmental control point. The default address is **cont-all**.
Valid Addresses: **cont-{1-4,all}**

The output report appears as follows:

```
/* Control Point Provisioning Report
=================================================================
Address  Description
=================================================================
cont-1   StartGenerator
cont-2   StartPump
cont-3   control3
cont-4   control4
*/
```

The output parameters are:

`Address` The address of the control point.

`Description` Provisioned description of the environmental control point.

NOTE:
This command will be denied if it is entered in a system whose SYSCTL CO/RT switch is set to CO. (Use the **rtrv-ne** command to determine the switch setting.) The following denial message will be displayed:

```
ENRI
/* Equipage, Not equipped for Retrieving specified Information */
/* Environmental controls can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-env

rtrv-ne

set-attr-cont

set-attr-env

NAME

rtrv-attr-env: Retrieve Attribute Environment

INPUT FORMAT

rtrv-attr-env[:*Address*];

DESCRIPTION

This command displays the provisioned alarm and provisioned name and provisioned alarm type of miscellaneous discrete environmental alarm/status points, as set by the **set-attr-env** command.

The input parameter is:

Address The address of the environmental input point. The default address is **env-all**.
Valid Addresses: **env-{1-15,all}**

The output report appears as follows:

```
/* Environmental Alarm Provisioning Report
================================================================
Address  Alarm  Alarm Type      Description
================================================================
env-1    CR     MISC            Fire
env-2    NA     Power           OpenDoor
env-3    MN     code-7          environment3
 .        .       .               .   .   .
 .        .       .               .   .   .
 .        .       .               .   .   .
env-15   MN     Misc            externalMinor
*/
```

The output parameters are:

Address The address of the environmental alarm/status point.

Alarm	Alarm is the provisioned alarm level of the environmental input and has the following values: CR Critical alarm MJ Major alarm MN Minor alarm NA Not alarmed, but reported
Alarm~Type	This report parameter is available with Release 6.2 (linear), Release 7.1 (rings), and later. This is the user-defined classification of the environmental alarm/status point.
Description	Provisioned description of the environmental alarm/status point.

NOTE:
This command will be denied if it is entered in a system whose SYSCTL CO/RT switch is set to CO. (Use the **rtrv-ne** command to determine the switch setting.) The following denial message will be displayed:

```
ENRI
/* Equipage, Not equipped for Retrieving specified Information */
/* Environmental alarms can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

rtrv-ne

set-attr-cont

set-attr-env

NAME

rtrv-crs-sts1: Retrieve Cross-Connection STS-1

INPUT FORMAT

rtrv-crs-sts1[:*Address***];**

DESCRIPTION

This command retrieves STS-1 cross-connections within the DDM-2000 system. Cross-connections are entered using the **ent-crs-sts1** command.

This command is available with all releases.

The input parameter is:

Address The address of one or more STS-1 channels for which cross-connections are to be reported. The default address is **all** STS-1 channels in the system.
Valid OC-3 linear STS-1 Addresses: **all, {a,b,c}, b-{1-2,all}, {m,c}-{1-3,all}**
Valid OC-3 ring STS-1 Addresses: **all, {m,c}-{1-3,all}**

The output report appears as follows:

```
/* STS-1 Cross-Connect Map Report
=============================================================
Address  Address   Cross Connect   Ring for
   1        2          Type        Drop&Cont
=============================================================
 m-1      m-1        twoway          -
 m-2      a          dc              m1
 m-3      b          twoway          -
 a        m-2        dc              m1
 b        m-3        twoway          -
*/
```

The output report shows the STS-1 channels in an order that reflects the physical layout of the system (for example, the high-speed slots are shown first, followed by those associated with function unit A, function unit B, etc.).

The output parameters are:

`Address 1` Address 1 is the address of an STS-1 channel.

`Address 2` Address 2 is the address of an STS-1 channel.

`Cross Connect Type`
This parameter is available with Release 7.0 and later ring releases. This column specifies whether the cross-connection is two way (**twoway**) or drop and continue (**dc**).

`Ring for Drop&Cont`
This parameter is available with Release 7.0 and later ring releases. This column identifies the ring for drop and continue connections, specifying which ring will be continued as well as dropped at the network element. The valid values are **m1** and **m2**.

For Release 3 and earlier, channels that are not cross-connected are indicated in the report by hyphens in the `Address 2` column. This report will also indicate if any VT1.5 or linear STS-3c cross-connections exist. A VT1.5 cross-connection map report, obtained by using the **rtrv-crs-vt1** command, will show the specific VT1.5 cross-connections.

STS-3c cross-connections are possible between MAIN slots and FN-C slots. In linear releases, the STS-3c mode must be set to **enabled** using the **set-oc3** command. STS-3c cross-connections are an optional feature that requires a special license from AT&T. See Chapter 8 for additional information.

RELATED COMMANDS

dlt-crs-sts1

ent-crs-sts1

rtrv-crs-vt1

NAME

rtrv-crs-vt1: Retrieve Cross-Connection VT-1.5

INPUT FORMAT

rtrv-crs-vt1[:*Address*];

DESCRIPTION

This command retrieves VT1.5 signal cross-connections within a DDM-2000 OC-3 system, as set by the **ent-crs-vt1** command.

This command is available with OC-3 Release 3 software and later.

The input parameter is:

Address Address is the address of VT1.5 channels or DS1 ports. See Table 11-1 for a list of valid addresses. The default is **all** addresses.

The output report appears as follows. For software releases prior to 3.1, all ports or channels are listed and a hyphen will appear in the Address 2 column for those that are not cross-connected. For Release 3.1 and later, only existing ports or channels that are cross-connected will be displayed in the output report.

```
/* VT1 Cross Connect Report
================================================================
Address      Address     Cross Connect    Ring for
   1            2            Type         Drop&Cont
================================================================
m-1-1-2      m-1-1-2       twoway           -
m-1-7-4      c-2-7-1       twoway           -
m-2-1-2      c-1-1-2       ldc              m1
m-2-6-1      b-6-1         dc               m2
m-2-6-3      b-6-3         dc               m2
  .            .             .              .
  .            .             .              .
  .            .             .              .
*/
```

The output parameters are:

Address 1 Address1 is the address of a VT1.5 channel or DS1 port.

Address 2 Address2 is the address of a VT1.5 channel or DS1 port.

`Cross Connect Type`
: This parameter is available with Release 7.0 and later ring releases. This column specifies whether the cross-connection is two way (**twoway**) or drop and continue (**dc**).

`Ring for Drop&Cont`
: This parameter is available with Release 7.0 and later ring releases. This column identifies the ring for drop and continue connections, specifying which ring will be continued as well as dropped at the network element. The valid values are **m1** and **m2**.

The report shows the current state of VT1.5 cross-connections in the NE. When the address of multiple VT1.5 channels or DS1 ports are specified in the execution of this command, the report will show the addresses in the first column in numerical order reflecting the physical layout of the shelf.

The report will also indicate if any STS-1 cross-connections exist. An STS-1 cross-connection map report, obtained by using the **rtrv-crs-sts1** command, shows the specific STS-1 cross-connections.

RELATED COMMANDS

dlt-crs-vt1

ent-crs-vt1

rtrv-crs-sts1

NAME

rtrv-ec1: Retrieve EC-1

INPUT FORMAT

rtrv-ec1[:*Address*];

DESCRIPTION

This command retrieves information about each EC-1 port. This information includes attributes set by the **set-ec1** command as well as parameters set by switches on the circuit pack.

This command is available with OC-3 Release 6 software or later.

The input parameter is:

Address This is the address of one or more EC-1 ports. The default address is **all** EC-1 ports in the system.
Valid Addresses: **{a,b,c,all}**

The output report appears as follows:

```
/* EC1 Port Provisioning Report
================================================================================
 Port      CP Transmission    Alarm  Signal Degrade  State
Address        Mode (hw)      Level    Threshold
================================================================================
address         mode          alarm       nn         state
address         mode          alarm       nn         state
     .           .             .          .           .
     .           .             .          .           .
     .           .             .          .           .
     .           .             .          .           .
*/
```

The output parameters are:

`Port Address` This column lists the address of one or more EC-1 ports.

`CP Transmission Mode (hw)`
This column reports the hardware provisioned transmission mode of the circuit pack that provides the EC-1 interface. The valid values are **High Speed** and **Low Speed**.

`Alarm Level` This column shows the alarm level for an incoming EC-1 signal failure, and may have one of the following values:

- `CR` Critical
- `MJ` Major
- `MN` Minor
- `NA` Not Alarmed

`Signal Degrade` This column shows a signal degrade threshold for the EC-1 port as a BER in terms of a logarithm to the base 10. The value may be an integer ranging from -9 through -5.

`State` This column shows the memory administrative state of the port. When the mode is set for **`High Speed`**, the state is always `is` (in service). When the mode is set for **`Low Speed`**, the state may be one of the following values:

- `is` In Service
- `auto` Automatic
- `nmon` Not Monitored

RELATED COMMANDS

set-ec1

NAME

rtrv-eqpt: Retrieve Equipment

INPUT FORMAT

rtrv-eqpt[:*Address*];

DESCRIPTION

This command displays the circuit pack type and version information for one or more slots.

The input parameter is:

Address Address identifies one or more slot(s). The default is **all** slots.
Valid Slot Addresses: **all, main-{1,2,all}, fn-all, fn-{a,b,c}-{1,2,all}, ls-all, tg-{1,2,all}, ls-{a,b,c}-{1-8,all}, sysctl, auxctl**

The output report appears as follows:

```
/* Equipage and Version Report
================================================================================
Slot      Circuit  Apparatus  Series     CLEI       ECI      Serial
Address    Pack       Code     Number     Code       Code     Number
================================================================================
tg-1      TGS      33MC?      33Iss?  33CLEI?     33CECI? 33Ser
                                      PID=AEKCG
tg-2      TGS      BBF2B      S1:1    SNPQAJCAAA  680153  92MV05601769
                                      PID=AEKCG
--------------------------------------------------------------------------------
main-1    OLIU     30MC       30Iss   30CLEI      30CECI  30Ser
main-2    OLIU     21G        27Iss   27CLEI      27CECI  27Ser
--------------------------------------------------------------------------------
fn-a-1    MXRVO    BBG2       S1:1    SNCMAAOAAA  663642  90MV07010165
fn-c-1    MXRVO    25MC       25Iss   25CLEI      25CECI  25Ser
--------------------------------------------------------------------------------
sysctl    SYSCTL   ?          ?       ?           ?
          Program version 3.2.1       PIDa=AEGGK  PIDb=AEGGL
--------------------------------------------------------------------------------
auxctl    OHCTL    BBG7       S2:4    DMPQ003AAB  680228  92MV05600571
          Program version 3.2.1       PIDa=AEGGH  PIDb=AEGGJ
shelf               ED-8C724-30,Gx
*/
```

The output parameters are:

Address	This is the address of the slot. "shelf" in the slot address is available for "new controller" releases (For OC-3 R8,R9 and later; For OC-12 R4,R5 and later).
Circuit Pack	Circuit pack is the mnemonic name that identifies the general type function provided by a circuit pack. For example, Optical Line Interface Units are all named "OLIU"; SYStem ConTroLlers are named "SYSCTL".
Apparatus Code	Apparatus code uniquely identifies the specific function provided by a circuit pack. Circuit packs with different apparatus codes are not interchangeable, even if they have the same name. An apparatus code for the shelf is actually an equipment code, where Gx identifies the backplane. In the equipment code, G3 means an old backplane and G4 means a new backplane that goes with new controllers.
Series Number	This is used to indicate interchangeability among circuit packs with the same circuit pack name and apparatus code, but different manufacturing versions. In general, a circuit pack can be replaced by another circuit pack that has the same apparatus code and the same or later series number.
CLEI Code	*CLEI** code is the 10-character code identifying each circuit pack.
ECI Code	Equipment catalog item (ECI) code is a 6-character code identifying each circuit pack. This code corresponds to the bar-coded label on the faceplate of the circuit pack, and is uniquely equivalent to the *CLEI* code.
Serial Number	This is a 12-character code uniquely identifying each circuit pack and indicating the date and place of manufacture.
Program Version	Program version is the version of software currently stored on the circuit pack.
PID	Program identification code identifies the version of firmware on one or more socketed devices on the circuit pack.

The report always contains a line for every slot included in the range of the address, whether or not the slot is equipped.

---

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Hyphens (-) indicate information in that field is not applicable (that is, type and version information for slots that are not equipped).

Question marks (?) indicate that the information is unknown (unrecognized circuit pack, unable to read version information from a circuit pack inserted into a slot in the AUTO state, for example).

If an incorrect circuit pack is inserted in a slot, the report will show the expected circuit pack for that slot and indicate that the current circuit pack does not match inventory.

If an unpowered circuit pack is placed in a slot, the report will indicate that the circuit pack is unpowered and version information is unavailable.

If the system cannot report complete, correct version information for a circuit pack because of a field upgrade, then the information that may be incorrect (apparatus code, series, *CLEI* code, and ECI code) is followed by a "?".

RELATED COMMANDS

rtrv-state

NAME

rtrv-feat: Retrieve Feature

INPUT FORMAT

rtrv-feat;

DESCRIPTION

This command retrieves a list of active feature options enabled by the **set-feat** command.

This command is available with Release 5 software and later.

The output report appears as follows:

```
/* Feature Options Enabled Report
================================================================================
 Feature Option     Description
================================================================================
      feature        description
      feature        description
       .                 .
       .                 .
       .                 .
       .                 .
*/
```

The output parameters are:

`Feature Option` This is the name of the feature currently enabled.

`Description` Description of the feature.

RELATED COMMANDS

set-feat

NAME

rtrv-fecom: Retrieve Far End Communications

INPUT FORMAT

rtrv-fecom: [*Address*];

DESCRIPTION

This command displays the provisioned state of a network element's section data communication channels (DCC), as set by the **set-fecom** command. This command also displays the X.25 communication status and an X.25 event history reports at the gateway network element (GNE) only.

The DCC is an embedded overhead communications channel in the SONET line used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements.

The input parameter is:

Address Address is the address of the DCC. The default value is **dcc-all**.

Valid Linear Addresses: **dcc-{m,a,b,c,all}**
Valid Ring Addresses: **dcc-{m1,m2,all}** (Release 5.1 only),
dcc-{m1,m2,b,c,all} (Release 7.0 and later)

In Release 6.1 and later, three output reports are displayed when this command is entered. In earlier releases, only the first output report is displayed. The first report shows the far end communication configuration, and the second report shows the status of the X.25 communication. The third report provides an X.25 event history.

The far end communication output reports appear as follows:

```
/* Far End Communication Configuration Report
=============================================================
   DCC          Communications
 Address
=============================================================
 dcc-m            enabled
 dcc-c            disabled
*/
```

The output parameters for this report are:

DCC Address	This column displays the address of a DCC.
Communication	This column shows whether communication over the DCC is enabled or disabled.

The second report shows the state of various X.25 communication entities. The report output appears as follows:

```
/* X.25 Communication Report
=============================================================
 Entity              State                    Code (hex)
=============================================================
X.25 lcn  1 (pvc)    down                        00
X.25 lcn  2 (pvc)    down                        00
X.25 lcn  3 (pvc)    down                        00
X.25 lcn 16 (svc)    down                        00
X.25 interface       down                        01
lapb                 down                        00
physical line        down                        00
*/
```

The output parameters for this report are:

`Entity` This column shows the various X.25 communication entities. The entities are:

`X.25 lcn 1 (pvc)`
This communication channel is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 2 (pvc)`
This communication channel is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 3 (pvc)`
This communication channel, used in Release 7.1 and later, is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 16 (svc)`
This communication channel, used in Release 7.1 and later, is considered to be **up** upon the successful acknowledgement of the CALL_REQ_IND packet with a CALL_ACC_CONN packet. This does *not* imply that TL1 communication is active.

`X.25 interface`
This communication channel, used in Release 7.1 and later, is considered to be **up** upon the successful acknowledgement of the RESTART_PACKET packet and the RESTART_CONFRM packet. This means that layer 3 is active and ready to establish the pvc or svc communication channel.

`lapb` When this communication channel is **up**, layer 2 is active and ready to send or receive a RESTART_PACKET.

`physical line`
This X.25 physical line is up only if the `lapb` is up. A **`down`** physical line does not necessarily mean that the physical connection (for example, a cable) is broken but that the interfacing equipment does not acknowledge the communication with the DDM-2000.

`State` This parameter is explained in each one of the above entities.

`Code (hex)` This column shows a hexadecimal output of the protocol states in the DDM-2000 software. This is used by RTAC personnel for diagnostic purposes.

A third output report lists an X.25 event history. The report output appears as follows:

```
/* X.25 Communication Report
=============================================================
Date    Time       Entity   Event                Data (hex)
=============================================================
01-01  00:18:48    lcn 16   xmt   CLR_CONFRM       10 10 17
01-01  00:18:47    lcn 16   rcv   CLR_REQ_IND      10 10 13 00 00
01-01  00:18:03    lcn 16   xmt   CALL_ACC_CONN    10 10 0f
01-01  00:00:21    lcn  2   rcv   RESET_CONFRM     10 03 1f
01-01  00:00:21    lcn  3   rcv   RESET_CONFRM     10 03 1f
01-01  00:00:21    lcn  1   xmt   RESET_REQ_IND    10 01 1b 00 00
01-01  00:00:21    lcn  2   xmt   RESET_REQ_IND    10 02 1b 00 00
*/
```

The output parameters for this report are:

`Date` This column shows the date the X.25 event occurred.

`Time` This column shows the time the X.25 event occurred.

`Entity` This column shows the X.25 communication entity where the event occurred.

`Event` This column lists the event and whether it was transmitted (**`xmt`**) or received (**`rcv`**) by the DDM-2000.

`Data` This column shows a hexadecimal representation of frame or packet information related to the event. This is used by RTAC personnel for diagnostic purposes.

RELATED COMMANDS

rtrv-nmap

set-fecom

rtrv-x25

NAME

rtrv-hsty: Retrieve History

INPUT FORMAT

rtrv-hsty;

DESCRIPTION

This command displays an event-history report. This report contains a list of the most recent system events. For software releases prior to Release 4, this report will contain up to 60 events. For Release 4 and later, this report will contain up to 500 events. The events are listed in last-in, first-out order and are date- and time-stamped.

NOTE:
Due to the large number of conditions reported, the RTRV-HSTY report pages have been located at the end of this section for easier reference. Please refer to the RTRV-HSTY table (Table 11-3) for a complete description of report outputs.

RELATED COMMANDS

rtrv-alm

NAME

rtrv-lgn: Retrieve Login

INPUT FORMAT

rtrv-lgn;

DESCRIPTION

This command retrieves login authorization information. This report lists each user's login and privileges. The report does not contain passwords.

This command is available with OC-3 Release 3 software and later.

NOTE:
This command is available to privileged users only.

The output report appears as follows:

```
/* Login Provisioning Report
================================================================
  Login          User Type
================================================================
  name           privileged
  name           privileged
----------------------------------------------------------------
  name           general
   .                .
   .                .
----------------------------------------------------------------
  name           reports-only
   .                .
   .                .
*/
```

The output parameters are:

Login	This column lists the login names.
User Type	This column indicates the type of authorization each user is assigned. The valid values are **privileged**, **general**, and **reports-only** (in Release 5 and all later releases).

Privileged logins are listed first in the report, followed by general logins, then reports-only logins. Each category of logins is separated by a row of hyphens. There are always two (and only two) privileged logins on the DDM-2000 system.

RELATED COMMANDS

set-lgn

set-secu

rtrv-secu

NAME

rtrv-link: Retrieve CIT Link Configuration.

INPUT FORMAT

rtrv-link;

DESCRIPTION

This command displays the currently-provisioned parameters for the user's craft interface link, as set by the **set-link** command. This includes the link which the user is logged into, the baud rate, and the page length of reports.

The output report appears as follows:

```
/* Interface Link Configuration Report
============================================================
Link=link, PageLength (pg)=pg, Baud=baud (hw)
*/
```

The output parameters are:

`Link` Link identifies the CIT link from which the command was executed, and may have the following values:

- `cit-1` The front-access port.
- `cit-2` The rear-access port.
- `dcc-x` A SONET DCC port used for remote access (**dcc-m**, **dcc-a**, **dcc-b**, or **dcc-c**).

`PageLength` This is the number of lines displayed in one page of a report. Reports with a number of lines greater than one report page will be paged.

`Baud` Baud identifies the data rate for this link. The (hw) after the data rate indicates that the data rate is set by hardware switches on the BBG5 SYSCTL circuit pack. When this command is executed via the SONET DCC, the data rate is fixed and cannot be changed. Therefore, the data rate is not reported for the DCC, and a hyphen (-) will appear in the report.

RELATED COMMANDS

set-link

rtrv-ne

NAME

rtrv-map-neighbor: Retrieve Neighbor Map

INPUT FORMAT

rtrv-map-neighbor;

DESCRIPTION

This command displays network elements (NEs) that can be accessed by the local NE and that are its immediate DCC neighbors.

This command is available for OC-3 Release 7.2 only. Earlier releases must use the **rtrv-nmap** command.

The output report appears as follows:

```
/* Neighbor Map for local_system
================================================================================
System Name             Connected     Comm.     Product
  (TID)                 Through       Status    Type
================================================================================
12345678911234567892    1234567891    123456    12345678911234567892
local_system                                    DDM-2000 OC-3
Site7NE1                main-1                  FT-2000
Site3NE1                main-2        FAILED    FT-2000
*/
```

The above report contains one line for each neighbor system with which the local system is communicating via SONET section DCC. The local system name is listed first in the report.

If multiple DSNEs are accidentally provisioned in a subnetwork, a warning message is displayed, followed by the Neighbor Map report, which may display inaccurate information (for example, if this command is executed from a DSNE node, another DSNE and a NE might be listed as neighbors. If the command is executed from a non-DSNE node, a DSNE and another non-DSNE node might be listed as neighbor to the local system). If these events occur, the user should always check the **rtrv-alm** and **rtrv-map-network** reports for more details. In this case, the output report might appear as follows:

```
/* Neighbor Map for local_system
=============================================================================
System Name              Connected     Comm.     Product
  (TID)                  Through       Status    Type
=============================================================================

-----------------------------------------------------------------------------
WARNING! The information displayed may be incomplete.  Check
         Rtrv-Alm report for further details.
-----------------------------------------------------------------------------

12345678911234567892     1234567891    123456    12345678911234567892
local_system                                     DDM-2000 OC-3
Site7NE1                 main-1                  FT-2000
Site3NE1                 main-2        FAILED    FT-2000
*/
```

The multiple DSNE situation is transparent in the above report (because the *NE Type* is not listed), and will have already created an alarm event. To recover from the above condition, the user must reprovision the incorrect DSNE as a non-DSNE, reset it, and obtain the Network Map report, which shows the NE_Types of NEs listed in the report. Furthermore, the user is reminded that if, at a certain NE, the multiple DSNE situation is not detected, the warning message will not be displayed and the report will show that there is only a single DSNE. To avoid confusing situations, the user is encouraged to *always* check the **rtrv-alm** report.

In the event no DSNE is provisioned for a subnetwork, or because of a DCC failure none of the NEs in the subnetwork can be identified as a DSNE, the Neighbor Map report appears as follows:

```
/* Neighbor Map for local_system
=============================================================================
System Name              Connected     Comm.     Product
  (TID)                  Through       Status    Type
=============================================================================
12345678911234567892     1234567891    123456    12345678911234567892

Notice: No DSNE can be identified; local system is displayed.

local_system                                     DDM-2000 OC-3
*/
```

The above situation will have already created an alarm event in the **rtrv-alm** report.

The output report parameters are:

`System Name`	This column contains the system name (or TID) of the local NE's direct DCC neighbors.
`Communication Status`	This column contains the word FAILED if there is a communication failure with the system identified in first line, first column of the report. If communication with the system identified as local NE is good, it is illustrated by a blank in this column.
`Product Type`	Product Type identifies the members of the AT&T 2000 Product Family that could be listed in this report. In larger subnetworks, various product families will interwork. The AT&T 2000 Product Family product types capable of interworking are listed after Table 11-1.
`Connected Through`	This column indicates the address of the OC-3 lines through which the local system is connected to the system identified in the System Name column.

NOTE:
The **`rtrv-map-neighbor`** report may be incomplete if there are network elements with the same TBOS or Site/NE parameter settings. These duplicate parameter settings will create an alarm. Refer to the TOP section (Volume 2) for additional information.

RELATED COMMANDS

rtrv-fecom

rtrv-ne

set-fecom

set-ne

NAME

rtrv-map-network: Retrieve Network Map

INPUT FORMAT

rtrv-map-network;

DESCRIPTION

This command creates a display of all network elements (NEs) that are registered in the DSNE and can be accessed through DCC by the local NE.

This command is used in OC-3 Release 7.2 only. Earlier software releases must use the **rtrv-nmap** command.

The output report appears as follows:

```
/* Network Map for local-system
================================================================================
System Name            Comm.   Product                NE          Alarm
  (TID)                Status  Type                   Type        Group
================================================================================
12345678911234567892   123456  12345678911234567892   123456789   123
local_system                   DDM-2000 OC-3                        3
Site7NE1                       FT-2000                DSNE          3
Site3NE1                       DDM-2000 OC-12                      56
Site4NE1               FAILED  DACS IV-2000                        56
Site5NE1                       FiberReach                         201
Site6NE1                       FiberReach                         201
Site8NE1                       FiberReach                         201
Site9NE1                       FiberReach                         250
Site10NE1                      FiberReach                         250
Site11NE                       FiberReach                         250
*/
```

The above report contains one line for each system with which the local system is communicating via the SONET section DCC. The local system name is listed first in the report.

If multiple DSNEs are accidentally provisioned for a subnetwork, a warning message is displayed, followed by the Network Map report, which may display inaccurate information (for example, if this command is executed from a DSNE node, multiple DSNEs and other NEs of the same subnetwork are listed. If this command is executed from a non-DSNE node, only one DSNE may be listed, along with non-DSNE nodes). If these events occur, the user must always check the **rtrv-alm** report. The output report may appear as follows:

```
/* Network Map for local-system
=============================================================================
System Name           Comm.   Product                NE          Alarm
  (TID)               Status  Type                   Type        Group
=============================================================================

-----------------------------------------------------------------------------
WARNING! The information displayed may be incomplete. Check
         Rtrv-Alm report for further details.
-----------------------------------------------------------------------------

12345678911234567892  123456  12345678911234567892  123456789   123
local_system                  DDM-2000 OC-3                       3
Site7NE1                      FT-2000               DSNE          3
Site3NE1                      DDM-2000 OC-12                      3
Site4NE1              FAILED  DACS IV-2000                        3
Site5NE1                      FT-2000               DSNE        201
Site6NE1                      DDM-2000 OC-12                    201
Site8NE1                      FiberReach                        201
Site9NE1                      FiberReach                        250
Site10NE1                     FiberReach                        250
Site11NE                      FiberReach                        250
*/
```

The above situation will have already created an alarm event. To recover from the above (multiple DSNE) condition, the user must reprovision the incorrect DSNE as a non-DSNE and reset it. Furthermore, the user is reminded that if at a certain NE the multiple DSNE situation is not detected, the warning message will not be displayed and the report will show that there is only a single DSNE. Again, to avoid confusing situations, the user is encouraged to *always* check the **`rtrv-alm`** report.

In the event no DSNE is provisioned for a subnetwork, or (because of a DCC failure) none of the NEs in the subnetwork can be identified as a DSNE, the Network Map report appears as follows:

```
/* Network Map for local-system
=============================================================================
System Name            Comm.    Product                NE          Alarm
  (TID)                Status   Type                   Type        Group
=============================================================================
12345678911234567892   123456   12345678911234567892   123456789   123

Notice: No DSNE can be identified; local system is displayed.

local_system                    DDM-2000 OC-12                      3
*/
```

The above situation will have created a corresponding alarm event. Check the **rtrv-alm** report.

The output report parameters are:

`System Name` This column contains the system name (or TID) of the local and other systems in the subnetwork.

`Communication Status` This column contains the word FAILED if there is a communication failure with the system identified in first line, first column of the report. If communication with the system identified as local NE is good, it is illustrated by a blank in this column.

`Product Type` Product Type identifies the members of the AT&T 2000 Product Family that could be listed in this report. In larger subnetworks, various product families will interwork. The AT&T-2000 Product Family product types capable of interworking are listed after Table 11-1.

`NE Type` This parameter indicates the type of network element. The possible value of for this parameter is **DSNE**, specifying the NE designated by the user as the directory services network element.

`Alarm Group` An alarm group is a set of NEs grouped together. Their alarms are reported through an NE (known as AGNE) which is a member of the same alarm group. Valid values are 1 to 255. This parameter can have the value of "0", indicating that the corresponding NE belongs to no Alarm Group.

NOTE:
The **rtrv-map-network** report may be incomplete if there are network elements with the same TBOS or Site/NE parameter settings. These duplicate parameter settings will create an alarm. Refer to the TOP section (Volume 2) for additional information.

RELATED COMMANDS

rtrv-fecom

rtrv-ne

set-fecom

set-ne

NAME

rtrv-ne: Retrieve Network Element

INPUT FORMAT

rtrv-ne;

DESCRIPTION

This command displays the information that is provisioned by the **set-ne** command or set by switches on the SYSCTL and OHCTL circuit packs.

The output report for Release 7.2 appears as follows:

```
/* DDM-2000 System Provisioning Report
============================================================
TID=system_name
DSNE=yes/no
GNE=active/not active
Alarm Group=x
AGNE=yes/no
AGNE Address=x
AGNE Address=x
CrsMode=x
Site=x (hw)
NE=x (hw)
Shelf=x (hw)
CO/RT Selector=location (hw)
TBOS:  Display=n (hw)
       Link=setting (hw)  (Link Active only if Selector = CO)
       Remote Reporting=setting (hw)
Baud:  CIT-1=rate (hw)
       CIT-2=rate (hw)
DCC UserSide/NetworkSide:  dcc-m=networkside (hw)
                           dcc-a=userside (hw)
                           dcc-b=userside (hw)
                           dcc-c=networkside (hw)
PMN=level (hw)
DCC Mode=value
*/
```

For Release 7.1 and earlier, the output report appears as follows:

```
/* DDM-2000 System Provisioning Report
============================================================
TID=system_name
GNE=x
GNE Address=x
CrsMode=x
Site=x (hw)
NE=x (hw)
Shelf=x (hw)
CO/RT Selector=location (hw)
TBOS:  Display=n (hw)
       Link=setting (hw)  (Link Active only if Selector = CO)
       Remote Reporting=setting (hw)
Baud:  CIT-1=rate (hw)
       CIT-2=rate (hw)
DCC UserSide/NetworkSide:  dcc-m=networkside (hw)
                           dcc-a=userside (hw)
                           dcc-b=userside (hw)
                           dcc-c=networkside (hw)
PMN=level (hw)
DCC Mode=value
*/
```

The (hw) after a parameter value indicates that the parameter is set by hardware switches on the BBG5 system controller or BBG7 overhead controller circuit pack.

For ring applications only, the `DCC UserSide/NetworkSide` switches on the BBG7 OHCTL will be reported as follows:

```
DCC UserSide/NetworkSide:  dcc-m1=networkside (hw)
                           dcc-m2=userside (hw)
                           dcc-b=userside (hw)
                           dcc-c=networkside (hw)
```

The output parameters are:

`TID` This is the system name, indicated by a string of up to 20 alphanumeric characters. The default value for `TID` is that set by the site and NE values and is a string of the form "Site*m*NE*n*". The `TID` must be unique for each element in a subnetwork.

DSNE — This parameter is shown for Release 7.2 only. The DSNE is used to identify whether this system is the Directory Services Network Element. There should be one, and only one, DSNE provisioned for a network. For mixed product networks, refer to the TOP section for further instructions on DSNE provisioning.

GNE — GNE indicates whether this system is a gateway network element (GNE), providing a TL1 interface. In Release 7.1 and earlier, it has a value of `yes` or `no`. For OSI systems (OC-3 Release 6 through Release 7.1) this is also the directory services network element (DSNE). In Release 7.2, this is an output-only parameter with a value of `active` or `not active`.

Alarm Group — This parameter is shown for Release 7.2 only. Alarm Group is used to identify all network elements that should be sharing NE Status, alarm information, and telemetry information with each other. For small networks of similar NEs, all NEs might be in the same Alarm Group. For larger applications, one alarm group might be assigned to some DDM-2000 shelves, and one or more different alarm groups might be assigned for other DDM-2000 shelves.

AGNE — This parameter is shown for Release 7.2 only. AGNE indicates whether this system is an alarm gateway network element (AGNE) that provides the NE alarm status communications for all NEs in this alarm group. It has a value of `yes` or `no`.

AGNE Address — This parameter is shown for Release 7.2 only. The AGNE Address is the Target Identifier (TID) of the AGNE for this alarm group. It can be the TID of this NE or any other NE in the alarm group. More than one NE can be an AGNE for backup reasons. If more than one AGNE exists for this alarm group, it is also listed here. AGNE Addresses for NEs in other alarm groups are not listed here. If an AGNE is not defined, this parameter is left blank.

GNE Address — This parameter is shown for Release 7.1 and earlier. GNE address is the TOD of the GNE or DSNE in the subnetwork. It is reported when a network element in the subnetwork sets the `GNE` parameter. If no GNE is defined, this parameter is left blank.

Crs Mode — Crs Mode is the cross-connect mode. The values may be `default` (original value) or `manual`. This parameter is available with Release 3 and later. In ring applications (Release 5), this parameter is always set to `manual`.

Site — Site is the site address. For Release 6.0 and earlier, the value is 1 through 8 (`1-8`). For Release 6.1 and all later releases, the value is 1 through 32 (`1-32`).

`NE` NE is the network element address (`1-5`).

`Shelf` Shelf is the shelf address (`1-8`). It identifies the physical position of the shelf in a bay.
.LI `CO/RT Selector` Two types of TBOS displays are provided to support central office and remote terminal applications. The CO/RT Selector identifies either a central office (CO) shelf or a remote terminal (RT) shelf to control the TBOS display formats and operation of the miscellaneous discrete points and fan control relays.

`TBOS:`

`Display` Display is the TBOS display number (`1-8`). This number identifies the TBOS display associated with a shelf and determines the TBOS poll to which a DDM-2000 will respond.

`Link` In software releases prior to Release 6.1, this report parameter will be labeled `Backup`.

When multiple CO DDM-2000s are connected to the same TBOS link, hardware switch settings on the BBG5 SYSCTL circuit pack are used to provision a backup function. The TBOS backup function assures that each DDM-2000 on the TBOS link is polled for its TBOS display even if one or more of the DDM-2000s fails to respond to the telemetry remote when polled. Link may be set to the following values:

`normal` The DDM-2000 has a TBOS link, but does not provide any backup functions. Of the four shelves connected to the TBOS link, only one may be set to primary and only one may be set to secondary. The remaining two should be set to normal.

`primary` The DDM-2000 serving as the primary TBOS backup will respond for any other DDM-2000 on the same TBOS link if the polled DDM-2000 fails to respond to the telemetry remote poll within 50 msec. The primary backup DDM-2000 will respond for the nonresponsive DDM-2000 by reporting TBOS point 59 (communications failure) and reporting all other TBOS points polled in the display as clear.

`secondary` The DDM-2000 serving as the secondary TBOS backup responds the same as the primary TBOS backup, except the secondary backup does not respond to polls for other DDM-2000s until about 100 msec after the poll is received. If after 100 msec neither the polled DDM-2000 or the primary backup DDM-2000 has responded to the telemetry remote poll, the secondary TBOS backup DDM-2000 will respond for the nonresponsive DDM-2000.

`no TBOS link`
No TBOS interface is directly connected to the shelf.

`TBOS Remote Reporting`
This parameter has the possible values of `enabled` and `disabled`. When the TBOS remote reporting switch is set to `enabled`, the shelf will report all its status and alarm conditions to other shelves via the SONET DCC. When the TBOS remote reporting switch is set to `disabled`, the shelf will not report its status and alarm conditions to other shelves. The `disabled` option is used when there are more than 8 DDM-2000 shelves in a SONET network.

`Baud:` These two lines of the report indicate the data rate settings of the front and rear access craft interface terminal ports.

`CIT-1 and CIT-2`
These are the data rates for the front and rear access craft interface ports. The possible values on the BBG5 SYSCTL are `300`, `1200`, `2400`, `4800`, `9600`, and `19200`.

`DCC UserSide/NetworkSide:`
DCC UserSide/NetworkSide are hardware switch settings on the BBG7 OHCTL circuit pack to identify the role of each DCC in the Network Element. This identification is needed for OSI communications and is required for all nodes in the subnetwork. To avoid alarms, only one end of a span may be designated as the User Side and only one end of a span may be designated as the Network Side. This is available with OC-3 Release 6 and later software. Earlier versions of this report will not include this parameter.

`PMN` PMN is the office alarm level to be raised during a power minor alarm condition. The level (`MJ` or `MN`) is set by an option switch on the BBG5 SYSCTL circuit pack.

`DCC Mode` DCC Mode is a keyword that further characterizes the behavior of the DCC in complex networks. DCC Mode is available in Release 7.1 and later ring releases.

`distinct` The shelf is part of a normal path switched ring network. The DCCs for ring m1 and ring m2 are distinct and will have different messages on each DCC. This is the default for ring software.

`identical` The shelf is connected to an OC-12 Release 3.1 or later dual 0x1 OC-12 network. The DCCs for ring m1 and ring m2 are connected to a single DCC on the selected OC-12 function unit, which sends identical messages to each ring.

RELATED COMMANDS

rtrv-link

rtrv-nmap

set-ne

NAME

rtrv-nmap: Retrieve Network Map

INPUT FORMAT

rtrv-nmap;

DESCRIPTION

NOTE:
For Release 7.2, the command **rtrv-map-network** must be used instead of this command to retrieve SONET network information.

This command retrieves a map of the SONET network for Releases 7.1 and earlier. This map includes a list of the systems in the network and how they are connected to each other.

The output report appears as follows:

```
/* Network Map for <system_name>
   ================================================================
    System Name (TID)  Connected    Neighbor   Communication  GNE
                        Through                    Status
   ================================================================
   local_system                                                yes
   Site7NE1              main        yes
   Site3NE1              fn-c        yes
   Site4NE1               -          no          FAILED

*/
```

The report contains one line for each system with which the local system is communicating via the SONET section DCC. The local system name is listed first in the report. The output report parameters are:

System Name	This column contains the system name (or TID) of another system in the subnetwork.
Connected Through	This column indicates the address of the OC-1 or OC-3 lines through which the local system is connected to the system identified in the System Name column.
Neighbor	This column indicates whether the identified system is an immediate neighbor. An immediate neighbor is a system directly connected to the other end of an optical span terminated on the local system.

	The valid values are `yes` and `no`. For OC-3 Ring applications, if a `no` appears in this column, then a hyphen (-) will appear in the `Connected Through` column.
`Communication Status`	This column contains the word FAILED if there is a communication failure with the system identified in the first column of the report. For a network element that is not a GNE, if the **`com`** parameter is set to `disabled` (by the **`set-fecom`** command) at this end for a given DCC, the status of that DCC will not be shown in this report. The **`rtrv-nmap`** report for the other end will show a FAILED communication status for this end. For a network element that is GNE (in Release 6 and later), a FAILED communication status *will* appear in this report. The user must use the **`dlt-tadrmap`** command to remove the failed network element.
`GNE`	This column is available with OC-3 Release 6 and later software. This indicates if the system is designated the gateway network element (GNE) or directory-services network-element (DS-NE), as set by the **`set-ne`** command. The valid values are `yes` or blank. To avoid alarms, only one network element should be designated as the GNE.

NOTE 1:
The **`rtrv-nmap`** report may be incomplete if there are network elements with the same TBOS or Site/NE switch settings. These duplicate switch settings will cause an alarm to be raised. Refer to the TOP section (Volume 2) for additional information.

NOTE 2:
For Releases 6.2, 7.1, and later, the pager function is disabled for the report output.

RELATED COMMANDS

rtrv-fecom

rtrv-ne

set-fecom

NAME

rtrv-oc3: Retrieve OC3

INPUT FORMAT

rtrv-oc3[:*Address*];

DESCRIPTION

This command displays the configuration of OC-3 lines, as set by the **set-oc3** command.

The input parameter is as follows:

Address Address identifies the OC-3 line(s). The default is **all**.
Valid OC-3 Line Pair Addresses: **main, fn-{a,b,c}, fn-all, all**
Valid OC-3 Ring Addresses: **main-{1,2,all}, all, fn-{a,b,c,all}**

The output report appears as follows:

```
/* OC-3 Line Provisioning Report
=============================================================================
 Line      Signal Degrade   Optical       Kbyte     Concat  AIS
Address      Threshold     Power (hw)     Message     Mode   Alarm
=============================================================================
address         n             x           message     mode    alm
address         n             x           message     mode    alm
   .            .             .             .         .       .
   .            .             .             .         .       .
   .            .             .             .         .       .
*/
```

The Concat mode is only visible in linear releases in which the STS-3c mode has been enabled with the **set-feat** command.

The output parameters are:

`Line Address` Address of the OC-3 line.

`Signal Degrade Threshold`
This is the bit error rate (BER) threshold shown as a logarithm to the base 10. The value of *n* is an integer with a range of -5 through -9 corresponding to BERs of 10^{-5} through 10^{-9}, respectively.

`Optical Power` This is the current setting of the optical power switch on the OLIU circuit pack carrying the specified OC-3 signal. The (`hw`) after `Optical Power` indicates that the optical power setting is determined by a hardware switch on the OLIU circuit pack. This parameter may have the following values:

`high` High optical power

`low` Low optical power

— A hyphen indicates that optical power is not settable by switches on the OLIU circuit pack.

`Kbyte Message` This parameter is available with Release 5 software and later. The valid values are `enabled`, indicating that proprietary Sync messages are used, and `disabled`, indicating that proprietary Sync messages are not used. The Sync messages use the K2 byte in the SONET overhead to determine synchronization quality. These values are set by the **`set-oc3`** command.

`Concat Mode` This parameter is available with Release 6 and later linear releases. This report parameter is visible only if the STS3c mode is enabled via the **`set-feat`** command. This indicates if the addressed line is concatenated or not. The valid values are `enabled` and `disabled`. For OC-3, only function unit C slots can report concatenated values.

RELATED COMMANDS

rtrv-sync

set-oc3

NAME

rtrv-passwd: Retrieve Passwords

INPUT FORMAT

rtrv-passwd;

DESCRIPTION

This command displays the logins, passwords (in encrypted form), and user type for all logins in the system. This command should *only* be used to backup this information to an external work station. Additional work station software and the **rstr-passwd** command (available in a future software release) will be used to recreate this information on the network element when a new controller is installed.

This command is available with Release 7.1 and all later releases.

NOTE:
This command is available to privileged users only.

The output report appears as follows:

```
/* Password Provisioning Report
============================================================
Login : Password : User Type :
============================================================
ATT01:08:sdfsdt-g:privileged:
ATT02:08:67&&8#1g:privileged:
DDM-2000:07:kdsm5:-:general:
pete:08:RTnu8*bB:reports-only:
*/
```

The output parameters are:

`Login`	The login name established by the security administrator.
`Password`	The length and current encrypted password selected by the user of the login.
`User Type`	The access class assigned to this login by the security administrator.

RELATED COMMANDS

rtrv-lgn

set-passwd

set-lgn

rstr-passwd

NAME

rtrv-pm-line: Retrieve Performance Monitoring Line

INPUT FORMAT

rtrv-pm-line:*Address*;

DESCRIPTION

This command displays performance-monitoring data associated with OC-3 lines from the fiber terminating on the system, or EC-1 lines from the DSX terminating on the system.

The input parameters are:

Address Address of the OC-1, OC-3 or EC-1 lines.
Valid OC-3 Line Addresses: **all, main-{1,2,all}, fn-{b,c,all}-{1,2,all}**
Valid EC-1 Line Addresses: **a,b,c,all**

The output report appears as follows:

```
/* Line Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
================================================================================
Address  Start    B2 CV    B2 ES    B2 ES     B2 ES    B2 SES    B2 UAS    PSC-L
         Time                       Type A    Type B
================================================================================
address   time     nn...    nn...     nn...     nn...    nn...     nn...     nn...
   .       .         .        .         .         .        .         .         .
   .       .         .        .         .         .        .         .         .
--------------------------------------------------------------------------------
address   time     nn...    nn...     nn...     nn...    nn...     nn...     nn...
   .       .         .        .         .         .        .         .         .
   .       .         .        .         .         .        .         .         .
   .       .         .        .         .         .        .         .         .
   .       .         .        .         .         .        .         .         .
*/
```

The output parameters are:

`Address` This column shows the address of the monitored signal.

`Start Time` This column indicates the time on the system clock when the data collection started. (In Release 2, this column is labeled "End Time" and indicates the time on the system clock when data collection ended.)

B2 CV	This parameter shows the number of coding violations for the data collection interval that started at the time reported in the previous column.
B2 ES	This parameter shows the number of errored seconds in the data collection interval.
B2 ES Type A	This parameter shows the number of Type A errored seconds in the data collection interval. A Type A errored second is a second with a single error.
B2 ES Type B	This parameter shows the number of Type B errored seconds in the data collection interval. A Type B errored second is a second with more than one error but less than the number of errors in a severely errored second.
B2 SES	This parameter shows the number of severely errored seconds. An OC-3 severely errored second contains 32 or more errors.
B2 UAS	This parameter shows the number of unavailable seconds.
PSC-L	This parameter shows the number of protection switches from this line. This parameter does not apply to EC-1 lines.

NOTE:
Rows that are all zeros are not printed, except for the current day and current quarter hour which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition (Release 2 only).

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the OLIU circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

rtrv-pmthres-line

set-pmthres-line

NAME

rtrv-pm-sect: Retrieve Performance Monitoring Section

INPUT FORMAT

rtrv-pm-sect:*Address***;**

DESCRIPTION

This command displays performance-monitoring data associated with the OC-3 optics and the STS-3 section from the fiber.

The input parameter is:

Address Address of the OC-3 line(s). The address **all** may be used to retrieve all performance-monitoring information.
Valid OC-3 Line Addresses: **all, main-{1,2,all}, fn-{b,c,all}-{1,2,all}**

The output report appears as follows:

```
/* Optics and Section Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
=================================================================
Address  Start  Transmit  Transmit  Laser   SEFS
         Time   Pwr -1dB  Pwr -2dB  Bias
                  TCA       TCA      TCA
=================================================================
address  time     aaa       aaa      aaa     nnn
   .      .        .         .        .       .
   .      .        .         .        .       .
-----------------------------------------------------------------
address  time     aaa       aaa      aaa     nnn
   .      .        .         .        .       .
   .      .        .         .        .       .
   .      .        .         .        .       .
   .      .        .         .        .       .
   */
```

The output parameters are:

Address	This indicates the address of the OC-3 line.
Start Time	This indicates the time on the system clock when the data collection started. (In Release 2, this column is labeled "End Time" and indicates the time on the system clock when data collection ended.)

`Transmit Power -1dB`	This column shows whether a -1 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack, and has a value of yes or no.
`Transmit Power -2dB`	This column shows whether a -2 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack, and has a value of yes or no.
`Laser Bias`	This column indicates the TCA of the OLIU laser bias threshold setting, and has a value of yes or no.
`SEFS`	This column displays the number of severely errored frame seconds.

NOTE:
Rows that are all zeros or "no's" are not printed except for current day and current quarter hour, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition, or the parameter is not applicable for current equipage.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **`reset`** or **`set-date`** command is entered into the system, or if the OLIU circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

rtrv-pmthres-sect

set-pmthres-sect

NAME

rtrv-pm-sts1: Retrieve Performance Monitoring STS-1

INPUT FORMAT

rtrv-pm-sts1:*Address*;

DESCRIPTION

This command reports path performance-monitoring data associated with STS-1 signals from the fiber terminating on the network element. For STS1 cross-connected paths, data is collected on the active path of the signals and only the active path is reported. For STS-1 cross-connections, path termination exists if one of the interfaces is not SONET (for example, a DS3 interface).

For all VT1.5 cross-connections there is an STS-1 path that is terminated. For OC-3 ring applications, data is collected on *both* STS-1 ring paths and both paths are reported.

For the STS1E high-speed interface, path performance-monitoring data is collected also. Signal names are the default signal assignments based on equipage.

The input parameter is:

Address This parameter identifies the address of STS-1 channels. (It is the address of the incoming STS-1 signal before it is cross-connected.)

Valid Linear Addresses:

all, {m}-{1-3,all}, {a,b}-{1-2,all},
c-{1-3,all} (to OLIU with VT1.5 cross-connections *or* to OLIU from DS3 or MXRVO)
all, {a,b,c} (to STS1E with VT1.5 cross-connections *or* to STS1E from DS3 or MXRVO *or* to High-speed STS1E with low-speed DS1)

Valid Ring Addresses:

all,
{m1,m2}-{1-3,all}, (to OC-3 OLIUs in main slots)
b-{1-2,all},
c-{1-3,all} (to OLIU with VT1.5 cross-connections)
all, m-{1-3,all}, b-{1-2,all},
c-{1-3,all} (to OLIU from DS3 or MVRVO)
all, {a,b,c} (to STS1E with VT1.5 cross-connections *or* to STS1E from DS3 or MXRVO)

For ring STS-1 cross-connections, the address "m" is the active path just as "m" in linear systems is the active path.

The output report appears as follows:

```
/* STS-1 Path Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
================================================================================
Address  Start   B3 CV    B3 ES  B3 ES   B3 ES   B3 SES  B3 UAS
         Time                   Type A  Type B
================================================================================
address   time   nn...    nn...  nn...    nn...    nn...   nn...
   .       .       .       .       .        .        .       .
   .       .       .       .       .        .        .       .
--------------------------------------------------------------------------------
address   time   nn...    nn...  nn...    nn...    nn...   nn...
   .       .       .       .       .        .        .       .
   .       .       .       .       .        .        .       .
   .       .       .       .       .        .        .       .
   .       .       .       .       .        .        .       .
*/
```

The output parameters are:

Address	This column shows the address of the monitored signal.
Start Time	This column indicates the time on the system clock when the data collection started. (In Release 2 only, this column is labeled "End Time" and indicates the time on the system clock when data collection ended.)
B3 CV	This column shows the number of coding violations.
B3 ES	This column shows the number of errored seconds.
B3 ES Type A	This column shows the number of Type A errored seconds. A Type A errored second is a second with a single error.
B3 ES Type B	This column shows the number of Type B errored seconds. A Type B errored second is a second with more than one error but less than the number of errors in a severely errored second.
B3 SES	This column shows the number of severely errored seconds. A severely errored second contains 9 or more errors.
B3 UAS	This column shows the number of unavailable seconds of service. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred.

NOTE:
Rows that are all zeros are not printed except for current day and current quarter hour, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition (Release 2 only).

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **`reset`** or **`set-date`** command is entered into the system or if the DS3 or MXRVO circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-tca

rtrv-pmthres-sts1

set-pmthres-sts1

NAME

rtrv-pm-t1: Retrieve Performance Monitoring T1

INPUT FORMAT

rtrv-pm-t1:*Address*;

DESCRIPTION

This command displays the parameter data associated with one or more DS1 signals passing through the system from the DSX. This command is available only if the DS1 performance monitoring feature is set via the **set-feat** command and the **set-t1** PMMode parameter is on.

For additional information on DS1 performance monitoring, refer to Section 9, "DDM-2000 OC-3 Maintenance Description," presented earlier in this book.

This command is available with Release 6 software and later linear releases. This command is also available with Release 5.1 and later ring releases. Quarter-hour registers are not currently available for DS1 PM.

The input parameter is:

Address Address is the address of DS1 ports.
Valid Addresses: **all, {a,b,c}-{1-7,all}-{1-4,all}**

For Release 7.2 only, the output report appears as follows:

```
/* DS1 Path Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
=============================================================================
Address  Start      ES-L       CV-P       ES-P       SES-P      UAS-P
         Time                  CV-PFE     ES-PFE     SES-PFE    UAS-PFE
=============================================================================
address  time         n          n          n          n          n
                                  n          n          n          n
address  time         n          n          n          n          n
                                  n          n          n          n
  .       .           .          .          .          .          .
  .       .           .          .          .          .          .
  .       .           .          .          .          .          .
```

For Release 7.1 and earlier, the output report appears as follows:

```
/* DS1 Path Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
================================================================================
Address  Start    ES-P   SES-P    UAS-P   ES-P       SES-P      UAS-P
         Time                             Far End    Far End    Far End
================================================================================
address  time     n       n        n       n          n          n
address  time     n       n        n       n          n          n
  .       .       .       .        .       .          .          .
  .       .       .       .        .       .          .          .
  .       .       .       .        .       .          .          .
  .       .       .       .        .       .          .          .
```

The output parameters are:

`Address` This shows the address of the DS1 signal.

`Start Time` This indicates the time on the system clock when the data collection started.

`ES-L` This column is available with Release 7.2 only. This indicates the number of errored second line counts (ES-L) during the data collection interval that started at the time reported in the second column.

`ES-P` This indicates the number of errored second path counts (ES-P) during the the data collection interval that started at the time reported in the previous column.

`CV-P` This column is available with Release 7.2 only. This indicates the number of path coding violations (CV-P) during the data collection interval that started at the time reported in the second column.

`SES-P` This indicates the number of severely errored second path counts (SES-P) during the data collection interval that started at the time reported in the previous column.

`UAS-P` This indicates the number of unavailable second path counts (UAS-P) during the data collection interval that started at the time reported in the previous column.

`CV-P Far End`
This column is available with Release 7.2 only. This indicates the number of far-end path coding violations during the data collection interval that started at the time reported in the second column.

`ES-P Far End`
: This indicates the number of errored second path far-end counts during the the data collection interval that started at the time reported in the previous column. For Release 7.2, this column is labeled `ES-P ES-PFE`.

`SES-P Far End`
: This indicates the number of severely errored second path far-end counts during the data collection interval that started at the time reported in the previous column. For Release 7.2, this column is labeled `SES-P SES-PFE`.

`UAS-P Far End`
: This indicates the number of unavailable second path far-end counts during the data collection interval that started at the time reported in the previous column. For Release 7.2, this column is labeled `UAS-P UAS-PFE`.

NOTE:
Rows that are all zeros are not printed except for current day and current quarter, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **`reset`** or **`set-date`** command is entered into the system or if the DS1 circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

This command may only be used if the `ds1pm` feature is enabled via the **`set-feat`** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available, feature disabled */
```

If this command entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available in this release */
```

RELATED COMMANDS

init-pm

rtrv-feat

rtrv-pmthres-vt1

set-feat

NAME

rtrv-pm-t3: Retrieve Performance Monitoring T3

INPUT FORMAT

rtrv-pm-t3:*Address*;

DESCRIPTION

This command displays performance-monitoring (PM) data associated with one or more DS3 signals passing through the system.

For Release 7.2, this report is enhanced to display the performance-monitoring data for the DS3 line and path incoming from the DSX-3, in addition to the previously displayed data for the DS3 path incoming from the fiber. The enhanced report is available only when a BBG4B pack is active (in-service) in a function unit slot. When a function unit slot is equipped with this new circuit pack, the DS3 line performance-monitoring data will always be displayed regardless of what type of mode the DS3 service has been provisioned for. If the *clear channel (cc)* mode is selected, the report will display the DS3 line PM data and dash lines (-) for both directions of the DS3 path PM data.

The input parameter is:

Address Address of the DS3 port(s).
Valid DS3 Port Addresses: **{a,b,c,all}**

The output report for Release 7.2 appears as follows:

```
/* DS3 Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
=============================================================================
Address  Start                CV-L      ES-L      SES-L
         Time     SEFS         CV-P      ES-P      SES-P      UAS-P (dsx-3)
                  SEFS         CV-P      ES-P      SES-P      UAS-P (fiber)
=============================================================================
address  time                   n         n         n
                        n       n         n         n          n
address                 n       n         n         n          n
-----------------------------------------------------------------------------
address  time                   n         n         n
    .      .          .         .         .         .          .
    .      .          .         .         .         .          .
   */
```

The output report for Releases 7.1 as follows:

```
/* DS3 Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
=============================================================================
 Address        Start    SEFS       CV-P     ES-P     SES-P     UAS-P
                Time
=============================================================================
 address        time       n          n        n         n         n
 address        time       n          n        n         n         n
-----------------------------------------------------------------------------
 address        time       n          n        n         n         n
    .             .       .          .        .         .         .
    .             .       .          .        .         .         .
    .             .       .          .        .         .         .
    .             .       .          .        .         .         .
=============================================================================
 address        time       n          n        n         n         n
 address        time       n          n        n         n         n
-----------------------------------------------------------------------------
 address        time       n          n        n         n         n
    .             .       .          .        .         .         .
    .             .       .          .        .         .         .
    .             .       .          .        .         .         .
   */
```

The output report for Release 7.0 and earlier appears as follows:

```
/* DS3 Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
=============================================================================
 Address        Start    SEFS       P CV
                Time
=============================================================================
 address        time       n          n
 address        time       n          n
-----------------------------------------------------------------------------
 address        time       n          n
    .             .       .          .
    .             .       .          .
    .             .       .          .
```

The output parameters are:

Address	This shows the address of the DS3 port.
Start Time	This indicates the time on the system clock when the data collection started. (In OC-3 Release 2 only, this column is labeled "End Time" and indicates the time on the system clock when data collection ended.)
CV-L	This column is shown for Release 7.2 only. This indicates the number of B3ZS coding violations occurring over the accumulation period for the DS3 signal incoming from the DSX-3.
ES-L	This column is shown for Release 7.2 only. This indicates the number of seconds with at least one B3ZS coding violation or LOS for the DS3 signal incoming from the DSX-3.
SES-L	This column is shown for Release 7.2 only. This indicates the number of seconds with greater than 44 B3ZS coding violations or LOS for the DS3 signal incoming from the DSX-3.
SEFS	This indicates the number of severely errored frame seconds or AIS seconds.
CV-P	This shows the number of P-bit or adjusted F&M bit coding violations. For releases prior to OC-3 Release 7.1, this column is labeled P CV and will only show the DS3 P-bit coding violation counts. For Release 7.2, this shows the number of P-bit or adjusted F&M bit coding violations for the DS3 signal incoming from the DSX-3 or the fiber.
ES-P	This shows the number of errored seconds. For Release 7.2, this shows the number of Path errored seconds for the DS3 signal incoming from the DSX-3 or the fiber.
SES-P	This shows the number of severely errored seconds. For Release 7.2, this shows the number of Path severely errored seconds for the DS3 signal incoming from the DSX-3 or the fiber. A severely errored second contains 44 or more errors.
UAS-P	This shows the number of unavailable seconds of service. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred. For Release 7.2, this shows the number of Path unavailable seconds of service for the DS3 signal incoming from the DSX-3 or the fiber.

NOTE:
Rows that are all zeros are not printed except for current day and current quarter, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition (Release 2 only).

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **reset** or **set-date** command is entered into the system or if the DS3 circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-tca

rtrv-pmthres-t3

set-pmthres-t3

set-t3

NAME

rtrv-pm-tca: Retrieve Performance-Monitoring TCA

INPUT FORMAT

rtrv-pm-tca;

DESCRIPTION

This command displays the number of threshold-crossing alerts (TCAs) associated with signals terminating in or passing through the system. A TCA occurs when a performance-monitoring counter exceeds a user-selected threshold.

For Release 7.2, the performance-monitoring summary output report appears as follows:

```
/* TCA Performance Monitoring Summary Report
================================================================================
Address    Optics  Section   Line   STS-1     DS3     DS3
                                    Path      Path    Line
================================================================================
address      n        n       n
address      n        n       n
address                              n
address                              n         n       n
address                              n         n
```

For Release 7.1 and earlier, the performance monitoring summary output report appears as follows:

```
/* TCA Performance Monitoring Summary Report
================================================================================
Address        Optics      Section        Line        STS-1      DS-3
                                                      Path
================================================================================
address          n            n            n
address          n            n            n
address                                                n
address                                                n          n
address                                                n
```

If the **dslpm** feature is enabled (via the **set-feat** command), the following additional lines will appear in the TCA report:

```
================================================================================
DS1          TCA   DS1          TCA   DS1          TCA   DS1          TCA
Address    Count   Address    Count   Address    Count   Address    Count
================================================================================
address    count   address    count   address    count   address    count
  .          .       .          .       .          .       .          .
  .          .       .          .       .          .       .          .
```

If the **vtpm** feature is enabled (via the **set-feat** command), the following additional lines will appear in the TCA report:

```
=============================================================================
VT1.5      TCA   VT1.5      TCA   VT1.5      TCA   VT1.5      TCA
Address  Count   Address  Count   Address  Count   Address  Count
=============================================================================
address  count   address  count   address  count   address  count
  .        .       .        .       .        .       .        .
  .        .       .        .       .        .       .        .
```

The output report shows the address and type of parameters that are generating TCAs. Blanks in the report indicate that the output parameter does not apply for the specified address.

The output parameters are:

`Address` Address of the monitored signal. This can be the address of an OC-1 or OC-3 line, STS-1 channel, EC-1 port or DS3 port.

`Optics` This shows the total number of TCAs associated with optical performance-monitoring parameters (Transmit Pwr -1dB, Transmit Pwr -2dB, Laser Bias).

`Section` This shows the total number of TCAs associated with section performance monitoring parameters (severely errored frame seconds).

`Line` This shows the total number of TCAs associated with line performance monitoring parameters (B2 CV, B2 ES, B2 ES Type A, B2 ES Type B, B2 SES, B2 UAS).

`STS-1 Path` This shows the total number of TCAs associated with STS-1 path performance monitoring parameters (B3 CV, B3 ES, B3 ES Type A, B3 ES Type B, B3 SES, B3 UAS).

`DS3 Path` This column is available with Release 7.2. This will show the total number of TCAs for the DS3 path performance-monitoring parameters (severely errored frame seconds, P-bit or adjusted F&M bit CV, ES, SES, UAS) incoming from the fiber and the DSX-3. The path TCAs for the DS3 signal incoming from the DSX-3 will be displayed with a port address (a,b,...). Path TCAs for the DS3 signal incoming from the fiber will be displayed with a channel address (m-1, m-2,...).

`DS3 Line` This column is available with Release 7.2. This will show the total number of TCAs for DS3 line performance monitoring parameters (CV, ES, SES). The line TCAs for the DS3 signal incoming from the DSX-3 will be displayed with a port address (a,b,...).

`DS3` This shows the total number of TCAs associated with DS3 signal performance monitoring parameters (severely errored frame seconds, P bit or adjusted F&M bit CV, ES, SES, UAS).

`DS1 Address` This column shows the address of the DS1 signal.

`VT1.5 Address`
This column shows the address of the VT1.5 signal.

`TCA Count` This column indicates the total number of TCAs associated with the addressed signal.

NOTE:
Rows that are all zeros are not printed except for current day and current quarter hour, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a **`reset`** or **`set-date`** command is entered into the system or if the circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-sect

set-pmthres-line

set-pmthres-sect

rtrv-pm-t3

set-pmthres-t3

NAME

rtrv-pm-vt1: Retrieve Performance Monitoring VT1.5

INPUT FORMAT

rtrv-pm-vt1:*Address*;

DESCRIPTION

This command displays the parameter data associated with one or more VT1.5 channels from the fiber terminating on a DS1 or DS1 PM circuit pack. This command is available only if the VT1.5 performance monitoring feature is set via the **set-feat** command.

This command is available with Release 6 software and later linear releases. This command is available with Release 5.0 and later ring releases.

The input parameter is:

Address Address is the address of VT1.5 channels.
Valid Addresses: all, {m,a,b,c}-{1-7,all}-{1-4,all}

The output report appears as follows:

```
/* VT1.5 Path Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
================================================================================
Address  Start    V5 ES    V5 SES    V5 UAS
         Time
================================================================================
address  time      n         n         n
address  time      n         n         n
   .       .       .         .         .
   .       .       .         .         .
   .       .       .         .         .
   .       .       .         .         .
   .       .       .         .         .
```

The output parameters are:

`Address` This shows the address of the VT1.5 signal.

`Start Time` This indicates the time on the system clock when the data collection started.

V5 ES	This indicates the number of VT1.5 errored seconds (ES) during the data collection interval that started at the time reported in the previous column.
V5 SES	This indicates the number of VT1.5 severely errored seconds (SES) during the data collection interval that started at the time reported in the previous column.
V5 UAS	This indicates the number of VT1.5 unavailable seconds (UAS) during the data collection interval that started at the time reported in the previous column.

NOTE:
Rows that are all zeros are not printed except for current day and current quarter, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a reset or set-date command is entered into the system or if the DS1 circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

This command may only be used if the vtpm feature is enabled via the **set-feat** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available, feature disabled */
```

If this command entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available in this release */
```

RELATED COMMANDS

init-pm

rtrv-pmthres-vt1

NAME

rtrv-pmthres-line: Retrieve Performance Monitoring Threshold Line

INPUT FORMAT

rtrv-pmthres-line;

DESCRIPTION

This command displays the system's current OC-3 line performance parameter thresholds, as set by the **set-pmthres-line** command.

The output report appears as follows:

```
/* Line Performance Monitoring Thresholds Report
=============================================================
Parameter                                    Thresholds
                                          Quarter     Day
                                           Hour
=============================================================
B2 Coding Violations OC3 (B2CVOC3)          n          n
B2 Coding Violations EC1 (B2CVEC1)          n          n
B2 Errored Seconds (B2ES)                   n          n
B2 Errored Seconds Type A (B2ESA)           n          n
B2 Errored Seconds Type B (B2ESB)           n          n
B2 Severely Errored Seconds (B2SES)         n          n
B2 Unavailable Seconds (B2UAS)              n          n
Line Protection Switch Counts (PSCL)        n          n
*/
```

The first column of the report contains the names of the line performance monitoring parameters. The second and third columns contain the quarter hour and day thresholds for each parameter. The output parameters are:

`B2 Coding Violations OC3` — This parameter displays the threshold values for the B2 coding violation counts for OC-3 lines. This parameter is available with Release 11 and later.

`B2 Coding Violations EC1` — This parameter displays the threshold values for the B2 coding violation counts for EC-1 lines. This parameter is available with Release 5 and later.

`B2 Errored Seconds` — This parameter displays the threshold values for the B2ES count.

`B2 Errored Seconds Type A`	This parameter displays the threshold values for the B2ESA count.
`B2 Errored Seconds Type B`	This parameter displays the threshold values for the B2ESB count.
`B2 Severely Errored Seconds`	This parameter displays the threshold values for the B2SES count.
`B2 Unavailable Seconds`	This parameter displays the threshold values for the B2UAS count.
`Line Protection Switch Count`	This parameter displays the threshold values for the line protection switch count.

A parameter threshold of zero indicates that thresholding is disabled.

A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^{-n}.

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

set-pmthres-line

NAME

rtrv-pmthres-sect: Retrieve Performance Monitoring Threshold Section

INPUT FORMAT

rtrv-pmthres-sect;

DESCRIPTION

This command displays the system's current section performance parameter thresholds, as set by the **set-pmthres-sect** command.

The output report appears as follows:

```
/* Optics and Section Performance Monitoring Thresholds Report
================================================================
Transmit Power 1dB (TxPwr1dB) = x
Transmit Power 2dB (TxPwr2dB) = x
Laser Bias = x
================================================================
Parameter                                  Thresholds
                                        Quarter    Day
                                         Hour
================================================================
Severely Errored Frame Seconds (SEFS)     n          n
*/
```

Values for the first three output parameters are **enabled** and **disabled**. The output parameters are:

`Transmit Power 1dB` OLIU transmit power threshold setting.

`Transmit Power 2dB` OLIU transmit power threshold setting.

`Laser Bias` OLIU laser bias threshold setting.

`Severely Errored Frame Seconds`
This parameter displays the threshold values for the SEFS count. A parameter threshold of zero indicates that the thresholding is disabled.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

set-pmthres-sect

NAME

rtrv-pmthres-sts1: Retrieve Performance Monitoring Threshold STS-1

INPUT FORMAT

rtrv-pmthres-sts1;

DESCRIPTION

This command retrieves the system's STS-1 path performance monitoring thresholds, as set by the **set-pmthres-line** command.

The output report appears as follows:

```
/* STS-1 Path Performance Monitoring Thresholds Report
================================================================
Parameter                                      Thresholds
                                          Quarter        Day
                                           Hour
================================================================
B3 Code Violations (B3CV)                    n             n
B3 Errored Seconds (B3ES)                    n             n
B3 Errored Seconds Type A (B3ESA)            n             n
B3 Errored Seconds Type B (B3ESB)            n             n
B3 Severely Errored Seconds (B3SES)          n             n
B3 Unavailable Seconds (B3UAS)               n             n
*/
```

The first column of the report contains the names of the path performance monitoring parameters. The second and third columns contain the quarter hour and day thresholds for each parameter. The output parameters are:

`Quarter Hour` This column contains the quarter hour thresholds for each performance monitoring parameter.

`Day` This column contains the day thresholds for each performance-monitoring parameter.

`B3CV` This parameter shows the threshold for coding violations. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^n. A threshold of zero indicates that the thresholding is disabled.

`B3ES` This parameter shows the threshold for errored seconds.

`B3ESA` This parameter shows the threshold for type A errored seconds.

B3ESB	This parameter shows the threshold for type B errored seconds.
B3SES	This parameter shows the threshold for the number of severely errored seconds.
B3UAS	This parameter shows the threshold for unavailable seconds of service.

RELATED COMMANDS

init-pm

set-pmthres-sts1

rtrv-pm-sts1

rtrv-pm-tca

NAME

rtrv-pmthres-t1: Retrieve Performance Monitoring Threshold T1

INPUT FORMAT

rtrv-pmthres-t1;

DESCRIPTION

This command displays the current DS1 path performance parameter thresholds set for a shelf by the **set-pmthres-t1** command, and it is available only if the DS1 performance monitoring feature is set via the **set-feat** command.

This command is available with Release 5.1 software or later.

The output report for Release 7.2 appears as follows:

```
/* DS1 Path Performance Monitoring Thresholds Report
================================================================================
Parameter                                                  Thresholds
                                                             Day
================================================================================
Errored Seconds-Line (ESL)                                  nnnn
Code Violations-Path SF (CVPSF)                             nnnn
Code Violations-Path ESF (CVPESF)                           nnnn
Errored Seconds-Path (ESP)                                  nnnn
Severely Errored Seconds-Path (SESP)                        nnnn
Unavailable Seconds-Path (UASP)                             nnnn
Code Violations-Path Far End (CVPFE)                        nnnn
Errored Seconds-Path Far End (ESPFE)                        nnnn
Severely Errored Seconds-Path Far End (SESPFE)              nnnn
Unavailable Seconds-Path Far End (UASPFE)                   nnnn
*/
```

The output report for Releases 7.1 and earlier appears as follows:

```
/* DS1 Path Performance Monitoring Thresholds Report
================================================================================
Parameter                                                    Thresholds
                                                               Day
================================================================================
Errored Seconds-Path (ESP)                                    nnnn
Severely Errored Seconds-Path (SESP)                          nnnn
Unavailable Seconds-Path (UASP)                               nnnn
Errored Seconds-Path Far End (ESPFE)                          nnnn
Severely Errored Seconds-Path Far End (SESPFE)                nnnn
Unavailable Seconds-Path Far End (UASPFE)                     nnnn
*/
```

The output parameters are:

`Errored Seconds-Line` This parameter is available with Release 7.2 only. This parameter shows the daily threshold for DS1 line errored seconds.

`Code Violations-Path SF`
This parameter is available with Release 7.2 only. This parameter shows the daily threshold for DS1 path code violations for SF-encoded paths. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

`Code Violations-Path ESF`
This parameter is available with Release 7.2 only. This parameter shows the daily threshold for DS1 path code violations for ESF-encoded paths. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

`Errored Seconds-Path` This parameter shows the daily threshold for DS1 errored seconds.

`Severely Errored Seconds-Path`
This parameter shows the daily threshold for DS1 severely errored seconds.

`Unavailable Seconds-Path`
This parameter shows the daily threshold for DS1 unavailable seconds of service.

`Code Violations-Path Far End`
This parameter is available with Release 7.2 only. This parameter shows the daily threshold for DS1 path code violations at the far end. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

`Errored Seconds-Path Far End`
This parameter shows the daily threshold for DS1 errored seconds at the far end.

`Severely Errored Seconds-Path Far End`
This parameter shows the daily threshold for DS1 severely errored seconds at the far end.

`Unavailable Seconds-Path Far End`
This parameter shows the daily threshold for DS1 unavailable seconds of service at the far end.

A threshold of zero indicates that thresholding is disabled.

A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^n.

This command may only be used if the `ds1pm` feature is enabled via the **`set-feat`** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available, feature disabled */
```

If this command entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available in this release */
```

RELATED COMMANDS

rtrv-feat

set-feat

set-pmthres-t1

NAME

rtrv-pmthres-t3: Retrieve Performance Monitoring Threshold T3

INPUT FORMAT

rtrv-pmthres-t3;

DESCRIPTION

This command displays the system's current DS3 performance parameter thresholds, as set by the **set-pmthres-t3** command.

The output report for Release 7.2 appears as follows:

```
/* DS3 Performance Monitoring Thresholds Report
=============================================================
   Parameter                                    Thresholds
                                              Quarter   Day
                                                Hour
=============================================================
 Line Coding Violations (CVL)                    n       n
 Line Errored Seconds (ESL)                      n       n
 Line Severely Errored Seconds (SESL)            n       n
 Severely Errored Frame Seconds (SEFS)           n       n
 P-bit Coding Violations (PCV)                   n       n
 F&M bit Coding Violations (FMCV)                n       n
 Errored Seconds (ESP)                           n       n
 Severely Errored Seconds (SESP)                 n       n
 Unavailable Seconds (UASP)                      n       n
 */
```

The output report for Releases 7.1 and earlier appears as follows:

```
/* DS-3 Performance Monitoring Thresholds Report
=============================================================
   Parameter                                    Thresholds
                                              Quarter   Day
                                                Hour
=============================================================
 Severely Errored Frame Seconds (SEFS)          n        n
 Coding Violations (CVP)                        n        n
 Errored Seconds (ESP)                          n        n
 Severely Errored Seconds (SESP)                n        n
 Unavailable Seconds (UASP)                     n        n
 */
```

A threshold of zero indicates that thresholding is disabled.

The output parameters are:

CVL — This output parameter is available with OC-3 Release 7.2. This parameter displays the threshold for the coding violations count of the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

ESL — This output parameter is available with OC-3 Release 7.2. This parameter displays the threshold for the errored seconds count of the DS3 line with at least one B3ZS coding violation.

SESL — This parameter displays the threshold for the severely errored seconds count of the DS3 line with greater than 44 B3ZS coding violations.

SEFS — Thise parameter displays the threshold values for severely errored frame seconds.

CVP — This parameter displays the threshold for the DS3 P bit or adjusted F&M bit coding violation counts. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n. In Release 7.2, this column is labeled PCV.

FMCV — This output parameter is available with OC-3 Release 7.2. This parameter displays the threshold for the DS3 F&M bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

ESP — Thise parameter displays the threshold for the DS3 P-bit or Adjusted F&M-bit errored seconds counts. This parameter is available with OC-3 Release 7.1 and later.

SESP This parameter displays the threshold for the DS3 P-bit or Adjusted F&M-bit severely errored seconds counts. This parameter is available with OC-3 Release 7.1 and later.

UASP This parameter displays the threshold for the DS3 P-bit or Adjusted F&M-bit unavailable seconds counts. This parameter is available with OC-3 Release 7.1 and later.

RELATED COMMANDS

init-pm

rtrv-pm-t3

rtrv-pm-tca

set-pmthres-t3

set-t3

NAME

rtrv-pmthres-vt1: Retrieve Performance Monitoring Threshold VT1.5

INPUT FORMAT

rtrv-pmthres-vt1;

DESCRIPTION

This command displays the current VT1.5 path performance parameter thresholds set for a shelf by the **set-pmthres-vt1** command, and it is available only if the VT1.5 performance monitoring feature is enabled via the **set-feat** command.

This command is available with Release 6 software and later linear releases. This command is not available for Release 5.1 rings.

The output report appears as follows:

```
/* VT1.5 Path Performance Monitoring Thresholds Report
=================================================================
Parameter                                          Thresholds
                                                  Quarter  Day
                                                   Hour
=================================================================
V5 Errored Seconds (V5ES)                          nnnn     nnn
V5 Severely Errored Seconds (V5SES)                nnnn     nnn
V5 Unavailable Seconds (V5UAS)                     nnnn     nnn
*/
```

In the report, a threshold of zero indicates that thresholding is disabled. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^{n}.

The output parameters are:

V5 Errored Seconds	This parameter shows the quarter hour and daily threshold for VT1.5 errored seconds.
V5 Severely Errored Seconds	This parameter shows the quarter hour and daily threshold for VT1.5 severely errored seconds.
V5 Unavailable Seconds	This parameter shows the quarter hour and daily threshold for VT1.5 unavailable seconds of service.

This command may only be used if the `vtpm` feature is enabled via the **`set-feat`** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available, feature disabled */
```

If this command entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available in this release */
```

RELATED COMMANDS

rtrv-feat

set-feat

set-pmthres-vt1

NAME

rtrv-secu: Retrieve Security

INPUT FORMAT

rtrv-secu;

DESCRIPTION

This command retrieves CIT and DCC port security and timeout information.

This command is available with OC-3 Release 3 software and later.

The output report appears as follows:

```
/* Port Security Configuration Report
================================================================
Access       Security       Timeout,
 Link                       minutes
================================================================
cit-1        disabled        0
cit-2        enabled        60
dcc-m        disabled       15
dcc-a        disabled       15
dcc-b        disabled       15
dcc-c        disabled       15
  .            .            .
  .            .            .
*/
```

The output parameters are:

`Access Link`	Access link is the address of a CIT or DCC interface. See Table 11-1 for a list of valid addresses.
`Security`	Security shows whether security is enabled or disabled on the selected CIT or DCC port. The valid values are `enabled` or `disabled`. When security is enabled, a user must enter a valid login and password to begin a session.
`Timeout`	Timeout shows the time duration, in minutes, before an inactive session is terminated on a specified CIT or DCC interface. If timeout is zero (0), then there is no timeout.

RELATED COMMANDS

rtrv-lgn

set-secu

NAME

rtrv-state: Retrieve State

INPUT FORMAT

rtrv-state[:*Address*];

DESCRIPTION

This command displays port and protection switching state information for one or more slots.

Systems with ring application software should use the command **rtrv-state-eqpt** to retrieve port and protection switching state information regardless of their release.

NOTE:
This command has been replaced by **rtrv-state-eqpt** in linear applications for Release 6.2 and later, and should be used instead of this command for all future releases.

The input parameter is:

Address Address identifies one or more slots. The default is **all**.
Valid Slot Addresses: **all, main-{1,2,all}, fn-all, fn-{a,b,c}-{1,2,all}, ls-all, ls-{a,b,c}-{1-8,all}, tg-{1,2,all}**

The output report appears as follows:

```
/* State Report
=============================================================
Address   Circuit    Port      Switch      Switch
           Pack    State(s)   State      Priority
=============================================================
address    pack       p         s        priority
                      .
                      .
                      .
address    pack       p         s        priority
*/
```

The output parameters are:

`Address` Address is the address of a slot.

`Circuit Pack` Circuit pack is the circuit pack name. A dash (-) means not applicable or not equipped.

`Port State(s)` Port State (`p`) may be one of the following:

`i` (In Service) In this state, the port is monitored for failures and the appropriate alarm is generated if a failure is detected. To retire the alarm and transition the associated port to the "auto" state, the update function must be performed after the input signal is removed.

`a` (Automatic) In this state, the port will automatically be put "in service" if a good signal is detected coming from the DSX panel.

`n` (Not Monitored) In this state, the signal from the DSX is not monitored or alarmed. The port will not automatically go to the "in service" state when a signal is detected.

`-` (blank) Not applicable or not equipped

For DS1 low-speed slots, four port states are shown, one for each of the four DS1 ports on the DS1 circuit pack, numbered 1 to 4 from left to right.

`Switch State`

Switch state reflects the state of the protection switching relays in the system. Switch state(s) may be one of the following:

`active` For OC-3 lines, "active" means the signal being received on this line is selected by the near end protection switch and the signal being transmitted on this line is selected by the far end. For DS1, DS3, STS1E (low-speed), MXRVO, and TGS circuit packs, "active" means that the circuit pack is currently carrying service.

`active-tx` The signal being transmitted is selected by the far end, but the received signal is not selected by the near end protection switch. (This applies only to OC-3 lines.)

`active-rx` The signal being received on this line is selected by the near end protection switch but the signal being transmitted is not selected by the far end. (This applies only to OC-3 lines.)

`active-?` The protection line is failed in the receive direction. The state of the protection line in the transmit direction is unknown; the signal transmitted on the protection line *might* be selected by the far end. (This applies only to OC-3 lines.)

`standby` The circuit pack or OC-3 line is not currently active.

Not applicable or not equipped

`Switch Priority` Switch priority is the currently active protection switch request. Only a higher priority protection switch request can cause a protection switch to be done. Switch priority may be one of the following:

`inhibit` No protection switches will be done until the switch is reset.

`lockout of protection`
This prevents access to the protection pack for the group.

`lockout of service`
This prevents access to the protection circuit pack for the specified service slot.

`forced` No automatic or manual switches will be done until the forced switch is reset.

`K1/K2 byte failure`
This occurs when the system cannot determine the protection switching state of the far end due to a failure of the automatic protection switching channel (K1/K2 bytes of the SONET line overhead on the protection line).

`APS-signal failure`
Automatic protection switching has occurred due to a signal failure.

`APS-signal degrade`
Automatic protection switching has occurred due to a signal degrade.

`APS-pack failure`
Automatic protection switching has occurred due to a circuit pack failure.

`APS-automatic lock`
Traffic is forced and held onto the protection pack, unable to revert to the service pack until midnight. This occurs following four automatic switches from service to protection during a 10-minute interval.

`manual` Traffic has been manually switched to protection.

Not applicable or not equipped

For Release 3 and later, the state of the timing reference is reported in the **`rtrv-sync`** command. For Release 2, the state of the timing reference is reported whenever the system is provisioned for `External` and an address of

all or *tg-all* is specified. When otherwise provisioned or not equipped, the timing reference is not reported.

RELATED COMMANDS

rtrv-alm

rtrv-eqpt

rtrv-sync

set-state-ec1

set-state-t1

set-state-t3

switch-fn

switch-line

switch-ls

switch-sync

upd

NAME

rtrv-state-eqpt: Retrieve State Equipment

INPUT FORMAT

rtrv-state-eqpt[:*Address*];

DESCRIPTION

This command displays slot, port, and protection switching state information for the network element (NE). This command replaces and extends the **rtrv-state** command used with linear releases.

This command is used with all ring releases, and should be used instead of the **rtrv-state** command with Release 6.2 and all later linear releases.

The input parameter is:

Address Address identifies one or more slots. The default is **all** for all slots in the system.
Valid OC-3 Addresses: **all, main-{1,2,all}, fn-all, fn-{a,b,c}-{1,2,all}, ls-all, ls-{a,b,c}-{1-8,all}, tg-{1,2,all}**

The output report appears as follows:

```
/* Equipment State Report
   ============================================================
   Address   Circuit    Port      Switch      Switch
              Pack     State(s)   State      Priority
   ============================================================
   address    pack       p          s        priority
   address    pack       p          s        priority
     .          .        .          .           .
     .          .        .          .           .
   ------------------------------------------------------------
   address    pack       p          s        priority
     .          .        .          .           .
     .          .        .          .           .
   address    pack       p          s        priority
*/
```

In the output report, slot types are separated by a row of dashes. Within each slot type, slots are listed in order of their addresses, with protection slots listed last. Slots for control circuit packs (SYSCTL, AUXCTL) are not listed in this report.

The output parameters are:

`Address` Address is the address of a slot.

`Circuit Pack` Circuit pack is the circuit pack name. A hyphen (-) means not applicable or not equipped.

`Port State(s)` The state of the signal, from the DSX for DS-1, DS-3, or EC-1 signals, or from the fiber for OC-1 signals, is reported.

Port State (`p`) may be one of the following:

`i` (In Service) In this state, the port is monitored for failures, and the appropriate alarm is generated if a failure is detected. To retire the alarm and transition the associated port to the "auto" state, the update function must be performed after the input signal is removed.

`a` (Automatic) In this state, the port will automatically be put "in service" if a good signal is detected. This state is not allowed for OC-1 signals.

`n` (Not Monitored) In this state, the signal is not monitored or alarmed. The port will not automatically go to the "in service" state when a signal is detected.

`-` Not applicable (not equipped)

blank

The port state is always blank for timing circuits, and for protection slots for 1x1 and 1xn protected circuit packs. The port state is always a hyphen (-) for low speed slots in the `auto` state.

`Switch State` This indicates whether the circuit pack is active or standby, corresponding to the state of the protection switching relays. Switch state(s) may be one of the following:

`active` For OC-N lines in a 1+1 line-protected configuration, active means the signal being received on this line is selected by the near end protection switch and the signal being transmitted on this line is selected by the far end. For ring applications, each OLIU in the main slots is feeding its ring channels incoming from

	the fiber to the other side for pass-through connections and is sending drop channels to the function units. Some or all of the received ring channels incoming from this OLIU may be active. This can be determined using the **rtrv-state-path** command on this system. Some or all of the transmitted ring channels outgoing to the fiber may also be active. This can be determined by using the **rtrv-state-path** command on *all* remote systems.
`active-fn`	For a main OLIU slot in ring applications, this means that the ring path protection switching is currently being done on this pack, and this pack is choosing each active ring channel from either ring and sending it to the function units. For other pack types, active means the signal is being transmitted and received from this pack. Even if the pack is removed, the slot will remain active unless there is a protection circuit pack that service can be switched to.
`active-tx`	For OC-3 function unit -3 lines, the signal being transmitted is selected by the far end, but the received signal is not selected by the near end protection switch.
`active-rx`	For OC-3 function unit -3 lines, the signal being received on this line is selected by the near end protection switch, but the signal being transmitted is not selected by the far end.
`active-?`	For OC-3 function unit lines, the protection line is failed in the receive direction. The state of the protection line in the transmit direction is unknown; the signal transmitted on the protection line *might* be selected by the far end.
`standby`	The circuit pack or optical line is not currently active.
-	Not applicable or not equipped

For ring applications because of pass-through connections, the switch state will always be active for both main OLIUs.

`Switch Priority` Switch priority is the currently active protection switch request. Only a higher priority protection switch request can cause a protection switch to be done. For ring applications, the switch priority in this report applies only to the equipment switching of the main to function unit signals. See the **`rtrv-state-path`** command for path protection switching information. Switch priority may be one of the following:

`inhibit` No protection switches will be done until the switch is reset.

`lockout of protection`
This prevents access to the protection pack for the group.

`lockout of service`
This prevents access to the protection circuit pack for the specified service slot.

`forced` No automatic or manual switches will be done until the forced switch is reset.

`K1/K2 byte failure`
This occurs when the system cannot determine the protection switching state of the far end due to a failure of the automatic protection switching channel (K1/K2 bytes of the SONET line overhead on the protection line).

`APS-protection line signal failure`
Automatic protection switching has occurred due to a protection line signal failure.

`APS-service line signal failure`
Automatic protection switching has occurred due to a service line signal failure.

`APS-signal failure`
Automatic protection switching has occurred due to a signal failure.

`APS-signal degrade`
Automatic protection switching has occurred due to a signal degrade.

`APS-pack failure`
Automatic protection switching has occurred due to a circuit pack failure.

`APS-automatic lock`
: Traffic is forced and held onto the protection pack, unable to revert to the service pack until midnight. This occurs following four automatic switches from service to protection during a 10-minute interval.

`APS-wait to restore`
: Automatic protection switching has occurred, but the service line is now good and service will revert back to its original source after a specified period of time.

`manual`
: Traffic has been manually switched to protection.

`-`
: No manual or automatic switch requests are active.

For ring applications, the switch priority in this report applies only to the equipment switching of the main OLIUs to function unit signals. See the **`rtrv-state-path`** command for path protection switching information.

The switch priority is always blank for protection slots, with one exception. For 1xn protected slots, the protected slot may have a switch priority of `lockout of protection`.

The state of the timing reference is reported in the **`rtrv-sync`** command.

RELATED COMMANDS

rtrv-alm

rtrv-state-path (Rings only)

rtrv-sync

set-state-t1

set-state-t3

switch-fn

switch-line

switch-ls

switch-sync

upd

NAME

rtrv-state-path: Retrieve State Path

INPUT FORMAT

rtrv-state-path[:*Address*];

DESCRIPTION

This command displays signal path state information for paths dropped at the network element (NE). To determine which of the transmitted ring channels outgoing to the fiber are active, it may be necessary to also use the **rtrv-state-eqpt** command on all remote systems.

NOTE:
A pass-through path passes directly from the OC-N receiver to the OC-N transmitter. The service carried with this path is not dropped at this node.

This command is available in OC-3 Release 5.1 and later ring releases.

The input parameter is:

Address For OC-3 Release 5.1, *address* is any dropped VT1.5 or STS-1 path. For OC-3 Release 7 and later, *address* is any drop or drop and continue VT1.5 or STS-1 path. The default is **all** for all paths in the system.
Valid VT1.5 Addresses:
all, {m1,m2}-{1-3,all}-{1-7,all}-{1-4,all}
Valid OC-3 STS-1 Addresses: **all, {m1,m2}-{1-3,all}**

The output report appears as follows:

```
/* Path Protection Switch State Report
   ================================================================
   ---------- Ring 1 -----------  ---------- Ring 2 -----------
   Address  Act   APS Condition   Address  Act   APS Condition
   ================================================================
   address   x     condition      address   x    condition
   address   x     condition      address   x    condition
      .      .        .             .      .       .
      .      .        .             .      .       .
      .      .        .             .      .       .
   */
```

The output parameters are:

`Address` For Release 5.1, `address` is any VT1.5 path. For Release 7 and later, `address` could be an STS-1 or VT1.5 path. The report always displays both the Ring 1 and Ring 2 addresses.

`Act` This column indicates whether the associated Ring 1 path (receive into local main-1) or Ring 2 path (receive into local main-2) is active.

This column may contain one of the following:

`Y` The path is provisioned as drop, or drop and continue, and this side is active.

`S` The path is provisioned as single 0x1, and is locked to this side.

`(blank)` The path is provisioned as drop, or drop and continue, and this side is standby.

`P` The path is provisioned as pass-through. The `P` indication will appear on both sides, as both sides are active

`APS Condition` This column lists the condition that caused the automatic protection switch to occur and appears on the path where the condition was detected. (The manual protection switch request is not shown because the system is nonrevertive.) The condition may be one of the following:

`signal failure`

`pack removal`

`pack failure`

`signal degrade`

Only manual or automatic protection switch (APS) requests that are higher priority than the currently active requests will cause a protection switch to occur. Currently, only the `manual` protection switch request is allowed, and because it is a lower priority than the APS requests, only APS requests will appear in the report. The APS conditions will remain active while the condition that caused the switch still exists. When that failure clears, the APS condition is changed to blank if no other APS requests exist.

RELATED COMMANDS

rtrv-state-eqpt

switch-path-vt1

switch-path-sts1

NAME

rtrv-state-sts1: Retrieve State of STS-1 Channels

INPUT FORMAT

rtrv-state-sts1[:*Address*];

DESCRIPTION

This command retrieves STS-1 channel states.

This command is available in Release 6.2 and later linear applications and Release 7.1 and later ring applications.

The input parameter is:

Address Address is the address of the STS-1 channels whose state is to be reported. The default is **all** STS-1 channels. Other valid addresses are:

{m,c}-{1-3,all}
{a,b}-{1-2,all}

The output report appears as follows. Only channels that are cross-connected will be displayed in the output report.

```
/* STS-1 Channel State Report
================================================================
Address     Channel State
================================================================
m-1         AUTO
m-2         IS
m-3         NMON
a-1         AUTO
b-2         IS
 .          .
 .          .
 .          .
*/
```

The output parameters are:

`Address` Address is the address of an STS-1 channel.

`Channel State` Channel State is the state of the STS-1 channel identified in the address field. It may have one of the following values:

- `auto` Automatic. There is no good signal on this channel. [STS-1 AIS or STS-1 loss of pointer (LOP) condition may be present.] Alarm or status conditions associated with this channel are not reported. Performance monitoring is not done for the channel. If a good signal is detected on this channel, then the channel will be put in the "In Service" state automatically.
- `is` In Service. The channel is monitored. Alarm and status conditions are reported normally.
- `nmon` Not Monitored. The channel is not being monitored. Alarm and status conditions are not reported for this channel. Performance monitoring is not done for the channel. The channel will remain in this state until the state is changed (with the `set-state-sts1` command) or until the cross-connection involving this channel is deleted.

RELATED COMMANDS

dlt-crs-sts1

ent-crs-sts1

rtrv-crs-sts1

rtrv-state-vt1

set-state-sts1

update

NAME

rtrv-state-vt1: Retrieve State of VT-1.5 Channels

INPUT FORMAT

rtrv-state-vt1[:*Address*];

DESCRIPTION

This command retrieves VT1.5 channel states.

This command is available in OC-3 Release 6.2 and later linear applications and in Release 7.1 and later ring applications.

The input parameter is:

Address Address is the address of VT1.5 channels whose state is to be reported. Table 11-1 contains a list of valid VT1.5 channel addresses. The default is **all** addresses.

The output report appears as follows. Only channels that are cross-connected will be displayed in the output report. (This includes VT1.5 channels that are implicitly cross-connected as part of an STS-1 cross-connection.

```
/* VT1.5 Channel State Report
================================================================================
Address     Channel State
================================================================================
m-1-1-1     auto
m-1-1-2     is
m-1-1-3     nmon
m-1-1-4     auto
*/
```

The output parameters are:

`Address` Address is the address of a VT1.5 channel.

`Channel State` Channel State is the state of the VT1.5 channel identified in the address field. It may have one of the following values:

- `auto` Automatic. There is no good signal on this channel. [The VT AIS or a VT loss of pointer (LOP) condition may be present.] Alarm or status conditions associated with this channel are not reported. Also, performance monitoring is not reported. If a good signal is detected on this channel, then the channel will be put in the "In Service" state automatically.
- `is` In Service. The channel is monitored. Alarm and status conditions are reported normally.
- `nmon` Not Monitored. The channel is not being monitored. Alarm and status conditions are not reported for this channel. Performance monitoring is not done for the channel. The channel will remain in this state until the state is changed (with the `set-state-vt1` command) or until the cross-connection involving this channel is deleted.

RELATED COMMANDS

dlt-crs-sts1

dlt-crs-vt1

ent-crs-sts1

ent-crs-vt1

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-state-sts1

set-state-vt1

update

NAME

rtrv-sts1: Retrieve STS1

INPUT FORMAT

rtrv-sts1[:*Address*]

DESCRIPTION

This command retrieves information about terminated (linear) or dropped (ring) STS-1 channels.

This command is available with Release 7.1 and later ring releases. The input parameter is:

Address Address is the address of the STS-1 channels whose state is to be reported. The default is **all** STS-1 channels. Other valid addresses are:

{m,c}-{1-3,all}
{a,b}-{1-2,all}

The output report appears as follows:

```
/* STS-1 Channel Provisioning Report
=================================================
SignalDegrade = value

STS-1 AIS Alarm Information
Address      AIS Alarm            AIS Alarm
           Service Affecting  Non Service Affecting
=================================================
address          sa                 nsa
address          sa                 nsa
  .              .                  .
  .              .                  .
  .              .                  .
*/
```

If the signal degrade value is zero (0), as set by the **set-sts1** command, then signal degrade is disabled and the following output report appears:

```
/* STS-1 Channel Provisioning Report
============================================================
SignalDegrade=0  (disabled)

STS-1 AIS Alarm Information
   Address         AIS Alarm            AIS Alarm
                Service Affecting  Non Service Affecting
============================================================
   address         sa                     nsa
   address         sa                     nsa
     .               .                      .
     .               .                      .
     .               .                      .
*/
```

If the AID is anything but *all*, then the report appears as follows:

```
/* STS-1 Channel Provisioning Report
=============================================
Address         AIS Alarm            AIS Alarm
             Service Affecting  Non Service Affecting
=============================================
address         sa                     nsa
address         sa                     nsa
  .               .                      .
  .               .                      .
  .               .                      .
*/
```

If the signal degrade and nsa report fields are not valid for the application (for example, a non-ring application), then the report appears as follows:

```
/* STS-1 Channel Provisioning Report
================================================
Address         AIS Alarm
             Service Affecting
================================================
address         sa
address         sa
   .              .
   .              .
   .              .
*/
```

RELATED COMMANDS

set-sts1

NAME

rtrv-sync: Retrieve Synchronization

INPUT FORMAT

rtrv-sync;

DESCRIPTION

This command displays the provisioning and operational information on the synchronization attributes of the DDM-2000, as set by the **set-sync** command.

The following pages show output reports for this command and explain the various fields on the reports. Output reports will vary according to the provisioned timing mode and the software release.

The (hw) after a parameter value on the following reports indicate that the parameter is set by hardware switches on the TGS circuit pack.

The synchronization output report on the following page is the general format for a system equipped with TGS circuit packs that include DS1 timing outputs in the sync mode. This report format is available in OC-3 Release 3.2 software and later.

```
/* Synchronization Report
 ============================================================================
 Parameter                    Value(s)
 ============================================================================
 Sync Source (src)            address  timing_message

 DS1 Line Code/Format         tg-1=fmt (hw)    tg-2=fmt (hw)

 Shelf Timing
   Provisioned Mode           mode (hw)
   Active Timing Mode         mode (hw)
   DS1 Reference Input State  ref-1=mode       ref-2=mode
   Active Circuit Pack        pack
   Active Reference/Line      ref
   Mode Switching (mdsw)      mode
   Last Reference Switch      YY-MM-DD HH:MM:SS

DS1 Outputs
   Provisioned Mode           mode (hw)
   DS1 Output Mode (omd)      mode
   DS1 Output State           refout-1=state   refout-2=state
   Active Line                ref
   Active Reference           ref

 Sync Message Information
   OC-N Line      Input Message     Output Message
----------------------------------------------------------------------------
   address          Message           Message
   address          Message           Message
   address          Message           Message

 Sync Autoreconfiguration    mode
*/
```

The output parameters for the reports are listed below. Some parameters may not apply to all the reports. The output parameters are:

`Sync Source` The sync source is the optical line provisioned from which shelf (and optionally, DS1 sync output) timing is derived. If the shelf timing mode is set for `LoopTimed` and DS1 sync output timing is also selected, `Sync Source` is both the source for shelf timing and DS-1 sync outputs. If the shelf timing mode is set for `External` and DS1 sync output timing is also selected, `Sync Source` is only the source for DS-1 sync outputs.

`main, fn-c`	OC-3 linear line address
`main-1, main-2, fn-c`	OC-3 ring line addresses
— (dash)	Timing mode is hardware provisioned to be FreeRunning or External without DS1 sync outputs (that is, `mult`).

The choices for Sync Source (except the dash) are followed by one of these messages:

`for Shelf only` Sync Source is set for LoopTimed shelf.

`for Shelf and DS1 Outputs`
Sync Source is set for LoopTimed shelf/Sync Out.

`for DS1 Outputs only`
Sync Source is set for External shelf timing/Sync Out.

`DS1 Line Code/Format`

This refers to the signal format and line coding of the DS1 `External` timing references (as set with option switches on the TGS circuit pack). The valid values are:

`DS1 Line Code`

`ami`	Alternate Mark Inversion
`b8zs`	Bipolar with 8 Zeros Substitution
— (dash)	Unequipped
`?`	Unreadable

`DS1 Line Format`

`sf`	Super Frame format (D4)
`esf`	Extended Super Frame format
— (dash)	Unequipped
`?`	Unreadable

`Mode Switching`

Mode Switching indicates whether the mode switching for the timing generator is revertive or nonrevertive.

`Revertive` Revertive mode switching. If the system is provisioned for revertive mode switching, it will automatically switch from holdover mode to the provisioned mode (`LoopTimed` or `External` timing) when a good reference becomes available.

`Nonrevertive` Nonrevertive mode switching. If the system is provisioned for nonrevertive mode, it will switch to holdover mode (as a result of a timing reference failure) and remain in this

mode until it is manually switched back to the provisioned timing mode by the **switch-sync** command.

— (dash) Not applicable. Provisioned mode is `FreeRunning`.

`Provisioned Mode`

Provisioned Mode is the provisioned synchronization mode of the timing generator circuit packs, as set with option switches on the TGS circuit pack. The valid values are:

`External` Timing derived from DS1 External reference.

`FreeRunning` Timing derived from internal oscillator.

`LoopTimed` Timing derived from OC-3 payload-carrying signal in the MAIN slots (Release 2) and MAIN or FN-C slots (Release 3.2 and later).

`Active Timing Mode`

Active timing mode is the active timing synchronization mode of the system. The value may be any of the values listed above in `Provisioned Mode` or one of the following:

`Holdover` Timing generator is operating in holdover mode because the provisioned references are not available, or because the system has been manually switched to holdover mode.

`No Timing` Timing circuit packs have been removed.

`?` Timing mode is unreadable.

`DS1 Reference Input State`

Input State refers to the primary state of the DS1 `External` timing reference ports, with values as follows:

`is` in service

`auto` automatic

`Active Circuit Pack`

Active Circuit Pack indicates which timing generator circuit pack is currently active. The value is `tg-1`, `tg-2`, or `-` (empty slot).

`Active Reference`

Active Reference is the active external reference for the timing generator. When Active Reference is reported, Active Line is not reported. When the Provisioned Mode is `External`, Active Reference has the following values:

`ref-1` The active timing reference is set to the timing reference "one".

`ref-2` The active timing reference is set to the timing reference "two".

`-` Not applicable, DS1 references are in auto input state.

`Active Line` Active Line is the active LoopTimed reference for the timing generator. When Active Line is reported, Active Reference is not reported. When Provisioned Mode is `LoopTimed`, Active Line has the following values:

`main-1`

`main-2`

`fn-c-1`

`fn-c-2`

`NA` Neither timing reference is active.

When the active timing mode is `Holdover`, Active Reference/Line is the timing reference that will provide timing if the system switches out of holdover mode.

When the Provisioned Mode is `FreeRunning` Active Reference and Active Line are not reported.

`Last Reference Switch`

Last Reference Switch Time is the date and time of the last switch of the `External` timing reference. It has an initial power-up value of "NA" which is retained until a reference switch occurs. The value of Switch Time (the instant a switch occurs) is obtained from the system clock. This parameter is reported only when the Provisioned Mode is `External`.

`DS1 Outputs` DS1 Outputs is the DS1 timing outputs and can be provisioned by hardware switches on the circuit pack. If the DS1 outputs are mult, then only Provisioned Mode is reported for this section.

`Provisioned Mode`

`mult` In the `External` timing mode, the `mult` is used to distribute the incoming DS1 reference to other shelves in the bay.

`sync out`
This mode indicates that timing is derived from a terminating OC-3 line and is used for network synchronization. (This mode is only available with the BBF2B circuit pack.)

`DS1 Output Mode`
Output Mode identifies whether the DS1 timing output derivation will track transmission or lock on a particular line (1 or 2) with values:

`track`

`lock1`

`lock2`

DS1 Output Mode is not reported for ring releases unless the `src` parameter is set to `fn-c` and the DS1 synchronization output is provisioned for `SYNC OUT` mode.

`DS1 Output State`
The output state is the status of the DS1 output when in the *`sync out`* mode, and may be one of the following:

`good` This status indicates that the DS1 output is traceable to the incoming OC-3 line.

`AIS` DS1 AIS is inserted if a failure exists that prohibits tracing of the DS1 output to the incoming optical line.

`-` Indicates the slot is in the auto state.

`?` The circuit pack is unreadable, or slot is equipped and empty.

`Active Line` This shows the actual line that the DS1 timing output is being derived from, with the following values:

`main-1`

`main-2`

`fn-c-1`

`fn-c-2`

`Sync Message Information`
This heading identifies the section of the report where input and output messages used to determine the timing source quality are listed. This section of the report is available with Release 5.1 software and later and only if the `kbyte` message parameter is set to **`enabled`** (using the **`set-oc3`** command).

`OC-N Line` This parameter identifies the addresses of optical interfaces that can carry sync messages.

`Input Message`
This column identifies the input message received on each optical interface line, and may be one of the following values:

`Don't Use`	The interface is not suitable for synchronization timing.
`Timing Looped Back`	The network element connected to this interface is loop-timed from it.
`Internal Clock`	This interface is generating timing from a system in holdover or free running.
`Sync Quality Unknown`	This interface is generating timing from a good quality clock source.
`disabled`	Indicates that the field is not applicable (for example, if synchronization messaging is disabled).
`?`	Indicates that the message is not readable (for example, due to a line failure).

`Output Message`
This identifies the output message sent out on each OC-N interface line. The valid values for this parameter are the same as those listed for `Input Message`.

`Sync Autoreconfiguration`
This capability allows the system to choose the best timing source to use when it is provisioned for Loop Timing. The valid values are **`enabled`** and **`disabled`**.

For OC-3 Release 3.1 and earlier, the following synchronization output report format is shown:

```
/* Synchronization Report
 ============================================================================
 Parameter                    Value(s)
 ============================================================================

 DS1 Line Code/Format         tg-1=fmt (hw) tg-2=fmt (hw)

 Shelf Timing
   Mode Switching             mode
   Input State                ref-1=state   ref-2=state
   Provisioned Mode           External (hw)
   Operational Mode           tg-1=External     tg-2=External
   Active Circuit Pack        pack
   Active Reference/Line      ref
   Last Switch Time           YY-MM-DD HH:MM:SS

DS1 Outputs                   tg-1=mode     tg-2=mode

 */
```

The output parameters that are different from those defined earlier are listed here.

`Operational Mode`
: Operational Mode is the current operating synchronization mode of the timing generator circuit packs, with the following values:

  `External`

  `FreeRunning`

  `LoopTimed`

  `Holdover`

`Input State`
: Same as DS1 Reference Input State defined earlier.

RELATED COMMANDS

rtrv-state

set-sync

switch-sync

NAME

rtrv-T1: Retrieve T1

INPUT FORMAT

rtrv-t1[:*Address*];

DESCRIPTION

This command displays the configuration information and attributes of one or more DS1 ports, as set by the **set-t1** command.

The input parameter is:

Address Address identifies the DS1 port(s). One or more ports may be specified. The default address is **all**.
Valid Addresses: **all, {a,b,c}-{1-7,all}-{1-4,all}**

The output report appears as follows:

```
/* T1 Port Provisioning Report
=============================================================================
 Port    Line Coding    Alarm  AIS Failure   BPV   State  PM  Format
Address                 Level      Thrshld  to LOS       Mode
=============================================================================
a-1-1    ami (hw)         na   yes   -3       no     is   off   none
a-1-2    ami (hw)         na   yes   -3       no    auto  off   none
a-1-3    ami (hw)         na   yes   -3       no    auto  off   none
a-1-4    ami (hw)         na   yes   -3       no    auto  off   none
  .        .              .    .     .        .      .    .     .
  .        .              .    .     .        .      .    .     .
  .        .              .    .     .        .      .    .     .
*/
```

The output parameters are:

`Port Address` Port Address is the address of the DS1 port.

`Line Coding` Line Coding is the DS1 line coding which may have the value `ami` (alternate mark inversion) or `b8zs` (AMI with bipolar 8-zero substitution).

If a previous **set-t1** command has set this parameter to a value that overrides the circuit pack switch setting, either of these values will be followed with the string "`override`"; otherwise it will be followed by the string "`(hw)`" to indicate that the line coding for the port is determined by the hardware switches.

`Alarm Level`

Alarm Level describes the alarm level for an incoming DS1 signal failure and may have one of the following values:

`MJ`	Major alarm
`MN`	Minor alarm
`NA`	No alarm

If the system is provisioned for and reporting no alarm but an alarm exists, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near end activity.

`AIS`

Alarm Indication Signal indicates whether an AIS is to be inserted toward the fiber when a loss of incoming DS1 signal is detected. The values are `yes` and `no`.

NOTE:
When the "BPV to LOS" DLC parameter is set to `yes`, the AIS parameter is ignored. (An all zeros signal, not AIS, is transmitted to the far end even if the `AIS` parameter is set to `yes`.)

`Failure Thrshld`

Failure threshold is the BER threshold in terms of a logarithm to the base 10. The value may be either -6 or -3, corresponding to BERs of 10^{-6} and 10^{-3}, respectively.

`BPVtoLOS`

This column indicates whether an incoming DS1 signal failure (a bit error ratio above the threshold set by the failure threshold parameter) will be translated into an outgoing all-zeros signal at the far end. The values are `yes` and `no`.

`State`

State is the state of the port. It may be one of the following:

`is`	In Service. A valid T1 signal from the DSX-1 is being monitored.
`auto`	Automatic. The system is waiting for a valid T1 signal from the DSX-1.
`nmon`	Not Monitored

`PM Mode`

This parameter is available with Release 5.1 software and later. This column shows the performance-monitoring (PM) mode of the DS1 interface, and may be one of the following values:

`on`	DS1 PM enabled on this port
`off`	DS1 PM disabled on this port

`Format`

This parameter is available with Release 5.1 software and later. This column shows the performance-monitoring (PM) format of the DS1 interface, and may be one of the following values:

`none`	No DS1 PM possible on this port due to equipage. (PM Mode always `off`.)
`sf`	Superframe
`esf`	Extended superframe, near end and far end.
`esfn`	Extended superframe, near end only.

RELATED COMMANDS

set-state-t1

set-t1

NAME

rtrv-t3: Retrieve T3

INPUT FORMAT

rtrv-t3[:*Address*];

DESCRIPTION

This command displays a port provisioning report for one or all DS3 ports, as set by the **set-t3** command.

The input parameter is:

Address Address identifies the DS3 ports. One port or all ports may be specified. The default address is **all**.
Valid DS3 Port Addresses: **{a,b,c,all}**

The output report appears as follows:

```
/* T3 Port Provisioning Report
================================================================================
 Port     Mode    AIS     Alarm     Failure     State     PM       PM
Address                  Level    Threshold             Mode    Format
================================================================================
address   mode    ais      alarm       fth       state    pmmd      fmt
   .       .      .         .          .          .        .        .
   .       .      .         .          .          .        .        .
   .       .      .         .          .          .        .        .
   .       .      .         .          .          .        .        .
*/
```

The output parameters are:

`Port Address` Port Address is the address of the DS3 port

`Mode` Mode is the violation monitor removal mode of the DS3 signal. It may have one of the following values:

- `vmr` Monitor and remove DS3 P bit errors (default value).
- `vm` Monitor but do not remove DS3 P bit errors.
- `cc` Clear channel - Do not monitor or remove DS3 P bit errors.

`AIS`

AIS indicates whether or not a DS3 alarm indication signal (AIS) should be inserted. The value may be `yes` or `no`. When AIS is set to `yes`:

— DS3 AIS is inserted towards the DSX-3 upon detection of an OC-3 loss of signal or STS path AIS incoming from the fiber.

— DS3 AIS is inserted towards the fiber upon detection of DS3 LOS incoming from the DSX-3.

NOTE:
AIS is always inserted if the violation monitor removal mode is provisioned for `vmr` or `vm`.

`Alarm Level`

Alarm describes the alarm level for an incoming DS3 signal failure and has the following values:

`CR`	Critical alarm
`MJ`	Major alarm
`MN`	Minor alarm
`NA`	No alarm

If the system is provisioned for and reporting no alarm but an alarm exists, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near end activity.

`Failure Threshold`

Failure threshold is the BER threshold in terms of a logarithm to the base 10. The value may be either -6 or -3, corresponding to BERs of 10^{-6} and 10^{-3}, respectively.

`State`

State is the state of the port with the values:

`is`	In Service. A valid T3 signal from the DSX-3 is being monitored.
`auto`	Automatic. The system is waiting for a valid T3 signal from the DSX-3.
`nmon`	Not Monitored

`PM Mode`

This column is available with OC-3 Release 7.1 and later. This column shows the performance-monitoring (PM) mode of the DS3 interface, and may be one of the following values:

`on` DS3 PM enabled on this port

`off` DS3 PM disabled on this port (PM data is not monitored or reported)

`– (dash)` Indicates no DS3 PM because `cc` was selected for `Mode`. Beginning with OC-3 Release 7.2, the DS3 PM report will display the line PM data and dash lines (—) for both directions of the DS3 path PM data when a BBG4B pack (in OC-3 systems) is active (in-service) in a function unit slot.

`PM Format`

This column is available with OC-3 Release 7.1 and later. `Format` sets the type of PMON that will appear in the DS3 PM report. This parameter will appear only if the `vmr` or `vm` mode has already been selected. This parameter may have one of the following values:

`pbit` When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 P bit CV, ES, SES, and UAS (default value).

`fmbit` When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 adjusted F&M bit CV, ES, SES, and UAS.

`– (dash)` Indicates no DS3 PM because `cc` was selected for `Mode`. Beginning with OC-3 Release 7.2, the DS3 PM report will display the line PM data and dash lines (—) for both directions of the DS3 path PM data when a BBG4B pack (in OC-3 systems) is active (in-service) in a function unit slot.

RELATED COMMANDS

set-state-t3

set-t3

NAME

rtrv-ulsdcc: Retrieve Upper Layer Section DCC

INPUT FORMAT

rtrv-ulsdcc;

DESCRIPTION

This command retrieves the network service access point (NSAP) as provisioned by the **ent-ulsdcc** command. The NSAP is a 20-byte address that provides unique identification for each network element in the system. Only certain portions of this address are user-settable.

This command is available with OC-3 Release 6 and later software.

The output report appears as follows:

```
/* Upper Layer Section DCC Provisioning Report
================================================================
                Parameter   Value      Provisionable
================================================================
NSAP address:    L3idp      value        no
                 L3dfi      value        no
                 L3org      value        YES
                 L3res      value        YES
                 L3rou      value        YES
                 L3sys      value        no
                 L3sel      value        no
*/
```

The output parameters are:

`NSAP Address` This is the 20-byte address assigned to a network element.

`Parameter` This identifies the six parameters that make up the NSAP address. They are:

L3idp This part of the NSAP address is assigned according to the International Standards Organization (ISO) standards. For SONET systems, the value is set to `39/0840` to indicate that U.S. American National Standards Institute (ANSI) is the registration authority responsible for the assignment of the NSAP address.

L3dfi This part of the NSAP address specifies the format for the rest of the NSAP address. For SONET systems, the value is set to `128`.

L3org This part of the NSAP address contains the allocated hexadecimal company code assigned by the ANSI-administered USA Registration Authority for OSI Organization Names.

L3res This part of the NSAP address currently has not been assigned a specific purpose by the SONET standards.

L3rou This part of the NSAP address indicates the `routing domain`, identifying a unique routing domain within an Administrative Domain, and the `area`, identifying the area within the `routing domain` to which the NSAP address belongs. Both parts of this address are hexadecimal values.

L3sys This part of the NSAP address is assigned by IEEE administrators to U.S.-manufactured systems to guarantee a globally-unique NSAP.

L3sel This part of the NSAP address is used to differentiate multiple NSAP addresses within a system. For DDM-2000, this parameter is always set to zero and is not user-settable.

`Value` This field indicates the numerical value of each portion of the NSAP Address.

`Provisionable`
This field indicates whether each portion of the NSAP address is user-settable. The valid values are **YES** or **no**.

RELATED COMMANDS

ent-ulsdcc

NAME

rtrv-vt1: Retrieve VT1.5

INPUT FORMAT

rtrv-vt1[:*Address*];

DESCRIPTION

This command retrieves the provisioned values for terminated and dropped VT1.5 channels.

This command is available with OC-3 Release 7.0 and later ring releases.

The input parameter is:

Address Address is the address of VT1.5 channels whose state is to be reported. Table 11-1 contains a list of valid VT1.5 channel addresses. The default is **all** addresses.

The output report appears as follows:

```
/* VT1.5 Channel Provisioning Report
============================================================
SignalDegrade = value

VT AIS Alarm Information
Address      AIS Alarm            AIS Alarm
           Service Affecting  Non Service Affecting
============================================================
address         sa                nsa
address         sa                nsa
  .             .                  .
  .             .                  .
  .             .                  .
*/
```

If the signal degrade value is zero (0) (as set by the **set-vt1** command), then signal degrade is disabled and the following output report appears:

```
/* VT1.5 Channel Provisioning Report
================================================================
SignalDegrade=0  (disabled)

VT AIS Alarm Information
Address       AIS Alarm            AIS Alarm
            Service Affecting  Non Service Affecting
================================================================
address         sa                 nsa
address         sa                 nsa
   .              .                  .
   .              .                  .
   .              .                  .
*/
```

If the signal degrade parameter and non-service-affecting AIS parameters are not valid for the application, for example a non-ring application, then the report appears as:

```
/* VT1.5 Channel Provisioning Report
================================================================
Address       AIS Alarm
            Service Affecting
================================================================
address          sa
address          sa
   .             .
   .             .
   .             .
*/
```

RELATED COMMANDS

set-vt1

NAME

rtrv-x25: Retrieve X.25 link

INPUT FORMAT

rtrv-x25;

DESCRIPTION

Three output reports are displayed when this command is entered. The first report displays the x.25 link packet size information provisioned by the **set-x25** command, and the second report shows the status of the X.25 communication. The third report provides an X.25 event history.

This command is available in Release 7.1 and later.

The x.25 link packet size output report appears as follows:

```
/* X.25 Link Provisioning Report
============================================================
TID=system_name
GNE=active|not active

------------------------------------------------------------
PKT=pkt
*/
```

The output parameters are:

TID	This is the system name, indicated by a string of up to 20 alphanumeric characters. The default value for TID is that set by the site and NE values and is a string of the form "SitemNEn". The TID must be unique for each element in a subnetwork.
GNE	This output-only parameter indicates whether this system is a gateway network element (GNE), providing a TL1 interface. It has a value of active or not active for Release 7.2, and a value of yes or no1 for Release 7.1 and earlier.
PKT	pkt is a string with possible values of 128 or 256; 256 being the default value.

The x.25 packet size is active only if this system is a GNE, otherwise it is inactive.

The second report shows the state of various X.25 communication entities. The output report appears as follows:

```
/* X.25 Communication Report
================================================================
 Entity                State                      Code (hex)
================================================================
X.25 lcn  1 (pvc)      up                           06
X.25 lcn  2 (pvc)      up                           06
X.25 lcn  3 (pvc)      up                           06
X.25 lcn 16 (svc)      up                           06
X.25 lcn 17 (svc)      down                         00
X.25 lcn 18 (svc)      down                         00
X.25 lcn 19 (svc)      down                         00
X.25 lcn 20 (svc)      down                         00
X.25 lcn 21 (svc)      down                         00
X.25 interface         down                         01
lapb                   down                         00
physical line          down                         00
*/
```

The output parameters for this report are:

`Entity` This column shows the various X.25 communication entities. The entities are:

`X.25 lcn 1 (pvc)`
This communication channel is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 2 (pvc)`
This communication channel is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 3 (pvc)`
This communication channel, used in Release 6.1 only, is considered to be **up** upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 16 (svc)`
This communication channel, used in Release 6.1 only, is considered to be **up** upon the successful acknowledgement of the CALL_REQ_IND packet with a CALL_ACC_CONN packet. This does *not* imply that TL1 communication is active.

`X.25 interface`
This communication channel, used in Release 6.1 only, is considered to be **up** upon the successful acknowledgement of the RESTART_PACKET packet and the RESTART_CONFRM packet. This means that layer 3 is active and ready to establish the pvc or svc communication channel.

`lapb` When this communication channel is **up**, layer 2 is active and ready to send or receive a RESTART_PACKET.

`physical line`
This X.25 physical line is up only if the `lapb` is up. A **down** physical line does not necessarily mean that the physical connection (for example, a cable) is broken but that the interfacing equipment does not acknowledge the communication with the DDM-2000.

`State` This parameter is explained in each one of the above entities.

`Code (hex)` This column shows a hexadecimal output of the protocol states in the DDM-2000 software. This is used by RTAC personnel for diagnostic purposes.

A third output report lists an X.25 event history. The output report appears as follows:

```
/* X.25 Event History
=================================================================
Date    Time        Entity   Event                  Data (hex)
=================================================================
01-01  00:18:48    lcn 16   xmt   CLR_CONFRM        10 10 17
01-01  00:18:47    lcn 16   rcv   CLR_REQ_IND       10 10 13 00 00
01-01  00:18:03    lcn 16   xmt   CALL_ACC_CONN     10 10 0f
01-01  00:00:21    lcn  2   rcv   RESET_CONFRM      10 03 1f
01-01  00:00:21    lcn  3   rcv   RESET_CONFRM      10 03 1f
01-01  00:00:21    lcn  1   xmt   RESET_REQ_IND     10 01 1b 00 00
01-01  00:00:21    lcn  2   xmt   RESET_REQ_IND     10 02 1b 00 00
*/
```

The output parameters for this report are:

`Date` This column shows the date the X.25 event occurred.

`Time` This column shows the time the X.25 event occurred.

`Entity` This column shows the X.25 communication entity where the event occurred.

`Event` This column lists the event and whether it was transmitted (**`xmt`**) or received (**`rcv`**) by the DDM-2000.

`Data` This column shows a hexadecimal representation of frame or packet information related to the event. This is used by RTAC personnel for diagnostic purposes.

RELATED COMMANDS

set-x25

NAME

set-attr-alm: Set Alarm Attribute

INPUT FORMAT

set-attr-alm[:**almdel=***AlarmDelay*][**,clrdel=***ClearDelay*];

DESCRIPTION

This command sets the alarm holdoff and clear delays.

The input parameters are:

almdel AlarmDelay is delay for incoming signal and equipment failures. It sets an interval of time that a fault condition is present before an alarm is declared. The delay is in seconds, between 0 and 30, with a default value of 2.

NOTE:
If a signal degrade threshold is exceeded, the recovery interval for the signal degrade condition may be longer than the provisioned holdoff delay, and an alarm will result. For example, suppose an OC-3 interface with an alarm delay of 20 seconds and a signal degrade threshold of 10^{-6} has a signal degrade failure of 10 seconds. Since the recovery interval for a 10^{-6} error rate threshold is 15 seconds, the total length of the alarm condition (10 seconds of failure plus 15 seconds of recovery) will exceed the provisioned alarm delay of 20 seconds, and an alarm will be declared.

clrdel ClearDelay is the delay in time before an alarm can be declared to be clear. For equipment failures and signal failures (including AIS and FERF), the clear delay time interval begins when the alarm failure clears. For equipment failures, the delay is between 0 and 30 seconds, with a default value of 15 seconds. For signal failures, clear delay is fixed at 15 seconds.

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Alarm or maint. thresholds are affected by this command.
    You have selected the set-attr-alm command with these parameters:

    AlarmDelay = nn
    ClearDelay = nn */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-attr-alm

NAME

set-attr-cont: Set Attribute Control

INPUT FORMAT

set-attr-cont:*Address*:**desc=***Description*;

DESCRIPTION

This command is used to provision (define) the name of the environmental control points.

The input parameters are:

Address — Address identifies the control point to be provisioned. There is no default for this parameter.
Valid Addresses: **cont-{1-4}**

desc — Description is a descriptive name for the control point. The description may be an alphanumeric string, upper and lower case with no spaces, up to 26 characters long.

NOTE:
This command will be denied if entered in a system whose SYSCTL CO/RT switch is set to CO. The following denial message will be displayed:

```
ENSI
/* Equipage, Not equipped for Setting specified Information */
/* Environmental controls can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

NAME

set-attr-env: Set Attribute Environment

INPUT FORMAT

set-attr-env:*Address*[:**alm**=*Alarm*][,**almtype**=*AlarmType*][,**desc**=*Description*];

DESCRIPTION

This command is used to provision (set) the alarm level of the environmental input points. Active inputs appear as entries in the alarm and history reports of the local network element and generate autonomous TL1 messages through the gateway network element. Inputs 1-15 also appear in the TBOS alarm display and as parallel telemetry outputs at the CO network element.

The input parameters are:

Address Address identifies the environmental point to be provisioned. There is no default value for this parameter.
Valid Addresses: **env-{1-15}**, **env-{all}**

⇒ NOTE:
The *address* **env-{all}** is allowed when **alm** is the only parameter used for this command. The *address* **env-{all}** is not allowed when the **almtype** and/or **desc** parameters are used.

alm Alarm is the provisioned alarm level of the environmental input and has the following values:

- **cr** Critical alarm
- **mj** Major alarm
- **mn** Minor alarm (default)
- **na** Not alarmed, but reported

almtype AlarmType. This parameter is available in Release 6.2 (linear), Release 7.1 (rings) and later. This parameter is used to classify the type of alarm. The description may be an alphanumeric string, upper- and lower-case with no spaces, up to 10 characters long. The original value of AlarmType is "Misc".

desc Description is a descriptive name for the point. The description may be an alphanumeric string, upper- and lower-case with no spaces, up to 26 characters long.

NOTE:
This command will be denied if entered in a system that has the SYSCTL CO/RT switch is set to CO. The following denial message will be displayed:

```
ENSI

/* Equipage, Not equipped for Setting specified Information */
/* Environmental alarms can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-env

NAME

set-date: Set Date and Time

INPUT FORMAT

set-date:[**date=***Date*][,**time=***Time*];

DESCRIPTION

This command sets the date and time at the local network element. Executing this command will corrupt the current quarter hour and day performance monitoring (PM) bins.

NOTE 1:
For OC-3 Release 6 and later, if security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

NOTE 2:
To synchronize the date and time throughout the network, the user should execute the **reset** command.

The parameters are:

date Date is entered as six digits YYMMDD, where YY is the last two digits of the year, MM is the month, and DD is the day. Default is the current system day.

time Time is entered as six digits HHMMSS, where HH is hours (00-23), MM is minutes (00-59), and SS is seconds (00-59). Default is the current system time.

When input, this command will cause the following confirmation message to be displayed:

```
/*Caution! Execution of this command will corrupt the
    current quarterhour and current day performance monitoring data.
    You have selected the set-date command with these parameters:

    Date = YYMMDD
    Time = HHMMSS */

Execute? (y/n or CANcel/DELete to quit) =
```

NAME

set-ec1: Set EC-1

INPUT FORMAT

set-ec1:*Address*:[**alm=***AlarmLevel*][**,dgr=***SignalDegradeThreshold*];

DESCRIPTION

This sets the characteristics of an EC-1 port.

This command is available with OC-3 Release 6 software or later.

The input parameters are:

address Address is the address of one or more EC-1 ports.
Valid OC-3 Addresses: **{a,b,c,all}**

alm AlarmLevel describes the alarm level for an incoming EC-1 signal failure, and has the following values:

- **cr** Critical alarm (default value)
- **mj** Major alarm
- **mn** Minor alarm
- **na** Not alarmed

dgr SignalDegradeThreshold specifies the bit error rate (BER) threshold for the EC-1 port in terms of a logarithm to the base 10 as an integer with values from -9 to -5, with a default of -6. When this threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated.

Entering this command will cause the following confirmation message to be displayed:

```
/* Caution!  Execution of this command may affect service.
   You have selected the set-ec1 command with these parameters:
   Address = address
   AlarmLevel = alarmlevel
   SignalDegrade= signaldegradethreshold */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-ec1

NAME

set-feat: Set Feature

INPUT FORMAT

set-feat:**feat=***Feature*,**act=***Action*;

DESCRIPTION

This command enables a user to configure the network element (NE) for feature options that are licensed for use.

This command is available with OC-3 Release 5.1 and later releases.

NOTE:
This command is available to privileged users only.

The input parameters are:

feat Feature is the feature option available to the user, and it may be one of the following:

- `sts3c` This feature allows STS-3c service (concatenated signals) to be supported. The user must also enable the **set-oc3** `concat` parameter to enable this feature. This feature is available with OC-3 Release 6.0 software and later linear releases.
- `vtpm` This feature provides performance-monitoring of cross-connected VT1.5 services. This feature is available with Release 6.0 software and all later releases.
- `ds1pm` This feature provides performance-monitoring of cross-connected (dropped) DS1 services in ring systems. The user must also set the **set-t1** `PMMode` parameter to `on` to enable this feature. This feature is available with Release 5.1 and all later releases.

act Action is the action the user wants to perform on the listed feature, and it may be one of the following:

- `enabled` This enables a feature option. This action will also unblock the use of commands needed by this feature.
- `disabled` This disables a feature option. This action will also block the use of commands needed by this feature. The user may be required to reprovision the shelf before disabling a feature.

If a user fails to remove all equipment or reprovision parameters associated with a feature before disabling that feature, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System must be reprovisioned to disable <Feature>. */
```

Enabling a feature will cause the following confirmation message to be displayed:

```
/* ACCESS TO, AND USE OF THIS <feature> FEATURE IS PERMITTED ONLY
   IF SPECIFICALLY AND EXPRESSLY AUTHORIZED UNDER THE RELEVANT
   DDM-2000 SOFTWARE AGREEMENT BETWEEN AT&T AND CUSTOMER.

   You have selected the set-feat command with the parameters:
   Feature = feature
   Action = action  */

Execute? (y/n or CANcel/DELete to quit) =
```

Disabling a feature will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command will disable all of the
   system capabilities associated with the <feature> feature
   and circuit packs which support that feature will no longer
   provide access to that feature.

   You have selected the set-feat command with these parameters:
   Feature = feature
   Action = action  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-feat

set-oc3

set-t1

NAME

set-fecom: Set Far End Communications

INPUT FORMAT

set-fecom:*Address*[:**com=***Communications*];

DESCRIPTION

This command enables or disables communication over the section data communication channels (DCC). A DCC is an embedded overhead communications channel in the SONET line used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements.

NOTE:
This command is available to privileged users only.

The input parameters are:

Address — Address identifies the address of the DCC.
Valid Linear Addresses: **dcc-{m,a,b,c,all}**
Valid Rings Addresses: **dcc-{m1,m2,b,c,all}**

com — Communications indicates whether communication over a specified DCC is enabled or disabled. The valid values are **enabled** or **disabled**. The default value is **enabled**. the other termination is different.

When this command is input, the following confirmation message will be displayed:

```
/* Caution!  Network element access is affected by this command.
   You have selected the set-fecom command with these parameters:

   Address = address
   Communications = enabled
   NS/US = value */

Execute? (y/n or CANcel/DELete to quit) =
```

This command can only be completed successfully if it is executed from a CIT or modem port. This command cannot be executed during a remote login session. If the command is executed during a remote login session, it will be denied with one of the following messages:

```
SNVS
/* Status, Not in Valid State */
/* This command cannot be executed from within a rlgn session. */
```

```
SNVS
/* Status, Not in Valid State */
/* Farend communication can not be set from a remote session. */
```

RELATED COMMANDS

rtrv-fecom

rtrv-nmap

NAME

set-lgn: Set Login

INPUT FORMAT

set-lgn[:**act=***Action*];

DESCRIPTION

This command enters, edits, and deletes logins and passwords. Prior to the first use of this command, the two default logins are `ATT01` and `ATT02` (all upper-case letters). The default password is `DDM-2000`.

NOTE:
This command is available to privileged users only.

This command is available with OC-3 Release 3 software and later.

NOTE:
To enable security, a privileged user must execute the **set-secu** command. Creating logins and passwords does *not* automatically enable security.

In releases prior to Release 5, a maximum of 10 logins is supported. For Release 5 and all later releases, a maximum of 50 logins is supported. When security is enabled, three types of users are permitted to access the system with a valid login and password. They are:

`privileged user`	The privileged user may execute any commands, including restricted commands.
`general user`	The general user may execute any commands that are not restricted to privileged users.
`reports-only`	The reports-only user may only execute commands that access the system and extract reports. This user type is available with Release 5 and all later releases.

All users may use the **set-passwd** command to modify their own passwords.

The input parameters are:

act Action has one of the following values:

enter Enter a new login and password pair (default value). Login is a case-sensitive alphanumeric string consisting of a minimum of five and a maximum of ten alphabetic characters and/or numbers. When entering a new login, the type of user (`privileged user`, `general user`, or `reports-only`) must be specified and a password should

also be assigned to the new user. A user may then use the **set-passwd** command to modify his/her own password after the login has been activated.

Password is a case-sensitive string or alphanumeric and symbolic characters. Password may have a minimum of six and a maximum of ten characters. Additionally, the password must include at least two non-alphabetic characters and one symbolic (non-alphabetic and non-numeric) character. The following symbolic characters have special meanings for either the user interface or the X.25/TL1 interface and cannot be included in a password:

;	semicolon	^	caret
$	dollar sign	?	question mark
@	at sign		space
_	underscore	!	exclamation point
:	colon	=	equal sign
"	double quote	,	comma
\	back slash	>	greater than sign

Additionally, the following control characters and special keys CANNOT be included in a password:

<CR>	carriage return	<tab>	tab key
<bksp>	backspace key	<esc>	escape key
<del>	delete key		

edit Change an existing login and/or password.

delete Delete an existing login.

The **set-lgn** command executes in prompt mode. Based on the action selected, there are three different dialogs, shown on the following pages. In these dialogs, the user input is indicated with bold type.

The following screen shows the dialog to enter a login:

```
set-lgn:act=enter;
enter the new login = new_login
enter password for new login = new_password
reenter password for new login = new_password
enter user type for this login = user_type

/* Caution! Network Element access is affected by this command.
   You have selected the set-lgn command with these parameters:

   Action = enter
   Login = new_login
   User Type = user_type */

Execute? (y/n or CANcel/DELete to quit) =
;
```

NOTE:
Passwords will not be displayed when they are entered.

The following screen shows the dialog to edit a login:

```
set-lgn:act=edit;
enter the login to be changed = old_login
enter the new login = new_login
enter password for new login = new_password
reenter password for new login = new_password
enter user type for this login = user_type

/* Caution! Network Element access is affected by this command.
   You have selected the set-lgn command with these parameters:

   Action = edit
   Old Login = old_login
   New Login = new_login
   Old User Type = user_type
   New User Type = user_type  */

Execute? (y/n or CANcel/DELete to quit) =
;
```

The following screen shows the dialog to delete a login:

```
set-lgn:act=delete;
enter the login to be deleted = user_login
/* Caution! Network Element access is affected by this command.
   You have selected the set-lgn command with these parameters:

   Action = delete
   Login = user_login  */

Execute? (y/n or CANcel/DELete to quit) =
;
```

If the values of the login and/or password do not match the defined parameters, one of the following messages will appear:

```
Entry does not follow rules for passwords and logins.
```

```
Login must be 5 to 10 letters and/or numbers
```

```
Password must be 6 to 10 characters, with at least 2 non-alphabetic
characters and at least 1 additional non-alphabetic, non-numeric character.
```

Privileged user logins can be edited to change the login name, password, or both. However, privileged logins cannot be added or deleted. If an attempt is made to add or delete a privileged user login, the following denial message will be displayed:

```
SDNC
/* Status, Data Not Consistent */
/* Privileged user logins cannot be deleted. */
```

In releases prior to Release 5, a maximum of 10 logins is supported. For Release 5 and all later releases, a maximum of 50 logins is supported.

If a user attempts to enter another login when the maximum supported logins already exists, the following denial message will appear:

```
SLEM
/* Status, List, Exceeds Maximum */
/* Maximum number of logins already exists.
   Cannot enter another login. */
```

RELATED COMMANDS

rtrv-lgn

set-passwd

set-secu

NAME

set-link: Set CIT Link Configuration

INPUT FORMAT

set-link:pg=*pagelength*;

DESCRIPTION

This command sets the configuration of the current user's craft interface link.

The input parameter is:

pg PageLength is the vertical size of the displayed page in lines. The value may be an integer between 3 and 150 with a default of 24. If the page length is set to zero, no pager is used and system output is sent directly to the screen. The page length is set to the default value each time a new CIT session is started.

RELATED COMMANDS

rtrv-link

NAME

set-ne: Set Network Element Name

INPUT FORMAT

set-ne:tid=*TID*[:**gne=***GNE*][,**crs=***CrsMode*]; (Linear Releases)

set-ne:tid=*TID*[:**gne=***GNE*]; (Rings Releases through Release 7.0)

set-ne:tid=*TID*[:**gne=***GNE*][,**dcc=***DCCMode*]; (Rings Release 7.1)

set-ne:tid=*TID*[,**dsne=***DSNE*][,**almgrp=***AlarmGroup*]
[,**agne=***AGNE*][,**dcc=***DCCMode*]; (Release 7.2)

DESCRIPTION

This command sets several network element parameters of the DDM-2000, as described below.

NOTE:
For OC-3 Release 3 and later, if security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

The input parameters are:

tid TID is a string of up to 20 alphanumeric characters, and may include upper and lower case letters, numbers, and dashes ("-"). Prior to the first use of this command, the initial value is `Site`*x*`NE`*y*, where *x* and *y* are the site and network element numbers. Site and network elements are set by switches on the BBG5 SYSCTL and BBG7 OHCTL circuit packs, respectively. The *TID* will be printed at the beginning of the output for all commands. For proper operation of TL1/X.25 OS interfaces, the *TID* must be unique for each network element.

NOTE:
Changing the `TID` (system name) does not change the network address, which is determined by the `Site` and `NE` parameters (in Release 5 and earlier), or by the NSAP (in Release 6.0 and later), but does affect proper TL1 message reporting.

dsne This parameter is available in Release 7.2 only. DSNE has a value of `yes` or `no`, which indicates whether this system is the directory services network element (DSNE). The DSNE is the gateway network element for OSI releases where the map listing all active nodes in the network is maintained. The default value for this parameter is `no`. One (and only one) network element in the subnetwork must be designated as a DSNE for proper DCC communication between nodes.

almgrp This parameter is available in Release 7.2 only. Alarm Group (AG) has a numeric value of 1 through 255. All NEs in the subnetwork, whether nearby or not, that have the same AG number are members of the same group. All members of the AG will share NE Status information with each other and with any Alarm Status NE (ASNE) monitoring this alarm group but not with NEs of different alarm groups. The default AG number for DDM-2000 is 255 and may not have to be changed if a single AG is desired.

agne This parameter is available in Release 7.2 only. AGNE (Alarm Gateway NE) has a value of yes or no, which indicates whether this system is an alarm gateway network element. The default value for this parameter is *no*. One AGNE is needed for each alarm group to support the message communications for NE Status features (FE activity, office alarms, parallel telemetry, miscellaneous discretes, remote ACO and FE user panel status). Any member of the alarm group can be an AGNE, but some may be preferred because of their position in the subnetwork or location near to a maintenance center. Other network elements of the same alarm group may be provisioned as backup AGNEs if required. At least one network element in each alarm group must be designated as an **agne**. Alarm groups without an AGNE have "AGNE communication failure" alarms.

gne This parameter is available in Release 7.1 and earlier releases only. GNE has a value of yes or no, which indicates whether this system is a gateway network element or a directory services network element (DSNE), in Release 6 and later. The DSNE is the gateway network element for OSI releases where the map listing all active nodes in the network is maintained. The default value for this parameter is *no*. The **gne** must be set to yes to enable the physical TL1/X.25 interface. If TL1 is used, *one* (and only one) network element may be designated the **gne**; otherwise TL1 messages will be lost. For releases with OSI communication protocol (Release 6 and later), *one* (and only one) network element may be designated the **gne** for proper DCC communication between nodes.

crs CrsMode is the cross-connect mode. This parameter may be set to *default* (default value) or *manual*. The *default* mode sets default cross-connections. See the **ent-crs-sts1** command for a list of default and valid manual cross-connections. In the *manual* mode, all cross-connections must be entered manually, using the **ent-crs-sts1**, **ent-crs-vt1**, **dlt-crs-sts1**, and **dlt-crs-vt1** commands. This parameter is available in Release 3 and later. In ring applications (Release 5.1 and later), this parameter is set to *manual* and cannot be changed by the user.

dcc DCCMode is a keyword that further characterizes the behavior of the shelf in complex networks. This parameter is available in Release 7.1 and later ring releases, and has one of the following values:

`distinct` The shelf is part of a normal path switched ring network. The DCCs for ring "m1" and ring "m2" are distinct and will have different messages on each DCC. This is the default for ring software.

`identical` The shelf is connected to an OC-12 Release 3.1 dual 0x1 OC-12 network. The DCCs for ring "m1" and ring "m2" are connected to a single DCC on a selected OC-12 function unit, which sends identical messages to each ring.

NOTE:
The value "identical" should only be used when interworking with OC-12 Release 3.1 systems.

When this command is entered, the following confirmation message will be displayed for Release 7.1 and earlier:

```
/* Caution! Network Element access is affected by this command.
   You have selected the set-ne command with these parameters:

    TID = SitenNEn
    GNE = x
    CrsMode = mode */

Execute? (y/n or CANcel/DELete to quit) =
```

When this command is entered, the following confirmation message will be displayed for Release 7.2:

```
/* Caution! Network Element access is affected by this command.
   You have selected the set-ne command with these parameters:

    TID = SitenNEn
    DSNE = yes|no
    AlarmGroup = number
    AGNE = yes|no
    CrsMode = mode */

Execute? (y/n or CANcel/DELete to quit) =
```

For Releases 6.0 through 7.1, if the **gne** parameter is changed, or if the **dcc** parameter is changed, the following confirmation message will be displayed:

```
/* Caution!  Network Element access is affected by this command.

   Caution! When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file.
   If possible, it will reinitialize the date and time with
   the far end via the DCC.  Otherwise, the
   date and time will assume default values.
   You have selected the set-ne command with these parameters:

    TID = SitenNEn
    GNE = x
    CrsMode = mode
    DCCMode = x   */
```

If CrsMode is currently set to *manual* and cross-connections other than the default cross-connections have been entered into the system, then an attempt to change the Crs Mode to *default* and execute the command will be denied with the following message:

```
SNVS
 /* Status, Not in Valid State */
 /* System provisioned with manual cross-connections. */
```

For Release 7.1 and earlier, if more than one network element is designated as the GNE, a "duplicate GNE" alarm condition will be detected and the following denial message will be displayed:

```
SROF
 /* Status, Requested Option Failed */
 /* Due to a network provisioning problem (duplicate GNE),
the system name cannot be changed at this time. */
```

RELATED COMMANDS

ins-prog

rlgn

rtrv-ne

NAME

set-oc3: Set OC-3 Characteristics

INPUT FORMAT

set-oc3:*Address*[:**dgr=***SignalDegradeThreshold*][,**kbyte=***Kbyte*]
[,**concat=***ConcatenationMode*]; (Linear Only)

DESCRIPTION

This command sets several characteristics (parameters) of a specified OC-3 line pair.

The input parameters are:

Address Address identifies the OC-3 line(s).
Valid OC-3 Linear Addresses: **main, fn-{a,b,c,all}, all**
Valid OC-3 Ring Addresses: **main-{1,2,all}, all, fn-{a,b,c,all}** *(Optical extensions)*

dgr SignalDegradeThreshold specifies the signal degrade threshold as a BER in terms of a logarithm to the base 10. When this threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated. The value of this parameter has a range of -9 to -5. The default value is -6. For rings releases, the signal degrade value for addresses of main-1 and main-2 *must* be the same. Therefore, any change to signal degrade for one address will automatically be made to the other by the software.

kbyte Kbyte specifies the usage of the K byte overhead for Sync Messages. Both the sending and receiving messages are affected. If Kbyte is `enabled`, proprietary Sync Messages are used. If Kbyte is `disabled`, proprietary Sync Messages are not used. The default value is `enabled`. This parameter is available in OC-3 Release 5.1 and later and applies to both linear and ring releases.

concat ConcatenationMode provisions the concatenation mode of the OC-3 line from MAIN to FN-C in linear systems to be independent channels or to be an sts-3c channel. The valid values are `enabled` and `disabled` (default value). If ConcatenationMode is `disabled` the channels in the OC-3 line are independent. If ConcatenationMode is `enabled`, the 3 STS-1 channels recovered from the OC-3 signal at the MAIN slots are passed as an sts-3c signal to the FN-C slots where they are converted back to an OC-3 signal. Both the FN-C and MAIN slots must be equipped before ConcatenationMode can be enabled. The only valid address to enable the ConcatenationMode parameter is FN-C. Also, the user must be sure that the proper cross-connections exist from MAIN to

FN-C for transmission to exist. These cross-connections are: *m-1 <-> c-1; m-2 <-> c-2; m-3 <-> c-3.*

The change of mode takes place after the confirmation is accepted. The value is not displayed or prompted for if the STS-3c feature is not first enabled using the **set-feat** command. This parameter is not applicable to rings applications.

The ConcatenationMode parameter requires that the MAIN slots be equipped. If they are not equipped the request will be denied with the following message:

```
ENEQ
/* Equipage, Not EQuipped */
/* Main slots must be equipped also. */
```

When input, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds and sync messages
   are affected by this command.
   You have selected the set-oc3 command with these parameters:

   Address = x
   SignalDegradeThreshold = -n
   Kbyte = value
   ConcatenationMode = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-oc3

rtrv-sync

set-feat

NAME

set-passwd: Set Password

INPUT FORMAT

set-passwd;

DESCRIPTION

This command changes a user's password. All users can change their own passwords. Privileged users can change other users' passwords by using the **set-lgn** command.

This command is available with OC-3 Release 3 software and later.

The following screen shows the dialog to change one's password. In the dialog, the user input is shown in bold type.

NOTE:
Passwords will not be displayed when they are entered.

```
   <set-passwd;

enter your old password = old_password
enter your new password = new_password
reenter your new password = new_password
;
```

There are no default values for the old and new passwords.

A valid password is a case-sensitive ASCII string containing a minimum of six and a maximum of ten characters. The password must also include at least two non-alphabetic characters and one symbolic (non-alphabetic and non-numeric) character. The following symbolic characters have special meanings either for the User Interface or for the x.25 TL1 interface and cannot be included in a password:

;	semicolon	^	caret
$	dollar sign	?	question mark
@	at sign		space
_	underscore	!	exclamation point
:	colon	=	equal sign
"	double quote	,	comma
\	back slash	>	greater than sign

Additionally, the following control characters and special keys CANNOT be included in a password:

<CR>	carriage return	<tab>	tab key
<bksp>	backspace key	<esc>	escape key
<del>	delete key		

If the new password does not match the valid password definition, the following message will be displayed:

```
/* Entry does not follow rules for passwords and logins. */

enter your new password:
```

The user may try once again to enter a password. If the user once again enters a password that does not match the valid password definition, the following denial message will be displayed:

```
IDEI
/* Input, Data Entry Invalid */
/* Entry does not follow rules for passwords and logins. */
```

If a user is changing a password and the password entered does not match the present valid password, it will be rejected and the user will be prompted to try again. The user is allowed only one retry. If the user attempts and fails a second time, the entry will be denied with the following message and the old password will remain in effect:

```
PIPW
/* Privilege, Illegal PassWord. */
/* The old password remains in effect. */
```

If the new password that a user enters when changing a password does not match on its two entries (`enter your new password`; `reenter your new password`), the following message will be displayed:

```
/* The first and second entries of new password did not match. */
```

The user may try once again to change the password. If the user fails a second time to match the two entries, the following denial message will be displayed and the old password will remain in effect:

```
IDNC
/* Input, Data Not Consistent */
/* First and second entries of new password did not match.
   The old password remains in effect. */
```

RELATED COMMANDS

rtrv-lgn

set-lgn

set-secu

NAME

set-pmthres-line: Set Performance Monitoring Threshold Line

INPUT FORMAT

set-pmthres-line:
[**QHB2CVOC3**=*nnnnn*][,**DayB2CVOC3**=*nnnnn*]
[,**QHB2CVEC1**=*nnnn*][,**DayB2CVEC1**=*nnnnn*]
[,**QHB2ES**=*nnn*][,**DayB2ES**=*nnnnn*]
[,**QHB2ESA**=*nnn*][,**DayB2ESA**=*nnnnn*]
[,**QHB2ESB**=*nnn*][,**DayB2ESB**=*nnnnn*]
[,**QHB2SES**=*nn*][,**DayB2SES**=*nnnn*]
[,**QHB2UAS**=*nn*][,**DayB2UAS**=*nnnn*]
[,**QHPSCL**=*nn*][,**DayPSCL**=*nn*]**;**

where *nnn. . . .* is a numerical value in the range given in the parameter description below.

NOTE:
Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets the performance parameter thresholds of OC-3 lines and activates and deactivates the processing of threshold crossings for performance parameters.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHB2CVOC3 This parameter sets the threshold for the OC-3 coding violations count on a quarter-hourly basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 13841. The default value is 1384. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10.

DayB2CVOC3 A positive value of this parameter sets the threshold for the OC-3 coding violation count on a daily basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 1328736. The default value is 132874. A negative value of this parameter sets the parity count threshold in terms of an equivalent BER expressed as a logarithm to the base 10.

QHB2CVEC1	This parameter sets the threshold for EC-1 coding violation counts on a quarter-hourly basis. This parameter is available with Release 5 software and later.
QHB2ES	This parameter sets the threshold for the ES type A count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and default value of 40.
DayB2ES	This parameter sets the threshold for the ES type A count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 900.
QHB2ESA	This parameter sets the threshold for the ES type A count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and default value of 30.
DayB2ESA	This parameter sets the threshold for the ES type A count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 90.
QHB2ESB	This parameter sets the threshold for the ES type B count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and default value of 30.
DayB2ESB	This parameter sets the threshold for the ES Type B count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 90.
QHB2SES	This parameter sets the threshold for the SES count on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 20.
DayB2SES	This parameter sets the threshold for the SES count on a daily basis. This parameter is an integer with range 0 through 4095 and default value of 60.
QHB2UAS	This parameter sets the threshold for the UAS count on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 30.
DayB2UAS	This parameter sets the threshold for the UAS count on a daily basis. This parameter is an integer with range 0 through 4095 and default value of 90.
QHPSCL	This parameter sets the threshold for the line protection switch counts on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 2.
DayPSCL	This parameter sets the threshold for the line protection switch counts on a daily basis. This parameter is an integer with range 0 through 255 and default value of 4.

The following display shows the error counts equivalent to different BER thresholds for OC-3 and EC-1.

B2 OC3 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVOC3)	Equivalent Day Threshold (DayB2CVOC3)
-7	13841	1328736
-8	1384	132874
-9	138	13287
-10	14	1329

B2 EC1 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVEC1)	Equivalent Day Threshold (DayB2CVEC1)
-7	4613	442848
-8	461	44285
-9	46	4428
-10	5	443

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

rtrv-pmthres-line

set-pmthres-sect

NAME

set-pmthres-sect: Set Performance Monitoring Threshold Section

INPUT FORMAT

set-pmthres-sect:[**TxPwr1dB=***n*][,**TxPwr2dB=***n*][,**LaserBias=***n*]
[,**Qhsefs=***nn*][,**Daysefs=***nnnn*];

DESCRIPTION

This command sets the performance-monitoring thresholds of an OC-3 section as well as activating and deactivating the processing of threshold crossings for performance parameters.

The input parameters are:

TxPwr1dB This parameter enables/disables the -1 dB threshold for optical transmit power. The valid values are **enabled** (default value) and **disabled**. This parameter applies only to the 21G OLIU circuit pack.

TxPwr2dB This parameter enables/disables the -2 dB threshold for optical transmit power. The valid values are **enabled** (default value) and **disabled**. This parameter applies only to the 21G OLIU circuit pack.

LaserBias This parameter enables/disables the laser bias threshold. The valid values are **enabled** (default value) and **disabled**.

Qhsefs This parameter sets the threshold for SEFS on a quarter-hourly basis. This parameter is an integer with range 0-63 and default value of 10. Entering a parameter value of zero (0) will disable thresholding for this parameter.

Daysefs This parameter sets the threshold for SEFS on a daily basis. This parameter is an integer with range 0-4095 and a default value of 30. Entering a parameter value of zero (0) will disable thresholding for this parameter.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

rtrv-pmthres-sect

NAME

set-pmthres-sts1: Set Performance Monitoring Threshold STS-1

INPUT FORMAT

set-pmthres-sts1:[**QHB3CV=***nnnn*][,**DayB3CV=***nnnnnn*][,**QHB3ES=***nnn*]
[,**DayB3ES=***nnnnn*][,**QHB3ESA=***nnn*][,**DayB3ESA=***nnnnn*][,**QHB3ESB=***nnn*]
[,**DayB3ESB=***nnnnn*][,**QHB3SES=***nn*][,**DayB3SES=***nnnn*][,**QHB3UAS=***nn*]
[,**DayB3UAS=***nnnn*];

where *nnn...* is the numerical value given in the parameter description listed below.

NOTE:
Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command provisions STS-1 path performance parameter thresholds as well as enabling and disabling the processing of threshold crossings for the various parameters. Entering a parameter value of zero (0) will disable thresholding for that parameter.

The input parameters are:

QHB3CV This parameter sets the threshold for the coding violations count on a quarter-hourly basis. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-4510. The default value is 451.

DayB3CV This parameter sets the threshold for the coding violations count on a daily basis. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-432960. The default value is 43296.

QHB3ES This parameter sets the threshold for errored seconds on a quarter-hourly basis. This parameter has an integer range of 0-900, with a default value of 40.

DayB3ES This parameter sets the threshold for errored seconds on a daily basis. This parameter has an integer range of 0-65535, with a default value of 900.

QHB3ESA This parameter sets the threshold for type A errored seconds on a quarter-hourly basis. A type A ES is a second with a single error. This parameter has an integer range of 0-900, with a default value of 30.

DayB3ESA This parameter sets the threshold for type A errored seconds on a daily basis. A type A ES is a second with a single error. This parameter has an integer range of 0-65535, with a default value of 90.

QHB3ESB This parameter sets the threshold for type B errored seconds on a quarter-hourly basis. A type B ES is a second with more than one error, but less than the number of errors in a severely errored second. This parameter has an integer range of 0-900, with a default value of 30.

DayB3ESB This parameter sets the threshold for type B errored seconds on a daily basis. A type B ES is a second with more than one error, but less than the number of errors in a severely errored second. This parameter has an integer range of 0-65535, with a default value of 90.

QHB3SES This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis. This parameter has an integer range of 0-63, with a default value of 20.

DayB3SES This parameter sets the threshold for the severely errored frame seconds count on a daily basis. This parameter has an integer range of 0-4095, with a default value of 60.

QHB3UAS This parameter sets the threshold for unavailable seconds on a quarter-hourly basis. This parameter has an integer range of 0-63, with a default value of 30.

DayB3UAS This parameter sets the threshold for unavailable seconds on a daily basis. This parameter has an integer range of 0-4095, with a default value of 90.

The following table shows the error counts equivalent to different BER thresholds.

B3 STS-1 Path Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB3CV)	Equivalent Day Threshold (DayB3CV)
-7	4510	432960
-8	451	43296
-9	45	4330
-10	5	433

RELATED COMMANDS

init-pm

rtrv-pmthres-sts1

rtrv-pm-sts1

rtrv-pm-tca

NAME

set-pmthres-t1: Set Performance Monitoring Threshold T1

INPUT FORMAT

For Release 7.2, the input format is:

set-pmthres-t1:[**DayESL=***nnnn*][,**DayCVPSF=***nnnn*][,**DayCVPESF=***nnnn*]
[**DayESP=***nnnnn*][,**DaySESP=***nnnnnnn*][,**DayUASP=***nnn*]
[,**DayCVPFE=***nnnn*][,**DayESPFE=***nnnnn*][,**DaySESPFE=***nnn*][,**DayUASPFE=***nnnnn*]

For Release 7.1 and earlier, the input format is:

set-pmthres-t1:[**DayESP=***nnnnn*][,**DaySESP=***nnnnnnn*][,**DayUASP=***nnn*]
[,**DayESPFE=***nnnnn*][,**DaySESPFE=***nnn*][,**DayUASPFE=***nnnnn*];

where *nnn. . .* is a numerical value in the range given in the parameter description listed below.

NOTE:
Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets DS1 path performance monitoring thresholds. This command also enables and disables the processing of threshold crossing alerts (TCAs) for these parameters.

This command may only be used if the `ds1pm` feature is enabled via the **set-feat** command.

This command is available with Release 5.1 software or later.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

A negative integer threshold value indicates that the threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^n.

The input parameters are:

DayESL This parameter is available with Release 7.2 only. This parameter sets the threshold for the errored second line (ESL) count on a daily basis. This parameter is an integer with a range of 0 through 65535 and a default value of 648.

DayCVPSF This paramter is available with Release 7.2 only. This parameter sets the threshold for the code violations path SF (CVPSF) count on a daily basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5}, and an integer range of 0 through 1048575. The default value is 691.

DayCVPESF This paramter is available with Release 7.2 only. This parameter sets the threshold for the code violations path ESF (CVPESF) count on a daily basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5}, and an integer range of 0 through 1048575. The default value is 132960.

DayESP This parameter sets the daily threshold for the errored second path (ESP) count. This parameter is an integer with a range of 0 through 65535 and a default value of 648.

DaySESP This parameter sets the threshold for the severely errored second path (SESP) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 100.

DayUASP This parameter sets the threshold for the unavailable second path (UASP) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 10.

DayCVPFE This parameter is available with Release 7.2 only. This parameter sets the threshold for the code violations path far end (CVPFE) count on a daily basis. A negative value of this parameter indicates that the code violation count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -8 through -5, corresponding to BERs of 10^{-8} through 10^{-5}, and an integer range of 0 through 1048575. The default value is 132960.

DayESPFE This parameter sets the threshold for the errored second path far-end (ESPFE) count on a daily basis. This parameter is an integer with a range of 0 through 65535 and a default value of 648.

DaySESPFE This parameter sets the threshold for the severely errored second path far-end (SESPFE) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 100.

DayUASPFE This parameter sets the threshold for the unavailable second path far-end (UASPFE) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 10.

This command may only be used if the `ds1pm` feature is enabled via the **`set-feat`** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available, feature disabled */
```

If this command entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available in this release */
```

RELATED COMMANDS

rtrv-feat

rtrv-pmthres-t1

set-feat

NAME

set-pmthres-t3: Set Performance Monitoring Threshold T3

INPUT FORMAT

For Release 7.2, the input format is:

set-pmthres-t3:[**QHCVL=***nnnnn*][,**DayCVL=***nnnnnnn*][,**QHESL=***nnn*]
[,**DayESL=***nnnnn*][,**QHSESL=***nn*][,**DaySESL=***nnnn*][,**QHSEFS=***nn*]
[,**DaySEFS=***nnnn*][,**QHPCV=***nnnnn*][,**QHFMCV=***nnnnn*]
[,**DayPCV=***nnnnnnn*][,**DayFMCV=***nnnnnnn*][,**QHESP=***nnn*]
[,**DayESP=***nnnnn*][,**QHSESP=***nn*][,**DaySESP=***nnnn*][,**QHUASP=***nn*]
[,**DayUASP=***nnnn*];

NOTE:
All DS3 line parameters, CVL, ESL, SESL, and DS3 path parameters for the incoming signal from the DSX-3 are only applicable when a BBG4B pack (in OC-3 systems) is active (in service) in a function unit slot.

For Release 7.1 and earlier, the input format is:

set-pmthres-t3:[**QHSEFS=***nnnn*][,**DaySEFS=***nnnnnn*][,**QHCVP=***nnnn*]
[,**DayCVP=***nnnnnn*][,**QHESP=***nn*][,**DayESP=***nnnn*][,**QHSESP=***nn*]
[,**DaySESP=***nnnn*][,**QHUASP=***nn*][,**DayUASP=***nnnn*];

where *nnn. . . .* is a numerical value in the range given in the parameter description listed below.

NOTE:
Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets the performance parameter thresholds of a DS3 signal as well as activating and deactivating the processing of threshold crossings for error performance parameters. Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHCVL This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-16383. The default value is 40.

DayCVL This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the coding violations count on a daily basis for the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-1048575. The default value is 3865.

QHESL This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for the DS3 line with at least one B3ZS coding violation. This parameter has an integer range of 0-900, with a default value of 25.

DayESL This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the errored seconds count on a daily basis for the DS3 line with at least one B3ZS coding violation. This parameter has an integer range of 0-65535, with a default value of 250.

QHSESL This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for the DS3 line with greater than 44 B3ZS coding violations. This parameter has an integer range of 0-63, with a default value of 4.

DaySESL This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the severely errored seconds count on a daily basis for the DS3 line with greater than 44 B3ZS coding violations. This parameter has an integer range of 0-4095, with a default value of 40.

QHSEFS This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis. This parameter has an integer range of 0-63, with a default value of 10 (for Release 7.1 and earlier) and a default value of 2 (for Release 7.2).

DaySEFS This parameter sets the threshold for the severely errored frame seconds count on a daily basis. This parameter has an integer range of 0-4095, with a default value of 30 (for Release 7.1 and earlier) and a default value of 8 (for Release 7.2).

QHPCV This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the P-bit type of format. The type is selected using the

set-t3 command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-16383. The default value is 40.

QHFMCV This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the F&M bit type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-16383. The default value is 40.

DayPCV This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the coding violations count on a daily basis for the P-bit type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-1048575. The default value is 3820.

DayFMCV This parameter is available with OC-3 Release 7.2. This parameter sets the threshold for the coding violations count on a daily basis for the F&M bit type of format. The type is selected using the **set-t3** command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-1048575. The default value is 3820.

QHCVP This parameter is available for Release 7.1 and earlier releases. This parameter sets the threshold for the coding violations count on a quarter-hourly basis for both the P bit and the adjusted F&M bit type of format. The type is selected using the *set-t3* command. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-16383. The default value is 40.

DayCVP This parameter sets the threshold for the coding violations count on a daily basis for both the P bit and the adjusted F&M bit type of format. The type is selected using the **set-t3** command. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0-1048575. The default value is 3820.

QHESP This parameter is available with OC-3 Release 7.1 and earlier releases. This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for both the P bit and the adjusted F&M bit type format. The type is selected using the **set-t3** command. This parameter has an integer range of 0-900, with a default value of 25.

DayESP This parameter is available with OC-3 Release 7.1 and earlier releases. This parameter sets the threshold for the errored seconds count on a daily basis for both the P bit and the adjusted F&M bit type format. The type is selected using the **set-t3** command. This parameter has an integer range of 0-65535, with a default value of 250.

QHSESP This parameter is available with OC-3 Release 7.1 and earlier releases. This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for both the P bit and the adjusted F&M bit type format. The type is selected using the **set-t3** command. This parameter has an integer range of 0-63, with a default value of 10 for Release 7.1 and earlier, and a default value of 4 for Release 7.2.

DaySESP This parameter is available with OC-3 Release 7.1 and earlier releases. This parameter sets the threshold for the severely errored seconds count on a daily basis for both the P bit and the adjusted F&M bit type format. The type is selected using the **set-t3** command. This parameter has an integer range of 0-4095, with a default value of 40.

QHUASP This parameter is available with OC-3 Release 7.1 and earlier releases. This parameter sets the threshold for the unavailable seconds count on a quarter-hourly basis for both the P bit and the adjusted F&M bit type format. The type is selected using the **set-t3** command. This parameter has an integer range of 0-63, with a default value of 10.

DayUASP This parameter is available with OC-3 Release 7.1 and earlier releases. This parameter sets the threshold for the unavailable seconds count on a daily basis for both the P bit and the adjusted F&M bit type format. The type is selected using the **set-t3** command. This parameter has an integer range of 0-4095, with a default value of 10.

For Release 7.2, the following two tables show the error counts equivalent to different BER thresholds.

DS3 P-bit and F&M bit Coding Violations

BER Threshold	Equivalent 15 Min. Threshold (QHCV)	Equivalent Day Threshold (DayCV)
-7	3979	381972
-8	398	38197
-9	40	3820
-10	4	382

DS3 Line Coding Violations

BER Threshold	Equivalent 15 Min. Threshold (QHCVL)	Equivalent Day Threshold (DayCVL)
-7	4026	386519
-8	402	38651
-9	40	3865
-10	4	386

For Release 7.1 and earlier, the following table shows the error counts equivalent to different BER thresholds.

DS3 CVP Coding Violations

BER Threshold	Equivalent 15 Min. Threshold (QHCVP)	Equivalent Day Threshold (DayCVP)
-7	3979	381972
-8	398	38197
-9	40	3820
-10	4	382

RELATED COMMANDS

init-pm

rtrv-pm-t3

rtrv-pm-tca

rtrv-pmthres-t3

set-t3

NAME

set-pmthres-vt1: Set Performance Monitoring Threshold VT1.5

INPUT FORMAT

set-pmthres-vt1:[**QHV5ES=***nnnnn*][,**DayV5ES=***nnnnnnn*][,**QHV5SES=***nnn*]
[,**DayV5SES=***nnnnn*][,**QHV5UAS=***nnn*][,**DayV5UAS=***nnnnn*];

where *nnn. . . .* is a numerical value in the range given in the parameter description listed below.

NOTE:
Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets VT1.5 path performance monitoring thresholds. This command also enables and disables the processing of threshold crossing alerts (TCAs) for these parameters.

This command may only be used if the `vtpm` feature is enabled via the **set-feat** command.

This command is available with Release 6 and later.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHV5ES This parameter sets the threshold for the errored second (ES) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 900 and a default value of 40.

DayV5ES This parameter sets the threshold for the errored second (ES) count on a daily basis. This parameter is an integer with a range of 0 through 65535 and a default value of 900.

QHV5SES This parameter sets the threshold for the severely errored second (SES) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 20.

DayV5SES This parameter sets the threshold for the severely errored second (SES) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 60.

QHV5UAS This parameter sets the threshold for the unavailable second (UAS) count on a quarter-hourly basis. This parameter is an integer with a range of 0 through 63 and a default value of 30.

DayV5UAS This parameter sets the threshold for the unavailable second (UAS) count on a daily basis. This parameter is an integer with a range of 0 through 4095 and a default value of 90.

This command may only be used if the `vtpm` feature is enabled via the **`set-feat`** command. If this feature is not enabled, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available, feature disabled */
```

If this command entered on a DDM-2000 loaded with a release of software that does not currently support this feature, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Command not available in this release */
```

RELATED COMMANDS

rtrv-feat

rtrv-pmthres-vt1

set-feat

NAME

set-secu: Set Security

INPUT FORMAT

set-secu:*address*[:**sec=***Security*][,**to=***Timeout*];

DESCRIPTION

This command configures NE system security on each CIT and DCC interface.

Prior to the first use of this command, the two default logins are `ATT01` and `ATT02` (all upper-case letters). The default password is `DDM-2000`. Privileged users should change these defaults before enabling security.

This command is available with OC-3 Release 3 software and later.

NOTE:
This command is available to privileged users only.

The input parameters are:

address Address is the address of one or more CIT and/or DCC ports. There is no default address.
Valid Addresses: **dcc-all, cit-{1,2,all}**

sec Security determines whether security is enabled or disabled on the specified CIT and DCC port(s). Enabling security requires users to enter a valid login and password pair to access the system. The values for this parameter are enabled and disabled (default value).

to Timeout specifies the time, in minutes, before an inactive session is automatically terminated. This has a value ranging from 0 to 120 minutes, with a default value of 15 minutes. Setting this parameter to 0 will disable the timeout function.

Execution of this command affects all subsequent attempts to establish login sessions but does not affect currently active sessions.

When security is enabled, three types of users are permitted to access the system with a valid login and password. They are:

`privileged user` The privileged user may execute any commands, including restricted commands.

`general user` The general user may execute any commands not restricted to privileged users.

`reports-only` The reports-only user may only execute commands that extract reports from the system, and several other basic commands. This user type is available in Release 5 and all later releases.

When security is enabled on a system, only the following commands may be executed by reports-only users:

- **?** (help)
- **logout** (logout)
- **rlgn** (remote login)
- **set-passwd** (set password)
- **set-link** (set link)
- **^T** (toggle)
- all **rtrv** commands except **rtrv-lgn**

In addition to **set-secu**, the commands **init-sys**, **rtrv-lgn**, **set-fecom**, **set-feat**, and **set-lgn** are restricted to privileged users only. The following commands also become restricted to privileged users only when security is enabled on a system:

- **cpy-prog** (copy program)
- **dlt-tadrmap** (delete TID address map)
- **ent-ulsdcc** (enter upper layer section DCC)
- **init-pm** (initialize performance-monitoring)
- **ins-prog** (install program)
- **reset** (reset system software)
- **set-date** (set date)
- **set-ne** (set network element)

Entering this command will cause the following confirmation message to be displayed:

```
/* Caution!  Network Element access is affected by this command.
   You have selected the set-secu command with these parameters:

   Address = address
   Security = security
   Timeout = n */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-lgn

rtrv-secu

set-fecom

set-lgn

NAME

set-state-ec1: Set EC-1 Port State

INPUT FORMAT

set-state-ec1:*Address*:**ps=***PrimaryState*;

DESCRIPTION

This command sets the state of the low speed EC-1 ports. This command is used to turn on and off the monitoring of signal failures from a specified port.

This command is available with OC-3 Release 6 and later software.

The input parameters are:

Address Address identifies the EC-1 port(s).
Valid Addresses: **all,a,b,c**

ps PrimaryState is the port state which may have one of the following values:

- **auto** Set state to be monitored for good signal at the specified port.
- **nmon** Set memory state to "not-monitored".

NOTE:
If a port is in the **nmon** state, it must be returned to the **auto** state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

NOTE:
If an EC-1 port that is to be put into the **nmon** state is STS-1 cross-connected to a function unit equipped with MXRVO circuit packs, the VT1.5 channels within that EC-1 port should also be put in the **nmon** state.

If a primary state of **nmon** is entered, the following message will be displayed:

```
/*  Port(s) address will not be monitored or alarmed in this state */
```

This command may be executed only if the specified addresses are not currently VT1.5 cross-connected. If a VT1.5 cross-connection already exists on the specified address, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* VT cross-connection exists.*/
```

If this command is entered with several addresses and one or more of these addresses are VT1.5 cross-connected, the command will complete but send the following message indicating that some of the cross-connections are not STS-1:

```
/* Following STS-1 channels not processed.
   VT cross-connection exists within STS address:
   address
   address
*/
```

If this command is entered with several addresses and one or more of these addresses is not properly equipped, the following message will be displayed:

```
/* Address not equipped properly -- provisioning unchanged. */
```

If this command is executed and an STS-1 cross-connection exists for the address entered, the cross-connection must be cross-connected to an OLIU. If no OLIU is present, the following denial message will be displayed:

```
EQWT
/* EQuipage, Wrong Type */
/* STS1E must be cross-connected to OLIU */
```

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected set-state-ec1 command with these parameters:

   Address = x
   PrimaryState = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-ec1

rtrv-state

rtrv-state-eqpt

rtrv-state-vt1

set-state-vt1

NAME

set-state-sts1: Set State of STS-1 Channels

INPUT FORMAT

set-state-sts1:*Address*:**ps=***PrimaryState*;

DESCRIPTION

This command sets the states of STS-1 channels. It is used to turn on and off the monitoring of signal failures and maintenance signals for specified channels.

This command is available in Release 6.2 and later linear applications and Release 7.1 and later ring applications.

The input parameters are:

Address Address identifies the STS-1 channel(s). Valid addresses are:

all, {m,c}-{1-3,all}, {a,b}-{1-2,all}

Channel states can be set for STS-1 channels within OC-3 interfaces that are cross-connected to DS3 or DS1 interfaces and for STS-1 channels that are dropped from an OC-3 ring interface to an OC-3, EC-1, DS1, or DS3 interface. Channel states can also be set for STS-1 channels within OC-3 or EC-1 interfaces that are VT1.5 cross-connected to OC-3, EC-1, or DS1 interfaces.

ps PrimaryState is the channel state which may have one of the following values:

auto Set the channel state to "Automatic." Monitor the channel, but do not report alarm or status conditions. When a good signal is detected, automatically change the channel state to "In Service" and begin normal reporting of alarm and status conditions.

nmon Set the channel state to "Not Monitored." Do not report alarm or status conditions for the channel. Do not change the channel state to "In Service" if a good signal is detected. The channel will remain in this state until the state is changed again with this command or until the cross-connection involving this channel is deleted.

NOTE:
It is recommended that an STS-1 channel that is either STS-1 cross-connected to a function unit equipped with MXRVO circuit packs or an STS-1 channel that is VT1.5 cross-connected **not** be put in the **nmon** state. If an STS-1 channel is put in the **nmon** or **auto** state using this command, the VT1.5 channels within the specified STS-1 channel are also put in the **nmon** or **auto** state. This applies only to VT1.5 channels for which channel states are defined (for example, VT1.5 channels that are cross-connected to DS1 interfaces or dropped from a ring).

If a primary state of **nmon** is entered, the following message will be displayed:

```
/*  Channel(s) address will not be monitored or
    alarmed in this state */
```

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected set-state-sts1 command with these parameters:

   Address = x
   PrimaryState = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

ent-crs-sts1

ent-crs-vt1

dlt-crs-sts1

dlt-crs-vt1

rtrv-crs-sts1

rtrv-state-sts1

set-state-vt1

update

NAME

set-state-t1: Set T1 Port State

INPUT FORMAT

set-state-t1:*Address*:**ps=***PrimaryState*;

DESCRIPTION

This command sets the state of DS1 ports. This command is used to turn on and off the alarm due to signal failures from a specified port.

The input parameters are:

Address Address identifies the DS1 port(s).
Valid Addresses: **all, {a,b,c}-{1-7,all}-{1-4,all}**

ps PrimaryState is the port state which may have one of the following values:

- **auto** Set state to be monitored for good signal at the specified port.
- **nmon** Set memory state to "not-alarmed".

NOTE:
If a port is in the **nmon** state, it must be returned to the **auto** state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If a primary state of **nmon** is entered, the following message will be displayed:

```
/*  Port(s) address will not be alarmed in this state */
```

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected set-state-t1 command with these parameters:

   Address = x
   PrimaryState = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-t1

rtrv-state

upd

NAME

set-state-t3: Set T3 Port State

INPUT FORMAT

set-state-t3:*Address*:**ps=***PrimaryState*;

DESCRIPTION

This command sets the state of one or more DS3 ports. This command is used to turn on and off the alarm due to signal failures from a specified port.

The input parameters are:

Address Address identifies the DS3 port(s).
Valid DS3 Port Addresses: **{a,b,c,all}**

ps PrimaryState is the port state which may have one of the following values:

auto Set state to be monitored for good signal at the specified port.

nmon Set memory state to "not-alarmed".

NOTE:
If a port is in the **nmon** state, it must be returned to the **auto** state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the UPD command.

If a port state of **nmon** is entered, the following message will be displayed:

```
/*  Port(s) address will not be alarmed in this state */
```

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected the set-state-t3 command with these parameters:

   Address = x
   PrimaryState =x */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-state

rtrv-t3

upd

NAME

set-state-vt1: Set State of VT1.5 Channels

INPUT FORMAT

set-state-vt1:*Address*:**ps=***PrimaryState*;

DESCRIPTION

This command sets the states of VT1.5 channels within OC-3 and EC-1 interfaces. It is used to turn on and off the monitoring of signal failures and maintenance signals for specified channels.

This command is available in Release 6.2 and later linear applications and Release 7.1 and later ring applications.

The input parameters are:

Address Address identifies the VT1.5 channel(s). Valid addresses for both linear and ring are:

{m,a,b,c}-all, **{m,c}-{1-3}-all**,
{a,b}-{1-3}-all,
{m,c}-{1-3}-{1-7}-{1-4,all}

Channel states can be set for VT1.5 channels within OC-3 and EC-1 interfaces that are cross-connected to DS1 interfaces and for VT1.5 channels that are dropped from an OC-3 ring to an OC-3 or EC-1 interface.

ps PrimaryState is the channel state which may have one of the following values:

auto Set the channel state to "Automatic." Monitor the channel, but do not report alarm or status conditions. Do not do performance monitoring for this channel. When a good signal is detected, automatically change the channel state to "In Service."

nmon Set the channel state to "Not Monitored." Do not report alarm or status conditions for the channel. Do not do performance monitoring for this channel. Do not change the channel state to "In Service" if a good signal is detected. The channel will remain in this state until the state is changed again with this command or until the cross-connection involving this channel is deleted.

If a primary state of **nmon** is entered, the following message will be displayed:

```
/* Channel(s) address will not be monitored or
   alarmed in this state */
```

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected set-state-vt1 command with these parameters:

   Address = x
   PrimaryState = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

dlt-crs-vt1

ent-crs-vt1

rtrv-crs-vt1

rtrv-state-vt1

set-state-sts1

NAME

set-sts1: Set STS-1 Characteristics

INPUT FORMAT

set-sts1:dgr=*SignalDegrade*;

DESCRIPTION

This command provisions the signal degrade alarm threshold of dropped STS-1 channels from the high-speed ring channels. Incoming STS-1 channels on an optical extension are not monitored.

The 22G-U and 22D-U OLIU circuit packs are used to support the provisionable signal degrade function.

This command is available in Release 7.1 and later ring releases.

The input parameter is:

dgr SignalDegrade specifies the bit error rate (BER) threshold for the STS-1 channel in terms of a logarithm to base 10. When this threshold is crossed, an alarm will be raised and automatic protection switching to the STS-1 protection path will be initiated. For OC-3, the signal degrade is an integer with range -5 through -9 and original value of 0. The value "0" means signal degrade is disabled. This is to allow mixing of OLIU circuit packs in the same shelf without the signal degrade feature (for example,the 22F circuit pack) to be mixed with OLIUs with the signal degrade feature. When mixed, the feature is disabled for both types of OLIUs. Only dropped signals are monitored.

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected the set-sts1 command with this parameter:

   SignalDegrade = <value>

   Execute? (y/n or CANcel/DELete to quit) =
```

To provision the signal degrade function the command requires that the MAIN slot(s) be equipped with 22G-U or 22D-U OLIU CPs.

If the slots are not equipped at all or incorrectly equipped, the command will be denied with the following message:

```
ENEQ
/* Equipage, Not EQuipped */
/* Circuit pack type with signal degrade function is missing. */
```

RELATED COMMANDS

rtrv-sts1

NAME

set-sync: Set Synchronization Characteristics

INPUT FORMAT

CAUTION:
Execution of this command may affect service.

This command provisions the synchronization mode switching, synchronization source, and output mode of timing signals when the TGS circuit pack hardware is provisioned to be externally timed, internally timed, or loop timed.

Each DDM-2000 can be provisioned to one of these timing modes:

- Free running from an internal oscillator
- Loop timed from an incoming optical interface. This timing reference is used to generate all outgoing signals. If the optical line is protected, the line selected for transmission is also the line selected as the timing reference. If equipped with a BBF2B timing generator (TGS) circuit pack, the line in Function Unit C selected for transmission can optionally be selected for the timing reference.
- External timing from a DS1 reference signal. Each TGS circuit pack receives one DS1 reference signal which it monitors and from which it recovers a clock signal. The recovered clock is cross-fed to the companion TGS circuit pack on the same shelf. If a DS1 reference failure is detected on one TGS circuit pack, the TGS will take the reference from the companion TGS on the same shelf.

These timing modes are supported by both the BBF2 and BBF2B TGS circuit packs. The BBF2B circuit pack can be used in any BBF2 application and is preferred for use in ring applications.

Use of this command may affect timing for other network elements of the timing network.

NOTE:
In Release 6.1 (linear) and Release 7.0 (rings), this command is available to privileged users only for all CIT or DCC ports on the shelf.

INPUT FORMAT

The following parameters are available for this command when provisioned for a specific synchronization reference. Parameters may vary depending upon whether the application is linear or rings.

LINEAR SYSTEMS - LOOP TIMED

set-sync:[**mdsw=***ModeSwitching*]; (BBF2 pack type)

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*]
[,**omd=***OutputMode*]; (BBF2B and Releases 3.2 through 6.0)

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*]
[,**omd=***OutputMode*][,**auto=***SyncAutoreconfiguration*];
(BBF2B pack type and Release 6.1 or later)

When using the BBF2B TGS circuit pack, the *SynchronizationSource* parameter is used to select the optical line for *shelf* timing or DS1 output mode.

RING SYSTEMS - LOOP TIMED

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*];
(BBF2 and BBF2B pack type, OC-3 R5.1 only)

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*]
[,**auto=***SyncAutoreconfiguration*]; (BBF2 pack type, Release 7.0)

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*]
[,**omd=***OutputMode*][,**auto=***SyncAutoreconfiguration*];
(BBF2B pack type, Release 7.0 and later)

When using the BBF2B TGS circuit pack, the *SynchronizationSource* parameter is used to select the optical line for *shelf* timing. If the BBF2B TGS circuit pack is used and hardware provisioned for DS1 output in SYNC OUT mode and if the *SynchronizationSource* is provisioned for FN-C, then the *OutputMode* parameter may be used.

LINEAR SYSTEMS - EXTERNAL TIMING

set-sync:[**mdsw=***ModeSwitching*]; (BBF2 pack type)

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*]
[,**omd=***OutputMode*]; (BBF2B pack type, Release 3.2 through 6.0)

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*]
[,**omd=***OutputMode*][,**auto=***SyncAutoreconfiguration*];
(BBF2B pack type and Release 6.1 and later)

RING SYSTEMS - EXTERNAL TIMING

set-sync:[**mdsw=***ModeSwitching*]; (BBF2 pack type)

set-sync:[**mdsw=***ModeSwitching*][,**src=***SynchronizationSource*]
[,**omd=***OutputMode*]; (BBF2B pack type)

If the BBF2B TGS circuit pack is used and hardware provisioned for DS1 output in SYNC OUT mode and if the *SynchronizationSource* is provisioned for FN-C, then the *OutputMode* parameter may be used.

NOTE:
For all applications, if the BBF2B TGS circuit pack is hardware provisioned for DS1 output in SYNC OUT mode, the *SynchronizationSource* parameter is also used to select the optical line for DS1 output.

The input parameters are:

mdsw ModeSwitching may have one of the following values:

revertive Revertive mode switching (default value).
If the system switches to holdover timing mode due to a failure of the timing references, it will automatically switch back to the provisioned timing mode (External or LoopTimed) after one of the references becomes good.

nonrevertive Nonrevertive mode switching.
If the system switches to holdover timing mode due to a failure of the timing references, it will not automatically switch back to either External or LoopTimed mode after the reference becomes good. The **switch-sync** command must be used to restore the system to the provisioned timing mode (External or LoopTimed).

src SynchronizationSource. This parameter is available with OC-3 linear Release 3.2 and later and rings Release 5.1 and later. This parameter selects the line from which shelf loop-timing and/or the DS1 synchronization output will be derived. **Src** may have one of the following values:

main Linear Releases (default)

main-1 Ring Releases (default)

main-2 Ring Releases

fn-c Linear Releases and rings optical extensions

omd OutputMode. This parameter is available with OC-3 linear Release 3.2 and later. This parameter is also available with OC-3 rings Release 7.0 and later when **src** equals fn-c. When a line protection switch occurs, **omd** determines whether the source of the DS1 synchronization output will always be derived from the active receive OC-3 line or is locked to a specified line, whether it is active or not. This parameter may have one of the following values:

lock1 Lock to line 1

lock2 Lock to line 2

track Track transmission to active receive line (Default for linear applications or for ring applications when **src** is fn-c).

auto SyncAutoreconfiguration allows the system to choose the best timing source to use when it is provisioned for Loop Timing. Automatic Protection Switching takes place to the standby timing source when the active source fails. The switch is nonrevertive, and there will not be an automatic switch back when the failed source becomes good.

When SyncAutoreconfiguration is enabled, the system automatically reconfigures between loop timing sources **main** and **fn-c** in linear systems, and **main-1** and **main-2** in ring systems. Use the **switch-sync** command to manually switch to the other timing source.

The parameter is available in OC-3 linear release 6.1 and ring release 7.0.

enabled SyncAutoreconfiguration is active.

disabled SyncAutoreconfiguration is not active (default).

If hardware provisioning switches are set for FreeRunning timing mode, execution of this command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for free-running. */
```

When sync messages are active (as set by the **set-oc3** command) and a user requests to set the timing source to a LoopTimed source which has a sync message that does not support timing, the command will be completed, but the following message will be displayed:

```
/* Source selected currently is unusable for timing.
   Timing will switch to holdover or if Sync Autoreconfiguration is
   enabled, timing may switch to other source. */
```

If the slot selected as a timing source (MAIN or FN-C) is not equipped with an OC-3 OLIU or if the **src** and **omd** parameter values selected refer to a slot that is not equipped or not properly equipped, or if **omd** is provisioned with a *lockx* value for a slot that is not properly equipped, the command request will be denied and the following denial message will be displayed:

```
EQWT
/* EQuipage, Wrong Type */
/* address is not equipped with the proper hardware.*/
```

NOTE:
If **omd** is assigned a *lockx* value, where slot *x* is not equipped or not properly equipped, the *address* mentioned in the above denial message will point to the exact slot number expressed by the *x* value.

If this is command entered and both timing slots are empty, the command will be denied with the following message:

```
EQWT
/* EQuipage, Wrong Type */
/* No change in provisioning - both timing slots are unequipped */
```

For SyncAutoreconfiguration, several other parameters must be set before this feature can be enabled. If these parameters are not set, the SyncAutoreconfiguration request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* <message reason>
Sync Autoreconfiguration cannot be enabled */
```

Valid message reasons include the following:

- K byte messages disabled
- Shelf not loop timed
- Sync output mode set to lock
- FN-C selected as the timing source.

In a linear application, if the TGS slots are equipped with BBF2 circuit packs, and if **src**, **omd**, or **auto** parameters are provisioned, the request will be denied with the following message:

```
EQWT
/* EQuipage, Wrong Type */
/* TGS slots are not equipped with proper hardware. */
```

In a ring application, if the TGS slots are equipped with BBF2-type circuit packs and FN-C is selected as the timing source, the command request will be denied with the following message:

```
EQWT
/* EQuipage, Wrong Type */
/* TGS slots are not equipped with proper hardware. */
```

When SyncAutoreconfiguration is enabled, the OutputMode cannot be set to **lock** and the SynchronizationSource cannot be set to **fn-c**. If one or both if these parameter choices are selected, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Sync Autoreconfiguration is enabled. */
```

The following confirmation message will be displayed after command entry:

```
/* Caution! Execution of this command may affect service.
   You have selected the set-sync command with these parameters:

   ModeSwitching = x
   SynchronizationSource = x
   OutputMode = x */

Execute? (y/n or CANcel/DELete to quit) =
```

When SyncAutoreconfiguration is available, the following confirmation message will be displayed after command entry:

```
/* Caution!  Execution of this command may modify network
   synchronization and affect service.
   You have selected the set-sync command with these parameters:

   ModeSwitching = x
   SynchronizationSource = x
   OutputMode = x
   SyncAutoreconfiguration = x */

Execute? (y/n or CANcel/DELete to quit) =
```

When SyncAutoreconfiguration is available and its value is being changed from **enabled** to **disabled**, the following confirmation message will be displayed after command entry:

```
/* Caution!  Execution of this command may modify network
   synchronization and affect service.  Executing this command with
   auto=disabled will disable autonomous selection of source for
   shelf timing.
   You have selected the set-sync command with these parameters:

   ModeSwitching = x
   SynchronizationSource = x
   OutputMode = x
   SyncAutoreconfiguration = disabled */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-sync

switch-sync

NAME

set-t1: Set T1 Characteristics

INPUT FORMAT

set-t1:*address*[:**lc=***LineCode*][,**alm=***AlarmLevel*][,**fth=***FailureThreshold*]
[,**dlc=***DLCBPVtoLOS*][,**ais=***AlarmIndicationSignal*][,**pmmd=***PMMode*]
[,**fmt=***Format*];

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command sets the parameters of one or more DS1 ports. These characteristics include alarm levels, line coding, failure thresholds, and AIS conditions.

The input parameters are:

Address Address is the address of the DS1 port(s) to be provisioned. One port or more may be specified.
Valid Addresses: **all, {a,b,c}-{1-7,all}-{1-4,all}**

lc LineCode is the DS1 line coding which may be one of the following:

ami	Alternate Mark Inversion (overrides the linecode switch)
b8zs	Bipolar with 8 Zero Substitution (overrides the linecode switch)
noOverride	No override of the linecode switch (default value)

If either **ami** or **b8zs** is selected, the line code will be set to the selected value, and a software override will be active even if the selected value matches the current switch setting. While the software override is active, changes in the switch settings will not affect the line code. A software override will remain active until the set-t1 command is executed again and the **noOverride** option is selected or until the associated circuit pack is removed from the equipment list.

alm AlarmLevel sets the alarm level for an incoming DS1 Signal Failure and may be one of the following:

mj	Major Alarm
mn	Minor Alarm
na	No Alarm (default value)

If the system is provisioned for no alarm, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near end activity.

fth FailureThreshold sets the failure threshold in terms of a logarithm to the base 10. The value may be either -6 or -3, corresponding to BERs of 10^{-6} and 10^{-3}, respectively. The default value is -3. When the failure threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated.

dlc (bpv) DLCBPVtoLOS determines whether an incoming DS1 signal failure (a bit error rate above the failure threshold set by the **fth** parameter, above) will be translated to an outgoing DS1 loss of signal (all zeros) at the far end. The value is either **yes** or **no**. The default value is **no**. Setting this parameter to **yes** permits a digital loop carrier system terminal (such as the SLC® 96 Carrier System) to detect the loss of signal and initiate protection switching of the DS1. When the parameter is set to **yes**, the ais parameter is automatically set to no. (An all zeros signal, not AIS, is transmitted to the far end even if the **AIS** parameter is set to **yes**.)

ais AlarmIndicationSignal determines whether an AIS should be inserted towards the optical fiber when a loss of incoming DS1 signal is detected. The values are **yes** and **no**; the default value is **yes**. This parameter is ignored if the **bpv** parameter (described above) is set to **yes**.

pmmd PMMode is available with software Release 5.1 and later. This parameter sets the mode for ports supported by the DS1 performance-monitoring circuit pack. **Pmmd** is only used for performance-monitoring. Setting this parameter does not affect the transmitted or received signal. This parameter may be one of the following values:

off	DS1 PM turned off (default value)
on	DS1 PM turned on (only if CP type is BBF3)

fmt Format supports the PMMode parameter. It is available with Release 5.1 and later and only if CP type is BBF3. This parameter sets the format to be monitored by the DS1 performance-monitoring circuit pack. **Fmt** is only used for performance-monitoring and setting this parameter does not effect the transmitted or received signal. This parameter may be one of the following values:

sf	Superframe
esf	Extended superframe, near end and far end. (default)
esfn	Extended superframe, near end only.

The following confirmation message will be displayed after command entry, when addressing packs without Performace Monitoring capability:

```
/* Caution! Execution of this command may affect service.
   You have selected the set-t1 command with these parameters:

   Address = x
   LineCode = x
   AlarmLevel = x
   FailureThreshold = x
   DLCBPVtoLOS = x
   AlarmIndicationSignal = x */

Execute? (y/n or CANcel/DELete to quit) =
```

The following confirmation message will be displayed after command entry, when addressing packs with Performace Monitoring capability or if addressing a group of packs using "all" in the address:

```
/* Caution! Execution of this command may affect service.
   You have selected the set-t1 command with these parameters:

   Address = x
   LineCode = x
   AlarmLevel = x
   FailureThreshold = x
   DLCBPVtoLOS = x
   AlarmIndicationSignal = x
   PMMode = x
   Format = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

If multiple addresses are specified, the following caution message will be printed out immediately before the confirmation request message:

```
/* Caution: This command addresses multiple objects within this
   system.  Selections other than CurrentValues will affect all
   addressed objects. */
```

RELATED COMMANDS

rtrv-t1

set-feat

set-state-t1

NAME

set-t3: Set T3 Characteristics

INPUT FORMAT

set-t3:*Address*:[**md=***Mode*][,**ais=***AlarmIndicationSignal*][,**alm=***AlarmLevel*]
[,**fth=***FailureThreshold*][,**pmmd=***PMMode*] [,**fmt=***Format*];

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command sets the characteristic parameters of one or more DS3 ports. These characteristics include alarm levels, failure thresholds, and AIS conditions.

The input parameters are:

Address Address is the address of the DS3 port(s) to be provisioned. One port may be specified or all ports may be specified.
Valid DS3 Port Addresses: **{a,b,c,all}**

md Mode is the violation monitor removal mode of the DS3 signal. In releases prior to Release 6, this parameter was labeled **mode**. This parameter may have one of the following values:

- **vmr** Monitor and remove DS3 P bit errors (default value).
- **vm** Monitor but do not remove DS3 P bit errors.
- **cc** Clear channel — Do not monitor or remove DS3 P bit errors.

If this parameter is set to **vmr** or **vm**, the **ais** parameter will not be prompted for.

If this parameter is set to **cc**, the **pmmd** and **fmt** parameters will not be used. Also in this case, the **pmmd** and **fmt** parameters will keep their current values. The current values for both parameters will be available to be used whether the value of **md** is set to vm or vmr.

`AIS` AlarmIndicationSignal determines whether or not a DS3 AIS should be inserted. The value may be `yes` or `no`. When AIS is set to `yes`:

— DS3 AIS is inserted towards the DSX-3 upon detection of an OC-3 loss of signal or STS path AIS incoming from the fiber.

— DS3 AIS is inserted towards the fiber upon detection of DS3 LOS incoming from the DSX-3.

NOTE:
AIS is always inserted if the violation monitor removal mode is provisioned for `vmr` or `vm`.

`alm` AlarmLevel sets the alarm level for an incoming DS3 Signal Failure and may be one of the following:

`cr` Critical Alarm

`mj` Major Alarm

`mn` Minor Alarm

`na` No Alarm.

For releases prior to Release 3.2, the default alarm level is major. For Release 3.2 and later, the default alarm level is critical. If the system is provisioned for no alarm and there is a loss-of-signal condition, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will

`fth` FailureThreshold sets the failure threshold in terms of a logarithm to the base 10. The value may be either -6 or -3, corresponding to BERs of 10^{-6} and 10^{-3}, respectively. The default value is -3. When the failure threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated.

`pmmd` This parameter is available with OC-3 Release 7.1 and later. PMMode is only used for performance-monitoring (PM). Setting this parameter does not affect the transmitted or received signal. This parameter will appear only if the **`vmr`** or **`vm`** mode has already been selected. This parameter may be one of the following values:

`on` DS3 PM turned on. This is the default value.

`off` DS3 PM turned off. PM data is neither collected nor reported in this mode.

fmt This parameter is available with OC-3 Release 7.1 and later. Format supports the PMMode parameter and sets the type of PMON that will appear in the DS3 PM report. This parameter will appear only if the **vmr** or **vm** mode has already been selected. If the **cc** mode is selected, these parameters will not be visible to the user. This parameter may have one of the following values:

pbit When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 P bit CV, ES, SES, and UAS (default value).

fmbit When this value is selected, the DS3 PM report will provide counts of SEFS as well as DS3 adjusted F&M bit CV, ES, SES, and UAS.

The following confirmation message will be displayed after command entry for Release 7.0 and earlier:

```
/* Caution! Execution of this command may affect service.
You have selected the set-t3 command with these parameters:

   Address = x
   Mode = x
   AlarmIndicationSignal = x
   AlarmLevel = x
   FailureThreshold = x */

Execute? (y/n or CANcel/DELete to quit) =
```

The following confirmation message will be displayed after command entry in OC-3 Release 7.1 and later:

```
/* Caution! Execution of this command may affect service.
You have selected the set-t3 command with these parameters:

   Address = x
   Mode = x
   AlarmIndicationSignal = x
   AlarmLevel = x
   FailureThreshold = x
   PMMode = x
   Format = x */

Execute? (y/n or CANcel/DELete to quit) =
```

NOTE:
The above display will only prompt for the alarm indication signal (AIS) if the mode is set to `cc`. The above display will only prompt for the PMMode and Format if the Mode parameter is set to `vmr` or `vm`.

If multiple addresses are specified, the following caution message will be printed out immediately before the confirmation request message:

```
/* Caution: This command addresses multiple objects within this
system.  Selections other than CurrentValues will affect all
addressed objects. */
```

RELATED COMMANDS

rtrv-t3

set-state-t3

NAME

set-vt1: Set VT1.5 Characteristics

INPUT FORMAT

set-vt1:dgr=*SignalDegrade***;**

DESCRIPTION

The command provisions the signal degrade alarm threshold of dropped VT1.5 channels from high-speed ring channels. Incoming VT-1 channels on optical extensions are not monitored. The signal degrade threshold parameter is used only for VT path protected ring applications. 22G-U and 22D-U OLIU circuit packs must be used to provision the signal Degrade parameter.

This command is available with OC-3 Release 7.0 software or later.

dgr SignalDegrade specifies the bit error rate (BER) threshold for the VT1.5 signals in terms of a logarithm to the base 10. The values are 10^{-8} to 10^{-5}, with an original value of zero (0). When this threshold is crossed, an alarm will be raised and automatic protection switching to the protection path will be initiated. The value of 0 means that signal degrade is disabled. Only signals dropped fom rings are monitored for SignalDegrade .

If the signal degrade parameter is entered and the address used is any value other than "all" the command will be denied with the following message:

```
/* The only valid address for the signal degrade parameter is { all }.
   To set the signal degrade parameter enter
 set-vt1:all:dgr=value; */
```

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected the set-vt1 command with these parameters: */

   SignalDegrade = <value> */

Execute? (y/n or CANcel/DELete to quit) =
```

Execution for the signal degrade parameter requires that 22G-U or 22D-U OLIU circuit packs are present in the main slots. If the slots are not equipped at all or are not equipped properly, the following denial message is displayed:

```
ENEQ
/* Equipage, Not EQuipped */
/* Circuit pack type with signal degrade function is missing. */
```

RELATED COMMANDS

rtrv-vt1

NAME

set-x25: Set X.25 Link

INPUT FORMAT

set-x25:PKT=*pkt***;**

DESCRIPTION

This command sets the Packet Size (128/256) of the X.25 link.

CAUTION:
Execution of this command may affect TL1 communication.

This command should be used during installation time, when network activities are at their minimum level, or when the x.25 link can be disabled. While this command is allowed at all Network Elements in the subnetwork, it will only be active at the GNE.

NOTE:
This command is available to privileged users only, if security is enabled.

The input parameter is:

pkt PKT is a string with possible values of 128 or 256 (default value).

When this command is entered, the following confirmation message will be displayed:

```
/* Caution! If this shelf is a GNE, X.25 link/TL1 communication is
affected by this command.  When executed, this command causes the
GNE x.25 link to be reset, all active TL1 logins to be dropped,
and all SVCs to be cleared.

You have selected the set-x25 command with this parameter:

    PKT = 128/256  */


Execute? (y/n or CANcel/DELete to quit) =
```

NOTE:
The execution of this command causes the GNE x.25 link to be reset, all active TL1 logins will be automatically dropped, and all established SVCs on the affected x.25 link will have to be reestablished.

RELATED COMMANDS

rtrv-x25

NAME

switch-fn: Protection Switch Function Unit

INPUT FORMAT

switch-fn:*Address*:**pri=***Priority*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command controls operation of function unit circuit pack protection switching when equipped with termination packs such as MXRVO, STS1E, or DS3 circuit packs. [The **switch-line** command is used for protection switching of non-ring system OC-3 lines (OLIU circuit packs), whether installed in the main or function unit slots.]

The input parameters for this command are:

Address Address of the function unit slot pair.
Valid Addresses: **fn-{a,b,c}**

pri Priority indicates the priority of the protection switching request and has the following values:

reset	Clear active external switch requests.
inhibit	Prevent further switches (automatic, manual, or forced) until the switch is reset.
forced	Switch to the standby slot, whether it is good or not, and prevent further switches (automatic or manual) until the switch is reset.
manual	Switch to the standby slot only if it is good.

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the switch-fn command with these parameters:

   Address = x
   Priority = pri */

Execute? (y/n or CANcel/DELete to quit) =
```

If this command is executed with priority **inhibit** or **forced**, then automatic protection switching will be disabled until this command is executed again with priority **reset**.

RELATED COMMANDS

rtrv-state

rtrv-state-eqpt

switch-line

NAME

switch-line: Protection Switch Line

INPUT FORMAT

switch-line:*Address*:**pri=***Priority*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command controls the operation of OC-3 line protection switching. DDM-2000 provides unidirectional (one-way) line switching. This command affects only the selection of one of the pair of incoming OC-3 signals at the local network element. This command is primarily used for maintenance.

The input parameters are:

Address Address of the pair of OC-3 lines.
Valid linear Addresses: **main, fn-{a,b,c}**
Valid ring Addresses: **fn-{b,c}**

pri Priority indicates the priority of the protection switching request and has the following values:

reset	Removes existing external switch requests
inhibit	Freezes the protection switching mechanism so that the current active line remains selected regardless of the subsequent failures.
lockout	Prevents selection of the protection line. If the protection line is currently selected at the near end as the active line, service will be switched to the service line unless there is an existing **inhibit** protection switching request.
forced	Selects the standby line unless there is an existing **inhibit**, **lockout** or **forced** protection switching request.
manual	Selects the standby line for the active line provided the standby line is good and there are no existing protection switching requests.

On entry, the following confirmation message is displayed:

```
/* The line protection switching request is unidirectional.
   It may be necessary to perform a switch-line at the far end
   to switch both transmit and receive to the same line */

/* Caution!  Execution of this command may affect service.
   You have selected the switch-line command with these parameters:

   Address = x
   Priority = pri */

Execute? (y/n or CANcel/DELete to quit) =
```

If this command is executed with priority **inhibit**, **lockout** or **forced**, then automatic protection switching will be disabled until this command is executed again with priority **reset**.

RELATED COMMANDS

rtrv-state

rtrv-state-eqpt

NAME

switch-ls: Protection Switch Low Speed

INPUT FORMAT

switch-ls:*Address*:**pri=***Priority*;

DESCRIPTION

⚠ CAUTION:
Execution of this command may affect service.

This command controls the operation of low-speed circuit pack protection switching.

The input parameters are:

Address The address of the low-speed slot(s). Addresses may either be a single low-speed slot (e.g., *ls-a-1*) or all low-speed slots in a single group (e.g., *ls-b-all*). The address *ls-all* is not valid for this command.

Valid low speed slot addresses for **manual** and **forced**:
ls-{a,b,c}-{1-7} (Note: "all" not allowed)

Valid low speed service slot addresses for **reset** and **lockout**:
ls-{a,b,c}-{1-7,all}

Valid low speed protection slot addresses for **reset** and **lockout**:
ls-{a,b,c}-8 (Note: Protection slot only)

pri Priority indicates the priority of the protection switching request and has the following values:

reset Clear active external switch requests (lockout, forced, or manual) and return any traffic on the protection slot to the service slot.

lockout Locks out protection switching requests (except the reset request). If the lockout is directed to the protection slot, any traffic that is currently on the protection line is unconditionally switched back to the service line, and no traffic from any service line will be switched to the protection line. If the lockout is directed to a service slot, traffic on that service line that was previously switched to protection is unconditionally switched back to the service line and no further traffic can be switched from that specific service line to the protection line. The lockout request for either condition

will remain in effect until a low-speed protection switch reset is entered.

forced Force switch to the protection low-speed slot unless there is an outstanding lockout or forced switch request. For a forced switch, the address must be a single slot. The forced switch will remain in effect until a low speed protection switch reset or lockout request is entered.

manual Manual switch to the protection low speed slot only if the protection slot is good and not in use (service slot only). For a manual switch, the address must be a single slot. The failure or removal or a DS1 circuit pack or a forced lockout or reset request will preempt a manual switch request.

If the protection switch request changes the protection switching condition to a condition lower or equal to the priority of the pre-existing protection switching condition, execution of this command will be denied with the following denial message:

```
SPSP
/* Status, Protection Switch Priority */
/* The CIT-initiated protection switch request has a lower priority
   than the existing protection switching condition. */
```

If an address of **all** is used with a priority of **manual**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Manual switch not allowed for multiple slots. */
```

If an address of **all** is used with a priority of **forced**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Forced switch not allowed for multiple slots. */
```

If a protection slot address is used with a priority of **manual**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Manual switch not allowed for protection slot. */
```

If a protection slot address is used with a priority of **forced**, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Forced switch not allowed for protection slot. */
```

If the switch request would place service onto a slot currently holding a circuit pack type that is not allowed ("CP not allowed" alarm active), the request will be denied with the following denial message:

```
SPFA
/* Status, Protection unit FAiled */
```

On entry, the following confirmation message is displayed:

```
/*Caution! Execution of this command may affect service.
  You have selected the switch-ls command with these parameters:

  Address = x
  Priority = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

If this command is executed with priority **lockout** or **forced**, then automatic protection switching will be disabled until this command is executed again with priority **reset**.

RELATED COMMANDS

rtrv-state

rtrv-state-eqpt

NAME

switch-path-sts1: Switch Path STS-1

INPUT FORMAT

switch-path-sts1:*Address*:**pri=***Priority*;

DESCRIPTION

This command controls STS-1 path switching on path protected ring configurations. Path switching is always unidirectional (one-way).

This command is available with OC-3 Release 5.1 and later ring releases.

The input parameters are:

Address — Address is the address of the STS-1 path currently carrying dropped or drop and continue (Release 7.0 and later) traffic. When this command is executed, traffic will be switched away from this path to the other path on the ring. There is no default for this parameter. *Valid OC-3 Addresses:* **m{1,2}-{1-3,all}**

pri — Priority indicates the priority of the protection switch request. The one and only valid value is *manual*. This requests a switch from the addressed path to the standby path unless a path signal fail or path signal degrade exists on the standby path.

NOTE:
A drop and continue path is simultaneously dropped to a low-speed interface and passed through.

Since DDM-2000 path switching is unidirectional, the user will receive the following notification message immediately before the confirmation request:

```
/* The path protection switching request is unidirectional.
   It may be necessary to perform a switch-path-sts1 at the far end
   to switch both transmit and receive to the same path. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the sw-path-sts1 command with these parameters:

   Address=
   Priority=        */

Execute? (y/n or CANcel/DELete to quit) =
```

If the path address specified in the command is not equipped or the STS-1 channel is not drop, add/drop, or drop and continue cross-connected, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not equipped and/or cross-connected. */
```

If the path address specified in the command is a pass-through path, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path does not drop on this system. */
```

NOTE:
A pass-through path passes directly from the OC-N receiver to the OC-N transmitter. The service carried with this path is not dropped at this node.

If an equal or higher priority switch already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If **-all** appears in the address and if an equal or higher priority switch already exists on some of the addressed paths, the command will list these exceptions. If **-all** appears in the address and the path is VT1.5 add/drop cross-connected, the command will list these exceptions.

```
/* sts1 address equal or higher priority switch exists
   sts1 address vt cross-connected signals exist
        .
        .
*/
```

If **-all** appears in the address and the path is not equipped, not cross-connected, or is a pass-through connection, the path will be silently skipped.

RELATED COMMANDS

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-state-eqpt

rtrv-state-path

NAME

switch-path-vt1: Switch Path VT1.5

INPUT FORMAT

switch-path-vt1:*Address*:**pri=***Priority*;

DESCRIPTION

This command controls VT1.5 path switching on path protected ring configurations. Path switching is always unidirectional (one-way).

This command is used with Release 5.1 software and later ring releases.

The input parameters are:

Address Address is the address of the VT1.5 path currently carrying drop or drop and continue traffic. When this command is executed, traffic will be switched away from this path to the other path on the ring. There is no default for this parameter.
Valid Addresses:
m{1,2}-{1-3,all}-{1-7,all}-{1-4,all} (OC-3 OLIU in Main slots)

NOTE:
A drop and continue path is simultaneously dropped to a low-speed interface and passed through.

pri Priority indicates the priority of the protection switch request. The one and only valid value is:

manual This requests a switch from the addressed path to the standby path unless a path signal failure exists on the standby path. In Release 7.0 and later ring releases, this parameter requests a switch from the addressed path to the standby path unless a path signal fail or path signal degrade exists on the standby path.

If the path address specified in the command is not equipped or VT1.5 cross-connected, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not equipped and/or cross-connected. */
```

If the path address specified in the command is a pass-through path, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path does not terminate on this system. */
```

NOTE:
A pass-through path passes directly from the OC-N receiver to the OC-N transmitter. The service carried with this path is not dropped at this node.

If an equal or higher priority switch already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If **-all** appears in the address and if an equal or higher priority switch already exists on some of the addressed paths, the command will list these exceptions. If **-all** appears in the address and the path is STS-1 add/drop cross-connected, it will be listed as an exception.

```
/* vt address equal or higher priority switch exists
   vt address sts cross-connected signal exists
      .     .     .     .     .     .     .
      .     .     .     .     .     .     .
      .     .     .     .     .     .     .
*/
```

Since DDM-2000 path switching is unidirectional, the user will receive the following notification message and confirmation request:

```
/* The path protection switching request is unidirectional.
   It may be necessary to perform a switch-path-vt1 at the far end
   to switch both transmit and receive to the same path. */


/* Caution! Execution of this command may affect service.
   You have selected the sw-path-vt1 command with these parameters:

   Address=
   Priority=        */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-state-eqpt

rtrv-state-path

NAME

switch-sync: Protection Switch Synchronization

INPUT FORMAT

switch-sync:**s=***SyncFunction*,**pri=***Priority*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command controls operation of the synchronization protection switching. This command lets the user control which synchronization reference is used and enables the user to switch a synchronization reference when needed.

The input parameters are:

s SyncFunction specifies the synchronization function and may be one of the following:

reference	Selects protection switching of DS1 timing references. Specify only if the system is provisioned for `External` DS1 timing.
mode	Selects protection switching of timing mode. Specify only if the system is provisioned for `External` DS1 or `LoopTimed`.
circuitpack	Selects protection switching of timing circuit packs.
src	Selects the optical line from which shelf loop-timing and/or the DS1 synchronization output will be derived. This parameter is available with OC-3 ring Release 7.1 and later ring releases. This parameter is only applicable if SyncAutoreconfiguration is enabled using the **set-sync** command. The SynchronizationSources that can be switched are: **main-1** and **main-2**.

pri Priority indicates the priority of the protection switching request. For SyncFunction values of **reference** and **circuitpack**, priority values are:

reset	Clear active protection switch requests
inhibit	Freeze the protection switching mechanism
manual	Switch from active timing reference to standby timing reference

For a SyncFunction value of **mode**, the priority (**pri**) values are:

reset	Clear any active manual switch. This will allow the system to switch back to External or LoopTimed if the system is provisioned for non-revertive mode switching or if it has been manually switched to holdover mode.
manual	Switch from the provisioned timing mode External or LoopTimed) to holdover mode. The system will remain in holdover mode until the switch is reset.

For a SyncFunction value of **src**, the priority (**pri**) value is:

manual	Switch from the active SynchronizationSource to the standby source.

If this command is executed with Priority=**inhibit** or with SyncFunction=**mode**, then automatic protection switching will be disabled until this command is executed again with the same SyncFunction and with Priority=**reset**.

If an equal or higher priority switch already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If the SyncFunction is **src** and the priority of **reset** or **inhibit** is entered, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Reset not allowed for source switching. */
```

or

```
IDNC
/* Input, Data Not Consistent */
/* Inhibit not allowed for source switching. */
```

If the switch request is issued for the SyncFunction value of **src** and SyncAutoreconfiguration is not enabled, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* SyncAutoreconfiguration is not enabled. */
```

The reference switching (reset, inhibit, manual) applies only to DS1 references. The command will not be executed if **reference** is entered for the synchronization function and the provisioned synchronization mode is not External.

After entering this command, the following confirmation message is displayed:

```
/* Caution!  Execution of this command may affect service.
   You have selected the switch-sync command with these parameters:

   SyncFunction=s
   Priority=pri */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-sync

set-sync

rtrv-state-eqpt

NAME

test-alm: Test Office Alarms

INPUT FORMAT

test-alm:[**md**=*Mode*][,**r**=*Repeat*];

DESCRIPTION

This command tests the audible and visible office alarms and associated user panel LEDs.

The specific office alarm test turns on a specific alarm for 10 seconds and turns it off for 10 seconds, after which the office alarm reverts to its normal operation.

The general office alarm test cycles through the various alarm levels (CR, MJ, MN) at 4-second intervals as shown in the following table:

General Alarm Test

Step	Time (Seconds)	ALARM LEVEL CR	MJ	MN
1	0-4	*off*	*off*	*off*
2	4-8	ON	*off*	*off*
3	*8-12*	*off*	ON	*off*
4	*12-16*	*off*	*off*	ON
5	*16-20*	*off*	*off*	*off*

The ACO button functions normally while this test is executing; depressing ACO silences audible office alarms.

Input parameters are:

md Mode identifies the office alarm test to be performed. It takes the following values:

- **all** General test of all office alarms (default)
- **cr** Specific test of critical alarm
- **mj** Specific test of major alarm
- **mn** Specific test of minor alarm

r Repeat specifies the number of times that Steps 2 through 4 should be repeated. It is an integer with a range of **1** through **10** and a default value of **1**.

This command can be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
test-alm: DENY
SSRB
/* Status, System Resource Busy */
```

NAME

test-auto: Test Auto Turnup

INPUT FORMAT

test-auto:md=*Mode*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command performs automatic turnup testing of the DDM-2000.

NOTE:
Automatic turnup tests are not currently available for ring applications. However, software for any nonring release may be used to perform local equipment and local wiring cross-connect tests. Manual automatic turnup tests can be done using the procedures listed in the TOP section (Volume 2) of this document.

The input parameter is:

md Mode specifies the type of turnup test and has the following values:

- **local** Local test
- **dsx** Cross-connect test
- **optics** Optical span test

NOTE:
For OSI releases (Release 6.0 and later), loopbacks on the fiber will cause an "inconsistent DCC switches" alarm condition. The alarm should be ignored during the loopback testing. To avoid this alarm, the user may disable the DCC prior to performing this test.

When the **local** or **dsx** test is input, this command will cause the following confirmation message to be displayed:

```
/* Caution!  Execution of this test may interrupt service.
   You have selected the test-auto command with these parameters:

   Mode=mode */

Execute? (y/n or CANcel/DELete to quit) =
```

The following denial message will be output if the **local** or **dsx** test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resource Busy */
```

When the **local** or **dsx** test is in progress, other commands entered at the **cit** will be denied until the test completes.

```
SSRB
/* Status, System Resource Busy */
/* Automatic <md value> turn up test active */
```

LOCAL TEST

CAUTION:
This test will affect all existing service carried on a shelf. This test should only be executed on an out-of-service shelf.

The local test checks an out-of-service shelf to verify that the transmission and timing circuit packs are operating error-free and that the SYSCTL can communicate with the other circuit packs. Optical loopbacks must be set up manually on the OLIU circuit packs before this test is run as shown in Figure 11-5. If the shelf is equipped as an electrical high speed multiplexer, then EC-1 electrical loopbacks must be set up manually at the STSX-1 cross-connection or through the coaxial connectors provided on the shelf backplane.

NOTE:
Before performing this test, the user should remove the shelf from loop-timed mode. If the shelf is in loop-timed mode during this test, a ? will result, indicating the status of the test results cannot be determined.

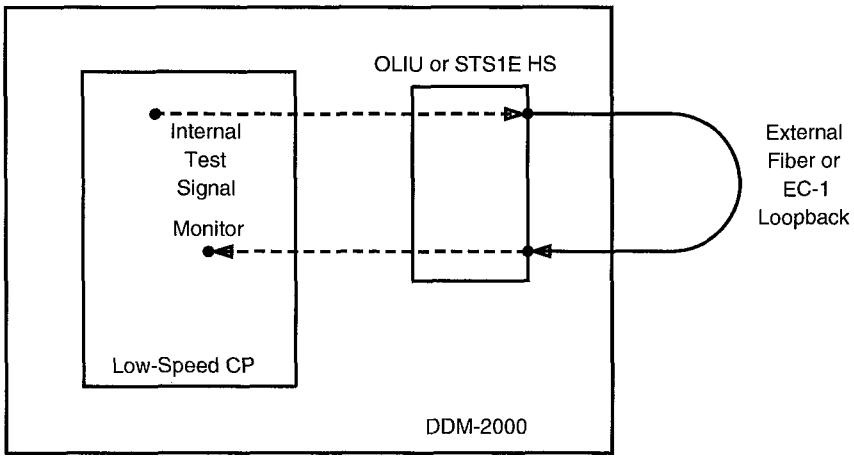


Figure 11-5. Automated Internal Test of Local Equipment (`test-auto:md=local`)

NOTE:
If this test is interrupted by removing the controller circuit pack, loopbacks automatically removed at the end of a completed test will remain in place. The test may be repeated or the loopbacks may be removed using the **`rls-lpbk-t1`** or **`rls-lpbk-t3`** command.

The local test report appears as follows:

```
/* Auto-Turnup Report  --  Local Equipment Test and Timing Ref. Check
================================================================================
--------Timing-------    -----Main-----    -------Function Units-------
tg-1 tg-2 ref-1 ref-2   main-1  main-2   a-1  a-2  b-1  b-2  c-1  c-2
 g    F     g     ?       g       g       g    g    g    F    -    -

Low Speed Group A  Low Speed Group B  Low Speed Group C   --Control--
 1 2 3 4 5 6 7 8    1 2 3 4 5 6 7 8    1 2 3 4 5 6 7 8   sysctl auxctl
 - - - g g F g g    - - - - - - - -    - - - - - - - -     g      g
*/
```

In the report, `g` stands for good, `F` stands for failed, "?" stands for unknown due to other failures, and "-" stands for not applicable (that is, slots not equipped). In addition to the output report, a circuit pack LED indicator will light if the circuit pack has failed.

CROSS-CONNECT TEST

CAUTION:
This test will affect all existing service carried on a shelf. This test should only be executed on an out-of-service shelf.

The cross-connect test checks the low speed DS1 and DS3 interfaces to detect cross-connect wiring or internal equipment problems. If the cross-connect mode is set to manual (**crs=manual**), as set by the **set-ne** command, then manual cross-connections must be entered before this test is run. Loopbacks must also be set up at the DSX before this test is run as shown in Figure 11-6. Additionally, all DS3s under test must be provisioned for clear channel (CC) mode to avoid any alarms during the test.

NOTE:
Before performing this test, the user should remove the shelf from loop-timed mode. If the shelf is in loop-timed mode during this test, a ? will result, indicating the status of the test results cannot be determined.

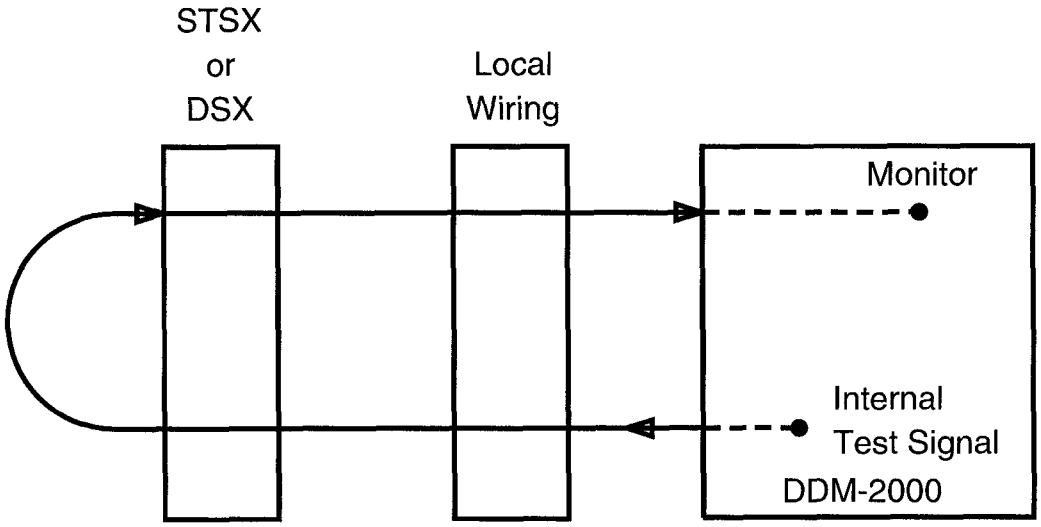


Figure 11-6. Automated Test of Local Wiring to Cross-Connect (test-auto:md=dsx)

The cross-connect test report appears as follows:

```
/* Auto-Turnup Report -- Local Wiring Cross-Connect Test
================================================================================
--Function Units--
fn-a    fn-b    fn-c
  -       F       -

       Low Speed Group A       Low Speed Group B       Low Speed Group C
port     1 2 3 4 5 6 7           1 2 3 4 5 6 7           1 2 3 4 5 6 7
 1       - - - g g ? g           - - - - - - -           - - - - - - -
 2       - - - g F ? g           - - - - - - -           - - - - - - -
 3       - - - g g ? g           - - - - - - -           - - - - - - -
 4       - - - g F ? g           - - - - - - -           - - - - - - -
*/
```

In the report, `g` stands for good, `F` stands for failed, "?" stands for unknown due to other failures, and "-" stands for not applicable (that is, slots not equipped).

In addition to the output report, a circuit pack LED indicator will flash if the port associated with a circuit pack has failed.

OPTICAL SPAN TEST

The optical span test checks the transmission across the optical interfaces. Signals are monitored at both ends of the span. Results from the far end are sent back to the near end for reporting. No manual loopbacks are required for this test. Execution of this test will not affect service. See Figure 11-7.

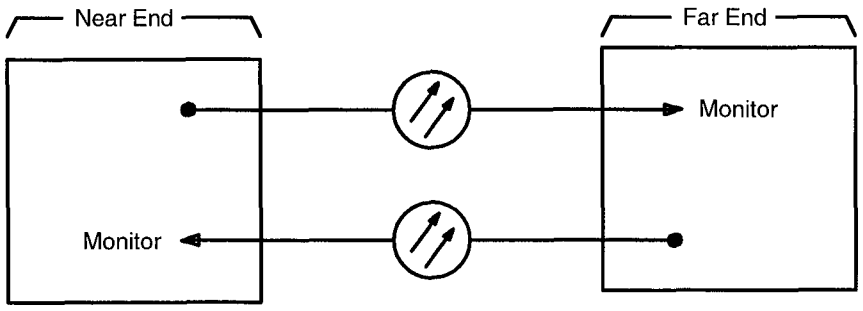


Figure 11-7. Automated Optical Span Test (`test-auto:md=optics`)

The output for the optical span test is as follows:

```
/* Auto-Turnup Report -- Optical Span Test
=============================================================================
EQUIPMENT  -----Main-----  -------Function Units-------
           main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g       g     g    g    g    F    -    -

TRANSMIT   -----Main-----  -------Function Units-------
           main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g       g     g    g    g    F    -    -

RECEIVE    -----Main-----  -------Function Units-------
           main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g       g     g    g    g    F    -    -

DCC        -----Main-----  -------Function Units-------
                               a         b         c
                 g             g         g         -
*/
```

In the report, `g` stands for good, `F` stands for failure (EQUIPMENT, TRANSMIT, RECEIVE, or DCC), "?" stands for unknown failure due to other causes, and "—" stands for not applicable (that is, slots not equipped). In addition to the output report, a circuit pack LED indicator will light if the circuit pack has failed.

RELATED COMMANDS

rtrv-pm-line

test-trmsn-t1

test-trmsn-t3

NAME

test-led: Test LED Indicators

INPUT FORMAT

test-led:[*Address*]:[**r=***Repeat*];

DESCRIPTION

This command activates circuit pack or user panel LEDs for 10 seconds on, then 10 seconds off, after which the LED reverts to normal operation. This command does not affect office alarms.

This test can also be done by pressing the ACO pushbutton on the user panel.

The input parameters are:

Address This parameter accepts the address of any slot(s) or **userpanel**, with a default value of **all**.
Valid Addresses: all, main-{1,2,all}, fn-{a,b,c,all}-{1,2,all}, ls-{a,b,c,all}-{1-8,all}, tg-{1,2,all}, sysctl, auxctl, userpanel

r Repeat specifies the number of times that the test should be repeated. It is an integer with the range **1** through **10**, and a default value of **1**.

This command can be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

When this command is entered while an alarm test is in progress, the following denial message will be output if the test cannot be done due to other activity in the system.

```
test-led:address DENY
SSRB
/* Status, System Resources Busy */
```

NAME

test-sysctl: Test System Controllers

INPUT FORMAT

test-sysctl;

DESCRIPTION

This command causes the entire control system (system controller and overhead controller) to perform a self-test. If this command is entered while a transmission test (**test-trmsn-t1** or **test-trmsn-t3**) is in progress, the following denial message will be displayed:

```
SSRB
/* Status, System Resources Busy  */
```

At the end of the test, one of several messages will be displayed.

If the test passes, the following message will be displayed:

```
test-sysctl: COMPLD
/* DDM-2000 Controller Diagnostic Test Report
================================================================================
Test PASSED
*/
```

If the test fails, one of the following messages may be displayed, indicating that one or both controller circuit packs have failed:

```
test-sysctl: COMPLD
/* DDM-2000 Controller Diagnostic Test Report
================================================================================
SYSCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* DDM-2000 Controller Diagnostic Test Report
================================================================================
OHCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* DDM-2000 Controller Diagnostic Test Report
================================================================================
SYSCTL CP FAILED
OHCTL CP FAILED
*/
```

In addition to a failure message, the Fault LED on the failed circuit pack(s) and the Major alarm LED on the user panel will be illuminated and the MJ office alarm will be activated.

NAME

test-tlm-par: Test Parallel Telemetry

INPUT FORMAT

test-tlm-par:[**md**=*Mode*][,**r**=*Repeat*];

DESCRIPTION

This command provides for general and specific tests of the parallel telemetry outputs. The general test turns all parallel telemetry points on for 20 seconds, then off for 20 seconds, and then reverts to normal operation. The specific test performs similarly, but on only one parallel telemetry point.

The input parameters are:

md Mode identifies the parallel telemetry output(s) to be tested. It takes the following values:

all	- General test of ALL parallel telemetry outputs (static default)
cr	- Specific test of the CRitical alarm
mj	- Specific test of the MaJor alarm
mn	- Specific test of the MiNor alarm
pmn	- Specific test of the Power MiNor alarm
aco	- Specific test of the Alarm Cutoff indicator
clf	- Specific test of the Carrier Line Failure
inc	- Specific test of the INComing status
ne	- Specific test of the Near-End indicator
fe1	- Specific test of the Far-End indicator #1
fe2	- Specific test of the Far-End indicator #2
fe3	- Specific test of the Far-End indicator #3
fe4	- Specific test of the Far-End indicator #4
fe5	- Specific test of the Far-End indicator #5
fe6	- Specific test of the Far-End indicator #6
sid	- Specific test of the Shelf IDentifier
output{1-15}	- Specific test of miscellaneous discrete point number 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15

`r` Repeat specifies the number of times that the test should be repeated. It is an integer with a range of 1 through 10 and a static default value of 1.

This command can be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

NAME

test-tlm-ser: Test Telemetry Serial

INPUT FORMAT

test-tlm-ser:[**d**=*Display*][,**p**=*Point*][,**r**=*Repeat*];

DESCRIPTION

This command initiates specific and general tests of the serial telemetry (TBOS) outputs. During the test, the telemetry points addressed by the command are turned ON and all other points are turned OFF for 20 seconds. When the test completes, all points return to normal operation.

The input parameters are:

d Display is the particular TBOS display being used and has a value between 1 and 8. The default value is that set by option switches on the SYSCTL. For a central office (CO) and the associated remotes, the TBOS display values may be set by option switches. For a remote terminal (RT), only the default values may be used for this test.

p Point is the particular TBOS point(s) to be tested and has the following values:

1-63

even

odd

all (default)

r Repeat is the number of times the test is to be repeated and has a range of 1-10, with a default of 1.

This command may be aborted by depressing the "CANcel" or "DELete" key while the command is in progress.

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

RELATED COMMANDS

test-tlm-par

test-alm

NAME

test-trmsn-t1: Test Transmission T1

INPUT FORMAT

test-trmsn-t1:*Address*:**[dirn=***Direction***][,dur=***Duration***]**;

DESCRIPTION

CAUTION:
Execution of this command will affect service. This command causes the insertion of a test signal on the selected channel in the MUX or DEMUX direction and will affect service on the selected channel.

This command sets up an automated transmission test for a low-speed DS1 port. The test signal is a repetitive pattern which the system checks for bit errors. Only one channel is tested each time; multiple channels may not be tested simultaneously. Before this command is executed, the signal must be appropriately looped back. DDM-2000 checks for the presence of a loopback before beginning the test. If no loopback exists, the system will return a warning message before performing the test.

This command is used for installation of new equipment and for maintenance.

The input parameters are:

Address — Address of the DS1 port.
Valid Addresses: **{a,b,c}-{1-7}-{1-4}**

dirn — Direction of the transmission test. This parameter has the following values:

- **mux** — The test signal is inserted in the MUX direction (towards the optical fiber) as shown in Figure 11-8 on the following page. This is the default for this parameter.
- **demux** — The test signal is inserted in the DEMUX direction (towards the DSX) as shown in Figure 11-9 on the following page.

dur — Duration of the test in minutes. This value has a range of 1 through 120 with a default value of 1.

This command can be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

NOTE:
For OSI releases (Release 6.0 and later), loopbacks on the fiber when testing in the MUX direction will cause an "inconsistent DCC switches" alarm condition. The alarm should be ignored during the loopback testing. To avoid this alarm, the user may disable the DCC prior to performing this test.

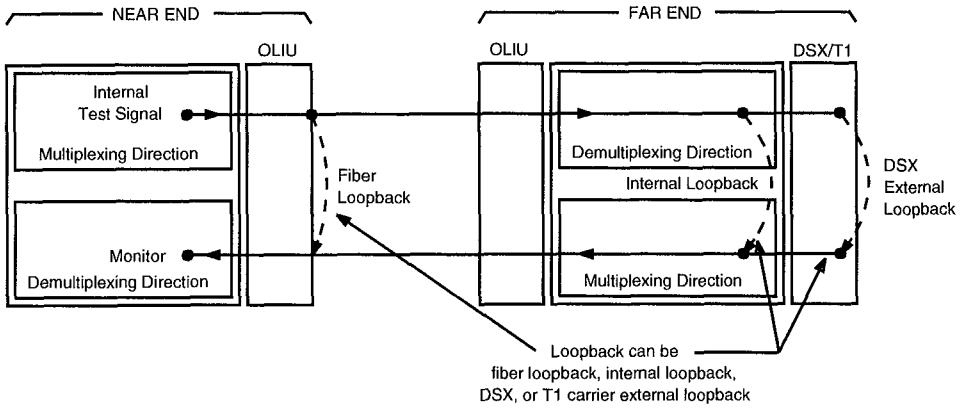


Figure 11-8. Automated Transmission Test of DS1 Signal in MUX Direction

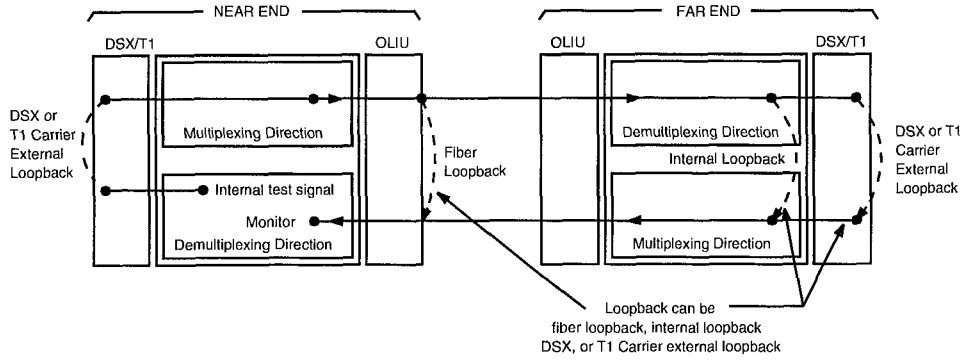


Figure 11-9. Automated Transmission Test of DS1 Signal in DEMUX Direction

This command displays the following output report:

```
/* DS-1 Transmission Test Report
================================================================
DS-1 Port = addr, Direction = dirn, Duration = dur minutes
================================================================
Elapsed        Errored
Time(sec)      Seconds
================================================================
 nnn             nnn
  .
  .
  .
 nnn             nnn
  */
```

The output parameters are:

`DS1 Port`	The address of the DS1 port
`Direction`	The direction of the transmission test
`Duration`	The duration of the test in minutes
`Elapsed Time`	Elapsed time of the test in seconds
`Errored Seconds`	Total number of errored seconds

A question mark (?) as the rightmost character in the `Errored Seconds` indicates uncertain data because of a protection switch during the test.

If an equipment failure is detected during test, the following message is displayed:

```
/* Hardware failed - Test Aborted */
```

The system checks for presence of a loopback at the beginning of the test. If a loopback does not exist, the test continues and the following message appears before and after the report:

```
/* Preliminary hardware test indicates no loopback. */
```

If the test is interrupted or aborted, the following message is displayed:

```
/* Test Manually Aborted */
```

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

When this command is entered, the following confirmation message is displayed:

```
/* Establish appropriate loopbacks (manual or electronic)
   prior to test execution, if appropriate. */

/* Caution! Execution of this test may interrupt service.
   You have selected the test-trmsn-t1 command with these parameters:

   Address = x
   Direction = dirn
   Duration = dur */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

opr-lpbk-t1

rls-lpbk-t1

NAME

test-trmsn-t3: Test Transmission T3

INPUT FORMAT

test-trmsn-t3:*Address*:**[dirn=***Direction***][,dur=***Duration***];**

DESCRIPTION

CAUTION:
Execution of this command will affect service. This command causes the insertion of a test signal on the selected channel in the MUX or DEMUX direction and will affect service on the selected channel.

This command sets up an automated transmission test for a low-speed DS3 port. The direction of the test can be towards either the MUX (towards the optical fiber) or the DEMUX (towards the DSX) transmission directions. The test signal is a framed DS-3 signal which DDM-2000 checks for P-bit parity errors. Only one channel is tested each time; multiple channels may not be tested simultaneously. Before this command is executed, the signal must be appropriately looped back.

This command is used for installation of new equipment and for maintenance. In either case, the signal must be appropriately looped back.

If the test is run in the MUX direction and an external loopback is established at the far end, then the far end must be provisioned for clear channel (CC) mode with no AIS in order to test the entire transmission path. If an external loopback is used and the far end is provisioned for VMR Mode, only errors in the receive direction will be monitored.

If the test is run using a DS3 internal loopback, DDM-2000 automatically puts the path in clear channel mode while the loopback is active. When the loopback is released, the mode returns to its previous state.

DDM-2000 checks for the presence if a loopback before beginning the test. If no looback exists, the system will return a warning message before peforming the test.

NOTE:
For OSI releases (Release 6.0 and later), loopbacks on the fiber when testing in the MUX direction will cause an "inconsistent DCC switches" alarm condition. The alarm should be ignored during the loopback testing. To avoid this alarm, the user may disable the DCC prior to performing this test.

The input parameters are:

Address Address of the DS3 port.
Valid DS3 Port Addresses: **{a,b,c}**

dirn Direction of the transmission test. This parameter has the following values:

mux The test signal is inserted in the MUX direction and the received signal is monitored from the MUX direction (default) as shown in Figure 11-10.

demux The test signal is inserted in the DEMUX direction and the received signal is monitored from the DEMUX direction as shown in Figure 11-11.

dur Duration of the test in minutes. This value has a range of 1 through 120 with a default value of 1.

This command can be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

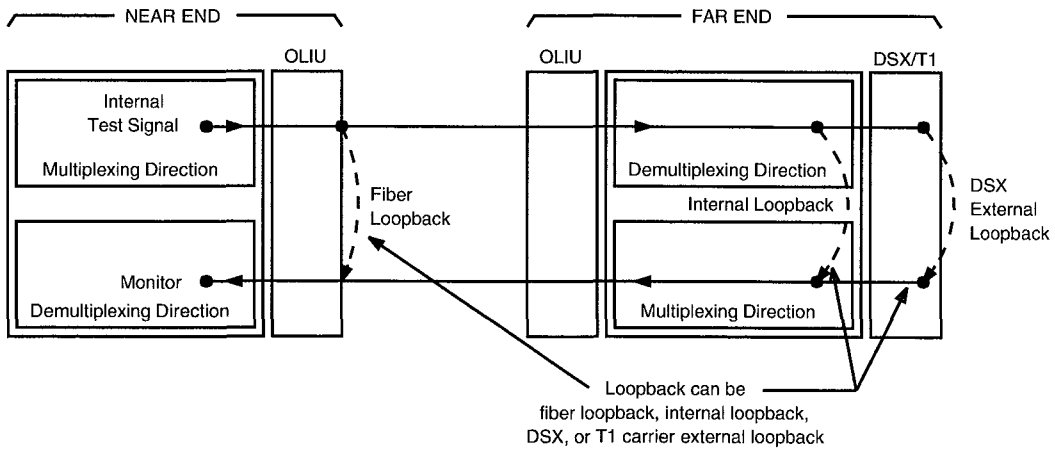


Figure 11-10. Automated Transmission Test of DS3 Signal in MUX Direction

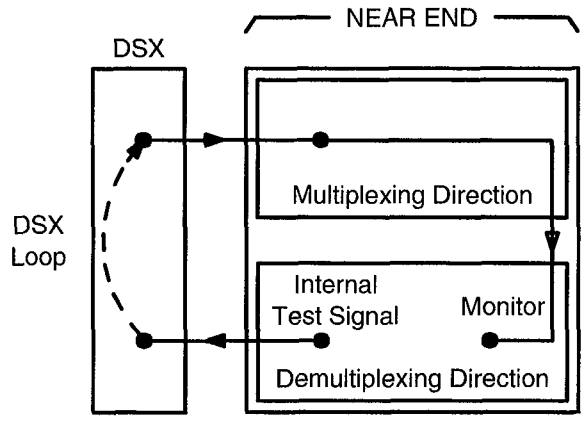


Figure 11-11. Automated Transmission Test of DS3 Signal in DEMUX Direction

This command displays the following output report:

```
/* DS-3 Transmission Test Report
================================================================
DS-3 Port = addr, Direction = dirn, Duration = dur minutes
================================================================
Elapsed        Errored
Time(sec)      Seconds
================================================================
 n               n       Out Of Frame
 .               .
 .               .
 .               .
  */
```

The output parameters are:

`DS3 Port`	The address of the DS3 port
`Direction`	The direction of the transmission test
`Duration`	The duration of the test in minutes
`Elapsed Time`	Elapsed time of the test in seconds
`Errored Seconds`	Total number of errored seconds

A question mark (`?`) as the rightmost character in the `Errored Seconds` column indicates uncertain data because of a protection switch during the test.

The message "Out Of Frame" appears in the report if an out-of-frame condition is detected during the test.

If an equipment failure is detected during the test, the following message is displayed:

```
/* Hardware Failed - Test Aborted */
```

The system checks for the presence of a loopback at the beginning of the test. If a loopback does not exist, the test continues and the following message appears before and after the report:

```
/* Preliminary hardware test indicates no loopback. */
```

If the test is interrupted or aborted, the following message is displayed:

```
/* Test Manually Aborted */
```

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

When this command is entered, the following confirmation message is displayed:

```
/* Establish appropriate loopbacks (manual or electronic)
   prior to test execution, if appropriate. */

/* Caution! Execution of this test may interrupt service.
   You have selected the test-trmsn-t3 command with these parameters:

   Address = x
   Direction = dirn
   Duration = dur */
Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

opr-lpbk-t3

rls-lpbk-t3

rtrv-pm-t3

NAME

toggle: Toggle Between Local and Remote Sessions

INPUT FORMAT

^t (Press "t" while holding the CTRL key)

DESCRIPTION

This command toggles the user between the local and remote sessions. It provides a quick and easy way to switch from the local session to the remote session, while not terminating either one. The user must have established two valid sessions with network elements (NEs) in the local NE's subnetwork before this command executes successfully.

This command may be entered *only* between command executions; that is, *only* at the system prompt. If entered as a response to a parameter prompt, an error message will be displayed.

This command does not display a typical completion message. When entered, the TID for the NE switched to is displayed, followed by the date and time. This line is followed by a prompt from that system.

The following denial message will be output if the toggle cannot be performed.

```
SNVS
/* Status, Not in Valid State */
/* No remote login is active */
```

If the toggle request fails due to a far end communication failure (after trying for 45 seconds or more), the following denial message will be displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Far end Communication failure */
```

RELATED COMMANDS

logout

rlgn

NAME

upd: Update Equipment List

INPUT FORMAT

upd;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command updates the system data base (as recorded in the nonvolatile memory) to reflect the existing hardware configuration and incoming signals.

This command can be executed either by pushing the Update/Initialize button, located on the SYSCTL circuit pack, or by entering the command from the CIT. When the Update/Initialize button is pushed, a dot (.) will appear on the 7-segment display.

NOTE 1:
upd may be performed at any time *except* before or during the 10-second window after powering up the System Controller (SYSCTL), while the CR LED is flashing.

NOTE 2:
For OSI releases (Release 6 and later), the user should note that the critical LED light on the SYSCTL circuit pack will continue to flash after pressing the Update/Initialize button for a system reset. Do *not* reenter this command. The LED light will stop flashing after 10 seconds.

This command should be executed after the following:

- Removing a circuit pack — Activating the **upd** command following circuit pack removal deletes the circuit pack from the equipment list and clears the associated alarm. This command also changes the slot state to *auto*. Failure to update after removing a circuit pack will continue the "CP removed" alarm, which will become an "unexpected CP type", or similar alarm when a new and different type of circuit pack is placed in the slot. Performing the update at this later time will clear this alarm and provide default provisioning for the new circuit pack, provided the circuit pack is acceptable.
- Removing a signal input — When an incoming OC-1, DS1, DS3 or EC-1 signal is removed, the system data base must be updated to reflect the change and clear the associated alarm.

- Removing an STS1 or VT1.5 AIS alarm for incoming channels.
- Changing a switch setting on a circuit pack — The **upd** command should be activated following switch setting changes on the BBF1 DS1, BBF3 DS1PM, BBG6 STS1E, 21G OLIU, or BBF2/BBF2B TGS circuit packs. This command enters the new settings into the system. Failure to update will cause an "unexpected CP switches" or "unexpected CP type" alarm, since the new switch settings do not agree with the switch settings already recorded in the system. Activating the update function will clear this alarm and make the new switch settings effective.

- Replacing Circuit Pack types — The user can "upgrade" from one type of circuit pack to another type in some cases:
  1. For low-speed slots — between BBF1 and BBF3 type DS1 packs
  2. For 1+1 slot pairs — between 21 type and 22 type OLIU packs.
  3. For low-speed slots (b & c) — between BBG6 and 22 type OLIU packs for ring applications.
  4. For timing slots — between BBF2 and BBF2B TGS packs.
  5. For 1+1 slot pairs — between 21 type OLIU packs.

  Following documented upgrade procedures, the old type circuit pack is removed and replaced with the new type circuit pack. Activating the update function will clear the alarm for new pack type and make the new circuit pack settings active.

  Note: Upgrading from EC-1/DS3 to OC-3/IS-3 will force application to 1+1.

ALARM RESTRICTIONS

Pressing the UPD button or issuing the **update** command will *not* change provisioning if the following alarms exist. The user will have to correct the alarmed condition before executing this command. These alarms are:

- illegal CP type
- CP not allowed -(*reason*)
- 2nd CP required for BBF3
- invalid CP switches.

SYSTEM RESTRICTIONS AND CORRECTIVE ACTIONS

Pressing the UPD button or issuing the **update** command will not retire a "CP removed", "unexpected CP Type", or "unexpected CP switches" alarm or allow the system to accept the new provisioning request if certain system conditions exist. The user will have to correct the condition before updating the system.

If a restriction is detected, the following message will be displayed:

```
/* Address not equipped properly -- provisioning unchanged. */
```

The system restriction and corrective actions needed are:

- **Port status in NMON or IN SERVICE**
  If a low-speed circuit pack is removed before the incoming signal is removed or while the associated port or ports are in the *nmon* state, the system will not recognize that service is no longer being carried on the port and will not remove the circuit pack from the equipment list.
  Corrective Action: If the port is in the *nmon* state, it must be moved to the *auto* state, using the **set-state-t1**, **set-state-t3**, **set-state-ec1**, or **set-state-oc1** command, before the circuit pack can be removed and the system can be updated. If an incoming signal is present, it must first be removed, then the circuit pack can be removed, and the system can be updated.

- **Manual cross-connection exists**
  A manual cross-connection is entered into the system when an arrangement other than the default is desired, and to support various applications.
  Corrective Action: The system will not recognize a circuit pack removal until the manual cross-connection to the addressed circuit pack is deleted. (See the **dlt-crs-sts1**, **dlt-crs-vt1**, **rtrv-crs-vt1**, and **rtrv-crs-sts1** commands for more information on manual cross-connections.) Note: For 1+1 or 1x1 slot pairs, one circuit pack of the pair can be removed as long as the other remains to support the cross-connection.

  For rings systems, the MAIN circuit packs are special, and all cross-connections in the system must be deleted before the addressed circuit pack can be removed.

- **Low speed protection circuit pack in service**
  The low-speed protection slot is currently supporting service.
  Corrective Action: Before the protection pack can be removed and the protection slot moved to the `auto` state, the service must be moved back to the service pack.

- **Upgrades from Slot 2**
  Upgrades from Slot 2 are not permitted when Slot 1 is equipped.
  Corrective Action: The documented upgrade procedures to change one type of circuit pack for another require that the change first be made in slot 1 of a slot pair when slot 1 is equipped.

- **TGS switches do not support timing source selected**
  The shelf is currently provisioned to be loop timed and the new TGS pack type or switch settings do not support the existing condition.
  Corrective Action: Reset the switches on the TGS circuit pack, or replace the circuit pack with one that supports timing from FN-C; or change Looptiming source to MAIN. The system may loop-time only from an 21- or 22-type OLIU in the MAIN or FN-C slots; the 27-type OLIU does not support loop timing.

- **Timing Source removed**
  When the sync timing source is provisioned to be LoopTimed and the addressed circuit pack is selected for timing, the slot state will not change to `auto`.
  Corrective Action: Insert an OLIU circuit pack that supports the timing selected or change the timing source.

- **Sync Autoreconfiguration Selected**
  When the sync timing is provisioned for Autoreconfiguration and the addressed circuit pack is one of the sources for timing, the slot state will not change to `auto`.
  Corrective Action: Insert an OLIU circuit pack that supports the timing selected or change the timing provisioning.

If a protection switch request of **forced**, **inhibit**, or **lockout** is specified to a slot that is now empty, entering the **upd** command may cause the protection switch to occur possibly affecting service. When this occurs, the following confirmation message will be displayed:

```
/* Caution!  Execution of the update command may interrupt
   service because of an active protection switch request on
   an empty slot.  It also updates the equipment list and
   initializes ALL parameters associated with empty slots. */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

dlt-crs-sts1

dlt-crs-vt1

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-eqpt

rtrv-state

set-state-t1

set-state-t3

set-state-ec1

set-state-oc1

Detailed Alarm and History Reports

This part provides details of the Retrieve Alarm and Retrieve History commands, with explanations of specific output messages.

Each command includes an **INPUT FORMAT** part, providing the syntax for the command, and a **DESCRIPTION** part, providing the details of the command input and output parameters. Following the **DESCRIPTION** part is a table listing the output messages associated with each command and a description of each message.

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

rtrv-alm:[*Address*]:[**alm=***AlarmLevel*]; (Release 6.0 and earlier)
rtrv-alm[:alm=*AlarmLevel*]; (Release 6.1 and all later releases)

DESCRIPTION

This command displays a report of active alarm and status conditions. The report includes the source address of the alarm, as well as the date and time of the alarm, whether or not the condition is service affecting, and a short description of the condition.

The input parameters are:

Address Address of one or more slots. The default is address is ***all***. In Releases 6.1 and later, this parameter is not used and all slots are always reported.
Valid Slot Addresses: **all, main-{1,2,all}, fn-all, fn-{a,b,c}-{1,2,all}, ls-all, tg-{1,2,all}, ls-{a,b,c}-{1-8,all}, sysctl, auxctl**

alm AlarmLevel for which a report is desired. This parameter may have one of the following values:

all

cr

mj

mn

pmn

other

Alarms are listed from greatest to least severity. Within a severity level, newer alarms are listed first.

Example Alarm Report:

```
/* Active Alarms and Status Report
================================================================
 Alarm       Source    Date   Time      Srv   Description
 Level       Address     Detected
================================================================
 Condition   address   MM-DD HH:MM:SS   srv   description
                             .
                             .
                             .
 Condition   address   MM-DD HH:MM:SS   srv   description
*/
```

The output parameters are:

`Alarm Level` Alarm level is the alarm or status condition being reported. A status condition is named status if there is no user panel LED illuminated for that condition. An alarm condition is the name of the topmost LED on the user panel that is illuminated and may be one of the following:

`CRITICAL`

`MAJOR`

`MINOR`

`PWR MINOR`

`abnormal (status LED)`

`ne-acty (status LED)`

`farend (status LED)`

`status (no LED)`

NOTE:
For Release 7.2, the `farend` alarms refer to alarms in the same alarm group as the local network element.

`Source Address` Source address is the address of the event. An event source may be a slot, channel, port, or an operations interface. See Table 11-1 at the beginning of this section for the address of slots, ports, channels, and operations interfaces, respectively.

`Date Detected` Month (MM) and day (DD) of the event.

`Time Detected` Time (Hours, Minute, Seconds) of event occurrence.

`Srv` Srv indicates whether the condition is service affecting or not, and may have the following values:

`SA`	Service affecting
`NSA`	Not service affecting
-	Not applicable for this condition (not service affecting).

`Description` Table 11-2 lists the meanings and likely causes of the conditions reported in the alarm and status report. For conditions with more than one possible cause, the most likely causes are listed first.

Table 11-2. RTRV-ALM Descriptions

Description	Meaning
2nd CP required for BBF3	The BBF3 (DS1PM) circuit pack requires both function unit slots in the group to be equipped. A second circuit pack of the same type should be inserted in the empty function unit slot.
-48V power/fuse failed	A -48 volt power feeder or a fuse on the user panel has failed.
AC power failed	The AC power supply to a remote terminal cabinet has failed.
ACO active	The parallel telemetry outputs and audible office alarms normally active due to the alarm conditions in the system are being suppressed. See the **opr-aco** command.
AGNE communication failure	This alarm is declared by a remote network element if it cannot establish communication with an alarm gateway network element (AGNE). The alarm is also declared by an AGNE that cannot establish communication with one or more NEs in its alarm group. Use the **set-ne** command to assign the NE to an alarm group or assign one of the NEs as an AGNE to clear the alarm.
APS - automatic lock	The service associated with a DS1 CP has been automatically switched and locked onto the protection DS1 CP. The automatic protection switching (APS) lock will remain active until midnight. Cause: Four automatic switches of a single DS1 CP in 10 minutes, probably because of an intermittent failure of the DS1 CP.
APS channel failed	The SONET automatic protection switching (APS) channel on the protection OC-3 line has failed. Likely causes: Failure of the OLIU CP on the protection line at the far end; failure of the OLIU CP on the protection line at the near end.
auto turnup test IP	An automatic turnup test is in progress.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
communication failure	The system is not communicating with another shelf in the subnetwork. The **rtrv-nmap** command will report the name of the system(s) with which this system is not communicating. Likely cause: An unprotected OC-n line failure in the subnetwork; a controller failure, reset, or initialization on another shelf; section DCC channel failure on this or another shelf; failure of the OHCTL CP.
control**n**	The specified environmental control point (miscellaneous discrete output) is active. Note: The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the **rtrv-attr-cont** and **set-attr-cont** commands. Cause: The system was instructed to close the environmental control point by either a TBOS control point or by the closing of the corresponding environmental control input at the far end.
CP not allowed-(crs)	The circuit pack does not support the manual cross-connection(s) currently provisioned for this slot. The user should change the circuit pack type or change the cross-connection(s) to the slot.
CP not allowed-(eqpt)	A DS1 or DS1PM CP is installed in a low speed slot associated with a function unit currently provisioned for DS3, STS1E_L, or OLIU service. The DS1 or DS1PM CP should be removed from the shelf, or the function unit CP should be replaced with a MXRVO or STS1E_H CP.
CP not allowed-(timing)	When associated with a TG slot, the current circuit pack switch settings do not support the synchronization timing provisioned. The user should change the circuit pack switches or change the settable synchronization parameters. When associated with function unit slot C, the circuit pack type does not support the current provisioned synchronization parameters. The circuit pack type or the timing options should be changed.
CP removed	A CP previously installed in this system is removed. The CP should be replaced, or an "update" should be done to remove it from the system equipment list.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
DS1 CP failed	Internal equipment failure of the specified DS1 CP.
DS1 loopback	A loopback (toward the optical fiber) is active on the specified T1 port. See the **opr-lpbk-t1** and **rls-lpbk-t1** commands.
DS1 trmsn test IP	A transmission test using the internal test signal generator and monitor is in progress on the specified T1 port. See the **test-trmsn-t1** command.
DS1PM CP failed	Internal equipment failure of the specified DS1PM CP.
DS3 CP failed	Internal equipment failure of the specified DS3 CP.
DS3 loopback	A loopback (toward the optical fiber) is active on the specified T3 port. See the **opr-lpbk-t3** and **rls-lpbk-t3** commands.
DS3 trmsn test IP	A transmission test using the internal test signal generator and monitor is in progress on the specified T3 port. See the **test-trmsn-t3** command.
DSNE communication failure	No network element in a subnetwork has been designated a directory service network element (DSNE). Use the **set-ne** command to provision one (and only one) DDM-2000 shelf as the DSNE. See the **set-ne** and **rtrv-ne** commands for DSNE provisioning information.
duplicate DSNE	For Release 7.2 only, a network element has been provisioned as a directory services network element (DSNE) in a subnetwork that already has a DSNE. Only one NE in the subnetwork may be provisioned as the DSNE to ensure proper DCC communication between nodes. See the **set-ne** and **rtrv-ne** commands for DSNE provisioning information.
duplicate GNE	For Release 7.1 and earlier, a shelf has been provisioned as a gateway network element (GNE) in a network that already has a GNE. Only one NE in the network may be provisioned as the GNE. For Release 7.2, this alarm message does not apply. See the **set-ne** and **rtrv-ne** commands for GNE provisioning information.
duplicate site/ne address	Two or more shelves in the network have the same site address (determined by switches on the SYSCTL CP) and the same network element address (determined by switches on the OHCTL CP).

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`duplicate TBOS display`	Two or more shelves in the network have the same TBOS display number (determined by switches on the SYSCTL CP).
`duplicate TID`	Two or more shelves in the network have the same system name or "TID" set by the **`set-ne`** command.
`EC1 loopback`	A loopback (toward the optical fiber) is active on the specified EC1 port. See the **`opr-lpbk-ec1`** and **`rls-lpbk-ec1`** commands for more information.
`environment`**n**	The specified environmental alarm point (miscellaneous discrete input) is active. Note: The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the **`rtrv-attr-env`** and **`set-attr-env`** commands.
`excessive holdover`	The system has been in holdover mode for more than 4 hours. This may cause degraded performance (high error rates) on the transmitted and/or received signals. Whenever this condition exists, the condition "`holdover mode active`" also exists. Likely Causes: See "`holdover mode active`".
`externalMinor`	The external minor alarm input (environmental alarm input 15) is active. Typically, this input will be connected to the power shelf, and will indicate that the DC power or the cooling fan in a remote terminal cabinet has failed. Note: The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the **`rtrv-attr-env`** and **`set-attr-env`** commands.
`fan control relay failed`	The thermostat on the SYSCTL indicates that the cooling fan should be turned on, and the fan control relay on the SYSCTL CP failed to operate or the fan control relay output (backplane connector P62) does not connect to a fan. The system will continue to operate but might overheat if the SYSCTL controls a fan, leading to degraded or interrupted transmission and/or circuit pack failures. Cause: Telemetry output common pin on P62 is not grounded; SYSCTL CP failure.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`fan shelf failed`	The system has detected a failure of the DDM-2000 fan shelf. The system will continue to operate but it may overheat. The fan must be replaced within *4 hours* of the failure; otherwise service might be interrupted and/or circuit packs might fail. Likely causes: Filter needs replacing, a fan pack failed, fan shelf has lost one or both power feeders, or the fan shelf control board has failed.
`forced switch`	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and an automatic or manual protection switch to make this the active receiving line will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. **`Note:`** switching is unidirectional (one-way). Because of this, the specified line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. See the **`switch-line`** command. When associated with a function unit slot or a low-speed service slot, this message means that the identified equipment is not active, and an automatic or manual switch to make it active will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. See the **`switch-fn`** and **`switch-ls`** commands.
`Frequency error`	This alarm condition indicates that an incoming timing signal has an unacceptable frequency offset. Likely causes: A DS1 external timing reference to the local shelf or a remote shelf has a frequency offset greater than about 20 hertz.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
holdover mode active	The system is in holdover synchronization mode. Likely Causes: a. The system was manually switched to holdover mode (with the **switch-sync** command, or, in a central office system, with a TBOS control point) and the switch has not been reset; or b. the system automatically switched to holdover mode due to failure of the timing references, and either: 1. the reference failures have not cleared, 2. the system is provisioned for nonrevertive synchronization mode switching, 3. the system is provisioned for External timing and no external timing references are available, 4. the system is provisioned for loop-timed operation and the optical line or OLIU circuit pack has failed, or a message indicating an upstream clock problem has been received on the sync message bits of the optical line, (See the **rtrv-sync** command) 5. the system is provisioned for sync message signaling, but the upstream system from which it loop-times has not been provisioned for sync message signaling. The condition can be cleared by provisioning both systems the same. (See the **set-sync** and **rtrv-sync** commands.) The condition can be cleared by repairing at least one of the timing references (if both are failed) and resetting synchronization mode protection switch with the command **switch-sync:s=mode,pri=reset**. In a central office system, the synchronization mode can also be reset with a TBOS control point.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`illegal CP type`	An illegal or unknown circuit pack type has been inserted into the shelf. The circuit pack should be removed from the shelf.
`inc. (from DSX) DS1 LOS`	At least 128 consecutive zeros are received in the DS1 signal incoming from the DSX-1, or the energy at the DS1 input is below a preset threshold. Likely causes: Hard failure of upstream equipment or facility (towards the DSX-1). The DS1 input is disconnected at the backplane or the DSX-1; equipment is failed or removed at DSX-1.
`inc. (from DSX) DS1 sig fail`	The bit error ratio (BER) in the DS1 signal incoming from the DSX-1 exceeds the provisioned failure threshold, 10^{-3} or 10^{-6}. Likely causes: Mismatch of line code (AMI/B8ZS); failure of upstream equipment or facility (towards the DSX-1); cross talk in office wiring; failure of the DS1 CP.
`inc. DS1 sync. ref. AIS`	DS1 alarm indication signal (AIS) is being received from the DS1 synchronization reference signal. Likely causes: Failure of upstream equipment or facility (towards the DSX-1).
`inc. DS1 sync. ref. BER`	The bit error ratio (BER) in the DS1 synchronization reference signal exceeds 10^{-3}. Likely causes: Failure of upstream equipment or facility (towards the DSX-1).
`inc. DS1 sync. ref. EOOF`	Excessive out-of-frame (OOF) events were detected in the DS1 synchronization reference signal. Excessive OOF is defined as more than 512 out-of-frame events in one day. Likely cause: Failure of the incoming DS1 synchronization reference signal.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`inc. DS1 sync. ref. LOF`	The system is unable to frame on the DS1 synchronization reference signal. Likely causes: Upstream failure in the clock providing the reference signal; high bit error ratio on the received signal, caused by failure of the office timing supply that provides the DS1 timing reference; the system is provisioned for SF format on the specified DS1 synchronization reference signal and the received DS1 signal is in ESF format.
`inc. DS1 sync. ref. LOS`	At least 128 consecutive zeros were received in the DS1 synchronization reference signal, or the energy at the DS1 input is below a preset threshold. Likely causes: Failure of the office timing supply that provides the DS1 timing reference or failure of the connection to the timing supply.
`inc. DS1 sync. ref. OOL`	The incoming DS1 synchronization reference signal is out of lock (OOL). The frequency of the clock providing the DS1 reference signal is out of specification. Likely causes: Failure of the office timing supply that provides the DS1 timing reference.
`inc. (from OC-3) DS3 AIS`	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. Likely causes: The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end.
`inc DS3 LOS`	At least 128 consecutive zeros were detected in the DS3 signal received from the DSX-3. Likely causes: Equipment failed or removed at DSX-3; DS3 input disconnected at the DSX-3 or at the DDM-2000 backplane.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
inc. (from OC-3) DS3 OOF	The system has detected a DS3 out-of-frame (OOF) condition in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. This condition is reported only if the DS3 interface is provisioned in VM or VMR mode. See the **set-t3** and **rtrv-t3** commands. Likely causes: An out-of-frame DS3 signal incoming to the DSX-3 at the far end; failure of the DS3 CP at the far end or near end; the DS3 signal is looped at both ends.
inc. (from DSX) DS3 sig. fail	The bit error ratio (BER) in the incoming DS3 signal exceeds the provisioned failure threshold, 10^{-3} or 10^{-6}. Likely causes: Failure of the upstream equipment or facility (towards the DSX-3); cross talk in office wiring; unprotected failure of DS3 CP.
inc. EC1 FERF	The system has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal. Likely causes: The far end has detected an incoming signal failure on the specified EC-1 line. This may be caused by failure of the STS1E or 3STS1E CP at the near end, the STS1E or 3STS1E CP at the far end, or the transmit cable on the specified line.
inc. EC1 LOF	The system has detected a loss-of-frame (LOF) condition in an incoming EC-1 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the STS1E or 3STS1E or equivalent CP at the far end, failure of the STS1E or 3STS1E or equivalent CP at the near end, failure of the incoming cable, or a cable disconnect at the STSX-1 or shelf connector.
inc. EC1 LOS	The system has detected a loss-of-signal (LOS) condition on the EC-1 line. Likely causes: Failure of the incoming signal or cable from the STSX-1, failure of the STS1E or 3STS1E CP at the near end, or a cable disconnect at the STSX-1 or shelf connector.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`inc. EC1 line AIS`	The system has detected an EC-1 line alarm indication signal (AIS) on an incoming EC-1 line. Likely cause: Failure of an STS1E or 3STS1E CP at the far end.
`inc. EC1 sig. degrade (BER)`	The bit error ratio (BER) in the received EC-1 signal exceeds the provisioned threshold (10^{-5} to 10^{-9}). Likely causes: Failure of the STS1E or 3STS1E CP at the near end, failure of the incoming cable, cross talk in office wiring, or failure of the incoming signal from the STSX-1.
`inc. EC1 sig. fail (BER)`	The bit error ratio (BER) in the received EC-1 signal exceeds the fixed threshold of (10^{-3}). Likely causes: Failure of the STS1E CP at the near end, failure of the incoming cable, cross talk in office wiring, or failure of the incoming signal from the STSX-1.
`inc. OC3 BER`	The bit error ratio (BER) in the received OC-3 signal exceeds 10^{-3}. Likely causes: Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.
`inc. OC3 FERF`	The system has detected the OC-3 far end receive failure (FERF) signal in the incoming OC-3 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-3 line. This may be caused by failure of the OLIU CP at the near end, the OLIU CP at the far end, or the transmit fiber on the specified line.
`inc. OC3 LOF`	The system has detected a loss-of-frame (LOF) condition in an incoming OC-3 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`inc. OC3 LOP STS1 x`	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. The *x* identifies the STS-1 tributary reporting the LOP. Likely causes: If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of a MXRVO or DS3 CP at the far end. If this condition occurs only on one OC-3 line, the likely cause is failure of the OLIU CP at the near end or far end.
`inc. OC3 LOS`	The system has detected loss-of-signal (LOS) condition on the OC-3 line. Likely causes: Failure of the OLIU CP at near end, failure of the OLIU CP at far end, or failure of the receive fiber.
`inc. OC3 line AIS`	The system has detected OC-3 line alarm indication signal (AIS) on an incoming OC-3 line. Likely cause: Failure of an OLIU CP at the far end.
`inc. OC3 sig. degrade (BER)`	The bit error ratio (BER) in the specified OC-3 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3}. Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, failure of the receive fiber, or incorrect setting of the optical power switch on the OLIU CP.
`inc. OC3 sig. failed (BER)`	The bit error ratio (BER) in the received OC-3 signal exceeds 10^{-3}. Likely causes: Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.
`inc. OC1 FERF`	The system has detected the OC-1 far end receive failure (FERF) signal in the incoming OC-1 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-1 line. This may be caused by failure of the OLIU CP at the near end, the OLIU CP at the far end, or the transmit fiber on the specified line.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
inc. OC1 LOF	The system has detected a loss-of-frame (LOF) condition in an incoming OC-1 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.
inc. OC1 LOS	The system has detected loss-of-signal (LOS) condition on the OC-1 line. Likely causes: Failure of the OLIU CP at near end, failure of the OLIU CP at far end, or failure of the receive fiber.
inc. OC1 line AIS	The system has detected OC-1 line alarm indication signal (AIS) on an incoming OC-1 line. Likely cause: Failure of an OLIU CP at the far end.
inc. OC1 sig. degrade (BER)	The bit error ratio (BER) in the specified OC-1 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3}. Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.
inc. OC1 sig. failed (BER)	The bit error ratio (BER) in the received OC-1 signal exceeds 10^{-3}. Likely causes: Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.
inc. STS1 AIS	The system has detected an incoming STS-1 alarm indication signal (AIS) in the active OC-3 or OC-1 line. The system responds by transmitting DS1 or DS3 AIS toward the DSX and transmitting STS-1 yellow back toward the fiber from which the AIS is being received. Likely causes: incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or failure of a DS3, MXRVO, STS1E, or OLIU CP at the far end; unprotected optical line failure.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`inc. STS1 LOP EC1 x`	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. The *x* identifies the slot that detects the LOP. Likely causes: Failure of the far end or near end STS1E or 3STS1E circuit pack.
`inc. STS1 LOP OC1 x`	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. The *x* identifies the slot that detects the LOP. Likely causes: If this condition occurs on the STS-1 on both OC-1 lines, the likely cause is an unprotected failure of an MXRVO or an OLIU CP at the far end. If this condition occurs on only one OC-1 line, the likely cause is failure of the OLIU CP at the near end or far end.
`inc. STS1 LOP OC3 x`	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. The *x* identifies the slot that detects the LOP. Likely causes: If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of an MXRVO or a DS3 CP at the far end. If this condition occurs on only one OC-3 line, the likely cause is failure of the OLIU CP at the near end or far end.
`inc. STS1 sig. degrade (BER)`	For STS-1 path switched ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold. Likely Causes: Failure at a fiber or failure of an OLIU circuit pack at some point in the STS-1 path.
`inc. STS1 unequipped`	The system has detected the unequipped code (SONET path overhead signal code label byte=0) on an in-service STS-1 channel. Likely cause: an upstream STS-1 cross-connect has been deleted.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
inc. STS1 sig. failed (BER)	For ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the signal fail threshold (10^{-6}). For VT1.5 path-switched rings, the system responds by inserting VT Path AIS in each pass-through VT contained in the STS-1. Locally, the system will select the VTs from the STS-1 on the other ring, as appropriate. Likely causes: Failure of the near end OLIU CP reporting the STS-1 failure, failure of the far end OLIU, or failure of the receive fiber if the OC-n is also reporting a failure.
inc. STS1 yellow	The system has detected an incoming STS-1 yellow signal inserted by the far end path terminating equipment. Likely causes: Unprotected unidirectional failure of an OLIU CP or fiber at some point in the end-to-end path.
inc. VT AIS	The system has detected a VT path alarm indication signal (AIS) incoming from the active OC-n line. The system responds by transmitting DS1 AIS toward the DSX-1 and VT yellow back toward the fiber from which the AIS is being received. Likely causes: Incomplete or incorrect cross-connect provisioning in end-to-end network; unprotected removal or failure of a DS1 CP at the far end. In ring applications, a non-service affecting VT AIS alarm message may result from an upstream OLIU or fiber failure affecting only one ring direction. A VT yellow alarm message is not returned for a non-service affecting VT AIS.
inc. VT LOP	The system has detected a VT loss-of-pointer (LOP) condition. Likely causes: Unprotected failure of a DS1 CP at the near end; unprotected failure of a DS1 CP at the far end; unprotected failure of an MXRVO CP at the near or far end; unprotected failure of an OC1 CP at the far end.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
inc. VT sig. degrade (BER)	In a VT path switched ring, the system has detected a VT error rate that exceeds the provisioned threshold of 10^{-5} to 10^{-8}. The system selects a good VT signal from the other ring path. Likely causes: An OLIU circuit pack failure, or a fiber failure at some point on the failed ring.
inc. VT unequipped	The system has detected the unequipped code (SONET path overhead VT signal code label byte=0) on an in-service VT1.5 channel. Likely cause: an upstream VT1.5 cross-connect has been deleted.
inc. VT yellow	The far end is detecting VT AIS or VT LOP and inserting VT yellow in its transmit signal. Likely causes: Unprotected unidirectional failure of a circuit pack or fiber at some point in the end-to-end path.
inconsistent DCC switches	The "User/Network" switch on the OHCTL circuit pack is set the same at both ends of the DCC.
inhibit switch	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be done. No further protection switching of specified line will be done until the protection switch is reset. Note: Line switching is unidirectional. Because of this, the specified line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. See the **switch-line** command. When associated with a function unit slot, timing slot, or timing reference, this message means that the identified equipment or reference is not active, and protection switches to the identified equipment or reference will not be done until the protection switch is reset. See the **switch-fn** and **switch-sync** commands.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`inhibit auto. OS messages`	This message occurs when TL1 autonomous alarm reporting is inhibited by the TL1 **`inh-msg`** command. This message is cleared by enabling autonomous message reporting with the TL1 **`alw-msg`** command.
`invalid CP switches`	When associated with a TG slot, this message means that the timing mode switch settings on the TGS CP are invalid.
`lockout of protection`	When associated with an OC-3 line, this message means that the identified protection line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be allowed. Note: Line switching is unidirectional. Because of this, the specified line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. The lockout will remain in effect until the protection switch is reset or until a protection switch "inhibit" request is entered. See the **`switch-line`** command. When associated with a low speed protection slot, this message means that no service slot in the entire low speed group will be allowed to switch to protection. The lockout will remain in effect until the protection switch is reset. See the **`switch-ls`** command.
`lockout of service`	When associated with a low speed service slot, this message means that the specified low speed service slot is active and will not be switched to protection. The lockout will remain in effect until the protection switch is reset. See the **`switch-ls`** command.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`manual switch`	The specified DS1 CP is manually switched to protection. The manual switch will remain in effect until the protection switch is reset or until a failure occurs and an automatic switch preempts the manual switch. See the **`switch-ls`** command.
`manual sync. mode switch`	The synchronization mode has been manually switched to holdover or free-running and will remain in that mode until the switch request is reset. See the **`switch-sync`** command.
`MXRVO CP failed`	Internal equipment failure of the specified MXRVO CP.
`OHCTL CP failed`	Internal equipment failure of the OHCTL CP.
`OLIU CP failed`	Internal equipment failure of the specified OLIU CP.
`program installation IP`	This system is being used to install software into another system. If this procedure is interrupted prior to completion, the remote systems' control circuit packs will likely become inoperable until another install program attempt is successful.
`section DCC channel failed`	The system cannot communicate with the far end system through the SONET section data communications channel (DCC). Likely causes: SYSCTL or OHCTL CP failure, reset, or initialization at the far end; failed program installation at far end; program installation in progress at the far end; SYSCTL or OHCTL CP failure at the near end.
`STS1E_H CP failed`	Internal equipment failure of the specified high-speed STS1E CP.
`STS1E_L CP failed`	Internal equipment failure of the specified low-speed STS1E CP.
`SYSCTL CP failed`	Internal equipment failure of the SYSCTL CP. The system has determined that some part of the SYSCTL CP has failed. Note that some types of failures cannot be reported since the SYSCTL CP cannot function under these conditions.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
TID address map full	The size of the directory services network element (DSNE) database at the GNE has been exceeded. Likely cause: Network elements have been removed from the network but not from the DSNE database located at the GNE. See the **dlt-tadrmap** command.
TGS CP failed	Internal equipment failure of the specified TGS CP, or the systems at both ends of the span are loop-timed from each other.
unexpected CP present	A DS1 circuit pack has been installed in a low-speed slot associated with a function unit currently provisioned for DS3 service. The DS1 CP should be removed from the shelf, or the DS3 CP should be replaced with an MXRVO CP.
unexpected CP switches	When associated with the SYSCTL or OHCTL slot, this message means that an invalid switch setting has been selected on the CP, or that some of the unused switches are not in the prescribed position. For OLIU slots, it indicates that the optical power switch on the OLIU CP was different from what is was before the OLIU CP was replaced. For DS3 or DS1 slots, this message means that a change in a circuit pack switch setting was made. When associated with a TG slot, this message means: 1. the timing mode switch settings on the TGS CP are: a. different from those on the companion TGS CP, or b. different from what they were before the TGS CP was replaced, or 2. the DS1 format or line coding switches on the TGS CP are not the same as they were before the TGS CP was replaced.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`unexpected CP type`	When associated with a function unit (FN) slot, this message means that a different but supported circuit pack is inserted in a slot already provisioned. When associated with a low speed slot, this message means that a different but supported circuit pack type (for example, BBF3) is inserted in a slot already provisioned. For the STS1E circuit pack, this message means that the CP type switch (located on the circuit pack) is different from that already provisioned for the slot.
`X.25 communication failure`	Failure in the X.25 communication channel. Likely causes: Failure of the X.25 communication equipment; failure at the OS; system is provisioned as a TL1/X.25 gateway but this interface is not being used. (See the **`set-ne`** command for provisioning.) This alarm is not applicable to Release 7.2.

NAME

rtrv-hsty:Retrieve History

INPUT FORMAT

rtrv-hsty;

DESCRIPTION

This command displays an event-history report. This report contains a list of the most recent system events. For software releases prior to Release 5, this report will contain up to 60 events. For Release 5 and later, this report will contain up to 500 events. The events are listed in last-in, first-out order and are date- and time-stamped.

The output report appears as follows:

```
/* Maintenance History Report
=============================================================
Date    Time      Sys.Alm.      Source       Event
                   Level                     Description
=============================================================
MM-DD HH:MM:SS  alarm         address      description
                  .
                  .
                  .
MM-DD HH:MM:SS  alarm         address      description
*/
```

The output parameters are:

Date	Month (MM) and day (DD) of the event.
Time	Time (hours, minute, seconds) of event occurrence. Time stamps reflect the time the entry is made. Entries are added to the history report BEFORE any applicable holdoff delays and AFTER any applicable clear delays.
System Alarm Level	Alarm level corresponds to the system alarm level at the time immediately after the event occurred. Alarm level is the level of the highest active or pending alarm/status condition. The alarm level is reported as if the holdoff delay was zero. Additionally, the alarm level column may show CR, MJ, MN, PMN alarms for troubles that never really became alarms, since holdoff delays may prevent the troubles from reaching an alarm condition.

The alarm level may be one of the following:

CRITICAL	Critical Alarm
MAJOR	Major Alarm
MINOR	Minor Alarm
PWR MINOR	Power Minor Alarm
abnormal	Abnormal condition
ne-acty	Near-End Activity
fe-acty	Far-End Activity
status	Status condition
-	No active alarm or status condition in the system.

Source — The source of the event. In Releases prior to Release 6, this column is labeled Source Address. An event source may be the entire system or a slot, a channel, or an operations interface. If security is enabled, it may also be a CIT or a login name. Refer to "Commands" and Table 11-1 at the beginning of this section for the addresses of lines, slots, ports, channels, and operations interfaces.

Event Description — Table 11-3 lists the meaning and likely cause of each of the messages that appear in the maintenance history report.

In addition to the messages listed here, any of the messages that appear in the alarm and status report can appear in the history report to record the onset of alarm and status conditions.

Also, all CIT and TL1 commands that affect the state of the system (provisioning commands; protection switching commands; loopbacks; transmission, alarm, and telemetry tests) will appear in the report.

Table 11-3. RTRV-HSTY Descriptions

Description	Meaning
2nd CP required clrd	A second circuit pack has been inserted into the empty function unit slot. The BBF3 (DS1PM) circuit pack requires both function unit slots in the group to be equipped.
-48V power/fuse good	A failed -48 volt power feeder or a failed fuse on the user panel has been repaired.
CP removed	A circuit pack has been removed from the specified slot.
AC power failed-FE clrd	The AC power supply to a remote terminal cabinet has been restored.
AC power good	The AC power supply to the shelf has been restored.
AGNE communication failure cleared	A communication failure has cleared. The AGNE can now communicate with the other NEs or an AGNE has been designated.
APS - CP failed	An automatic protection switch was done because the system detected a circuit pack failure.
APS - automatic lock reset	The automatic protection switch lock for a DS1 circuit pack has been released.
APS - sig. degraded	An automatic protection switch was done because the system detected a degraded signal on the OC-N line, or path.
APS - sig. failed	An automatic protection switch was done because the system detected a failure of the OC-N line, or path (incoming AIS, loss of signal, or bit error rate higher than 10^{-3}).
APS channel good	A failure of the SONET automatic protection switching channel has cleared.
auto switch	An automatic protection switch of a DS1 circuit pack is active. When the failure that caused the switch to be done clears, the switch will be reset automatically. Likely causes: Protected failure or removal of a DS1 CP.

NOTE:
Any messages that appear in the RTRV-ALM report may also appear in the history report.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
auto sync. mode switch	An automatic protection switch of the synchronization mode is active. When the failure that caused the switch to be done clears, the switch will be reset automatically if automatic mode switching is enabled. (See the **set-sync** and **rtrv-sync** commands.)
CIT timeout	A craft interface terminal (CIT) session was automatically terminated because there was no activity on the CIT for the provisioned time. (See the **set-secu** command.)
communication good	A communication failure has cleared. The system can now communicate, via the SONET section DCC, with another system with which it had previously lost communication.
control**n** rlsd	The system has released the specified miscellaneous discrete environmental control because it has been requested to do so through the serial telemetry or discrete telemetry interface. This message will appear only in a remote terminal. Any name may be provisioned in place of the control**n** part of this message.
disconnect	The craft interface terminal has been disconnected.
DS1 CP good	The failure of the specified circuit pack has cleared.
DS1 CP inserted	A circuit pack was inserted into the shelf.
DS1 port in service	A DS1 port was put in the "in service" state. This happens automatically when an incoming signal is detected (coming from the DSX) unless the port has been provisioned to the "not monitored" state.
DS1 sync. ref. port in service	A DS1 External timing reference was automatically put in the "in service" state because an incoming DS1 signal was detected.
DS1PM CP good	The failure of the DS1PM circuit pack has cleared.
DS1PM CP inserted	A DS1PM circuit pack was inserted into the shelf.
DS3 CP good	The failure of the DS3 CP has been cleared.
DS3 CP inserted	A DS3 circuit pack was inserted into the shelf.
DS3 port in service	A DS3 port was put in the "in service" state. This happens automatically when an incoming signal is detected (coming from the DSX) unless the port has been provisioned to the "not monitored" state.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
DSNE communication good	Communication has been restored between the DSNE and other network elements in the subnetwork.
duplicate DSNE clrd	A shelf has been reprovisioned, and there is no longer more than one DSNE in the subnetwork. This message applies to Release 7.2 only.
duplicate GNE clrd	A shelf has been reprovisioned, and there is no longer more than one GNE in the network. This message does not apply to Release 7.2.
duplicate site/ne address clrd	A shelf has been reprovisioned and no longer has the same site or NE address as any other shelf in the network.
duplicate TID clrd	A shelf has been renamed and no longer has the same TID as any other shelf in the network.
duplicate TBOS display clrd	A shelf has been reprovisioned and no longer has the same TBOS display number as any other shelf in the network.
EC1 port in service	An EC1 port has been placed in the "in service" state.
enable auto OS messages	Autonomous OS message reporting has been enabled with the TL1 command **alw-msg**.
environment**n** rlsd	The specified miscellaneous discrete environment alarm input point has been released, indicating that an environmental alarm or status condition has cleared. This message will appear only in a remote terminal. Any name may be provisioned in place of the environment**n** part of this message.
externalMinor clrd	The external minor alarm condition has cleared.
fan control relay good	The fan control relay on the SYSCTL CP was failed but is now operating properly to turn on the fans.
fan shelf good	A fault on the fan shelf has been cleared.
frequency error clrd	The frequency offset failure has been cleared.
holdover mode clrd	The system is no longer in holdover timing mode. It has switched from holdover mode to the provisioned timing mode (either LoopTimed or phaselocked to an External DS1 timing reference).
inc. DS1 good	A failure of the DS1 signal coming from the DSX is cleared.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
inc. DS1 sync. ref. good	A failure of the External DS1 timing reference is cleared.
inc. DS3 AIS clrd	The system is no longer detecting DS3 AIS (alarm indication signal) in the DEMUX direction (that is, coming from the fiber).
inc. DS3 good	A failure of the DS3 signal coming from the DSX is cleared.
inc. DS3 OOF clrd	A DS3 out-of-frame (OOF) condition in the DEMUX direction (coming from the fiber) is cleared.
inc. EC1 FERF clrd	The system is no longer detecting an EC-1 far end receive signal failure (FERF) signal.
inc. EC1 good	A failure of the EC-1 signal has been cleared.
inc. EC1 line AIS clrd	The EC-1 alarm indication signal (AIS) is no longer being received. A downstream failure has cleared.
inc. EC1 sig. degrade (BER) clrd	A failure of the specified EC-1 signal has cleared.
inc. OC3 FERF clrd	The system is no longer detecting the OC-3 far end receive failure (FERF) signal.
inc. OC3 good	A failure of the OC-3 line has been cleared.
inc. OC3 LOP STS1 #*x* clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. STS1 LOP OC3 *slot* clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. OC3 sig. degrade clrd	A failure of the specified OC-3 signal has cleared. OC-3 line AIS and/or OC-3 line FERF conditions may still be present on the specified OC-3 line. The OC-3 LOP condition may still be present for one or more of the STS-1 signals in the OC-3 line.
inc. OC3 line AIS clrd	The system is no longer detecting the OC-3 alarm indication signal (AIS) on the specified OC-3 line.
inc. STS1 AIS clrd	The STS-1 alarm indication signal (AIS) is no longer being received. An upstream failure (in the MUX direction) has cleared.
inc. STS1 LOP EC1 clrd	A loss-of-pointer condition on the STS-1 signal of the EC-1 line has been cleared.
inc. STS1 sig. degrade clrd	A failure of the specified STS-1 signal has cleared.
inc. STS1 sig. failed clrd	A failure of the specified STS-1 signal has cleared.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
`inc. STS1 unequipped clrd`	A failure of the specified STS-1 signal has cleared.
`inc. STS1 yellow clrd`	The STS-1 yellow signal is no longer being received.
`inc. VT AIS clrd`	The VT alarm indication signal (AIS) is no longer being received. A downstream failure (in the MUX direction) has cleared
`inc. VT LOP clrd`	A loss-of-pointer condition on the VT1.5 signal has been cleared.
`inc. VT sig. degrade clrd`	Failure of the specified VT1.5 signal has cleared.
`inc. VT unequipped clrd`	A failure of the specified VT1.5 signal has cleared.
`inc. VT yellow clrd`	The VT yellow signal is no longer being received from the fiber (in the DEMUX direction).
`login:`*`login_id`*	A login session with a users' login identification has been started on the specified CIT port.
`login:`*`login_id DENY`*	A login session was attempted but denied because of an invalid login and password pair.
`logout:`*`login_id`*	A login session with a users' login identification has ended on the specified CIT port.
`logout:`*`login_id DISCONNECT`*	A login session with a users' login identification has ended by a disconnect on the specified CIT port.
`main-{1,2} protection switch`	Equipment switching in a ring application has occured due to equipment failure.
`MXRVO CP good`	The failure of the specified circuit pack has cleared.
`MXRVO CP inserted`	A circuit pack was inserted into the shelf.
`OLIU CP good`	The failure of the specified circuit pack has cleared.
`OLIU CP inserted`	A circuit pack was inserted into the shelf.
`program installation compl.`	The software installation procedure has been completed.
`remote session logout`	A remote CIT session (set up by the `rlgn` command) has been terminated. This may have been caused by normally logging out of the remotely accessed far end session, or once in the far end session, the user toggled back and logged out of the local session.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
remote session terminated	A remote CIT session (set up by the `rlgn` command) has been abnormally terminated. This may have been caused by a failure of the controller, circuit pack failure, timeout, or any other abnormal termination at the far end NE.
reset	The system software program has been reset.
section DCC channel good	The failure of the SONET section data communications channel has cleared.
STS1 channel in service	An STS1 channel was put in the "in service" state. This happens automatically when a "good" signal is detected on the channel (neither AIS, unequipped signal, nor "loss of pointer" condition is present), unless the channel has been provisioned to the "not monitored" state.
STS1E CP good	The failure of the specified STS1E circuit pack has cleared.
STS1E CP inserted	An STS1E circuit pack was inserted into the shelf.
switch reset	— An automatic protection switch of a DS1 circuit pack been automatically reset. — The system has switched from holdover synchronization mode to the provisioned synchronization mode (`LoopTimed` or `phaselocked` to an `External` DS1 timing reference). or — A manually initiated protection switch has been reset (by the **`switch-sync`**, **`switch-line`**, **`switch-fn`**, or **`switch-ls`** command), or by removing a CP from the shelf.
sysctl crs map recovered	A read failure of the cross-connection data base occurred during restart but the backup copy was recovered and is being used.
sysctl crs map initialized	A read failure of the cross-connection data base occurred during restart and recovery using backup copies also failed. The cross-connection map was initialized.
TGS CP good	The failure of the specified circuit pack has cleared.
TGS CP inserted	A circuit pack was inserted into the shelf.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
`X.25 communication restored`	Communication over the X.25 communication channel has been restored. This message does not apply to Release 7.2.
`VT channel in service`	A VT channel was put in the "in service" state. This happens automatically when a "good" signal is detected on the channel (neither AIS, unequipped signal, nor "loss of pointer" condition are present), unless the channel has been provisioned to the "not monitored" state.

A SONET Overview



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A SONET Overview



Overview

This section briefly describes the Synchronous Optical Network (SONET).

History

In the early 1980's, the American National Standards Institute (ANSI) recognized the need for an optical signal standard for future broadband transmission. The ANSI T1X1 subcommittee began working on optical signal and interface standards in 1984. In 1985, Bellcore proposed a network approach to fiber system standardization to T1X1. The proposal suggested a hierarchical family of signals whose rates would be **integer multiples** of a basic modular signal. The proposal further suggested a synchronous multiplexing technique, leading to the coining of the term *Synchronous Optical NETwork* (SONET).

The International Telephone and Telegraph Consultative Committee (CCITT) first showed interest in 1986. Conferences held through 1987 and 1988 resulted in coordinated specifications for both the American National Standard (SONET) and the CCITT-International Standard, Synchronous Digital Hierarchy (SDH). Approval of both sets of standards occurred in late 1988.

Basic Purpose

The basic purpose of SONET is to provide a standard synchronous optical hierarchy with sufficient flexibility to accommodate digital signals that currently exist in today's network as well as those planned for the future.

SONET currently defines standard rates and formats and optical interfaces. These and other related issues continue to evolve through the ANSI committees. SONET ultimately will permit an optical midspan meet in a multivendor environment.

The American National Standard defines the following:

- Optical parameters (*ANSI** T1.106-1988)
- Electrical parameters (*ANSI* T1.102-1993 Draft)
- Multiplexing schemes to map existing digital signals (for example, DS1, DS2, and DS3) into SONET payload signals (*ANSI* T1.105-1991)
- Criteria for optical line automatic protection switch (APS) (*ANSI* T1.105-1991)
- Overhead channels to support standard operation, administration, maintenance, and provisioning (OAM&P) functions (*ANSI* T1.105-1991).

Technical Overview

SONET Signal Hierarchy

The SONET signal hierarchy is based on a basic "building block" frame called the synchronous transport signal - level 1 (STS-1), as shown in Figure A-1 on the following page. The STS-1 frame has a reoccurring rate of 8000 frames per second. Each frame is 125 microseconds.

The STS-1 frame consists of:

- 90 columns (each column is an 8-bit byte)
- 9 rows.

The STS-1 frame is transmitted serially starting from the left with row 1 column 1 on through column 90, then row 2 column 1 through 90, continuing on, row-by-row, until all 810 bytes (9 X 90) of the STS-1 frame have been transmitted.

---

* Registered trademark of American National Standards Institute

Since each STS-1 frame consists of 810 bytes and each byte has 8 bits, the frame contains 6480 bits a frame. There are 8000 STS-1 frames per second, at the STS-1 signal rate of 51,840,000 (6480 X 8000) bits a second.

The first three columns in each of the nine rows carry the SECTION and LINE overhead bytes. Collectively, these 27 bytes are referred to as transport overhead.

The remainder of the frame, columns 4 through 90, is reserved for payload signals (for example, DS1, DS3, and path overhead) and is referred to as the STS-1 synchronous payload envelope (STS-1 SPE). The optical counterpart of the STS-1 is the optical carrier level 1 signal (OC-1), which is the result of a direct optical conversion. The electrical counterpart of the STS-1 is the electrical carrier level 1 signal (EC-1).

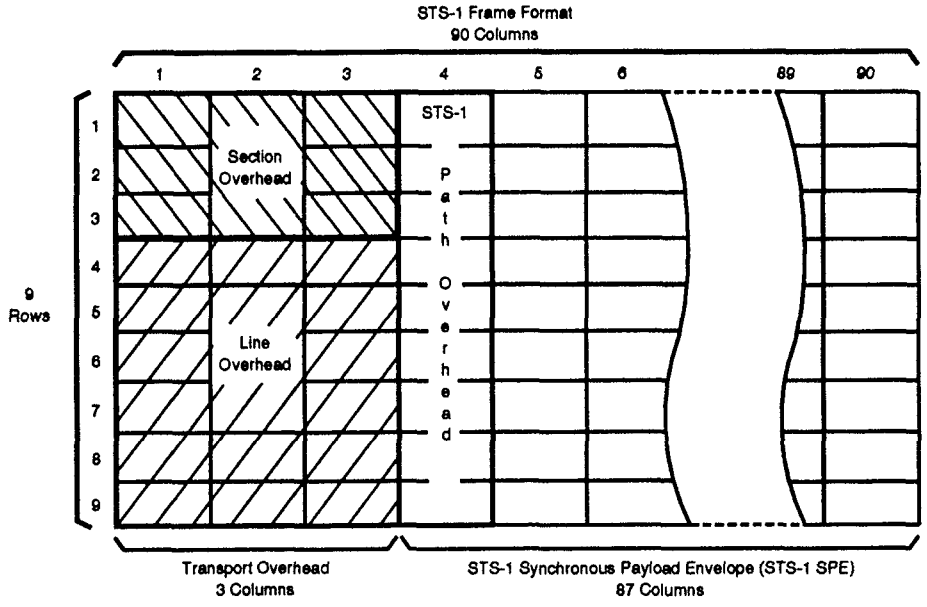


Figure A-1. SONET STS-1 Frame — Simplified Version

SONET Layers

SONET divides its processing functions into three layers. These three layers are associated with equipment that reflects the natural divisions in network spans. Figure A-2 shows these defined layers in a signal path. They include:

- **SECTION** and **Section Terminating Equipment** - the transmission spans between lightwave terminating equipment and the regenerators. The spans between the regenerators are also considered sections. Section terminating equipment provides regenerator functions and terminates the section overhead to provide single-ended operations and section performance monitoring.
- **LINE** and **Line Terminating Equipment** - the transmission span between terminating equipment (STS-1 cross-connections) that provides line performance monitoring. If there are no intervening repeaters, the line terminating equipment also functions as section terminating equipment.
- **STS-1 and VT Path** and **Path Terminating Equipment** - the transmission span for an end-to-end tributary (DS1 or DS3) signal that provides functions including signal labeling and path performance monitoring for signals as they are transported through a SONET network. STS-1 path terminating equipment can also provide cross-connections for lower rate (that is, DS1) signals. A virtual tributary (VT) is a sub-DS3 payload and is described later in more detail.

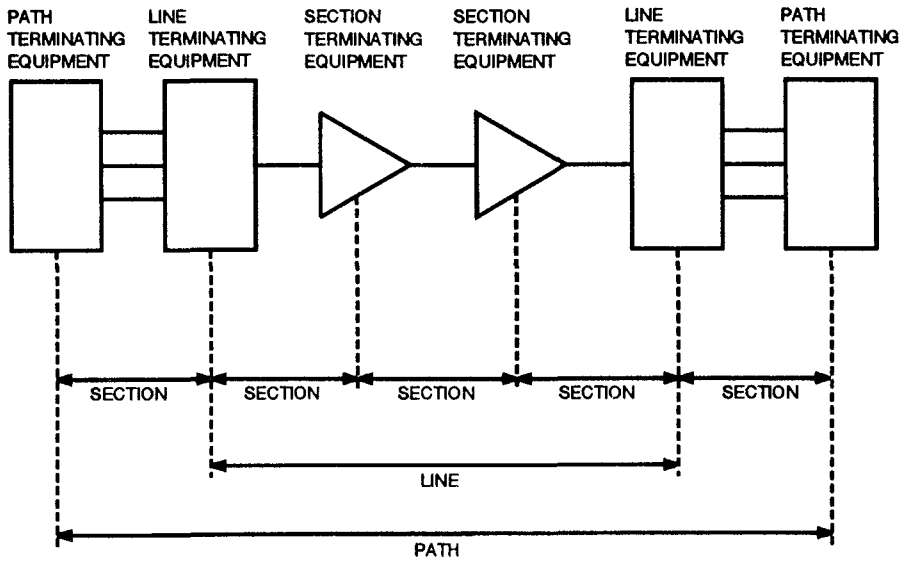


Figure A-2. Section, Line, and Path Definitions

Each SONET layer has a set of overhead bytes as shown in Figure A-3. These bytes carry information used by various network elements.

- **Section Overhead** contains information that is used by all SONET equipment including repeaters.
- **Line Overhead** is used by all SONET equipment except repeaters.
- **Path Overhead** is carried within the payload envelope.
  - — **STS-1 path overhead** remains with the STS-1 SPE until its asynchronous signal is extracted (for example, DS-3) or until its individual VT1.5 signals are demultiplexed.
  - — **VTN (N= 1.5, 2, 3, or 6) path overhead** remains with the VTN until its asynchronous signal is extracted.

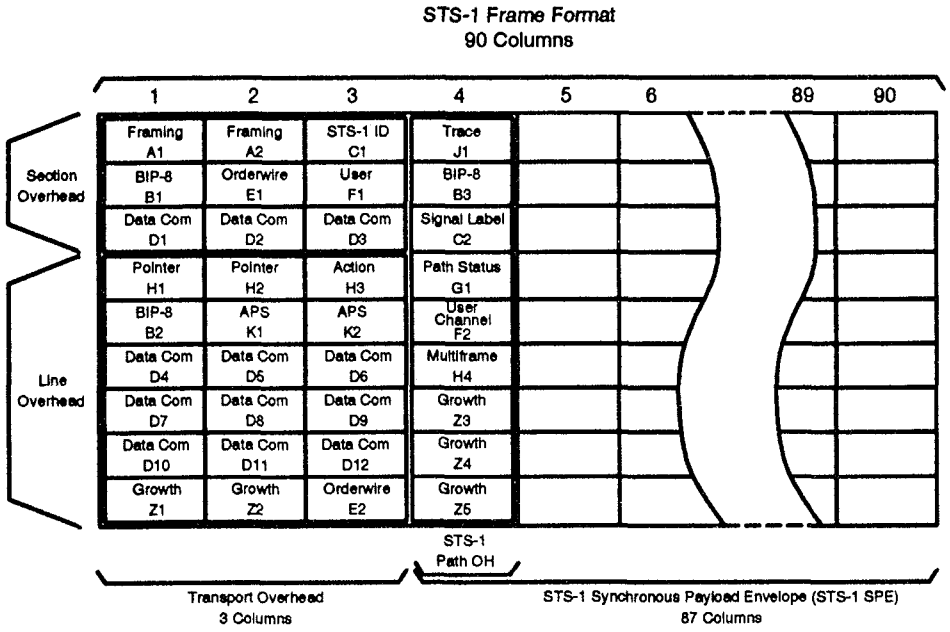


Figure A-3. SONET Frame Format

SONET Frame Structure

The following pages provide more detailed information on the function of various overhead bytes for each SONET layer.

Section Overhead

- Framing (A1, A2)
  - — Provides framing for each STS-1.
- STS-1 ID (C1)
  - — Provides the order of appearance in a byte-interleaved STS-N frame; for example, STS-1 #1, STS-1 #2.....STS-1 #48.
- Section Bit-Interleaved Parity (BIP-8) (B1)
  - — Provides SECTION performance monitoring and is calculated over all bits of the previous STS-*N* frame. Defined only for STS-1 #1 of an STS-*N* signal.
- Section Orderwire (E1)
  - — Provides a local orderwire for voice communication channel between section terminating network elements, such as repeaters. Defined only for STS-1 #1 of an STS-*N* signal.
- Section User Channel (F1)
  - — Set aside for the user's purpose. Defined only for STS-1 #1 of an STS-*N* signal.
- Section Data Communications Channel (D1, D2, D3)
  - — Is a 192 kb/s message-based channel. Used for alarms, maintenance, control, monitoring, and other communication needs between section terminating equipment. Defined only for STS-1 #1 of an STS-*N* signal.

Line Overhead

- Line Pointer (H1, H2)
  - — Two bytes indicate the offset in bytes between the pointer action byte (H3) and the first byte (J1) of the STS-1 synchronous payload envelope (SPE).
- Pointer Action (H3)
  - — One byte is allocated for frequency justification.
- Line Bit-Interleaved Parity (BIP-8) (B2)
  - — This byte is for line performance monitoring. This byte is provided in all STS-1 signals within an STS-*N* signal.
- Line Automatic Protection Switching (APS) (K1, K2)
  - — Two bytes used for APS signaling between line level entities. In addition, bits 6, 7, and 8 of K2 are used for line alarm indication signal (AIS) and line far-end receive failure (FERF). Defined only for STS-1 #1 of an STS-*N* signal.
- Line Data Communications Channel (D4 - D12)
  - — Is a 576 kb/s message-based channel.
- Line Growth (Z1, Z2)
  - — Two bytes are set aside for future functions.
- Line Orderwire (E2). Defined only for STS-1 #1 of an STS-*N* signal.
  - — One byte is allocated to be used as an express orderwire between line terminating equipment.

Path Overhead

There are two types of path overheads:

— STS-1 path overhead

— VT path overhead.

STS-1 Path Overhead

The STS-1 path overhead is assigned to and remains with the STS-1 SPE until the payload is extracted and is used for functions that are necessary to transport all synchronous payload envelopes.

- STS-1 Path Trace (J1)
  - — Repetitively transmits a 64 byte, fixed length, string so that an STS-1 path receiving terminal can verify its continued connection to the intended transmitter.
- STS-1 Path Bit-Interleaved Parity (BIP-8) (B3)
  - — Provides each STS-1 path performance monitoring. This byte is calculated over all bits of the previous STS-1 SPE before scrambling.
- STS-1 Path Signal Labels (C2)
  - — Indicates the construction of the STS-1 SPE. A value of 00000000 indicates an unequipped STS-1 SPE. Values for various payload mappings are defined in TR-NWT-000253, Issue 2.
- STS-1 Path Status (G1)
  - — Conveys the STS-1 path terminating status, far end block errors (FEBE), and yellow alarm signal conditions back to an originating STS-1 path terminating equipment.
- STS-1 Path User Channel (F2)
  - — Reserved for user communication.
- VT Multiframe Indicator (H4)
  - — Provides a general multiframe indicator for VT-structured payloads.
- Growth (Z3 - Z5)
  - — Reserved for future functions.

VT Path Overhead

There is one byte of VT path overhead called V5. It occurs on every fourth frame; that is, 2000 times a second.

This byte provides for VT paths the same functions that B3, C2, and G1 provide for STS paths, namely:

- Error checking
- Signal label
- Path status.

The bit assignments of the VT path overhead are specified in the following list and are illustrated in Figure A-4:

— Bits 1 and 2 are used for error performance monitoring (BIP-2).

— Bit 3 is a VT path far-end-block-error (FEBE) indication that is sent back toward an originating VT PTE when errors are detected by the BIP-2.

— Bit 4 is unassigned (X).

— Bits 5 through 7 provide a VT signal label.

— Bit 8 is a VT path yellow indication.

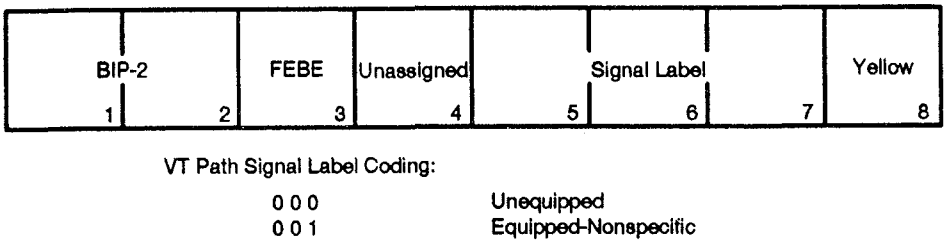


Figure A-4. VT Path Overhead Byte

SONET Multiplexing Procedure

SONET has provisions for multiplexing asynchronous DS1s, synchronous DS1s, and asynchronous DS3s. Refer to Figures A-5 and A-6.

The first stage in multiplexing is mapping the input DS1 or DS3 tributary. In the case of DS1 inputs, three time slots (DS0s) are added to the incoming signal thus becoming a VT1.5. An asynchronous DS1 that fully meets the specified rate is mapped into the VT1.5 SPE as clear channel input since no framing is needed.

- Each VT1.5 carries a single DS1 payload.
- Four VT1.5s are bundled into a VT group (VT-G).
- Seven VT-Gs are byte-interleaved into an STS-1 frame.

The VT-G to-STS-1 multiplex is a simple byte-interleaving process, so individual VT signals are easily observable within the STS-1. Thus, cross-connections and add/drop can be accomplished without the back-to-back multiplexing/multiplexing steps required by asynchronous signal formats. The structured VTs are now multiplexed into the STS-1 SPE, and the path, line, and section overhead are added. The final multiplexing, as shown in Figure A-5, provides the scrambled STS-*N* signal to the optical conversion stage.

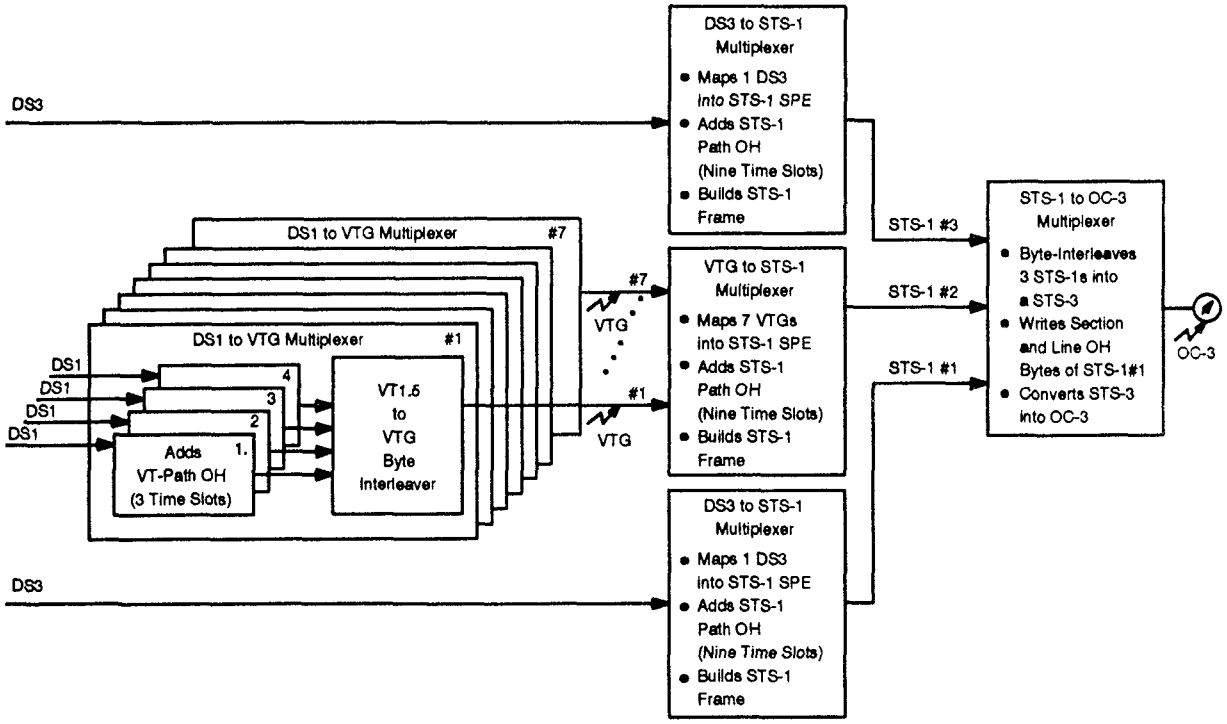


Figure A-5. SONET Multiplexing Procedure

SONET Demultiplexing Procedure

As shown in Figure A-6, demultiplexing is the inverse of multiplexing. The unscrambled STS-1 signal from the optical conversion stages is processed to extract the section and line overhead and accurately locate the SPE. The next stage processes the path overhead and demultiplexes the VTs. A standard DS3 signal will be provided to the asynchronous network after path overhead processing. For DS1 signals, the individual DS1 VTs are then processed to extract VT overhead and, via the VT pointer, accurately locate the DS1 SPE. Finally, desynchronization of the DS1 SPE provides a standard DS1 signal to the asynchronous network.

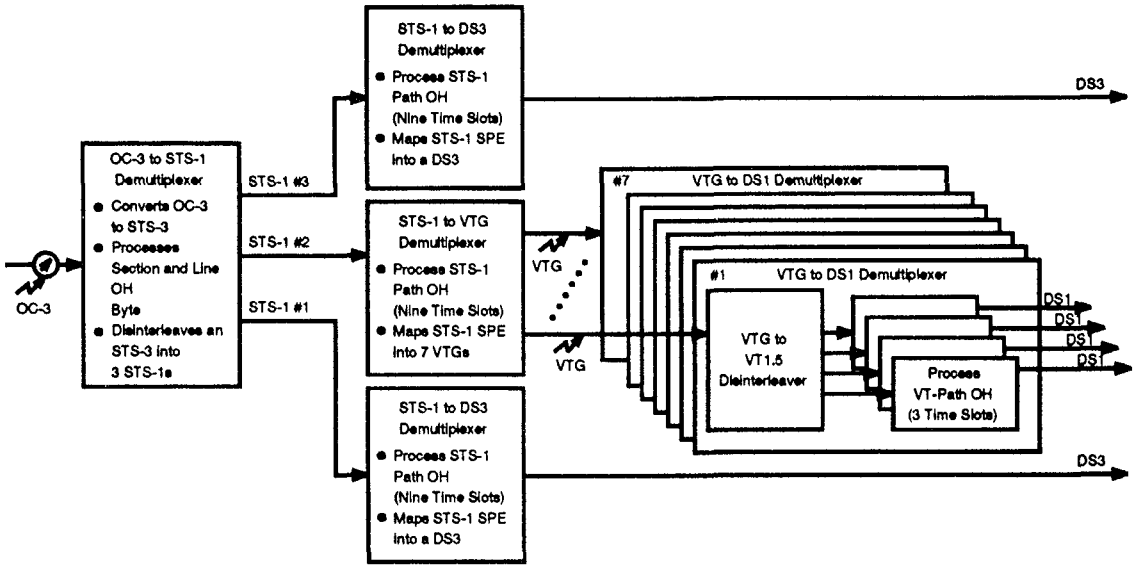


Figure A-6. SONET Demultiplexing Procedure

Two key points should be noted at this time. First, the SONET frame is a fixed time (125 μs) and no bit-stuffing is used. Second, as shown in Figure A-7, the synchronous payload envelope can *float* within the frame using byte-stuffing. This is to permit compensation for small variations in frequency between the clocks of the two systems that may occur if the systems are independently timed (plesiochronous timing). The SPE can also drift across the 125-μs frame boundary.

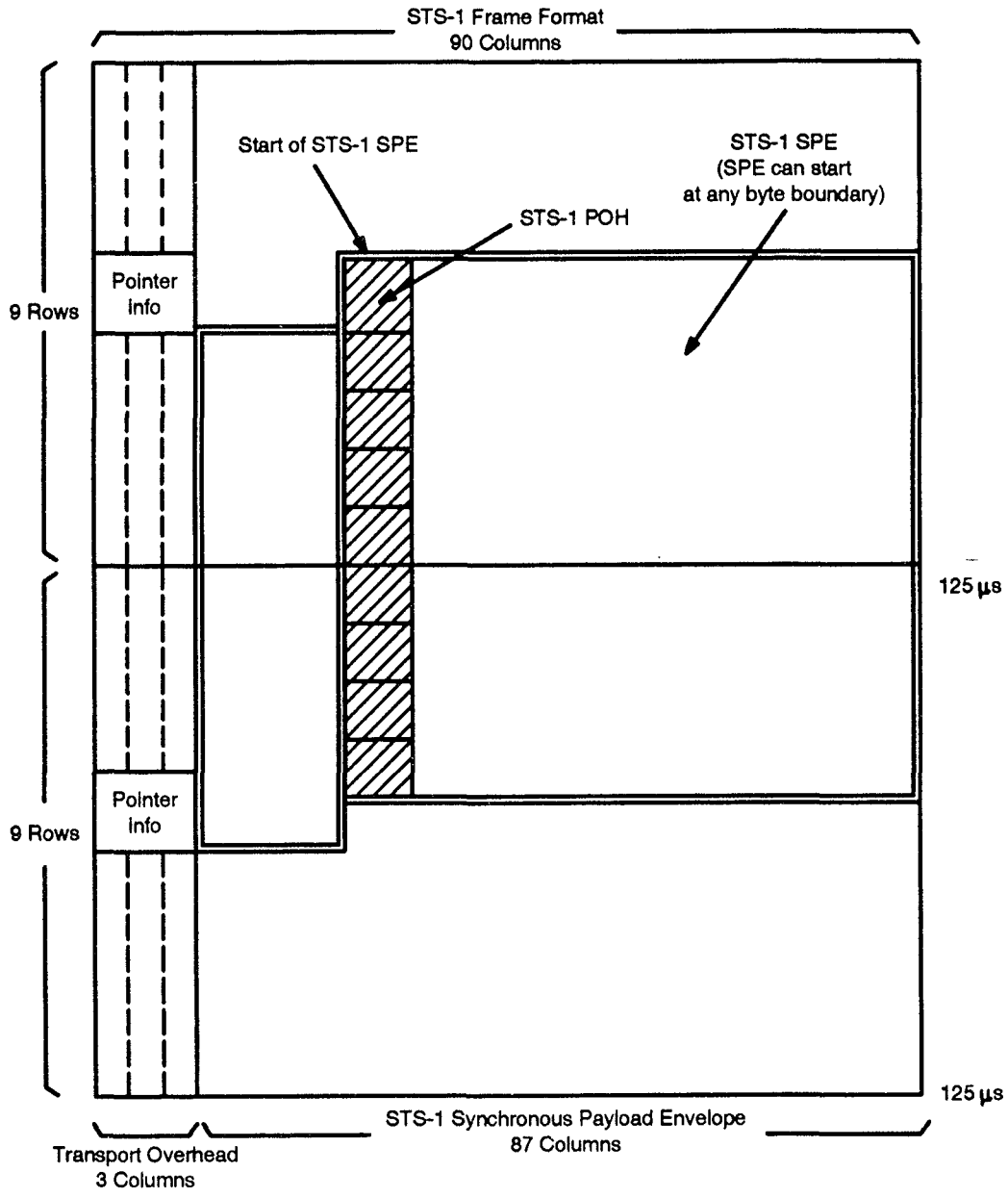


Figure A-7. STS-1 Synchronous Payload Envelope in Interior of STS-1 Frame

SONET Digital Multiplexing Schemes

Asynchronous Multiplexing

Currently, fiber optic facilities are primarily used to carry DS3 signals. The DS3 signal consists of a combination of the following payload signals:

- 28 DS1s
- 14 DS1Cs
- 7 DS2s.

Typically, 28 DS1 signals are multiplexed into a DS3 signal, using an M13 format. Refer to Figure A-8. M13 format is a process that includes bit-interleaving four DS1 into a DS2 signal and then bit-interleaving seven DS2 signals into a DS3. The DS3 rate is not a direct multiple of the DS1 or the DS2 rates due to the bit-stuffing synchronization technique used in asynchronous multiplexing.

Identification of DS0s contained in any DS-*N* signal, except DS1, is complex and DS0s cannot be directly extracted. Thus, an asynchronous DS3 signal must be demultiplexed down to the DS1 level to access and cross-connect DS0 and DS1 signals.

Another disadvantage of the M13 format is there is no end-to-end overhead channel for use by OAM&P groups.

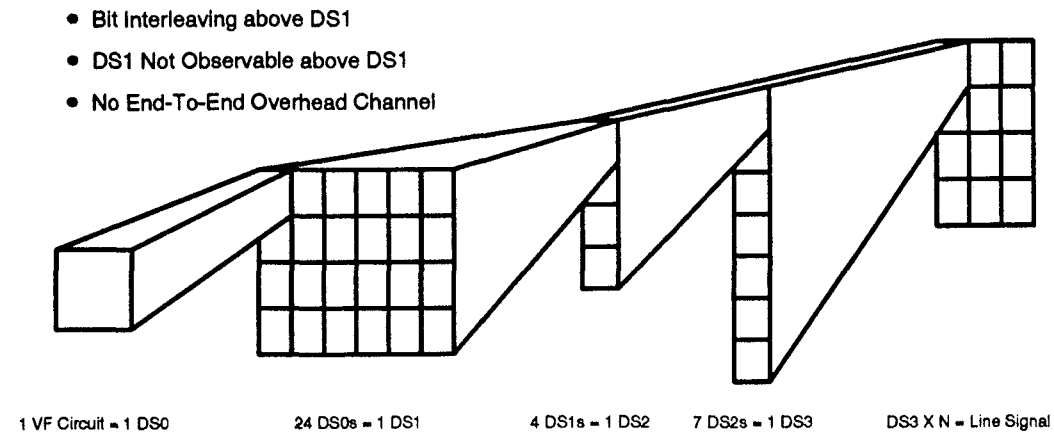


Figure A-8. Asynchronous Multiplexing

Synchronous Multiplexing

SONET's method of *byte-interleaving* DS1s to a higher signal rate permits economical extraction of a single DS1 without the need to demultiplex the entire STS-1 SPE. In addition, SONET provides overhead channels for use by OAM&P groups.

In SONET, a single asynchronous DS3 signal is mapped into an STS-1 SPE (Figure A-9).

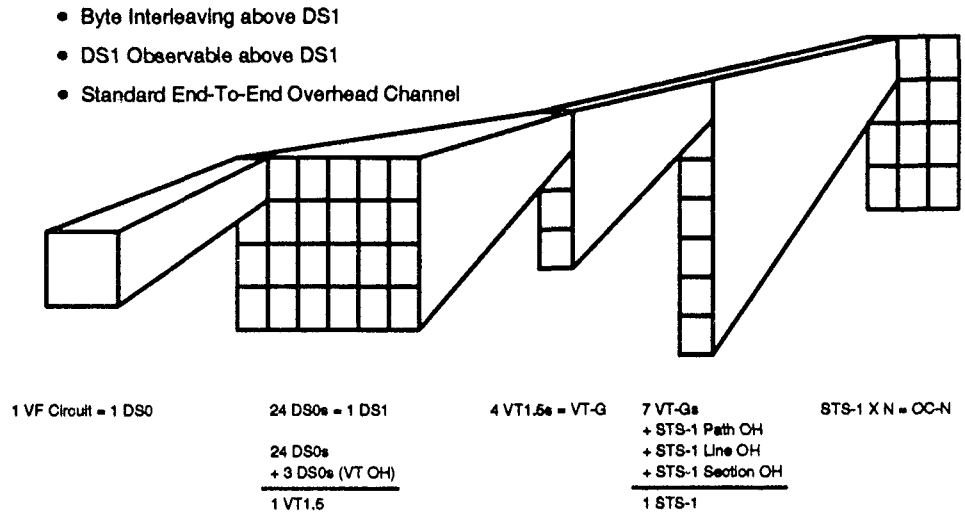


Figure A-9. Synchronous Multiplexing

Virtual Tributary Signals

Sub-DS3 asynchronous signals (DS1, DS1C, DS2 and E1) are *byte-interleaved* into a digital signal called a virtual tributary (VT). The VT is a structure designed for the transport and switching of sub-DS3 payloads. Like the STS-1 signal, the VT signal has a floating pointer that allows each VT SPE to move within the VT structure. There are four sizes of virtual tributaries (VT1.5, VT2, VT3, VT6). Higher rate payloads are transported as one or more concatenated STS-1 signals.

Concatenated Mode

For services requiring multiples of the STS-1 rate, STS-1 path payloads may be shared to create a single broadband payload called a concatenated STS-*N*c (OC-*N*c). To create this payload, *N* number of STS-1 signals are mapped into an STS-*N*c SPE and transported as a concatenated STS-*N*c signal. This STS-*N*c signal can be carried by an STS-*N* or OC-*N* (or higher level) line signal.

The STS-*N* signal is multiplexed, switched, and transported through the network as a single entity. A payload pointer, pointing to the start of the concatenated payload, is contained in the transport overhead of the first STS-1 signal. A concatenation indicator, used to show that the STS-1s of the STS-*N*c signal are linked together, is contained in the STS-1 payload pointer of all the remaining ST-1 signals. The line and section overhead is sent on the first STS-1 and the payload pointer of the first STS-1 is applied to all the remaining STS-1 signals in the concatenated signal.

Figure A-10 shows an example of an STS-3c (OC-3c) concatenated signal. The payload pointer in STS-1 #1 points to the payload overhead of all three STS-1 signals, and indicates that the payload of the 3 signals should be transported as a single entity through the network.

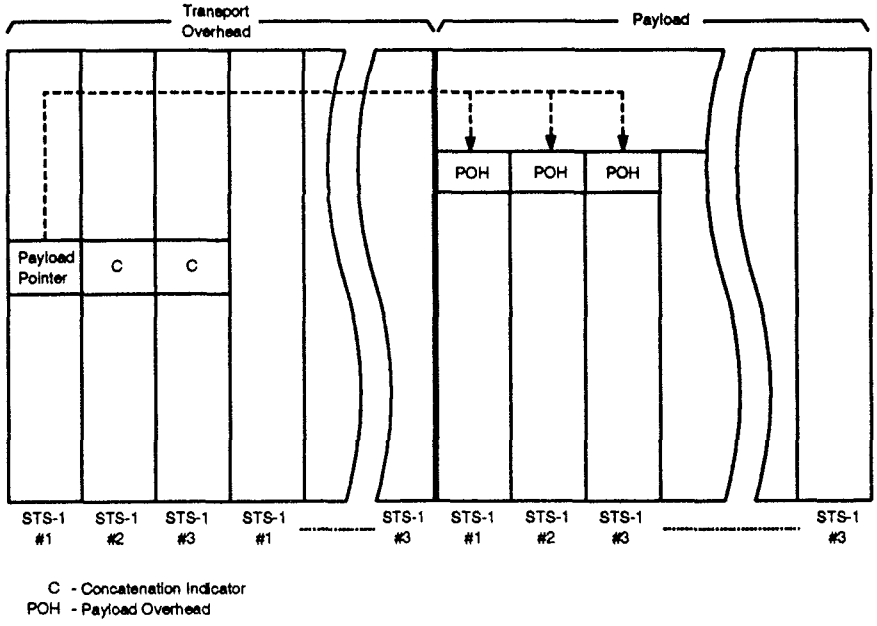


Figure A-10. STS-*N*c Concatenated Signal

SONET Interface

The SONET interface (Figure A-11) provides the optical midspan meet between SONET network elements. A SONET network element is the hardware and software that processes one or more layers of the SONET signal.

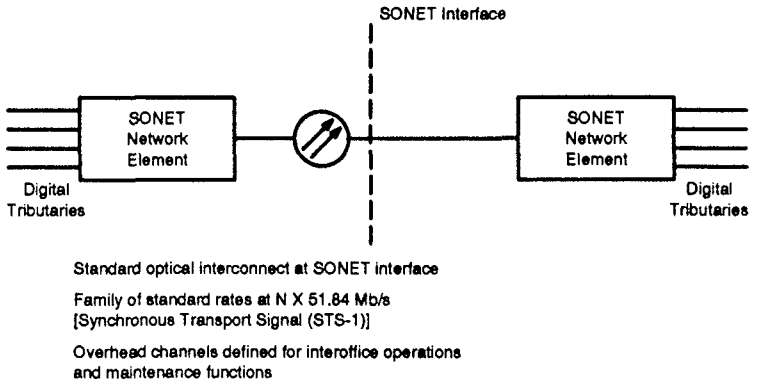


Figure A-11. SONET Interface

SONET Payloads

Table A-1 shows the digital signals that can be transported as SONET payloads.

Table A-1. SONET Payloads

Equivalent Channels	Signal Input	Rate	SONET Signal	Rate
24 DS0s	DS1	1.544 Mb/s	VT1.5	1.728 Mb/s
32 DS0s	E1 (CEPT)	2.048 Mb/s	VT2	2.304 Mb/s
48 DS0s	DS1C	3.152 Mb/s	VT3	3.456 Mb/s
96 DS0s	DS2	6.312 Mb/s	VT6	6.912 Mb/s
672 DS0s	DS3	44.736 Mb/s	STS-1	51.840Mb/s
Future payloads		up to 150 Mb/s per STS-Nc		

DS1 and DS3 signals are the most important of these signals, as are future broadband payloads with rates of 150 Mb/s and higher. Other payloads may be defined for specific applications.

Higher Rate Transport

Higher rate SONET signals are created by byte-interleaving *N* STS-1 to form an STS-*N* signal. The STS-*N* is then scrambled and converted to an optical carrier - level *N* (OC-*N*) signal. The OC-*N* has a line rate of exactly *N* times the OC-1 signal (see Table A-2).

Table A-2. SONET Transport Rates

OC Level	Line Rate (Mb/s)	Capacity
OC-1	51.84	28 DS1s or 1 DS3
OC-3	155.52	84 DS1s or 3 DS3s
OC-9	466.56	252 DS1s or 9 DS3s
OC-12	622.08	336 DS1s or 12 DS3s
OC-18	933.122	504 DS1s or 18 DS3s
OC-24	1244.16	672 DS1s or 24 DS3s
OC-36	1866.24	1008 DS1s or 36 DS3s
OC-48	2488.32	1344 DS1s or 48 DS3s

Conclusion

The intent of this section is to present a short overview of SONET. More detailed expositions can be found in various literature. An excellent description of SONET can be found in Reference 3.

REFERENCES

1. ANSI T1.106-1988 American National Standard for Telecommunications - Digital Hierarchy Optical Interface Specifications, Single Mode, and ANSI T1.105-1991 American National Standard for Telecommunications - Digital Hierarchy Optical Rates and Formats Specification.
2. CCITT Recommendations G.707, G.708, G.709.
3. R. Ballert and Y. C. Ching, SONET: Now It's the Standard Optical Network, *IEEE Communications Magazine*, Vol. 27, No. 3 (March 1989): 8-15.
4. ANSI T1.102-1993 Draft American National Standard for Telecommunications - Digital Hierarchy Electrical Interface Specifications.

Glossary

1+1

The 1+1 protection switching architecture protects against failures of the optical transmit/receive equipment and their connecting fiber facility. One bidirectional interface (two fibers plus associated OLIUs on each end) is designated "service", and the other is designated "protection". In each direction, identical signals are transmitted on the service and protection lines ("dual-fed"). The receiving equipment monitors the incoming service and protection lines independently, and selects traffic from one line (the "active" line) based on performance criteria and technician/OS control. In 1+1 both service and protection lines could be active at the same time.

1xN, 1x1

1xN protection switching pertains to circuit pack protection that provides a redundant signal path through the DDM-2000 (it does not cover protection switching of an optical facility; see "1+1"). In 1xN switching, a group of N service circuit packs share a single spare protection circuit pack. 1x1 is a special case of 1xN, with N=1. In 1x1 only one is active at a time.

A

ABN

Abnormal (status condition)

ACO

Alarm Cutoff — A pushbutton switch available on the user panel that can be used to retire an audible office alarm.

ACO/TST

Alarm Cutoff and Test — The name of a pushbutton on the user panel.

Active

Active identifies a 1+1 protected OC-N line which is currently selected by the receiver at either end as the payload carrying signal or a 1x1 or 1xn protected circuit pack that is currently carrying service. (See Standby.)

ADM

Add/Drop Multiplexer.

AIS

Alarm Indication Signal — A code transmitted downstream in a digital network that shows that an upstream failure has been detected and alarmed.

AMI

Alternate Mark Inversion — A line code that employs a ternary signal to convey binary digits, in which successive binary ones are represented by signal elements that are

normally of alternating, positive and negative polarity but equal in amplitude, and in which binary zeros are represented by signal elements that have zero amplitude.

ANSI
American National Standards Institute

APS
Automatic Protection Switch

AS&C
Alarm, Status, and Control

ASCII
American Standard Code for Information Interchange — A standard 8-bit code used for exchanging information among data processing systems and associated equipment.

ASN.1
Abstract Syntax Notation 1

ATM
Asynchronous Transfer Mode

Auto
Automatic — One possible state of a DS1 or DS3 port. In this state, the port will automatically be put "in service" if a good signal is detected coming from the DSX panel.

Automatic Protection Switch
A protection switch that occurs automatically in response to an automatically detected fault condition.

Automatic Synchronization Reconfiguration
A feature that allows another synchronization source to be automatically selected and the synchronization source provisioning to be automatically reconfigured in the event of a synchronization source failure or network synchronization change, for example, a fiber cut.

AUXCTL
Auxiliary Control — The name of the slot to the left of the SYSCTL slot on the DDM-2000 OC-3 shelf and to the right of the SYSCTL slot on the DDM-2000 OC-12 shelf.

Available Time
In performance monitoring, the 1 second intervals.

B

B3ZS
Bipolar 3-Zero Substitution — A line coding method that replaces a string of three zeros with a sequence of symbols having some special characteristic.

B8ZS
Bipolar 8-Zero Substitution — A line coding method that replaces a string of eight zeros with a sequence of symbols having some special characteristic.

BDFB
Battery Distribution and Fuse Bay.

BER
Bit Error Ratio — The ratio of bits received in error to the total bits sent.

BIP
Bit Interleaved Parity — A method of error monitoring over a specified number of bits, that is, BIP-3 or BIP-8.

BITS
Building Integrated Timing Supply — A single clock that provides all the DS1 and DS0 synchronization references required by clocks in a building.

Broadband
Any communications channel with greater bandwidth than a voice channel; sometimes used synonymously with wideband.

C

CC
Clear Channel — A provisionable mode for the DS3 output that causes parity violations not to be monitored or corrected before the DS3 signal is encoded.

CCITT
International Telephone and Telegraph Consultative Committee — An international advisory committee under United Nations' sponsorship that has composed and recommended for adoption worldwide standards for international communications. Recently changed to the International Telecommunications Union Telecommunications Standards Sector (ITU-T).

CEV
Controlled Environment Vault

Channel
A logical signal within a port. For example, for an EC-1 port there is one STS-1 channel and sometimes 28 VT1.5 channels. See Port.

Channel State Provisioning
A feature that allows a user to suppress reporting of alarms and events during provisioning by supporting multiple states (automatic, in-service and not monitored) for VT1.5 and STS-1 channels. See Port State Provisioning.

CIT
Craft Interface Terminal

CLF
Carrier Line Failure Status

CLK
Clock

CMOS
Complementary Metal Oxide Semiconductor

CO
Central Office

COACH
A system of on-line support tools aimed at providing product news and bulletins, diagnostic services, compatibility information, and on-line documents.

CP
Circuit Pack

CR
Critical (alarm status)

CSA
Carrier Serving Area

CS&O
Customer Support and Operations

CV
Coding Violation (a performance-monitoring parameter)

CVFE
Coding Violation Far-End — An indication returned to the transmitting terminal that an errored block has been detected at the receiving terminal.

D

DACS III-2000
Digital Access and Cross-Connect System that provides clear channel switching at either the DS3 or the STS-1 rates, eliminating the need for manual DSXs.

DACS IV-2000
Digital Access and Cross-Connect System that provides electronic DS3/STS-1 or DS1/VT1.5 cross-connect capability, eliminating the need for manual DSXs.

DCC
Data Communications Channel — The embedded overhead communications channel in the SONET line. It is used for end-to-end communications and maintenance. It carries alarm, control, and status information between network elements in a SONET network.

DCE
Data Communications Equipment — In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

DDM-1000
AT&T's Dual DS3 Multiplexer — A digital multiplexer that multiplexes DS1, DS1C, or DS2 signals into a DS3 signal or optical signal.

DDM-2000
AT&T's next generation network multiplexer that multiplexes DS1, DS3, or EC-1 inputs into an EC-1, OC-3 or OC-12 outputs.

Default Provisioning
The parameter values that are preprogrammed as shipped from the factory.

Demultiplexing
A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DEMUX
Demultiplexer - "the DEMUX direction" is from the fiber toward the DSX.

Digital Multiplexer
Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

DPLL
Digital Phase-Locked Loop

DRI
Dual Ring Interworking. Two ring networks interconnected at two common nodes.

Drop and continue
A technique that allows redundant signal appearances at two central offices in a DRI network, allowing protection against central office failures.

DS1
Digital Signal Level 1 (1.544 M/bs)

DS1 Circuit Pack
The DS1 interface circuit pack interfaces to the DSX-1 panel.

DS3
Digital Signal Level 3 (44.736 M/bs)

DS3 Circuit Pack
The DS3 circuit pack interfaces to the DSX-3 panel.

DSn
Digital Signal Rate n — One of the possible digital signal rates at DDM-2000 interfaces: DS1 (1.544 Mb/s), DS3 (44.736 Mb/s).

DSNE
Directory Services Network Element — A designated network element that is responsible for administering a database that maps network element names (TIDs) to addresses [NSAPs (network service access points)] in an OSI maintenance subnetwork. There can be one DSNE per ring. Can also be a GNE.

DSX
Digital Cross-Connect Panel — A panel designed to interconnect equipment that operates at a designated rate. For example, a DSX-3 interconnects equipment operating at the DS3 rate.

DT
Distant Terminal

DTE
Data Terminating Equipment — That part of a data station that serves as a data source (originates data for transmission), a data sink (accepts transmitted data), or both.

Dual 0x1
Used with OC-12 VT1.5 path switched ring. Dual 0x1 means an OC-3 ring and an OC-12 ring are connected by two service lines (no protection lines). VT1.5 and STS-1 level switching is done at the OC3. STS1s can be dropped to OC-3 shelves via the dual 0x1 interface at several nodes on the OC-12 ring.

E

EC-1, EC-n
Electrical Carrier — The basic logical building block signal with a rate of 51.840 Mb/s for an EC-1 signal and a rate of n times 51.840 Mb/s for an EC-n signal. An EC-1 signal can be built in two ways: A DS1 can be mapped into a VT1.5 and 28 VT1.5s multiplexed into an EC-1 (VT1.5 based EC-1), or a DS3 can be mapped directly into an EC-1 (DS3 based EC-1).

ECI
Equipment Catalog Item — The bar code number on the faceplate of each circuit pack used by some inventory systems.

EEPROM
Electrically Erasable Programmable Read-Only Memory

EIA
Electronic Industries Association

EMC
Electromagnetic Compatibility

EMI
Electromagnetic Interference

EOOF
Excessive Out of Frame

EPROM
Erasable Programmable Read-Only Memory

EQ
Equipped (memory administrative state)

ES
Errored Seconds — A performance monitoring parameter. ES "type A" is a second with exactly one error, ES "type B" is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

ESD
Electrostatic Discharge

ESF
Extended Super Frame (format for DS1 signal)

F

FDDI
Fiber Distribution Data Interface

FE
Far-End. Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

FE-ACTY
Far End Activity — An LED on the user panel.

FEBE
Far End Block Error — An indication returned to near-end transmitting node that an errored block has been detected at the far end.

FE ID
Far End Identification — The 7-segment display on the faceplate of the SYSCTL circuit pack.

FEPROM
Flash EPROM — A new technology that combines the nonvolatility of EPROM with the in-circuit reprogrammability of EEPROM (electrically-erasable PROM).

FERF
Far-End-Receive Failure — An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure.

FE SEL
Far End Select — An LED on the user panel.

FIT
Failures in /10^9 hours of operation

Free Running
An operating condition of a clock in which its local oscillator is not locked to an internal synchronization reference and is using no storage techniques to sustain its accuracy.

FT-2000
AT&T's SONET OC-48 lightwave system

Function Unit
Refers to any one of a number of different circuit packs that can reside in the A, B, or C function unit slots on the DDM-2000 OC-3 Multiplexer, or in the A, B, C, or D function unit slots of the DDM-2000 OC-12 Multiplexer.

G

GCNS-2000
AT&T's Gigabit Cell Network Switch.

GNE
Gateway Network Element — A network element that funnels information between several network elements and their supporting operations systems. Can also be a DSNE.

Group
The eight slots that may be equipped.

GTP
General Telemetry Processor

H

Holdover
An operating condition of a network element in which its local oscillator is not locked to any synchronization reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

I

IC
Internal Clock. Used in synchronization messaging.

ID
Identifier. See shelf ID and site ID.

IEC
International Electrotechnology Commission

IMF
Infant Mortality Factor

INC
Incoming Status

INCM
A parallel telemetry point used to indicate incoming low-speed failures.

I/O
Input/Output

IR
Intermediate Reach

IS
In Service — One possible state of a DS1, DS3, or EC-1 port. Other possible states are "auto" (automatic) and "nmon" (not monitored).

ISDN
Integrated Services Digital Network

IS-3
An Inexpensive Short-reach proprietary interface provided by the 21D/21D-U and 22D-U optical line interface units.

ISO
International Standards Organization. See OSI.

J

Jitter
Timing jitter is defined as short-term variations of the significant instants of a digital signal from their ideal positions in time.

L

LAN
Local Area Network

LAPD
Link Access Procedure "D"

LBO
Line Build Out — An equalizer network between the DDM-2000 Multiplexer and the DSX panel. It guarantees the proper signal level and shape at the DSX panel.

LCN
Local Communications Network

LED
Light Emitting Diode — Used on a circuit pack faceplate to show failure (red) or service state. It is also used to show the alarm and status condition of the system.

Local
See Near-End.

LOF
Loss of Frame — A failure to synchronize to an incoming signal.

Loop Timing
A timing mode in which the terminal derives its transmit timing from the received line signal.

LOP
Loss of Pointer — A failure to extract good data from an STS-1 payload.

LOS
Loss of Signal — The complete absence of an incoming signal.

LR
Long Reach

LS
Low-Speed

M

Main
Two slots on the DDM-2000 OC-3 shelf in which the OLIU circuit packs are installed.

Maintenance Subnetwork
A maintenance subnetwork consists of a CO (or gateway network element), DDM-2000, and all remote DDM-2000s connected via SONET DCC that are enabled.

Midspan Meet
The capability to interface between two lightwave terminals of different vendors. This applies to high-speed optical interfaces.

MD
Mediation Device

MJ
Major Alarm

MML
huMan-Machine Language defined by CCITT

MN
Minor Alarm

MSDT
Multi-Services Distant Terminal

MTBF
Mean Time Between Failures

MTBMA
Mean Time Between Maintenance Activities

Multiplexing
The process of combining several distinct digital signals into a single composite digital signal.

Mult
Multipling. The cascading of signals in a bay. In the MULT mode, the DS1 external reference can be cascaded to other shelves in a bay using Mult cables. Normally starting with the bottom shelf (Number 1) and working towards the top of the bay.

MUX
Multiplex

MXRVO Circuit Pack
The MXRVO circuit pack multiplexes seven VT-G signals from the DS1 circuit packs to an STS-1 signal for connection to the OLIU circuit packs.

N

NE
Near-End. The network element the user is at or working on. Also called local.

NE
Network Element — The basic building block of a telecommunications equipment with-in a telecommunication network that meets SONET standards. Typical internal attributes of a network element include: one or more high- and low-speed transmission ports, built-in intelligence, synchronization and timing capability, access interfaces for use by technicians and/or operation systems. In addition, a network element may also include a time slot interchanger.

NE-ACTY
Near End Activity — An LED on the user panel.

NEBS
Network Equipment-Building System

nm
Nanometer (10^{-9} meters)

NMA
Network Monitoring and Analysis — An operations system designed by Bellcore which is used to monitor network facilities.

NMON
Not Monitored — A provisioning state for equipment that is not monitored or alarmed.

Node
In SONET a node is a line terminating element.

Non-Revertive
A protection switching mode in which, after a protection switch occurs, the equipment remains in its current configuration after any failure conditions that caused a protection switch to occur clear or after any external switch commands are reset. (See Revertive.)

NRZ
Nonreturn to Zero

NSA
Not Service Affecting

NSAP
Network Services Access Point — An address that identifies a network element. Used for maintenance subnetwork communication using the OSI protocol.

O

OAM&P
Operations, Administration, Maintenance, and Provisioning

OC, OC-n
Optical Carrier — The optical signal that results from an optical conversion of an STS signal; that is, OC-1 from STS-1 and OC-n from STS-n.

OC-1
Optical Carrier Level 1 Signal (51.84 Mb/s)

OC-3
Optical Carrier Level 3 Signal (155 Mb/s)

OC-3c (STS-3c)
Optical Carrier Level 3 concatenated Signal — Low-speed broadband signal equivalent to three STS-1s linked together with a single path overhead.

OC-12
Optical Carrier Level 12 Signal (622 Mb/s)

OHCTL
The overhead controller circuit pack provides user access to the SONET overhead channels.

OLIU
Optical Line Interface Unit

OOF
Out of Frame

Operations Interface
Any interface that provides information on the system performance or control. These include the equipment LEDs, user panel, CIT, office alarms, and all telemetry interfaces.

OOL
Out of Lock

OS
Operations System — A central computer-based system used to provide operations, administration, and maintenance functions.

OSI
Open Systems Interconnection — Referring to the OSI reference model, a logical structure for network operations standardized by the international standards organization (ISO).

OSP
Outside Plant

P

Pass Through
Paths that are cross-connected directly across an intermediate node in a ring network.

PC
Personal Computer

PID
Program Identification

PINFET
Positive Intrinsic Negative Field Effect Transistor

PJC
Pointer Justification Count

Plesiochronous Network
A network that contains multiple maintenance subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly

different at any particular instant. For example in SONET networks, each timing traceable to their own Stratum 1 clock are considered plesiochronous with respect to each other.

PLL
Phased-Locked Loop

PM
Performance Monitoring — Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

PMN
Power Minor Alarm

POH
Path Overhead

Port
The physical, electrical, or optical interface on a system. For example, DS1, DS3, EC-1, OC-3, and OC-12. See Channel.

Port State Provisioning
A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service and not monitored) for low speed ports. See Channel State Provisioning.

POTS
Plain Old Telephone Service

Proactive Maintenance
Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect (for example, performance monitoring).

Protection Line
As defined by the SONET standard, the protection line is the pair of fibers (one transmit and one receive) that carry the SONET APS channel (K1 and K2 bytes in the SONET line overhead). On a DDM-2000 OC-3 system, a *protection* line is a pair of fibers that terminate on an OLIU circuit pack in the `main-2`, `fn-a-2`, `fn-b-2`, or `fn-c-2` slot. (See "Service Line.")

PRM
Performance Report Message

PROTN
Protection

PRS
Primary Reference Source

PVC
Permanent Virtual Circuit

PWR
Power

R

RAM
Random Access Memory

Reactive Maintenance
Refers to detecting defects/failures and clearing them.

Remote
See Far-End.

Revertive
A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the service equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur clear or after any external switch commands are reset. (See "Non-Revertive.")

Ring
A configuration of nodes comprised of network elements connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over a protection line.

RPP
Reliability Prediction Procedure — Described in Bellcore TR-NWT-00032.

RT
Remote Terminal — An unstaffed equipment enclosure that may have a controlled or uncontrolled environment.

RTAC
AT&T Regional Technical Assistance Center (1-800-225-RTAC)

RZ
Return to Zero

S

SA
Service Affecting

SD
Signal Degrade

Self-Healing
Ring architecture in which two or more fibers are used to provide route diversity. Node failures only affect traffic dropped at the failed node.

SEFS
Severely Errored Frame Seconds

SEO
Single-Ended Operations — The maintenance capability that provides remote access to all DDM-2000 systems from a single location over the DCC.

Service Line
On a DDM-2000 OC-3 system, a service (or "working") line is a pair of fibers (one transmit and one receive) that terminate on an OLIU circuit pack in the `main-1`, or `fn-a-1`, or `fn-b-1`, or `fn-c-1` slot. As defined by the SONET standard, the SONET APS channel is not defined on a service (or "working") line. (See "Protection Line.")

Shelf ID
A switch settable parameter with values of from 1 to 8. Used to log into a selected shelf in a bay using the CIT.

Site ID
A switch settable parameter with values of from 1 to 8. Displayed on SYSCTL circuit pack to indicate to which site the user panel alarms and LEDs apply.

SES
Severely Errored Seconds — This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occurs.

SF
Super Frame (format for DS1 signal)

SID
System Identification

SONET
Synchronous Optical Network

SPE
Synchronous Payload Envelope

SQU
Sync Quality Unknown. Used in synchronization messaging.

SRD
Software Release Description

Standby
Standby identifies a 1+1 protected OC-N line which is not currently selected by the receiver at either end as the payload carrying signal, or a 1x1 or 1xn protected circuit pack that is not currently carrying service. (See Active.)

Status
The indication of a short-term change in the system.

STS, STS-n
Synchronous Transport Signal — The basic logical building block signal with a rate of 51.840 Mb/s for an STS-1 signal and a rate of n times 51.840 Mb/s for an STS-n signal.

STS-1 SPE
STS-1 Synchronous Payload Envelope — A 125-microsecond frame structure composed of STS path overhead and the STS-1 payload.

STS-3c
Synchronous Transport Level 3 concatenated Signal. See OC-3c.

Subnetwork
See maintenance subnetwork.

Synchronization Messaging
SONET synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

SYSCTL
The system controller circuit pack that provides overall administrative control of the terminal.

T

T1X1 and T1M1
The ANSI committees responsible for telecommunications standards.

TA
Bellcore Technical Advisory

TABS
Telemetry Asynchronous Byte Serial (Protocol)

TBOS
Telemetry Byte-Oriented Serial (Protocol) — Defines one physical interface for direct connection between the telemetry remote and the monitored equipment. An RS-422 port is used to provide the operations system with sufficient alarm and status information to localize a problem to a given DDM-2000 and to determine the severity of the problem.

TCA
Threshold-Crossing Alert — A condition set when a performance-monitoring counter exceeds a user-selected threshold. A TCA does not generate an alarm but is available on demand through the CIT and is shown by TBOS and causes a message to be sent to NMA via the X.25/TL1 interface.

TCVCXO
Temperature-Compensated Voltage-Controlled Crystal Oscillator — A highly stable and accurate clock source used in the DDM-2000 TGS circuit pack.

TGS
The timing generator circuit pack generates clock signals for distribution to the transmit circuits. It operates in the free-running, loop-timing, phase-lock, and holdover modes.

TID
Target Identifier — The Bellcore name for the system name.

TL1
Transaction Language 1 — A Bellcore machine-to-machine communications language that is a subset of CCITT's human-machine language.

TLB
Timing Looped Back. Used in synchronization messaging.

TOP
Task Oriented Practice

TR
Bellcore Technical Requirement

TSA
Time Slot Assignment

TSI
Time Slot Interchange

TSO
Technical Support Organization — Supports RTAC and the customers.

U

UAS
Unavailable Seconds. In performance monitoring, the count of seconds in which a signal is declared failed or, in which, 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

Unidirectional
A protection switching mode in which the system at each end of an optical span monitors both service and protection lines and independently chooses the best signal (unless overridden by an equipment failure or by an external request, such as a forced switch or lockout). In a system that uses unidirectional line switching, both the *service* and *protection* lines may be *active* simultaneously, with one line carrying traffic in one direction and the other line carrying traffic in the other direction. The K1 and K2 bytes in the SONET line overhead are used to convey to the far end which line the near end receiver has chosen, so that an "active" indication may be made at the far end.

UOC
Universal Optical Connector — Receptacles on the faceplate of some OLIUs that accept *ST*, SC, or FC connectors.

UPD/INIT
A pushbutton on the user panel.

V

VF
Voice Frequency

VLSI
Very Large Scale Integration — Refers to very complex state of the art integrated circuits.

VM
Violation Monitor — A mode of the DS3 circuit pack in which it will monitor but not remove P-bit parity violations on the DS3 signal received from the fiber.

VMR
Violation, Monitor, and Removal — A mode of the DS3 circuit pack in which it will monitor and remove P-bit parity violations on the DS3 signal received from the fiber.

VT
Virtual Tributary — A structure designed for transport and switching of a sub DS3 payload.

VT1.5
A 1.728 Mb/s virtual tributary

VT-G
Virtual Tributary Group — A 9-row by 12-column SONET structure (108 bytes) that carries one or more VTs of the same size. Seven VT groups (756 bytes) are byte-interleaved within the VT-organized STS-1 synchronous payload envelope.

Z

Zero Code Suppression
A technique used to reduce the number of consecutive zeros in a line-codes signal (B3ZS for DS3 signals and B8ZS for DS1 signals).

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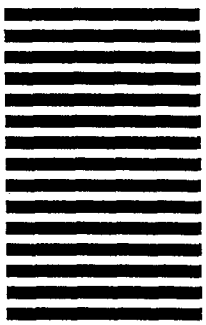
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Document Title: DDM-2000 OC-3 Multiplexer Releases 2, 3, 5, 6, and 7 User/Service Manual (TOP) - Volume II

Document No.: AT&T 363-206-202 Issue 5A Revision Date: July 1995

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Operation and Maintenance (TOP)

Contents

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Acceptance Tab

System Turnup/Circuit Order Tab

Operation Tab

Trouble Clearing Tab

Detailed Level Procedures Tab

Operation and Maintenance (TOP)

Overview

This section supports operation and maintenance of the DDM-2000 OC-3 Multiplexer. It includes the following five separate tabs:

- Acceptance — Yellow tab
- System Turnup/Circuit Order — Orange tab
- Operation — Green tab
- Trouble Clearing — Red tab
- Detailed Level Procedures — Blue tab.

TOP Section Organization

The **Acceptance** tab covers procedures to check the shelf or system after the shelf has been equipped or after the system has been established.

The **System Turnup/Circuit Order** tab includes procedures for the following:

a. Equipping (turning up) a shelf in a looped back condition for the first time.

b Establishing an end-to-end system after all shelves have been equipped.

c. Establishing initial end-to-end DS1, DS3, EC-1, or OC-3c service.

d Adding, converting, or discontinuing DS1, DS3, EC-1, or OC-3c service to an in-service system.

e. Adding new shelves or spans to existing configurations.

f. Upgrading software to a new release.

g. Converting or upgrading an OC-3 system to an OC-12 system.

h. Upgrading an OC-3 point-to-point system to path switched ring.

i. Establish OC-3/IS-3 dual ring interworking (DRI) OC-3 to OC-12 or FT-2000 OC-48.

j. Upgrade OC-3/FT-2000 OC-48 DRI from EC-1 to OC-3.

The **Operation** tab covers procedures for operating the system such as connecting and using the craft interface terminal (CIT), displaying alarm and status conditions, installing a new generic program, etc.

The **Trouble Clearing** tab covers alarms and trouble reports.

The **Detailed Level Procedures** (DLP) tab contains all of the DLPs, beginning with DLP-500, used in this manual.

How To Use This TOP Section

To find the instructions for performing acceptance, system turnup/circuit order, operation, or trouble clearing tasks, proceed as follows:

1. Find your job in the Task Index under the appropriate colored tab and go to the referenced procedure (for example: **Acceptance IXL-001**). Or you may use the Master Task Index (**IXL-001**) in this introduction.

2. Turn to the indicated director level, detail level, or trouble-clearing procedure.

   Procedures in this TOP are of three types:

   a. Non-Trouble-Clearing Procedures (**NTP**) - a director level procedure that lists normal work items to perform other than trouble clearing.

   b. Trouble Analysis Procedure (**TAP**) - a director level procedure that contains step-by-step trouble-clearing instructions to locate and/or fix troubles.

   c. Detailed Level Procedures (**DLP**) - detailed step-by-step instructions.

   All procedures in each section of this TOP are in numerical order, regardless of the type of procedure (see Table 1.) Table 1, which lists all the procedures used in this TOP, is provided as a reference only. It should not be used alone in finding instructions for performing tasks.

3. Perform all the items in the director level procedure in the indicated order unless it sends you to another director-level procedure. When you

complete a director-level procedure, you have finished the task. Where more detailed information is required, you will be sent to a Detailed Level Procedure **DLP-( ).** You may also be sent to a Detailed Level Procedure by another Detailed Level Procedure. All DLPs are in the Detailed Level Procedures tab section of this manual.

4. **IMPORTANT:** Unless otherwise directed, when you complete a Detailed Level Procedure, you **MUST** return to the procedure that sent you there.
5. **IMPORTANT:** Unless otherwise directed, if one director level procedure sends you to another director level procedure, you should not return to the first director level procedure after you complete the second.
6. Sometimes you will be asked to verify that things have occurred. This may take the form of a formal statement of the expected response. At other times, the instructions will merely state *verify that ...* .

   If the expected response is not observed and a specific trouble clearing reference is not made, you should reference the trouble analysis procedures under the Trouble Clearing tab to clear the trouble.
7. When performing tests or procedures using a CIT and system commands, you should refer to the "Commands and Reports" section of this manual for a description of the command, its parameters, and the output messages associated with the command.
8. If a procedure refers to software releases, for example Release 5 or later, it refers to all linear and ring releases with a numerical value of 5 or higher. If the procedure refers to software releases as Release 5 or later ring releases, it refers to all ring software releases with a numerical value of 5 or higher.
9. If you need assistance in clearing a trouble after completing all the applicable trouble-clearing procedures in this section, contact your local or regional maintenance assistance group. The telephone number for the AT&T Regional Technical Assistance Center (RTAC) is **1-800-225-RTAC**.

Circuit packs being returned for repair should be sent to the following address:

AT&T Network Systems
Returned Goods Dept.
Dept. 11MV287122
1600 Osgood Street
North Andover, Massachusetts 01845

Screen Display and Panel Stamping Fonts

The procedures in this manual use a `monospace` font to identify actual text on a screen or a response displayed from the system. A **bold** font identifies panel stamping such as alarm names or circuit pack names. Also, the **bold** font is used throughout this manual for emphasis.

DDM-2000 OC-3 Installation

AT&T 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual*, is available for customers planning to install the equipment themselves. To acquire this manual, refer to "How to Order Documents" in the About This Document tab.

AT&T recommends that ONLY designated AT&T cables be used with DDM-2000. Failure to use these cables will void the product warranty.

Safety Instructions

Admonishments

This manual may contain admonishments in the form of **DANGERS, WARNINGS,** and **CAUTIONS**. These admonishments have the following definitions:

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

Lightwave Safety

An AT&T lightwave digital transmission system and associated optical test sets use semiconductor laser transmitters. The lasers emit lightwaves, at or near infrared wavelengths, into lightguide 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, since viewing optics tends to collimate the energy from an optical connector and, hence, increases the potential risk for injury.*

* Registered trademark of F.J.W. Industries, Inc

Electrostatic Discharge (ESD) Considerations

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

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

- Assume all circuit packs contain solid state electronic components that can be damaged by ESD.
- When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat. If a static-dissipating floor mat is used, be sure that it is clean to ensure a good discharge path.
- Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats. If a static-dissipating floor mat is used, be sure that it is clean to ensure a good discharge path.
- 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 bay, immediately put circuit packs into static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.

To reduce the possibility of ESD damage, shelves are equipped with grounding jacks to enable personnel to ground themselves using wrist straps (see Figure A) while handling circuit packs or working on a shelf(s). The jacks for connection of

wrist straps are located at the lower right-hand corner of each shelf and are labeled. When grounding jacks are not provided, an alligator clip adapter enables connection to bay frame ground.

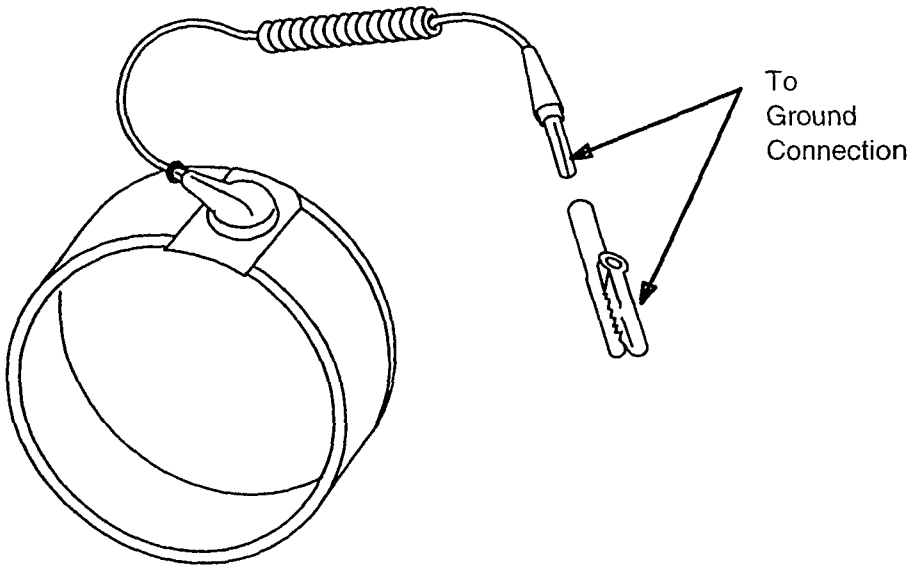


Figure A. Static Control Wrist Strap

Removing and Installing Circuit Packs

Circuit packs can be damaged by improperly removing and installing them in the shelf. Never install or remove more than one circuit pack at a time.

To remove a circuit pack, unseat the circuit pack from the slot by carefully operating the faceplate latch. Remove the pack with one slow, steady, continuous motion. Do not rock the circuit pack back and forth.

To install a circuit pack, remove the plastic shipping protector from the contacts of the new circuit pack and insert the circuit pack into the slot. Push at the bottom and top of the circuit pack with one slow continuous motion until the circuit pack stops. (Do not rock the circuit pack back and forth.) Raise the faceplate latch and push gently on the circuit pack until the latch engages the slot on the shelf. After the latch engages the slot, close the latch (push down) to seat the circuit pack. After closing the latch, with one thumb on the latch and the other thumb at the bottom of the circuit pack, press firmly to assure that the circuit pack is fully seated. Do not use excessive force to seat the circuit pack.

IMPORTANT SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS.

* Registered trademark of Underwriters Laboratories, Inc.

IMPORTANT INSTALLATION SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS.

Master Task Index
Operation and Maintenance

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
ABN Indication - Clear	Trouble Clearing: TAP-109
CIT - Activate Optional System Features	Detailed Level Procedure: DLP-512
CIT - Connect and Establish Session	Detailed Level Procedure: DLP-521
CIT - Enable or Disable System Security and/or Edit, Delete, or Enter a User's Login	Detailed Level Procedure: DLP-541
DS1 Service — Add New (Group Already In Service)	Circuit Order: NTP-006
DS1 Service — Add New MXRVO Group — System In Service	Circuit Order: NTP-008
DS1 Service — Add New STS1E High Speed Group — EC-1 Electrical Multiplexer System In Service	Circuit Order: NTP-032
DS1 Service — Convert to DS3 Group Service	Circuit Order: NTP-009
DS1 Service — Discontinue	Circuit Order: NTP-011
DS1 Service — Establish Initial End-to-End — Group Equipped But Not In Service	System Turnup: NTP-004

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
DS3 Service — Add New DS3 Group — In Service	Circuit Order: NTP-007
DS3 Service — Convert to DS1 Group Service	Circuit Order: NTP-010
DS3 Service — Discontinue	Circuit Order: NTP-012
DS3 Service — Establish Initial End-to-End — Group Equipped But Not In Service	System Turnup: NTP-005
EC-1 Service — Add New STS1E Group — System In Service	Circuit Order: NTP-035
EC-1 Service — Establish Initial End-to-End — Group Equipped With STS1E Not In Service	System Turnup: NTP-034
EC-1 Service — Discontinue	Circuit Order: NTP-036
FAULT LED Indication (Flashing) - Clear	Trouble Clearing: TAP-110
FE SEL — Display Alarm/Status Condition	Detailed Level Procedure: DLP-530
LEDs — Test	Detailed Level Procedure: DLP-509
NE ACTY/FE ACTY Alarm Only - Clear	Trouble Clearing: TAP-117
SYSCTL — Install or Replace	Detailed Level Procedure: DLP-501
Accept DDM-2000 OC-3 Multiplexer Shelf (Looped Back)	Acceptance: NTP-003
Accept End-to-End System - OC-3 Point-to-Point	Acceptance: NTP-004
Accept DDM-2000 OC-3 Multiplexer (Equipped) — Overview	Acceptance: NTP-002

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Add DDM-2000 OC-3 Shelf — Linear or Hub Configuration Shelf Added in Middle of Optical Span	Circuit Order: NTP-014
Add DDM-2000 OC-3 Shelf and/or New Optical Span — Shelf and/or Span Added as Extension to DDM-2000 OC-3 Ring	Circuit Order: NTP-015
Add DDM-2000 Shelf and Optical Span — Linear or Hub Configuration Shelf Added as Extension to DDM-2000 OC-12	Circuit Order: NTP-018
Add New DDM-2000 OC-3 Node (Shelf) To DDM-2000 OC-3 Path Switched Ring	Circuit Order: NTP-026
Add New DS1 Service — Group Already In Service	Circuit Order: NTP-006
Add New DS3 Group For DS3 Service — System In Service	Circuit Order: NTP-007
Add New DDM-2000 OC-3 Node (Shelf) To Path Switched Ring	Circuit Order: NTP-026
Add New MXRVO Group For DS1 Service — System In Service	Circuit Order: NTP-008
Add New STS1E High Speed Group For DS1 Service — EC-1 Electrical Multiplexer System In Service	Circuit Order: NTP-032
Add New STS1E Group For EC-1 Service — System In Service	Circuit Order: NTP-035

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Add/Drop OC-3 Shelf — Convert (Upgrade) DDM-2000 OC-3 Shelf	Circuit Order: NTP-020
Alarm - Critical (CR) - Clear	Trouble Clearing: TAP-101
Alarm - Major (MJ) - Clear	Trouble Clearing: TAP-102
Alarm - Minor (MN) - Clear	Trouble Clearing: TAP-112
Alarm - NE ACTY/FE ACTY Only - Clear	Trouble Clearing: TAP-117
Alarm - Power Minor (PMN) - Clear	Trouble Clearing: TAP-104
Alarm/Status Condition — Display Using FE SEL	Detailed Level Procedure: DLP-530
Condition System Operating on Release 1 For an Upgrade to Release 2 or 3	Detailed Level Procedure: DLP-549
Convert (Upgrade) DDM-2000 OC-3 Shelf to DS1 Add/Drop OC-3 Shelf	Circuit Order: NTP-020
Convert (Upgrade) DDM-2000 OC-3 System to OC-12 System Linear and Hub Configuration	Circuit Order: NTP-021
Convert DS1 Group Service to DS3 Group Service	Circuit Order: NTP-009
Convert DS1 Group Service to EC-1 Group Service	Circuit Order: NTP-038
Convert DS3 Group Service to DS1 Group Service	Circuit Order: NTP-010

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Copy Diskettes (Floppy Disks) and Make Backups	Detailed Level Procedure: DLP-534
Critical (CR) Alarm - Clear	Trouble Clearing: TAP-101
Discontinue DS1 Service	Circuit Order: NTP-011
Discontinue DS3 Service	Circuit Order: NTP-012
Discontinue OC-3 Optical Span From DDM-2000 OC-3 Hub or OC-12 System	Circuit Order: NTP-019
Discontinue DDM-2000 OC-3 Node (Shelf) From Path Switched Ring	Circuit Order: NTP-027
Discontinue EC-1 Service	Circuit Order: NTP-036
Discontinue STS1E High Speed Group EC-1 Electrical Multiplexer Shelf	Circuit Order: NTP-033
Diskettes (Floppy Disks) — Copy and Make Backups	Detailed Level Procedure: DLP-534
Display Terminal Alarm/Status Condition — Using FE SEL	Detailed Level Procedure: DLP-530
Equip DDM-2000 EC-1 Electrical Multiplexer Shelf — Looped Back	System Turnup: NTP-031
Equip DDM-2000 OC-3 Shelf (Looped Back) — OC-3 Release 2 and Later	System Turnup: NTP-016
Establish DDM-2000 OC-3c (STS-3c) Service	System Turnup: NTP-002

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Establish End-to-End DDM-2000 OC-3 System — OC-3 Point-to-Point	System Turnup: NTP-003
Establish End-to-End DDM-2000 OC-3 System — Linear or Hub Configuration DDM-2000 OC-3 Optical Fiber Spans	System Turnup: NTP-017
Establish End-to-End DDM-2000 OC-3 System — Optical Fiber Spans Dual 0X1 Path Switched Ring Network	System Turnup: NTP-040
Establish End-to-End DDM-2000 OC-3 System — Optical Fiber Spans Path Switched Ring Network	System Turnup: NTP-022
Establish Initial EC-1 Service — Group Equipped With STS1E Not In Service	System Turnup: NTP-034
Establish Initial End-to-End DS1 Service — Group Equipped But Not In Service	System Turnup: NTP-004
Establish Initial End-to-End DS3 Service — Group Equipped But Not In Service	System Turnup: NTP-005
Establish OC-3/IS-3 Dual Ring Interworking — DDM-2000 OC-3 to OC-12 or FT-2000 Ring Configurations OC-3 Optical Fiber Spans	System Turnup: NTP-041
Establish Remote Login	Detailed Level Procedure: DLP-522
Fan Shelf Alarm - Clear	Trouble Clearing: TAP-118
Fan Shelf Assembly - Test	Detailed Level Procedure: DLP-539

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Fan Shelf Filter - Replace	Detailed Level Procedure: DLP-540
Fuse - Remove –48V DC User Panel	Detailed Level Procedure: DLP-555
Generic Program — Install New	Detailed Level Procedure: DLP-532
Generic Software Version Identification — Retrieve	Detailed Level Procedure: DLP-531
Install or Replace SYSCTL	Detailed Level Procedure: DLP-501
Install New Generic Program	Detailed Level Procedure: DLP-532
Login — Establish Remote	Detailed Level Procedure: DLP-522
Maintenance Philosophy	Trouble Clearing: TAD-100
Major (MJ) Alarm - Clear	Trouble Clearing: TAP-102
Minor (MN) Alarm- Clear	Trouble Clearing: TAP-112
Modem - Condition and Connect	Detailed Level Procedure: DLP-526
Option Settings - Check (Set)	Detailed Level Procedure: DLP-513
Circuit Pack — Replace (Reference Only)	Detailed Level Procedure: DLP-523
Power Minor (PMN) Alarm - Clear	Trouble Clearing: TAP-104
Program — Upgrade Release 2 to Release 3	Detailed Level Procedure: DLP-532
Remote Login — Establish	Detailed Level Procedure: DLP-522
Replace Circuit Pack (Reference Only)	Detailed Level Procedure: DLP-523

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Service — Convert DS1 to DS3 Group Service	Circuit Order: NTP-009
Service — Convert DS1 to EC-1 Group Service	Circuit Order: NTP-038
Service — Convert DS3 to DS1 Group Service	Circuit Order: NTP-010
Service — Discontinue DS1	Circuit Order: NTP-011
Service — Discontinue DS3	Circuit Order: NTP-012
Service — Discontinue EC-1	Circuit Order: NTP-036
Service — Establish Initial End-to-End EC-1 — Group Equipped With STS1E Not In Service	System Turnup: NTP-034
Service — Establish Initial End-to-End DS1 — Group Equipped But Not In Service	System Turnup: NTP-004
Service — Establish Initial End-to-End DS3 — Group Equipped But Not In Service	System Turnup: NTP-005
Shelf — Add DDM-2000 OC-3 — Linear or Hub Configuration Shelf Added in Middle of Optical Span	Circuit Order: NTP-014
Shelf — Add DDM-2000 OC-3 — Shelf Added to DDM-2000 OC-3 Ring	Circuit Order: NTP-015
Shelf and Optical Span — Add DDM-2000 OC-3 — Shelf Added as Extension to DDM-2000 OC-12	Circuit Order: NTP-018
Shelf — Equip DDM-2000 Electrical Multiplexer — EC-1 (Looped Back)	System Turnup: NTP-031
Shelf — Equip DDM-2000 OC-3 (Looped Back) — OC-3 Release 2 or Later	System Turnup: NTP-016

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Software Program — Upgrade	Detailed Level Procedure: DLP-532
Software Program Upgrade — Release 1 to Release 2 or 3 System in Service	Circuit Order: NTP-013
Software Version ID - Retrieve	Detailed Level Procedure: DLP-531
Span — Add OC-3 Shelf and/or Optical Span Hub, Point-to-Point, Linear Add/Drop Configuration	Circuit Order: NTP-015
Span — OC-3 Optical — Discontinue Linear, Hub, or OC-12 Configuration	Circuit Order: NTP-019
System Backup and Restore — SNC-2000 cPro	Operation: NTP-002
System — Establish End-to-End DDM-2000 OC-3 — OC-3 Point-to-Point	System Turnup: NTP-003
System — Establish End-to-End DDM-2000 OC-3 — Linear or Hub Configuration Optical Fiber Spans	System Turnup: NTP-017
System — Establish End-to-End DDM-2000 OC-3 — Dual 0X1 Path Switched Ring Network Optical Fiber Spans	System Turnup: NTP-040
System — Establish End-to-End DDM-2000 OC-3 — Path Switched Ring Network Optical Fiber Spans	System Turnup: NTP-022
Telemetry — Upgrade TBOS/Parallel to TL1/X.25	Detailed Level Procedure: DLP-538

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Test LEDs	Detailed Level Procedure: DLP-509
Test (Accept) DDM-2000 OC-3 Multiplexer (Looped Back)	Acceptance: NTP-003
Test (Accept) End-to-End System - OC-3 Point-to-Point	Acceptance: NTP-004
Test (Accept) DDM-2000 OC-3 Multiplexer (Equipped) — Overview	Acceptance: NTP-002
Timing — Upgrade	Detailed Level Procedure: DLP-535
Trouble Report - Clear	Trouble Clearing: TAP-105
Upgrade DDM-2000 — Release 1 to Release 2 or 3 System In Service	Circuit Order: NTP-013
Upgrade Program	Detailed Level Procedure: DLP-532
Upgrade Timing	Detailed Level Procedure: DLP-535
Upgrade TBOS/Parallel Telemetry to TL1/X.25	Detailed Level Procedure: DLP-538
Upgrade (Convert) DDM-2000 OC-3 Shelf to DS1 Add/Drop OC-3 Shelf	Circuit Order: NTP-020
Upgrade (Convert) DDM-2000 OC-3 System to OC-12 System Linear or Hub Configuration	Circuit Order: NTP-021
Upgrade DDM-2000 OC-3 Point-to-Point to Path Switched Ring In Service	Circuit Order: NTP-029

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Upgrade DDM-2000 OC-3 Point-to-Point to Path Switched Ring Out of Service	Circuit Order: NTP-030
Upgrade DDM-2000 OC-3 Add/Drop Network to Path Switched Ring	Circuit Order: NTP-039
Upgrade DDM-2000 OC-3/FT-2000 Dual Ring Interworking Network from EC-1 to OC-3 In Service	Circuit Order: NTP-042

Numerical List of TOP Procedures

Table 1. Numerical List of TOP Procedures (Note)

Acceptance Tab	
IXL-001	Acceptance Task Index
NTP-002	Overview of Acceptance (Test) Procedures for DDM-2000 OC-3 Multiplexer (Equipped)
NTP-003	Test (Accept) DDM-2000 (Looped-Back)
NTP-004	Test (Accept) End-to-End DDM-2000 OC-3 System
System Turnup/Circuit Order Tab	
IXL-001	System Turnup/Circuit Order Task Index
NTP-002	Establish DDM-2000 OC-3c (STS-3c) Service
NTP-003	Establish End-to-End System DDM-2000 OC-3 Point-to-Point
NTP-004	Establish Initial End-to-End DS1 Service (Group Equipped But Not In-Service)
NTP-005	Establish Initial End-to-End DS3 Service (Group Equipped But Not In Service)
NTP-006	Add New DS1 Service (Group Already In Service)
NTP-007	Add New DS3 Group for DS3 Service System In Service
NTP-008	Add New MXRVO Group for DS1 Service System In Service
NTP-009	Convert DS1 Group Service to DS3 Group Service
NTP-010	Convert DS3 Group Service to DS1 MXRVO Group Service
NTP-011	Discontinue End-to-End DS1 Service
NTP-012	Discontinue End-to-End DS3 Service
NTP-013	Upgrade DDM-2000 OC-3 Release 1 to Release 2 or 3 System In Service
NTP-014	Add DDM-2000 OC-3 Shelf Linear or Hub Configuration Shelf Added in Middle of Optical Span
NTP-015	Add DDM-2000 OC-3 Shelf and/or New Optical Span Shelf and/or Span Added as Extension to DDM-2000 OC-3 Ring Hub, Point-to-Point, Linear Add/Drop Configuration
NTP-016	Equip DDM-2000 OC-3 Shelf (Looped-Back) Release 2 Software or Later
NTP-017	Establish End-to-End System Linear or Hub Configuration DDM-2000 OC-3 Optical Fiber Spans

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

System Turnup/Circuit Order Tab (Contd)	
NTP-018	Add DDM-2000 OC-3 Shelf and New Optical Span Linear or Hub Configuration Shelf Added as Extension to DDM-2000 OC-12
NTP-019	Discontinue OC-3 Span From DDM-2000 OC-3 Hub or OC-12 System
NTP-020	Convert (Upgrade) DDM-2000 OC-3 Shelf to DS1 Add/Drop Shelf
NTP-021	Convert (Upgrade) DDM-2000 OC-3 System to OC-12 System Linear and Hub Configuration
NTP-022	Establish End-to-End DDM-2000 OC-3 System Optical Fiber Spans Path Switched Ring Network
NTP-023	Deleted
NTP-024	Deleted
NTP-025	Deleted
NTP-026	Add New DDM-2000 OC-3 Node (Shelf) To DDM-2000 OC-3 Path Switched Ring
NTP-027	Discontinue DDM-2000 OC-3 Node (Shelf) From DDM-2000 OC-3 Path Switched Ring Network
NTP-028	Deleted
NTP-029	Upgrade DDM-2000 OC-3 Point-to-Point to Path Switched Ring In Service
NTP-030	Upgrade DDM-2000 OC-3 Point-to-Point to Path Switched Ring Out of Service
NTP-031	Equip DDM-2000 EC-1 Electrical Multiplexer Shelf (Looped Back)
NTP-032	Add New STS1E High Speed Group for DS1 Service System In Service
NTP-033	Discontinue STS1E High Speed Group EC-1 Electrical Multiplexer Shelf
NTP-034	Establish Initial EC-1 Service Group Equipped With STS1E But Not In Service
NTP-035	Add New STS1E Low Speed Group for EC-1 Interface System In Service
NTP-036	Discontinue EC-1 Interface
NTP-037	Deleted
NTP-038	Convert DS1 Group Service to EC-1 Group Service
NTP-039	Upgrade DDM-2000 OC-3 Add/Drop Network to Path Switched Ring
NTP-040	Establish End-to-End DDM-2000 OC-3 System Dual 0x1 Path Switched Ring

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

System Turnup/Circuit Order Tab (Contd)	
NTP-041	Establish OC-3/IS-3 Dual Ring Interworking DDM-2000 OC-3 to OC-12 or FT-2000 Ring Configurations OC-3 Optical Fiber Spans
NTP-042	Upgrade DDM-2000 OC-3/FT-2000 Dual Ring Interworking Network from EC-1 to OC-3 In Service
Operations Tab	
IXL-001	Task Index
NTP-002	SNC-2000 cPro System Backup and Restore
Trouble Clearing Tab	
IXL-001	Task Index
TAD-100	Maintenance Philosophy
TAP-101	Clear Critical (CR) Alarm
TAP-102	Clear Major (MJ) Alarm
TAP-103	Clear Multiple Failure
TAP-104	Clear Power Minor (PMN) Alarm
TAP-105	Clear Trouble Report
TAP-106	Isolate and Clear Failure
TAP-107	Clear Far End Alarm Using Craft Interface Terminal (CIT)
TAP-108	Clear Obscure Failure Condition
TAP-109	Clear Abnormal (ABN) Indication
TAP-110	Clear Flashing FAULT LED Indication
TAP-111	Clear OLIU or Fiber Trouble — Linear or Hub Configuration
TAP-112	Clear Minor (MN) Alarm
TAP-113	Clear Obscure Minor (MN) Alarm
TAP-114	Clear External Minor Alarm at RT
TAP-115	Clear LED Test Trouble
TAP-116	Clear Trouble During Program Upgrade
TAP-117	Clear NE ACTY/FE ACTY Alarm Only
TAP-118	Clear Fan Shelf Alarm
TAP-119	Clear OLIU or Fiber Trouble — Path Protected Ring
TAP-120	Clear STS/VT AIS Alarm Conditions

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab	
DLP-500	Install BBG7 OHCTL Circuit Pack
DLP-501	Install or Replace SYSCTL
DLP-502	Install STS1E Circuit Packs
DLP-503	Install TGS Circuit Packs
DLP-504	Install OLIU Circuit Packs
DLP-505	Connect Optical Loop
DLP-506	Install MXRVO Circuit Packs
DLP-507	Install DS3 Circuit Packs
DLP-508	Install DS1/DS1PM Circuit Packs
DLP-509	Perform LED Test
DLP-510	Perform DS1 Transmission Test
DLP-511	Perform DS3 Transmission Test
DLP-512	Activate Optional System Features Using CIT
DLP-513	Set Circuit Pack Options
DLP-514	Perform Optical Facility Connections and Verify Integrity of Optical Facility
DLP-515	Perform End-to-End OC-3 Optical Line Test
DLP-516	Check Local Office Alarms
DLP-517	Check Parallel Telemetry
DLP-518	Check TBOS Serial Telemetry
DLP-519	Test Protection Switching Function
DLP-520	Condition DS1/DS1PM Circuit Pack/Port for New DS1 Service
DLP-521	Connect CIT and Establish Session
DLP-522	Establish Remote Login
DLP-523	Replace Circuit Pack
DLP-524	Check –48 V DC Office Battery
DLP-525	Perform Automatic End-to-End OC-3 Line Test - Release 2 or Later
DLP-526	Condition and Connect Modems to Establish Communication From Remote Location
DLP-527	Clean Optical Fibers, Connectors, and Lightguide Buildouts (LBOs)
DLP-528	Perform Automatic Local Transmission Test - Release 2 or Later
DLP-529	Perform Automatic Cross-Connect Wiring Test - Release 2 or Later
DLP-530	Operate FE SEL Pushbutton on SYSCTL
DLP-531	Retrieve Generic Software Version ID
DLP-532	Install New Generic Program
DLP-533	Introduction to the PC
DLP-534	Copy Diskettes and Make Backups
DLP-535	Upgrade BBF2 TGS To BBF2B TGS
DLP-536	Perform Test of RT Batteries Using 197A BATTERY LOAD TEST SET
DLP-537	Check 197A BATTERY LOAD TEST SET

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab (Contd)	
DLP-538	Upgrade TBOS/Parallel Telemetry to TL1/X.25
DLP-539	Test ED-8C733-30, G7 Fan Shelf
DLP-540	Replace ED-8C733-30, G4 Fan Filter
DLP-541	Enable or Disable System and/or Edit, Delete, or Enter a User's Login (Release 3 or Later)
DLP-542	Replace Existing OLIU With Different Type OLIU
DLP-543	Change Timing Mode on TGS Circuit Pack
DLP-544	Perform OC-3c (STS-3c) Transmission Test
DLP-545	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Linear or Add/Drop Configuration
DLP-546	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Single Ring Configuration
DLP-547	DDM-2000 Receiver Sensitivity Test
DLP-548	Replace Defective Fan Pack
DLP-549	Condition System Operating on OC-3 Release 1 Software for an Upgrade to OC-3 Release 2 or Release 3 Software
DLP-550	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration (Release 7)
DLP-551	Replace DDM-2000 OC-3 Shelf User Panel Out of Service
DLP-552	Install/Remove Lightguide Buildout
DLP-553	Perform DS3 Transmission Test Dual Ring Interconnection DDM-2000 to FT-2000 Ring Network
DLP-554	Perform DS1 Transmission Test Dual Ring Interconnection DDM-2000 to FT-2000 Ring Network
DLP-555	Remove –48 V DC User Panel Fuse

Table 1 is provided as a reference only, and should not be used alone in finding instructions for performing tasks.

SNC-2000 cPro

SNC-2000 cPro provides simultaneous access to the CIT interface [ASCII user interface (AUI)] window as well as a graphical user interface (GUI) window to DDM-2000 OC-3 systems.

During an SNC-2000 cPro session, the AUI and GUI will appear as two separate windows. In *Microsoft Windows** environment, one window is always active. The user must move the mouse pointer inside a window and click the left mouse button to make that window active. The keyboard is always attached to the active window.

For example, the user must activate the GUI to issue a command or carry out a task from the GUI menu. Similarly, the user must activate the AUI window before entering a CIT command from the keyboard. Please read the *SNC-2000 cPro User's Guide* for further information on the uses of AUI and GUI.

The user can execute all CIT commands from the AUI window of SNC-2000 cPro and, consequently, all procedures found in the TOP can be performed from within SNC-2000 cPro.

SNC-2000 cPro offers the following unique capabilities that are available only via the GUI:

- On-demand network element (NE) inventory. The NE inventory consists of the following information:
  - — Equipage of each node
  - — STS-1 and VT-1.5 cross-connections at each node.
- On-demand subnetwork inventory and display. The subnetwork inventory consists of the following information.
  - — The number of nodes in the subnetwork
  - — TIDs of the nodes in the subnetwork
  - — The connectivity between the nodes in the subnetwork
  - — The NE inventory of each node in the subnetwork.
- Setting and retrieving options for DS1, DS3, and EC1 ports.
- Setting and retrieving options for OC-3 lines

* Microsoft is a registered trademark and windows is a trademark of Microsoft Corporation.

- Entering and deleting STS-1 and VT-1.5 cross-connections with or without drop-and-continue individually or in a range at each node.
- Entering and deleting STS-1 and VT-1.5 paths all the way around a path switched ring for a straight ring or dual interconnected ring (DRI) application.
- NE data base backup and restoration, covering
  - — NE TID and SW version number
  - — NE equipage
  - — NE cross-connections
  - — NE DS1/DS3/EC1 port provisioning data
  - — NE OC-3 Line provisioning.
- On-demand update of alarm display for the NE as well as for the entire subnetwork.

SNC-2000 cPro is recommended only if it is planned to exploit these capabilities. When using SNC-2000 cPro to operate DDM-2000 OC-3 systems, the user MUST adhere to the following general guidelines:

- For commands/capabilities supported by SNC-2000 cPro (see the DDM-2000 CIT command to SNC-2000 cPro menu items in Table 11-2 SNC-2000 cPro Conversion Table at the beginning of the Chapter 11), ALWAYS USE THE GUI. If, for example, cross-connections are not established using the GUI and are done using the AUI, the SNC-2000 cPro temporary data base will not be updated with those cross-connections. This will reduce the usefulness of SNC-2000 cPro.
- Whenever a procedure calls for an update function to be performed at the NE or for adding circuit packs that did not previously exist at a particular NE, issue the **upd** command from the AUI of SNC-2000 cPro and immediately follow that with an NE inventory command from the GUI to make the graphics reflect the updates to the DDM-2000 data base.
- Whenever a procedure calls for a CNVT-CRS-STS1 function to be performed, issue the **cnvt-crs** command from the AUI and immediately follow that with an NE inventory from the GUI. You may also run the analysis to verify that the conversion has not caused any provisioning errors.
- Whenever a procedure calls for adding or deleting nodes to the subnetwork, immediately follow it with a subnetwork inventory command from the GUI to make the temporary data base of SNC-2000 cPro to be updated with the updates to the subnetwork

- Use **rlgn** and **logout** commands in and out of remote nodes instead of toggles.

Table 2 lists the NTPs and DLPs that would benefit most by the use of SNC-2000 cPro.

NOTE 1:
CIT commands must be used from the AUI for any commands not yet supported by SNC-2000 cPro.

NOTE 2:
The user may also use the RESTORE capability of SNC-2000 cPro to set up cross-connections quickly at any added node.

Table 2. Suggested Procedures for Using SNC-2000 cPro

System Turnup/Circuit Order	
NTP-002	Establish DDM-2000 OC-3c (STS-3c) Service
NTP-004	Establish Initial End-to-End DS1 Service (Group Equipped But Not In-Service)
NTP-005	Establish Initial End-to-End DS3 Service (Group Equipped But Not In Service)
NTP-006	Add New DS1 Service (Group Already In Service)
NTP-007	Add New DS3 Group For DS3 Service System In Service
NTP-008	Add New MXRVO Group For DS1 Service System In Service
NTP-009	Convert DS1 Group Service to DS3 Group Service
NTP-010	Convert DS3 Group Service to DS1 MXRVO Group Service
NTP-011	Discontinue End-to-End DS1 Service
NTP-012	Discontinue End-to-End DS3 Service
NTP-026	Add New DDM-2000 OC-3 Node (Shelf) To DDM-2000 OC-3 Path Switched Ring
NTP-027	Discontinue DDM-2000 OC-3 Node (Shelf) From DDM-2000 OC-3 Path Switched Ring Network
NTP-034	Establish Initial EC-1 Service Group Equipped With STS1E But Not In Service
NTP-035	Add New STS1E Low Speed Group for EC-1 Interface System In Service
NTP-036	Discontinue EC-1 Interface
NTP-038	Convert DS1 Group Service to EC-1 Group Service

Table 2. Suggested Procedures for Using SNC-2000 cPro (Contd)

Detailed Level Procedures (DLP)	
DLP-531	Retrieve Generic Software Version ID
DLP-545	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Linear or Add/Drop Configuration
DLP-546	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Single Ring Configuration
DLP-550	Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration (Release 7)

Acceptance Task Index

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Acceptance Procedures (Shelf Equipped)

⇒ NOTE:
The following procedures are for use in testing the DDM-2000 OC-3 Multiplexer system after another organization has equipped it. The procedures test the DDM-2000 OC-3 system *after* all circuit packs have been installed and the shelf is looped back or after a system has been established end-to-end. They are not intended to be used for initial system turnup or in establishing an end-to-end system. System Turnup procedures are found in this manual under the System Turnup/Circuit Order tab.

Test (Accept) DDM-2000 OC-3 Multiplexer (Equipped) — Overview . . . . . Acceptance: NTP-002

Test (Accept) DDM-2000 OC-3 Multiplexer (Looped Back) . . Acceptance: NTP-003

Test (Accept) End-to-End DDM-2000 OC-3 System (Network) . . . . . Acceptance: NTP-004

Acceptance Procedures (Shelf Unequipped)

⇒ NOTE:
Procedures for installing and testing DDM-2000 OC-3 system bays, shelves, and cables are found in AT&T 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual.*

Overview of Acceptance (Test) Procedures for DDM-2000 OC-3 Multiplexer (Equipped)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

A. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE:
This procedure is an overview of acceptance procedures that may be performed on the DDM-2000 OC-3 Multiplexer. It assumes that the DDM-2000 OC-3 shelf or system has been installed and equipped with circuit packs. It also assumes that the system is being tested (accepted) by an organization that *did not* install it. This procedure is for reference only. It contains a list of items that may be performed in doing acceptance of a shelf or system and is not intended to be done in sequence.

Verify that office battery has been applied to the shelf. (**PWR ON** LED lighted on User Panel.) **DLP-524**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
B. Set (check) circuit pack option switch settings, if required.	**DLP-513**
C. Test (accept) DDM-2000 OC-3 Multiplexer (looped back). [**Acceptance: NTP-003**]	
D. Test (accept) end-to-end DDM-2000 OC-3 System [**Acceptance: NTP-004**]	
E. If required, perform DS1 transmission tests on each DS1 port.	
A. Linear or Single Ring Configuration	**DLP-510**
B. Dual Ring (DRI) Configuration	**DLP-554**
F. If required, perform DS3 transmission tests on each DS3 port.	
A. Linear or Single Ring Configuration	**DLP-511**
B. Dual Ring (DRI) Configuration	**DLP-553**
G. If required, perform OC-3c transmission tests.	**DLP-544**

Test (Accept) DDM-2000 OC-3 Multiplexer Shelf (Looped-Back)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This test is to be performed if the DDM-2000 is being tested or accepted by an organization that did not install it.

⇒ NOTE 2:
It is assumed that the DDM-2000 is installed, powered, equipped, and free of alarms. If it was not left in that condition, notify the organization that installed the DDM-2000 that they have not completed the installation or use **Trouble Clearing: IXL-001.**

⇒ NOTE 3:
If the DDM-2000 fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-2000 or use **Trouble Clearing: IXL-001.**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
The `rtrv-( )` commands (`rtrv-ne`, `rtrv-oc3`, `rtrv-sync`, or `rtrv-tl`) may be used to retrieve switch settings except for LBO settings on **DS1** and **DS3** circuit packs.

Verify correct circuit packs have been installed and option switches have been set correctly, if not already performed. **DLP-513**

2. NOTE:
In Release 6 or later, an `inconsistent DCC switches` alarm will occur when the **OLIU**s are looped back. To clear the alarm during a fiber loopback, use the `set-fecom:`*`address`*`:com=disable` command to disable the DCC.

Install **OLIU** optical loops between their respective **IN** and **OUT** optical connectors. **DLP-505**

3. NOTE 1:
If the **ACO** button is depressed longer than 2 seconds, the **SYSCTL** display will scroll through the software version code and all LEDs will remain lighted until the code is displayed.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

⇒ NOTE 2:
The proper release of software must be installed for this test to work. If software has not been installed, the letter "**P**" will be displayed in the 7-segment **FE ID** display. If the software in the **SYSCTL** is incompatible with the software in the **OHCTL** or with the shelf configuration, the letter "**d**" or "**C**" will be displayed in the 7-segment **FE ID** display. If the proper release of software has not been installed or if the **SYSCTL** and **OHCTL** have incompatible software, refer the problem to the organization that installed the shelf.

Depress and hold the **ACO** pushbutton on the User Panel. Verify that all User Panel and circuit pack LEDs and the **SYSCTL** display light. Verify proper version of software is installed. **DLP-509**

4. Release the **ACO** pushbutton. Verify that all LEDs on the DDM-2000 go off.

5. ⇒ NOTE 1:
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000.

⇒ NOTE 2:
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to their default values. STS1 and/or VT1.5 cross-connections may have been made which should be deleted before the system is placed in service. The `init-sys:all` command may be used to reset all provisionable parameters and cross-connections to default values.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
In Release 6 or later, an `inconsistent DCC switches` alarm will occur when the `init-sys:all` command is executed. To clear the alarm, use the `set-fecom:`*`address`*`:com=disable` command to disable the DCC.

CAUTION:
The `init-sys:all` *command should NOT be used on an in-service system.*

If required, use the command `init-sys:all` to reset provisionable parameters to default values.

6. NOTE 1:
Automatic turnup tests using the `test-auto` command are available for Release 2 and later, except Releases 5 and 7. Automatic local and DSX turnup tests will **not** operate properly if a local DDM-2000 shelf is provisioned for loop-timed mode. The timing mode must be set to external or free running (**DLP-513**) before executing the `test-auto:` command. The timing mode should be returned to the correct state after these tests have been run. For Releases 5 and 7, perform the DS1 or DS3 transmission tests.

NOTE 2:
These procedures assume that the DDM-2000 has been connected to the DSX-( ) cross-connect points, as required. DS1 and/or DS3 circuit packs must be inserted, as required, before performing these tests.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

NOTE 3:
In Release 2 or later, except Releases 5 and 7, the automatic turnup tests expect the default internal STS-1 cross-connections to be in place. If the cross-connections are not in place or have been deleted, all **MXRVO** and **DS3** circuit packs will fail when the automatic test is run.

Perform transmission or automatic turnup tests for each group, as required. Refer any failures to organization that installed the DDM-2000.

Rings (R5, R7)

A. DS1 Single Ring test in **demux** direction	**DLP-510**
B. DS1 Dual Ring (DRI) test in **demux** direction	**DLP-554**
C. DS3 Single Ring test in **demux** direction	**DLP-511**
D. DS3 Dual Ring (DRI) test in **demux** direction	**DLP-553**

Linear (R2, R3, R6)

1. Automatic turnup local (looped back) test	**DLP-528**
2. Automatic turnup cross-connect test	**DLP-529**

7.	Test ED-8C733-30, G7 fan shelf, if installed.	**DLP-539**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE:
   A craft interface terminal (CIT) is required to access the optional features of the DDM-2000 OC-3 Multiplexer. Refer to the Commands and Reports section and use the `rtrv-( )` commands to determine the existing options.

   Activate optional features that you require at this time. **DLP-512**

9. After each shelf in the network has been tested, the DDM-2000 will be ready for end-to-end testing.
   [**Acceptance: NTP-004**]

Test (Accept) End-to-End DDM-2000 OC-3 System (Network)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
This test is to be performed if the DDM-2000 is being tested or accepted by an organization that did not install it.

NOTE 2:
It is assumed that the DDM-2000 is installed and running in an end-to-end network configuration and each shelf has previously been tested in a looped-back configuration.

NOTE 3:
If the DDM-2000 fails to respond in the indicated manner, refer the trouble to the organization that installed the DDM-2000 or use **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Determine the optical loss of the optical facility from office records or by making the required measurements.

2. ⇒ NOTE:
Only **21G/21G-U OLIU**s have option switches. There are no option switches on other OC-3 **OLIU**s.

If **21G/21G-U OLIU**s are installed, ensure **HIGH/LOW POWER** option switches are set to agree with the loss of the optical facility. **DLP-513**

3. ⇒ NOTE:
The **rtrv-nmap** command may be used to retrieve a map of the network, including the systems in the network and how they are connected.

Ensure all DDM-2000 OC-3 shelves (**OLIU**s) in the network have been properly connected to the optical facility. Verify the integrity of each optical span. **DLP-514**

4. Use **rtrv-sync** command at each node to verify proper timing options. At least one node in the network should be set for *DS1 External* or *Free Running*. All nodes cannot be set to *Loop Timed*.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⚠ CAUTION:
The **`init-sys:all`** *command should NOT be used on an in-service system.*

⇒ NOTE 1:
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to default values. STS-1 and/or VT1.5 (DS1) cross-connections may have been made which should be deleted before the system is placed in service. The **`init-sys:all`** command will reset all provisionable parameters and cross-connections to default values. Some parameters will have to be set again later before service is established.

⇒ NOTE 2:
In Release 6 or later, an `inconsistent DCC switches` alarm will occur when the **`init-sys:all`** command is executed, if fecom has not been enabled at both ends of the system.

If required, use the command **`init-sys:all`** to reset provisionable parameters to default values.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⇒ NOTE 1:
In Releases 6 thru 7.1, the "**set-ne:**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DSNE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DSNE), a "duplicate GNE" alarm will occur. In Releases 6 thru 7.1, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

⇒ NOTE 2:
In Release 7.2, the "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In Release 7.2, multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 3:
In Release 7.2, shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

For Releases 6 thru 7.1, use the "**rtrv-ne:**" command to verify ONE shelf is designated as the GNE.

For Release 7.2, use the "**rtrv-ne:**" command to verify ONE shelf is designated as the DSNE. Use "**rtrv-ne:**" to verify one shelf (two shelves max.) is designate as the AGNE(s) and the alarm group number is assigned, as required.

7. ⇒ NOTE 1:
If Kbyte (sync messaging) (R5.1 and later) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

⇒ NOTE 2:
If Kbyte (sync messaging) (R5.1 and later) is enabled at any node in a linear system, it **must** be enabled at all nodes of the linear system.

⇒ NOTE 3:
The **rtrv-oc3:** command retrieves the OC-3 Line Provisioning Report. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte parameter, as required.

8. ⇒ NOTE 1:
If Sync Autoreconfiguration (R6.1 and later) is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any loop-timed node in a ring or linear system, it **must** be enabled at all loop-timed nodes of a ring or linear system.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE 1:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line test to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the `set-fecom:` command **at each shelf** to enable far end communications.

⇒ NOTE 2:
The `rlgn` command can be used to log in to each shelf at optical span being tested.

Perform end-to-end OC-3 line test on all optical spans. Report any failures to the organization that installed the DDM-2000.

A. Rings (R5 and R7) **DLP-515**
B. Linear (R2, R3, R6) **DLP-525**

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10. Perform end-to-end DS1 transmission test in the **mux** direction for each function unit group, if required.

A. DS1 Single Ring test in **mux** direction **DLP-510**
B. DS1 Dual Ring (DRI) test in **mux** direction **DLP-554**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Perform end-to-end DS3 transmission test in the **mux** direction for each function unit group, if required.	
A. DS3 Single Ring test in **mux** direction	**DLP-511**
B. DS3 Dual Ring (DRI) test in **mux** direction	**DLP-553**
12. Perform end-to-end OC-3c (STS-3c) transmission test in the **mux** direction, if required.	**DLP-544**
13. Check local office alarm interface as required.	**DLP-516**
14. Check office telemetry interface as required.	
A. Parallel telemetry	**DLP-517**
B. Serial telemetry	**DLP-518**
15. Test protection switching function, if required.	**DLP-519**
16. The system is ready for service to be established.	
17. Activate optional features as required.	**DLP-512**

Task Index
System Turnup/Circuit Order

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Equipment Required for Shelf Turnup

1. AT&T PC 6300 compatible personal computer with *MS-DOS** Release 2.1 or later. Used for loading software.
2. Proper software release for system configuration you have.
3. **FS1E-E-02** lightguide jumpers for looping shelf **OLIU**s.

Initial Shelf Turnup and Establishing End-to-End System

⇒ NOTE:
These procedures are used to equip DDM-2000 OC-3 shelves, establish end-to-end OC-3 systems, and establish initial end-to-end DS1/DS3 service after all necessary bay, shelf, and cable installation has been done.

Shelf — Equipping (Looped Back)

Equip DDM-2000 OC-3 Shelf (Looped Back)
as EC-1 Electrical Multiplexer —
OC-3 Release 6 . . . . . System Turnup: NTP-031

Equip DDM-2000 OC-3 Shelf (Looped Back) —
OC-3 Release 2, 3, 5, 6 or 7 . . . . . System Turnup: NTP-016

Equip DDM-2000 OC-3 Shelf (Looped Back) —
For OC-3c Service (Release 6) . . . . . System Turnup: NTP-002

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FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

System — Establish End-to-End

Establish End-to-End DDM-2000 OC-3 System —
OC-3 Optical Fiber Spans
Dual 0x1 Path Switched Ring . . . . . System Turnup: NTP-040

Establish End-to-End DDM-2000 OC-3 System —
OC-3 Optical Fiber Spans
For Linear and Hub Configurations . . . . . System Turnup: NTP-017

Establish End-to-End DDM-2000 OC-3 System —
OC-3 Optical Fiber Spans
For Path Switched Ring . . . . . System Turnup: NTP-022

Establish End-to-End DDM-2000 OC-3 System —
OC-3 Point-to-Point . . . . . System Turnup: NTP-003

Establish OC-3/IS-3 Dual Ring Interworking
DDM-2000 OC-3 to OC-12 or FT-2000 Ring —
OC-3 Optical Fiber Spans . . . . . System Turnup: NTP-041

Service — Establish Initial DS1

Establish Initial End-to-End DS1 Service —
(Group Equipped But Not In Service) . . . . . System Turnup: NTP-004

Establish Initial Low Speed EC-1 Interface —
Group Equipped With STS1E Not In Service . . . . . System Turnup: NTP-034

Service — Establish Initial DS3

Establish Initial End-to-End DS3 Service —
(Group Equipped But Not In Service) . . . . . System Turnup: NTP-005

Establish Initial Low Speed EC-1 Interface —
Group Equipped With STS1E Not In Service . . . . . System Turnup: NTP-034

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Circuit Order/Work Order Procedures

NOTE:
Some of these procedures are used to add, convert, or discontinue DS1 and/or DS3 service after the system is running with initial service. Other procedures are used to add new shelves and optical spans and upgrade system configurations.

Shelf/Span — Adding New

Add DDM-2000 OC-3 Shelf —
To Linear or Hub Configuration
(Shelf Added in Middle of Optical Span) . . . . . Circuit Order: NTP-014

Add DDM-2000 OC-3 Shelf and/or Optical Span —
(Shelf Added as Extension to DDM-2000 OC-3) . . . . . Circuit Order: NTP-015

Add DDM-2000 OC-3 Shelf and Optical Span —
Shelf Added as Extension to DDM-2000 OC-12 . . . . . Circuit Order: NTP-018

Add DDM-2000 OC-3 Shelf (Node) —
To Path Switched Ring
(Shelf Added in Middle of Optical Span) . . . . . Circuit Order: NTP-026

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Service — Adding New DS1

Add New DS1 Service —
(MXRVO/STS1E Group Already In Service) . . . . . Circuit Order: NTP-006

Add New MXRVO Group for DS1 Service —
In-Service . . . . . Circuit Order: NTP-008

Service — Adding New DS3

Add New DS3 Group for DS3 Service —
In-Service . . . . . Circuit Order: NTP-007

EC-1 Interface — Adding

Add New STS1E Group for EC-1 Interface —
System In Service . . . . . Circuit Order: NTP-035

Add New STS1E High Speed Group for DS1 Service —
EC-1 Electrical Multiplexer —
System In Service . . . . . Circuit Order: NTP-032

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Conversions

Convert (Upgrade) DDM-2000 OC-3 Shelf to DS1 Add/Drop Shelf . . . . . Circuit Order: NTP-020

Convert (Upgrade) DDM-2000 OC-3 System to OC-12 System (Linear) . . . . . Circuit Order: NTP-021

Convert DS1 Group Service to EC-1 Group Service . . . . Circuit Order: NTP-038

Convert DS1 Group Service to DS3 Group Service . . . . Circuit Order: NTP-009

Convert DS3 Group Service to DS1 Group Service . . . . Circuit Order: NTP-010

Service — Discontinue DS1

Discontinue DS1 Service . . . . . Circuit Order: NTP-011

Service — Discontinue DS3

Discontinue DS3 Service . . . . . Circuit Order: NTP-012

Service — Discontinue EC-1 Interface

Discontinue EC-1 Service — . . . . . Circuit Order: NTP-036

Discontinue STS1E High Speed Group EC-1 Electrical Multiplexer Shelf . . . . . Circuit Order: NTP-033

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Shelf (Node) — Discontinue

Discontinue an OC-3 Shelf (Node)
From Path Switched Ring . . . . . Circuit Order: NTP-027

Span (Shelf) — Discontinue OC-3 Optical

Discontinue an OC-3 Optical Span
From Linear and Hub Configurations . . . . . Circuit Order: NTP-019

Upgrades

Upgrade DDM-2000 OC-3/FT-2000 Dual Ring Interworking
Network from EC-1 to OC-3 —
In Service . . . . . System Turnup: NTP-042

Upgrade DDM-2000 OC-3 System —
Linear Add/Drop to Path Switched Ring . . . . . Circuit Order: NTP-039

Upgrade DDM-2000 OC-3 System —
Linear Drop to Path Switched Ring
(In Service) . . . . . Circuit Order: NTP-039

Upgrade DDM-2000 OC-3 System —
Point-to-Point to Path Switched Ring
(In Service) . . . . . Circuit Order: NTP-029

Upgrade DDM-2000 OC-3 System —
Point-to-Point to Path Switched Ring
(Out of Service) . . . . . Circuit Order: NTP-030

Upgrade DDM-2000 OC-3 System —
Release 1 to Release 2 or Release 3 . . . . . Circuit Order: NTP-013

Upgrade DDM-2000 OC-3 System —
With New Software Release . . . . . Detailed Level Procedures: DLP-532

Upgrade Timing . . . . . Detailed Level Procedures: DLP-535

Upgrade TBOS/Parallel Telemetry to TL1/X.25 . Detailed Level Procedures: DLP-538

Establish DDM-2000 OC-3c (STS-3c) Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
In previous issues of this manual, this NTP-002 was used to "Equip DDM-2000 OC3 Shelf (Looped Back) - Release 1 Only". Since Release 1 is rated Discontinued Availability (DA), this procedure number is being reused for this procedure.

⇒ NOTE 2:
It is assumed that the DDM-2000 has been properly equipped and has passed the looped transmission test(s) [**System Turnup: NTP-016**]. It is also assumed that the end-to-end OC-3 optical spans have been established [**System Turnup: NTP-003** or **NTP-017**].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 3:
It is assumed that the DDM-2000 OC-3 shelf is colocated with the broadband terminal equipment which is connected to the **OLIU**s in the **FUNCTION UNITS C** slots.

⇒ NOTE 4:
It is assumed that **21G/21G-U OLIU**s are installed in **MAIN** and **FUNCTION UNITS C** slots for OC-3c service and that the **OLIU**s in **FUNCTION UNITS C** slots are looped back at the terminating ends. **FUNCTION UNITS A** and **B** and **LOW SPEED** slots are not equipped when the DDM-2000 OC-3 shelf is equipped for OC-3c service.

Verify **21G/21G-U OLIU** circuit packs are installed in **FUNCTION UNITS C** slots.

2. Use the `ent-crs-sts1:` command at each shelf to make the following STS-1 cross-connections: m-1 to c-1, m-2 to c-2, and m-3 to c-3. For example, `ent-crs-sts1:m-1,c-1.`

3. Use the `set-feat:feat=sts3c,act=enable` command to allow OC-3c service to be supported.

4. Use the `set-oc3:` command to set the OC-3 line for *concat* mode.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. Determine the optical loss of the OC-3c span from the DDM-2000 to the terminating equipment.	
6. Remove optical loops from **OLIU**s in **FUNCTION UNITS C** slots and the terminating equipment.	
7. Set the option switches on the **21G/21G-U OLIU**s in the **FUNCTION UNITS C** slots to agree with the loss of the optical span to the terminating equipment.	**DLP-513**
8. ⇒ NOTE: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is installed. Reinstall **OLIU**s (if removed) and connect the optical cables from the DDM-2000 OC-3 to the terminating equipment.	**DLP-514**
9. Perform an OC-3c transmission test using a SONET test set, if required.	**DLP-544**

Establish End-to-End System
DDM-2000 OC-3 Point to Point

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

NOTE 2:
It is assumed that the DDM-2000s at both ends of the system have passed the looped shelf transmission test(s).

Determine the optical loss of the optical facility from office records or by making the required measurements.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Releases 5, 7 and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

If required, verify/set switches on **OHCTL**s. **DLP-513**

3. ⇒ NOTE:
In Release 6 or later, the `set-ne:tid=`*`TID:`*`,gne=yes` command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DS-NE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DS-NE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DS-NE), a `duplicate GNE` alarm will occur. In Release 6 or later, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

If Release 6 or later software is installed, use the `set-ne:tid=`*`TID:`*`,gne=yes` command to designate ONE shelf as the GNE.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYSCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the `set-ne` command) will cause a `duplicate TID` alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The `rtrv-ne:` command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches or use the `set-ne` command to make new settings. **DLP-513**

5. Remove **OLIU** optical loops (if installed).

6. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line test to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the `set-fecom:` command **at each shelf** to enable far end communications. This command is available for Release 2 and later software.

At each shelf, use the `set-fecom:`*`address`*`:com=enabled` command to ensure far end communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. If **21G/21G-U OLIU**s are installed, set the option switch on the **21G/21G-U OLIU**s to agree with the loss of the optical facility.	**DLP-513**
8. ⇒ NOTE: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is installed.	
Reinstall **OLIU**s, if removed, and perform optical fiber connections and verification of the optical facility.	**DLP-514**
9. ⇒ NOTE 1: If loop timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.	
⇒ NOTE 2: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the `rtrv-sync` command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected.

	Set timing mode on **TGS** to the timing mode specified in work order or office records.	**DLP-513**
10.	Perform end-to-end OC-3 line test.	**DLP-525**
11.	Perform end-to-end DS1 transmission test for each group, if required.	**DLP-510**
12.	Perform end-to-end DS3 transmission test for each group, if required.	**DLP-511**
13.	The system is now ready for initial DS1, DS3, or EC-1 service to be established. [**System Turnup: NTP-004**] (DS1), [**System Turnup: NTP-005**] (DS3), [**System Turnup: NTP-034**] (EC-1).	

Establish Initial End-to-End DS1 Service (Group Equipped But Not In Service)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   The OC-3 system must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves and establish the system.

   ⇒ NOTE 2:
   This procedure assumes that **MXRVO** circuit packs have already been installed during initial shelf turnup at the DS1 terminating end(s) of the circuit and either **MXRVO** or **STS1E** circuit packs have been installed during initial shelf turnup at the other terminating end(s) of the circuit. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new group for DS1 service.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

2. NOTE:
The **rtrv-eqpt:** command retrieves the Equipage and Version Report. This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

At each terminating end, use the **rtrv-eqpt:** command to obtain the Equipage and Version Report and verify that the proper service and protection (if required) **MXRVO** (**STS1E**) circuit packs have been installed in group(s) (**FN A**, **FN B**, or **FN C**) being put into service.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. At the DS1 terminating node(s) of the circuit being established, determine which DS1 port(s) is to be put into service and what options are to be selected.

4. ⇒ NOTE:
   The **rtrv-t1:** command retrieves the T1 Port Provisioning Report. This report lists information about each DS1 port. This information includes attributes set by the **set-t1:** command. See the "Commands and Reports" section of this manual for a description of the **rtrv-t1:** command format.

   At each DS1 terminating node, use the **rtrv-t1:** command to obtain the T1 Port Provisioning Report and verify the hardware and software option settings.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE 1:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the **`set-t1:`***`address`***`:ais=no`** command) on any DS1 circuit that is not in service.

⇒ NOTE 2:
If DS1 protection is required and any service **DS1PM** circuit packs are installed, a **DS1PM** circuit pack must be installed in the protection **8(P)** slot.

⇒ NOTE 3:
If the group is to be equipped with any **BBF3 DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed.

At each DS1 terminating node, set option switches and install **DS1/DS1PM** circuit pack(s), as required. **DLP-508**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⚠ CAUTION 1:
No service **LOW SPEED** DS1 slot locations should be left empty in groups equipped with **MXRVO** and protection **DS1/DS1PM** circuit packs.

⚠ CAUTION 2:
When a **DS1/DS1PM** circuit pack is switched to protection, removal of any other **DS1/DS1PM** circuit pack or **177A** Retainer Card in the same group will result in a loss of service to the protected **DS1/DS1PM** and the removed **DS1/DS1PM** circuit pack.

⇒ NOTE:
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Cards into all unused service **DS1** slots in groups equipped with **MXRVO** and protection **DS1/DS1PM** circuit packs.

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7. At each DS1 terminating node, use the `set-t1:` command to set the characteristics of the DS1 port of the circuit being established.

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8. At each DS1 terminating node, make the appropriate cable connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

10. If one of the terminating nodes is equipped with **STS1E** circuit packs for an EC-1 interface to support DS1 services being established, establish initial EC-1 low speed interface [**NTP-034**].

11. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the `set-ne:crs=manual` command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**cnvt-crs**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, and **rtrv-crs-vt1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. Make necessary VT1.5/STS1 cross-connections at each node in the network.

A. Linear or Add/Drop Configuration	**DLP-545**
B. Single Ring Configuration	**DLP-546**
C. Dual Ring Interworking (DRI) Configuration	**DLP-550**

13. ⇒ NOTE:
For a DS1 circuit in a path protected ring network, the **sw-path-( ):***address* command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active VT1.5 (DS1) path to repeat this test on the other path(s).

Perform DS1 end-to-end transmission test for each circuit being put into service, as required.

A. Linear or Single Ring Configuration	**DLP-510**
B. Dual Ring Interworking (DRI) Configuration	**DLP-554**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. Use the **rtrv-state:** command to determine the port state of the DS1 port(s) of the circuit being established.

15. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-t1:** command to set the port state of the DS1 port(s) of the circuit being established.

16. If **BBF3 DS1PM** circuit packs are installed and the optional ***ds1pm*** performance monitoring feature is to be used, use the **set-feat:feat=ds1pm,act=enable** command to enable the feature.

Establish Initial End-to-End DS3 Service (Group Equipped But Not In Service)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
The OC-3 system must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves, and to establish a system.

⇒ NOTE 2:
This procedure assumes that **DS3/DS3PM** circuit packs have already been installed during the initial shelf turnup at the DS3 terminating end(s) of the circuit and either **DS3/DS3PM** or **STS1E** circuit packs have been installed during initial shelf turnup at the other terminating end of the circuit. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new DS3 group for DS3 service.

⇒ NOTE 3:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

At the DS3 terminating node(s) of the circuit being established, determine which DS3 port is to be put into service and what options are to be selected.

2. ⇒ NOTE:
The **rtrv-eqpt:** command retrieves the Equipage and Version Report. This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

Use the **rtrv-eqpt:** command to obtain the Equipage and Version Report and verify that the service and protection (if required) **DS3/DS3PM** circuit packs have been installed in proper group (**FN A**, **FN B**, or **FN C**) being put into service.

3. ⇒ NOTE:
The **rtrv-t3:** command retrieves the T3 Port Provisioning Report. This report lists information about each DS3 port. This information includes attributes set by the **set-t3:** command. See the "Commands and Reports" section of this manual for a description of the **rtrv-t3:** command format.

Use the **rtrv-t3:** command to obtain the T3 Port Provisioning Report and verify the software option settings.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. ⇒ NOTE: **DS1** circuit packs ***cannot*** be installed in a group that is equipped with **DS3/DS3PM** circuit packs. Verify the line build out (LBO) option jumpers are installed as required and reinstall **DS3/DS3PM** circuit pack(s).	**DLP-513**
5. Make the appropriate cable connection(s) to the DS3 cross-connect point(s) or equivalent connection point(s) for the circuit being added.	
6. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.	
7. If one of the terminating nodes is equipped with **STS1E** circuit packs for an EC-1 interface to support DS3 services being established, establish initial EC-1 low speed interface.	**NTP-034**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **`set-ne:crs=manual`** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 3:
The following commands may be used to delete, enter, and retrieve STS-1 cross-connections in a path protected ring network: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of this manual for a description of commands.

Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

9. Make necessary STS-1 cross-connections for each node in the network.

A. Linear or Add/Drop Configuration	**DLP-545**
B. Single Ring Configuration	**DLP-546**
C. Dual Ring Interworking (DRI) Configuration	**DLP-550**

10. ⇒ NOTE:
For a DS3 circuit in a path protected ring network, the **`sw-path-sts1:`***`address`* command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path(s).

Perform DS3 end-to-end transmission test for each circuit being put into service (optional).

A. Linear or Single Ring Configuration	**DLP-511**
B. Dual Ring Interworking (DRI) Configuration	**DLP-553**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Use the **set-t3:** command to set the characteristics of the DS3 port of the circuit being established.	
12. Use the **rtrv-state:** command to determine the port state of the DS3 port of the circuit being established.	
13. ⇒ NOTE: If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t3:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command. Use the **set-state-t3:** command to set the port state of the DS3 port of the circuit being established.	

Add New DS1 Service
(Group Already In Service)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure assumes that the DDM-2000 is in service and that a new DS1 port or **DS1/DS1PM** circuit pack is being added to a group that is already in service and equipped with **MXRVO** circuit packs at the DS1 terminating end(s). It also assumes that **STS1E** circuit packs have been installed if the other end is an EC-1 interface. If proper circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new group (**MXRVO** or **STS1E**).

⇒ NOTE 2:
If the group is to be equipped with any **BBF3 DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed. Also, if DS1 protection is required and service **DS1PM** circuit packs are to be installed, a **DS1PM** circuit pack must first be installed in the protection **8(P)** slot.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 3:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the **`set-t1:`***`address`***`:ais=no`** command) on any DS1 circuit that is not in service.

⇒ NOTE 4:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Determine which DS1 ports/slots are to be put into service and what options are to be selected.

2. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⚠ CAUTION 1:
To minimize "hits" on in-service ports on **DS1/DS1PM** *circuit packs having a port added, it is recommended that a CIT be used to manually switch (using the* **`switch-ls`** *command) the DS1 to protection if the* **DS1/DS1PM** *circuit pack is removed or to set channel options without removing the circuit pack.*

⚠ CAUTION 2:
If the protection **DS1/DS1PM** *circuit pack is not available for a protection switch, removing a service* **DS1/DS1PM** *circuit pack will interrupt service on all ports on that circuit pack. If a CIT is available, use the* **`rtrv-state`** *command to check the status of the protection switch.*

⚠ CAUTION 3:
When a **DS1/DS1PM** *circuit pack is switched to protection, removal of any other* **DS1/DS1PM** *circuit pack or* **177A** *Retainer Card in the same group will result in a loss of service to the protection* **DS1/DS1PM** *circuit pack and the removed* **DS1/DS1PM** *circuit pack.*

⚠ CAUTION 4:
No service DS1 **LOW SPEED** *slots should be left empty in a group equipped with* **MXRVO** *and protection* **DS1/DS1PM** *circuit packs.*

Condition **DS1/DS1PM** circuit pack or port for new DS1 service being added. **DLP-520**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. At each DS1 terminating node, use the **`set-t1:`** command to set the characteristics of the DS1 port being established, if not already performed.	
5. At each DS1 terminating node, make the appropriate cable connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.	
6. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.	
7. ⇒ NOTE 1: Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **`set-ne:crs=manual`** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **`cnvt-crs`**, **`dlt-crs-sts1`**, **`dlt-crs-vt1`**, **`ent-crs-sts1`**, **`ent-crs-vt1`**, **`rtrv-crs-sts1`**, and **`rtrv-crs-vt1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. Make necessary VT1.5/STS1 cross-connections for each node in the network.

   A. Linear or Add/Drop Configuration **DLP-545**
   B. Single Ring Configuration **DLP-546**
   C. Dual Ring Interworking (DRI) Configuration **DLP-550**

9. ⇒ NOTE:
   For a DS1 circuit in a path protected ring network, the **`sw-path-vt1:`***`address`* command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active VT1.5 (DS1) path to repeat this test on the other path.

   Perform DS1 end-to-end transmission test for each circuit being put into service.

   A. Linear or Single Ring Configuration **DLP-510**
   B. Dual Ring Interworking (DRI) Configuration **DLP-554**

10. Use the **`rtrv-state:`** command to determine the port state of the DS1 port(s) of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-t1:** command to set the port state of the DS1 port(s) of the circuit being established.

12. If **BBF3 DS1PM** circuit packs are installed and the optional ***ds1pm*** performance monitoring feature is to be used, use the **set-feat:feat=ds1pm,act=enable** command to enable the feature.

Add New DS3 Group for DS3 Service System In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇶ NOTE 1:
This procedure assumes that the DDM-2000 is in service and that a new group is being equipped with **DS3/DS3PM** circuit packs for DS3 service. It also assumes that **STS1E** circuit packs have been installed if the other end is an EC-1 interface. If it has not been installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add a new **STS1E** group.

⇶ NOTE 2:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
2. Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.	
3. Verify no **DS1/DS1PM** circuit packs are installed in slots associated with new DS3 group being added.	
4. Set line build out (LBO) option jumpers and install **DS3/DS3PM** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, or **C**) being equipped.	**DLP-507**
5. Make the appropriate connection(s) to the DS3 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.	
6. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **`set-ne:crs=manual`** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve STS-1 cross-connections: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

8. Make necessary STS-1 cross-connections for each node in the network.

A. Linear or Add/Drop Configuration	**DLP-545**
B. Ring Configuration	**DLP-546**
C. Dual Ring Interworking (DRI) Configuration	**DLP-550**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE:
For a DS3 circuit in a path protected ring network, the **sw-path-sts1:** *address* command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path.

Perform DS3 end-to-end transmission test for each circuit being put into service (optional).

A. Linear or Single Ring Configuration **DLP-511**
B. Dual Ring Interworking (DRI) Configuration **DLP-553**

10. Use the **set-t3:** command to set the characteristics of the DS3 port.

11. Use the **rtrv-state:** command to determine the port state of the DS3 port(s) of the circuit being established.

12. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t3:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-t3:** command to set the port state of the DS3 port(s) of the circuit being established.

Add New MXRVO Group for DS1 Service
System In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure assumes that the DDM-2000 is in service and that a new group(s) is being added with **MXRVO** circuit packs for DS1 service. If the group is already equipped with **MXRVO** circuit packs, refer to **Circuit Order: NTP-006.** This procedure also assumes that **STS1E** circuit packs have been installed if the other end is an EC-1 interface. If proper circuit packs have not been installed at the EC-1 interface, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add new **STS1E** group.

⇒ NOTE 2:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

2. Use the **`rtrv-alm`** command to verify that no alarms, locks, loops, or switches are present.

3. ⇒ NOTE:
   If the group is to be equipped with any **BBF3 DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed.

   At DS1 terminating end, install **MXRVO** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, or **C**) being equipped. **DLP-506**

4. ⇒ NOTE:
   Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the **`set-t1:`***`address`***`:ais=no`** command) on any DS1 circuit that is not in service.

   Option and install required service **DS1/DS1PM** circuit packs. **DLP-508**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

5. NOTE:
If DS1 protection is required and service **DS1PM** circuit packs are installed, a **DS1PM** circuit pack must be installed in the protection **8(P)** slot.

Install protection **DS1/DS1PM** circuit pack into slot **8P** of group being put into service, if required. **DLP-508**

6. At the DS1 terminating end(s) use the **`set-t1`** command to set the characteristics of the DS1 ports.

7. CAUTION:
No service DS1 **LOW SPEED** *slots should be left empty in groups equipped with* **MXRVO** *and protection* **DS1/DS1PM** *circuit packs.*

NOTE:
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Cards into all unequipped service DS1 slots in groups equipped with **MXRVO** and protection **DS1/DS1PM** circuit packs.

8. Make the appropriate connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.

10. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the `set-ne:crs=manual` command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (`cnvt-crs`) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **`cnvt-crs`**, **`dlt-crs-sts1`**, **`dlt-crs-vt1`**, **`ent-crs-sts1`**, **`ent-crs-vt1`**, **`rtrv-crs-sts1`**, and **`rtrv-crs-vt1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or circuit order.

11. Make necessary VT1.5/STS1 cross-connections for each node in the network.

A. Linear or Add/Drop Configuration	**DLP-545**
B. Ring Configuration	**DLP-546**
C. Dual Ring Interworking (DRI) Configuration	**DLP-550**

12. NOTE:
For a DS1 circuit in a path protected ring network, the **`sw-path-vt1:`***`address`* command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active VT1.5 (DS1) path to repeat this test on the other path(s).

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Perform DS1 end-to-end transmission test for each circuit being put into service.	
A. Linear or Single Ring Configuration	**DLP-510**
B. Dual Ring Interworking (DRI) Configuration	**DLP-554**

13. Use the **rtrv-state:** command to determine the port state of the DS1 port(s) of the circuit being established.

14. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-t1:** command to set the port state of the DS1 port(s) of the circuit being established.

15. If **BBF3 DS1PM** circuit packs are installed and the optional ***ds1pm*** performance monitoring feature is to be used, use the **set-feat:feat=ds1pm,act=enable** command to enable the feature.

Convert DS1 Group Service to DS3 Group Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure assumes that the DDM-2000 is in service and that a DS1 group is being changed to a DS3 group for DS3 service.

⇒ NOTE 2:
If, at any point in this procedure, the DDM-2000 fails to respond in the indicated manner, you should refer to **Trouble Clearing: IXL-001.**

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being converted.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. Use the **rtrv-alm** command to verify that no alarms, locks, loops, or switches are present.

3. At the DSX-1, remove the DS1 signals associated with the DS1 group being converted. (**FAULT** LED flashes on **DS1/DS1PM** circuit packs with signals removed.)

4. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen, to operate it.

On the **SYSCTL**, momentarily depress the **UPD/INIT** button. (**FAULT** LEDs go off.)

5. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **set-ne:crs=manual** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **`cnvt-crs`**, **`dlt-crs-sts1`**, **`dlt-crs-vt1`**, **`ent-crs-sts1`**, **`ent-crs-vt1`**, **`rtrv-crs-sts1`**, and **`rtrv-crs-vt1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Use the **`dlt-crs-sts1:`** or **`dlt-crs-vt1:`** command to delete cross-connections associated with all **DS1/DS1PM** circuit packs being removed.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
6. Remove the **DS1/DS1PM** circuit packs from group being converted to DS3.	
7. Remove the **MXRVO** circuit packs from group being converted to DS3.	
8. Momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.	
9. Verify that all alarms are off.	
10. ⇒ NOTE: **DS1/DS1PM** circuit packs **cannot** be installed in a group that is equipped with **DS3/DS3PM** circuit packs. Set line build out (LBO) option jumpers and install **DS3/DS3PM** circuit packs into **FUNCTION UNITS** group (**A**, **B**, or **C**) being put into service.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Make appropriate connections(s) to the DS3 cross-connect point(s) or equivalent connection point(s) for the channel(s) being added.	
12. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.	
13. Determine the necessary STS-1 cross-connections for each node from the work order of circuit order.	
14. As required, at each shelf in the end-to-end network, use the **`ent-crs-sts1`**: command at each shelf to make required STS-1 cross-connections for DS3 channel being established.	
A. Linear or Add/Drop Configuration	**DLP-545**
B. Ring Configuration	**DLP-546**
C. Dual Ring Interworking (DRI) Configuration	**DLP-550**
15. Perform an end-to-end DS3 low-speed transmission test for each DS3 group being put into service (optional).	
A. Linear or Single Ring Configuration	**DLP-511**
B. Dual Ring Interworking (DRI) Configuration	**DLP-553**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
16. Use the **set-t3:** command to set the characteristics of the DS3 port.	
17. Use the **rtrv-state:** command to determine the port state of the DS3 port(s) of the circuit being established.	
18. ⇒ NOTE: If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t3:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command. Use the **set-state-t3:** command to set the port state of the DS3 port(s) of the circuit being established.	

Convert DS3 Group Service to DS1 MXRVO Group Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   Determine which DS3 group is to be converted.

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2. ⇒ NOTE:
   The following operation will activate the office major (critical) alarm. The audible alarm may be suppressed by depressing the **ACO** button.

   Remove service (signal) from the DS3 group being discontinued. (**FAULT** LED flashes on **DS3/DS3PM** circuit packs with signal removed.)

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3. Momentarily depress **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **`set-ne:crs=manual`** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The following commands may be used to delete, enter, and retrieve STS1 cross-connections: **dlt-crs-sts1**, **ent-crs-sts1**, and **rtrv-crs-sts1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

From the work order or **rtrv-crs-sts1** command, determine the cross-connections for circuit being discontinued. Use the **rtrv-crs-sts1** command at each node to obtain the `STS-1 Cross Connect Report`.

5. CAUTION:
Removal of the wrong cross-connect may interrupt service.

NOTE:
DS3 slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In ring configurations, remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the non-terminating nodes, if required. A Critical alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **`dlt-crs-sts1:`** command to delete the STS-1 cross-connections associated with **DS3/DS3PM** circuit pack being removed.

6. Remove **DS3/DS3PM** circuit packs associated with group(s) being discontinued, if required.

7. Momentarily depress **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.

8. Verify that all alarms go off.

9. ⇒ NOTE 1:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the **`set-t1:`***`address`***`:ais=no`** command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
⇒ NOTE 2: If the group is to be equipped with any **BBF3 DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed.	
Install **MXRVO** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, or **C**) being converted to DS1 service.	**DLP-506**
10. Option and install required service **DS1/DS1PM** circuit packs.	**DLP-508**
11. ⇒ NOTE: If DS1 protection is required and service **DS1PM** circuit packs are installed, a **DS1PM** circuit pack must be installed in the protection **8(P)** slot.	
Install protection **DS1/DS1PM** circuit pack into slot **8(P)** of group being put into service, if required.	**DLP-508**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. Use the **`set-t1:`** command to set the characteristics of the DS1 port.

13. ⚠ CAUTION:
No service DS1 **LOW SPEED** *slots should be left empty in groups equipped with* **MXRVO** *and protection* **DS1/DS1PM** *circuit packs.*

⇒ NOTE:
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Cards into all unequipped service DS1 slots in groups equipped with **MXRVO** and protection **DS1/DS1PM** circuit packs.

14. Make appropriate cable connection(s) to DSX-1 cross-connect point(s) or equivalent connection point(s) for DS1 ports(s) being added.

15. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

16. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **`set-ne:crs=manual`** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same ring must be provisioned the same, either all VT1.5 or all STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The following commands may be used to delete, enter, and retrieve cross-connections: **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, and **rtrv-crs-vt1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross connections for each node from the work order or circuit order.

17. If required, use the **ent-crs-( ):** command(s) at each shelf to make necessary STS-1 and/or DS1 (VT1.5) cross-connections.

A. Linear or Add/Drop Configuration	**DLP-545**
B. Ring Configuration	**DLP-546**
C. Dual Ring Interworking (DRI) Configuration	**DLP-550**

18. Perform an end-to-end DS1 transmission test for each DS1 port being put into service (optional).

A. Linear or Single Ring Configuration	**DLP-510**
B. Dual Ring Interworking (DRI) Configuration	**DLP-554**

19. Use the **rtrv-state:** command to determine the port state of the DS1 port(s) of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

20. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-t1:** command to set the port state of the DS1 port(s) of the circuit being established.

21. If **BBF3 DS1PM** circuit packs are installed and the optional ***ds1pm*** performance monitoring feature is to be used, use the **set-feat:feat=ds1pm,act=enable** command to enable the feature.

Discontinue End-to-End DS1 Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION 1:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⚠ CAUTION 2:
When a **DS1/DS1PM** *circuit pack is switched to protection, removal of any other* **DS1/DS1PM** *circuit pack or* **177A** *Retainer Card in the same group will result in a loss of service to the protection* **DS1/DS1PM** *circuit pack and the removed* **DS1/DS1PM** *circuit pack.*

⇒ NOTE:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the **`set-t1:`***`address`***`:ais=no`** command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Determine which DS1 ports are to be discontinued and verify no alarms exist on the system.

2. ⇒ NOTE 1:
The following operation may activate the office major, minor, or no alarm. The audible alarm may be suppressed by depressing the **ACO** button.

⇒ NOTE 2:
One of the terminating nodes for the DS1 service may be equipped with **STS1E** circuit packs to provide an EC-1 interface for the DS1 service.

At the DSX-1 at the DS1 terminating nodes, remove the DS1 signals associated with the port(s) being discontinued. (**FAULT** LEDs begin flashing on **DS1/DS1PM** circuit pack with signals removed.)

3. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

Momentarily depress the **UPD/INIT** button on the **SYSCTL** at the DS1 terminating nodes or use the `upd` command to update the equipment list. (Flashing **FAULT** LEDs go off.)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. If a craft interface terminal (CIT) is available, use the **`rtrv-state-eqpt`** command to verify that the right port has been changed from *in-service* (`i`) to *auto* (`a`) state.

5. ⚠ CAUTION:
   Removing the wrong cross-connection may cause service interruption. Use the **`rtrv-crs-( )`** command to determine the proper cross-connections.

   From work order or **`rtrv-crs-( )`** command, determine the cross-connections for circuit being discontinued.

6. ⇒ NOTE 1:
   DS1 **LOW SPEED** slots cannot be unequipped without an alarm until all port cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In a ring configuration, remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the intermediate nodes. A Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**cnvt-crs**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **cnvt-crs**, **dlt-crs-vt1**, **dlt-crs-sts1**, **ent-crs-vt1**, **ent-crs-sts1**, **rtrv-crs-vt1**, and **rtrv-crs-sts1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
If the cross-connection to a group with a DS1 being discontinued is an STS1 cross-connection, removal of the STS1 cross-connection may cause service interruption to other **DS1** circuit packs. In order to remove an individual **DS1**, the `cnvt-crs` may have to be used to convert the STS1 cross-connection to 28 individual VT1.5 cross-connections. If the entire group is being discontinued, the STS1 cross-connection may be removed, if required.

Use the `dlt-crs-vt1:` command to delete the terminating (drop) node cross-connections for all DS1 service being removed, if required.

7. Use the `dlt-crs-vt1:` command to delete the pass-through cross-connections at each nonterminating node for all DS1 service being removed, if required.

8. If all four DS1 ports on the **DS1/DS1PM** circuit pack are being discontinued, you may remove the **DS1/DS1PM** circuit pack, if required.

9. If *all* **DS1/DS1PM** circuit packs in a group are removed, you may remove the group function unit (**MXRVO** or **STS1E**) circuit packs and the protection **DS1/DS1PM** circuit pack, if required.

10. If group **MXRVO/STS1E** circuit packs are removed, proceed to Step 12. Otherwise, continue with Step 11.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⚠ CAUTION:
No service DS1 **LOW SPEED** *slots should be left empty in groups equipped with* **MXRVO** *or* **STS1E** *(high speed mode) and protection* **DS1/DS1PM** *circuit packs.*

⇒ NOTE:
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Card(s), as required, into the DS1 slot(s) for the **DS1/DS1PM** circuit pack(s) removed.

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12. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If circuit packs have been removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.

If circuit packs have *not* been removed, use the **set-state-t1:** command to set the port state of the DS1 port(s) to *auto* or *nmon*, as required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Verify all alarms are off.	

Discontinue End-to-End DS3 Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION 1:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   Determine which DS3 group is to be discontinued and verify no alarms exist on the system.

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2. ⇒ NOTE 1:
   The following operation may activate the office critical, major, or minor alarm. The audible alarm may be suppressed by depressing the **ACO** button (`opr-aco` command).

   ⇒ NOTE 2:
   One of the terminating (drop) nodes for the DS3 service may be equipped with **STS1E** circuit packs to provide an EC-1 interface for the DS3 service.

   At the DSX-3/STSX cable cross-connect point at the terminating (drop) nodes, remove the DS3/EC-1 service (signal) from the DS3 group being discontinued. (**FAULT** LED flashes on **DS3/DS3PM/STS1E** circuit packs with signal removed.)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

At the terminating (drop) nodes, momentarily depress the **UPD/INIT** button on the **SYSCTL** circuit pack or use the **upd** command to update the equipment list. (Flashing **FAULT** LEDs go off.)

4. If a craft interface terminal (CIT) is available, use the **rtrv-state-eqpt** command to verify that the right port has been changed from *in-service* (i) to *auto* (a) state at the terminating nodes.

5. From the work order or **rtrv-crs-sts1** command, determine the cross-connections for circuit being discontinued. Use the **rtrv-crs-sts1** command at each node in the ring network to obtain the STS-1 Cross Connect Report.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⚠ CAUTION:
Removal of the wrong cross-connect may interrupt service.

NOTE 1:
DS3 slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In ring configurations, remove the cross-connections from the terminating (drop) nodes first, then remove the pass-through cross-connections at the non-terminating nodes, if required. A Critical alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (`cnvt-crs`) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to.28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connects.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The following commands may be used to delete, enter, and retrieve STS-1 cross-connections: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

At the terminating (drop) nodes, use the **`dlt-crs-sts1:`** command to delete the STS-1 cross-connections for the DS3 service being discontinued, if required.

7. Use the **`dlt-crs-sts1:`** command to delete the pass-through STS-1 cross-connections at each non-terminating node for the DS3 service being removed, if required.

8. Remove the **DS3/DS3PM/STS1E** circuit packs associated with the group(s) being discontinued, if required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t3:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If circuit pack(s) was removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.

If circuit pack(s) was *not* removed, use **set-state-t3** command to set state of **DS3/DS3PM/STS1E** circuit pack to "not monitored" (nmon).

10. Verify that all alarms go off.

Upgrade DDM-2000 OC-3 Release 1 to Release 2 or 3 System In Service

---

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
This procedure assumes that the DDM-2000 is in service and is being upgraded from Release 1 software to Release 2 or 3 software. Release 2 and Release 3 software requires that a new **BBG5 SYSCTL** and a **BBG7 OHCTL** be installed in each shelf. This procedure must be performed locally at all shelves in the same control network. To upgrade a Release 1 system to a ring Release 5 or later ring configuration, the system must first be upgraded to a Release 3 system.

NOTE 2:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
2. Use Release 1 ED-8C724-34, GB DDM-2000 OC-3 UPGRADE TOOL diskette to condition system for upgrade.	**DLP-549**

3. ⇒ NOTE 1:
After the first shelf is upgraded, single ended operations will not be available and major alarms (section DCC channel failed) will exist until all shelves are upgraded.

⇒ NOTE 2:
This procedure will not affect transmission when properly performed.

Notify maintenance center that alarms will be generated.

4. Use the retrieve [RTRV-( )] commands to retrieve all parameters that might have been set using the SET commands [**DLP-512**]. See the "Commands and Reports" section of this manual for a description of the `rtrv-( )` commands.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⚠ CAUTION:
Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display (see* **Note***) may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE:
Before removing the **SYSCTL** you must momentarily depress the **ACO** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

Remove **BBG1 SYSCTL** circuit pack.

6. Remove **BBG3 TLMCTL** circuit pack, if installed.

7. Install **BBG7 OHCTL**. **DLP-500**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

8. ⇒ NOTE:
   The **FAULT** LED on the **OHCTL** will flash and the **MJ** LED will be lighted until the other end is upgraded.

   Install new **BBG5 SYSCTL**. **DLP-501**

9. Repeat this procedure from Step 2 for all shelves being upgraded, if not already performed.

Add DDM-2000 OC-3 Shelf
Linear or Hub Configuration
Shelf Added in Middle of Optical Span

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

---

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   NOTE 1:
   This procedure assumes that the DDM-2000 is in service and a new RT site (shelf) is being added in the middle of an optical span. Release 2 or later software is required. (See Figures 1 and 2.)

   NOTE 2:
   It is assumed that the optical loops are installed on the new shelf and that the new shelf has been tested in a looped-back configuration. [**System Turnup: NTP-002**]

   NOTE 3:
   All shelves in the same network must have the same or compatible software releases.

   NOTE 4:
   If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

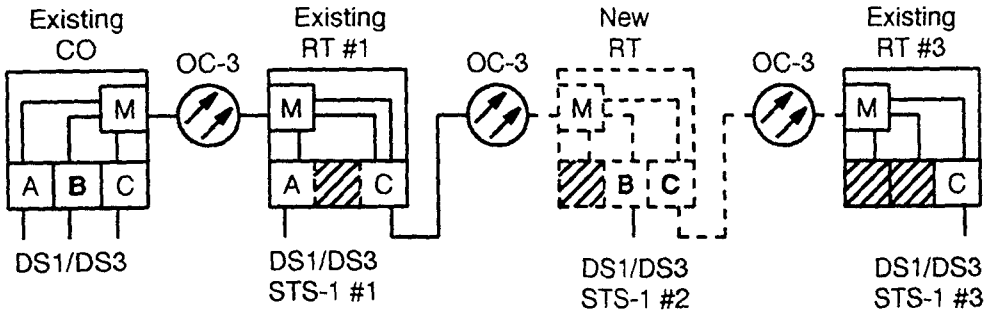


Figure 1. Adding an RT in Middle of an Add/Drop Optical Span

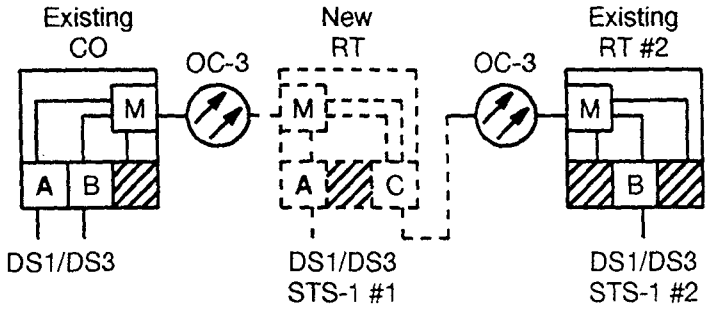


Figure 2. Adding an RT in Middle of a Point-to-Point Optical Span

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. At **both** shelves on each side of the RT being added (for example, RT #1 and RT #3 in Figure 1), use the `switch-line:`*`address`*`:pri=manual` command to switch to the protection line [slot **2(P)**], if not already on protection.

4. ⇒ NOTE:
   The data communication channel (DCC) [far-end communication (fecom)] must be turned off at each shelf before the new shelf is spliced in. The DCC must be disabled on both **MAIN** and **FUNCTION UNITS C** DCCs at the new shelf using these commands:
   `set-fecom:dcc-m:com=disabled` and
   `set-fecom:dcc-c:com=disabled`.
   If the configuration is as shown in Figure 1, the DCC must be disabled on **FUNCTION UNITS C** DCCs at RT #1 and on main DCC at RT #3.
   If the configuration is as shown in Figure 2, the DCC must be disabled on main DCCs at the CO and RT #2. The `set-fecom:` command must be performed individually at each site through a physical CIT connection or through a modem connection. This command cannot be done from within a remote login.

   Use `set-fecom:`*`address`*`:com=disabled` command at each shelf to disable the DCC section communication link.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. Use `rtrv-crs-vtl:` command at existing RTs to verify proper cross-connections.

   NOTE:
   See Figure 1. If the new RT is being added between existing RT #1 and existing RT #3, use the `rtrv-crs-vtl:` command at RT #1 to display the existing DS1 (VT1.5) cross-connections to RT #3.

6. At the new RT, use `ent-crs-sts1:m-1,c-1`; `ent-crs-sts1:m-2,c-2`; and `ent-crs-sts1:m-3,c-3`; commands to cross-connect all STS-1 signals from main to **FUNCTION UNITS C OLIUs**.

7. WARNING:
   Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

   CAUTION:
   Ensure system is operating on the protection fiber lines. Cutting the wrong fiber lines will cause a service interruption.

   Use local procedures to cut the service (slot **1**) fiber line connecting existing shelves and condition the fiber for connection to the new RT shelf.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
8. At new RT, remove **OLIU** optical loops.	
9. Determine the optical loss of the optical facility from office records or by making the required measurements.	
10. If **21G/21G-U OLIU**s are used, set option switch on **OLIU**s to agree with the loss of the optical facility, if required.	**DLP-513**
11. ⇒ NOTE: DCC failures will exist on the new RT after the service fibers are connected to the new RT (**MJ** alarm lighted and **FAULT** LED flashing on the **OHCTL**).	
Connect service line optical fibers to new RT **MAIN** and **FUNCTION UNITS C OLIU**s.	**DLP-514**
12. ⇒ NOTE 1: If loop timing mode is specified or external timing mode is specified but the timing reference was not available at new shelf turnup, the new shelf **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.	
⇒ NOTE 2: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the `rtrv-sync` command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected.

Set timing mode on new shelf **TGS** to the timing mode specified in work order or office records. **DLP-513**

13. NOTE:
The OC-3 optical line tests have to be performed at each physical shelf location associated with the optical spans being tested.

Perform end-to-end OC-3 optical line test locally on service line at ***each*** shelf in the network associated with new optical spans. **DLP-515**

14. CAUTION:
The `switch-line:` *command in the following step must be performed in the order given.*

NOTE:
This step will force selection of the service line and place the new RT in the active path and in service.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use `switch-line:`*`address`*`:pri=lockout` command at the following four locations to force selection of the service line at new and existing shelves (Figure 3):

1. New shelf (RT), **MAIN** (*address*=main)
2. New shelf (RT), **FUNCTION UNITS C** (*address*=fn-c)
3. Downstream shelf (RT) away from CO, **MAIN** (*address*=main) [Forces service to downstream line.]
4. Upstream shelf (CO or RT) toward the CO, **MAIN** (*address*=main). [Forces service to upstream line.]

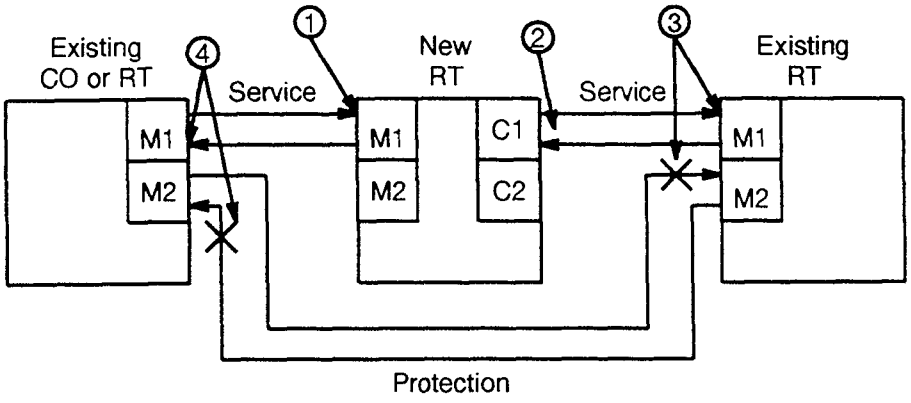


Figure 3. Example of Use of `switch-line` Command

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
15. ⚠ CAUTION: *Ensure system is operating on the service fiber lines. Cutting the wrong fiber lines will cause a service interruption.* Use local procedures to cut the protection fiber line connecting existing shelves and condition the fiber for connection to the new RT shelf.	
16. Connect protection line optical fibers to new RT **MAIN** and **FUNCTION UNITS C OLIUs**.	**DLP-514**
17. Perform end-to-end OC-3 optical line test locally on protection line at ***each*** shelf in the network.	**DLP-515**
18. At the following locations, use `switch-line:`*`address`*`:pri=reset` command in the following order to return system to normal state with no external switch requests (Figure 4): 1. Upstream shelf (CO or RT) toward the CO, **MAIN** (*address*=main) 2. New shelf (RT), **FUNCTION UNITS C** (*address*=fn-c) 3. New shelf (RT), **MAIN** (*address*=main) 4. Downstream shelf (RT) away from CO, **MAIN** (*address*=main).	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

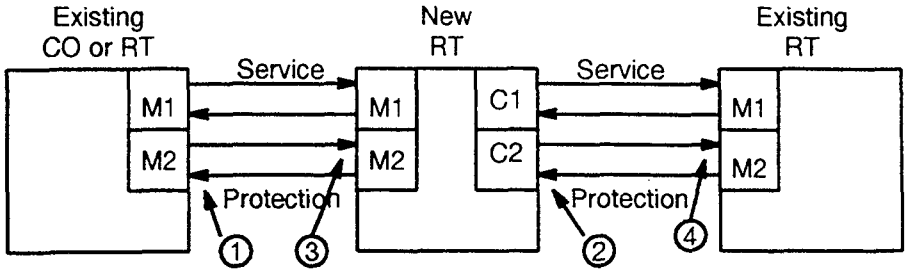


Figure 4. Use of `switch-line` Command to Return System to Normal

19. Use `set-fecom:`*address*`:com=enabled` command at each shelf to enable the DCC section communication link.

20. Perform end-to-end DS1 transmission test for DS1s being added, as required. **DLP-510**

21. The system is ready for service to be established.

Add DDM-2000 OC-3 Shelf and/or New Optical Span Shelf and/or Span Added as Extension to DDM-2000 OC-3 Ring, Hub, Point-to-Point, Linear Add/Drop Configuration

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure assumes that the DDM-2000 is in service and a new DDM-2000 OC-3 shelf and/or new optical span are being added. See Figures 1, 2, 3, and 4.

   ⇒ NOTE 2:
   If a new shelf is being added, it is assumed that it has been tested in a looped-back mode [**System Turnup: NTP-016**] and configured for the type of shelf required, STS1 drop (default) or DS1 add/drop [**System Turnup: NTP-020**].

   ⇒ NOTE 3:
   If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

   Use `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

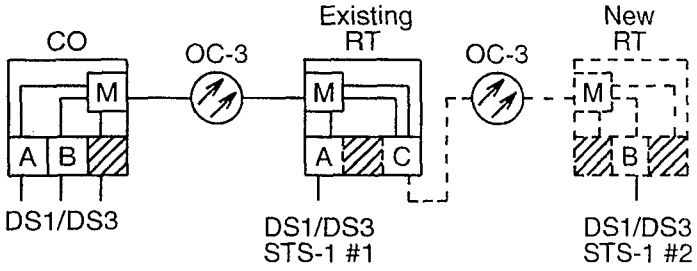


Figure 1. Adding RT and Optical Span to Point-to-Point Configuration

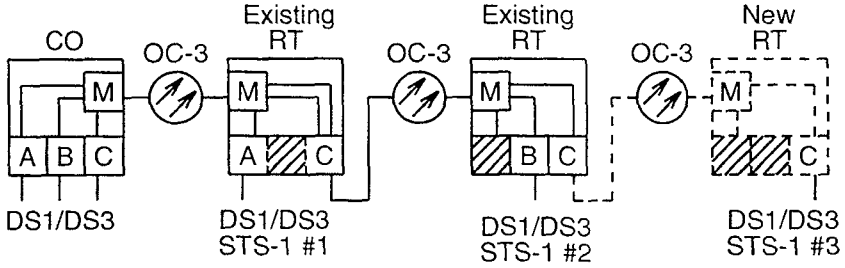


Figure 2. Adding RT and Optical Span to End of STS-1 Drop Configuration

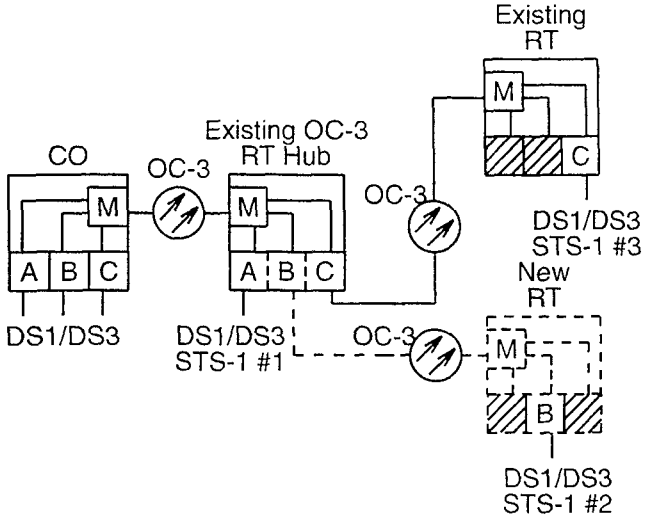


Figure 3. Adding RT and Optical Span to Hub Location

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

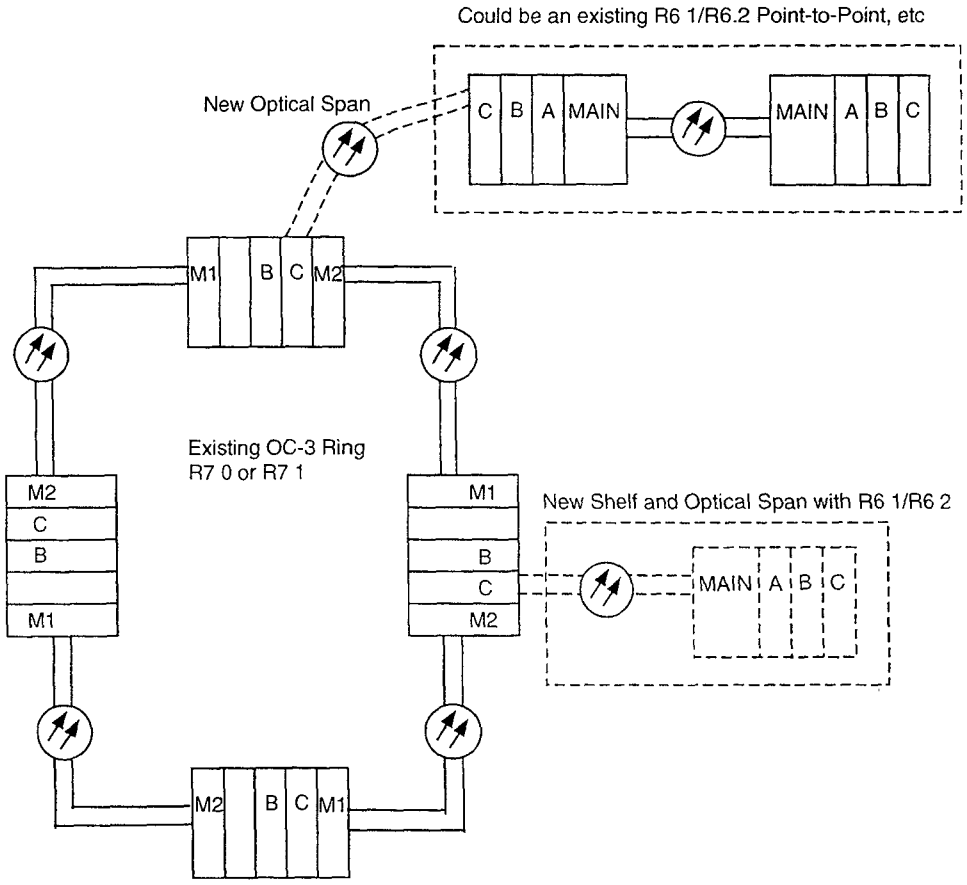


Figure 4. Adding New Shelf and/or Optical Span to OC-3 Ring

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

3. If this is a linear system and the existing RT is going to be a DS1 add/drop shelf and is not yet converted, convert it using the procedures of **NTP-020**, then return to this procedure.

4. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

   At existing RT, install **OLIU** circuit packs in **FUNCTION UNITS** slots being used for the new extension, if not already performed. **DLP-504**

5. ⇒ NOTE:
If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops. **22G-U OLIU**s require a 10 dB LBO. **22G2-U OLIU**s require **no** attenuation when it is looped on itself.

   At existing RT, connect optical loops to the new **OLIU**s. **DLP-505**

6. After new **OLIU** alarm LEDs go off, remove **OLIU** optical loops at both existing and new RTs.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Determine the optical loss of the optical facility from office records or by making the required measurements.	
8. If **21G/21G-U OLIU**s are used, set option switch on each **21G/21G-U OLIU** to agree with the loss of the optical facility.	**DLP-513**
9. ⇒ NOTE: If option switch setting is changed, an update must be performed by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is reinstalled.	
Reinstall **OLIU**s (if removed) and connect each **OLIU** to the new optical facility.	**DLP-514**
10. ⇒ NOTE 1: If loop timing mode is specified or external timing mode is specified but the timing reference was not available at new shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.	
⇒ NOTE 2: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected.

Set timing mode on **TGS** to the timing mode specified in work order or office records. **DLP-513**

11. Perform automatic end-to-end OC-3 line test at new or existing RT.
    A. Linear configuration with linear extension **DLP-525**
    B. Ring configuration with linear extension **DLP-515**

12. Use **`rtrv-crs-sts1`** or **`rtrv-crs-vt1`** commands at existing RT to see if required cross-connections have been made to new RT. If required, use **`ent-crs-( )`** commands at existing RT to make required cross-connections.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Perform end-to-end DS1 transmission test for added low speed group, as required.	DLP-510
14. Perform end-to-end DS3 transmission test for added low speed group, as required.	DLP-511
15. The system is ready for service to be established.	

Equip DDM-2000 OC-3 Shelf (Looped-Back)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
This procedure is **not** used to equip a shelf as an EC-1 electrical multiplexer (Release 6) or for OC-3c service (Release 6). See **System Turnup: IXL-001** for proper procedures.

NOTE 2:
This procedure assumes that all hardwired installation and testing of the unequipped DDM-2000 shelf has been done. It also assumes that power is applied to the shelf (**PWR ON** LED(s) lighted on User Panel).

NOTE 3:
Many of the circuit packs have numerous option switches which must be set before they are installed.

Check –48 V DC office battery, if required. **DLP-524**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Releases 5, 7 and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

Install **BBG7 OHCTL** circuit pack. **DLP-500**

3. ⇒ NOTE:
If system software has not been previously installed in the **OHCTL** and **SYSCTL**, it must be installed [DLP-532] after the **SYSCTL** is installed.

Install **BBG5 SYSCTL** circuit pack. **DLP-501**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE 1:
As additional circuit packs are installed, office alarms may be activated, accompanied by flashing **FAULT** LEDs on some of the circuit packs. This is a normal condition at this stage of the procedure. You can momentarily depress the **ACO/TST** button to retire office alarms.

⇒ NOTE 2:
To avoid timing alarms before the end-to-end OC-3 system has been established, the **TGS** option switches must be *temporarily* set to *free running* if either of the following is true:

- DS1 external timing is specified but the DS1 timing reference is not yet available.
- Loop timing mode is specified but the **OLIU**s will be optically looped back at the shelf.

When the DS1 external timing references become available or when the end-to-end system is established, the timing mode must be changed to the specified timing mode. If external timing is the specified timing mode and external timing is available to the shelf, the timing mode may be set for external timing.

Install **TGS** timing circuit packs. **DLP-503**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE:
22-Type OLIUs are required for add/drop and ring configurations. For other configurations, if **21G/21G-U OLIU**s are used, the **HIGH/LOW POWER** switch is set to **LOW** for shelf loopback.

Install **OLIU** circuit packs. **DLP-504**

6. ⇒ NOTE 1:
A **22G-U OLIU** requires a 10 dB LBO when the **22G-U OLIU** is looped on itself. **22G2-U OLIU** does **not** require a LBO when it is looped on itself.

⇒ NOTE 2:
In Release 6 or later, if fecom is enabled, an `inconsistent DCC switches` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the user/network switches on the **OHCTL**s at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address`***`:com=disable`** command to disable the DCC.

Install **OLIU** optical loops. **DLP-505**

7. ⇒ NOTE:
BBG2 MXRVO circuit packs must be installed in both **FUNCTION UNIT** slots **1** and **2(P)** if **BBF3 DS1PM** circuit packs are going to be installed.

Install **BBG2 MXRVO** circuit packs (if required). **DLP-506**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
8. Install **BBG4 DS3** circuit packs (if required).	**DLP-507**
9. Install **BBG6 STS1E** (optioned for LOW SPEED) circuit packs (if required).	**DLP-502**

10. ⇒ NOTE 1:
BBF1( ) DS1 or **BBF3 DS1PM** interface circuit packs must not be installed in a group that is not going to be equipped with **MXRVO** circuit packs.

⇒ NOTE 2:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the TIP and RING of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the **`set-t1:`***`address`***`:ais=no`** command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
177A Retainer Cards must be installed in all empty **DS1** slots in groups equipped with **MXRVO** and protection **DS1/DS1PM** circuit packs. This is generally performed when initial service is established. [**System Turnup: NTP-004**] All **LOW SPEED** DS1 slots must be empty in groups that are unequipped or in groups that are not equipped with **MXRVO** circuit packs.

NOTE 4:
If **BBF3 DS1PM** circuit packs are installed in service slots, then a **BBF3 DS1PM** circuit pack must be installed in the protection slot, if protection is required.

Install service and protection **BBF1 DS1** or **BBF3 DS1PM** circuit packs (if required). **DLP-508**

11. CAUTION:
The command **`init-sys:all`** *may affect service. It should never be used on an in-service system. It should be used only after a shelf has been equipped to reset all provisionable parameters and cross-connections to their default values.*

NOTE:
In Release 6 or later, an `inconsistent DCC switches` alarm will occur when the **`init-sys:all`** command is executed because "fecom" becomes enabled again. To clear the alarm, use the **`set-fecom:`***`address`***`:com=disable`** to disable the DCC.

If a CIT is available, use the **`init-sys:all`** command to initialize all provisionable parameters to their original default values.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. Perform an LED test.	DLP-509

13. ⇒ NOTE:
This procedure assumes that the DDM-2000 high speed signals are looped back [manual optical (OLIU) loopback]. Automatic local tests (looped back) using the `test-auto` command are not available for Release 5 or 7.

Perform automatic local (looped back) transmission test.

A. Release 5 or 7 DS1/EC-1 transmission test	DLP-510
B. Release 5 or 7 DS3/EC-1 transmission test	DLP-511
C. Releases 2, 3, and 6	DLP-528

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
14. ⇒ NOTE: This procedure assumes that the DDM-2000 has been connected to the low-speed DSX cross-connection as required. Automatic cross-connect tests (looped back) using the **`test-auto`** command are not available for Release 5 or 7. Perform automatic local wiring cross-connect test (looped back). A. Release 5 or 7 DS1/EC-1 transmission test B. Release 5 or 7 DS3/EC-1 transmission test C. Releases 2, 3, or 6	 **DLP-510** **DLP-511** **DLP-529**
15. Perform DDM-2000 OC-3 receiver sensitivity test (if required). Optional test.	**DLP-547**
16. Check office alarm interface as required.	**DLP-516**
17. Check telemetry interface as required. A. Parallel telemetry B. Serial telemetry	 **DLP-517** **DLP-518**
18. Test protection switching function, if required. (Not required for Release 5 or 7.)	**DLP-519**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

19. ⚠ CAUTION:
The command **`init-sys:all`** *may affect service. It should never be used on an in-service system. It should be used only after a shelf has been equipped to reset all provisionable parameters and cross-connections to their default values.*

NOTE:
In Release 6 or later, an `inconsistent DCC switches` alarm will occur when the **`init-sys:all`** command is executed because "fecom" becomes enabled again. To clear the alarm, use the **`set-fecom:`***`address`***`:com=disable`** to disable the DCC.

If a CIT is available, use the **`init-sys:all`** command to initialize all provisionable parameters to their original default values.

---

20. NOTE 1:
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000, such as system name and GNE status, security and logins, date and time, far end communications (fecom), etc.

NOTE 2:
If you choose to make VT1/STS1 cross-connections at this time using the **`ent-crs-( )`** commands, alarm activity will result when optical fiber loops are removed for end-to-end system testing.

Activate optional features as required from work order or office records. **DLP-512**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. After all shelves in the network have been tested, you can establish the end-to-end DDM-2000 OC-3 subnetwork.

    A. DDM-2000 OC-3 Point-to-Point [**NTP-003**]
    B. DDM-2000 OC-3 Linear or Hub [**NTP-017**]
    C. DDM-2000 OC-3 Path Switched Rings [**NTP-022**]
    D. DDM-2000 OC-3 Dual 0x1 Interface [**NTP-040**]

Establish End-to-End System
Linear or Hub Configuration
DDM-2000 OC-3 Optical Fiber Spans

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

NOTE 2:
It is assumed that all DDM-2000s in the system have passed the looped transmission test(s). [**System Turnup: NTP-016**]

Determine the optical loss of each optical span from office records or by making the required measurements.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Releases 5, 7 and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

If required, verify/set switches on **OHCTL**s at each end of optical span. **DLP-513**

3. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYSCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the **`set-ne`** command) will cause a `duplicate TID` alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **`rtrv-ne:`** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches or use the **`set-ne`** command to make new settings. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE:
In Release 6 or later, the **`set-ne:tid=`*`TID`*`:gne=yes`** command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DS-NE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DS-NE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DS-NE), a "`duplicate GNE`" alarm will occur. In Release 6 or later, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

If Release 6 or later software is installed, use the **`set-ne:tid=`*`TID`*`:gne=yes`** command to designate ONE shelf as the GNE.

---

5. Remove optical loops from **OLIU**s in the OC-3 optical span being established.

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6. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each shelf** to enable far end communications.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
At each shelf, use the **set-fecom:***address*:**com=enabled** command to ensure far end communications (fecom) is enabled.	
7. If **21G/21G-U OLIU**s are used, set the option switches on the **21G/21G-U OLIU**s to agree with the loss of the optical facility.	**DLP-513**
8. ⇒ NOTE: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is installed.	
Reinstall **OLIU**s (if removed) and connect the optical span being established to the DDM-2000 OC-3 **OLIU**s at each end.	**DLP-514**
9. ⇒ NOTE 1: If loop timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. **DLP-513**

10. NOTE 1:
If Kbyte (sync messaging) (R5.1 and later) is enabled for the at any node in a system, it **must** be enabled at all nodes of the system.

NOTE 2:
The **rtrv-oc3:** command retrieves the `OC-3 Line Provisioning Report`. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte parameter, as required.

11. ⇒ NOTE 1:
If Sync Autoreconfiguration (R6.1 and later) is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any loop-timed node in a linear system, it **must** be enabled at all loop-timed nodes of a linear system.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. Perform automatic end-to-end OC-3 line test on OC-3 optical span established.	**DLP-525**
13. (Optional test). Perform end-to-end DS1 transmission test for DS1 group being dropped at end of span being established, if required.	**DLP-510**
14. (Optional test). Perform end-to-end DS3 transmission test for DS3 group being dropped at end of span being established, if required.	**DLP-511**
15. Repeat this procedure from Step 3 for each OC-3 optical span being established in the DDM-2000 OC-3 network.	
16. The system is now ready for initial DS1, DS3, or EC-1 service to be established. [**System Turnup: NTP-004**] (DS1) [**System Turnup: NTP-005**] (DS3) [**System Turnup: NTP-034**] (EC-1)	

Add DDM-2000 OC-3 Shelf and New Optical Span
Linear or Hub Configuration
Shelf Added as Extension to DDM-2000 OC-12

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure assumes that the DDM-2000 OC-12 system is in service and a new DDM-2000 OC-3 shelf and new optical span is being added to the OC-12.

⇒ NOTE 2:
This procedure assumes that the new DDM-2000 OC-3 shelf has been established and tested in a looped-back configuration.

⇒ NOTE 3:
Release 3 or later software must be installed in the OC-3 system.

⇒ NOTE 4:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

Verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

3. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⇒ NOTE 1:
The **21G/21G-U OLIU** has a **HIGH/LOW POWER** switch which must be set to **LOW** when the **21G/21G-U OLIU** is looped.

⇒ NOTE 2:
Any **FUNCTION UNITS** slot of the OC-12 system may be used to connect the OC-3 shelf to the OC-12 shelf. **21D/21D-U** or **21G/21G-U OLIU**s may be used in the OC-12 system. **21D/21D-U**, **21G/21G-U**, **22F**, **22D-U**, or **22G-U OLIU**s may be used in the OC-3 system. **21G/21G-U**, **22F**, and **22G-U OLIU**s use single-mode fiber connections in the transmit direction. **21D/21D-U/22D-U OLIU**s use multimode fiber connections in both directions.

At OC-12 system, install required **OLIU** circuit packs in **FUNCTION UNITS** slots being used for OC-3 extension (AT&T 363-206-207, *DDM-2000 OC-12 Multiplexer User/Service Manual*, **DLP-503**).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE:
For Release 6 (Release 2, OC-12) or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 (Release 2, OC-12) or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

If required, verify/set switches on **OHCTL**s. **DLP-513**

5. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYSCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the `set-ne` command) will cause a `duplicate TID` alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The `rtrv-ne:` command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches or use the `set-ne` command to make new settings. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⇒ NOTE:
   In Release 6 (Release 2, OC-12) or later, the `set-ne:tid=TID:,gne=yes` command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DS-NE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DS-NE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DS-NE), a "`duplicate GNE`" alarm will occur. In Release 6 (Release 2, OC-12) or later, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

   If Release 6 (Release 2, OC-12) or later software is installed, use the "`rtrv-ne`" command to verify only ONE shelf is set as the GNE.

7. Connect OC-12 **OLIU** optical loops.
   (AT&T 363-206-207, *DDM-2000 OC-12 Multiplexer User/Service Manual*, **DLP-504**).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. After new OC-12 **OLIU** alarm LEDs go off, remove all **OLIU** optical loops at both the OC-3 and OC-12 system.

9. Determine the optical loss of the optical facility from office records or by making the required measurements.

10. ⇒ NOTE:
21D/21D-U/22D-U OLIUs have no option settings and are intended to be used for short-reach intra-office applications. **22F OLIU**s have no option settings and are intended to be used for intermediate-reach add/drop applications.

If **21G/21G-U OLIU**s are used, set **HIGH/LOW POWER** option switch to agree with the loss of the optical facility. **DLP-513**

11. ⇒ NOTE:
If the option switch setting is changed, an update must be performed by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is reinstalled.

Reinstall **OLIU**s, if removed, then connect each **OLIU** to the new optical fiber span. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

12. ⇒ NOTE 1:
If loop timing mode is specified or external timing mode is specified but the timing reference was not available at new shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the `rtrv-sync` command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on **TGS** to the timing mode specified in work order or office records.	**DLP-513**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Perform automatic end-to-end OC-3 line test at each end of the optical fiber spans.	DLP-525
14. Perform end-to-end DS1 transmission test for each low speed group, if required.	DLP-510
15. Perform end-to-end DS3 transmission test for each low speed group, if required.	DLP-511
16. The system is ready for service to be established.	

Discontinue OC-3 Span From DDM-2000 OC-3 Hub or OC-12 System

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE:
The craft interface terminal (CIT) `rtrv-nmap:` command may be used to retrieve a map of the SONET network, including a list of the systems in the network and how they are connected. The `rtrv-crs-( ):` command may be used to retrieve STS-1/VT1.5 cross-connections within the DDM-2000 OC-3 system.

Determine which optical span(s) is being discontinued.

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2. Ensure service (signals) has been removed from the DS1/DS3/EC-1 groups in the span(s) being discontinued [**NTP-011** (DS1), **NTP-012** (DS3), and/or **NTP-036** (EC-1)].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⚠ CAUTION:
Removal of wrong fiber connections will result in a service interruption. Ensure you remove only the fiber connections for the optical span being discontinued.

⇒ NOTE:
The following operations will activate office alarms. The audible alarm may be suppressed by depressing the **ACO** button.

Remove optical fiber connections from all **OLIU**s associated with optical span(s) being discontinued.

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4. Remove **OLIU**(s) associated with optical span being discontinued, if required.

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5. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen to operate it.

If **OLIU** circuit pack(s) was removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.

If **OLIU** circuit pack(s) was *not* removed, connect optical fiber loops to **OLIU**(s). **DLP-505**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⇒ NOTE 1:
With Release 6 (Release 2, OC-12) or later software, when a shelf is removed from a DDM-2000 network, the `dlt-tadrmap:tid=`*`tid`* command must be used to delete the TID of the removed shelf from the directory services data base used for routing messages over the DCC. This prevents that TID from appearing in `rtrv-nmap` reports and will retire the "`communication failure`" alarms at all shelves in the network.

⇒ NOTE 2:
The `dlt-tadrmap:tid=`*`tid`* command is valid only at the GNE. The `rtrv-nmap` command may be used to determine which shelf is the GNE.

Wait at least one minute, then at the GNE, use the `dlt-tadrmap:tid=`*`tid`* command to delete the TID of the removed shelf from the directory services data base, if required.

7. Verify that all alarms go off.

Convert (Upgrade) DDM-2000 OC-3 Shelf to DS1 Add/Drop Shelf

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure is used to convert/upgrade a DDM-2000 OC-3 shelf to a DS1 Add/Drop shelf. It requires replacing all **OLIU** circuit packs in a shelf with **22-Type OLIU** circuit packs which require Release 3 or later software. If Release 3 or later software is not installed, a software upgrade must be done before the **OLIU**s are installed. After the software and **OLIU**s are installed, the `set-ne:`*`TID`*`:crs=manual` command sets the shelf cross-connect mode to manual to allow cross-connections to be entered manually. The shelf is now an STS-1 add/drop shelf. In order to convert it to a DS1 add/drop shelf, the `cnvt-crs:` command is used to convert an existing STS-1 cross-connection to up to 28 individual VT1.5 (DS1) cross-connections.

   ⇒ NOTE 2:
   If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

   Use `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
2. Notify maintenance center that alarms will be generated.	
3. Install generic program Release 3 or later, if not already installed.	**DLP-532**
4. Replace existing **OLIU**s with **22-Type OLIU**s, if not already performed.	**DLP-542**

5. ⇒ NOTE:
The "Commands and Reports" section of this manual gives a description of commands.

Use the `set-ne:`*`TID`*`:crs=manual` command to set shelf cross-connect mode to manual.

6. ⚠ CAUTION:
Execution of the `cnvt-crs` *command for existing STS-1 cross-connections that are supporting DS3 or other non-DS1 services will interrupt those services. This command should only be executed when existing STS-1 cross-connections are supporting either no service or DS1 service.*

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
No inverse capability is available with this command to convert from 28 DS1 cross-connections back to a single STS-1 cross-connection. In order to do this, you must delete each of the 28 DS1 cross-connections using the `dlt-crs-vt1` command and then enter the STS-1 cross-connection using the `ent-crs-sts1` command.

Use the `cnvt-crs:`*`address1,address2`* command to convert the required STS-1 cross-connections to DS1 cross-connections.

7. NOTE:
The shelf is now a DS1 add/drop shelf. Individual DS1 cross-connections may now be made using the `ent-crs-vt1` command. The command description in the "Commands and Reports" section of this manual lists the valid cross-connections. See *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

See **System Turnup/Circuit Order: IXL-001** for procedures to add DS1 service.

Convert (Upgrade) DDM-2000 OC-3 System to OC-12 System Linear or Hub Configuration

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure is used to upgrade/convert from an in-service DDM-2000 OC-3 point-to-point system to a DDM-2000 OC-12 point-to-point system. It assumes that timing arrangements and cabling have been engineered and installed to satisfy the timing requirements of the new network arrangement.

Basically, this procedure first establishes an end-to-end DDM-2000 OC-12 system with function unit slots equipped with proper **OLIU** circuit packs. Then, the optical fibers from the OC-3 **MAIN** slots are removed and connected to the OC-12 **MAIN-B** slots if the OC-12 system is going to use the removed fibers. If extra fiber pairs exist, the OC-12 system may be established and end-to-end tests performed before the upgrade begins. Protection circuit packs must be available in the OC-3 **MAIN 2(P)** slots to allow service to switch to the protection **OLIU** when the optical fibers are removed. After the OC-12 system is established, new optical fiber connections are made between the OC-3 **MAIN** slots and the OC-12 **FUNCTION UNITS** slots.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

This procedure requires craft to be at both ends of the OC-3/OC-12 optical span.

NOTE 2:
It is assumed that the OC-12 shelves have been established and have passed local tests.

NOTE 3:
Any **FUNCTION UNITS** slot of the OC-12 system may be used to connect the OC-3 shelf to the OC-12 shelf. **21D/21D-U** or **21G/21G-U OLIUs** may be used in the OC-12 system. **21D/21D-U**, **21G/21G-U**, **22G-U**, **22D-U**, or **22F OLIUs** may be used in the OC-3 system. **21G/21G-U** and **22F OLIUs** use single-mode or multimode fiber connections in the both directions. **21D/21D-U OLIUs** use multimode fiber connections in both directions.

NOTE 4:
The OC-3 system must have Release 3 or later software [**DLP-532**]. All shelves in the same network must have compatible software releases. A network is defined as all shelves tied together through optical fiber connections with communication among all shelves.

NOTE 5:
This procedure assumes that the optical fibers from **MAIN 1** at one end of the OC-3 system connect to **MAIN 1** at the other end of the OC-3 system. This upgrade requires technicians at both ends of the system to remove and make fiber connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 6:
Different system configurations may require different timing arrangements. Before performing this upgrade, work orders and/or office records must be available to determine the new timing arrangements. Depending on the timing mode used and the availability of external timing, timing cables may have to be installed or moved and/or different timing modes set for the OC-3 and/or OC-12 shelves.

NOTE 7:
If timing upgrades are required, perform the timing upgrades before performing this procedure.

NOTE 8:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Verify that the shelf timing cabling and timing modes are provided as required. If external timing is being used, verify that the external timing inputs are good.

A. OC-3 Shelf **DLP-513**
B. OC-12 Shelf [**AT&T 363-206-207**] **DLP-510**

2. Ensure that OC-3 software is compatible with the OC-12 system to be turned up. **DLP-532**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
3. Establish an end-to-end OC-12 system. [AT&T **363-206-207, NTP-003**]	
4. Use the `rtrv-alm` and `rtrv-state` commands to verify that no alarms, locks, loops, or switches are present.	
5. Notify maintenance center that alarms will be generated.	
6. ⇒ NOTE: Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYSCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the `set-ne` command) will cause a `duplicate TID` alarm. Verify no duplicate TBOS, site/ne, or TID settings exist. The `rtrv-ne:` command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches or use the `set-ne` command to make new settings.	**DLP-513**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. ⇒ NOTE 1:
For OC-3 Release 6 or later, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection (OSI) protocol. Switches **S2-1** through **S2-4** must be set to control the identification of the DCC for OSI interworking. **S2:3** or later **OHCTL**s are factory-programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

⇒ NOTE 2:
The **FAULT** LED on the **OHCTL** will flash, and the **MJ** LED will be lighted until the other end is upgraded.

If required, set switches on **OHCTL**. **DLP-513**

8. ⇒ NOTE:
In OC-3 Release 6 or later software, the `set-ne:TID:gne=yes` command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DS-NE). **One**, and only one, shelf in the network **must** be provisioned as a GNE. If there is no GNE (DS-NE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DS-NE), a `duplicate GNE` alarm will occur. In Release 6 or later software, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
If Release 6 or later software is installed and the GNE is to be in the OC-3 system, use the `set-ne:`*`TI D`*`:gne=yes` command to designate ONE OC-3 shelf as the GNE.	
9. Ensure that OC-3 shelves are equipped with both **MAIN 1** and **MAIN 2(P) OLIUs** so that service can be switched from service slot **MAIN 1** to protection slot **MAIN 2(P)**.	
10. At each OC-12 shelf, use `set-fecom:`*`address`*`:com=disable` command to disable DCC communications for the function slot being used in the OC-12 system. For example, if **FUNCTION UNITS** slot **A** in the OC-12 is being used to connect the OC-3 system, the command `set-fecom:dcc-a:com=disable` disables communication for **FUNCTION UNITS** slot A.	
11. At each OC-3 shelf, use `set-fecom:dcc-m:com=disable` to disable DCC communications for OC-3 **MAIN** slots.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. NOTE:
Service must be switched to the protection slot [**MAIN 2(P)**] at both ends of the OC-3 system being upgraded. If only the service **MAIN OLIU**s have **ACTIVE** LEDs lighted, the `switch-line:main:pri=manual` command must be performed at both ends of the system. If both service and protection **MAIN OLIU**s have the **ACTIVE** LEDs lighted, use the `rtrv-state:main-all` command to determine the switch state of the main **OLIU**s. The `switch-line:main:pri=manual` command must be performed at the end of system that shows `active-rx` for **MAIN 1**.

At **both** ends of the OC-3 system, use the `switch-line:main:pri=manual` command to switch to the protection line, if required.

Response: Only **OLIU**s in the protection slot have **ACTIVE** LEDs lighted.

13. CAUTION:
Disconnecting the wrong fiber will cause service interruption. After the **MAIN 1** *fiber is disconnected, the OC-3 system will continue service unprotected on* **MAIN 2(P)**.

At each end of the OC-3 system, disconnect the optical fiber from **MAIN 1 OLIU**.

Response: Incoming OC-3 loss of signal alarm for **MAIN 1** fiber.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

14. If the optical fiber just removed from OC-3 **MAIN 1** is to be used for the OC-12 system, connect the fiber to the **OLIU** in **MAIN-B-1** at each end of the OC-12 system [**AT&T 363-206-207, NTP-003**].

15. ⇒ NOTE:
When a circuit pack is removed, a `CP removed` alarm is activated. When a different circuit pack is installed or one is reinstalled with different switches, an `unexpected CP type/switches` alarm is activated.

At both ends of the OC-3 system, if **21G/21G-U OLIU**s are used, remove **OLIU**s from **MAIN 1** slots, set optical power switches to proper position, then reinstall **OLIU**s. **DLP-513**

If a different type of **OLIU** is to be used in the OC-3 **MAIN** slots, remove existing **OLIU**s from **MAIN 1** slots, and install new **OLIU**s.

16. One at a time, at both ends of the OC-12 system, connect new optical fiber from the OC-12 **OLIU** in **FUNCTION UNITS** service slot **1** to OC-3 **OLIU** in **MAIN 1** slot [**AT&T 363-206-207, DLP-551**].

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
17. One at a time, at both ends of the OC-3 system, momentarily depress the **UPD/INIT** button on the **SYSCTL**. Verify that **FAULT** LEDs go off on all **OLIU**s.	
18. At **both** ends of the OC-3 system, use the `switch-line:main:pri=manual` command to switch to the **MAIN 1** service line, if not already switched (**ACTIVE** LED lighted on only the **OLIU** in **MAIN 1** slot).	
19. At both ends of the OC-3 system, disconnect the optical fiber from **OLIU** in **MAIN 2(P)** slot. Response: Incoming OC-3 loss of signal alarm for **MAIN 2(P)** fiber.	
20. If the optical fiber just removed from OC-3 **MAIN 2(P)** is to be used for the OC-12 system, connect the fiber at each end of the OC-12 system to the **OLIU** in **MAIN-B-2(P)** [**AT&T 363-206-207, DLP-511**].	
21. At both ends of the OC-3 system, remove OC-3 **OLIU** from **MAIN 2(P)** and momentarily depress **UPD/INIT** button on the **SYSCTL**.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
22. At both ends of the OC-3 system, install in **MAIN 2(P)** the same type **OLIU** with same switch settings as used in **MAIN 1**.	
23. One at a time, at both ends of the OC-12 system, connect new optical fiber from OC-12 **OLIU** in **FUNCTION UNITS** protection slot **2(P)** to OC-3 **OLIU** in **MAIN 2** slot. Verify that **FAULT** LEDs go off on all **OLIU**s [**AT&T 363-206-207, DLP-551**].	
24. At each OC-3 shelf, use `set-fecom:dcc-m:com=enable` to enable DCC communications for OC-3 **MAIN** slots.	
25. At each OC-12 shelf, use `set-fecom:`*`address`*`:com=enable` to enable DCC communications for the function slot being used in the OC-12 system. For example, if **FUNCTION UNITS** slot **A** in the OC-12 system is being used to connect the OC-3 system, the command `set-fecom:dcc-a:com=enable` enables communication for **FUNCTION UNITS** slot A.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

26. The upgrade is now complete. Maintenance operations may need to be moved from the OC-3 shelf to the OC-12 shelf. This may include setting **SYSCTL** switches to enable TBOS on the OC-12 and disable it on the OC-3 [**DLP-513**]. It may also include using the `set-ne:` command to indicate which system is a gateway network element (GNE).

Establish End-to-End DDM-2000 OC-3 System Optical Fiber Spans Path Switched Ring Network

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

NOTE 2:
It is assumed that all DDM-2000s in the system have passed the looped transmission test(s). [**System Turnup: NTP-016**]

Determine the optical loss of each optical span from office records or by making the required measurements.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE 1:
If loop timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. **DLP-513**

3. ⇒ NOTE 1:
If Kbyte (sync messaging) (R5.1 and later) is enabled for the **`main-1`** and **`main-2`** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

⇒ NOTE 2:
The **`rtrv-oc3:`** command retrieves the `OC-3 Line Provisioning Report`. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **`rtrv-oc3:`** command format.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte parameter, as required.

4. ⇒ NOTE 1:
If Sync Autoreconfiguration (R6.1 and later) is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any loop-timed node in a ring, it **must** be enabled at all loop-timed nodes of a ring.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Releases 5, 7, and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

If required, verify/set switches on **OHCTL**s at each end of optical span being established. **DLP-513**

6. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYSCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the **`set-ne`** command) will cause a `duplicate TID` alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **`rtrv-ne:`** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches or use the **`set-ne`** command to make new settings. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. ⇒ NOTE 1:
In Release 7.0 and 7.1, the "**set-ne:**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DSNE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DSNE), a "duplicate GNE" alarm will occur. In Release 7.0 and 7.1, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

⇒ NOTE 2:
In Release 7.2, the "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In Release 7.2, multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 3:
In Release 7.2, shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

For Release 7.0 and 7.1, use the "**set-ne:**" command to designate ONE shelf as the GNE.

For Release 7.2, use the "**set-ne:**" command to designate ONE shelf as the DSNE. Use the "**set-ne:**" to designate the AGNE(s) and alarm group number, as required.

8. ⇒ NOTE:
A ring configuration requires that the **MAIN 1 OLIU** at one shelf (node) connects to the **MAIN 2 OLIU** at an adjacent shelf (node). See Figure 1. This procedure will establish the ring configuration starting from one node (near end) and continuing to an adjacent node, then to the next node until the final connection is made from the last node back to the first node.

At the near end, remove the optical loop from ONE **OLIU** (for example, **MAIN 2**) associated with the optical span being established. At the other end, remove the optical loop from the associated **OLIU** (for example, **MAIN 1**) in the optical span being established.

9. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

10. ⇒ NOTE:
The **`rtrv-pm-line`** command in the following procedure displays performance monitoring data associated with the STS-3 lines terminated on the system.

Perform end-to-end OC-3 line test. **DLP-515**

11. Repeat this procedure from Item 2 for each optical span being established in the DDM-2000 OC-3 network.

12. The system is now ready for initial service to be established.
Initial DS1 Service [**System Turnup: NTP-004**]
Initial DS3 Service [**System Turnup: NTP-005**]
Initial EC-1 Interface [**System Turnup: NTP-034**]

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

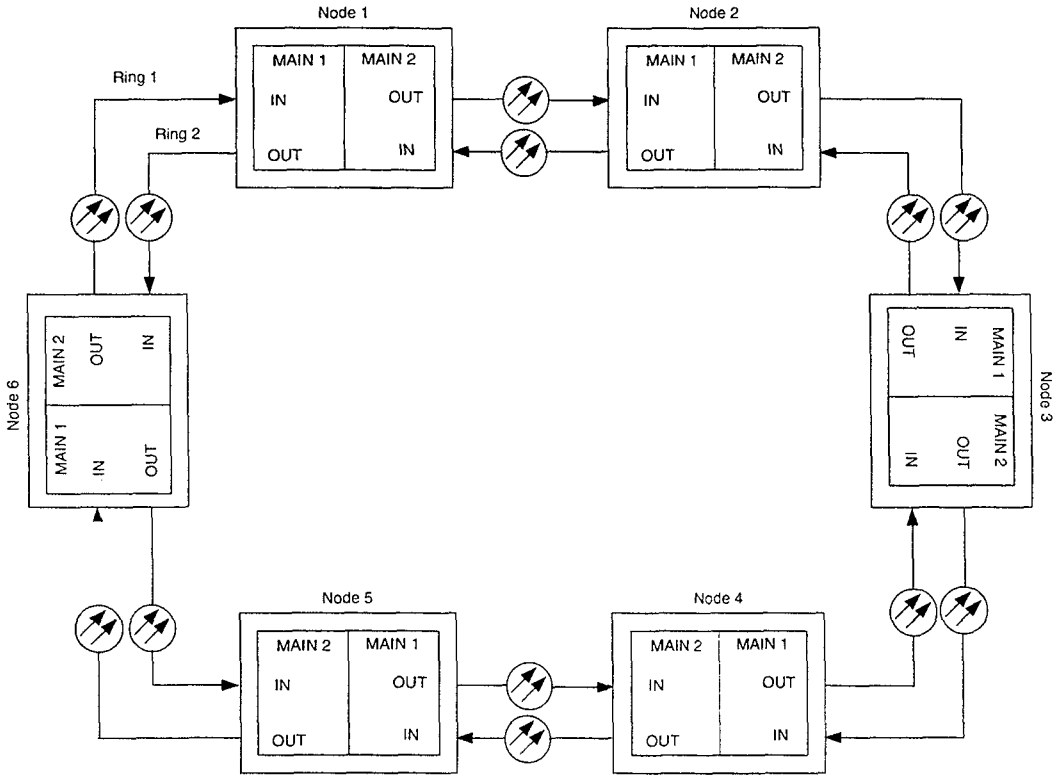


Figure 1. Example Ring Configuration Connections

Establish Initial End-to-End DS1 Service Path Protected Ring (Group Equipped But Not In Service)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
This procedure was published in Issue 4, Preliminary of this manual but has since been combined with **NTP-004**.

Add New DS1 Service
VT1.5 Path Protected Ring
(Group Already In Service)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
This procedure was published in Issue 4, Preliminary of this manual but has since been combined with **NTP-006**.

Discontinue End-to-End DS1 Service From Nodes of VT1.5 Path Switched Ring Network

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
This procedure was published in Issue 4, Preliminary of this manual but has since been combined with **NTP-011**.

Add New DDM-2000 OC-3 Node (Shelf) To DDM-2000 OC-3 Path Switched Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   NOTE 1:
   This procedure assumes that the DDM-2000 is in service and a new RT site (shelf) is being added to the Path Switched Ring configuration. Release 5 or later software is required. (See Figure 1.)

   NOTE 2:
   It is assumed that optical loops are installed on the new shelf, that the new shelf has been tested in a looped-back configuration, and that the proper release of software (Release 5 or later) has been loaded. [**System Turnup: NTP-016**]

   NOTE 3:
   All shelves in the same network must have the same or compatible software releases.

   NOTE 4:
   This procedure requires information from other sites in the network, either through remote modem connection or by having a technician at the neighboring site.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

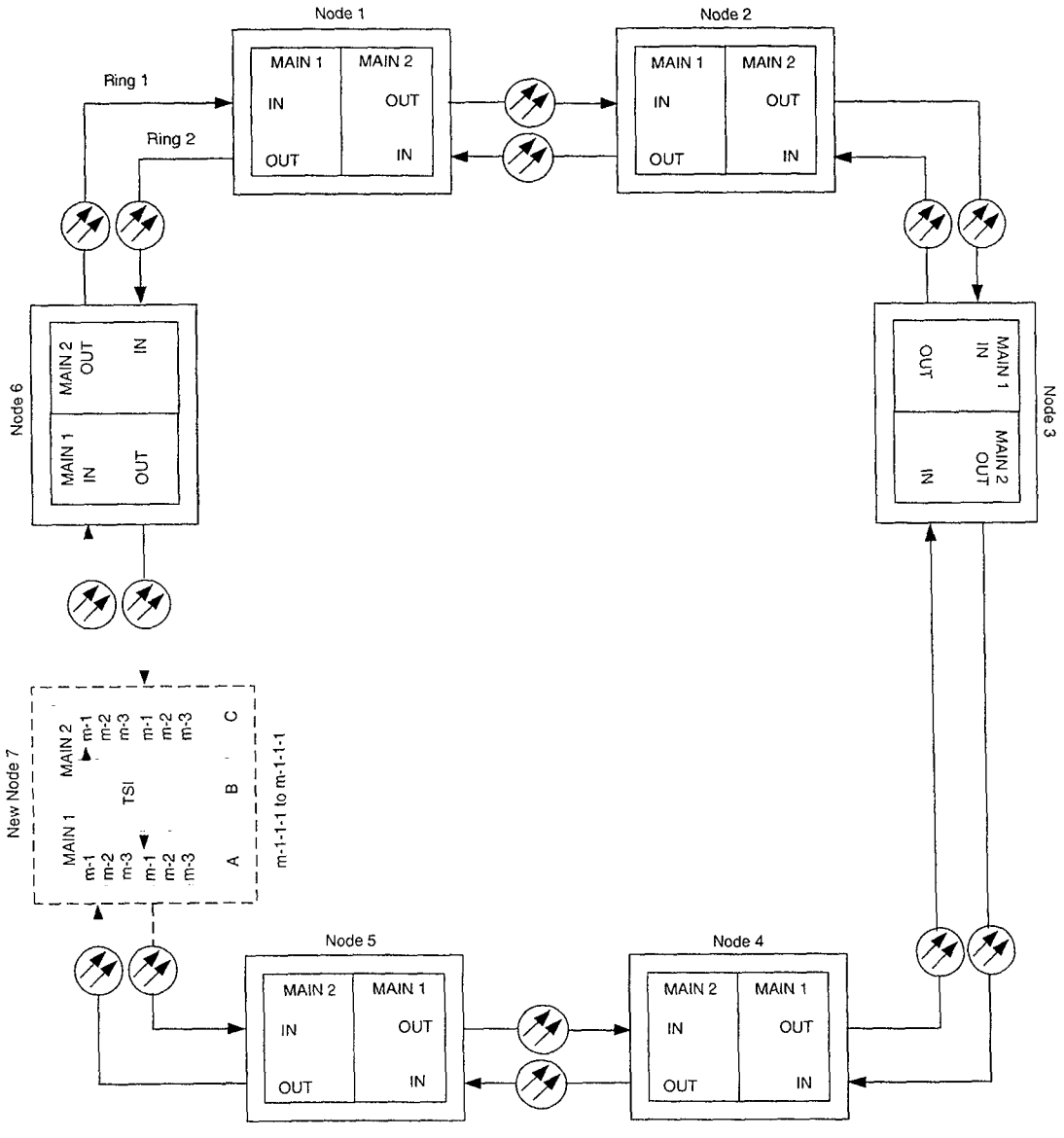


Figure 1. Adding an RT (Node) to an Existing Ring Network

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 5:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. NOTE:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Releases 5, 7 and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

If required, verify/set switches on new shelf **OHCTL**. **DLP-513**

4. NOTE:
It may be helpful to make a sketch of the network to visualize the cross-connections required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use **rtrv-nmap:** command (R7.1 and earlier) or **rtrv-map-network:** and **rtrv-map-neighbor:** commands (R7.2) to determine systems (sites) in the network and how they are connected to each other.

5. ⇒ NOTE 1:
In Release 7.0 and 7.1, the "**set-ne:**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DSNE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DSNE), a "duplicate GNE" alarm will occur. In Release 7.0 and 7.1, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

⇒ NOTE 2:
In Release 7.2, the "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In Release 7.2, multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface. For a network greater than 16 nodes, the alarm gateway network element (AGNE) and TL1 GNE should be on separate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 3:
Two or more shelves in the same network with the same TBOS display number (determined by **SYSCTL** switch settings) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address (determined by **SYSCTL** SITE ID switch settings and **OHCTL** network element number switch settings) will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the **`set-ne`** command) will cause a `duplicate TID` alarm.

Use the **`rtrv-ne`** command at each site to verify no duplicate GNE (R7.0 and 7.1), DSNE (R7.2), TBOS, site/ne, or TID settings exist. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches to new settings or use the **`set-ne`** command. **DLP-513**

For Release 7.2, use the **`set-ne:`** command to set the alarm group number for this shelf, if required. (Default alarm group number is 255.) If the shelf is an AGNE, use the **`set-ne:`** command to designate the shelf as an AGNE. For Release 7.2, one primary AGNE and one backup per alarm group is recommended.

6. From office records or by using the **`rtrv-crs-vt1:all`** or **`rtrv-crs-sts1:all`** command at any site, determine the existing cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. ⚠ CAUTION:
Critical or Major alarms will be generated if pass-through cross-connections are not made on the new shelf before splicing it into the network.

⇒ NOTE 1:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
Up to 84 DS1s may be terminated in a ring network. Once a DS1 is terminated, that timeslot must be reserved in both directions around the ring to the far end. Therefore, if a DS1 is terminated (cross-connected) to a function group on a near-end and far-end terminating shelf, it must also be pass-through cross-connected in every shelf in the network. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross connections.

Use the **ent-crs-vt1:** or **ent-crs-sts1:** command at the new shelf to make all required *pass-through* cross-connections (for example, **ent-crs-vt1:m-1-1-1,m-1-1-1** or **ent-crs-sts1:m-1,m-1**). Pass-through cross-connections must be made at the new shelf to correspond to each terminating cross-connection present on every shelf in the ring network. (See Figure 1.)

8. NOTE 1:
If Kbyte (sync messaging) (R5.1 and later) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

NOTE 2:
The **rtrv-oc3:** command retrieves the `OC-3 Line Provisioning Report`. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte parameter, as required.

9. ⇒ NOTE 1:
If Sync Autoreconfiguration (R6.1 and later) is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any loop-timed node in a ring, it **must** be enabled at all loop-timed nodes of a ring.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
An automatic protection switch service hit may occur when the correct optical fibers are cut. Cutting the wrong fiber lines will cause a service interruption.

At the point where the new DDM-2000 shelf will be added, use local procedures to cut the two fiber lines connecting existing shelves and condition the fiber for connection to the new shelf.

---

11. ⇒ NOTE:
Cutting the main sync source will cause the loop-timed node to go into *holdover*.

Verify that only `minor nsa OC-3 LOS` and `nsa inc. VT/STS1 AIS` alarms are present at each end of the fiber cut.

---

12. ⇒ NOTE 1:
If loop timing mode is specified or external timing mode is specified but the timing reference was not available at new shelf turnup, the new shelf **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected.

Set timing mode on new shelf **TGS** to the timing mode specified in work order or office records.	**DLP-513**
13. At new shelf, remove **OLIU** optical loops.	
14. Determine the optical loss of the optical facility from office records or by making the required measurements.	
15. Connect one pair of optical fibers from an adjacent shelf (site) to new shelf **MAIN 1 OLIU**. Ensure that the correct fibers are connected to the proper **OLIU** [**MAIN 2(P)** in one node to **MAIN 1** in an adjacent node.]	**DLP-514**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
16. ⇒ NOTE: If the report in this step indicates wrong fiber connections or no connection, verify that *fecom* is ON (**rtrv-fecom:**) and check fiber integrity. Use **rtrv-nmap:** command (R7.1 and earlier) or **rtrv-map-neighbor:** command (R7.2) to verify proper fiber connections have been made to the adjacent node.	
17. Connect optical fibers from the other adjacent shelf (site) to new shelf **MAIN 2(P) OLIU**. Ensure that the correct fibers are connected to the proper **OLIU** [**MAIN 2(P)** in one node to **MAIN 1** in an adjacent node.]	**DLP-514**
18. ⇒ NOTE: If the report in this step indicates wrong fiber connections or no connection, verify that *fecom* is ON (**rtrv-fecom:**) and check fiber integrity. Use **rtrv-nmap:** command (R7.0 and 7.1) or **rtrv-map-neighbor:** command (R7.2) to verify proper fiber connections have been made to the adjacent node.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
19. Verify that all alarm and status conditions clear. If `nsa inc. VT AIS` alarm is present and no `inc. OC-3 LOS` alarm, check that all pass-through cross-connections have been properly made using the **`rtrv-crs-vt1:`** command. If `nsa inc. STS AIS` alarm is present and no `inc. OC-3 LOS` alarm, check that all pass-through cross-connections have been properly made using the **`rtrv-crs-sts1:`** command.	
20. Perform end-to-end OC-3 optical line test on optical spans being established.	**DLP-515**
21. ⇒ NOTE: Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS1/DS3/EC-1 port being tested. After one path (ring1 or ring2) has been tested, use the **`sw-path-( ):`** command at both ends to test the other ring path.	
Perform appropriate end-to-end transmission test for the circuits being added, as required.	
A. Single ring DS1 test	**DLP-510**
B. Dual Ring Interworking (DRI) DS1 test	**DLP-554**
C. Single ring DS3 test	**DLP-511**
D. Dual Ring Interworking (DRI) DS3 test	**DLP-553**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

22. The system is ready for service to be established.
Initial DS1 Service [**System Turnup: NTP-004**]
Initial DS3 Service [**System Turnup: NTP-005**]
Initial EC-1 Service [**System Turnup: NTP-034**]

Discontinue DDM-2000 OC-3 Node (Shelf) From DDM-2000 OC-3 Path Switched Ring Network

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE:
   The craft interface terminal (CIT) **`rtrv-nmap:`** command (R7.1 and earlier) or **`rtrv-map-network:`** and **`rtrv-map-neighbor:`** commands (R7.2) may be used to retrieve a map of the SONET network, including a list of the systems in the network and how they are connected. The **`rtrv-crs-vt1:`** command may be used to retrieve VT1.5 (DS1) cross-connections within the DDM-2000 OC-3 system. The **`rtrv-crs-sts1:`** command may be used to retrieve STS-1 cross-connections within the DDM-2000 OC-3 system.

   Use **`rtrv-alm`** command to verify no alarms, locks, loops, or switches are present.

2. Determine which DDM-2000 node (shelf) is being discontinued.

3. Verify that optical line loss budget will not be exceeded by removing this node.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. At the shelf being discontinued and all associated terminating shelves, ensure service (signals) has been removed from the DS1 function groups being discontinued.
   Discontinue DS1 Service [**System Turnup: NTP-011**]
   Discontinue DS3 Service [**System Turnup: NTP-012**]
   Discontinue EC-1 Interface [**System Turnup: NTP-036**]

5. ⇒ NOTE:
   In ring Release 7 or later, if the node being discontinued is the GNE (R7.0 or R7.1) or DSNE (R7.2), another shelf must be designated as the GNE or DSNE. A `duplicate DSNE (GNE) alarm` will occur when a new shelf is designated as the DSNE (GNE) before discontinuing the old DSNE (GNE).

   If required, remote login to the shelf that is designated as the new DSNE (GNE) and use the **`set-ne`** command to set the shelf as a DSNE (GNE).

6. ⇒ NOTE:
   It may take 5 minutes or more for the network to stabilize after the DSNE (GNE) has been discontinued.

   If required, at the shelf being discontinued, use the **`set-ne`** command to discontinue the shelf as a DSNE (GNE).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. ⚠ CAUTION:
Removal of wrong fiber connections will result in a service interruption. Ensure you remove only the fiber connections for the optical span being discontinued.

⇒ NOTE:
The following operations will activate office alarms. The audible alarm may be suppressed by depressing the **ACO** button.

Remove optical fiber connections from **MAIN OLIU**s in node (shelf) being discontinued.

8. Reconnect the optical fibers, bypassing the node just removed. Ensure all alarms in the ring configuration are off. If alarms are present, verify fiber connections and integrity.

9. If the removed shelf is not to be left powered, power down the shelf per local procedures then continue with Step 12. Otherwise, continue with Step 10.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
10. If **OLIU** circuit packs are *not* removed, connect optical fiber loops to **OLIU**s.	**DLP-505**

11. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen to operate it.

If any circuit packs were removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **`upd`** command to update the DDM-2000 internal equipment list.

12. ⇒ NOTE 1:
With Release 6 or later software, when a shelf is removed from a DDM-2000 network, the **`dlt-tadrmap:tid=`***`tid`* command must be used to delete the TID of the removed shelf from the directory services data base used for routing messages over the DCC. This prevents that TID from appearing in **`rtrv-nmap`** (R7.1 and earlier) report or **`rtrv-map-network`** and **`rtrv-map-neighbor`** (R7.2) reports and will retire the `communication failure` alarms at all shelves in the network.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
The **dlt-tadrmap:tid=***tid* command is valid only at the GNE (R7.0 and 7.1) or DSNE (R7.2). The **rtrv-nmap:** command (R7.1 and earlier) or **rtrv-map-network** command (R7.2) may be used to determine which shelf is the GNE (R7.0 and 7.1) or DSNE (R7.2).

Wait at least one minute, then at the GNE or DSNE, use the **dlt-tadrmap:tid=***tid* command to delete the TID of the removed shelf from the directory services data base, if required.

13. Verify that all alarms go off.

Add New MXRVO Group for DS1 Service VT1.5 Path Protected Ring (System In Service)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
This procedure was published in Issue 4, Preliminary of this manual but has since been combined with **NTP-008**.

Upgrade DDM-2000 OC-3 Point-to-Point Network to Path Switched Ring In Service

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION 1:
This procedure requires **22-type OLIU** *circuit packs in all shelves. If existing* **OLIU***s will be replaced in this procedure* **[DLP-542]**, *you must determine if the* **22-type OLIU***s will support the existing span length. For example,* **22F OLIU** *circuit packs will not support span lengths as long as* **21G OLIU** *circuit packs will support. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.*

⚠ CAUTION 2:
This procedure has been tested using a Gould fiber splitter which introduces 3 dB of loss into the fiber span. The amount of loss may differ for the type of splitter used and must be considered when doing an upgrade. If there is not enough excess loss budget in the optical spans between the CO and first RT to allow the use of a splitter, the upgrade may be performed out of service. Optical fiber switches which introduce no loss may also be used, but require extra steps in the upgrade procedure which are not documented. Fiber splitters and/or switches are available from manufacturers such as Gould, Fibercell, Corning, DiCon, ADC, and others.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⚠ CAUTION 3:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.

NOTE 1:
This procedure assumes that the DDM-2000 is in service and the optical line connections are going to be changed to a ring configuration. Release 3.1, 3.2, or Release 6 software is initially required in each shelf to support **22-type OLIU**s. Release 5 or 7 software is required for the final ring configuration.

NOTE 2:
All shelves in the same network must have the same or compatible software releases.

NOTE 3:
You may also contact AT&T to provide this in-service upgrade. Experienced AT&T installers will help you plan and execute the network upgrade. For more information, contact your AT&T Account Representative.

Use the **`rtrv-alm:`** command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

3. ⇒ NOTE:
   Releases 5, 7 and later ring releases require series **S2:4A** or later **OHCTL**s to support the open systems interconnection protocol (OSI). **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

   Verify correct **OHCTL**s are installed and switches are set correctly. **DLP-513**

4. Upgrade software in each DDM-2000 shelf with a release that supports **22-type OLIU**s (Release 3.1, 3.2, or 6), if not already performed. **DLP-532**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE:
Mixing of **21-type OLIU**s and **22-type OLIU**s in one shelf is not allowed in ring software.

Replace **OLIU**s in each shelf with proper **22-type OLIU**s, if not already done. (Protection **OLIU**s are required.) **DLP-542**

6. At **all** shelves in the network being upgraded, use **`set-ne:tid=`*`tid`*`:crs=manual`** command to set cross-connect mode to manual.

7. ⚠ CAUTION:
The **`cnvt-crs`** *command in Release 3 causes up to a 135 ms transmission hit on all DS1 circuits. Since Release 5 does not support the* **`cnvt-crs`** *command, when upgrading from Release 3 to Release 5 the* **`cnvt-crs`** *command must be performed before the upgrade. In Release 3, if the transmission hits caused by the* **`cnvt-crs`** *command are unacceptable, an interim Release 6.1 or 6.2 may be loaded first. The* **`cnvt-crs`** *command in Release 6.1 or 6.2 causes transmission hits of less than 25 ms. However, Release 6 is an OSI release and may require additional steps in upgrading from a non-OSI Release 3. When upgrading to Release 7.1 or later, the* **`cnvt-crs`** *command may be performed after the upgrade and causes transmission hits of less than 25 ms on all DS1 circuits.*

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 1:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**cnvt-crs**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ NOTE 2:
If Release 5 software is going to be used and STS-1 cross-connections exist presently and VT1.5 cross-connections will be required, conversion of STS-1 cross-connections to VT1.5 cross-connections must be performed before Release 5 ring software is loaded into the system. Release 7.1 ring software supports the **cnvt-crs** command.

If required, at all shelves in the network, use the **cnvt-crs:***address1*,*address2* command to convert all low-speed DS1 STS-1 cross-connections to corresponding VT1.5 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. Use **`rtrv-sync:`** command to check timing mode and parameters for proper provisioning. If necessary, use **`set-sync:`** command to change timing provisioning to that specified on the work order.

9. ⚠ CAUTION:
Transmission configuration information for in service systems is stored on the **TGS** circuit pack in **TIMING** slot **1**. In some instances (for example, during system tests or while performing this upgrade), if the version of software being installed is not compatible with the current transmission configuration, it will be necessary to remove the **TGS** circuit pack in **TIMING** slot **1** in order to force the system to run the software you are trying to download. If both **TGS** circuit packs are not installed, removal of the only **TGS** circuit pack will cause service interruption.

Ensure both **TGS** circuit packs are installed. Then, use the **`switch-sync:s=circuitpack,pri=manual`** command to switch to the protection **TGS** circuit pack, if not already **ACTIVE**. Use `rtrv-sync:` command to verify that the **TGS-2** circuit pack is **ACTIVE**. Unplug the **TGS** circuit pack in **TIMING** slot **1**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. At Node 1 and Node 2, use the **`switch-line:main:pri=manual`** command to switch to the protection line. Use the **`rtrv-state:main-all`** command to check switch state (`main-2 OLIU active`). (See Figure 1.)

11. Use **`set-fecom:dcc-m:com=disabled`** command to disable far-end communications (fecom) at Node 1.

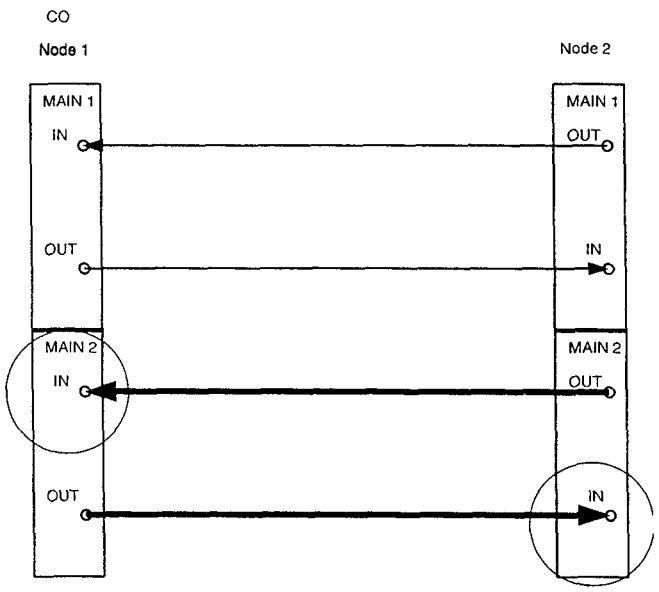


Figure 1. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. At Node 1, install optical splitter in **MAIN 1 OUT** optical line as shown in Figure 2.

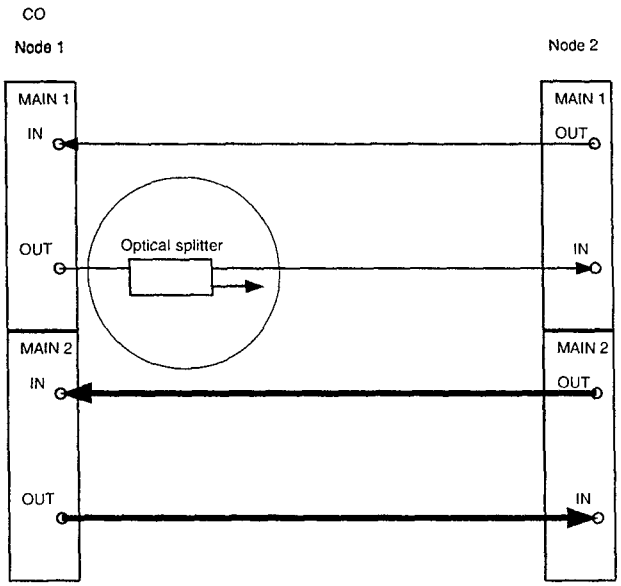


Figure 2. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the **`switch-line:main:pri=manual`** command to switch to the service (MAIN 1) line (`main-1 OLIU active`). (See Figure 3.)

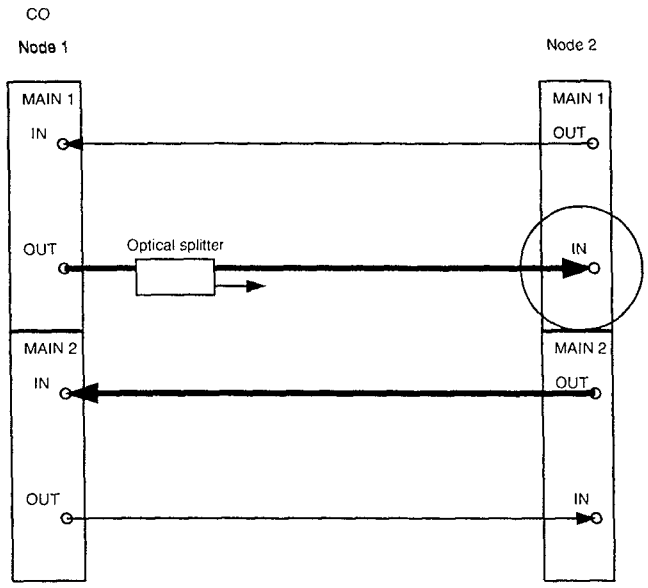


Figure 3. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. At Node 1, remove optical fiber from **OLIU MAIN 2 OUT** and connect it to the other output of the optical splitter. (See Figure 4.)

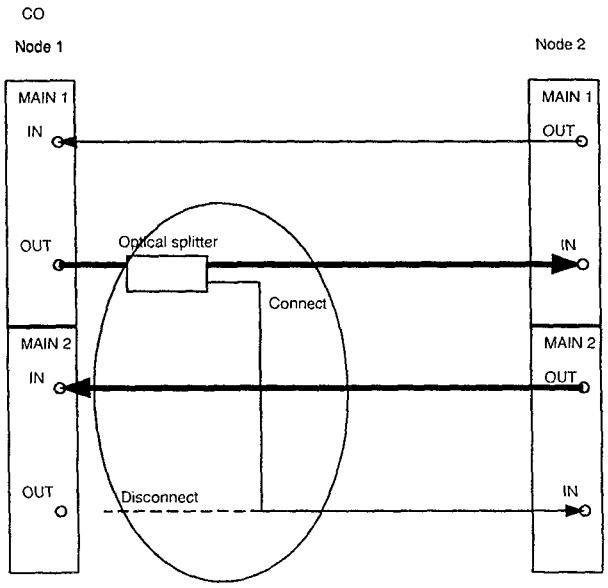


Figure 4. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

15. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active` at Node 2). (See Figure 5.)

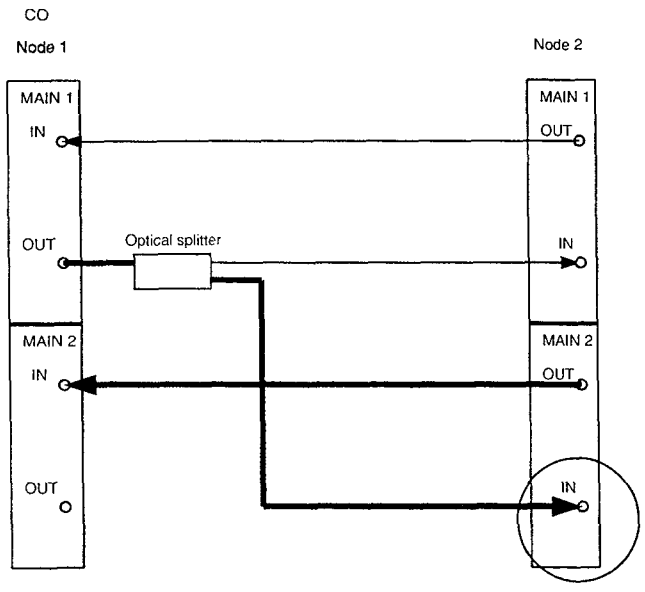


Figure 5. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

16. Disconnect the optical splitter output from the fiber going to Node 2 **MAIN 1 IN** and connect the fiber to Node 1 **MAIN 2 OUT**. (See Figure 6.)

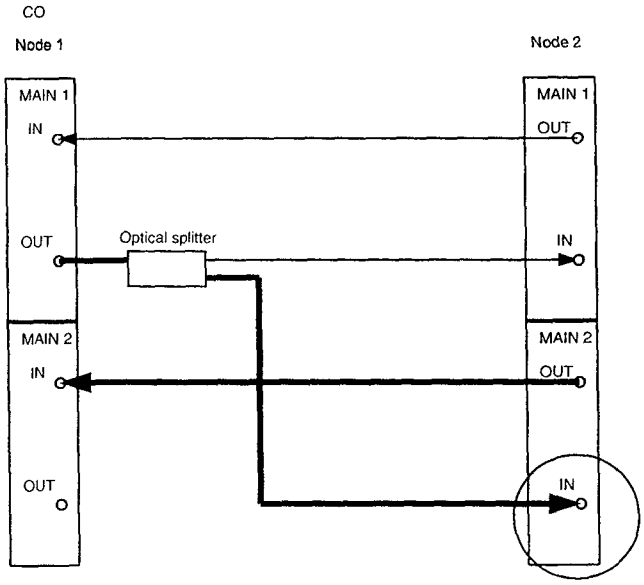


Figure 6. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

17. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the **`switch-line:main:pri=manual`** command to switch service to the service line (`main-1 OLIU active` at Node 2). (See Figure 7.)

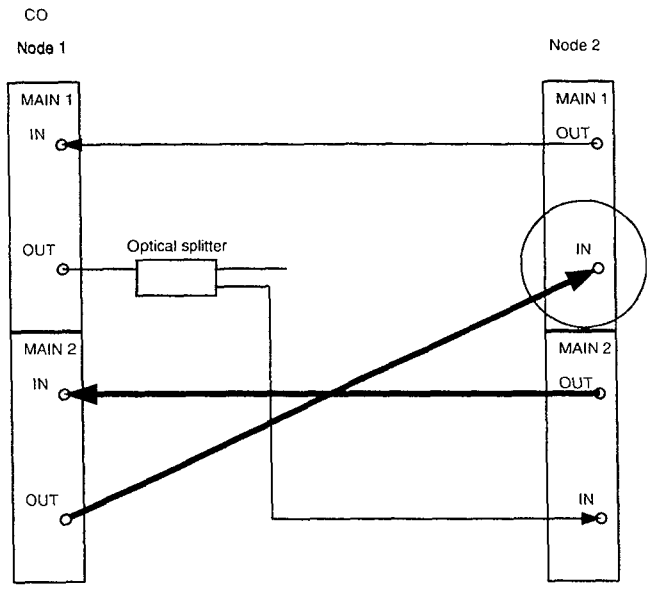


Figure 7. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

18. At Node 1, remove optical splitter from **MAIN 1 OUT**. Connect optical fiber from Node 1 **MAIN 1 OUT** to Node 2 **MAIN 2 IN**. (See Figure 8.)

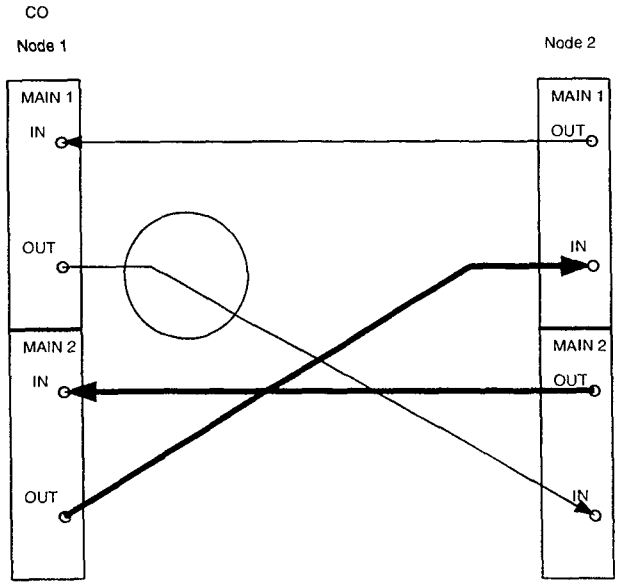


Figure 8. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

19. Disconnect optical fiber from **MAIN 1 IN** at Node 1 and install optical splitter in **MAIN 1 IN** optical line as shown in Figure 9.

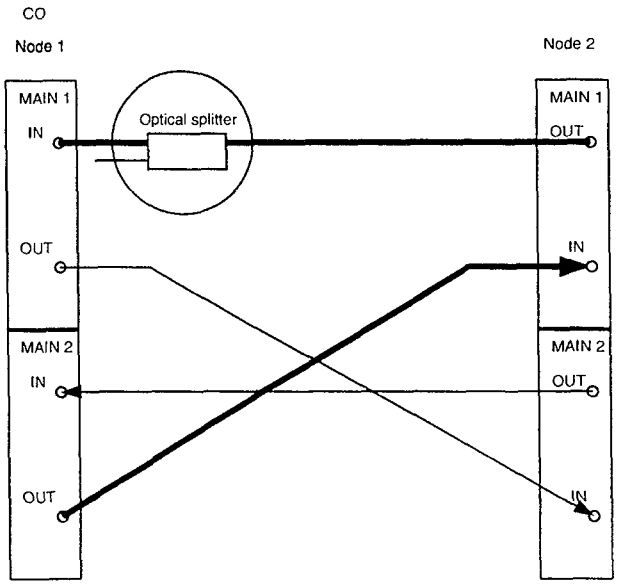


Figure 9. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

20. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 1 only, use the **`switch-line:main:pri=manual`** command to switch service to the service line (`main-1 OLIU active` at Node 1). (See Figure 10.)

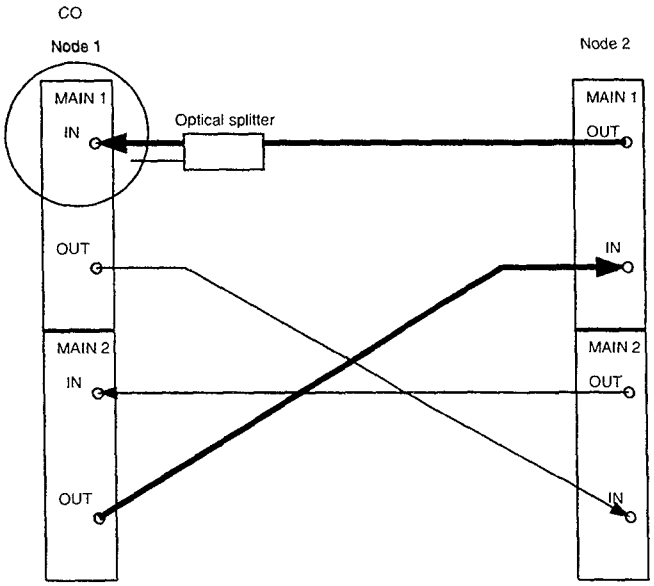


Figure 10. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. Disconnect optical fiber from Node 1 **MAIN 2 IN** and connect remaining optical splitter output to **MAIN 2 IN**. (See Figure 11.)

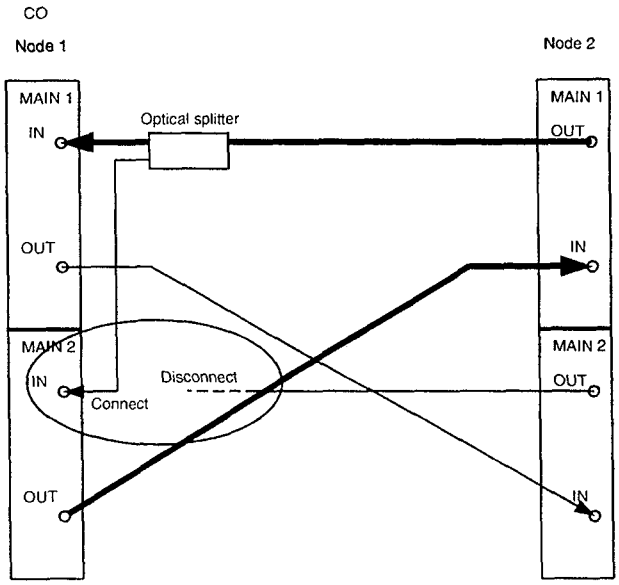


Figure 11. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

22. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 1, use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active` at Node 1). (See Figure 12.)

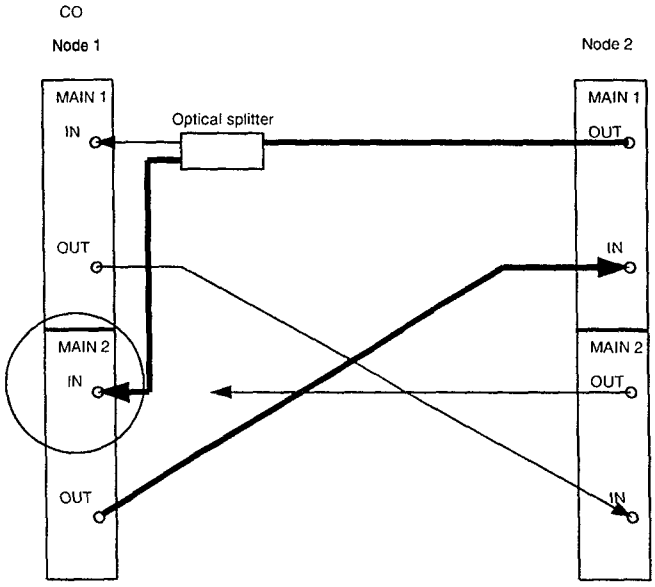


Figure 12. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

23. At Node 1, remove optical splitter output from **MAIN 1 IN** and connect optical fiber from Node 2 **MAIN 2 OUT** to Node 1 **MAIN 1 IN**. (See Figure 13.)

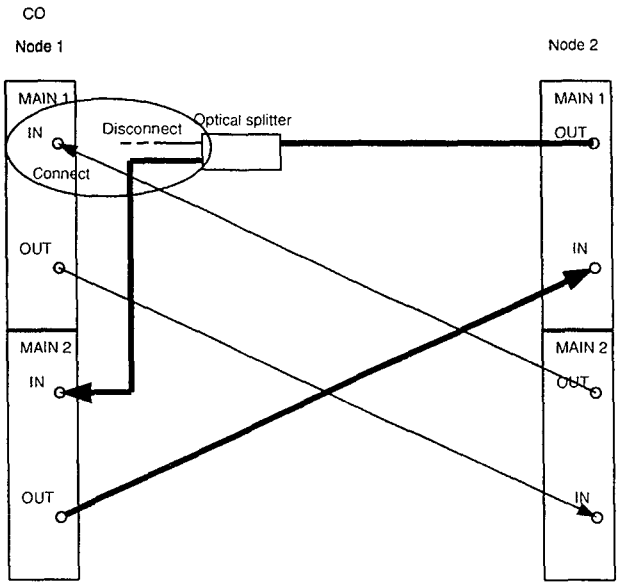


Figure 13. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

24. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 1, use the **`switch-line:main:pri=manual`** command to switch service to the service line (`main-1 OLIU active`) at Node 1. (See Figure 14.)

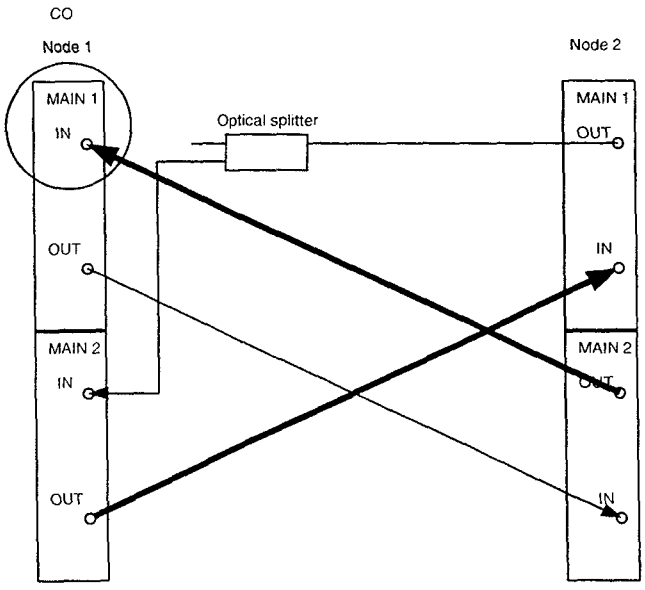


Figure 14. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

25. At Node 1, remove optical splitter from **MAIN 2 IN**. Connect optical fiber from Node 2 **MAIN 1 OUT** to Node 1 **MAIN 2 IN**. (See Figure 15.)

26. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2, use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active`) at Node 2. (See Figure 15.)

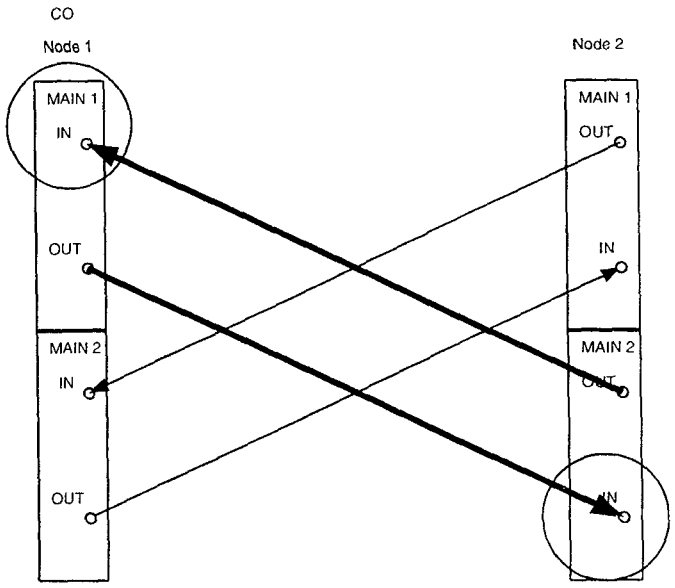


Figure 15. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
27. Upgrade both nodes (shelves) with Release 5 or 7 software. (Software upgrades must be made locally at each shelf.)	**DLP-532**
28. Reinstall **TGS** circuit pack into **TIMING** slot **1**. Use the **`switch-sync:s=circuitpack,pri=reset`** command to reset the manual protection switch.	
29. Use **`set-fecom:dcc-all:com=enabled`** command at both ends to enable far-end communications (fecom).	
30. ⇒ NOTE 1: In Release 7.0 and 7.1, the "**`set-ne:`**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DSNE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DSNE), a "`duplicate GNE`" alarm will occur. In Release 7.0 and 7.1, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
In Release 7.2, the "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In Release 7.2, multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

NOTE 3:
In Release 7.2, shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

For Release 7.0 and 7.1, use the "**set-ne:**" command to designate ONE shelf as the GNE.

For Release 7.2, use the "**set-ne:**" command to designate ONE shelf as the DSNE. Use the "**set-ne:**" to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

31. ⇒ NOTE 1:
If Kbyte (sync messaging) (R5.1 and later) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

⇒ NOTE 2:
The **rtrv-oc3:** command retrieves the OC-3 Line Provisioning Report. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

32. ⇒ NOTE 1:
If Sync Autoreconfiguration (R6.1 and later) is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any loop-timed node in a ring, it **must** be enabled at all loop-timed nodes of a ring.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

33. The ring configuration is now complete and new nodes may be added as required [**NTP-026**].

Upgrade DDM-2000 OC-3 Point-to-Point to Path Switched Ring Out of Service

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION 1:
This procedure requires **22-type OLIU** *circuit packs in all shelves. If existing* **OLIU***s will be replaced in this procedure, you must determine if the* **22-type OLIU***s will support the existing span length. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.*

⚠ CAUTION 2:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.

NOTE 1:
This procedure requires that the system be taken out of service long enough to change **OLIU** optical fiber connections to the ring configuration. Release 3.1, 3.2, or 6 software is initially required in each shelf to support **22-type OLIU**s. Release 5 or 7 software is required for the final ring configuration.

NOTE 2:
All shelves in the same network must have the same software release.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
You may also contact AT&T to provide an in-service upgrade. Experienced AT&T installers will help you plan and execute the network upgrade. For more information, contact your AT&T Account Representative.

Use the **rtrv-alm:** command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. NOTE:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Releases 5, 7 and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

Verify correct **OHCTL**s are installed and switches are set correctly. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. Upgrade software in each DDM-2000 shelf with a release that supports **22-type OLIU**s [Release 3.1, 3.2, or 6], if not already performed.	**DLP-532**
5. Replace **OLIU**s in each shelf with **22-type OLIU**s, if not already done. (Protection **OLIU**s are required.)	**DLP-542**
6. At **each** shelf, use `set-ne:tid=tid:crs=manual` command to set cross-connect mode to manual.	

7. ⇒ NOTE 1:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

   1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

   2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (`cnvt-crs`) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

   3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 2:
If Release 5 software is going to be installed and STS-1 cross-connections exist presently and VT1.5 cross-connections will be required, conversion of STS-1 cross-connections to VT1.5 cross-connections must be performed before Release 5 ring software is loaded into the system. Release 7.1 ring software supports the **cnvt-crs** command.

If required, at all shelves in the network, use the **cnvt-crs:***address1,address2* command to convert all low-speed DS1 STS-1 cross-connections to corresponding VT1.5 cross-connections.

8. Use **rtrv-sync:** command to check timing mode and parameters for proper provisioning. If necessary, use **set-sync:** command to change timing provisioning.

9. Use **set-fecom:dcc-m:com=disabled** command to disable far-end communications (fecom) at the near end shelf.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⚠ CAUTION:
Transmission configuration information for in service systems is stored on the **TGS** circuit pack in **TIMING** slot **1**. In some instances (for example, during system tests or while performing this upgrade), if the version of software being installed is not compatible with the current transmission configuration, it will be necessary to remove the **TGS** circuit pack in **TIMING** slot **1** in order to force the system to run the software you are trying to download. If both **TGS** circuit packs are not installed, removal of the only **TGS** circuit pack will cause service interruption.

Ensure both **TGS** circuit packs are installed. Then, use the **`switch-sync:s=circuitpack,pri=manual`** command to switch to the protection **TGS** circuit pack, if not already **ACTIVE**. Use `rtrv-sync:` command to verify that the **TGS-2** circuit pack is **ACTIVE**. Unplug the **TGS** circuit pack in **TIMING** slot **1**.

11. ⚠ CAUTION:
This step will interrupt service until the optical lines have been properly reconnected. Notify maintenance center and other required personnel that service will be interrupted.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
In the ring configuration, optical fibers from **MAIN 1** at one node connect to **MAIN 2** at the adjacent node.

At Node 1, remove and reconnect the optical fibers as shown in Figure 1.

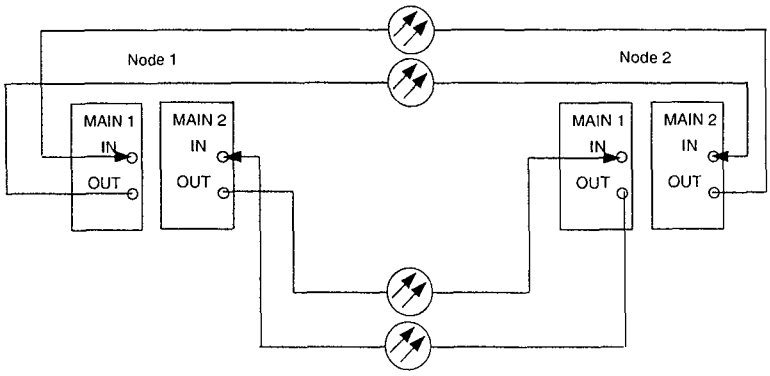


Figure 1. DDM-2000 OC-3 Point-to-Point to Ring Upgrade

12. Upgrade both nodes (shelves) with Release 5 or 7 software. (Software upgrades must be made locally at each shelf.) **DLP-532**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE 1:
In Release 7.0 and 7.1, the "**set-ne:**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DSNE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DSNE), a "duplicate GNE" alarm will occur. In Release 7.0 and 7.1, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

⇒ NOTE 2:
In Release 7.2, the "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In Release 7.2, multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 3:
In Release 7.2, shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

For Release 7.0 and 7.1, use the "**set-ne:**" command to designate ONE shelf as the GNE.

For Release 7.2, use the "**set-ne:**" command to designate ONE shelf as the DSNE. Use the "**set-ne:**" to designate the AGNE(s) and alarm group number, as required.

14. Use **set-fecom:dcc-all:com=enabled** command at both ends to enable far-end communications (fecom).

15. ⇒ NOTE 1:
If Kbyte (sync messaging) (R5.1 and later) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

⇒ NOTE 2:
The **rtrv-oc3:** command retrieves the OC-3 Line Provisioning Report. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

16. ⇒ NOTE 1:
If Sync Autoreconfiguration (R6.1 and later) is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any loop-timed node in a ring, it **must** be enabled at all loop-timed nodes of a ring.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the `Synchronization Report`. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the `Synchronization Report` and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

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17. The ring configuration is now complete and new nodes may be added as required [**NTP-026**].

Equip DDM-2000 EC-1 Electrical Multiplexer Shelf (Looped-Back)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

---

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure assumes that all hardwired installation and testing of the unequipped DDM-2000 shelf has been done. It also assumes that power is applied to the shelf (**PWR ON** LED lighted on User Panel).

   ⇒ NOTE 2:
   Many of the circuit packs have numerous option switches which must be set before they are installed.

   Check –48 V DC office battery, if required. **DLP-524**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
2. Install **BBG7 OHCTL** circuit pack.	**DLP-500**
3. Install **BBG5 SYSCTL** circuit pack.	**DLP-501**
4. ⇒ NOTE 1: As additional circuit packs are installed, office alarms may be activated, accompanied by flashing **FAULT** LEDs on some of the circuit packs. This is a normal condition at this stage of the procedure. You can momentarily depress the **ACO/TST** button to retire office alarms. ⇒ NOTE 2: To avoid timing alarms before the end-to-end system has been established, the **TGS** option switches must be *temporarily* set to *free running* if DS1 external timing is specified but the DS1 timing reference is not yet available. When the DS1 external timing references become available or when the end-to-end system is established, the timing mode must be changed to the specified timing mode. If external timing is the specified timing mode and external timing is available to the shelf, the timing mode may be set for external timing. Install **TGS** timing circuit packs.	**DLP-503**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. Install **BBG6 STS1E** circuit packs (as required) with option switches set for high speed.	DLP-502
6. At the cross-connect point or backplane connectors [**J38-J39** (Group A), **J40-J41** (Group B), **J42-J43** (Group C)], loop back the EC-1 signal associated with function unit slots equipped with **STS1E** circuit packs.	DLP-502
7. Use `set-ec1` command to set the characteristics of the EC-1 port(s).	DLP-502

8. ⇒ NOTE 1:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the `set-tl:`*`address`*`:ais=no` command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

NOTE 2:
177A Retainer Cards must be installed in all empty **LOW SPEED** DS1 slots in groups equipped with **STS1E** and protection **DS1** circuit packs.

Install service and protection **DS1/DS1PM** circuit packs, as required.	**DLP-508**

9. CAUTION:
The command `init-sys:all` *may affect service. It should never be used on an in-service system. It should only be used after a shelf has been equipped to reset all provisionable parameters and cross-connections to their default values.*

If a CIT is available, use the `init-sys:all` command to initialize all provisionable parameters to their original default values.

10. Perform an LED test.	**DLP-509**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. ⇒ NOTE: This procedure assumes that the DDM-2000 high speed signals are looped back (as required) at the backplane coaxial connectors (**J38-J39, J40-J41, J42-J43**) or at a cross-connect point. Perform automatic local (looped back) transmission test.	**DLP-528**
12. ⇒ NOTE: This procedure assumes that the DDM-2000 has been connected to the low-speed DSX-1 cross-connection as required. Perform automatic local wiring cross-connect test (looped back).	**DLP-529**
13. Check office alarm interface as required.	**DLP-516**
14. Check telemetry interface as required. A. Parallel telemetry B. Serial telemetry	**DLP-517** **DLP-518**
15. Test protection switching function, if required.	**DLP-519**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
16. ⇒ NOTE: A craft interface terminal (CIT) is required to access the optional features of the DDM-2000, such as security, date and time, logins, etc. Activate optional features as required.	**DLP-512**
17. This shelf is now equipped to provide DS1 service through an EC-1 high speed electrical interface.	
18. When the EC-1 electrical interface is required, remove the required EC-1 loopback, make appropriate cable connections to the coaxial connectors, and set the required **TGS** timing options [**DLP-513**].	

Add New STS1E High Speed Group for DS1 Service
EC-1 Electrical Multiplexer Shelf
System In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure assumes that the DDM-2000 is equipped as a DDM-2000 EC-1 electrical multiplexer shelf. It is also assumed that the shelf is in service and that a new function group is being equipped with **STS1E** circuit packs for DS1 service. If the group is already equipped with **STS1E** circuit packs, refer to **Circuit Order: NTP-006.**

⇒ NOTE 2:
Software Release 6 must be installed for **STS1E** high speed applications in a shelf configured as a DDM-2000 EC-1 electrical multiplexer.

⇒ NOTE 3:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

2. Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

3. ⇒ NOTE:
   If the group is to be equipped with any **BBF3 DS1PM** circuit packs, both service and protection **STS1E** circuit packs must be installed.

   Install **STS1E** circuit packs (high speed mode) into proper slots of **FUNCTION UNITS** group (**A**, **B**, or **C**) being equipped. **DLP-502**

4. Use the `set-ec1` command to set the characteristics of the EC-1 port.

5. ⇒ NOTE:
   Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the `set-tl:`*`address`*`:ais=no` command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Option and install required service **DS1/DS1PM** circuit packs.	**DLP-508**

6. ⇒ NOTE:
If **BBF3 DS1PM** circuit packs are installed and DS1 protection is required, a **BBF3 DS1PM** circuit pack must be installed in the protection slot.

Install protection **DS1/DS1PM** circuit pack into slot **8(P)** of group being put into service, if required.	**DLP-508**

7. Use the `set-tl` command to set the characteristics of the DS1 ports.

8. ⚠ CAUTION:
No service low speed DS1 locations (slots) should be left empty in groups equipped with **STS1E** *and protection* **DS1/DS1PM** *circuit packs.*

⇒ NOTE:
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 slot locations from the DDM-2000's internal protection bus.

Install **177A** Retainer Cards into all unequipped service DS1 slots in groups equipped with **STS1E** and protection **DS1/DS1PM** circuit packs.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
9. Make the appropriate connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the circuit(s) being added.	
10. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.	
11. Make EC-1 coaxial connections to proper backplane connectors [**J38-J39** (Group A), **J40-J41** (Group B), **J42-J43** (Group C)].	
12. If **BBF3 DS1PM** circuit packs are installed and the optional *dslpm* performance monitoring feature is used, use the `set-feat:feat=dslpm,act=enable` command to enable the feature.	
13. After terminating end is established, perform an end-to-end DS1 transmission test for each DS1 circuit being put into service (optional).	**DLP-510**

Discontinue STS1E High Speed Group EC-1 Electrical Multiplexer Shelf

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION 1:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⚠ CAUTION 2:
When a **DS1** *is switched to protection, removal of any other* **DS1** *circuit pack or* **177A** *Retainer Card in the same group will result in a loss of service to the protected* **DS1** *and the removed* **DS1** *circuit pack.*

NOTE:
Standard DS1 transmitter sources are designed to terminate in a nominal 100-ohm impedance. This termination is usually provided by the receiving equipment. When not connected to receiving equipment (that is, idle or unterminated), DS1 transmitter equipment should terminate in a 100-ohm load. When connecting through DSX equipment, this can be accomplished with terminating plugs available from the DSX manufacturer. Any alternative method may be used resulting in 100-ohms across the tip and ring of the DS1 circuit output while in an idle state. Failure to terminate DS1 outputs may result in violation of FCC Part 15 emission requirements and possibly interfere with other electronic equipment. Also, AIS should be turned off (using the `set-tl:`*`address`*`:ais=no` command) on any DS1 circuit that is not in service.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Determine which DS1 group is to be discontinued and verify no alarms exist on the system.	
2. ⇒ NOTE: The following operation may activate the office major or minor alarm. The audible alarm may be suppressed by depressing the **ACO** button. At the DSX-1, remove the DS1 signals associated with the group(s) being discontinued. (**FAULT** LEDs begin flashing on **DS1** circuit pack with signals removed.)	
3. ⇒ NOTE: The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen to operate it. On the **SYSCTL**, momentarily depress the **UPD/INIT** button to update the equipment list. (**FAULT** LEDs go off.)	
4. Remove **DS1/DS1PM** circuit packs, if required.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. Remove the group **STS1E** circuit packs, if required.	
6. If circuit packs are removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.	
7. Verify all alarms are off.	

Establish Initial Low Speed EC-1 Interface (Group Equipped But Not In Service)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
The end-to-end network must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves, and to establish the end-to-end network.

⇒ NOTE 2:
This procedure assumes that **STS1E** circuit packs, optioned for low speed, have been installed during the initial shelf turnup at the EC-1 terminating end(s) of the circuit. The other terminating end(s) may be equipped with **DS3**, **STS1E**, or **MXRVO** and **DS1/DS1PM** circuit packs. If the appropriate circuit packs have not been installed and the system is in service on other groups, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the new groups.

⇒ NOTE 3:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

At the EC-1 terminating (drop) node(s), determine which **STS1E** circuit pack is to be put into service and what options are to be selected.

2. ⇒ NOTE:
The **rtrv-eqpt:** command retrieves the Equipage and Version Report. This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

Use the **rtrv-eqpt:** command to obtain the Equipage and Version Report and verify that the service and protection (if required) **STS1E** circuit packs have been installed in proper group (**FN A**, **FN B**, or **FN C**) being put into service.

3. ⇒ NOTE:
The **rtrv-ec1:** command retrieves the EC1 Port Provisioning Report. This report lists information about each EC-1 port. This information includes attributes set by the **set-ec1:** command and parameters set by switches on the circuit pack. See the "Commands and Reports" section of this manual for a description of the **rtrv-ec1:** command format.

Use the **rtrv-ec1:** command to obtain the EC1 Port Provisioning Report and verify the hardware and software option settings.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. ⇒ NOTE: **DS1/DS1PM** circuit packs ***cannot*** be installed in a shelf group equipped with **STS1E** circuit packs optioned for LOW SPEED mode. Verify/set line build out (LBO) option jumpers on **STS1E** circuit pack(s), as required.	**DLP-513**
5. ⇒ NOTE: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** circuit pack after the **STS1E** circuit pack is reinstalled. If necessary, set the **STS1E** circuit pack option switch to LOW SPEED and reinstall the **STS1E** circuit pack(s).	**DLP-513**
6. Use the `set-ec1:` command to set the characteristics of the EC-1 port at the EC-1 terminating node(s) of the circuit being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. Make the appropriate backplane cable connection(s) [**J38-J39** (FN A), **J40-J41** (FN B), or **J42-J43** (FN C)] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.

8. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

9. If both terminating nodes are equipped with **STS1E** circuit packs to terminate the EC-1, continue with Step 10. Otherwise, refer to **System Turnup/Circuit Order: IXL-001** for procedures to establish initial end-to-end DS1/DS3 service.

10. ⇒ NOTE 1:
    Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the `set-ne:crs=manual` command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**cnvt-crs**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, and **rtrv-crs-vt1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or office records.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Make necessary VT1.5/STS-1 cross-connections for each node.	
A. Linear or Add/Drop Configuration	**DLP-545**
B. Ring Configuration	**DLP-546**
C. Dual Ring (DRI) Configuration	**DLP-550**
12. Perform the appropriate end-to-end transmission test for circuit(s) being put into service. For a circuit in a path-protected single-ring network, use the **sw-path-( ):***address* command at both terminating nodes to switch the active path and repeat this test on the other path.	
A. DS1 single-ring test	**DLP-510**
B. DS1 dual ring (DRI) test	**DLP-554**
C. DS3 single-ring test	**DLP-511**
D. DS3 dual ring (DRI) test	**DLP-553**
13. Use the **rtrv-state:** command to determine the port state of the EC-1 port of the circuit being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-ec1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-ec1:** command to set the port state of the EC-1 port of the circuit being established.

Add New STS1E Low Speed Group for EC-1 Interface System In Service

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇶ NOTE 1:
   This procedure assumes that the DDM-2000 is in service and that a new group is being equipped with **STS1E** circuit packs for an EC-1 interface.

   ⇶ NOTE 2:
   If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

   At the EC-1 terminating end(s), determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being equipped.

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2. Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
3. Verify no **DS1/DS1PM** circuit packs are installed in slots associated with new STS1E group being added.	
4. Set line build out (LBO) option jumpers and LOW SPEED mode, then install **STS1E** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, or **C**) being equipped.	**DLP-502**
5. Use the `set-ec1:` command to set the characteristics of the EC-1 port.	
6. Make the appropriate backplane cable connection(s) [**J38-J39** (FN A), **J40-J41** (FN B), or **J42-J43** (FN C)] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.	
7. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.	
8. If both terminating nodes are equipped with **STS1E** circuit packs to terminate the EC-1, continue with Step 9. Otherwise, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add DS1/DS3 service.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **`set-ne:crs=manual`** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **cnvt-crs**, **dlt-crs-sts1**, **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **rtrv-crs-sts1**, and **rtrv-crs-vt1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or office records.

10. Make necessary VT1.5/STS1 cross-connections for each node.

A. Linear or Add/Drop Configuration	**DLP-545**
B. Single Ring Configuration	**DLP-546**
C. Dual Ring Configuration	**DLP-550**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. Perform the appropriate end-to-end transmission test for circuit being put into service. For a circuit in a path protected ring network, use the **sw-path-( ):***address* command at both terminating nodes to switch the active path and repeat this test on the other path.

A. DS1 single-ring test	**DLP-510**
B. DS1 dual ring (DRI) test	**DLP-554**
C. DS3 single-ring test	**DLP-511**
D. DS3 dual ring (DRI) test	**DLP-553**

12. Use the **rtrv-state:** command to determine the port state of the EC-1 port(s) of the circuit being established.

13. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-ec1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-ec1:** command to set the port state of the EC-1 port(s) of the circuit being established.

Discontinue EC-1 Interface

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION 1:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE:
This procedure assumes that **STS1E** circuit packs are installed at one terminating node in the circuit and either **STS1E**, **DS3**, or **MXRVO** circuit packs are installed at the other terminating node(s) of the circuit. It further assumes that the EC-1 interface is being discontinued, not just an individual DS1. If DS1/DS3 service is being discontinued, see **System Turnup/Circuit Order: IXL-001** for procedures to discontinue DS1/DS3 service.

At the EC-1 terminating node, determine which EC-1 port is to be discontinued, verify service has been removed, and verify no alarms exist on the system.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE:
The following operation may activate the office major or minor alarm. The audible alarm may be suppressed by depressing the **ACO** button.

At the EC-1 cable cross-connect panel at the terminating nodes, remove the EC-1 signal(s) associated with the port(s) being discontinued. (**FAULT** LEDs begin flashing on **STS1E** circuit pack with signals removed.)

3. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

At the terminating nodes, momentarily depress the **UPD/INIT** button on the **SYSCTL** circuit pack or use the `upd` command to update the equipment list. (Flashing **FAULT** LEDs go off.)

4. If a craft interface terminal (CIT) is available, use the `rtrv-state-eqpt` command to verify that the right port has been changed from *in-service* (`i`) to *auto* (`a`) state at the terminating nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE:
If the other terminating node for the EC-1 interface is equipped with **DS3** circuit packs, then STS1 cross-connections will be present. If the other terminating node(s) for the EC-1 interface is equipped with **DS1** circuit packs, then either STS1 or VT1.5 cross-connections will be present. The `rtrv-crs-sts1:` command retrieves the `STS-1 Cross Connect Report`. The `rtrv-crs-vt1:` command retrieves the `VT1 Cross Connect Report`.

From the work order or `rtrv-crs-( )` command, determine the cross-connections for circuit being discontinued. Use the `rtrv-crs-( )` command at each node in the ring network to obtain the `STS-1 or VT1 Cross Connect Report`.

6. ⚠ CAUTION:
Deleting wrong cross-connections may interrupt service.

⇒ NOTE 1:
STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. Remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the non-terminating nodes. A Critical or Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
The following commands may be used to delete, enter, and retrieve VT1.5 cross-connections: `dlt-crs-vt1`, `ent-crs-vt1`, and `rtrv-crs-vt1`. The following commands may be used to delete, enter, and retrieve STS-1 cross-connections: `dlt-crs-sts1`, `ent-crs-sts1`, and `rtrv-crs-sts1`. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connections.

Use the `dlt-crs-vt1:` or `dlt-crs-sts1:` command to delete the terminating node cross-connections for all service being removed, if required.

7. Use the `dlt-crs-vt1:` or `dlt-crs-sts1:` command to delete the pass-through cross-connections at each non-terminating node for all service being discontinued, if required.

8. If **STS1E** circuit packs are at the other terminating node, remove the service and protection **STS1E** circuit packs, if required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. Use the `rtrv-state:` command to determine the port state of the EC-1 port(s) of the circuit being established.

10. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the `set-state-ecl:` command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the `upd` command.

Use the `set-state-ecl:` command to set the port state of the EC-1 port(s) of the circuit being established.

11. If the other terminating node(s) is equipped with **DS1/DS1PM** or **DS3** circuit packs, discontinue the DS1/DS3 service at those nodes as required.

A. Discontinue DS1 service. **NTP-011**
B. Discontinue DS3 service. **NTP-012**

12. Verify all alarms are off.

Condition System Operating on OC-3 Release 1 Software for Upgrade to OC-3 Release 2 or Release 3 Software

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
This procedure was published in Issue 4, Preliminary of this manual but has since been moved to **DLP-549**.

Convert DS1 Group Service to EC-1 Group Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure assumes that the DDM-2000 is in service and that a DS1 group is being changed to an EC-1 group to provide an EC-1 interface. Releases 2 and 3 do not support an EC-1 interface.

   ⇒ NOTE 2:
   If, at any point in this procedure, the DDM-2000 fails to respond in the indicated manner, you should refer to **Trouble Clearing: IXL-001.**

   Determine which **FUNCTION UNITS** group (**A**, **B**, or **C**) is being converted.

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2. Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. At the DSX-1, remove the DS1 signals associated with the DS1 group being converted. (**FAULT** LED flashes on **DS1/DS1PM** circuit packs with signals removed.)

4. ⇒ NOTE:
   The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen, to operate it.

   On the **SYSCTL**, momentarily depress the **UPD/INIT** button. (**FAULT** LEDs go off.)

5. ⇒ NOTE 1:
   Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the `set-ne:crs=manual` command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

   From work order or `rtrv-crs-( )` command, determine the cross-connections for circuit being discontinued.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⚠ CAUTION:
Removing the wrong cross-connection may cause service interruption. Use the `rtrv-crs-( )` command to determine the proper cross-connections.

NOTE 1:
DS1 **LOW SPEED** slots cannot be unequipped without an alarm until all port cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In a ring configuration, remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the intermediate nodes. A Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

NOTE 2:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: `cnvt-crs`, `dlt-crs-sts1`, `dlt-crs-vt1`, `ent-crs-sts1`, `ent-crs-vt1`, `rtrv-crs-sts1`, and `rtrv-crs-vt1`. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Use the `dlt-crs-sts1:` or `dlt-crs-vt1:` command to delete cross-connections associated with all **DS1/DS1PM** circuit packs being removed.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Remove the **DS1/DS1PM** circuit packs from group being converted to EC-1 service.	
8. Remove the **MXRVO** circuit packs from group being converted to EC-1 service.	
9. Momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.	
10. Verify that all alarms are off.	
11. Set the **S1** switch on the **STS1E** circuit pack to LOW-SPEED operating mode ("**I or III**" position).	**DLP-513**
12. ⇒ NOTE: **DS1/DS1PM** circuit packs **cannot** be installed in a group that is equipped with **STS1E** circuit packs.	
Set line build out (LBO) option jumpers and install **STS1E** circuit packs into **FUNCTION UNITS** group (A, B, or **C**) being put into service.	**DLP-513**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Use the `set-ecl:` command to set the characteristics of the EC-1 port.	
14. Make appropriate backplane cable connections(s) [**J38-J39** (FN A), **J40-J41** (FN B), or **J42-J43** (FN C)] to the EC-1 cross-connect point or equivalent connection point for the channel being added.	
15. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.	
16. If both terminating nodes are equipped with **STS1E** circuit packs to terminate the EC-1, continue with Step 17. Otherwise, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add DS1/DS3 service.	
17. Determine the necessary cross-connections for each node from the work order or office records.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
18. Make necessary VT1.5/STS1 cross-connections for each node.	
A. Linear or Add/Drop Configuration	**DLP-545**
B. Single Ring Configuration	**DLP-546**
C. Dual Ring Configuration	**DLP-550**
19. Perform the appropriate end-to-end transmission test for circuit being put into service. For a circuit in a path protected ring network, use the `sw-path-( ):`*address* command at both terminating nodes to switch the active path and repeat this test on the other path.	
A. DS1 single-ring test	**DLP-510**
B. DS1 dual ring (DRI) test	**DLP-554**
C. DS3 single-ring test	**DLP-511**
D. DS3 dual ring (DRI) test	**DLP-553**
20. Use the `rtrv-state:` command to determine the port state of the EC-1 port(s) of the circuit being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the `set-state-ecl:` command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the `upd` command.

Use the `set-state-ecl:` command to set the port state of the EC-1 port(s) of the circuit being established.-

Upgrade DDM-2000 OC-3 Add/Drop Network to Path Switched Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION 1:
Three STS-1 channels or 84 VT1.5 channels is the maximum capacity for an OC-3 ring. Before this upgrade is performed, you should verify that there is enough capacity in the ring to carry **ALL CO sourced** channels plus **ALL added** channels coming into the network at any RT.

⚠ CAUTION 2:
This procedure requires **22-type OLIU** *circuit packs in all shelves. If existing* **OLIU***s will be replaced in this procedure* **[DLP-542]**, *you must determine if the* **22-type OLIU***s will support the existing span length. For example,* **22F OLIU** *circuit packs will not support span lengths as long as* **21G OLIU** *circuit packs will support. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.*

⚠ CAUTION 3:
This procedure has been tested using a Gould fiber splitter which introduces 3 dB of loss into the fiber span. The amount of loss may differ for the type of splitter used and must be considered when doing an upgrade. If there is not enough excess loss budget in the optical spans between the CO and first RT to allow the use of a splitter, the upgrade may be performed out of service. Optical fiber switches which introduce no loss may also be used, but require extra steps in the upgrade procedure which are not documented. Fiber splitters and/or switches are available from manufacturers such as Gould, Fibercell, Corning, DiCon, ADC, and others.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⚠ CAUTION 4:
Plans, patch facilities, and loss budget calculations must be available for the fiber line to be connected between the CO and the "last" RT to form the ring network.

⚠ CAUTION 5:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.

NOTE 1:
This procedure assumes that the DDM-2000 is in service and the optical line connections are going to be changed to a ring configuration. Release 3.1, 3.2, or Release 6 software is initially required in each shelf to support **22-type OLIU**s. Release 7 software is required for the final ring configuration.

NOTE 2:
All shelves in the same network must have the same or compatible software releases.

NOTE 3:
You may also contact AT&T to provide this in-service upgrade. Experienced AT&T installers will help you plan and execute the network upgrade. For more information, contact your AT&T Account Representative.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
This procedure is completed in a series of node upgrades beginning at the near end (Node 1 CO), then going to the last RT Node (RTn) and sequentially upgrading each DDM-2000 to a ring until you get back to the near end Node 1. The first steps of this procedure performed between Node 1 (CO) and Node 2 (the first RT) use an optical splitter to convert the two nodes into a ring configuration. This part of the procedure is similar to a point-to-point to ring upgrade.

Use the `rtrv-alm:` command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. NOTE:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Releases 5, 7 and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

Verify correct **OHCTL**s are installed and switches are set correctly. **DLP-513**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. Upgrade software in each DDM-2000 shelf with a release that supports **22-type OLIU**s (Release 3.1, 3.2, or 6), if not already performed.	**DLP-532**
5. ⇒ NOTE: Mixing of **21-type OLIU**s and **22-type OLIU**s in one shelf is not allowed in ring software.	
Replace **OLIU**s in each shelf with proper **22-type OLIU**s, if not already done. (Protection **OLIU**s are required.)	**DLP-542**
6. At **all** shelves in the network being upgraded, use **`set-ne:tid=`*`tid`*`:crs=manual`** command to set cross-connect mode to manual.	
7. ⇒ NOTE: Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the **`set-ne:crs=manual`** command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

If required, at all shelves in the network, use the **cnvt-crs:***address1,address2* command to convert all low-speed DS1 STS-1 cross-connections to corresponding VT1.5 cross-connections.

8. Use **rtrv-sync:** command to check timing mode and parameters for proper provisioning. If necessary, use **set-sync:** command to change timing provisioning to that specified on the work order.

9. ⚠ CAUTION:
Transmission configuration information for in service systems is stored on the **TGS** circuit pack in **TIMING** slot **1**. In some instances (for example, during system tests or while performing this upgrade), if the version of software being installed is not compatible with the current transmission configuration, it will be necessary to remove the **TGS** circuit pack in **TIMING** slot **1** in order to force the system to run the software you are trying to download. If both **TGS** circuit packs are not installed, removal of the only **TGS** circuit pack will cause service interruption.

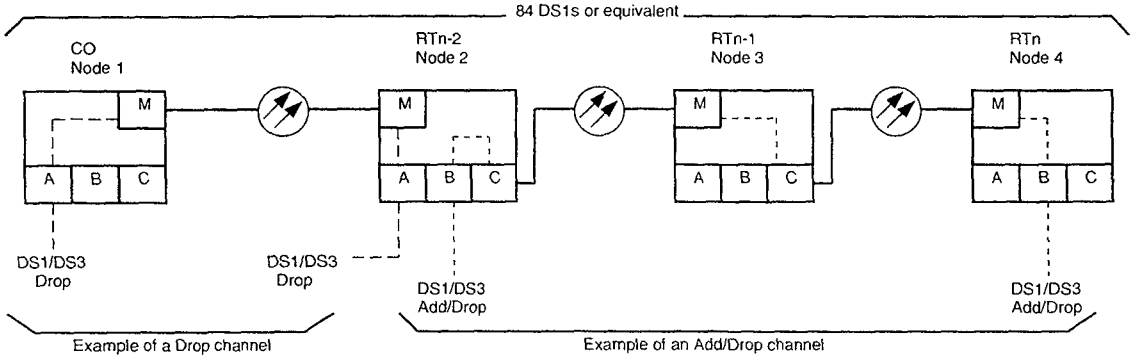
Ensure both **TGS** circuit packs are installed. Then, use the **switch-sync:s=circuitpack,pri=manual** command to switch to the protection **TGS** circuit pack, if not already **ACTIVE**. Use rtrv-sync: command to verify that the **TGS-2** circuit pack is **ACTIVE**. Unplug **TGS** circuit pack in **TIMING** slot **1**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⇒ NOTE:
This procedure uses an example configuration as shown in Figure 1. Your configuration may differ, but the procedures are the same for any drop or add/drop configuration. "Add" traffic is defined in relation to a "head-end" node. A head-end node is determined for the network and should be the node that terminates the most traffic. In this procedure, the head-end node is Node 1 (CO) and other nodes are designated as Node 4 [last RT, (RTn)], Node 3 [next-to-last RT, (RTn-1)], and Node 2 (RTn-2). All traffic that does not terminate at the CO is referred to as "Add" traffic. "Drop" traffic is defined as traffic that terminates at the CO. See Figure 1.

This procedure will convert the first two nodes (Node 1 and Node 2) to a ring, then the last (Node 4) and first (Node 1) nodes, and then continue to work back through the network from last node to first.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO



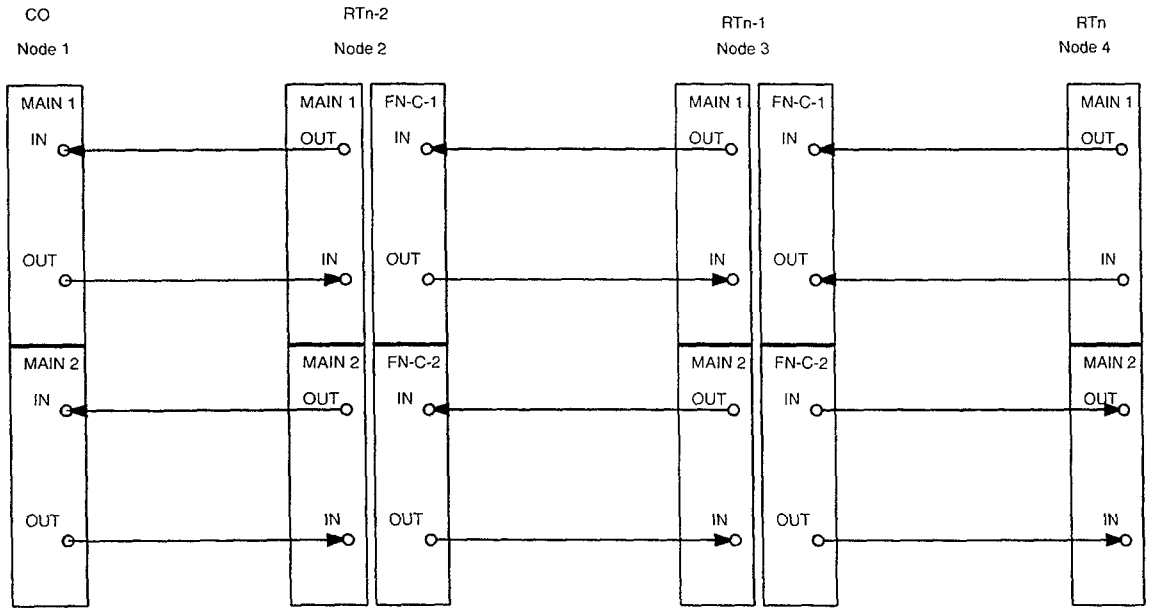


Figure 1. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⇒ NOTE:
Steps 11 through 26 are performed between the CO (Node 1) and the first RT (Node 2). An optical splitter is used to convert the optical span to a ring configuration.

At Node 1 and Node 2, use the **`switch-line:main:pri=manual`** command to switch to the protection line. Use the **`rtrv-state:main-all`** command to check switch state (`main-2 OLIU active`). (See Figure 2.)

12. Use **`set-fecom:dcc-m:com=disabled`** command to disable far-end communications (fecom) at Node 1.

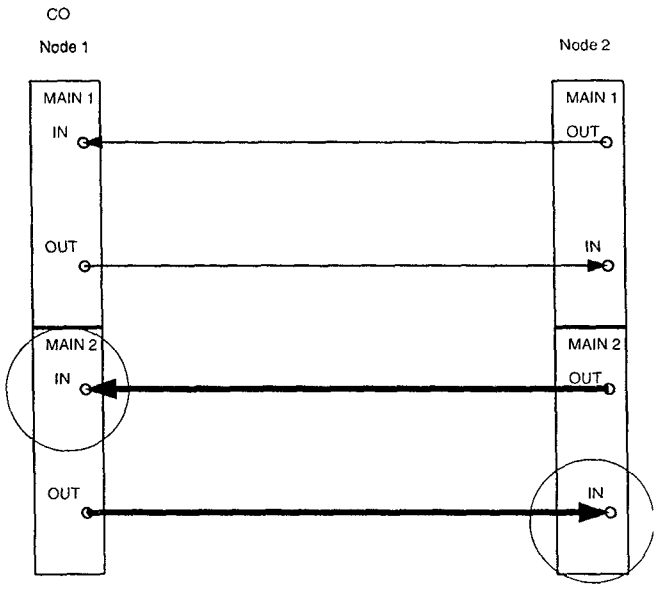


Figure 2. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. At Node 1, install optical splitter in **MAIN 1 OUT** optical line as shown in Figure 3.

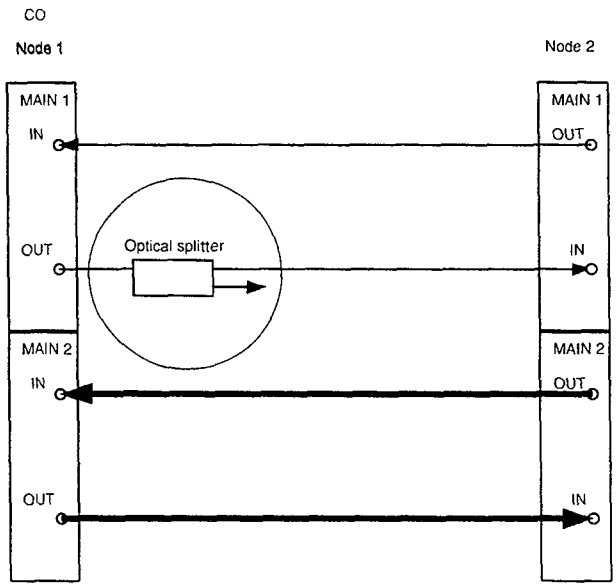


Figure 3. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the **`switch-line:main:pri=manual`** command to switch to the service (MAIN 1) line (`main-1 OLIU active`). (See Figure 4.)

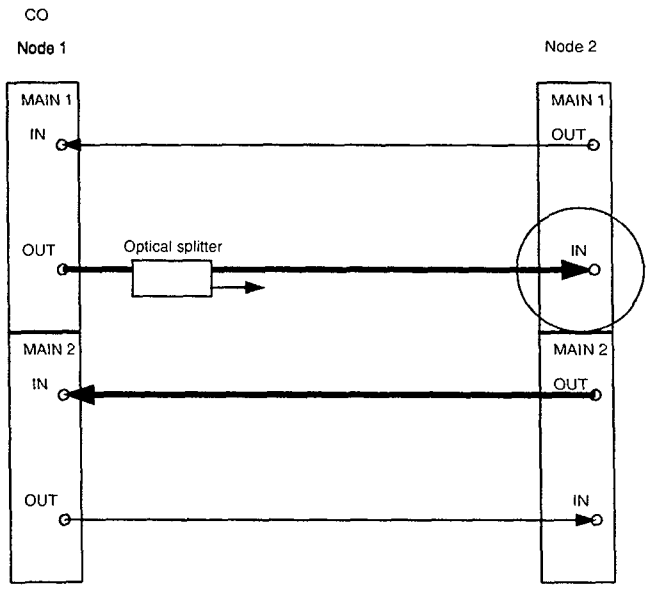


Figure 4. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

15. At Node 1, remove optical fiber from **OLIU MAIN 2 OUT** and connect it to the other output of the optical splitter. (See Figure 5.)

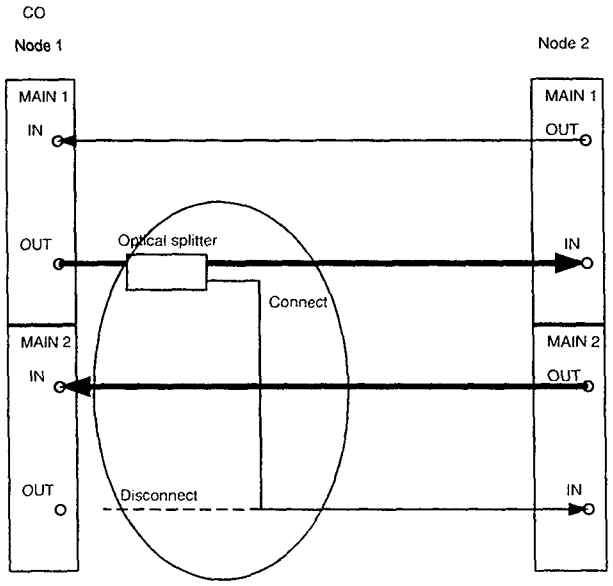


Figure 5. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

16. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active` at Node 2). (See Figure 6.)

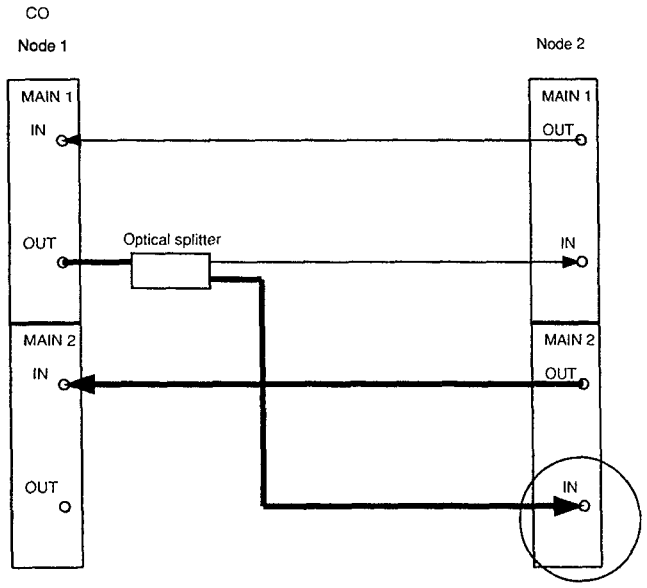


Figure 6. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

17. Disconnect the optical splitter output from the fiber going to Node 2 **MAIN 1 IN** and connect the fiber to Node 1 **MAIN 2 OUT**. (See Figure 7.)

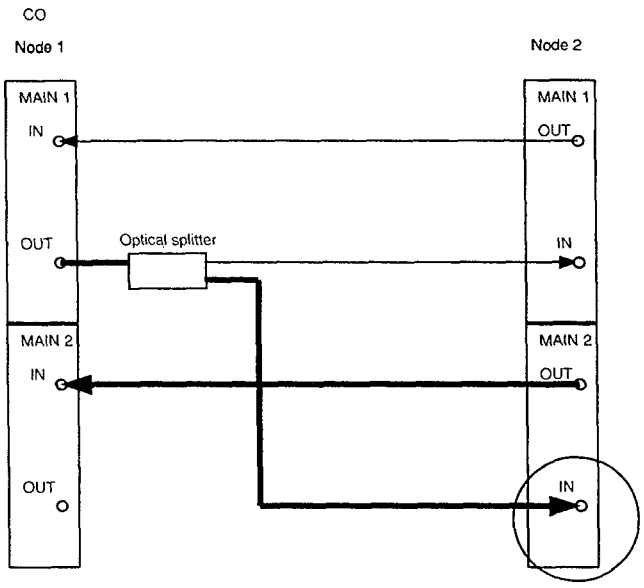


Figure 7. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

18. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2 only, use the **`switch-line:main:pri=manual`** command to switch service to the service line (`main-1 OLIU active` at Node 2). (See Figure 8.)

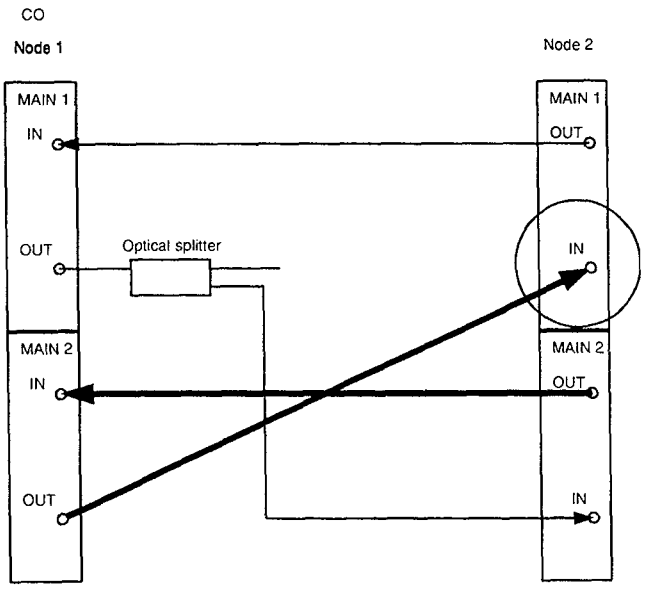


Figure 8. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

19. At Node 1, remove optical splitter from **MAIN 1 OUT**. Connect optical fiber from Node 1 **MAIN 1 OUT** to Node 2 **MAIN 2 IN**. (See Figure 9.)

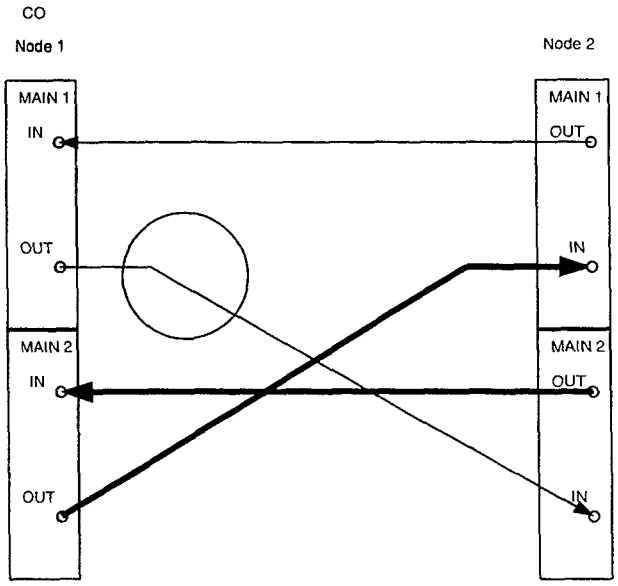


Figure 9. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

20. Disconnect optical fiber from **MAIN 1 IN** at Node 1 and install optical splitter in **MAIN 1 IN** optical line as shown in Figure 10.

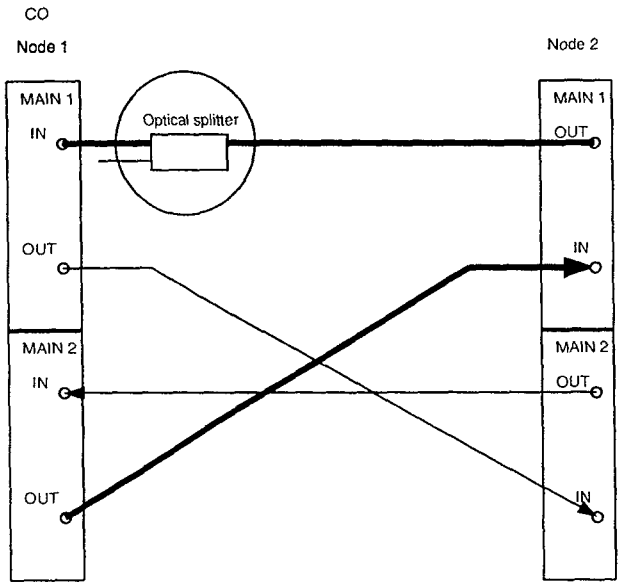


Figure 10. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 1 only, use the **`switch-line:main:pri=manual`** command to switch service to the service line (`main-1 OLIU active` at Node 1). (See Figure 11.)

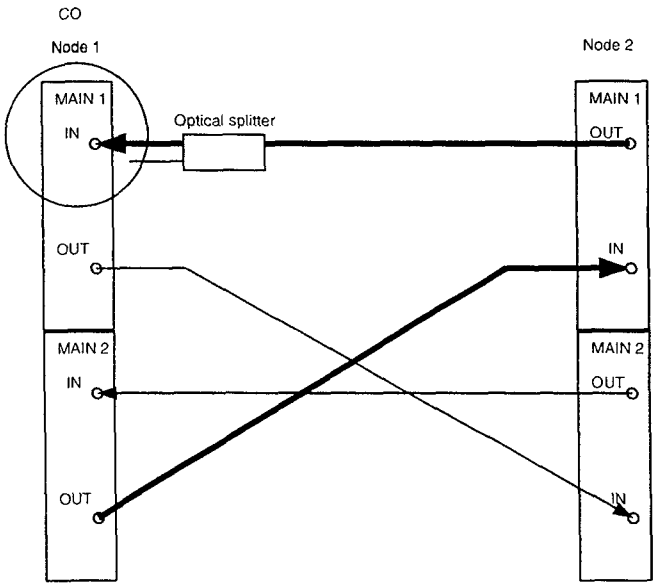


Figure 11. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

22. Disconnect optical fiber from Node 1 **MAIN 2 IN** and connect remaining optical splitter output to **MAIN 2 IN**. (See Figure 12.)

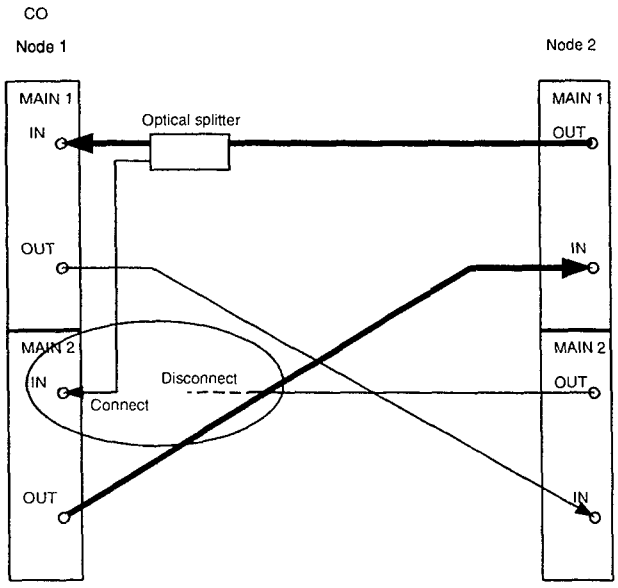


Figure 12. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

23. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 1, use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active` at Node 1). (See Figure 13.)

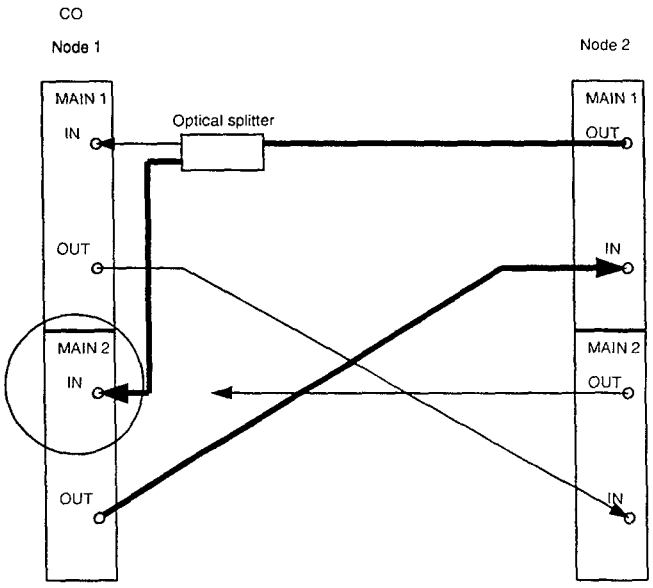


Figure 13. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

24. At Node 1, remove optical splitter output from **MAIN 1 IN** and connect optical fiber from Node 2 **MAIN 2 OUT** to Node 1 **MAIN 1 IN**. (See Figure 14.)

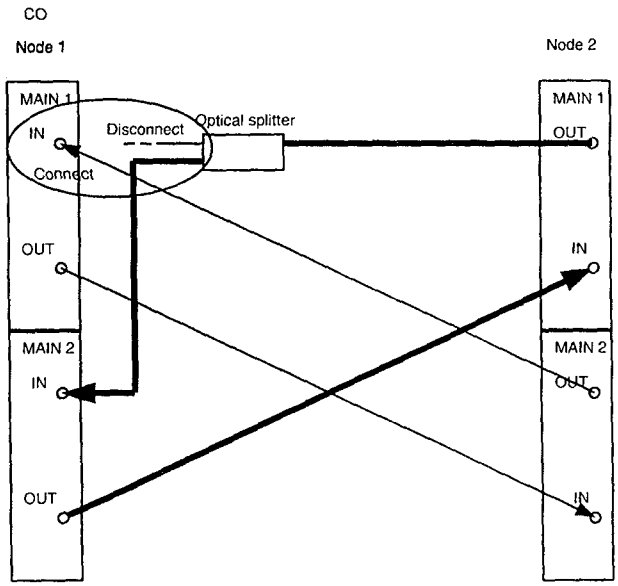


Figure 14. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

25. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 1, use the **`switch-line:main:pri=manual`** command to switch service to the service line (`main-1 OLIU active`) at Node 1. (See Figure 15.)

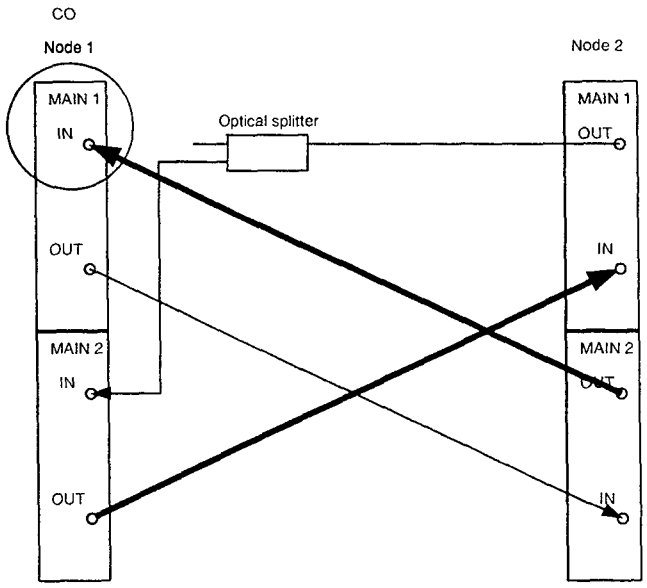


Figure 15. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

26. At Node 1, remove optical splitter from **MAIN 2 IN**. Connect optical fiber from Node 2 **MAIN 1 OUT** to Node 1 **MAIN 2 IN**. (See Figure 16.)

27. ⇒ **NOTE:**
Wait until **FAULT** LED on **MAIN OLIU** extinguishes before attempting switch.

At Node 2, use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active`) at Node 2. (See Figure 16.)

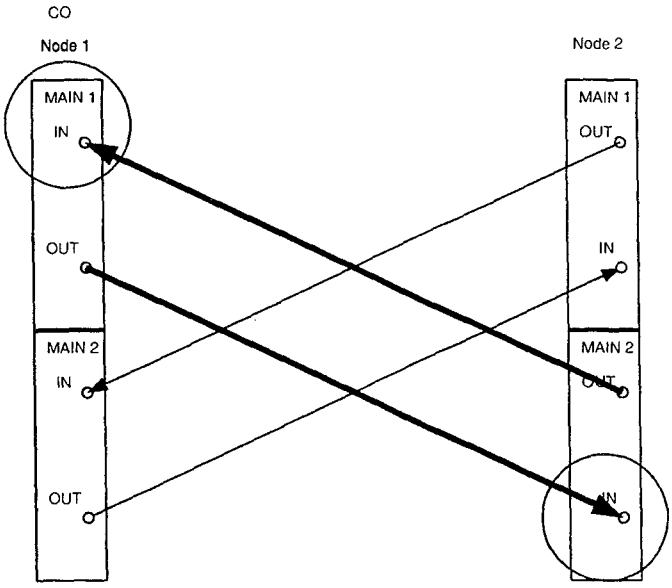


Figure 16. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

28. The example 4-node configuration now looks like that shown in Figure 17. Steps completed between the last RT and next to last RT are repeated as each span is converted to a ring configuration.

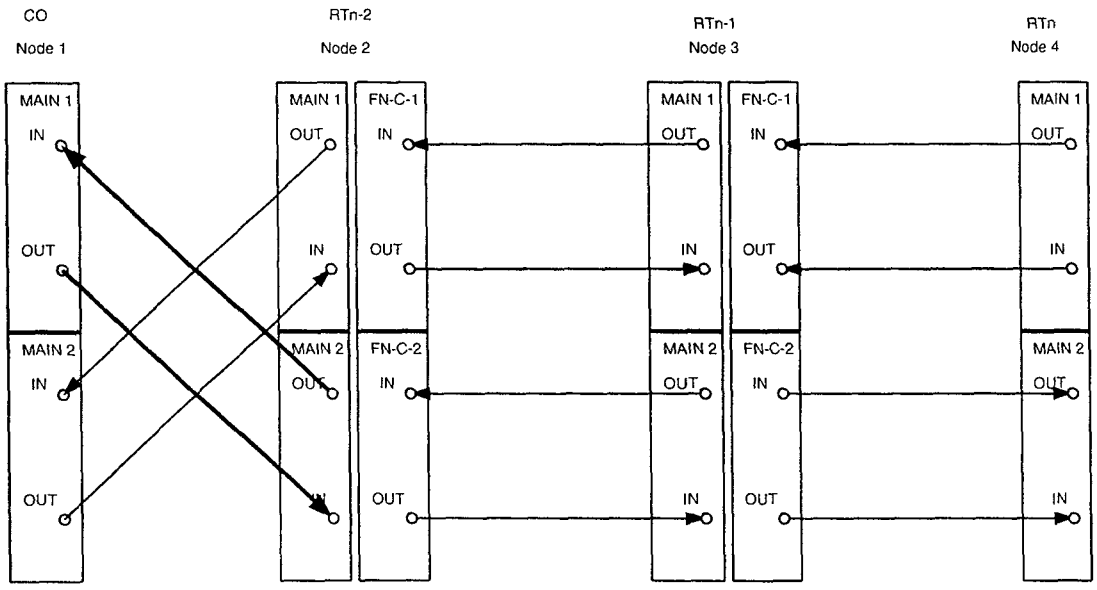


Figure 17. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

29. At Node 1 (CO) and Node 2, disconnect fiber from **MAIN 2 OUT** at the CO and **MAIN 1 IN** at Node 2. Disconnect fiber from **MAIN 2 IN** at the CO and **MAIN 1 OUT** at Node 2. (See Figure 18.)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

30. At the next-to-last Node (Node 3), use the **`switch-line:fn-c:pri=manual`** command to switch service to the protection line (`fn-c-2 OLIU active` at Node 3). At the last Node (Node 4), use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active` at Node 4). (See Figure 18.)

31. At the last Node (Node 4) and next-to-last Node (Node 3), disconnect optical fiber from **MAIN 1 OUT** at Node 4 and **FN-C 1 IN** at Node 3. Disconnect fiber from **MAIN 1 IN** at the Node 4 and **FN-C 1 OUT** at Node 3. (See Figure 18.)

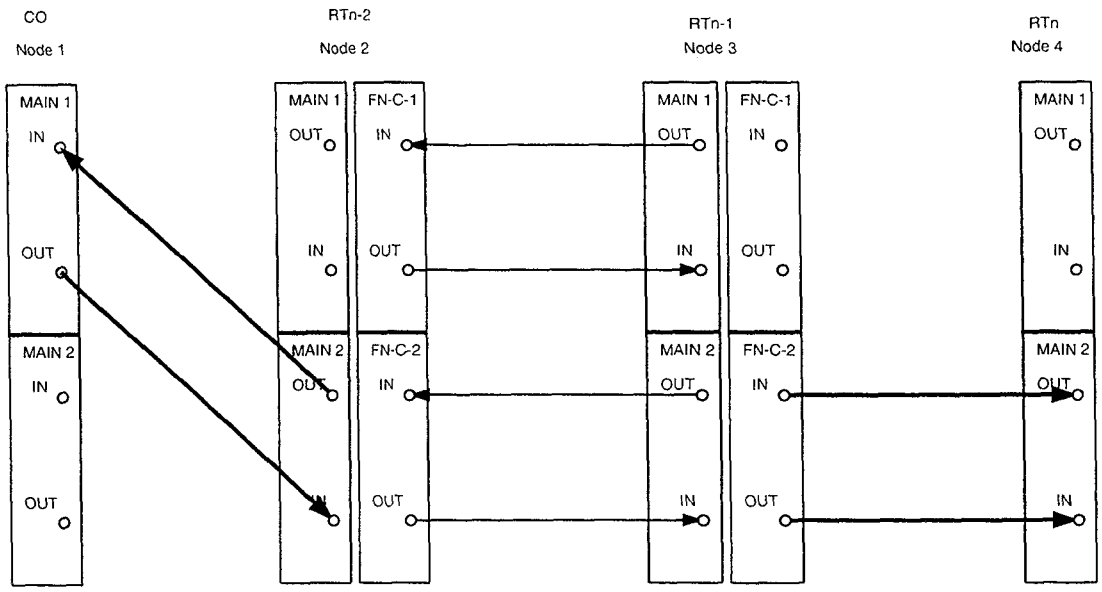


Figure 18. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
32. At Node 1 (CO), locally download Release 7 software. Then use **`set-fecom:dcc=m2:com=disabled`** command to disable DCC at Node 1.	**DLP-532**

33. ⚠ CAUTION:
Service interruption will occur if the following step is not performed for all timeslots that terminate at other nodes in the ring network.

NOTE:
"Drop" traffic is defined as traffic that terminates at the CO. All traffic that does not terminate at the CO is referred to as "Add" traffic.

At Node 1 (CO), use the **`ent-crs-vt1`** command or **`ent-crs-sts1`** command to set up main-to-main pass-through cross-connections associated with all STS/VT timeslots that are terminated on other nodes of the ring but are not terminated at the CO.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

34. ⚠ CAUTION:
Plans, patch facilities, and loss budget calculations must be available for the fiber line to be connected between the CO and the "last" RT to form the ring network.

Connect optical fiber from Node 1 (CO) **MAIN 2 OUT** to last Node 4 (RTn) **MAIN 1 IN**. Connect optical fiber from Node 1 (CO) **MAIN 2 IN** to last Node 4 (RTn) **MAIN 1 OUT**. (See Figure 19.)

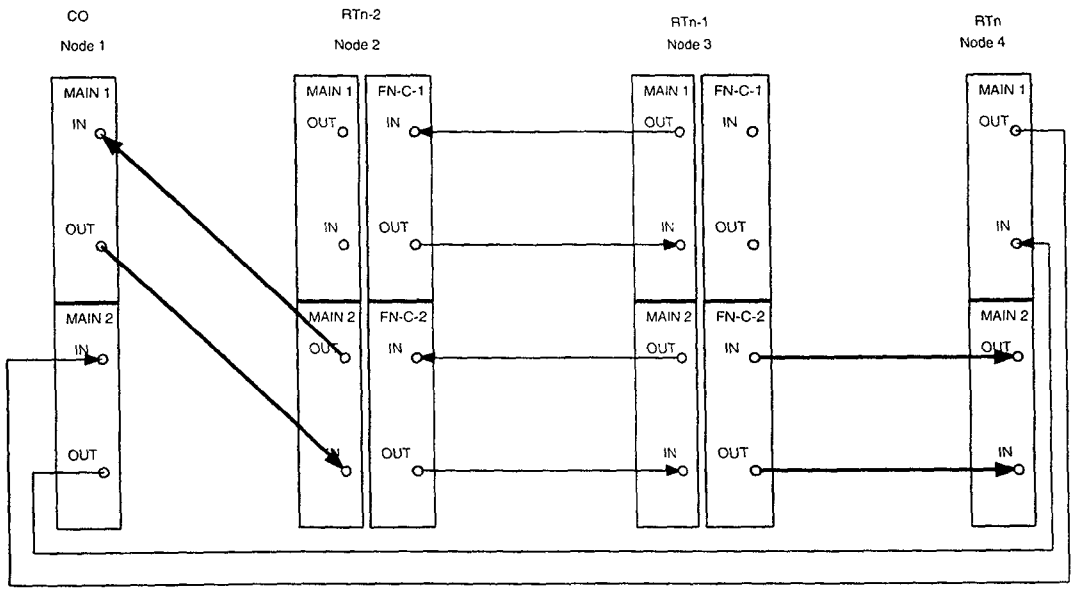


Figure 19. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
35. At last Node 4 (RTn), locally download Release 7 software.	DLP-532

36. ⚠ CAUTION:
Service interruption will occur if the following step is not performed for all timeslots that terminate at other nodes in the ring network.

At last Node 4 (RTn) use the **`ent-crs-vt1`** command or **`ent-crs-sts1`** command to set up all main-to-main pass-through cross-connections associated with all remaining STS/VT timeslots that are terminated on other nodes of the ring.

37. ⇒ NOTE:
Traffic is now passing from Node 1 (CO) to Node 4 (RTn) and is accessible to all of the RTs from this direction. The following steps will work back from Node 4 to Node 2, reconfiguring the fibers and upgrading the software at each node.

If this is an add/drop network (with traffic terminating at other nodes but not at the CO), continue with Step 37. If this is a drop network (with traffic terminating only between the CO and another node), continue with Step 41.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

38. ⚠ CAUTION:
If this is an add/drop network instead of a drop network and channels are "added" at the node being converted, service interruption will occur when cross-connections are deleted. The following must be performed prior to disconnecting the fibers from this node to the downstream node to minimize out-of-service time. For example, if channels are added and dropped between Node 3 and Node 4, pass-through cross-connections must be established in all remaining nodes to minimize service interruption.

For all added channels, use the **ent-crs-( )** command(s) to set up pass through cross-connections from fn-c to main at all nodes leading back to Node 1 (CO).

---

39. Ensure main-to-main pass-through cross-connections are made at the CO as specified in Step 33.

---

40. At the node being converted, use the **dlt-crs-( )** command to delete the cross-connections from function unit A or B (`fn-a`, `fn-b`) to function unit C (`fn-c`). Immediately after each cross-connection is deleted, use the **ent-crs-( )** command to reroute the channel from `fn-a` or `fn-b` to `main`. This routes the added traffic channel back to the CO and over the installed ring nodes to the intended drop points.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

41. At Node 3, use the `dlt-crs-vt1` or `dlt-crs-sts1` command to delete all "main" to "fn-c" cross-connections.

42. At Node 3, disconnect the fibers from **FN-C 2 OLIU**s. Remove the **OLIU**s from **FUNCTION UNIT C** slots. Momentarily depress the **UPD/INIT** button on the **SYSCTL**. (See Figure 20.)

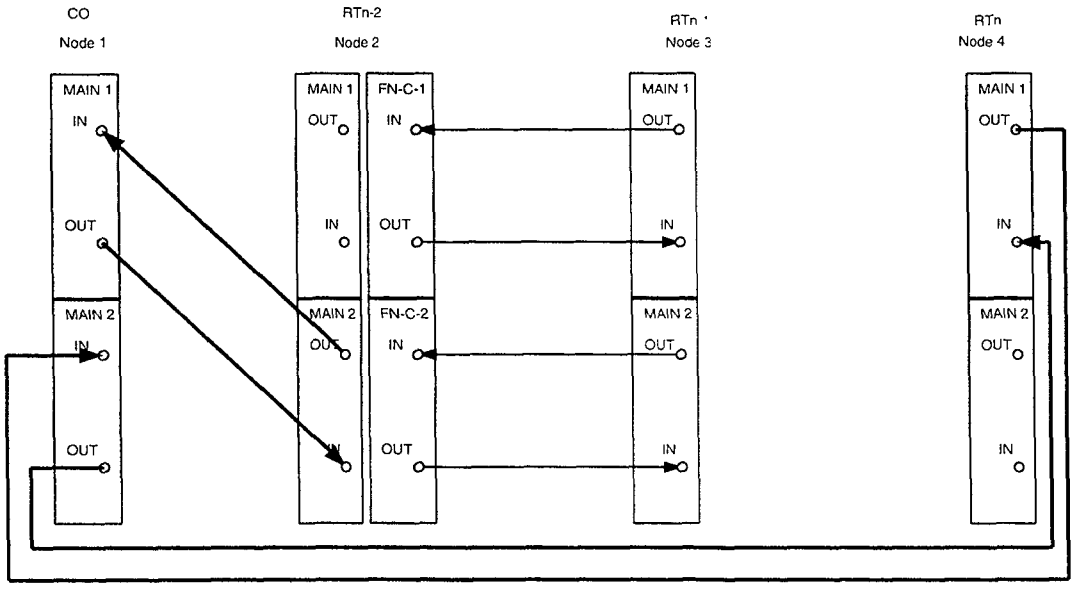


Figure 20. DDM-2000 OC-3 Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

43. At Node 2 (RTn-2) and Node 3 (RTn-1), use the **`switch-line:main:pri=manual`** command to switch service to the protection line (`main-2 OLIU active`). (See Figure 21.)

44. At Node 3 (RTn-1), disconnect the optical fibers from **MAIN 1 OLIU**s. At Node 2 (RTn-2), disconnect the optical fibers from **FN-C 1 OLIU**s (See Figure 21.)

45. Connect optical fiber from Node 3 (RTn-1) **MAIN 1 OUT** to Node 4 (RTn) **MAIN 2 IN**. Connect optical fiber from Node 3 (RTn-1) **MAIN 1 IN** to Node 4 (RTn) **MAIN 2 OUT**. (See Figure 21.)

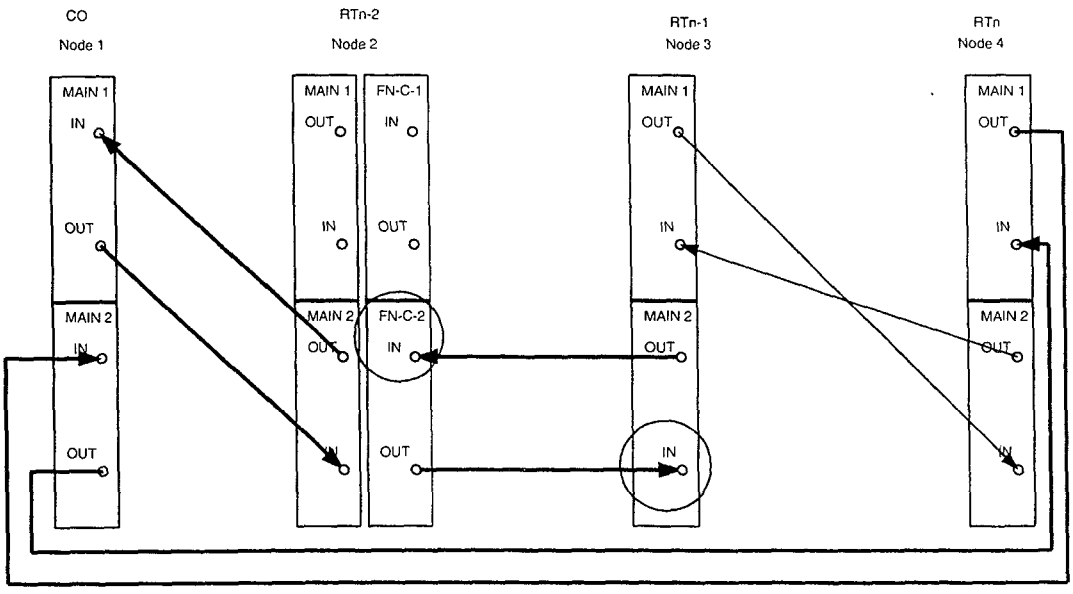


Figure 21. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
46. At Node 4 (RTn-1), locally download Release 7 software.	**DLP-532**
47. Reinstall **TGS** circuit pack into **TIMING** slot **1**. Use the **`switch-sync:s=circuitpack,pri=reset`** command to reset the manual protection switch.	
48. At Node 4 (RTn-1), use the **`ent-crs-vt1`** command or **`ent-crs-sts1`** command to set up all main-to-main pass-through cross-connections associated with all remaining STS/VT timeslots that are terminated on other nodes of the ring.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

49. Repeat this procedure from Step 37 for all remaining nodes to be converted. Figure 22 shows the completed ring configuration.

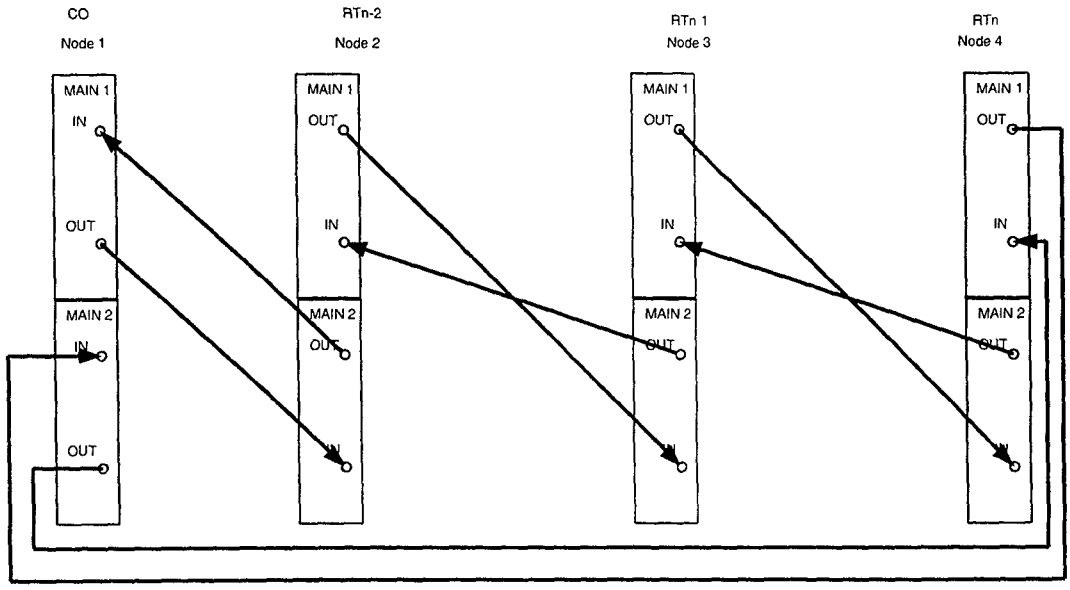


Figure 22. DDM-2000 OC-3 Drop or Add/Drop Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

50. ⇒ NOTE 1:
In Release 7.0 and 7.1, the "**set-ne:**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DSNE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DSNE), a "duplicate GNE" alarm will occur. In Release 7.0 and 7.1, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

⇒ NOTE 2:
In Release 7.2, the "**set-ne:**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In Release 7.2, multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 3:
In Release 7.2, shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

For Release 7.0 and 7.1, use the "**set-ne:**" command to designate ONE shelf as the GNE.

For Release 7.2, use the "**set-ne:**" command to designate ONE shelf as the DSNE. Use the "**set-ne:**" to designate the AGNE(s) and alarm group number, as required.

51. Use **set-fecom:dcc-all:com=enabled** command at all nodes to enable far-end communications (fecom).

52. Reinstall all **TGS-1** circuit packs, if still removed.

53. ⇒ NOTE 1:
If Kbyte (sync messaging) (R5.1 and later) is enabled for the **main-1** and **main-2** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the ring.

⇒ NOTE 2:
The **rtrv-oc3:** command retrieves the `OC-3 Line Provisioning Report`. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte parameter, as required.

54. ⇒ NOTE 1:
If Sync Autoreconfiguration (R6.1 and later) is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any loop-timed node in a ring, it **must** be enabled at all loop-timed nodes of a ring.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
55. The ring configuration is now complete and new nodes may be added as required [**NTP-026**].	

Establish End-to-End DDM-2000 OC-3 System Optical Fiber Spans Dual 0x1 Path Switched Ring Network

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

NOTE 2:
It is assumed that all DDM-2000 OC-3 shelves in the system have passed the looped transmission test(s) [**System Turnup: NTP-016**] and the OC-12 ring has been established.

Determine the optical loss of each optical span from office records or by making the required measurements.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

2. ⇒ NOTE:
   A Dual 0x1 OC-3/IS-3 ring configuration requires that the DDM-2000 OC-3 **MAIN 1 OLIU** connect to the **FN( ) 1 OLIU** on the DDM-2000 OC-12 shelf. The DDM-2000 OC-3 **MAIN 2 OLIU** connects to the associated **FN( ) 2P OLIU** on the DDM-2000 OC-12 shelf. See Figure 1.

   Determine the DDM-2000 OC-12 **FUNCTION UNITS (FN)** slots to be used for the OC-3 interface.

3. At the DDM-2000 OC-3 shelf, use the **`set-ne:`** command to set the **`dcc`** mode parameter to **`identical`** (**`dcc=identical`**).

4. At the DDM-2000 OC-12 shelf, use the **`set-oc3:`***`address`* command to set the application (**`app`**) mode parameter of the function unit to **`dual0x1`** (**`app=dual0x1`**).

5. At the DDM-2000 OC-3 shelf being connected to the OC-12, remove the optical loop from ONE **OLIU** (for example, **MAIN 2**) associated with the optical span being established. At the other end, remove the optical loop from the associated **OLIU** (for example, **FN( ) 2P**) in the optical span being established.

6. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

7. ⇒ NOTE 1:
If loop timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records.	**DLP-513**

8. ⇒ NOTE:
The **`rtrv-pm-line`** command in the following procedure displays performance monitoring data associated with the STS-3 lines terminated on the system.

Perform end-to-end OC-3 line test.	**DLP-515**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. Repeat this procedure from Item 5 for each optical span being established in the DDM-2000 OC-3 network.

10. ⇒ NOTE:
Up to three [*address1 mb-{1-12}* to *address2 {a,b,c,d}-{1-3}*] STS-1 signal cross-connections may be made to the OC-12 function unit slot interfacing with the OC-3 shelf.

At the OC-12 shelf, use the **ent-crs-sts1:***address1,address2* command to specify the STS-1 signal cross-connections to the OC-12 function unit interfacing with the OC-3 shelf.

Reference AT&T 363-206-202, *DDM-2000 OC-3 Multiplexer User/Service Manual — Volume I*, Issue 5A, Section 8. Administration and Provisioning, OC-12 VT1.5 Path Switched Ring (Dual 0X1) for an explanation of dual 0X1 cross connects.

11. The system is now ready for initial service to be established.
Initial DS1 Service [**System Turnup: NTP-004**]
Initial DS3 Service [**System Turnup: NTP-005**]
Initial EC-1 Interface [**System Turnup: NTP-034**]

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

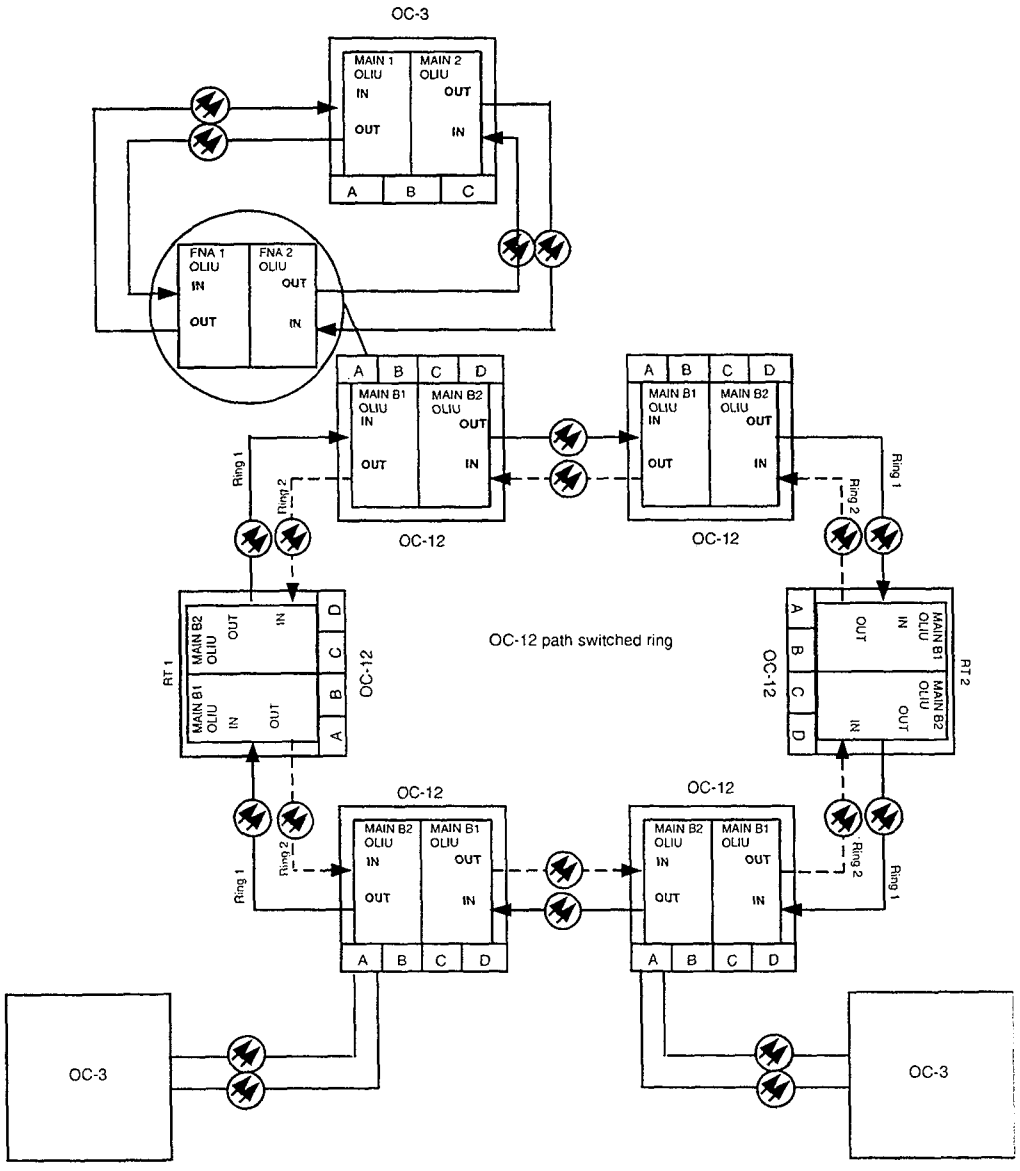


Figure 1. Example Dual 0x1 Ring Configuration Connections

Establish OC-3/IS-3 Dual Ring Interworking DDM-2000 OC-3 to OC-12 or FT-2000 Ring Configurations OC-3 Optical Fiber Spans

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001** in the appropriate DDM-2000/FT-2000 documentation.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 2:
It is assumed that the DDM-2000 or FT-2000 systems have been established in required individual ring configurations. Ring Release 7.2 or later software is required in each DDM-2000 OC-3 shelf. Ring Release 5 or later software is required in each DDM-2000 OC-12 shelf. Ring Release 6 or later software is required in each FT-2000 shelf. If **OLIU**s have already been installed in the function unit slots and the systems established in a DRI configuration using OC-3/IS-3 connections, go to Step 13 to establish new service. Otherwise, continue with this procedure to establish the initial DRI configuration.

⇒ NOTE 3:
If the OC-3 ring is to be loop timed (no external timing available) from another system or ring, **BBF2B TGS** timing circuit packs must be installed in the node connected to the other system and the **FN C** function unit slot must be equipped first to provide a source of synchronization. See the **`set-sync:`** command in the Commands and Reports section of this manual.

Consult office records or work/circuit orders to determine the **OLIU** function slots in each DRI node that will be used to connect the two systems together in a DRI configuration. See Figure 1.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. NOTE 1:
Series **S2:4A** or later DDM-2000 **OHCTL**s are required to support the open systems interconnection protocol (OSI). **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf.

NOTE 2:
The network elements that terminate on each end of the optical span must have their "Network Side"/"User Side" parameters set to opposite values to avoid an `inconsistent DCC switches` alarm. Switches on DDM-2000 **OHCTL**s must be properly set at each end of OC-3 optical spans If FT-2000 systems are in the network, the proper command must be used if one end is an FT-2000 network element. One end is provisioned as "Network" and the other end is provisioned as "User". Both ends of the OC-3 line cannot be the same and it makes no difference which end is "Network".

Verify/set "Network/User" switches on **OHCTL**s at DDM-2000 end of optical spans. **DLP-513**

3. NOTE:
This procedure requires LAA10 circuit packs in the Low Speed slots of the FT-2000 OC-48 shelves. **22G-U/22G2-U/22F OLIU** circuit packs are required in the main and function unit slots of DDM-2000 OC-3 shelves. **21G-U**s (OC-3) or **21D-U OLIU**s (IS-3) circuit packs are required in the selected function unit slots of DDM-2000 OC-12 shelves. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

Install **OLIU** circuit packs in selected function unit slots. **DLP-504**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

4. ⇒ NOTE 1:
22G-U OLIUs require an 10 dB LBO when the **22G-U OLIU**s are looped. **22G2-U/22F OLIU**s do **not** require an LBO when the **OLIU**s are looped.

⇒ NOTE 2:
If fecom is enabled, an `inconsistent DCC switches` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the user/network switches on the **OHCTL**s at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address`***`:com=disable`** command to disable the DCC.

Install **OLIU** optical loops. **DLP-505**

5. Determine the optical loss of each OC-3 optical span from office records or by making the required measurements.

6. Remove optical loops from **OLIU**s in the OC-3 optical span being established.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

7. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line tests to work when the optical span is being established. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each DDM-2000 shelf** to enable far end communications.

At each DDM-2000 DRI shelf, use the **`set-fecom:`***`address`***`:com=enabled`** command to ensure far end communications (fecom) is enabled.

8. At each OC-3 DRI shelf, use the **`set-oc3`** command to disable Kbyte sync messaging for the DDM-2000 function unit groups used to connect to the other ring system (for example, FT-2000).

9. Perform optical fiber connections and verification of the optical facility. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⇒ NOTE 1:
If more than one network element in the same maintenance network has been provisioned as a DSNE (set by the **set-ne** command in DDM-2000 network elements), a `duplicate DSNE` alarm will occur. In mixed DDM-2000 and FT-2000 networks, the DSNE must be provisioned in an FT-2000 network element.

⇒ NOTE 2:
It may take 5 minutes or more for the network to stabilize after the DDM-2000 DSNE is discontinued. The FT-2000 DSNE must record and map all the new network elements in the network.

Use the **set-ne** command in the DDM-2000 system to to discontinue the DDM-2000 DSNE. Use the RESET command at the FT-2000 DSNE to reset the DSNE node.

---

11. At the FT-2000 DRI nodes, use **CONFIGURATION-Set-OC3** command to set the protection mode to **0 X 1** for the OC-3 slot used for DRI connections, if only one **OLIU** is used for the DRI connection. If two **OLIU**s are used for the DRI connection, use **CONFIGURATION-Set-OC3** command to set the protection mode to **1 + 1** for the OC-3 slot used for DRI connections.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. At FT-2000 shelf, use **CONFIGURATION-Enter-Assignment-DCC** command to assign a DCC channel to slot(s) used for DRI connections.	
13. Perform end-to-end OC-3 line test at DRI nodes.	**DLP-515**
14. The network is now ready for initial DS1, DS3, or EC-1 service to be established. [**System Turnup: NTP-004**] (DS1) [**System Turnup: NTP-005**] (DS3) [**System Turnup: NTP-034**] (EC-1)	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

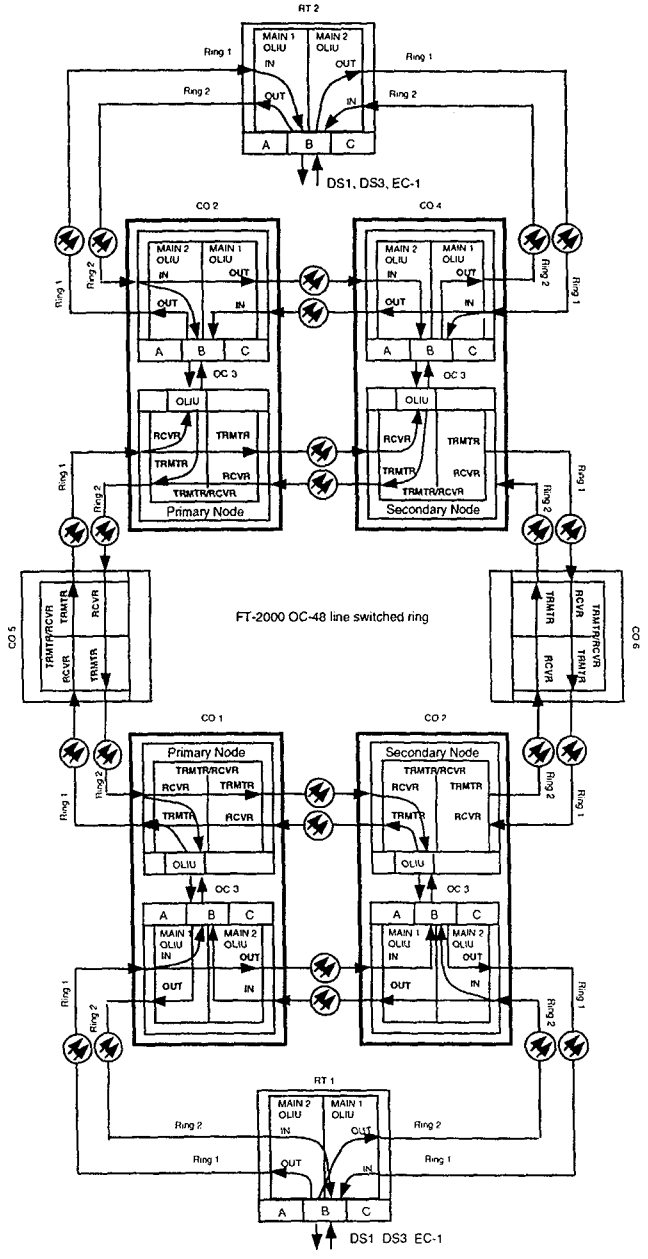


Figure 1. Example of DDM-2000 OC-3/FT-2000 OC-48 Dual Ring Interworking Network

Upgrade DDM-2000 OC-3/FT-2000 Dual Ring Interworking Network from EC-1 to OC-3 In Service

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.

⇒ NOTE 1:
This procedure will require LAA10 circuit packs in the Low Speed slots of the FT-2000 OC-48 shelves and **22G-U/22G2-U/22F OLIU**s (OC-3) or **22D-U OLIU**s (IS-3) circuit packs in the function unit slots of DDM-2000 OC-3 shelves. Existing **STS1E** and **3STS1E** circuit packs will be replaced in this procedure with **OLIU** circuit packs to support OC-3/IS-3 applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

⇒ NOTE 2:
This procedure assumes that the DDM-2000 and FT-2000 systems are in service. Ring Release 7.2 or later software is required in each DDM-2000 OC-3 shelf. Ring Release 6 or later software is required in each DDM-2000 FT-2000 shelf.

⇒ NOTE 3:
All shelves in the same network must have the same or compatible software releases.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
You may also contact AT&T to provide this in-service upgrade. Experienced AT&T installers will help you plan and execute the network upgrade. For more information, contact your AT&T Account Representative.

Use the **rtrv-alm:** command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. Upgrade software in each FT-2000 OC-48 and DDM-2000 OC-3 shelf with a release that supports OC-3 interfaces (Ring Release 6 or later (OC-48), Ring Release 7.2 or later (OC-3), if not already performed. **DLP-532**

4. CAUTION 1:
Ensure traffic is being carried through the FT-2000 **primary** *node to prevent unnecessary service hits. (For example, node B in Figure 1.)*

CAUTION 2:
Removal of the wrong cross-connections may cause service interruption.

NOTE:
When signals or circuit packs are removed, alarms will be generated until update procedures are performed.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

⇒ NOTE 2:
STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs.

Discontinue the EC-1 interface cross-connections at the OC-3 node associated with the FT-2000 secondary. Note that only cross-connections at the DRI node are being discontinued when using the procedures of NTP-036.	**NTP-036**

5. At the OC-3 node associated with the FT-2000 **secondary** dual ring interworking node, remove **STS1E** circuit pack(s) from function unit slot(s) being upgraded to **OLIU**s. (For example, node D in Figure 1.)

6. Momentarily depress **UPD** button on **SYSCTL** or use the **`update`** command from the CIT.

7. At the FT-2000 **secondary** dual ring interworking node (For example, node A in Figure 1), use FT-2000 procedures to "Delete EC-1 Low Speed Port".

8. At the FT-2000 **secondary** dual ring interworking node, use FT-2000 procedures to "Add OC-3 Low Speed Slots".

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

9. ⇒ NOTE 1:
Series **S2:4A** or later **OHCTL**s are required to support the open systems interconnection protocol (OSI). **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf.

⇒ NOTE 2:
The network elements that terminate on each end of the optical span must have their "Network Side"/"User Side" parameters set to opposite values to avoid an `inconsistent DCC switches` alarm. Switches on DDM-2000 **OHCTL**s must be properly set at each end of OC-3 optical spans. One end is provisioned as "Network" and the other end is provisioned as "User". Both ends of the OC-3 line cannot be the same and it makes no difference which end is "Network".

Verify/set "Network/User" switches on **OHCTL**s at the DDM-2000 end of optical span. **DLP-513**

10. Install **22G-U/22G2-U/22F OLIU**(s) (OC-3) or **22D-U OLIU**(s) (IS-3) in the OC-3 node associated with the FT-2000 secondary node. (For example, node D in Figure 1.) **DLP-504**

11. At the OC-3 shelf, use the **`set-oc3`** command to disable Kbyte messages for the function unit group used to connect to the FT-2000.

12. Perform optical fiber connections and verification of the optical facility. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE 1:
If more than one network element in the same maintenance network has been provisioned as a DSNE (set by the **set-ne** command in DDM-2000 network elements), a `duplicate DSNE` alarm will occur. In mixed DDM-2000 and FT-2000 networks, the DSNE must be provisioned in an FT-2000 network element.

⇒ NOTE 2:
It may take 5 minutes or more for the network to stabilize after the DDM-2000 DSNE is discontinued. The remaining FT-2000 DSNE must record and map all the new network elements in the network.

Use the **set-ne** command in the DDM-2000 system to discontinue the DDM-2000 DSNE. Use the RESET command at the FT-2000 DSNE to reset the DSNE node.

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14. At the FT-2000 shelf, use **CONFIGURATION-Set-OC3** command to set the protection mode to **0 X 1** for the OC-3 slot used for DRI connections, if only one **OLIU** is used for the DRI connection. If two **OLIU**s are used for the DRI connection, use **CONFIGURATION-Set-OC3** command to set the protection mode to **1 + 1** for the OC-3 slot used for DRI connections.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

15. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line tests to work when the optical span is being established. Default condition in DDM-2000 is "enabled" for the DCC channel. If it has been disabled, use the **`set-fecom:`** command **at the DDM-2000 shelf** to enable far end communications.

At the DDM-2000 shelf, use the **`set-fecom:`***`address`***`:com=enabled`** command to ensure far end communications (fecom) is enabled.

16. At the FT-2000 shelf, use **`CONFIGURATION-Enter-Assignment-DCC`** command to assign a DCC channel to slot(s) used for DRI connections, if required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
17. Perform end-to-end OC-3/IS-3 line test at DRI nodes associated with the FT-2000 secondary node (for example, between nodes A and D in Figure 1).	DLP-515
18. At the OC-3 DRI node, use the **ent-crs-sts1** or **ent-crs-vt1** commands to make proper "drop and continue" cross-connections.	DLP-550
19. At the FT-2000 **primary** node, use the **FAULT-Switch-Path-STS3-Manual** command to switch the designated tributary from primary node to secondary node. (Switch traffic to secondary node.) See Figure 2.	
20. Discontinue the EC-1 interface cross-connections at the OC-3 node associated with the FT-2000 primary node. Note that only cross-connections at the DRI node are being discontinued when using the procedures of NTP-036.	NTP-036
21. At the OC-3 node associated with the FT-2000 **primary** dual ring interworking node, remove both **STS1E** circuit packs from function unit slots being upgraded to **OLIU**s. (For example, node C in Figure 2.)	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
22. Momentarily depress **UPD** button on **SYSCTL** or use the **`update`** command from the CIT.	
23. At the FT-2000 **primary** dual ring interworking node (For example, node B in Figure 2), use FT-2000 procedures to "Delete EC-1 Low Speed Port".	
24. At the FT-2000 **primary** dual ring interworking node, use FT-2000 procedures to "Add OC-3 Low Speed Slots".	
25. Verify/set "Network/User" switches on **OHCTL**s at the DDM-2000 end of optical span between the FT-2000 primary node and DDM-2000.	**DLP-513**
26. Install **22G-U/22G2-U/22F OLIU**(s) (OC-3) or **22D-U OLIU**(s) (IS-3) in the OC-3 node.	**DLP-504**
27. At the OC-3 shelf, use the **`set-oc3`** command to disable Kbyte messages for the function unit group used to connect to the FT-2000.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
28. At the FT-2000 shelf, use **CONFIGURATION-Set-OC3** command to set the protection mode to **0 X 1** for the OC-3 slot used for DRI connections, if only one **OLIU** is used for the DRI connection. If two **OLIU**s are used for the DRI connection, use **CONFIGURATION-Set-OC3** command to set the protection mode to **1 + 1** for the OC-3 slot used for DRI connections.	
29. At the DDM-2000 shelf, use the **set-fecom:***address*:**com=enabled** command to ensure far end communications (fecom) is enabled.	
30. At the FT-2000 shelf, use **CONFIGURATION-Enter-Assignment-DCC** command to assign a DCC channel to slot(s) used for DRI connections.	
31. At the OC-3 shelf, use the set-oc3 command to disable Kbyte messages for the function unit group used to connect to the FT-2000.	
32. Perform end-to-end OC-3/IS-3 line test at DRI nodes associated with the FT-2000 primary node (for example, nodes B and C in Figure 2).	**DLP-515**
33. At the OC-3 DRI node, use the **ent-crs-sts1** or **ent-crs-vt1** commands to make proper "drop and continue" cross-connections.	**DLP-550**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
34. At FT-2000 primary node, use the **`FAULT-Switch-Path-STS3-Reset`** command to switch the designated tributary from secondary node to primary node. (Switch traffic to primary node.)	
35. Remove all EC-1/DS3 connections between the nodes with **STS1E/STS1E** circuit packs removed, if required.	
36. The upgrade is now complete.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

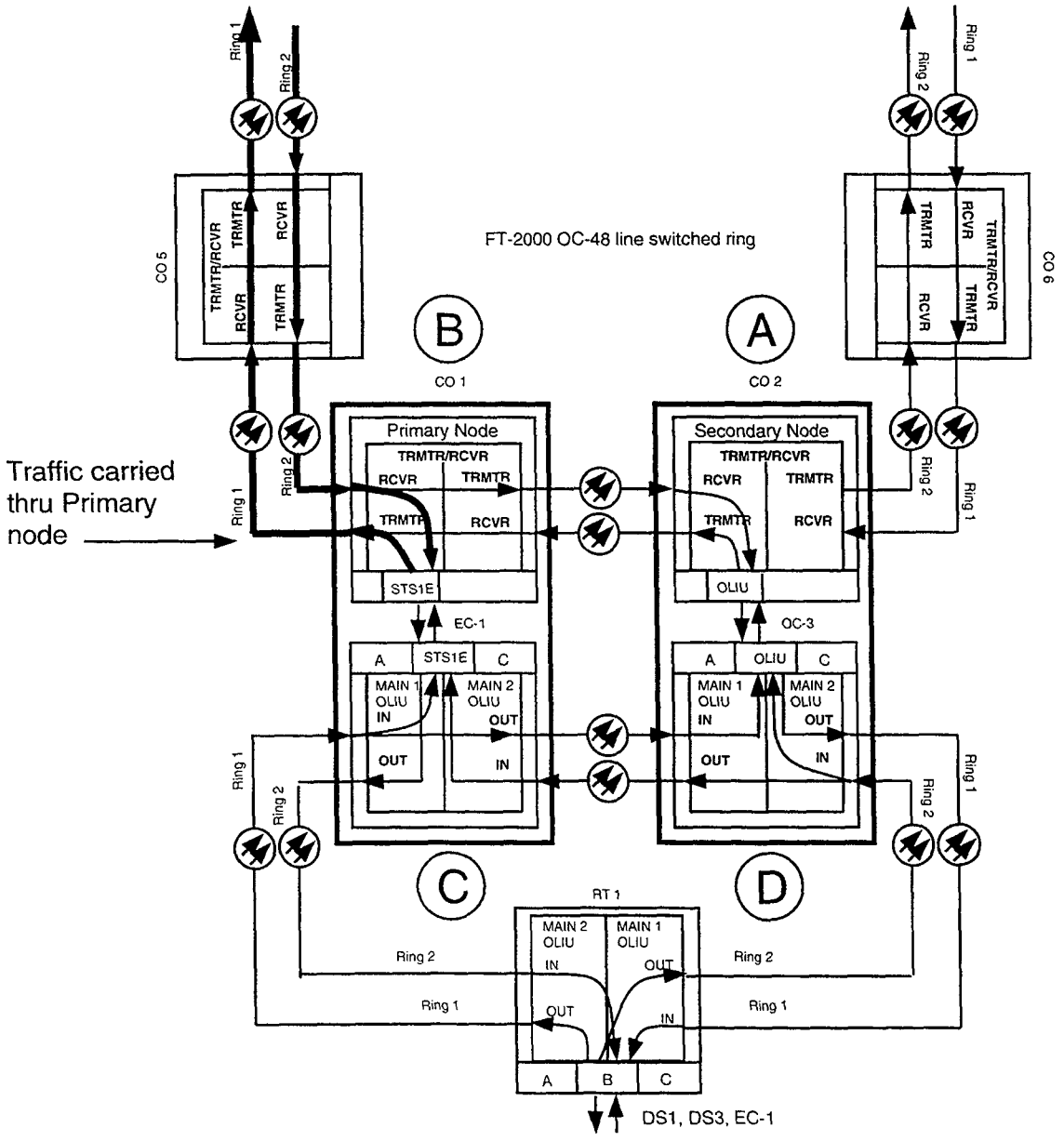


Figure 1. OC-3/OC-48 DRI Interworking

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

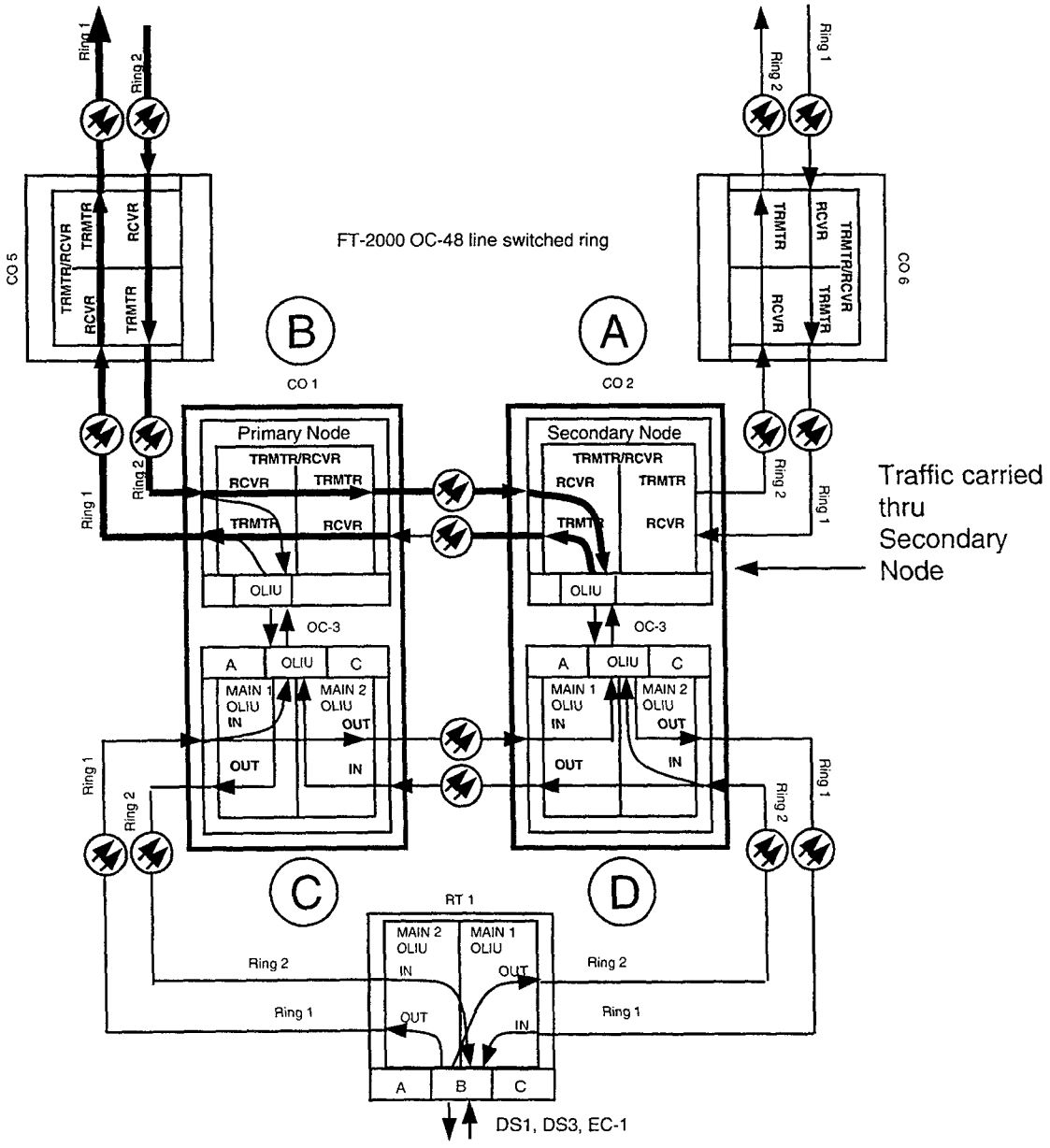


Figure 2. OC-3/OC-48 DRI Interworking

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Using Far End Select (FE SEL) . . . . . Detailed Level Procedure: DLP-530

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Reference Only Procedures

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Replace Circuit Pack (Reference Only)	Detailed Level Procedure: DLP-523

SNC-2000 cPro System Backup and Restore

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE:
The SNC-2000 cPro Graphical User Interface and Provisioning Tool includes backup and restore features to protect provisioning information in ring applications. These features save a copy of a node's provisionable parameters so they can be restored at a later date, if necessary.

These features provide backup and restore for:

- Cross-connections
- DS1 port options
- DS3 port options
- EC-1 port options
- OC-3 line options.

See the SNC-2000 cPro Graphical User Interface and Provisioning Tool on-line user's guide for more information on these features.

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Trouble Clearing

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Maintenance Philosophy

Overview

The maintenance philosophy is built on gathering system information at two levels. One maintenance level is a local visual inspection of the user panel and the circuit pack LEDs. The user panel LEDs show a composite of near end and far end alarms. By using the **FE SEL** button on the **SYSCTL**, the alarm conditions at any site may be displayed. Most problems can be corrected at this level. A second maintenance level requires a craft interface terminal (CIT) for detailed information on the local and/or remote DDM-2000 OC-3 terminals. The CIT retrieves detailed reports about performance monitoring, alarms and status, and system configuration for near and far end terminals.

Trouble Analysis Procedures

The trouble analysis procedures in this document involve replacing faulty circuit packs and obtaining performance reports and/or alarm and status reports for analysis to determine proper system operation and/or trouble. If the trouble cannot be corrected or identified, the procedures direct the technician to obtain assistance because no more step-action procedural data is known for the specific trouble.

RTAC Assistance

The technician must make the decision regarding trouble analysis, corrective action, and obtaining assistance. The technician or local technical support staff may choose to continue trouble analysis based on their knowledge or experience on the DDM-2000 system, or may elect to obtain assistance by calling the Regional Technical Assistance Center **1-800-225-RTAC**.

COACH Assistance

Various customer computer-support tools are on-line and available via COACH. A login identification and password must be obtained to gain access to the COACH tools. Contact your regional DDM-2000 coordinator for information on obtaining a COACH login.

Diagnostic Dictionary	The Diagnostic Dictionary tool gives the user access to previously detected symptoms, problems, temporary fixes, cautions, and solutions. These may be usable in diagnosing, correcting, or avoiding a system problem.
Compatibility Data	The Compatibility Data tool gives the user access to hardware configuration data that is compatible to a user-specified software generic.
News and Bulletin	The News and Bulletin tool allows the user to process News and Bulletin information. News consists of messages which may be of general interest to the user. Bulletins contain information of a more urgent nature.

Circuit Pack Failures

Circuit pack failures are identified by LEDs and reported by system alarms and/or by manual or automatic diagnostic reports. When this occurs, a determination must be made as to why a circuit pack has failed. One recommendation as a first step for determining the cause of a failure is to unseat and then reseat the suspected circuit pack. For example, if a DS3 circuit pack is reported faulty, that circuit pack should be unseated and then reseated before being returned as defective. This will cause an automatic recovery and diagnostic operation to be performed on that DS3 circuit pack. If there is a contact problem such as dirt, oil, or lack of total contact connection, then this may be corrected by reseating and thus avoiding the return of a good unit for repair. Use caution when unseating circuit packs. For example, ensure protection switching is available for pack being removed; and **before removing a SYSCTL, always perform a countdown procedure by momentarily depressing, at the same time, the FE SEL button on the SYSCTL and the ACO/TST button on the user panel.**

When circuit packs are replaced in some sequence to clear a trouble, they should be replaced one at at time by installing the original circuit packs if they were found to be operational.

Electrostatic Discharge (ESD) Considerations

Any integrated circuit on a circuit pack can be damaged by static electricity that builds up within a work area, particularly in areas with low relative humidity. This static buildup on work surfaces and on personnel and their clothing is produced by the various charging effects of even simple movements and by contact between various objects.

As a rule, the greatest potential for electrostatic damage occurs in areas with the lowest relative humidity. But, because such damage can occur anywhere, all personnel handling circuit packs should take the following precautions:

1. Since materials such as food wrappers, plastics, and Styrofoam containers tend to generate static electricity, keep them away from all circuit packs.
2. Be sure to read all warning labels on bags and cartons before opening any packaging.
3. If possible, open all circuit packs at a static-safe work position using properly grounded wrist straps and table mats that can dissipate static electricity.
4. Whenever possible, wait to remove circuit packs from their protective antistatic packaging until it is time to insert them into a bay.
5. Never touch a circuit pack's components, conductors, or connector pins. Handle all circuit packs only by the faceplate or latch or by the top and bottom outermost edges.
6. When opening and handling circuit packs or when working on backplanes, always wear a grounded wrist strap or wear a heel strap and stand on a grounded floor mat that can dissipate static electricity.
7. Always store and transport circuit packs in static-safe packages. (Shielding is not required unless specified.)
8. Whenever you remove circuit packs from a shelf, immediately put them into static-safe packages.
9. Try to keep relative humidity above 20 percent.
10. DDM-2000 shelves are equipped with grounding jacks for connecting static ground wrist straps. The jacks are located on the bottoms of the user panels.

Clear Critical (CR) Alarm

1. ⇒ NOTE:
   Critical alarms are failures that cause loss of service to more than four DS1s (96 DS0 customer channels). Table A lists conditions which may cause critical alarms.

   Is a CIT available?

   If **NO**, then continue with **Step 2**.
   If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

   Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

4. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?

   If **NO**, then continue with **Step 5**.
   If **YES**, then proceed to **Step 16**.

5. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

6. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?

   If **YES**, then continue with **Step 7**.
   If **NO**, then do **TAP-108**.

7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display). (**DLP-530**).

8. Issue a trouble report of critical alarm condition at the far-end DDM-2000 site indicated in **FE ID** display.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. ⇒ NOTE:
For all network configurations except point-to-point, there will be multiple far-end "farend" terminals. Using a Craft Interface Terminal (CIT) aids in troubleshooting multi-shelf DDM-2000 networks.

Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system, if not already performed.

Reference: **DLP-521**

11. ⇒ NOTE 1:
The `rtrv-alm` command can be used to display a report of active alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

⇒ NOTE 2:
The `Active Alarm and Status Report` is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the `Source Address` and `Description` columns for the top entry/entries above the first single-dashed line (for example, "CRITICAL ... inc.OC3 LOS" in the report below) in the `Active Alarm and Status Report`.

```
/* Active Alarms and Status Report
=============================================================
 Alarm       Source     Date   Time      Srv   Description
 Level       Address      Detected
=============================================================
 CRITICAL    main-2     MM-DD HH:MM:SS   SA    inc  OC3 LOS
-------------------------------------------------------------
 MAJOR       m2-2-1-1   MM-DD HH:MM:SS         inc  VT AIS



 MAJOR       dcc-m2     MM-DD HH:MM:SS         section DCC chan fail
 MAJOR       dcc-m1     MM-DD HH:MM:SS         section DCC chan fail
-------------------------------------------------------------
 MINOR       main-1     MM-DD HH:MM:SS         inc  OC3 LOS
-------------------------------------------------------------
 ne-acty     -                                 holdover mode active
*/
```

Figure 1. Example of Active Alarms and Status Report

12. ⇒ NOTE:
    Far-end alarm or status conditions are listed in this report with a `Source Address` of "`farend`". Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

    Does the `Source Address` of any top entry in the alarm report indicate a **local** slot, channel, port or operations interface for the `CRITICAL` alarm?

    If **NO**, then do **TAP-107**.
    If **YES**, then continue with **Step 13**.

13. Use `opr-aco` command to silence active audible office alarms, if required.

14. Note the **local** trouble indication in the `Description` column of the `Active Alarm and Status Report`, starting with the highest alarm level (Critical) listed in the `Alarm Level` column.

15. Find the trouble description in Table A for the highest alarm level and go to the indicated step or procedure.

Table A. Critical (CR) Alarm Conditions

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. **CR** LED lighted **FAULT** LED flashing on **OLIU**(s)	incoming (inc.) OC3 loss of signal (LOS) loss of frame (LOF) sig. failed (BER) loss of pointer (LOP) STS1 #1 loss of pointer (LOP) STS1 #2 loss of pointer (LOP) STS1 #3 sig. degrade (BER)	Failure of **OLIU** at near or far end, or failure of receive fiber.	TAP-111 (R2, R3, R6) or TAP-119 (R5, R7)
	inc STS1 LOP OC3 *slotaid*	If failure on both OC-3 lines: unprotected removal or failure of **MXRVO** or **DS3** CP at far end.	Step 31
		If failure on only one OC-3 line: Failure of **OLIU** at near or far end.	TAP-111 (R2, R3, R6) or TAP-119 (R5, R7)
CRITICAL. **CR** LED lighted.	inc OC3 line AIS	Failure of **OLIU** at the far end.	Step 37
CRITICAL. **CR** LED lighted. **FAULT** LED flashing on **DS3**.	inc (from DSX) DS3 LOS* inc (from DSX) DS3 sig fail*	Equipment failed or removed at DSX-3	Step 17
CRITICAL. **CR** LED lighted **FAULT** LED flashing on **STS1E**	inc. EC1 LOS* inc EC1 LOF*~ inc EC1 sig. failed (BER)* inc EC1 sig. degrade (BER)*	Failure of incoming EC-1 signal from STSX, failure of **STS1E** at the near end, failure of incoming cable or cable disconnect at EC-1 STSX cross-connect point or shelf connector, cross talk in office wiring,	Step 17
	inc. EC1 Line AIS*	Failure of the **STS1E** circuit pack or equivalent at other end of EC-1 line.	Step 35
	inc. STS1 LOP EC1	Failure of the near-end or far-end **STS1E** circuit pack.	Step 35

See notes/footnotes at end of table

Table A. Critical (CR) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. **CR** LED lighted.	inc. STS1 AIS	Incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or obscure failure of a **DS3**, **STS1E**, **MXRVO**, or **OLIU** CP at the far end.	TAP-120
	inc. STS1 unequipped	STS-1 cross-connects have been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring.	Find the deleted cross-connects in the upstream equipment.
	inc. STS1 sig failed (BER) inc. STS1 sig degrade (BER)	Failure of **OLIU** at near end or far end or failure of receive fiber.	TAP-111 (R2, R3, R6) or TAP-119 (R5, R7)
	invalid CP switches	When associated with **TG** slot, timing mode switch settings on **TGS** circuit packs are invalid.	Step 24
CRITICAL. **CR** LED lighted. **FAULT** LED may be lighted on failed circuit packs.	Both TGS circuit packs fail Both MXRVO circuit packs fail Both OLIU circuit packs fail Both DS3 circuit packs fail Both STS1E circuit packs fail	Internal circuit pack failure. Replace circuit pack.	DLP-523

See notes/footnotes at end of table.

Table A. Critical (CR) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. **CR** LED lighted.	Both TGS circuit packs removed Both MXRVO circuit packs removed Both OLIU circuit packs removed Both DS3 circuit packs removed Both STS1E circuit packs removed	Circuit packs removed without doing upd command to remove circuit packs from equipment list.	Step 29
	CP not allowed - (crs)	CP does not support the manual cross-connection(s) currently provisioned for this slot.	Change CP or change cross-connections
	CP not allowed - (timing)	When associated with **TG** slot, current CP switch settings do not support the sync. timing provisioned.	Change TGS switches [**DLP-513**] or change sync. parameters (**set-sync**).
		When associated with function unit slot C, CP type does not support the current provisioned sync. parameters. (**set-sync**.	Change CP type or change timing options
	environment***n****	Default message, can be changed. An environmental alarm point (miscellaneous discrete input) is active	Use **rtrv-attr-env** command at RT to determine cause

See notes/footnotes at end of table.

Table A. Critical (CR) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure

CRITICAL. **CR** LED lighted. **FAULT** LED lighted on circuit pack.	`unexpected CP switches`
	`unexpected CP type/switches`
	`unexpected CP type`
		Switch settings invalid, different from other circuit pack, or different than they were before circuit pack was removed or replaced. Circuit pack inserted into slot provisioned for different circuit pack.	Step 21

CRITICAL. **CR** LED lighted.	`illegal CP type`	An illegal or unknown circuit pack type has been inserted into the shelf.	Remove CP and install correct CP.
	`2nd CP required for BBF3`	The BBF3 (DS1PM) circuit pack requires both function unit slots in the group to be equipped.	Insert CP of same type in the companion function unit slot.
CRITICAL. **CR** LED lighted	`frequency error`	The DS1 external timing reference or the timing from a remote shelf has a frequency offset greater than 20 hertz.	Check the DS1 external timing source or the timing obtained from a remote shelf.

Note: Similar descriptions of trouble may also appear in the CIT Alarm and Status Report.

*May be provisioned for Critical, Major, Minor or no alarm.

16. ⇒ NOTE:
The alarm level for incoming DS3/EC-1 signal failure may be set for Critical. The `set-t3` (DS3) or `set-ec1` (EC-1) command is used to set the alarm level.

Is the **FAULT** LED on any **DS3/ STS1E** circuit pack flashing?

If **YES**, then continue with **Step 17.**
If **NO**, then proceed to **Step 19.**

17. Issue a trouble report of a bad incoming DS3 (EC-1) signal from DSX-3 (STSX) cross-connect point. Clear trouble using local procedures. If no trouble found, replace **STS1E** circuit pack at near end.

Reference: **DLP-523**

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. Is **FAULT** LED on an **OLIU** circuit pack lighted or flashing?

If **YES**, then do **TAP-111** if not Release 5.
Do **TAP-119** if Release 5 (ring configuration).
If **NO**, then continue with **Step 20.**

20. ⇒ NOTE:
Failure of both the service and protection **TGS, MXRVO, STS1E**, or **DS3** circuit packs will activate a Critical alarm.

Are the **FAULT** LEDs lighted (not flashing) on a service and protection circuit pack of the same type?

If **YES**, then continue with **Step 21.**
If **NO**, then proceed to **Step 28.**

21. ⇒ NOTE:
Alarm may be caused by circuit packs inserted into the wrong slots or by invalid or wrong switch settings on the **TGS** circuit packs.

Are circuit packs installed in the correct slots?

If **YES**, then proceed to **Step 24**.
If **NO**, then continue with **Step 22**.

22. Remove circuit packs from wrong slots, check option switches (**DLP-513**) and reinstall circuit packs into the correct slots.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

24. ⚠ CAUTION:
When removing circuit packs ensure that protection switching is available. Also, remove the circuit pack without the lighted **ACTIVE** *LED first.*

Check switch settings (`rtrv-sync` command) on the **TGS** circuit packs for correct settings. If the circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced. Also check if the switches are set the same as the companion circuit pack.

Reference: **DLP-513**

25. Are switch settings correct?

If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 26**.

26. Change switch settings to the correct settings. (Use `sw-sync` command to switch to other circuit pack before removing pack.) If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

28. Have two of the same type (service and protection **TGS**, **MXRVO**, **STS1E**, or **DS3**) circuit packs been removed from the system?

If **YES**, then continue with **Step 29**.
If **NO**, then do **TAP-108**.

29. Determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. Indications are that there is an unprotected failure or removal of a **MXRVO**(s) or **DS3**(s) circuit pack at the far-end associated with the identified **OLIU** slot at the near-end. Determine location of the circuit pack(s) from office records or use the `rtrv-crs-()` commands to trace back through the STS1/VT1.5 cross-connections associated with the identified **OLIU** slot.

32. If circuit packs are removed, determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the `upd` command. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the `upd` command to remove the circuit pack from the inventory.

33. If the **MXRVO** or **DS3** circuit packs have not been removed, replace the **MXRVO** or **DS3** circuit pack associated with the identified **OLIU** slot in the alarm message.

    Reference: **DLP-523**

34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

35. If the source address is a function unit slot, the likely cause of trouble is a failure of the equipment at the far end of the EC-1 line (towards the STSX) or the near-end **STS1E** circuit pack. Replace **STS1E** circuit pack [**DLP-523**]. If trouble does not clear, issue a trouble report of equipment failure at the far end.

    If the source address is an **OLIU** slot, the likely cause of trouble is a failure of the far-end **STS1E** circuit pack associated with the identified STS-1 signal. Determine location of the **STS1E** circuit pack from office records or use the `rtrv-crs-( )` commands to trace back through the STS1/VT1.5 cross-connections associated with the identified STS-1 signal. Replace far-end **STS1E** circuit pack.

    Reference: **DLP-523**

36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. Replace **OLIU**s at far end that are associated with the `Source Address` of the "`inc. OC3 line AIS`" alarm message.

    Reference: **DLP-523**

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Major (MJ) Alarm

1. ⇒ NOTE:
   Major alarms are failures that cause loss of service to 96 or less DS0 customer channels. Table A lists conditions which may cause a major alarm.

   Is a CIT available?

   If **NO**, then continue with **Step 2**.
   If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

   Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

4. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?

   If **NO**, then continue with **Step 5**.
   If **YES**, then proceed to **Step 15**.

5. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

6. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?

   If **YES**, then continue with **Step 7**.
   If **NO**, then do **TAP-108**.

7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display). (**DLP-530**).

8. Issue a trouble report of critical alarm condition at the far-end DDM-2000 site indicated in **FE ID** display.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. ⇒ NOTE:
For all network configurations except point-to-point, there will be multiple far-end "farend" terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

Connect the CIT to the **CIT** connector on the near-end User Panel and log in or remote log in to the near-end system, if not already performed.

Reference: **DLP-521**

11. ⇒ NOTE 1:
The **rtrv-alm** command can be used to display a report of active alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

⇒ NOTE 2:
The Active Alarm and Status Report is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line in the Active Alarm and Status Report (Figure 1) (for example, "MAJOR m1-1-1-1 MM-DD HH:MM:SS SA inc. VT AIS").

```
/* Active Alarms and Status Report
============================================================
 Alarm       Source     Date   Time       Srv   Description
 Level       Address      Detected
============================================================
 MAJOR       m1-1-1-1   MM-DD HH:MM:SS    SA    inc. VT AIS
------------------------------------------------------------
 ne-acty     m2-1-1-1   MM-DD HH:MM:SS    nsa   inc. VT AIS
*/
```

Figure 1. Example of Active Alarms and Status Report

12. ⇒ NOTE:
Far-end alarm or status conditions are listed in this report with a `Source Address` of "`farend`". Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

Does the `Source Address` of any top entry in the alarm report indicate a **local** slot, channel, port or operations interface for the `MAJOR` alarm?

If **NO**, then do **TAP-107**.
If **YES**, then continue with **Step 13**.

13. Use **`opr-aco`** command to silence active audible office alarms, if required.

14. Note the **local** trouble indication in the `Description` column of the `Active Alarm and Status Report`, starting with the highest alarm level (Major) listed in the `Alarm Level` column.

15. See Table A for trouble description for the highest alarm level and go to the indicated step or procedure.

Table A. Major (MJ) Alarm Conditions

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. **MJ** LED lighted.	AGNE communication failure	The AGNE has not been assigned in an alarm group The AGNE and NE(s) are assigned different alarm group numbers. The AGNE has failed (Unless there are 2 or 3 AGNEs)	Use **rtrv-ne** command to check AGNE assignment and alarm group number assignment Use **set-ne** command to change AGNE assignment and alarm group assignment.
MAJOR. **MJ** LED lighted.	CP not allowed - (eqpt)	A **DS1/DS1PM** CP is installed in a low speed slot associated with function unit provisioned for DS3, STS1E low speed, or OLIU service.	Remove DS1 pack or change function unit to **MXRVO** or **STS1E-H**.
MAJOR. **MJ** LED lighted.	DSNE communication failure	No network element has been provisioned as a directory service network element (DSNE), Release 6 or later.	See the **set-ne** and **rtrv-ne** commands for DSNE provisioning information. Use the **set-ne** command to provision one (and only one) shelf as the DSNE
MAJOR **MJ** LED lighted. **FAULT** LED lit on **SYSCTL** and **OHCTL** CP.	duplicate site/ne address	Two or more shelves in the network have the same site address (determined by switches on the **SYSCTL** CP) and the same network element address (determined by switches on the **OHCTL** CP)	Use **rtrv-ne** command to check switch settings at each shelf. Change CP switches. [**DLP-513**]
MAJOR. **MJ** LED lighted	duplicate DSNE	A shelf have been provisioned as a directory services network element (DSNE) in a network that already has a DSNE. Only one network element in the network may be provisioned as the DSNE	Delete duplicate DSNE using **set-ne** command. Reset remaining DSNE. See **set-ne** and **rtrv-ne** commands for DSNE provisioning information

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. **MJ** LED lighted	duplicate GNE	A shelf have been provisioned as a gateway network element (GNE) in a network that already has a GNE. Only one network element in the network may be provisioned as the GNE.	Provision only one shelf as GNE. See **set-ne** and **rtrv-ne** commands for GNE provisioning information.
	duplicate TBOS display	Two or more shelves in the network have the same TBOS display number (determined by switches on the **SYSCTL** CP).	Use **rtrv-ne** command to check switch settings at each shelf. Change CP switches. [**DLP-513**]
	duplicate TID	Two or more shelves in the network have the same system name or "TID" set by the **set-ne** command.	Change TID of improperly named shelves. [**DLP-513**]
	externalMinor*	External minor alarm (environmental alarm input 15) is active. DC power or cooling fan in RT failed.	Clear trouble using local procedures.
	environment***n****	An environmental alarm point (miscellaneous discrete input) is active	Clear trouble using local procedures
MAJOR. **MJ** LED lighted **FAULT** LED flashing on **TGS**.	incoming (inc.) DS1 sync. ref. loss of signal (LOS) loss of frame (LOF) bit error rate (BER) alarm indication signal (AIS) out of lock (OOL) excessive out of frame (EOOF)	Failure of **TGS** at near or far end, or failure of upstream timing supply, timing eqpt , system set for SF and received DS1 is ESF	Step 23
MAJOR. **MJ** LED lighted. **FAULT** LED flashing on **DS3**	inc. (from DSX) DS3 LOS† inc. (from DSX) DS3 sig. fail†	Equipment failed or DSX-3 signal removed	Step 21

See notes and footnotes at end of table

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure

MAJOR. **MJ** LED lighted. **FAULT** LED flashing on **STS1E**.	`inc. EC1 LOS*`
	`inc. EC1 LOP*`
	`inc. EC1 sig. failed (BER)*`
	`inc. EC1 sig. degrade (BER)*`
		Failure of the **STS1E** or equivalent circuit pack at other end of EC-1, failure of the incoming cable, failure of the **STS1E** circuit pack at the near end, cross talk in office wiring, or a cable disconnect at the EC-1 STSX cross-connect point or shelf connector.	Step 21

	`inc. EC1 Line AIS*`	Failure of **STS1E** circuit pack or equivalent at other end of EC-1 line.	Step 21
	`inc. STS1 LOP EC1`	Failure of the far end **STS1E** circuit pack or failure of the **STS1E** circuit pack at the near end.	Step 21
MAJOR. **MJ** LED lighted. **FAULT** LED flashing on **DS1**	`inc. (from DSX) DS1 LOS†` `inc. (from DSX) DS1 sig. fail†`	Equipment failed or DSX-1 signal removed	Step 19
MAJOR. **MJ** LED lighted. **FAULT** LED lighted on circuit pack.	`DS1 CP failed` `DS1PM CP failed`	Two service **DS1/DS1PM** CPs failed Unprotected service **DS1/DS1PM** CP failure.	Step 62
	`SYSCTL CP failed`	Internal circuit pack failure	Step 42
	`OHCTL CP failed`	Internal circuit pack failure	Step 50
MAJOR. **MJ** LED lighted.	`Software upgrade failed`	Need to repeat download procedure. Link failure between PC and system. PC disk (diskette) failure. **SYSCTL** failure.	TAP-116

	`DS1 circuit pack removed`
	`DS1PM circuit pack removed`
	`OHCTL circuit pack removed`
		Circuit packs removed without doing **upd** command to remove circuit packs from equipment list.	Step 59

	`unexpected CP type/switches`
	`unexpected CP type`
	`unexpected CP switches`
		Switch settings invalid, different from other circuit pack, or different than they were before circuit pack was removed or replaced Circuit pack inserted into slot provisioned for different pack	Step 67

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. **MJ** LED lighted.	illegal CP type	An illegal or unknown circuit pack type has been inserted into the shelf.	Remove CP and install correct CP.
	inc. VT LOP	Unprotected failure of **DS1/DS1PM** or **MXRVO** at near end or far end.	Replace failed CP [**DLP-523**]
	inc. VT AIS	Incomplete or incorrect cross-connect provisioning in end-to-end network. In ring applications, unprotected removal or failure of **DS1/DS1PM** CP at far end; fiber or **OLIU** failure.	TAP-120
	excessive holdover	System has been in holdover mode for more than 4 hours because of timing ref. fail or manual switch.	Check timing ref., check state of eqpt. (**rtrv-state**)
MAJOR. **MJ** LED lighted Flashing **FAULT** LED on **OHCTL**	section DCC channel failed	**SYSCTL** failure, reset, or initialization at far end. **SYSCTL** removed from a site. Program installation in progress or failed at far end. **SYSCTL** or **OHCTL** failed at near end. **OLIU** or fiber failure between this node and node connected to the source address (no communication with other end).	Step 25
MAJOR **MJ** LED lighted.	Inconsistent DCC switches	The "User/Network" switch on the **OHCTL** CP is set the same at both ends of a DCC (optical span)	Use **rtrv-ne** command to check switch settings at each shelf in the network. Change switches at one end [DLP-513]
	X.25 communication failure	X.25 communication eqpt. failed; failure at the OS. System provisioned as a TL1/X.25 gateway network element (GNE) but this interface is not being used.	Issue trouble report to OS Enable X.25 interface or use **set-ne:tid**:gne=no command to set GNE=no.

See notes and footnotes at end of table

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. **MJ** LED lighted.	`TID address map full`	Network elements have been removed from the network but not from the DS-NE database located at the GNE. See the **`dlt-tadrmap`** command.	Delete removed NEs from database.
	`frequency error`	The DS1 external timing reference or the timing from a remote shelf has a frequency offset greater than 20 hertz.	Check the DS1 external timing source or the timing obtained from a remote shelf.
	`inc. VT unequipped`	VT1.5 cross-connects have been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring.	Find the deleted cross-connects in the upstream equipment.

Note: Similar descriptions of trouble may also appear in the CIT Alarm and Status Report.

* May be provisioned for Critical, Major, Minor or no alarm.

† May be provisioned for Major, Minor or no alarm

16. ⇒ NOTE:
If a program installation is being performed to a **SYSCTL** at the far end, it is normal for the **FAULT** LED on the near-end **OHCTL** to flash and the **MJ** and **NE ACTY** LEDs to light on the User Panel. If there is a **MJ** alarm at the end receiving the program, trouble is indicated. You should check if a program installation is being done.

Was new software generic being downloaded (program upgrade) to the **SYSCTL** at this end when alarm occurred?

If **YES**, then do **TAP-116**.
If **NO**, then continue with **Step 17**.

17. Is the **FAULT** LED on the faceplate of one or more circuit packs flashing?

    If **YES**, then continue with **Step 18**.
    If **NO**, then proceed to **Step 41**.

18. Find the circuit pack(s) with a flashing LED in Table B below and go to the indicated step or procedure.

Table B. Circuit Pack(s) With Flashing LED

Circuit Pack	Go To
DS1/DS1PM	Step 19
DS3/STS1E (SRV or PROTN)	Step 21
TGS	Step 23
OHCTL	Step 33
OLIU (linear)	TAP-111
OLIU (rings)	TAP-119

19. Switch service to protection. If LED is flashing on protection **DS1/DS1PM**, issue trouble report of bad incoming signal at input to **DS1/DS1PM** circuit pack with flashing LED(s). If LED is not flashing on protection **DS1/DS1PM**, replace service **DS1/DS1PM** circuit pack [**DLP-523**].

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. Switch service to protection. If LED is flashing on protection **DS3/STS1E**, issue trouble report of bad incoming DS3/EC-1 signal from DSX-3/STSX cross-connect point. If LED is not flashing on protection **DS3/STS1E**, replace service **DS3/STS1E** circuit pack [**DLP-523**].

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. Check **TGS** option switches for proper line coding and frame format settings (`rtrv-sync`). If no trouble found, check incoming timing reference signals. If timing reference signals are bad, issue trouble report of bad incoming timing reference signal(s). If no trouble found with timing references, replace **TGS** circuit packs.

    Reference: **DLP-523**

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. ⇒ NOTE:
If a program installation is being performed to a **SYSCTL** at the far end, it is normal for the **FAULT** LED on the near-end **OHCTL** to flash and the **MJ** and **NE ACTY** LEDs to light on the User Panel. If there is a **MJ** alarm at the end receiving the program, trouble is indicated. You should check if a program installation is being done.

Is new software generic being downloaded (program upgrade) to the **SYSCTL** at the far end terminal?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 26**.

26. In alarm report, is there any indication of **OLIU** or fiber trouble at near end or far end such as "`inc. OC3 FERF`" alarm message?

If **YES**, then continue with **Step 27**.
If **NO**, then proceed to **Step 29**.

27. ⇒ NOTE:
If there is a DCC failure, a remote login to the shelf connected through the `Source Address` cannot be done. The **`rtrv-alm`** and **`rtrv-nmap`** or **`rtrv-map-neighbor`** (R7.2) command can be used to check for `dcc failure` for main (and function units A, B, or C). Also, use **`rtrv-fecom`** command to see if "fecom" has been disabled.

Note `Source Address` of DCC channel failure. Check optical fibers connected through the `Source Address` per local procedures. If no trouble found, replace near-end **OLIU** first then far-end **OLIU**.

Reference: **DLP-523**

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. Use CIT and **reset** command to reset **SYSCTL** at the near end or unplug and reseat the **SYSCTL**.

30. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (section DCC channel failed)?

    If **YES**, then continue with **Step 31**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. If possible, use CIT and **rlgn** command to log in to the far-end terminal (**DLP-522**) and use the **reset** command to reset **SYSCTL** at the far end.

32. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (section DCC channel failed)?

    If **YES**, then proceed to **Step 37**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

33. ⚠ CAUTION:
    Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

    ⇒ NOTE 1:
    Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

    ⇒ NOTE 2:
    Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

    Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

34. Is the **FAULT** LED on the affected circuit pack still flashing?

    If **YES**, then continue with **Step 35**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

35. Obtain a CIT and repeat this procedure.

36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. ⚠ CAUTION:
    Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

    ⇒ NOTE:
    Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

    Refer to **DLP-501** and replace **SYSCTL** at near-end terminal.

38. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing?

    If **YES**, then continue with **Step 39**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

39. At far-end terminal, reset **SYSCTL** by unseating and reseating **SYSCTL** or by using a CIT and the `reset` command, if not already performed. If **FAULT** LED is still flashing after a reset, refer to **DLP-501** and replace **SYSCTL** at far-end terminal. If the **FAULT** LED is still flashing after the **SYSCTL** is replaced, replace the **OHCTL** [**DLP-523**] first at one end and then the other, if trouble still exists.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

41. Is the **FAULT** LED lighted on the **SYSCTL**?

    If **YES**, then continue with **Step 42**.
    If **NO**, then proceed to **Step 49**.

42. ⚠ CAUTION:
    Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

    ⇒ NOTE:
    Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

    Remove **SYSCTL** and check data rate and site switch settings. Two or more shelves cannot have the same site address.

    Reference: **DLP-513**

43. Are switch settings correct?

    If **YES**, then proceed to **Step 45**.
    If **NO**, then continue with **Step 44**.

44. Set switches to correct settings.

    Reference: **DLP-513**

45. Reinstall the **SYSCTL**. Is the **FAULT** LED still lighted?

    If **YES**, then continue with **Step 46**.
    If **NO**, then proceed to **Step 48**.

46. Refer to **DLP-501** and replace the **SYSCTL**.

47. Is the **FAULT** LED still lighted on the **SYSCTL**?

    If **YES**, then proceed to **Step 53**.
    If **NO**, then continue with **Step 48**.

48. Is the **MJ** alarm LED still lighted?

    If **YES**, then continue with **Step 49**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

49. Is the **FAULT** LED on **OHCTL** lighted?

    If **YES**, then continue with **Step 50**.
    If **NO**, then proceed to **Step 55**.

50. Remove **OHCTL** and check switch settings for correct network element number. Two or more shelves cannot have the same network element number. If switch settings are correct, refer to **DLP-523** and replace **OHCTL** circuit pack.

51. Is the **FAULT** LED on **OHCTL** still lighted?

    If **YES**, then proceed to **Step 53**.
    If **NO**, then continue with **Step 52**.

52. Is the **MJ** alarm LED still lighted?

    If **YES**, then proceed to **Step 55**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

53. The problem appears to be in the backplane of the DDM-2000 or another circuit pack in the shelf is causing the **FAULT** LED on the **SYSCTL** to light. Remove service from one function group (A, B, or C) and unseat all circuit packs associated with that group. If the trouble clears, it means that one or more of the circuit packs removed is defective. If the trouble does not clear, reinsert the removed circuit packs and repeat the above for another function group. If the trouble cannot be isolated by removing circuit packs, seek technical assistance and/or replace the shelf. Notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

54. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

55. ⇒ NOTE:
A major alarm may also be caused by a wrong circuit pack inserted into the **AUXCTL** slot, DS1 line code switch settings that are different from what they were before a **DS1/DS1PM** circuit pack was replaced, excessive holdover due to loss of synchronization reference, or a manual switch to holdover in effect too long.

Is any circuit pack except an **OHCTL** installed in the **AUXCTL** slot?

If **YES**, then continue with **Step 56**.
If **NO**, then proceed to **Step 58**.

56. Remove wrong circuit pack from **AUXCTL** slot and install correct **OHCTL** circuit pack [**DLP-523**].

57. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

58. ⚠ CAUTION:
If a DS1 is switched to protection, removal of any other **DS1/DS1PM** *circuit pack or* **177P** Retainer Card in the same group will result in a loss of service to the protected DS1 and the removed **DS1/DS1PM** circuit pack.

Has an unprotected **DS1/DS1PM** circuit pack or more than one **DS1/DS1PM** circuit pack been removed from the system?

If **YES**, then continue with **Step 59**.
If **NO**, then proceed to **Step 61**.

59. Determine the reason the circuit packs were removed. If the same circuit pack(s) is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.

60. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

61. Is **FAULT** LED lighted on any **DS1/DS1PM** circuit pack?

If **YES**, then continue with **Step 62**.
If **NO**, then proceed to **Step 66**.

62. Check switch settings on **DS1/DS1PM** circuit pack (with lighted **FAULT** LED) for correct line code settings. If circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced.

Reference: **DLP-513**

63. Are switch settings correct?

    If **YES**, then do **TAP-103**.
    If **NO**, then continue with **Step 64**.

64. Change switch settings to the correct settings. If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.

65. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

66. Is there an "`inc. VT AIS`" alarm indication?

    If **YES**, then do **TAP-120**.
    If **NO**, then do **TAP-103**.

67. ⇒ NOTE:
    Alarm may be caused by circuit packs inserted into the wrong slots or by invalid or wrong switch settings on the **TGS** circuit packs.

    Are circuit packs installed in the correct slots?

    If **YES**, then proceed to **Step 70**.
    If **NO**, then continue with **Step 68**.

68. Remove circuit packs from wrong slots, check option switches (**DLP-513**) and reinstall circuit packs into the correct slots.

69. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

70. ⚠ CAUTION:
When removing circuit packs ensure that protection switching is available. Also, remove the circuit pack without the lighted **ACTIVE** *LED first.*

Check switch settings on the circuit packs for correct settings. If the circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced. Also check if the switches are set the same as the companion circuit pack.

Reference: **DLP-513**

71. Are switch settings correct?

If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 72**.

72. Change switch settings to the correct settings. (Use `sw-( )` command to switch to other circuit pack before removing pack.) If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.

73. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Multiple Failure

1. ⚠ CAUTION:
Although the **FAULT** *LEDs may be lighted or flashing on an* **OLIU**, *service may be interrupted if the* **OLIU** *is removed. The* **OLIU**s *may be in unidirectional switching mode and transmitting on one* **OLIU** *while receiving on the other. The state of the switch mode must be analyzed before removing an* **OLIU**.

⇒ NOTE:
A multiple failure condition exists when a service circuit pack and its associated protection circuit pack have failed, when two service DS1 circuit packs in the same group have failed, or when the switch mode is inhibited or locked and a failure occurs on a service circuit pack.

Is the **FAULT** LED on an **OLIU** lighted (`CP failed`) or flashing (`inc. OC3 LOS`, etc.)?

If **YES**, then do **TAP-111** if linear.
Do **TAP-119** if ring configuration.
If **NO**, then continue with **Step 2**.

2. Are the **FAULT** LEDs on both a service and protection circuit pack of the same type lighted (not flashing) (`CP failed`)?

If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 7**.

3. ⚠ CAUTION:
Replacement circuit pack may have option switches which must be properly set before the circuit pack is installed.

Replace the service circuit pack with the lighted **FAULT** LED.

Reference: **DLP-523**

4. Is the **FAULT** LED on the circuit pack just replaced off?

   If **YES**, then continue with **Step 5**.
   If **NO**, then do **TAP-106**.

5. Replace the protection circuit pack with the lighted **FAULT** LED.

   Reference: **DLP-523**

6. Is the **FAULT** LED on the circuit pack just replaced off?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then do **TAP-106**.

7. Are the **FAULT** LEDs on two or more service **DS1** circuit packs lighted (not flashing)?

   If **YES**, then continue with **Step 8**.
   If **NO**, then proceed to **Step 12**.

8. Replace either of the service **DS1** circuit packs with the lighted **FAULT** LED.

   Reference: **DLP-523**

9. Is the **FAULT** LED on the circuit pack just replaced off?

   If **YES**, then continue with **Step 10**.
   If **NO**, then do **TAP-106**.

10. Replace the other service **DS1** circuit pack with the lighted **FAULT** LED.

    Reference: **DLP-523**

11. Is the **FAULT** LED on the circuit pack just replaced off?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then do **TAP-106**.

12. Use CIT and the `rtrv-( )` commands (`rtrv-state`, `rtrv-sync`, etc.) to check switching mode for inhibits, locks, etc.

13. Was any trouble found?

    If **YES**, then continue with **Step 14**.
    If **NO**, then do **TAP-108**.

14. Determine reason for locks, inhibits, etc. to be in place. See the "Commands and Reports" section of this manual for a description of the `switch-( )` commands and the `rtrv-alm` command report descriptions. Use the `switch-( )` commands to reset switching mode or priority.

    If you need assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Power Minor (PMN) Alarm

1. ⚠ CAUTION:
   There is an AC power failure at the remote DDM-2000 terminal. This will result in a service interruption if it is not restored.

   Are you at the remote terminal site?

   If **YES**, then proceed to **Step 5.**
   If **NO**, then continue with **Step 2.**

2. Momentarily depress the **ACO** pushbutton on the DDM-2000 User Panel.

   Response: The audible alarm is silenced.

3. Issue a trouble report of an AC power failure at the remote terminal.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. What type of RT configuration do you have?

   If **Bulk Power**, then continue with **Step 6.**
   If **Distributed Power**, then proceed to **Step 8.**

6. Use documentation for your bulk power plant to clear trouble. Check AC circuit breakers and verify AC power is present at the RT enclosure.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Using digital multimeter (DMM), measure incoming AC voltage (Use **AC** and **GND** jacks on **LDU** faceplate in J1C182BA power shelf).

9. Is measured AC voltage between 105 and 129 volts?

   If **YES,** then continue with **Step 10.**
   If **NO,** then proceed to **Step 19.**

10. Is power shelf a J1C182BA Power Shelf?

    If **YES**, then continue with **Step 11.**
    If **NO**, then proceed to **Step 27.**

11. Is **FAIL** LED lighted on any **336A RECTIFIER**s at RT?

    If **YES,** then continue with **Step 12.**
    If **NO,** then proceed to **Step 14.**

12. Replace **336A RECTIFIER**s that have **FAIL** LED lighted.

13. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 27.**

14. Is **BAT DISCHG** LED lighted on any **337A BATTERY CHARGER**(s)?

    If **YES,** then continue with **Step 15.**
    If **NO,** then proceed to **Step 27.**

15. Replace one **336A RECTIFIER**.

16. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 17.**

17. Replace another **336A RECTIFIER**.

18. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 27.**

19. Is fuse blown or circuit breaker tripped at RT main AC circuit breaker box?

    If **YES,** then continue with **Step 20.**
    If **NO,** then proceed to **Step 23.**

20. Replace blown fuse or reset circuit breaker.

21. Does fuse blow or circuit breaker trip again?

    If **YES,** then proceed to **Step 27.**
    If **NO,** then continue with **Step 22.**

22. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 27.**

23. Contact local power company if loss of AC power has occurred or if there is overvoltage or undervoltage condition.

24. Does local power company verify abnormal power condition?

    If **YES,** then continue with **Step 25.**
    If **NO,** then proceed to **Step 27.**

25. Estimate restoration time for AC power. If necessary, equip RT with fully charged batteries or other power source to maintain power until AC power is restored.

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

27. ⇒ NOTE:
    If alarms remain, multiple troubles exist and trouble analysis must be repeated.

    If you have a J1C182BA Power Shelf, use SD-7C117 and SD-7C118 to locate trouble. If another power shelf or powering arrangement is used, use the appropriate documentation and wiring diagrams to locate power trouble. If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

Clear Trouble Report

1. Is the **CR** alarm LED lighted on the User Panel?

   If **YES**, then do **TAP-101**.
   If **NO**, then continue with **Step 2**.

2. Is the **MJ** alarm LED lighted on the User Panel?

   If **YES**, then do **TAP-102**.
   If **NO**, then continue with **Step 3**.

3. Is the **MN** alarm LED lighted on the User Panel?

   If **YES**, then do **TAP-112**.
   If **NO**, then continue with **Step 4**.

4. Is the **FAULT** LED on the faceplate of a DS1, DS3, or STS1E circuit pack flashing [`inc. ( ) LOS`]?

   If **YES**, then continue to **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. There appears to be an incoming DS1, DS3, or EC-1 signal failure. Refer to **TAP-110** and clear the condition.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Is the **FAULT** LED on the faceplate of any circuit pack in the DDM-2000 lighted (not flashing) [`( ) CP failed`]?

   If **YES**, then continue with **Step 8**.
   If **NO**, then proceed to **Step 10**.

8. ⇒ NOTE:
   There is an inconsistent combination of alarms and diagnostic indications.

   Refer to **TAP-108** and determine the true status of the system.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Perform an LED test by depressing the **ACO/TST** button or using the `test-led` command.

    Reference: **DLP-509**

11. Did all the circuit packs pass the LED test?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 14**.

12. ⇒ NOTE:
    The DDM-2000 appears to be operating correctly with no failures present.

    Return a report of NO TROUBLE FOUND.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Replace the circuit pack that failed the LED test.

    Reference: **DLP-523**

15. Repeat the LED test.

16. Did all the circuit packs pass the LED test?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 17**.

17. ⇒ NOTE:
    The failure is not in the circuit pack just replaced.

    Refer to **TAP-106** to isolate and clear the failure.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Isolate and Clear Failure

1. ⇒ NOTE:
   It is assumed that the **FAULT** LED on a circuit pack is lighted and replacing the circuit pack does not clear the problem.

   Is the circuit pack with the lighted LED a **DS1** or **OLIU**?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 12**.

2. Unseat and reseat the standby (without lighted **ACTIVE** LED) **MXRVO** (**STS1E**) in the same group as the affected circuit pack with the lighted LED.

3. Is a CIT available?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 6**.

4. Use the CIT and `reset` command to reset **SYSCTL**.

5. Is the **FAULT** LED on the affected circuit pack still lighted?

   If **YES**, then proceed to **Step 8**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. ⚠ CAUTION:
   Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

   ⇒ NOTE 1:
   Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

NOTE 2:
Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

7. Is the **FAULT** LED on the affected circuit pack still lighted?

   If **YES**, then continue with **Step 8**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Have both **MXRVO** (**STS1E**) circuit packs been unseated and reseated?

   If **YES**, then proceed to **Step 10**.
   If **NO**, then continue with **Step 9**.

9. Unseat and reseat the active **MXRVO** (**STS1E**) in the same group as the affected circuit pack with the lighted LED. Repeat this procedure from **Step 3**.

10. Replace the standby **MXRVO** (**STS1E**) (without lighted **ACTIVE** LED) in the same group as the affected circuit pack with the lighted LED. If the **FAULT** LED on the affected circuit pack is still lighted, replace the active **MXRVO** (**STS1E**) in the same group as the affected circuit pack with the lighted LED.

    Reference: **DLP-523**

11. Is the **FAULT** LED on the affected circuit pack still lighted?

    If **YES**, then proceed to **Step 17**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. Is a CIT available?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 15**.

13. Use the CIT and `reset` command to reset **SYSCTL**.

14. Is the **FAULT** LED on the affected circuit pack still lighted?

    If **YES**, then proceed to **Step 17**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. ⚠ CAUTION:
Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE 1:
Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

⇒ NOTE 2:
Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

16. Is the **FAULT** LED on the affected circuit pack still lighted?

If **YES**, then continue with **Step 17.**
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. ⚠ CAUTION:
Replacing the **SYSCTL** *involves updating the internal memory on the circuit pack.*

Refer to **DLP-501** and replace the **SYSCTL.**

18. Is the **FAULT** LED on the affected circuit pack still lighted?

If **YES**, then continue with **Step 19.**
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. ⇒ NOTE:
The problem appears to be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000 the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

Check for bent or broken pins, shorted pins, etc. If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Far End Alarm Using Craft Interface Terminal (CIT)

1. ⇒ NOTE:
   It is assumed that a CIT is available and that there is a failure at a far end node (as indicated by an **FE ACTY** LED on the local system or by the `Source Address` of `farend` in the local alarm and status report).

   Connect the CIT to the connector on the User Panel or remote login to the near-end system, if not already performed.

   Reference: **DLP-521**

2. ⇒ NOTE:
   The `Active Alarm and Status Report` is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

   Note the information in the `Source Address` and `Description` columns for the top entry/entries above the first single-dashed line in the `Active Alarm and Status Report` (Figure 1) (for example, "`MINOR farend MM-DD HH:MM:SS - SiteXNE1`")

```
/* Active Alarms and Status Report
============================================================
 Alarm       Source    Date   Time      Srv   Description
 Level       Address     Detected
============================================================
 MINOR       farend    MM-DD HH:MM:SS   -     SiteXNE1
 MINOR       farend    MM-DD HH:MM:SS   -     SiteYNE1
------------------------------------------------------------
 ne-acty     m1-1-1-1  MM-DD HH:MM:SS         inc. VT AIS
*/
```

Figure 1. Example of Active Alarms and Status Report

3. ⇒ **NOTE:**
   Far-end alarm or status conditions are listed in this report with a `Source Address` of "`farend`". Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

   Does the `Source Address` of any top entry above the first single-dashed line in the alarm report indicate a **local** alarm?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 6**.

4. Find the `Alarm Level` for the local alarm in Table A and go to the indicated procedure.

Table A. Trouble Conditions

Alarm Level	TAP
CRITICAL	TAP-101
MAJOR	TAP-102
MINOR	TAP-112
ne-acty	TAP-117
PWR MINOR (PMN)	TAP-104
abnormal (ABN)	TAP-109

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. Use the **`rtrv-nmap/rtrv-map-network`** command to get a network map report.

7. NOTE 1:
The TID of the far-end system is the TID listed in the "Description" column of the near-end "Active Alarm and Status Report" obtained using the **rtrv-alm** command.

NOTE 2:
In a path protection switched ring network, FAILED Communication Status most likely indicates a total node failure (power failure, failure of both **OLIU**s or both fiber pairs). In a linear or hub configuration, it most likely indicates a failure of both service and protection paths between the last shelf without communication failure and the first shelf with a communication failure.

NOTE 3:
If any systems have a Communications Status of FAILED, you may have to log in to the system nearest to the system with a FAILED communications status or issue a trouble report on the system you cannot log into.

NOTE 4:
For Release 7.2, the farend alarms refer to alarms in the same alarm group as the local network element. For systems you cannot log into, issue a trouble report on the system indicated in the alarm and status report.

If possible, enter the **rlgn:*TID*** command to log in to any far-end system indicated in the top entry in the Alarm and Status Report (for example, MINOR farend MM-DD HH:MM:SS - SiteXNE1)

Reference: **DLP-522**

8. Use the **rtrv-alm** command at the far-end system to get a report of status and alarms. See Table B for a detailed description of the messages in the alarm and status report.

9. Repeat this procedure from Step 3 for the shelf you are now logged into. Remember that when the procedures refer to local it is now the shelf from which you are getting the Alarm and Status Report.

Table B. RTRV-ALM Message Descriptions

Description	Alarm Level	Meaning
2nd CP required for BBF3	CR or MN	The BBF3 (DS1PM) circuit pack requires both function unit slots in the group to be equipped. A second circuit pack of the same type should be inserted in the empty function unit slot.
-48V power/fuse failed	MN	A -48 volt power feeder or a fuse on the user panel has failed
AC power failed	PMN	The AC power supply to a remote terminal cabinet has failed.
ACO active	Status	The parallel telemetry outputs and audible office alarms normally active due to the alarm conditions in the system are being suppressed (See the **opr-aco** command.)
AGNE communication failure	MJ	A remote network element (NE) cannot establish and NE status association with an alarm gateway network element (AGNE). The alarm is also declared by an AGNE that can not establish an NE status association with one or more NEs in its alarm group. **Likely cause**: The AGNE has not been assigned in an alarm group. The AGNE and NEs are assigned different alarm group numbers
APS - automatic lock	MN	The service associated with a DS1 CP has been automatically switched and locked onto the protection DS1 CP. The automatic protection switching (APS) lock will remain active until midnight. **Likely cause** Four automatic switches of a single DS1 CP in 10 minutes, probably because of an intermittent failure of the DS1 CP
APS channel failed	MN	The SONET Automatic Protection Switching (APS) channel on the protection OC-3 line has failed. **Likely causes**: Failure of the OLIU CP on the protection line (main-2) at the far end; failure of the OLIU CP on the protection line (main-2) at the near end
auto turnup test IP	ABN	An automatic turnup test is in progress.
communication failure	Status	The system is not communicating with another shelf in the subnetwork This system is normally communicating with that shelf through the SONET section DCC specified in the address column. The **rtrv-nmap** command will report the name of the system(s) with which this system is not communicating. **Likely causes**: An unprotected OC-3 line failure in the subnetwork, a controller failure, reset, or initialization on another shelf, section DCC channel failure on this or another shelf, failure of the OHCTL CP.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
`controln`	Status	The specified environmental control point (miscellaneous discrete output) is active. Note The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the **`rtrv-attr-cont`** and **`set-attr-cont`** commands. **Likely cause**: The system was instructed to close the environmental control point by either a TBOS control point or by the closing of the corresponding environmental control input at the far end
`CP not allowed - (crs)`	CR or MN	The circuit pack does not support the manual cross-connection(s) currently provisioned for this slot. The user should change the circuit pack type or change the cross-connection(s) to the slot.
`CP not allowed - (eqpt)`	MJ or MN	A DS1 or DS1PM CP is installed in a low speed slot associated with a function unit currently provisioned for DS3, STS1E_L, or OLIU service. The DS1 or DS1PM CP should be removed from the shelf, or the function unit CP should be replaced with an MXRVO or STS1E_H CP.
`CP not allowed - (timing)`	CR or MN	When associated with a TGS slot, the current circuit pack switch settings do not support the synchronization timing provisioned. The user should change the circuit pack switches or change the settable synchronization parameters When associated with function unit slot C, the circuit pack type does not support the current provisioned synchronization parameters. The circuit pack type or the timing options should be changed
`CP removed`	CR, MJ or MN	A CP previously installed in this system is removed The CP should be replaced, or an "update" should be done to remove it from the system equipment list
`DS1 CP failed`	MJ or MN	Internal equipment failure of the specified DS1 CP
`DS1PM CP failed`	MJ or MN	Internal equipment failure of the specified DS1PM CP.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
DS1 loopback	ABN	A loopback (toward the optical fiber) is active on the specified T1 port. (See the **opr-lpbk-t1** and **rls-lpbk-t1** commands.)
DS1 trmsn test IP	ABN	A transmission test using the internal test signal generator and monitor is in progress on the specified T1 port (See the **test-trmsn-t1** command.)
DS3 CP failed	CR or MN	Internal equipment failure of the specified DS3 CP.
DS3 loopback	ABN	A loopback (toward the optical fiber) is active on the specified T3 port. (See the **opr-lpbk-t3** and **rls-lpbk-t3** commands.)
DS3 trmsn test IP	ABN	A transmission test using the internal test signal generator and monitor is in progress on the specified T3 port (See the **test-trmsn-t3** command.)
DSNE communication failure	MJ	No network element has been designated a directory service network element (DSNE). (Use the **set-ne** command to provision one (and only one) shelf as the DSNE Use **rtrv-ne** command to check DSNE provisioning.
duplicate DSNE	MJ	A shelf has been provisioned as a directory services network element (DSNE) in a network that already has a DSNE. Only one network element in the network may be provisioned as the DSNE. See the **set-ne** and **rtrv-ne** commands for DSNE provisioning information
duplicate GNE	MJ	A shelf has been provisioned as a gateway network element (GNE) in a network that already has a GNE Only one network element in the network may be provisioned as the GNE. See the **set-ne** and **rtrv-ne** commands for GNE provisioning information
duplicate site/ne address	MJ	Two or more shelves in the network have the same site address (determined by switches on the SYSCTL CP) and the same network element address (determined by switches on the OHCTL CP)
duplicate TBOS display	MJ	Two or more shelves in the network have the same TBOS display number (determined by switches on the SYSCTL CP).
duplicate TID	MJ	Two or more shelves in the network have the same system name or TID set by the **set-ne** command
EC1 loopback	ABN	A loopback (toward the optical fiber) is active on the specified EC1 port See **opr-lpbk-ec1** and rls-lpbk-ec1 commands

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
environmentn	CR, MJ, MN or none	The specified environmental alarm point (miscellaneous discrete input) is active. Note: The actual message that appears in the alarm and status report for this condition can be provisioned, this is the default message. See the **rtrv-attr-env** and **set-attr-env** commands.
excessive holdover	MJ	The system has been in holdover mode for more than 4 hours. This may cause degraded performance (high error rates) on the transmitted and/or received signals. Whenever this condition exists, the condition holdover mode active also exists **Likely cause**: See holdover mode active, below.
externalMinor	CR, MJ, MN or none	The external minor alarm input (environmental alarm input 15) is active Typically, this input will be connected to the power shelf, and will indicate that the DC power or the cooling fan in a remote terminal cabinet has failed Note: The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the **rtrv-attr-env** and **set-attr-env** commands
fan control relay failed	MN	The thermostat on the SYSCTL indicates that the cooling fan should be turned on, and the fan control relay on the SYSCTL CP failed to operate. The system will continue to operate, but it might overheat, leading to degraded or interrupted transmission and/or circuit pack failures. **Likely causes:** Telemetry input common (TLMIC, pin 9) on J62 not grounded (adapter plug missing from J62 on RT shelf when J62 does not have a cable attached.) SYSCTL CP failure.
fan shelf failed	MN	The system has detected a failure of the DDM-2000 fan shelf. The ED-8C733-30, G7 CO cooling fan has failed The system will continue to operate but it may overheat. The fan must be repaired within **4 hours** of the failure, otherwise service may be interrupted and/or circuit packs may fail. **Likely causes:** Filter needs replacing, a fan pack failed, a fan pack has lost one or both power feeders, or the fan shelf control board has failed.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
`forced switch`	ABN	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and an automatic or manual protection switch to make this the active receiving line will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. Note: OC-3 line switching is unidirectional Because of this, the specified OC-3 line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. See the **`switch-line`** command. When associated with a function unit slot or a low speed service slot, this message means that the identified equipment is not active, and an automatic or manual switch to make it active will not be done. The forced switch will remain in effect until the protection switch is reset, or a lockout or inhibit switch request is received. See the **`switch-fn`** and **`switch-ls`** commands.
`frequency error`	CR or MJ	This alarm condition indicates that an incoming timing signal has an unacceptable frequency offset. **Likely causes**: A DS1 external timing reference to the local shelf or a remote shelf has a frequency offset greater than about 20 hertz.
`holdover mode active`	NE ACTY	The system is in holdover synchronization mode **Likely causes** The system was manually switched to holdover mode (with the **`switch-sync`** command, or, in a central office system, with TBOS control point 54) and the switch has not been reset, or, the system automatically switched to holdover mode due to failure of the timing references, and either the reference failures have not cleared or the system is provisioned for nonrevertive synchronization mode switching, or the system is provisioned for `External` timing and no external timing references are available, or the system is provisioned for loop-timed operation and the optical line, or an OLIU circuit pack has failed. The condition can be cleared by repairing at least one of the timing references (if both are failed) and resetting synchronization mode protection switch with the command **`switch-sync:s=mode,pri=reset`** In a central office system, the synchronization mode can also be reset with TBOS control point 55.
`illegal CP type`	CR, MJ or MN	An illegal or unknown circuit pack type has been inserted into the shelf

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. DS1 LOS inc. (from DSX) DS1 LOS	MJ, MN or none	At least 128 consecutive zeros are received in the DS1 signal incoming from the DSX-1, or the energy at the DS1 input is below a preset threshold. **Likely causes:** Hard failure of upstream equipment or facility (towards the DSX-1). The DS1 input is disconnected at the backplane or the DSX-1; equipment is failed or removed at DSX-1.
inc. DS1 sig failed (BER) inc. (from DSX) DS1 sig fail	MJ, MN or none	The bit error ratio (BER) in the DS1 signal incoming from the DSX-1 exceeds the provisioned failure threshold, 10^{-3} or 10^{-6}. **Likely causes:** Mismatch of line code (AMI/B8ZS) Failure of upstream equipment or facility (towards the DSX-1) Cross-talk in office wiring. Failure of the DS1 CP.
inc. DS1 sync. ref. AIS	MJ or MN	DS1 alarm indication signal (AIS) is being received from the DS1 synchronization reference signal **Likely causes:** Failure of upstream equipment or facility (towards the DSX-1).
inc. DS1 sync. ref. BER	MJ or MN	The bit error ratio (BER) in the DS1 synchronization reference signal exceeds 10^{-3}. **Likely causes:** Failure of upstream equipment or facility (towards the DSX-1)
inc. DS1 sync. ref. EOOF	MJ or MN	Excessive out-of-frame (OOF) events were detected in the DS1 synchronization reference signal. Excessive OOF is defined as more than 512 out of frame events in one day **Likely cause:** Failure of the incoming DS1 synchronization reference signal
inc. DS1 sync. ref. LOF	MJ or MN	The system is unable to frame on the DS1 synchronization reference signal. **Likely causes:** Upstream failure in the clock providing the reference signal; High bit error ratio on the received signal, caused by failure of the office timing supply that provides the DS1 timing reference. The system is provisioned for SF format on the specified DS1 synchronization reference signal and the received DS1 signal is in ESF format
inc. DS1 sync. ref. LOS	MJ or MN	At least 128 consecutive zeros were received in the DS1 synchronization reference signal, or the energy at the DS1 input is below a preset threshold **Likely causes** Failure of the office timing supply that provides the DS1 timing reference or failure of the connection to the timing supply.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
`inc. DS1 sync. ref. OOL`	MJ or MN	The incoming DS1 synchronization reference signal is out-of-lock (OOL). The frequency of the clock providing the DS1 reference signal is out of specification. **Likely cause:** Failure of the office timing supply that provides the DS1 timing reference.
`inc. DS3 AIS` `inc. (from OC3) DS3 AIS`	NE ACTY	The system has detected DS3 alarm indication signal (AIS) in the demux direction (that is, coming from the fiber) for the specified DS3 signal. **Likely causes:** The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end.
`inc. DS3 LOS` `inc. (from DSX) DS3 LOS`	CR	At least 128 consecutive zeros were detected in the DS3 signal received from the DSX-3 **Likely causes:** Equipment failed or removed at DSX-3; DS3 input disconnected at the DSX-3 or at the DDM-2000 backplane.
`inc. DS3 OOF` `inc. (from OC3) DS3 OOF`	NE ACTY	The system has detected a DS3 out-of-frame (OOF) condition in the demux direction (that is, coming from the fiber) for the specified DS3 signal. This condition is reported only if the DS3 interface is provisioned in VM or VMR mode (See the **`set-t3`** and **`rtrv-t3`** commands.) **Likely causes:** An out-of-frame DS3 signal incoming to the DSX-3 at the far end. Failure of the DS3 CP at the far end or near end. The DS3 signal is looped at both ends

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. DS3 sig. failed (BER) inc. (from DSX) DS3 sig. fail	CR, MJ MN or none	The bit error ratio (BER) in the incoming DS3 signal exceeds the provisioned failure threshold, 10^{-3} or 10^{-6}. **Likely causes:** Failure of the upstream equipment or facility (towards the DSX-3) Cross-talk in office wiring. Unprotected failure of DS3 CP.
inc. EC1 FERF	NE ACTY	The system has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal. **Likely causes:** The far end has detected an incoming signal failure on the specified EC-1 line. This may be caused by failure of the STS1E CP at the near end, the STS1E CP at the far end, or the transmit cable on the specified line
inc. EC1 LOF	CR, MJ MN, or none	The system has detected a loss-of-frame (LOF) condition in an incoming EC-1 signal. LOF is defined as an out of frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least three milliseconds. **Likely cause:** Failure of the STS1E or equivalent CP at the far end Failure of the STS1E or equivalent CP at the near end. Failure of the incoming cable, or a cable disconnect at the STSX-1 or shelf connector.
inc. EC1 LOS	CR, MJ MN or none	The system has detected loss of signal (LOS) condition on the EC-1 line. **Likely cause:** Failure of the STS1E or equivalent CP at far end. Failure of the incoming cable. Failure of the STS1E CP at the near end. Cable disconnect at the STSX-1 or shelf connector.
inc. EC1 line AIS	CR, MJ MN or none	The system has detected the EC-1 line alarm indication signal (AIS) on an incoming EC-1 line. **Likely cause:** Failure of an STS1E CP at the far end
inc. EC1 sig degrade (BER)	CR, MJ, MN, or none	The bit error ratio (BER) in the received EC-1 signal exceeds the provisioned threshold, 10^{-5} or 10^{-9}. **Likely causes:** Failure of the STS1E CP at the near end Failure of the incoming cable. Cross-talk in office wiring Failure of the STS1E CP at the far end.
inc. EC1 sig. fail (BER)	CR, MJ, MN, or none	The bit error ratio (BER) in the received EC-1 signal exceeds the provisioned threshold of 10^{-3}. **Likely causes:** Failure of the STS1E CP at the near end Failure of the incoming cable Cross-talk in office wiring. Failure of the STS1E CP at the far end.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. OC3 BER inc. OC3 sig. fail (BER)	CR or MN	The bit error ratio (BER) in the received OC-3 signal exceeds 10^{-3}. **Likely causes:** Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.
inc. OC3 FERF	NE ACTY	The system has detected the OC-3 Far End Receive Failure (FERF) signal in the incoming OC-3 signal. **Likely causes:** The far end has detected an incoming signal failure on the specified OC-3 line. This may be caused by failure of the OLIU CP at the near end, the OLIU CP at the far end, or the transmit fiber on the specified line.
inc. OC3 LOF	CR or MN	The system has detected a loss-of-frame (LOF) condition in an incoming OC-3 signal. LOF is defined as an out-of-frame (OOF) condition (five consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds. **Likely causes:** Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.
inc. OC3 LOS	CR or MN	The system has detected loss-of-signal (LOS) condition on the OC-3 line. **Likely causes:** Failure of the OLIU CP at near end, failure of the OLIU CP at far end, or failure of the receive fiber.
inc. OC3 line AIS	CR or NE ACTY	The system has detected OC-3 line alarm indication signal (AIS) on an incoming OC-3 line **Likely cause:** Failure of an OLIU CP at the far end
inc. OC3 sig. degrade (BER)	CR or MN	The bit error ratio (BER) in the specified OC-3 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3} **Likely causes:** Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, failure of the receive fiber, or incorrect setting of the optical power switch on the OLIU CP
inc. OC3 sig. failed (BER)	CR or MN	The bit error ratio (BER) in the specified OC-3 signal exceeds 10^{-3}. **Likely causes:** Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, or failure of the receive fiber.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. STS1 AIS	CR or NE ACTY	The system has detected an incoming STS-1 alarm indication signal (AIS) in the active OC-3 line. The system responds by transmitting DS1 or DS3 AIS toward the DSX and transmitting STS-1 yellow toward the fiber from which the AIS is being received. **Likely causes:** Incomplete or incorrect cross-connect provisioning in an end-to-end network. Unprotected removal or failure of a DS3, MXRVO, or OLIU CP at the far end.
inc. STS1 LOP EC1 #x	CR, MJ, MN, or none	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. **Likely cause:** Failure of the far end STS1E circuit pack or failure of the STS1E circuit pack at the near end.
inc. STS1 LOP OC3 #x	CR or MN	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. **Likely causes:** If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of an MXRVO or a DS3 CP at the far end. If this condition occurs on only one OC-3 line, the likely cause is failure of the OLIU CP at the near end or far end.
inc. STS1 sig. degrade (BER)	CR or MN	For STS-1 path ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold.
inc. STS1 sig. failed (BER)	CR or MN	For ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the signal fail threshold (10^{-6}) For VT1.5 path-switched rings, the system responds by inserting VT path AIS in each pass-through VT contained in the STS-1. Locally, the system will select the VTs from the STS-1 on the other ring, as appropriate. **Likely causes:** Failure of the near end OLIU CP reporting the STS-1 failure, failure of the far end OLIU, or failure of the receive fiber if the OC-3 is also reporting a failure.
inc. STS1 unequipped	CR or MN	The system has detected the unequipped code (SONET path overhead signal code label byte=0) on an in-service STS-1 channel. **Likely causes:** An upstream STS-1 cross-connect has been deleted.
inc. STS1 yellow	NE ACTY	The system has detected an incoming STS-1 yellow signal, which indicates that the far end is receiving STS-1 AIS on the active OC-3 line. The system responds to the STS-1 yellow signal by transmitting DS1 or DS3 yellow toward the DSX. **Likely causes:** Incomplete or incorrect cross-connect provisioning in end-to-end network, unprotected unidirectional failure of the OLIU CP, or fiber at some point in the end-to-end path.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
inc. VT AIS	MJ or NE ACTY	The system has detected VT path alarm indication signal (AIS) incoming from the active OC-3 line. The system responds by transmitting DS1 AIS toward the DSX-1 and VT yellow toward the fiber from which the AIS is being received. **Likely causes:** Incomplete or incorrect cross-connect provisioning in end-to-end network (In ring applications, this alarm may be caused by fiber or OLIU failures). Unprotected removal or failure of a DS1 CP at the far end.
inc. VT LOP	MJ or MN	The system has detected a VT loss-of-pointer (LOP) condition. **Likely causes:** Unprotected failure of a DS1 CP at the near end; unprotected failure of a DS1 CP at the far end; unprotected failure of a MXRVO CP at the near end, unprotected failure of a MXRVO CP at the far end.
inc. VT unequipped	MJ or MN	The system has detected the unequipped code (SONET path overhead VT signal code label byte=0) on an in-service VT1.5 channel. **Likely causes:** An upstream VT1.5 cross-connect has been deleted.
inc. VT yellow	NE ACTY	The far end is detecting VT AIS or VT LOP and inserting VT yellow in its transmit signal. **Likely causes:** Unprotected failure of a DS1 CP at the near end, a DS1 CP at the far end, an MXRVO CP at the near end, an MXRVO CP at the far end, or fiber at some point in the end-to-end path
inconsistent DCC switches	ABN	The "User/Network" switch on the OHCTL CP is set the same at both ends of the DCC.
inhibit switch	ABN	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be done. No further protection switching of specified line will be done until the protection switch is reset. Note: OC-3 line switching is unidirectional. Because of this, the specified OC-3 line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. See the **switch-line** command. When associated with a function unit slot, timing slot, or timing reference, this message means that the identified equipment or reference is not active, and protection switches to the identified equipment or reference will not be done until the protection switch is reset. See the **switch-fn** and **switch-sync** commands.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
invalid CP switches	CR or MN	When associated with a TGS slot, this message means that the timing mode switch settings on the TGS CP are invalid.
lockout of protection	ABN	When associated with an OC-3 line, this message means that the identified line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be done. Note: OC-3 line switching is unidirectional. Because of this, the specified OC-3 line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. The lockout will remain in effect until the protection switch is reset or until a protection switch inhibit request is entered. See the **switch-line** command. When associated with a low speed protection slot, this message means that no service slot in the whole low speed group will be allowed to switch to protection The lockout will remain in effect until the protection switch is reset See the **switch-ls** command.
lockout of service	ABN	When associated with a low speed service slot, This message means that the specified low speed service slot is active and will not be switched to protection The lockout will remain in effect until the protection switch is reset. See the **switch-ls** command.
manual switch	ABN	The specified DS1 CP is manually switched to protection. The manual switch will remain in effect until the protection switch is reset or until a failure occurs and an automatic switch preempts the manual switch (See the **switch-ls** command.)
manual sync. mode switch	ABN	The synchronization mode has been manually switched to holdover or free-running and will remain in that mode until the switch request is reset. (See the **switch-sync** command.)
MXRVO CP failed	CR or MN	Internal equipment failure of the specified MXRVO CP.
OHCTL CP failed	MJ	Internal equipment failure of the OHCTL CP
OLIU CP failed	CR or MN	Internal equipment failure of the specified OLIU CP.
program installation IP	Status	This system is being used to install software into another system. If this procedure is interrupted prior to completion, the remote systems' control circuit packs will likely become inoperable until another install program attempt is successful

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
`section DCC channel failed`	MJ	The system cannot communicate with the far-end system through the SONET section data communications channel (DCC). **Likely causes:** SYSCTL or OHCTL CP failure, reset, or initialization at the far end; failed program installation at far end; program installation in progress at the far end; SYSCTL or OHCTL CP failure at the near end
`STS1E_H CP failed` `STS1E_L CP failed`	CR or MN	Internal equipment failure of the specified STS1E CP.
`SYSCTL CP failed`	MJ	Internal equipment failure of the SYSCTL CP. The system has determined that some part of the SYSCTL CP has failed. Note that some types of failures cannot be reported since the SYSCTL CP cannot function under these conditions.
`TID Address map full`	MJ	The size of the directory service-network element (DS-NE) database at the GNE has been exceeded. **Likely causes:** Network elements have been removed from the network but not from the DS-NE database located at the GNE See the **`dlt-tadrmap`** command.
`TGS CP failed`	CR or MN	Internal equipment failure of the specified CP or the systems at both ends of the span are loop-timed.
`unexpected CP present`	MN	A DS1 CP is installed in a low speed slot associated with a function unit currently provisioned for DS3 service. The DS1 CP should be removed from the shelf, or the DS3 CP should be replaced with an MXRVO CP.
`unexpected CP switches`	CR, MJ, or MN	When associated with the SYSCTL or OHCTL slot, this message means the CIT data rate or site switch settings on the CP are invalid, or that some of the unused switches are not in the off (down) position. For OLIU slots, it indicates that the optical power switch on the OLIU CP was different from what it was before the OLIU was replaced. For DS1 or DS3 slots, this message means that a change in a circuit pack switch setting was made When associated with a TG slot, this message means 1. The timing mode switch settings on the TGS CP are a. invalid, b different from those on the companion TGS CP, or c. different from what they were before the TGS CP was replaced, 2 The DS1 format or line coding switches on the TGS CP are not the same as they were before the TGS CP was replaced.

Table B. RTRV-ALM Message Descriptions (Continued)

Description	Alarm Level	Meaning
`unexpected CP type`	CR, MJ, or MN	When associated with a function unit (FN) slot, this message means that a different but supported circuit pack is inserted in a slot already provisioned. When associated with a low speed DS1 slot, this message means that a different but supported DS1 circuit pack type (for example, BBF3) is inserted in a slot already provisioned. For the STS1E circuit pack, this message means that the CP type switch (located on the circuit pack) is different from that already provisioned for the slot.
`unexpected CP type/switches`	CR, MJ or MN	When associated with a TG slot, this message means: 1. The timing mode switch settings on the TGS CP are a invalid, b different from those on the companion TGS CP, or c different from what they were before the TGS CP was replaced, 2 The DS1 format or line coding switches on the TGS CP are not the same as they were before the TGS CP was replaced. When associated with a MAIN slot, this message means a CP other than an OLIU is inserted in the specified slot, or that the optical power switch on the OLIU CP is different from what it was before the OLIU CP was replaced When associated with a function unit (FN) slot, this message means a DS3 or OLIU CP is inserted in a slot provisioned for an MXRVO CP When associated with a low speed (LS) slot, this message means the line coding switches on the DS1 CP are different from what they were before the DS1 CP was replaced. For the STS1E circuit pack, this message means that the CP type switch (located on the circuit pack) is different from that already provisioned for the slot.
`X.25 communication failure`	MJ	Failure in the X.25 communication channel. **Likely causes:** Failure of the X.25 communication equipment, failure at the OS, system is provisioned as a TL1/X.25 gateway but this interface is not being used (See **`set-ne`** command for provisioning.)

Clear Obscure Failure Condition

1. ⇒ NOTE:
   It is assumed that a set of alarms or conditions exist which are inconsistent or may not have associated LEDs indications.

   Perform LED test by depressing the **ACO** button or using the CIT command `test-led`.

   Reference: **DLP-509**

2. Did any LED fail the LED test?

   If **YES**, then do **TAP-115**.
   If **NO**, then continue with **Step 3**.

3. Is a CIT available?

   If **YES**, then proceed to **Step 7**.
   If **NO**, then continue with **Step 4**.

4. Is trouble no associated LED indications (for example, no **NE ACTY** or **FE ACTY** LED lighted; no **CR, MJ, MN, PMN**, etc. LED lighted when alarm is present, etc.)?

   If **YES**, then proceed to **Step 11**.
   If **NO**, then continue with **Step 5**.

5. ⚠ CAUTION:
   Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

NOTE 1:
Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. Note that if the **SYSCTL** is failed, the countdown might not occur.

NOTE 2:
Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

6. Is trouble still present?

   If **YES**, then proceed to **Step 9**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Use the CIT and `reset` command to reset **SYSCTL**.

8. Is the trouble still present?

   If **YES**, then continue with **Step 9**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. CAUTION:
   Replacing the **SYSCTL** *involves updating the internal memory on the circuit pack.*

   Replace the **SYSCTL**.

   Reference: **DLP-501**

10. Is the trouble still present?

    If **YES**, then continue with **Step 11**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. ⇒ NOTE 1:
The problem may be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000, the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

⇒ NOTE 2:
A CIT and the system `rtrv-( )` commands may be helpful in determining the condition of the system.

Use CIT and `rtrv-alm` command to get an alarm and status report. See the COMMANDS AND REPORTS section of this manual under **RTRV-ALM** for a description of each message retrieved with the `rtrv-alm` command.

If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Abnormal (ABN) Indication

1. ⇒ NOTE:
The **ABN** LED indicates a manually caused abnormal condition. Table A lists the conditions which may cause an **ABN** alarm. These conditions may have been initiated locally, from another DDM-2000 at the other end of the facility, or through telemetry.

Is the **CR**, **MJ**, **MN**, or **PMN** LED on the User Panel lighted?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 4**.

2. ⇒ NOTE 1:
It is better to clear the higher priority alarms (**CR**, **MJ**, etc.) first, although in most cases this will not clear an **ABN** alarm. If the higher priority alarm is cleared first, you can then use this procedure to clear the **ABN** alarm.

⇒ NOTE 2:
In some cases, clearing an **ABN** alarm will result in a higher priority alarm being cleared. For example, clearing the abnormal condition `manual sync. mode switch` may cause an `excessive holdover` **MJ** alarm to clear.

Refer to Task Index **IXL-001** for procedure to clear the indicated alarm.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. Is a CIT available?

   If **NO**, then continue with **Step 5**.
   If **YES**, then proceed to **Step 12**.

5. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote alarm and status conditions [**DLP-530**].

   Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

6. Was **NE ACTY** LED lighted on the User Panel when local shelf alarm conditions are displayed (**L.** displayed in **FE ID** display)?

   If **YES**, then proceed to **Step 27**.
   If **NO**, then continue with **Step 7**.

7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

8. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?

   If **YES**, then continue with **Step 9**.
   If **NO**, then do **TAP-108**.

9. Refer to **DLP-530** and use **FE SEL** pushbutton on **SYSCTL** to display far-end alarm conditions for other sites/shelves in the network.

10. Issue a trouble report of abnormal (**ABN**) alarm condition at the far-end DDM-2000 terminal.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. ⇒ NOTE:
    For all network configurations except point-to-point, there will be multiple far-end "`farend`" terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

    Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system, if not already performed.

    Reference: **DLP-521**

13. NOTE 1:
The `rtrv-alm` command can be used to display a report of active alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

NOTE 2:
The `Active Alarm and Status Report` is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the `Source Address` and `Description` columns for the top entry/entries above the first single-dashed line in the `Active Alarm and Status Report` (Figure 1) (for example, "abnormal a-1-1 MM-DD HH:MM:SS nsa DS1 loopback").

```
/* Active Alarms and Status Report
================================================================
 Alarm        Source     Date   Time       Srv   Description
 Level        Address      Detected
================================================================
 abnormal     a-1-1      MM-DD HH:MM:SS    nsa   DS1 loopback
----------------------------------------------------------------
*/
```

Figure 1. Example of Active Alarms and Status Report

14. ⇒ NOTE:
    Far-end alarm or status conditions are listed in this report with a `Source Address` of "`farend`". Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the `rtrv-alm` command to get another report, if necessary.

    Does the `Source Address` of any top entry in the alarm report indicate local slot, channel, port or operations interface for the `abnormal` alarm?

    If **NO**, then do **TAP-107**.
    If **YES**, then continue with **Step 15**.

15. Use `opr-aco` command to silence active audible office alarms, if required.

16. Note the **local** trouble indication in the `Description` column of the `Active Alarm and Status Report`, starting with the highest alarm level (`abnormal`) listed in the `Alarm Level` column.

17. Find the trouble description in Table A for the highest alarm level and note the related commands.

Table A. Abnormal (ABN) Alarm and Status Conditions

Description	Related Commands
forced switch inhibit switch	switch-line switch-fn switch-sync
lockout of protection	switch-line switch-ls
lockout of service manual switch	switch-ls
manual sync mode switch	switch-sync
DS1 loopback	opr-lpbk-t1 rls-lpbk-t1
DS3 loopback	opr-lpbk-t3 rls-lpbk-t3
EC1 loopback	opr-lpbk-ec1 rls-lpbk-ec1
DS1 trmsn test IP DS3 trmsn test IP auto turnup test IP	test-trmsn-t1 test-trmsn-t3 test-auto

18. ⚠ CAUTION:
You must determine the reason for the **ABN** *indication before attempting to clear it.*

Use the command `rtrv-state` to see if you can determine the condition associated with the **ABN** indication.

19. Contact the appropriate personnel at your location, at the far-end location, and at any central maintenance location to determine the reason for the **ABN** indication before clearing it.

20. Have you determined that it is appropriate for you to clear the condition causing the **ABN** indication?

    If **YES**, then proceed to **Step 23.**
    If **NO**, then continue with **Step 21.**

21. There is nothing more to be done until the reason for the **ABN** condition is known.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. Use the appropriate command to clear the abnormal condition. The command will be `rls-lpbk-( )` or `switch-( ).`

24. Is the **ABN** indicator still lighted?

    If **YES**, then continue with **Step 25.**
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. Use the `rtrv-alm` command to determine if there are other conditions causing the **ABN** alarm. See Table A.

26. See Table A. Does the `rtrv-alm` command report any other abnormal conditions.

    If **NO**, then do **TAP-108.**
    If **YES**, then repeat this procedure from **Step 16.**

27. ⚠ CAUTION:
Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE:
Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

Unseat and reseat the **SYSCTL** to perform a reset.

28. Is the **ABN** LED still lighted?

    If **YES**, then continue with **Step 29**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. Obtain CIT and repeat this procedure from **Step 12**.

Clear Flashing FAULT LED Indication

1. Is the **MN** LED lighted on the User Panel?

   If **YES**, then do **TAP-112.**
   If NO, then continue with **Step 2**.

2. Is the **MJ** LED lighted on the User Panel?

   If **YES**, then do **TAP-102.**
   If NO, then continue with **Step 3**.

3. Is the **CR** LED lighted on the User Panel?

   If **YES**, then do **TAP-101.**
   If NO, then continue with **Step 4**.

4. Is the **FAULT** LED flashing on the faceplate of one or more **DS1/DS1PM** circuit packs?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 10**.

5. ⇒ NOTE:
   There is an incoming DS1 signal failure. This failure can be further isolated using a CIT.

   Is a CIT available?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 8**.

6. Connect the CIT to the connector on the User Panel and establish session.

   Reference: **DLP-521**

7. Refer to the Commands and Reports section of this manual under **RTRV-( )** and use the `rtrv-( )` commands to further isolate the particular incoming DS1 signal failure.

8. Switch service to protection. If LED is flashing on protection **DS1/DS1PM**, issue trouble report of bad incoming signal at input to **DS1/DS1PM** circuit pack with flashing LED(s). If LED is not flashing on protection **DS1/DS1PM**, replace service **DS1/DS1PM** circuit pack [**DLP-523**].

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Is the **FAULT** LED flashing on the faceplate of one or more **DS3/STS1E** circuit packs?

    If **YES**, then continue with **Step 11**.
    If **NO**, then do **TAP-108**.

11. Switch service to protection. If LED is flashing on protection **DS3/STS1E**, issue trouble report of bad incoming DS3/EC-1 signal from DSX-3 (STSX) cross-connect point. If LED is not flashing on protection **DS3/STS1E**, replace service **DS3/STS1E** circuit pack [**DLP-523**]. With a CIT, use the command `rtrv-alm` to verify the alarm.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear OLIU or Fiber Trouble
Linear or Hub Configurations

1. ⚠ WARNING 1:
Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
When removing circuit packs, ensure that protection switching is available. When available, use a CIT and the `switch-line` *command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a* `switch-line` *at the near end and far end to switch both transmit and receive to the same line.*

⚠ CAUTION 2:
When removing circuit packs, always remove the one without a lighted **ACTIVE** *LED first.*

NOTE 1:
A lighted **FAULT** LED on the **OLIU** indicates that either the receiver, the transmitter, or both has failed. A flashing **FAULT** LED on the **OLIU** indicates that either the near-end receiver, far-end transmitter, or incoming (receive) fiber has failed. A lighted **ACTIVE** LED indicates that the **OLIU** is carrying service (transmitting, receiving, or both).

NOTE 2:
Because the OC-3 line protection switching request is unidirectional in all releases except Release 5, it is possible to have lighted **FAULT** LEDs on both the service and protection **OLIU**s and still be in service. When troubleshooting **OLIU** problems, you must first fully analyze the trouble indications. This may be done by noting LED indications at both ends of the system or using a CIT to log in to the far-end terminal and using the `rtrv-alm` and `rtrv-state` commands to check the far-end status.

NOTE 3:
This procedure can be used to clear some troubles, but a knowledge of the **OLIU** protection switching arrangement and use of CIT commands are necessary to clear other troubles where a service interruption might occur.

Was **OLIU**(s) removed or being replaced, installed, or having switch setting changed when alarm occurred?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 11**.

2. NOTE:
An alarm will occur if a circuit pack is removed without performing an update by momentarily depressing the **UPD/INIT** button or using the `upd` command.

Is any previously installed **OLIU**(s) removed from the shelf?

If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 5**.

3. Determine the reason the circuit pack(s) was removed. If the same circuit pack is to be reinserted and switch setting is not changed, reinstall the circuit pack. If the circuit pack was removed and switch setting changed, reinstall the circuit pack (**DLP-514**) and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from equipment inventory.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Is **OLIU**(s) installed in correct slot(s) (`rtrv-eqpt`)?

   If **NO**, then continue with **Step 6**.
   If **YES**, then proceed to **Step 8**.

6. Remove optical fibers from circuit packs, if connected, then remove circuit pack(s) from wrong slot(s). Check option switch setting (**DLP-513**), and install circuit pack(s) into correct slot(s). Reconnect optical fibers (**DLP-514**).

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Was circuit pack installed with switch setting(s) changed from what it was previously (`rtrv-oc3`)?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 11**.

9. Ensure switch setting on the **OLIU** circuit pack(s) is correct (**DLP-513**). If an **OLIU** circuit pack(s) was replaced or installed with switch setting changed from what it was previously, momentarily depress the **UPD/INIT** button on the **SYSCTL**.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Are **FAULT** LEDs flashing (`inc. OC3 LOS, LOF, sig. failed`, etc.) on both the service and protection **OLIU**s?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 14**.

12. ⇒ NOTE:
    Indications are that both incoming (receive) optical fiber lines have failed, or both near-end or far-end service and protection **OLIU**s have failed, or both **TGS**, **MXRVO**, or **DS3** circuit packs have failed or been removed.

    Check for failed or removed **TGS**, **MXRVO**, or **DS3** circuit packs. Replace failed circuit packs [**DLP-523**]. Use local procedures to check optical fiber connections and transmission. If no trouble is found on the optical fibers, replace **OLIU**s at near end first (**DLP-523**). If trouble still exists, replace **OLIU**s at far end. If alarm still exists, trouble is in the optical fibers.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Is **FAULT** LED lighted (`OLIU CP fail, unexpected CP type/switches`, etc.) or flashing (`inc. OC3 LOS, LOF, sig. failed`, etc.) on only ONE **OLIU** at either near end or far end?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed to **Step 24**.

15. Is **ACTIVE** LED lighted on both service and protection **OLIU**s (`rtrv-state`)?

    If **YES**, then proceed to **Step 17**.
    If **NO**, then continue with **Step 16**.

16. Is alarm Critical or Minor?

    If **MINOR**, then proceed to **Step 19**.
    If **CRITICAL**, then continue with **Step 17**.

17. ⇒ NOTE:
    Indications are that the near-end or far-end **OLIU** or incoming fiber line has failed and protection switching has been inhibited or locked at one or both ends. Also, if the protection fiber fails, the **ACTIVE** LEDs on both **OLIU**s will be lighted because of the uncertain state of the far end. If the `rtrv-state` report indicates `active-?` for the protection line (slot **2(P)**, indications are that the protection line is failed. If the service line (slot **1**, indicates `active-rx` at both ends of the system, the service line is carrying all service.

    Use CIT and `rtrv-state` command to check switch status at BOTH ends of the system.

18. Use CIT and `switch-line` command to reset switch and switch both near-end and far-end lines to **OLIU** pair without lighted **FAULT** LED.

19. ⇒ NOTE:
    Local procedures may require you to check optical fibers first before replacing **OLIU**s.

    Replace **OLIU** with lighted or flashing **FAULT** LED.

    Reference: **DLP-523**

20. Did trouble clear?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 21**.

21. Is **FAULT** LED lighted or flashing?

    If **FLASHING**, then continue with **Step 22**.
    If **LIGHTED**, then do **TAP-106**.

22. Replace **OLIU** at far-end (**DLP-523**). If trouble does not clear, trouble is in incoming optical fiber.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

24. ⇒ NOTE:
    Remember that the OC-3 line protection switching request is unidirectional. It is possible to have a lighted **FAULT** LED on an **OLIU** and still have that **OLIU** active (for example, if the transmitter failed, the receiver could still be receiving). It is necessary to analyze the lighted or flashing **OLIU** LEDs before replacing an **OLIU**. If the **ACTIVE** LED is lighted on an **OLIU**, it is in service (ACTIVE) either transmitting or receiving or both. It may be necessary to perform a `switch-line` at the near end and at the far end to switch both transmit and receive to the same line.

    Is **FAULT** LED lighted or flashing on both service and protection **OLIU**s?

    If **NO**, then continue with **Step 25**.
    If **YES**, then proceed to **Step 32**.

25. Is **ACTIVE** LED lighted on **OLIU**s with lighted **FAULT** LEDs?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 27**.

26. Use CIT and `rtrv-state` command to check switch status at both ends of the system. Use CIT and `switch-line` command to reset switch and switch both near-end and far-end lines to **OLIU**s without lighted **FAULT** LED.

27. ⇒ NOTE:
    Local procedures may require you to check optical fibers first before replacing **OLIU**s.

    Replace **OLIU**s with lighted **FAULT** LEDs.

    Reference: **DLP-523**

28. Did trouble clear?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 29**.

29. Is **FAULT** LED(s) lighted or flashing?

    If **FLASHING**, then continue with **Step 30**.
    If **LIGHTED**, then do **TAP-106**.

30. Trouble is in optical fiber. Clear trouble using local procedures.

31. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

32. Multiple troubles exist which are beyond the scope of this document. Without knowing the exact LED indications, the alarm and status indications (obtained with the `rtrv-alm` command), or the state of the protection switch (using the `rtrv-state` command), this procedure can not go any further.

    Use the LED indications, the `rtrv-alm` and `rtrv-state` commands to analyze the trouble. Look for protection switch locks or inhibits. If the system is found to be completely out of service, replace circuit packs with lighted **FAULT** LEDs. If system is still in-service and a protection switch can place all service on either the protection or service **OLIU**s, perform the switch then replace circuit packs with lighted **FAULT** LEDs.

    If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Minor (MN) Alarm

1. ⇒ NOTE:
   Table A lists some possible causes and indications of minor alarms.

   Is a CIT available?

   If **NO**, then continue with **Step 2**.
   If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

   Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

4. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?

   If **NO**, then continue with **Step 5**.
   If **YES**, then proceed to **Step 15**.

5. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

6. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?

   If **YES**, then continue with **Step 7**.
   If **NO**, then do **TAP-108**.

7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display). (**DLP-530**).

8. Issue a trouble report of critical alarm condition at the far-end DDM-2000 site indicated in **FE ID** display.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. ⇒ NOTE:
For all network configurations except point-to-point, there will be multiple far-end "farend" terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

Connect the CIT to the **CIT** connector on the near-end User Panel and log in or remote log in to the near-end system, if not already performed.

Reference: **DLP-521**

11. ⇒ NOTE 1:
The **rtrv-alm** command can be used to display a report of active alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

⇒ NOTE 2:
The Active Alarm and Status Report is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the Source Address and Description columns for the top entry/entries above the first single-dashed line in the Active Alarm and Status Report (Figure 1) (for example, "MINOR dcc-m2 MM-DD HH:MM:SS nsa section dcc channel failed").

```
/* Active Alarms and Status Report
============================================================
 Alarm       Source    Date   Time      Srv   Description
 Level       Address     Detected
============================================================
 MINOR       farend    MM-DD HH:MM:SS   nsa   SiteXNE1
 MINOR       dcc-m2    MM-DD HH:MM:SS   nsa   section dcc channel failed
------------------------------------------------------------
 ne-acty     farend    MM-DD HH:MM:SS    -    SiteYNE1
 ne-acty     m2-1      MM-DD HH:MM:SS    -    inc. STS1 yellow
 ne-acty     m2-2      MM-DD HH:MM:SS    -    inc. STS1 yellow
 ne-acty     main-2    MM-DD HH:MM:SS    -    inc. OC3 FERF
*/
```

Figure 1. Example of Active Alarms and Status Report

12. ⇒ **NOTE:**
    Far-end alarm or status conditions are listed in this report with a `Source Address` of "`farend`". Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

    Does the `Source Address` of any top entry in the alarm report indicate **local** slot, channel, port or operations interface for the `MINOR` alarm?

    If **NO**, then do **TAP-107**.
    If **YES**, then continue with **Step 13**.

13. Use **`opr-aco`** command to silence active audible office alarms, if required.

14. Note the trouble indication in the `Description` column of the `Active Alarm and Status Report`, starting with the highest alarm level (Minor) listed in the `Alarm Level` column.

15. Find the trouble description in Table A for the highest alarm level and go to the indicated step or procedure.

Table A. Minor Alarm Conditions

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted.	`-48V power/fuse failed`	-48V power feeder or fuse on User Panel failed.	Replace fuse. [**DLP-555**]
MN LED lighted.	`automatic protection switch (APS) channel failed`	Failure of near-end or far-end prot. **OLIU** (main-2) CP or failure of receive fiber on the prot. line at near end	TAP-111
MN LED lighted	`automatic protection switch (APS) automatic lock`	Four auto. switches of one **DS1** CP in 10 min. **DS1** intermittent failure.	Replace DS1 CP [**DLP-523**]
MN LED lighted.	`CP not allowed - (crs)`	CP does not support the manual cross-connection(s) currently provisioned for this slot.	Change CP or change cross-connections
MN LED lighted	`CP not allowed - (eqpt)`	A **DS1** or **DS1PM** CP is installed in a low speed slot associated with function unit provisioned for DS3, STS1E_L, or OLIU service.	Remove DS1 CP c change function ur to **MXRVO** or **STS1E-H**.
MN LED lighted.	`CP not allowed - (timing)`	When associated with **TGS** slot, current CP switch settings do not support the sync. timing provisioned.	Change **TGS** switches [**DLP-51** or change sync. parameters (**`set-sync`**).
		When associated with function unit slot C, CP type does not support the current provisioned sync. parameters	Change circuit pac type or change tim options

MN LED lighted. **FAULT** LED lighted on circuit pack	`DS1 circuit pack failed`
	`DS1PM circuit pack fail`
	`DS3 circuit pack fail`
	`STS1E_L circuit pack fail`
	`STS1E_H circuit pack fail`
	`TGS circuit pack fail`
	`MXRVO circuit pack fail`
	`OLIU circuit pack fail`
		Internal failure of circuit pack with lighted LED	Step 17

MN LED lighted.	`DS1 circuit pack removed`
	`DS1PM circuit pack removed`
	`DS3 circuit pack removed`
	`STS1E_L circuit pack removed`
	`STS1E_H circuit pack removed`
	`TGS circuit pack removed`
	`MXRVO circuit pack removed`
	`OLIU circuit pack removed`
		Circuit packs removed without doing **`upd`** command to remove circuit packs from equipment list.	Step 29

See Notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted.	`environment`***n****	The specified environmental alarm point (misc. discrete input) is active at RT Note: The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the **`rtrv-attr-env`** and **`set-attr-env`** commands.	Use **`rtrv-attr-env`** command at RT to determine trouble.
MN LED lighted.	`externalMinor`†	The external minor alarm input (environmental alarm input 15) is active. Typically, this input will be connected to the power shelf, and will indicate that the DC power or the cooling fan in a remote terminal cabinet has failed. Note: The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See **`rtrv-attr-env`** and **`set-attr-env`** commands.	Use **`rtrv-attr-env`** command at RT to determine trouble
MN LED lighted. **FAULT** LED lighted on **SYSCTL**	`fan control relay failed`	Telemetry output common is not grounded. **SYSCTL** failed.	Step 18
MN LED lighted. LEDs lighted on fan shelf	`fan shelf failed`	Fan filter needs replacing Fan pack failed. Fan shelf control board failed. Fan power feeder failed. The fan must be repaired within 4 hours, otherwise service interruption may occur.	**TAP-118**
MN LED lighted.	`illegal CP type`	An illegal or unknown circuit pack type has been inserted into the shelf	Remove CP and install correct CP

See Notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted. **FAULT** LED flashing on **DS1**	`inc. (from DSX) DS1 LOS†` `inc. (from DSX) DS1 sig fail†`	Equipment failed or removed at DSX-1	Step 23

MN LED lighted. **FAULT** LED flashing on TGS circuit pack	`Incoming (inc.) DS1 sync. ref.`
	`alarm indication signal (AIS)`
	`bit error rate (BER) exceeds threshold`
	`excessive out of frame (EOOF)`
	`loss of frame (LOF)`
	`loss of signal (LOS)`
	`out of lock (OOL)`
		Failure of incoming sync. ref. signal. **TGS** provisioned for wrong frame format (SF or ESF).	Step 27

MN LED lighted. **FAULT** LED flashing on DS3	`inc. (from DSX) DS3 LOS*` `inc. (from DSX) DS3 sig. fail†`	Equipment failed or removed at DSX-3	Step 25

MN LED lighted **FAULT** LED flashing on **OLIU**	`incoming (inc.) OC3 sig. failed (BER) exceeds threshold`
	`loss of frame (LOF)`
	`loss of pointer (LOP) STS1 #1`
	`loss of pointer (LOP) STS1 #2`
	`loss of pointer (LOP) STS1 #3`
	`loss of signal (LOS)`
	`sig. degrade (BER)`
		Failure of **OLIU** at near or far end, or failure of receive fiber.	**TAP-111** (R2, R3, R6) **TAP-119** (R5, R7)

	`inc. STS1 LOP OC3 slotaid`	If failure on both OC-3 lines: unprotected removal or failure of **MXRVO** or **DS3** CP at far end	Step 48
		If failure on only one OC-3 line. Failure of **OLIU** at near or far end.	**TAP-111** (R2, R3, R6) or **TAP-119** (R5, R7)

See Notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted. **FAULT** LED flashing on **STS1E**	incoming (inc.) EC1 sig. failed (BER) exceeds threshold loss of frame (LOF) loss of pointer (LOP) STS1 #1 loss of pointer (LOP) STS1 #2 loss of pointer (LOP) STS1 #3 loss of signal (LOS) sig. degrade (BER) line AIS	Failure of **STS1E** at near or far end, or failure of receive fiber.	Step 25
MN LED lighted.	inc. STS1 sig failed (BER)	Failure of **OLIU** at near end or far end or failure of receive fiber.	**TAP-111** (R2, R3, R6) **TAP-119** (R5, R7)
	inc. STS1 unequipped	An STS-1 cross-connect has been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring	Find the deleted cross-connect in the upstream equipment.
MN LED lighted.	inc. VT LOP	Unprotected failure of **DS1** or **MXRVO** at near end or far end.	Replace CP associated with alarm.
	inc. VT unequipped	An VT1.5 cross-connect has been deleted in upstream equipment interfacing with the DDM-2000 OC-3 ring	Find the deleted cross-connect in the upstream equipment
MN LED lighted.	invalid CP switches	When associated with **TG** slot, timing mode switch settings on **TGS** circuit packs are invalid.	Step 44

See Notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MJ LED lighted. Flashing **FAULT** LED on **OHCTL**	`section DCC channel failed`	**SYSCTL** failure, reset, or initialization at far end. **SYSCTL** removed from a site. Program installation in progress or failed at far end. **SYSCTL** or **OHCTL** failed at near end or removed at far end. **OLIU** or fiber failure between this node and node connected to the source address (no communication with other end).	Step 52

MN LED lighted. **FAULT** LED lighted on circuit pack	`unexpected CP switches`
	`unexpected CP type/switches`
	`unexpected CP type`
		Switch settings invalid, different from other circuit pack, or different than they were before circuit pack was removed or replaced. Circuit pack inserted into slot provisioned for different circuit pack.	Step 41

MN LED lighted.	`unexpected CP present`	A **DS1** is in slot associated with group prov. for **DS3**.	Remove **DS1** pack or change **DS3** to **MXRVO**

Note: Similar descriptions of trouble may also appear in the CIT alarm and status report.

* May be provisioned for Critical, Major, Minor or no alarm.
† May be provisioned for Major, Minor or no alarm.

16. Is a **FAULT** LED lighted or flashing on an **OLIU** circuit pack?

    If **YES**, then do **TAP-111** if linear configuration.
    Do **TAP-119** if ring configuration.
    If **NO**, then continue with **Step 17**.

17. Is the **FAULT** LED lighted (not flashing) on the faceplate of one and only one circuit pack of the **DDM-2000**?

    If **YES**, then continue with **Step 18**.
    If **NO**, then proceed to **Step 21**.

18. ⚠ CAUTION:
    Replacement circuit packs may have option switches which must be properly set before the circuit pack is installed.

    Check circuit pack option switch settings for improper or invalid settings. If no trouble is found, refer to **DLP-523** and replace the circuit pack with the lighted **FAULT** LED.

19. Is the **MN** LED off on the User Panel?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 20**.

20. Is the **FAULT** LED lighted on the faceplate of the replacement circuit pack just installed?

    If **YES**, then do **TAP-106**.
    If **NO**, then return to **Step 1**.

21. Is the **FAULT** LED on the faceplate of one or more circuit packs flashing?

    If **YES**, then continue with **Step 22**.
    If **NO**, then proceed to **Step 29**.

22. Find the circuit pack(s) with the flashing LED(s) in Table B below and go to the indicated step.

Table B. Flashing LEDs

Circuit Pack With Flashing LED	Go To
DS1/DS1PM	Step 23
DS3/STS1E	Step 25
TGS	Step 27

23. There is an incoming DS1 signal failure. Switch service to protection. If LED is flashing on protection **DS1/DS1PM**, issue trouble report of bad incoming signal at input to **DS1/DS1PM** circuit pack with flashing LED(s). If LED is not flashing on protection **DS1/DS1PM**, replace service **DS1/DS1PM** circuit pack [**DLP-523**].

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. Switch service to protection. If LED is flashing on protection **DS3/STS1E**, issue trouble report of bad incoming DS3/EC-1 signal from DSX-3/STSX cross-connect point. If LED is not flashing on protection **DS3/STS1E**, replace service **DS3/STS1E** circuit pack [**DLP-523**].

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

27. Check **TGS** option switches for proper line coding and frame format settings (`rtrv-sync`). If no trouble found, check incoming timing reference signals. If timing reference signals are bad, issue trouble report of bad incoming timing reference signal(s). If no trouble found with timing references, replace **TGS** circuit packs.

    Reference: **DLP-523**

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. Have two of the same type (service and protection **TGS**, **MXRVO**, **STS1E**, or **DS3**) circuit packs been removed from the system?

    If **YES**, then continue with **Step 30**.
    If **NO**, then proceed to **Step 32**.

30. Determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.

31. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

32. Is ED-8C733-30, G7 Fan Shelf installed?

    If **YES**, then continue with **Step 33**.
    If **NO**, then proceed to **Step 35**.

33. Is **POWER ON** LED lighted on fan shelf?

    If **YES**, then continue with **Step 34**.
    If **NO**, then go to **TAP-118**.

34. Is **FILTER REPLACE** or any **FAULT** LED lighted on fan shelf?

    If **NO**, then continue with **Step 35**.
    If **YES**, then go to **TAP-118**.

35. ⚠ CAUTION:
If fuse on User Panel is not blown, trouble may be a failure of **one** *of the –48V DC power feeders. Removing the wrong fuse or disconnecting the wrong feeder for power measurement will cause service interruption. Blown fuses are detected by noting that the fuse indicator pin is extended through the fuse holder.*

⇶ NOTE:
If fuse is not blown on the User Panel, check office battery distribution fuse board for blown fuses or tripped breakers. Replace fuse or reset breaker if necessary.

Is –48V fuse blown on User Panel?

If **YES**, then continue with **Step 36**.
If **NO**, then do **TAP-113**.

36. ⇶ NOTE:
The fuses on the G3 shelf User Panel are 5 amp indicator type fuses, part number WP90247L113, COMCODE 405697442. With older fuse types, 334005, COMCODE 405697442, insure the indicator end of the fuse is placed into the fuse cap so the indicator can protrude through the hole in the fuse cap if the fuse blows.

Replace blown –48V fuse on User Panel?

37. Did fuse blow again?

If **YES**, then proceed to **Step 39**.
If **NO**, then continue with **Step 38**.

38. Is MINOR alarm cleared?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then proceed to **Step 41**.

39. ⚠ CAUTION 1:
Removal of an unprotected circuit pack may cause service interruption.

⚠ CAUTION 2:
Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE 1:
Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

⇒ NOTE 2:
The –48V power feeders/fuses on the User Panel supply power to DC-to-DC converters on the **TGS**, **OLIU**, **MXRVO**, **DS3**, and **SYSCTL** circuit packs. It is unlikely that a circuit pack failure would cause only one feeder fuse to blow. The more probable cause of failure of only one feeder fuse would be a short of the backplane feeder path or a problem with a circuit pack shelf connector. After a thorough inspection of the backplane, if no trouble is found, the circuit packs can be removed one at a time to try and isolate the trouble.

Remove ***one*** of each pair of circuit packs listed in the above note and replace blown –48V fuse. If fuse does not blow again, reinstall all removed circuit packs one at a time, beginning with the **SYSCTL**. Replace any circuit pack that causes the fuse to blow (**DLP-523**). If fuse blows again with one of each pair of circuit packs removed, reinstall removed circuit packs and repeat the procedure for the remaining circuit packs (except DS1s). If fuse blows after all circuit packs have been removed, trouble is in the backplane.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

41. NOTE:
Alarm may be caused by circuit packs inserted into the wrong slots or by invalid or wrong switch settings on the **TGS** circuit packs.

Are circuit packs installed in the correct slots (`rtrv-eqpt`)?

If **YES**, then proceed to **Step 44**.
If **NO**, then continue with **Step 42**.

42. Remove circuit packs from wrong slots, check option switches (**DLP-513**) and reinstall circuit packs into the correct slots.

43. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

44. CAUTION:
When removing circuit packs ensure that protection switching is available. Also, remove the circuit pack without the lighted **ACTIVE** *LED first.*

Check switch settings (`rtrv-sync` command) on the **TGS** circuit packs for correct settings. If the circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced. Also check if the switches are set the same as the companion circuit pack.

Reference: **DLP-513**

45. Are switch settings correct?

If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 46**.

46. Change switch settings to the correct settings. (Use `sw-sync` command to switch to other circuit pack before removing pack.) If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.

47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

48. Indications are that there is an unprotected failure or removal of a **MXRVO** or **DS3** circuit pack at the far-end associated with the identified **OLIU** slot at the near-end. Determine location of the circuit pack(s) from office records or use the **rtrv-crs-()** commands to trace back through the STS1/VT1.5 cross-connections associated with the identified **OLIU** slot.

49. If circuit packs are removed, determine the reason the circuit packs were removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL or use the upd** command. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **upd** command to remove the circuit pack from the inventory.

50. If the **MXRVO** or **DS3** circuit packs have not been removed, replace the **MXRVO** or **DS3** circuit pack associated with the identified **OLIU** slot in the alarm message.

    Reference: **DLP-523**

51. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

52. In alarm report, is there any indication of **OLIU** or fiber trouble at near end or far end such as "inc. OC3 FERF" alarm message?

    If **YES**, then continue with **Step 53**.
    If **NO**, then proceed to **Step 55**.

53. ⇒ NOTE:
    If there is a DCC failure, a remote login to the shelf connected through the Source Address cannot be done. The **rtrv-alm**, **rtrv-nmap**, and **rtrv-map-neighbor** (R7.2) commands can be used to check for dcc failure for main (and function units A, B, or C). Also, use **rtrv-fecom** command to see if "fecom" has been disabled.

    Note Source Address of DCC channel failure. Check optical fibers connected through the Source Address per local procedures. If no trouble found, replace near-end **OLIU** first then far-end **OLIU**.

    Reference: **DLP-523**

54. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

55. Use CIT and **`reset`** command to reset **SYSCTL** at the near end or unplug and reseat the **SYSCTL**.

56. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (`section DCC channel failed`)?

    If **YES**, then continue with **Step 57**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

57. If possible, use CIT and **`rlgn`** command to log in to the far-end terminal (**DLP-522**) and use the **`reset`** command to reset **SYSCTL** at the far end.

58. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (`section DCC channel failed`)?

    If **YES**, then continue with **Step 59**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

59. ⚠ CAUTION:
    Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

    ⇒ NOTE 1:
    Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

    ⇒ NOTE 2:
    You may prefer to go to the far end first and check if the **OHCTL** is failed or removed before replacing the **SYSCTL** at the near end.

    Refer to **DLP-501** and replace **SYSCTL** at near-end terminal.

60. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing?

    If **YES**, then continue with **Step 61**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

61. At far-end terminal, reset **SYSCTL** by unseating and reseating **SYSCTL** or by using a CIT and the `reset` command, if not already performed. If **FAULT** LED is still flashing after a reset, refer to **DLP-501** and replace **SYSCTL** at far-end terminal. If the **FAULT** LED is still flashing after the **SYSCTL** is replaced, replace the **OHCTL** [**DLP-523**] first at one end and then the other, if trouble still exists.

62. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Obscure Minor (MN) Alarm

1. Perform an LED test by depressing the **ACO** button or using the `test-led` command from a CIT.

   Reference: **DLP-509**

2. Did any circuit pack fail the LED test?

   If **YES**, then do **TAP-115**.
   If **NO**, then continue with **Step 3**.

3. Is this site a remote terminal location with separate J1C182BA Power Shelf and/or fan unit?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 5**.

4. Look for blown fuses and/or lighted LEDs on the battery shelf, battery charger, or fan assembly. Is there any indication of trouble?

   If **YES**, then do **TAP-114**.
   If **NO**, then continue with **Step 5**.

5. Is a CIT available?

   If **YES**, then proceed to **Step 11**.
   If **NO**, then continue with **Step 6**.

6. ⚠ CAUTION:
   Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

NOTE 1:
Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

NOTE 2:
Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

7. Is the **MN** alarm LED still lighted, after about 20 seconds?

   If **YES**, then continue with **Step 8.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. CAUTION:
   Replacing the **SYSCTL** *involves updating the internal memory on the circuit pack.*

   Replace the **SYSCTL** (**DLP-501**).

9. Is **MN** alarm LED still lighted?

   If **YES**, then continue with **Step 10.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. NOTE:
    Without a CIT it is difficult to determine the cause of the minor alarm. **Table A** lists some remaining possible causes of a minor alarm.

    Obtain a CIT and establish session with the DDM-2000 system.

    Reference: **DLP-521**

11. Use CIT and `rtrv-alm` command to get an alarm and status report. See the REPORT DESCRIPTIONS section of this manual under **RTRV-ALM** for a description of each message retrieved with the `rtrv-alm` command.

12. Refer to **Table A**. Are any of the conditions listed in the Description column reported in the Alarm and Status Report?

    If **YES**, then continue with **Step 13.**
    If **NO**, then proceed to **Step 27.**

13. Refer to **Table A**. Note the suspected trouble and go to the indicated step or procedure.

Table A. Obscure Minor Alarm Conditions

Description	Meaning	Step
`APS - automatic lock`	Service associated with a **DS1** CP has been automatically switched and locked onto the protection **DS1**. The APS lock will remain active until midnight.	Step 14
`APS channel failed`	The APS channel on the protection OC-3 line has failed	Step 17
`external minor`	DC power or fan failure at a remote terminal far end.	TAP-114
`environment`*xx*	A miscellaneous discrete input is active. This message may be changed using the `set-attr-env` command The description may be an alphanumeric string up to 26 characters long (for example, Fire, Open door, etc.)	Step 19
protected `CP removed`	A circuit pack previously installed in the system is removed The pack should be replaced or an update (**upd**) should be done to remove it from the equipment list.	Step 21

`unexpected CP/type switches`
`unexpected CP switches`
`unexpected CP type`
`unexpected CP present`
	A circuit pack is installed in a slot provisioned for a different circuit pack, or switch settings have been changed from what they were before the circuit pack was removed.	Step 23

14. NOTE:
There is an automatic lock. An automatic lock occurs when an *automatic* protection switch is made and then broken four times within a 10-minute interval.

From the Alarm and Status Report, determine the source address of the **DS1** circuit pack locked onto the protection **DS1**.

15. CAUTION:
When a **DS1** *is switched to protection, removal of any other* **DS1** *circuit pack or* **177A** *Retainer Card in the same group will result in a loss of service to the protected* **DS1** *and the removed* **DS1** *circuit pack.*

Replace **DS1** service circuit pack locked onto protection.

Reference: **DLP-523**

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. NOTE:
Indications are that the **OLIU** circuit pack on the protection line (slot **2**) has failed at the near end or far end, or the receive fiber on the protection line at the near end has failed.

Go to **TAP-111** and isolate trouble on the **OLIU**s.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. Use local procedures to clear condition(s) that caused environmental alarm.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. Locate source address of removed circuit pack from the Alarm and Status Report then determine the reason the **DS1** circuit pack was removed. If the same circuit pack is to be reinserted and no switch settings are changed, reinstall the circuit pack. If the circuit pack was removed and switch settings changed, reinstall the circuit pack and momentarily depress the **UPD/INIT** button on the **SYSCTL**. If the circuit pack is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from the inventory.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. ⇒ NOTE:
    Indications are that a circuit pack has been installed in a wrong slot; switch settings are invalid or different from a companion circuit pack; or switches are set differently from what they were before a circuit pack was replaced.

    Determine the source address from the Alarm and Status Report. Refer to the Commands and Reports section of this manual under **RTRV-ALM** for a more detailed description of the meaning of the report.

24. If a circuit pack(s) is installed in the wrong slot, remove the circuit pack. Determine correct position of the circuit pack and install circuit pack into the correct slot.

    Check circuit pack switch settings for valid settings or wrong settings (**DLP-513**). If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. Has the **SYSCTL** been replaced?

    If **YES**, then proceed to **Step 31**.
    If **NO**, then continue with **Step 27**.

27. Use the CIT and `reset` command to reset **SYSCTL**.

28. Is the **MN** alarm LED still lighted after about 20 seconds?

    If **YES**, then continue with **Step 29.**
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. ⚠ CAUTION:
    Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

    ⇒ NOTE 1:
    Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

    ⇒ NOTE 2:
    Replacing the **SYSCTL** involves updating the internal memory on the circuit pack.

    Replace the **SYSCTL** (**DLP-501**).

30. Is **MN** alarm LED still lighted?

    If **YES**, then continue with **Step 31.**
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. ⇒ NOTE:
The problem appears to be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000 the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

Check for broken or bent pins, shorted pins, etc. If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

32. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear External Minor Alarm at RT

1. Are there any blown fuses on battery shelf or **BFU** (for bulk powering)?

   If **YES,** then continue with **Step 2.**
   If **NO,** then proceed to **Step 4.**

2. Replace blown fuse(s).

3. Does alarm clear?

   If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO,** then continue with **Step 4.**

4. Is bulk power (J1C182BB bulk power shelf) being used?

   If **YES,** then proceed to **Step 25.**
   If **NO,** then continue with **Step 5.**

5. Is **OPEN BATT** LED on **337A BATTERY CHARGER** lighted at RT battery shelf?

   If **YES,** then continue with **Step 6.**
   If **NO,** then proceed to **Step 25.**

6. Condition DMM (digital multimeter) to measure voltage.

7. Measure voltage at **–48B** and **GND** and **–48L** and **GND** jacks on the **LDU** faceplate.

8. Does voltage measure between –42 and –58 volts?

   If **YES,** then continue with **Step 9.**
   If **NO,** then proceed to **Step 18.**

9. Use SD-7C119 to check wiring between **337A BATTERY CHARGER** and batteries.

10. Was a problem found in wiring?

    If **YES,** then continue with **Step 11.**
    If **NO,** then proceed to **Step 12.**

11. Correct wiring problem and proceed to **Step 17.**

12. Is fuse blown on **337A BATTERY CHARGER**?

    If **YES,** then proceed to **Step 16.**
    If **NO,** then continue with **Step 13.**

13. Is **BAT DISCHG** LED on **337A BATTERY CHARGER** lighted?

    If **YES,** then continue with **Step 14.**
    If **NO,** then proceed to **Step 16.**

14. Depress and hold **HIGH RATE CHG ACTIVATE** pushbutton on **337A BATTERY CHARGER**. Is **BAT DISCHG** LED lighted?

    If **YES,** then continue with **Step 15.**
    If **NO,** then proceed to **Step 16.**

15. ⇒ NOTE:
    HIGH RATE CHG ON LED will remain lighted until batteries reach approximately –58 volts. If batteries are completely discharged, it may take approximately one day for **HIGH RATE CHG ON** LED to go out.

    Release **HIGH RATE CHG ACTIVATE** pushbutton. Does **BAT DISCHG** LED go off and is **HIGH RATE CHG ON** LED lighted?

    If **YES,** then proceed to **Step 17.**
    If **NO,** then continue with **Step 16.**

16. Replace **337A BATTERY CHARGER** and proceed to **Step 17.**

17. Did alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 23.**

18. Use DMM to measure voltage at battery shelf jacks **J5** (**+BAT**) and **J6** (**–BAT**).

19. Does voltage measure between –42 and –58 volts?

    If **YES,** then proceed to **Step 37.**
    If **NO,** then continue with **Step 20.**

20. Is **197A BATTERY LOAD TEST SET** available for use in testing batteries?

    If **YES,** then continue with **Step 21.**
    If **NO,** then proceed to **Step 23.**

21. Test batteries using **197A** test set.

    Reference: **DLP-536**

22. Replace any failed battery pack(s) and reconnect battery leads to battery shelf and proceed to **Step 24.**

23. Replace battery packs one at a time until –48 volts is present at output jacks on battery shelf.

24. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 25.**

25. Is **FAN ALARM** LED lighted on a fan assembly?

    If **YES,** then continue with **Step 26.**
    If **NO,** then proceed to **Step 37.**

26. Remove **FAN H** and **FAN L** fuses on corresponding **BFU** on power shelf. Are fuses blown?

    If **YES,** then continue with **Step 27.**
    If **NO,** then proceed to **Step 30.**

27. Replace **FAN H** and **FAN L** fuses on corresponding **BFU**.

28. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 29.**

29. Is **FAN ALARM** LED lighted on fan assembly?

    If **YES,** then continue with **Step 30.**
    If **NO,** then proceed to **Step 37.**

30. ⚠ WARNING:
    To avoid possible damage, do not overextend fan assembly power cable.

    Remove fan assembly from bay.

31. Examine fan assembly for anything that will prevent fan from operating properly.

32. Remove any blockages and reinstall fan assembly and fuses.

33. Is fan assembly **FAN ALARM** LED off?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 34.**

34. Remove **FAN H** and **FAN L** fuses on corresponding **BFU.**

35. Replace fan assembly with new fan assembly and install fuses.

36. Is fan assembly **FAN ALARM** LED off?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 37.**

37. Replace one of the **336 RECTIFIER**s.

38. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 39.**

39. Reinstall original **336A RECTIFIER.**

40. Replace second **336A RECTIFIER.**

41. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 42.**

42. Reinstall original **336A RECTIFIER.**

43. If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

44. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear LED Test Trouble

1. Did all of the LEDs in the **DDM-2000** fail to light?

   If **YES**, then proceed to **Step 4**.
   If **NO**, then continue with **Step 2**.

2. ⚠ CAUTION:
   Replacement circuit packs may have option switches which must be properly set before the circuit pack is installed.

   Refer to **DLP-523** and replace the circuit pack that failed the LED test. Repeat the LED test.

3. Did the same LED fail the test again?

   If **YES**, then continue with **Step 4**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. ⚠ CAUTION:
   Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

   ⇒ NOTE 1:
   Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

NOTE 2:
Using the CIT and `reset` command or unseating and reseating the **SYSCTL** restarts the software program.

Enter `reset` command or unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

5. Repeat the LED test.

6. Did the same LED(s) fail the test again?

   If **YES**, then continue with **Step 7.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. CAUTION:
   Replacing the **SYSCTL** *involves updating the internal memory on the circuit pack.*

   Replace the **SYSCTL** (**DLP-501**) and repeat the LED test.

8. Did the LED test fail again?

   If **YES**, then continue with **Step 9.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. NOTE:
   The problem appears to be in the backplane wiring of the DDM-2000. One way to verify this is to swap the **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with the corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more of the circuit packs is defective. If the problem stays with the original DDM-2000 the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

   If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble During Program Upgrade

1. ⇒ NOTE:
   Program installation may fail due to failure of communication link between PC and DDM-2000, failure of the floppy disk on the PC, failure or loss of power in the PC, or failure of the **SYSCTL** or **OHCTL**.

   Was the following prompt printed indicating communication was established with near-end shelf:

   ```
   /*Enter a shelf number from 1 to 8*/
   shelf [default] =
   ```

   If **YES**, then proceed to **Step 4**.
   If **NO**, then continue with **Step 2**.

2. Check PC to CIT port connections. Make sure the cable is connected between the PC **COM( )** port and the CIT port on the DDM-2000. If the rear CIT port is being used on the DDM-2000, make sure a null modem is installed on the port. Check baud rate settings on **SYSCTL** and CTRM terminal emulator. Check if CIT bay mult cabling is connected to this shelf but not terminated at another shelf.

   If you need assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. Was the following message received?

   ```
   /* Status, execution stopped. */
   /* Communication link could not be established.
   Please connect PC with DDM-2000 upgrade program and
   start again. */
   ```

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. ⇒ NOTE:
   Indications are that the PC is not functioning properly, you are using a CIT instead of a PC, the disk drive is inoperable, the diskette has been removed, or the program has previously been erased from the **SYSCTL**. A program upgrade to the near end DDM-2000 cannot be performed with a CIT. Ensure you are using a PC to upgrade the program. Check that the PC is operating properly and the diskette has not been removed.

   Has program installation procedure been tried more than once?

   If **YES**, then continue with **Step 6.**
   If **NO**, then proceed to **Step 14.**

6. Was the following message received?

```
ins-prog:tid DENY
  SSTP
  /* Status, execution stopped. */
  /* Far end not responding.
```

   If **YES**, then continue with **Step 7.**
   If **NO**, then proceed to **Step 10.**

7. Are **SYSCTL** and **OHCTL** circuit packs installed at far end?

   If **YES**, then proceed to **Step 10.**
   If **NO**, then continue with **Step 8.**

8. Determine reason **SYSCTL** or **OHCTL** is not installed. The **SYSCTL** and **OHCTL** must be installed to upgrade program. Reinstall the **SYSCTL** and **OHCTL** and repeat the program installation procedure.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Did **SYSCTL** or **OHCTL** fail, indicated by the following or similar SYSCTL CP failed message?

```
ins-prog:tid DENY
  SSTP
  /*Status, execution stopped.*/
  /*Installation cannot be done because of SYSCTL test
  failure. */
```

    If **YES**, then proceed to **Step 17.**
    If **NO**, then continue with **Step 11.**

11. Did **FAULT** LED on **SYSCTL** light and did the **SYSCTL FE ID** display go off?

    If **YES**, then proceed to **Step 19.**
    If **NO**, then continue with **Step 12.**

12. ⇒ NOTE:
    It is assumed that the program installation failed in one of two ways: before the old program was erased or after the old program was erased. If the program installation failed after 1 minute, the DDM-2000 may have erased its old program and will be unable to report alarms or do protection switches. If program installation failed within 1 minute, the old program may not have been erased and the DDM-2000 may have automatically reset and restarted its old program. A new attempt must be made to install the program.

    Check PC COM( ) port to CIT connection. Check PC disk drive and floppy diskette.

13. Has program installation procedure been tried more than once?

    If **NO**, then continue with **Step 14.**
    If **YES**, then proceed to **Step 15.**

14. ⇒ NOTE:
The new program installation may have failed because of faulty diskettes.

Disconnect PC and repeat program installation procedure. Use your *backup diskettes* containing new generic program, if available.

15. If new program installation cannot be completed and the old program has been erased, one the following procedures may be used to restore the old program or install a different version program.
    A. Go to the far-end shelf and establish session with a CIT. Enter the **ins-prog:** *tid* [**cpy-prog:** *tid*, Release 6.2 or later] command where the *tid* is the *tid* (shelf name) for the failed shelf where you want to install the old program.

    B. Replace the **SYSCTL** and **OHCTL** with one that has compatible software.

       Reference: **DLP-523**

    C. If a "**C**" was displayed in the **FE ID** display during a software upgrade, indications are that the software being loaded will not support the current system transmission configuration. This indicates a problem with the version of software you are trying to install, or you are trying to install an older version of software that does not support the system configuration that you have. To load another version of software, unseat and then reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a "**P**" appears in the **FE ID** display. Release buttons and install program using the procedures of **DLP-532**.

    If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. ⚠ CAUTION:
If old program is still running, removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE:
Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

Unseat and reseat **SYSCTL** to perform reset.

18. Is alarm still present?

If **YES**, then continue with **Step 19.**
If **NO**, then proceed to **Step 21.**

19. Has **SYSCTL** or **OHCTL** been replaced?

If **NO**, then continue with **Step 20.**
If **YES**, then proceed to **Step 23.**

20. ⚠ CAUTION:
Caution: Replacing the **SYSCTL** *involves updating the internal memory on the circuit pack.*

Replace the **SYSCTL** or **OHCTL.**

Reference: **DLP-523**

21. Repeat program installation procedure.

    Reference: **DLP-532**

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. If you need technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear NE ACTY/FE ACTY Alarm Only

1. Is a CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 8**.

2. ⇒ NOTE:
   For all network configurations except point-to-point, there will be multiple far-end "farend" terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

   - Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system.

     Reference: **DLP-521**

3. ⇒ NOTE 1:
   The `rtrv-alm` command can be used to display a report of active alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

   ⇒ NOTE 2:
   The `Active Alarm and Status Report` is output automatically following CIT log in. The report shown in Figure 1 is an example that shows one entry. There may be many entries in the actual report.

   Note the information in the `Source Address` and `Description` columns for the top entry/entries above the first single-dashed line in the `Active Alarm and Status Report` (Figure 1) (for example, "ne-acty m2-1-1-1 MM-DD HH:MM:SS nsa inc. VT AIS").

```
/* Active Alarms and Status Report
=============================================================
 Alarm       Source    Date   Time      Srv   Description
 Level       Address     Detected
=============================================================
 ne-acty     m2-1-1-1  MM-DD HH:MM:SS   nsa   inc  VT AIS
-------------------------------------------------------------

*/
```

Figure 1. Example of Active Alarms and Status Report

4. ⇒ NOTE:
   Far-end alarm or status conditions are listed in this report with a `Source Address` of "`farend`". Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

   Does the `Source Address` of any top entry in the alarm report indicate a **local** slot, channel, port or operations interface for the `MAJOR` alarm?

   If **NO**, then do **TAP-107**.
   If **YES**, then continue with **Step 5**.

5. Note the trouble indication in the `Description` column of the `Active Alarm and Status Report`.

6. Find the trouble description in Table A and perform the indicated repair procedure(s).

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-530**].

   Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

9. Was **NE ACTY** LED lighted on User Panel when local shelf alarm conditions were displayed (**L.** displayed in **FE ID** display)?

   If **NO**, then continue with **Step 10**.
   If **YES**, then proceed to **Step 12**.

10. ⇒ NOTE:
    The **FE SEL** button on the **SYSCTL** is used to display local and remote alarm and status conditions [**DLP-530**].

    Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

11. Was **NE ACTY** LED lighted on the User Panel when alarms were displayed for any selected site?

    If **NO**, then do **TAP-108**.
    If **YES**, then continue with **Step 12**.

12. See the description of activity indications in Table A. Without a CIT it is difficult to diagnose the trouble further. If trouble cannot be isolated using the conditions listed in Table A, obtain a CIT for further analysis.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. Alarm and Status - NE ACTY

Activity	Meaning
`holdover mode active`	System is in holdover synchronization mode. **Likely causes**: (1) manual switch to holdover mode; (2) Automatic switch to holdover mode due to failure of timing ref. and failures have not cleared or system is prov. for non-revertive sync. mode switching; (3) in R5.1 ring applications, the selected optical line source for shelf timing has failed and the sync source has not been switched. Repair timing reference(s) if failed, and set synchronization mode protection switch with command `switch-sync:s=mode,pri=reset`. In R5 or R7 ring applications, set the timing sync source to the good path using the `set-sync:src=main-1` or `main-2`.
`inc. VT AIS`	System detects inc. VT path AIS from active OC-3 line. System responds by transmitting DS1 AIS toward the DSX-1 and VT yellow toward the fiber. **Likely causes**: Incomplete or incorrect cross-connect provisioning in end-to-end network [**TAP-120**] (in ring applications, this alarm may be caused by fiber or **OLIU** failures); unprotected removal or failure of DS1 circuit pack at far end; DS1 circuit pack installed at one terminating end with terminating cross-connections made and no DS1 pack installed at the other terminating end.
`inc. STS1 AIS`	System detects inc. STS-1 AIS from active OC-3 line. System responds by transmitting DS1 or DS3 AIS toward the DSX and STS-1 yellow toward the fiber. **Likely causes**: Incomplete or incorrect cross-connect provisioning in end-to-end network [**TAP-120**]; unprotected removal or failure of **DS3** or **MXRVO** circuit pack at far end; OC-3 system interworking with OC-12 system at one end and no associated OC-3 system at the other end. Use **TAP-120** to look for missing cross-connections.
`inc. OC-3 line AIS`	System detects inc. OC-3 line AIS on active OC-3 line. **Likely cause**: failure of OLIU circuit pack at far end [**TAP-111**] or [**TAP-119**].
`inc DS1 LOS` `inc (from DSX) DS1 LOS`	At least 128 consecutive zeros are received in the DS1 signal incoming from the DSX-1, or the energy at the DS1 input is below a preset threshold. **Likely causes**: Hard failure of upstream equipment or facility (towards the DSX-1). The DS1 input is disconnected at the backplane or the DSX-1; equipment is failed or removed at DSX-1. Repair using local procedures.

Table A. Alarm and Status - NE ACTY (Continued)

Activity	Meaning
inc. DS1 sig failed (BER)	The bit error ratio (BER) in the DS1 signal incoming from the DSX-1 exceeds the provisioned failure threshold, 10^{-3} or 10^{-6}. **Likely causes**: Mismatch of line code (AMI/B8ZS); failure of upstream equipment or facility (towards the DSX-1); crosstalk in office wiring; failure of the DS1 CP.
inc. DS3 AIS inc. (from OC3) DS3 AIS	The system has detected DS3 AIS in the demux direction (coming from the fiber) for the specified DS3 signal. **Likely causes**: The incoming DS3 signal at the far end has failed, DS3 AIS is received from the DSX-3 at the far end, or incomplete or missing STS1 (DS3) cross-connections at a far end terminal. Check incoming DS3 signal at far end and/or look for missing cross-connections [**TAP-120**].
inc. DS3 OOF inc. (from OC3) DS3 OOF	System detects a DS3 out-of-frame condition in demux direction (coming from fiber). **Likely causes**: An OOF DS3 signal inc. to the DSX-3 at the far end; or failure of DS3 circuit pack at near or far end. If no trouble with DSX-3 signal, replace **DS3** pack [**DLP-523**].
inc EC1 FERF	The system has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal. **Likely causes:** The other end has detected an incoming signal failure on the specified EC-1 line. This may be caused by failure of the STS1E CP at the near end, the STS1E CP at the far end, or the transmit cable on the specified line. Replace STS1E CP at near end and/or far end [**DLP-523**] or repair EC-1 cable.
inc. OC3 FERF	System detects the OC-3 Far End Receive Failure (FERF) signal in the incoming OC-3 signal. **Likely causes**: The far end has detected an incoming signal failure on the specified OC-3 line. This may be caused by failure of the OLIU CP at the near end, the OLIU CP at the far end, or the transmit fiber on the specified line [**TAP-111**] or [**TAP-119**].
inc. STS1 yellow	System detects an incoming STS-1 yellow signal inserted by the far end path terminating equipment. **Likely causes**: Incomplete or incorrect cross-connect provisioning in the end-to-end network [**TAP-120**], or unprotected unidirectional failure of the OLIU CP or fiber at some point in the end-to-end path.
inc. VT yellow	The far end is detecting VT AIS or VT LOP and inserting VT yellow in its transmit signal. **Likely causes**: Unprotected unidirectional failure of a circuit pack or fiber at some point in the end-to-end path

Clear Fan Shelf Alarm

1. ⇒ NOTE:
   POWER ON LED not lighted indicates power failure. **POWER FAULT** LED lighted indicates a single power feeder failure. **CONTROL FAULT** LED lighted indicates fan shelf assembly failure. **FILTER REPLACE** LED lighted indicates fan filter needs replacing. **FAN FAULT 1, 2, 3,** or **4** LED lighted indicates single fan failure. Execute **ALARM RESET** after failure is cleared.

   Is **POWER ON** LED lighted on fan shelf?

   If **NO**, then continue with **Step 2.**
   If **YES**, then proceed to **Step 9.**

2. Are **POWER RESET A** and **B** circuit breakers tripped (pins extended)?

   If **YES**, then continue with **Step 3.**
   If **NO**, then proceed to **Step 7.**

3. Reset circuit breakers (depress pins).

4. Did circuit breakers trip again?

   If **YES**, then continue with **Step 5.**
   If **NO**, then proceed to **Step 25.**

5. ⚠ CAUTION:
   Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

   ⇒ NOTE:
   To remove the front cover of a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 shelf.

Trouble in fan shelf. Remove front cover, disconnect cables to all 4 fan packs, and reset circuit breakers. If circuit breakers trip again, replace the fan shelf. If circuit breakers do not trip, reconnect fan units one at a time and replace the fan unit that causes the breaker to trip. The fan shelf must be repaired within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Trouble in power feeder(s). Check office battery distribution fuse panel for blown fuses. Check power feeders to fan shelf. Power must be restored within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if power is not restored and fan made operational.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Is **POWER FAULT** LED lighted on fan shelf?

   If **YES**, then continue with **Step 10.**
   If **NO**, then proceed to **Step 17.**

10. Is circuit breaker tripped?

    If **NO**, then continue with **Step 11.**
    If **YES**, then proceed to **Step 13.**

11. Trouble in one of the power feeders. Check office battery distribution fuse panel for blown fuses. Check power feeders to fan shelf.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. Reset circuit breaker (depress pin).

14. Did circuit breaker trip again?

    If **YES**, then continue with **Step 15.**
    If **NO**, then proceed to **Step 25.**

15. ⚠ CAUTION:
Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

NOTE:
To remove the fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 shelf.

Trouble in fan shelf. Replace fan shelf.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Is **CONTROL FAULT** LED lighted on fan shelf?

If **YES**, then continue with **Step 18.**
If **NO**, then proceed to **Step 20.**

18. ⚠ CAUTION:
Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

NOTE:
To remove a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 shelf.

Trouble in fan shelf. Replace fan shelf within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

20. Is **FILTER REPLACE** LED lighted on fan shelf?

If **YES**, then continue with **Step 21.**
If **NO**, then proceed to **Step 23.**

21. ⇒ NOTE:
The fan filter is located on the bottom of the DDM-2000 OC-3 shelf that is installed immediately below the fan shelf. It is held in place by magnetic strips. To remove the filter, simply pull it out. To install a filter, insert the filter, with magnetic strips facing up, into the bottom cavity of the shelf.

Replace fan filter. Momentarily depress **ALARM RESET** button.

Reference: **DLP-540**

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. Is **FAN FAULT 1, 2, 3,** or **4** LED lighted on fan shelf?
If **YES**, then continue with **Step 24.**
If **NO**, then proceed to **Step 25.**

24. ⇒ NOTE:
Fan packs are numbered from left to right as viewed from the front of the fan shelf. To replace fan pack, remove front cover and disconnect fan cable from failed fan pack. Remove 2 screws holding fan in place. Slide out old fan and install new one. Reinstall screws and connect fan cable.

Trouble is in fan pack associated with lighted LED. Replace ED-8C733-30, G6 fan pack.

Reference: **DLP-548**

25. Momentarily depress the **ALARM RESET** button to reset alarms.

26. Verify that all fan shelf alarm LEDs are extinguished and no circuit breakers are tripped.

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Main OLIU or Fiber Trouble
Path Protected Ring

1. ⚠ WARNING 1:
Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
When removing **OLIU** *circuit packs or replacing fiber, ensure that all VT/STS paths are active on the* **OLIU** *and fiber that is* **NOT** *being removed or replaced. When available, use a CIT and the* `switch-path-( ):all:pri=manual` *command to switch all VT/STS paths to the* **OLIU** *and fiber that are not being removed or replaced. It is also recommended to login to the far end of the* **OLIU** *and use the* `switch-path-( ):all:pri=manual` *command to switch all VT/STS paths to the* **OLIU** *and fiber that are not being removed or replaced.*

⚠ CAUTION 1:
If timing source has been previously set to optical line (main-1 or main-2) that has failed, use the `set-sync:src=main-1` *or* `main-2` *command to select timing source from good optical line.*

⇒ NOTE:
A lighted **FAULT** LED on the **OLIU** indicates that either the receiver, the transmitter, or both has failed. A flashing **FAULT** LED on the **OLIU** indicates that either the near-end receiver, far-end transmitter, or incoming (receive) fiber has failed. In a Path Protected Ring network, both **OLIU**s are normally **ACTIVE**. One **OLIU** carries service on one path of the ring and the other **OLIU** carries service on the other path. If possible, log into shelf associated with source address (for example, main-2) of "`inc. OC3 LOS`, etc. to see if ciruit pack is removed or failed.

Was **OLIU**(s) removed or being replaced or installed when alarm occurred?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 8**.

2. ⇒ NOTE:
An alarm will occur if a circuit pack is removed without performing an update by momentarily depressing the **UPD/INIT** button or using the `upd` command.

Is any previously installed **OLIU**(s) removed from the shelf?

If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 5**.

3. Determine the reason the circuit pack was removed. If the same circuit pack is to be reinserted, reinstall the circuit pack. If the circuit pack was removed and is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from equipment inventory.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Is **OLIU**(s) installed in correct slot(s) (rtrv-eqpt)?

If **NO**, then continue with **Step 6**.
If **YES**, then proceed to **Step 8**.

6. Remove optical fibers from circuit packs, if connected, then remove circuit pack(s) from wrong slot(s). Install circuit pack(s) into correct slot(s). Reconnect optical fibers (**DLP-514**).

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Is **FAULT** LED lighted (`OLIU CP failed`) on **OLIU** at any location associated with source address?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 11**.

9. Replace **OLIU** with lighted **FAULT** LED.

   Reference: **DLP-523**

10. Is **FAULT** LED still lighted (`OLIU CP failed`) on **OLIU**?

    If **YES**, then do **TAP-106**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Is **FAULT** LED flashing (`inc. OC3 LOS`) on **MAIN 1** or **MAIN 2 OLIUs**?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 14**.

12. ⇒ NOTE:
    Indications are that the incoming (receive) optical fiber line has failed or near-end or far-end **MAIN 1** or **MAIN 2 OLIUs** have failed.

    Check optical fiber lines per local procedures, repair if necessary. If no trouble is found in the optical fibers, replace **OLIU**(s) at near end first (**DLP-523**). If trouble still exists, replace **OLIU**(s) at far end. Check for removed or failed **TGS**, **MXRVO**, or **DS3** circuit packs at the far end. If trouble still exists, trouble is in receive optical fiber associated with **OLIU** with flashing LED. Clear trouble in optical fiber per local procedures.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. For technical assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear STS/VT AIS Alarm Conditions

1. ⇒ NOTE 1:
Incoming VT and/or STS1 AIS often indicates missing or incorrect cross-connects. In linear or add/drop configurations these are reported in the alarm and status report and the history report with an alarm level of "ne-acty." In ring configurations they may have an alarm level of "ne-acty", MJ or CR. Incoming STS1 AIS may also indicate an unprotected failure or removal of a **DS3**, **MXRVO**, **STS1E** or **OLIU** at the far end associated with the Source Address of the alarm message. Incoming VT AIS may indicate an unprotected failure or removal of a **DS1** or **OLIU** failures in ring applications.

⇒ NOTE 2:
VT and STS1 AIS conditions are only reported at service termination (drop) points. Incoming VT and/or STS AIS reported as "ne-acty" at a shelf where the service is cross-connected to a DS1, DS3 or EC1 drop can be caused by missing or incorrect cross-connections at the other terminal shelf or at any shelves where the service should be pass-through cross-connected.

Does the alarm and status report indicate incoming VT AIS or STS1 AIS (inc. VT AIS or inc. STS1 AIS?

If **STS1 AIS**, then continue with **Step 2.**
If **VT AIS**, then proceed to **Step 12.**

2. Note the Source Address of the STS1 AIS condition reported in the alarm and status report (e.g. m-1). Based on the circuit layout or other office records, determine the other shelf where that time slot is supposed to be terminated (cross-connected to a DS1, DS3 or EC-1 termination).

3. Use the 'rlgn' command to login to the other terminating shelf, then use the rtrv-crs-sts1 command to determine if the time slot identified in Step 2 is cross-connected as specified in circuit layout or other office records.

4. Were there incomplete or incorrect cross-connects?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. Use the commands ent-crs-sts1 and dlt-crs-sts1, as necessary, to correct the provisioning.

6. Have all indications of STS1 AIS cleared?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 7.**

7. ⇒ NOTE:
   If the service is STS1 cross-connected at either terminating shelf, both terminating shelves must be properly equipped to terminate the entire STS1. For example, if DS1 service is being provided, both ends must be equipped with **MXRVO** circuit packs and the same number of **DS1/DS1PM** circuit packs in the groups that are STS1 cross-connected.

   Use the rtrv-eqpt command at both shelves to verify that the shelves are properly equipped for the service being provided. If the shelves are not properly equipped, install circuit packs as required.

8. Have all indications of STS1 AIS cleared?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 9.**

9. Using the `rlgn` command, login to every shelf where the service should be pass-through cross-connected (e.g. m-1 to c-1) and use the `rtrv-crs-sts1` command to determine if the time slot identified in Step 2 is cross-connected as specified in circuit layout or other office records. If service is cross-connected through other maintenance subnetworks, such as dual ring interworking (DRI), look for missing cross-connections in the other subnetworks.

10. At any shelves with missing cross-connects use the `ent-crs-sts1` command to provision the pass-through cross-connect (e.g. m-1 to c-1).

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. Note the `Source Address` of the VT AIS condition reported in the alarm and status report (e.g. `m-1-1-1`). Based on the circuit layout or other office records, determine the other shelf where that time slot is supposed to be terminated (cross-connected to a DS1 or EC-1 termination).

13. Use the `rlgn` command to login to the other terminal shelf, then `rtrv-crs-sts1` and `rtrv-crs-vt` to determine if the time slot identified in Step 12 is cross-connected as specified in circuit layout or other office records.

14. Were there incomplete or incorrect cross-connects?

    If **YES**, then continue with **Step 15.**
    If **NO**, then proceed to **Step 17.**

15. Use the commands `ent-crs-( )` and `dlt-crs-( )`, as necessary. to correct the provisioning.

16. Have all indications of VT AIS cleared?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 17.**

17. ⇒ NOTE:
    If the service is STS1 cross-connected at either terminating shelf, both terminating sheves must be equipped to terminate the entire STS1. For example, if DS1 service is being provided, both ends must be equipped with **MXRVO** circuit packs and the same number of **DS1/DS1PM** circuit packs in the groups that are STS1 cross-connected.

    Use the `rtrv-eqpt` command at both shelves to verify that the shelves are properly equipped for the service being provided. If the shelves are not properly equipped, install circuit packs as required.

18. Have all indications of VT AIS cleared?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 19.**

19. Use the `rlgn` command to login to a shelf where the service should be pass-through cross-connected (e.g. m-1-1-1 to c-1-1-1). Use the `rtrv-crs-( )` command to determine if the time slot identified in Step 12 is cross-connected as specified in circuit layout or other office records. If service is cross-connected through other maintenance subnetworks, such as dual ring interworking (DRI), look for missing cross-connections in the other subnetworks.

20. Are there any missing cross-connects?

    If **YES**, then continue with **Step 21.**
    If **NO**, then proceed to **Step 24.**

21. At any shelves with missing cross-connects use `ent-crs-( )` to provision the pass-through cross-connect.

22. Use the `rtrv-alm` command to see if alarms have cleared.

23. Did alarms clear?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 24.**

24. Repeat this procedure from Step 19 to look for other missing cross-connections.

Install BBG7 OHCTL Circuit Pack

1. ⇒ NOTE 1:
Release 2 supports limited manual STS-1 cross-connections. Releases 3 and 6 support full STS-1 and VT1.5 (DS1) add/drop connections. Releases 5 and 7 support only manual VT1.5 and STS-1 cross-connections. Default cross-connections may be used, except in Releases 5 and 7, unless a shelf is set for manual cross-connections using the `set-ne:crs=manual` command. In Release 5 or 7 or when a shelf is set for manual cross-connections, manual STS-1 and/or DS1 cross-connections have to be made at each shelf to configure the transmission path for each DS1 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
A **BBG7 OHCTL** must have software installed and it must be compatible with the software in the **BBG5 SYSCTL**. If no software is installed or if the software is not compatible, the letter **C**, **P**, or **d** will be displayed in the **FE ID** display on the **SYSCTL** when installed. If this occurs, you must find circuit packs with compatible software or install new software in both the **OHCTL** and **SYSCTL**. The shelf must be equipped with both **OHCTL** and **SYSCTL** [**DLP-501**] circuit packs before new software can be installed [**DLP-532**].

⇒ NOTE 3:
Switches **S1-1**, **S1-2**, and **S1-3** on the **OHCTL** set the Network Element number of the shelf. The Network Element number and the Site ID (set on the **SYSCTL**) form a unique address for a shelf at a site. If two shelves within the same control network have the same address, a "duplicate site id" alarm is declared.

Determine the Network Element number from work order or office records. Refer to Table A and Figure 1 and set the Network Element number for this shelf.

Table A. OHCTL Switch 1 (S1) Network Element Number

Network Element	Switch S1 Settings			Unused (Note)				
	S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	S1-8
1	ON	ON	ON	ON	ON	ON	ON	ON
2	OFF	ON	ON	ON	ON	ON	ON	ON
3	ON	OFF	ON	ON	ON	ON	ON	ON
4	OFF	OFF	ON	ON	ON	ON	ON	ON
5	ON	ON	OFF	ON	ON	ON	ON	ON
Invalid*	OFF	ON	OFF	ON	ON	ON	ON	ON
Invalid*	ON	OFF	OFF	ON	ON	ON	ON	ON
Invalid*	OFF	OFF	OFF	ON	ON	ON	ON	ON

Note: Switch 1, sections 4 through 8 (**S1-4, S1-5, S1-6, S1-7,** and **S1-8**) must be set to the **ON** position. If they are set to the **OFF** position, the **FAULT** LED will light on the **OHCTL** and an alarm will be generated.

* If an invalid setting is selected, the **FAULT** LED is lighted and an `unexpected switches` alarm is generated.

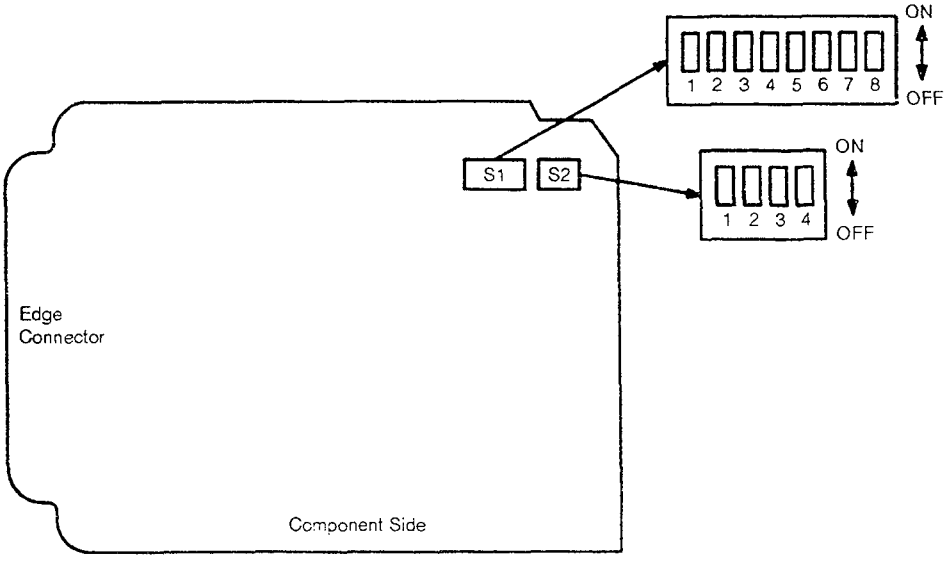


Figure 1. OHCTL Option Switch

2. If Release 5 or earlier, continue with **Step 3**.
   If Release 6 or later, proceed to **Step 6**.

3. ⇒ NOTE:
   Switches **S2-1, S2-2, S2-3,** and **S2-4** are unused and ignored by the system in Release 5 or earlier. Although these switches are unused, using the settings in Table B below will make future upgrades easier.

   Refer to Table B and Figure 1 and set unused switches on **OHCTL** circuit pack.

Table B. Unused Switch 2 (S2) Settings (Note)

Switch S2			
S2-1	S2-2	S2-3	S2-4
ON	OFF	OFF	OFF

Note: These switches are reserved for applications using the open systems interconnection protocol (OSI), Release 6 or later The suggested settings will make future upgrades easier

4. ⇒ NOTE:
   When the **OHCTL** is installed, the **FAULT** LED will light and remain lighted until the **SYSCTL** is installed.

   Install **OHCTL** into **AUXCTL** slot.

   Response: **FAULT** LED lights.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. ⇒ NOTE 1:
   Switches **S2-1** through **S2-4** on the **OHCTL** are used to control the identification of the DCC for open systems interconnection (OSI) interworking. For a given optical span, the network elements that terminate on each side of the optical span must have their "network side"/"user side" parameters set to opposite values to avoid an "`inconsistent DCC switches`" alarm. Switch **S2** is set to **OFF** for the Network Side and **ON** for the User Side of network elements in an optical span. Figure 2 illustrates the **S2** switch settings for switches associated with **OLIUs** in the **MAIN** and **FUNCTION UNITS** slots at each end of the interconnected optical spans for linear/hub configurations. Figure 3 illustrates the switch settings for ring configurations.

   ⇒ NOTE 2:
   Note that factory settings for switch **S2** are **S2-1 ON**, **S2-2 OFF**, **S2-3 OFF**, and **S2-4 OFF**. This will permit the establishment of a linear/hub system without changing any **S2** switch settings except on the **OHCTL** at the CO. In this case, **S2-1** on the **OHCTL** at the CO would be set to **OFF**. Factory settings also allow the establishment of a ring configuration without changing any **S2** switch settings.

   Refer to Figures 2 or 3 for example system configurations. Set **S2** switches for OSI interworking using the examples and/or work order or office records. (The necessary switch settings in the example figures are highlighted in bold type. For example, in Figure 2, the optical span between RT1 and RT3 requires that switch **S2-3** at RT1 be set to **OFF** and switch **S2-1** at RT3 be set to **ON**.)

7. Set remaining unused **S2** switches to **OFF**.

8. ⇒ NOTE:
   When the **OHCTL** is installed, the **FAULT** LED will light and remain lighted until the **SYSCTL** is installed.

   Install **OHCTL** into **AUXCTL** slot.

   Response: **FAULT** LED lights.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

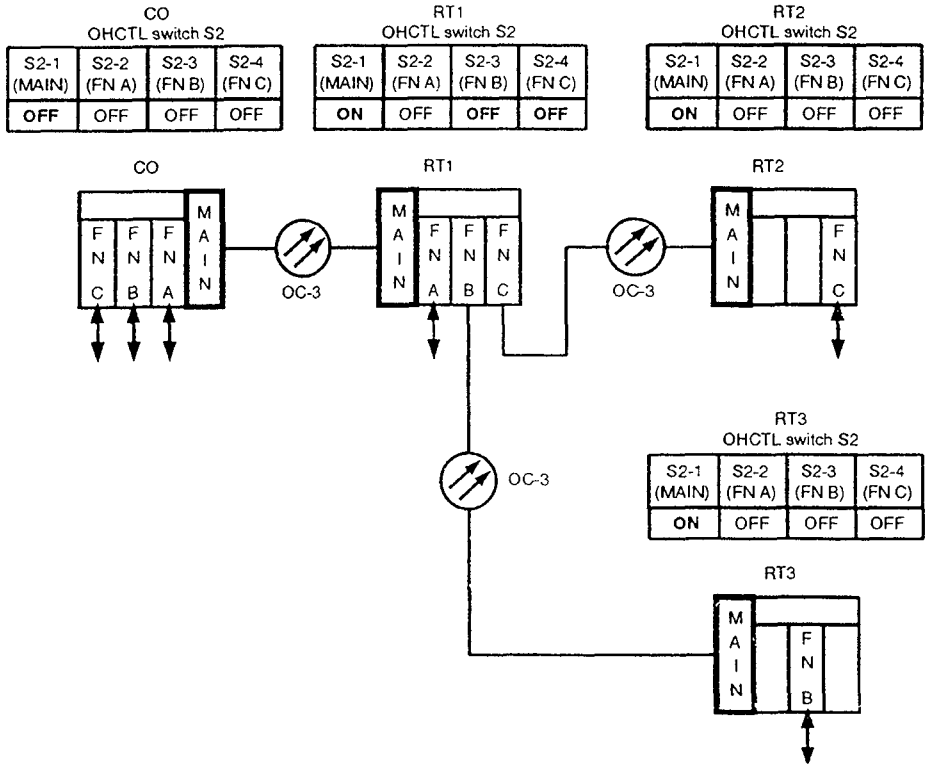


Figure 2. Example OHCTL Switch S2 Settings — OC-3 Linear/Hub Configuration Using OSI Protocol

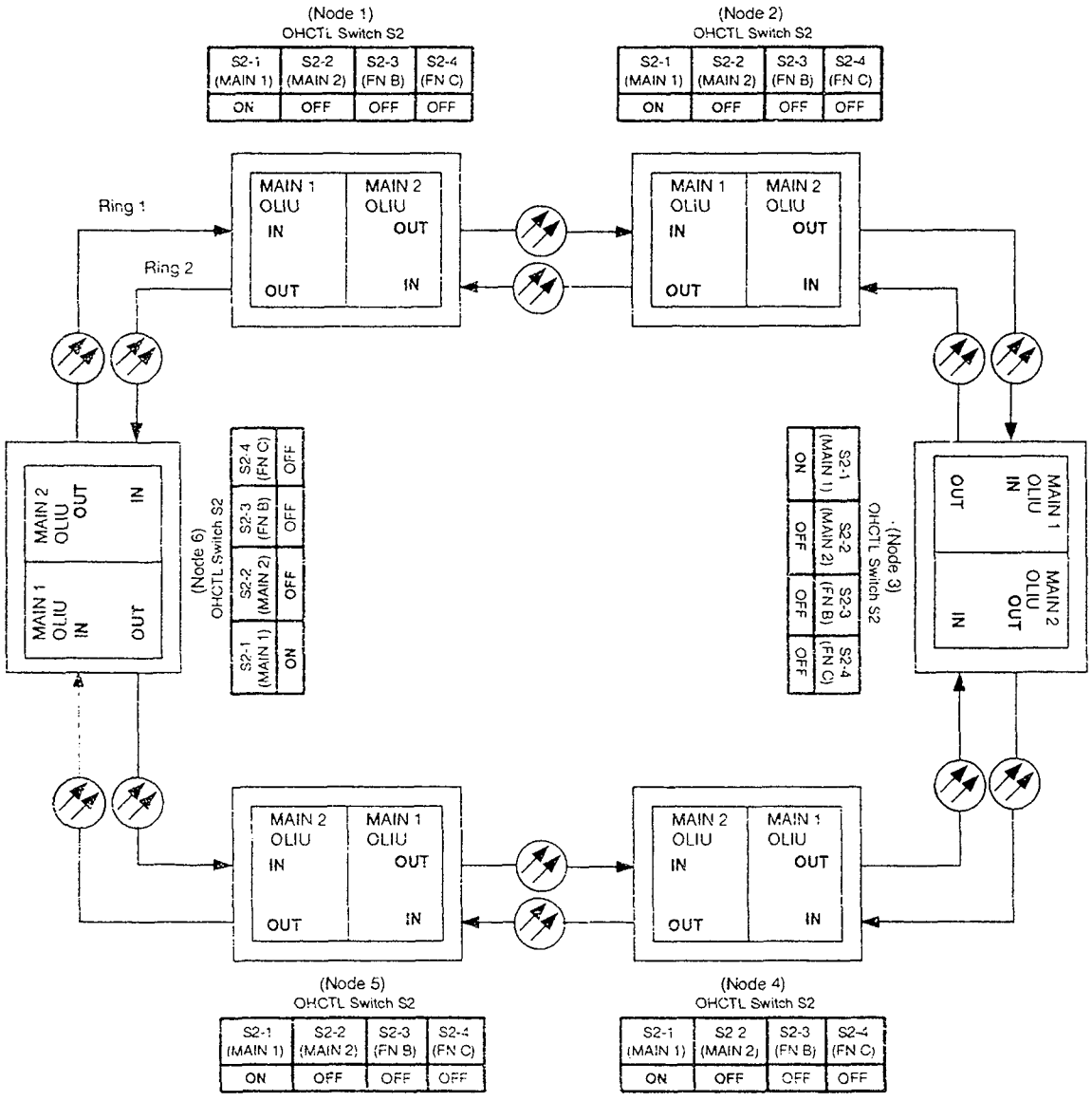


Figure 3. Example OHCTL Switch S2 Settings — OC-3 Ring Configuration Using OSI Protocol

Install or Replace SYSCTL

1. Is **SYSCTL** being installed in shelf for the first time (initial shelf turnup, only **OHCTL** installed at this time) or is it being replaced in an in-service system?

   If **BEING INSTALLED**, then continue with **Step 2**.
   If **BEING REPLACED**, then proceed to **Step 3**.

2. If **SYSCTL** is being installed in shelf for the first time (initial shelf turnup, only **OHCTL** installed at this time) and switches have not been set, determine the **SYSCTL** option switch settings from office records. See Figure 1. Set switches per Tables A, B, C, and D. (The procedures of **DLP-513** provide more information on switch settings).

   Proceed to Step 5.

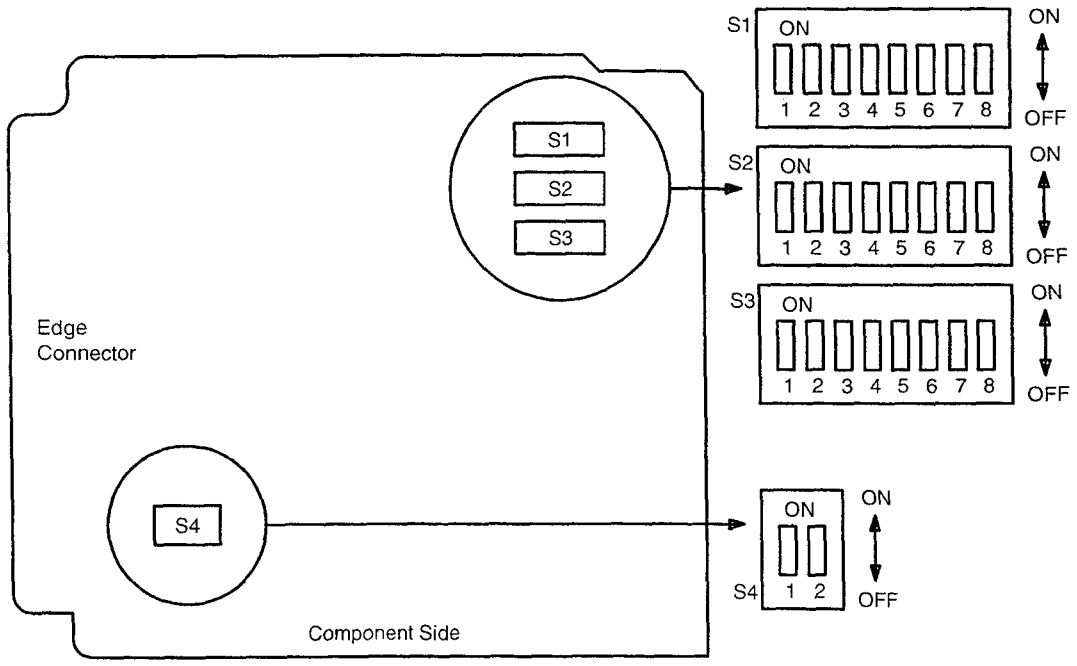


Figure 1. SYSCTL Option Settings

3. ⚠ CAUTION 1:
Transmission configuration information for in-service systems is stored on the **TGS** *circuit pack in* **TIMING** *slot* **1**. *In some instances (for example, during some upgrades or during system tests), if the system is in service and a* **SYSCTL** *is being installed that contains a version of software not compatible with the current transmission configuration (Table E) it may be necessary to remove the* **TGS** *circuit pack in* **TIMING** *slot* **1** *in order to force the system to run the software in the* **SYSCTL**. *If both* **TGS** *circuit packs are not installed, removal of the only* **TGS** *circuit pack would cause service interruption.*

⇒ NOTE:
If the system is in service and the **SYSCTL** is being replaced, the following step is recommended to protect against a loss of service because of installing a **SYSCTL** with incompatible software. But, if you are sure that you want to install a **SYSCTL** with incompatible software (for example, Release 3 linear into a system with Release 5 ring), you may elect to remove the **TGS** in **TIMING** slot **1** and allow the software to download without having to force the system to run the software.

Before performing this procedure, it is strongly suggested that both **TGS** circuit packs be installed in the shelf and the **`switch-sync:s=circuitpack,pri=manual`** command be used to switch to the protection **TGS-2** circuit pack if not already **ACTIVE**. Use **`rtrv-sync:`** command to verify that the **TGS-2** circuit pack is **ACTIVE**. Use the **`switch-sync:s=circuitpack,pri=inhibit`** command to freeze the protection switch on **TGS-2**.

Table A. SYSCTL Switch 1 (S1) Settings

TBOS Display Number				TBOS Backup Number			CO/RT Select		Remote TBOS		Unused (Note)
	Switch				Switch			Switch		Switch	Switch
Display	S1-1	S1-2	S1-3	Backup	S1-4	S1-5	Value	S1-6	Value	S1-7	S1-8
1	ON	ON	ON	Primary	ON	ON	RT	OFF	Enabled	OFF	OFF
2	OFF	ON	ON	Secondary	OFF	ON	CO	ON	Disabled	ON	
3	ON	OFF	ON	Normal	OFF	OFF					
4	OFF	OFF	ON	No TBOS	ON	OFF					
5	ON	ON	OFF								
6	OFF	ON	OFF								
7	ON	OFF	OFF								
8	OFF	OFF	OFF								

Note: Switch 1, section 8 (S1-8) is not used at this time and must be set to the **OFF** position

Table B. SYSCTL Switch 2 (S2) Settings

Site ID Setting (Notes)						Shelf ID Setting			
	Switch						Switch		
Site ID	S2-1	S2-2	S2-3	S2-7	S2-8	Shelf ID	S2-4	S2-5	S2-6
1	ON	ON	ON	ON	ON	1	ON	ON	ON
2	OFF	ON	ON	ON	ON	2	OFF	ON	ON
3	ON	OFF	ON	ON	ON	3	ON	OFF	ON
4	OFF	OFF	ON	ON	ON	4	OFF	OFF	ON
5	ON	ON	OFF	ON	ON	5	ON	ON	OFF
6	OFF	ON	OFF	ON	ON	6	OFF	ON	OFF
7	ON	OFF	OFF	ON	ON	7	ON	OFF	OFF
8	OFF	OFF	OFF	ON	ON	8	OFF	OFF	OFF
9	ON	ON	ON	OFF	ON				
10	OFF	ON	ON	OFF	ON				
11	ON	OFF	ON	OFF	ON				
12	OFF	OFF	ON	OFF	ON				
13	ON	ON	OFF	OFF	ON				
14	OFF	ON	OFF	OFF	ON				
15	ON	OFF	OFF	OFF	ON				
16	OFF	OFF	OFF	OFF	ON				
17	ON	ON	ON	ON	OFF				
18	OFF	ON	ON	ON	OFF				
19	ON	OFF	ON	ON	OFF				
20	OFF	OFF	ON	ON	OFF				
21	ON	ON	OFF	ON	OFF				
22	OFF	ON	OFF	ON	OFF				
23	ON	OFF	OFF	ON	OFF				
24	OFF	OFF	OFF	ON	OFF				
25	ON	ON	ON	OFF	OFF				
26	OFF	ON	ON	OFF	OFF				
27	ON	OFF	ON	OFF	OFF				
28	OFF	OFF	ON	OFF	OFF				
29	ON	ON	OFF	OFF	OFF				
30	OFF	ON	OFF	OFF	OFF				
31	ON	OFF	OFF	OFF	OFF				
32	OFF	OFF	OFF	OFF	OFF				

Note: 1 The following table lists the maximum number of network elements in a maintenance subnetwork:

	Linear					Ring			
OC-3 Releases	R2.1.n	R3 x.n	R6.0.n	R6.1.n	R6.2.n	R5.1 n	R7.0.n	R7.1.n	R7.2.n
Number of NEs Supported	5	8	10	10	10	12	10	16	24
Site ID Settings Supported	8	8	8	32	32	8	32	32	32
OC-12 Releases	R1.1 n	R1.2.n	R2.0 n	R2.1.n	R2.2.n	R3 0.n	R3.1.n		
Number of NEs Supported	10	10	10	10	10	10	16		
Site ID Settings Supported	8	8	8	32	32	32	32		

Note 2: Site ID settings 1-32 are supported for OC-3 Release 6 1 and later linear and ring releases and OC-12 Release 2 1 and later linear and ring releases Prior to these releases only Site ID settings 1-8 are supported (if more than 8 NEs are in the network you must use unique combinations of the Site ID and NE (OHCTL) settings to prevent "`duplicate site/ne address`" alarms in the network)

Prior to OC-3 Release 6 1 and OC-12 Release 2 1, Switch 2, sections 7 and 8 (S2-7 and S2-8) are not used and must be set to the ON position For OC-3 Release 6 1 and later and OC-12 Release 2 1 and later Switch 2, sections 7 and 8 (S2-7 and S2-8) are used in conjunction with Switch 2, sections 1 2 and 3 (S2-1, S2-2, and S2-3) to support the 32 Site ID settings For Releases supporting 1-32 Site ID settings any of the 32 possibilities may be chosen for Site ID settings for the number of NEs allowed (for example, 1, 10, 20, 30, etc)

Table C. SYSCTL Switch S3 Settings

CIT Front Access Data Rate				CIT Rear Access Data Rate				PMN Alarm		Unused (Note)
	Switch				Switch				Switch	Switch
Baud	S3-1	S3-2	S3-3	Baud	S3-4	S3-5	S3-6	Alarm	S3-7	S3-8
300	OFF	OFF	OFF	300	OFF	OFF	OFF	Major	ON	OFF
1200	OFF	OFF	ON	1200	OFF	OFF	ON	Minor	OFF	
2400	OFF	ON	OFF	2400	OFF	ON	OFF			
4800	OFF	ON	ON	4800	OFF	ON	ON			
9600	ON	OFF	OFF	9600	ON	OFF	OFF			
19200	ON	OFF	ON	19200	ON	OFF	ON			
Invalid	ON	ON	OFF	Invalid	ON	ON	OFF			
Invalid	ON	ON	ON	Invalid	ON	ON	ON			

Note: Switch 3, section 8 (S3-8) is not used at this time and must be set to the **OFF** position

Table D. SYSCTL Switch 4 (S4)
TBOS Link Terminator

Shelf Position	Switch	
	S4-1	S4-2
Not Last	OFF	OFF
Last	ON	OFF

Table E. DDM-2000 OC-3 In-Service Upgrade Compatibility (Note)

Current Release in Shelf (OLD)	Software Release To Be Installed (NEW)										
	Linear				Ring	Linear			Ring		
	2.1.n	3.0.n	3.1.n	3.2.n	5.1.n	6.0.n	6.1.n	6.2.n	7.0.n	7.1.n	7.2.n¶
2.1 n	OK	OK	OK	OK	C†	C‡	C‡	C‡	C†	C†	C†
3 0 n	C	OK	OK	OK	C†	C‡	C‡	C‡	C†	C†	C†
3 1 n	C	C	OK	OK	C‡	OK‡	OK‡	OK‡	C‡	C‡	C‡
3 2 n	C	C	C	OK	C‡	OK‡	OK‡	OK‡	C‡	C‡	C‡
5 1 n	C*	C*	C*	C*	OK	C*	C*	C*	OK‡	OK‡	OK‡
6 0 n	C	C	C	C	C‡	OK	OK§	OK§	C‡	C‡	C‡
6 1.n	C	C	C	C	C‡	C	OK	OK	C‡	C‡	C‡
6 2 n	C	C	C	C	C‡	C	C	OK	C‡	C‡	C‡
7 0 n	C*	C*	C*	C*	C	C*	C*	C*	OK	OK	OK‡
7 1 n	C*	C*	C*	C*	C	C*	C*	C*	C	OK	OK‡
7 2 n¶	C*	C*	C*	C*	C	C*	C*	C*	C	C	OK‡

Note: All DDM-2000 OC-3 shelves in a subnetwork should be using the same or compatible version of software. "n" is the latest point release available. When doing an upgrade, it is recommended that the latest point release of software be used, if possible.

OK - Indicates software compatibility. Normal download procedures should occur without having to force the system to run the software to be installed Other equipment/fiber changes and/or software/equipment provisioning may be required before and/or after the upgrade. See **System Turnup: IXL-001** for particular upgrade procedures and Software Release Description for software release being installed.

C - Indicates software incompatibility. The software you are installing will not support the transmission configuration that is stored in the **TGS 1** circuit pack If required, you will have to force the system to run the software to be installed.

* When downloading a linear software release into a shelf currently containing a ring release, remove the **OLIU** circuit pack(s), reseat the **SYSCTL** circuit pack, download the linear software release, and then press the **UPD/INIT** pushbutton during the 10-second flashing **CR** LED which occurs after the last diskette is loaded. After the download is completed, reseat the **OLIU** circuit pack(s). If additional assistance is required contact the AT&T Regional Technical Assistance Center (RTAC).

† Upgrade to Release 3.1 or 3.2 required first before upgrading to desired release.

‡ Remote upgrades are not allowed. Software must be downloaded locally at each shelf. OSI upgrades require setting **OHCTL S2** user/network switches. Also, OSI releases require **ONE** shelf be set as the GNE [DSNE (R7.2)] using the **`set-ne`** command Software should be downloaded to the GNE (DSNE) (R7.2) first

§ The **`rtrv-nmap`** command is used at the GNE to sketch network Software must be downloaded locally to the GNE first Other shelves are then downloaded using the **`cpy-prog:tid`** command starting with the farthest shelf from the GNE and working back toward the GNE.

¶ Due to changes in OSI Protocol required for OC-3 Operations Interworking between DDM-2000 and FT-2000, Release 7.2 **DOES NOT INTERWORK** with previous OC-3 or OC-12 Releases.

4. ⚠ CAUTION:
Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note 1)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE:
Before removing the **SYSCTL**, you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown (9, 8, 7, etc.) on the **FE ID** display. During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

If you are replacing a **SYSCTL**, remove and inspect circuit pack being replaced for proper option switch settings. Set option switches on the replacement **SYSCTL** the same as the original.

5. NOTE:
Both the **BBG5 SYSCTL** and **BBG7 OHCTL** must be installed for the controllers to function.

Ensure the **BBG7 OHCTL** is installed.

Reference: **DLP-500**

6. NOTE:
Steps 7 and 8 must be performed without unnecessary delays. Familiarize yourself with these steps before continuing with the procedure.

Read Steps 7 and 8 before proceeding.

7. CAUTION 1:
When a **SYSCTL** *is replaced or installed for the first time, you MUST initialize the* **SYSCTL** *to prevent service interruption or incorrect alarms. It is NOT recommended to initialize the* **SYSCTL** *if it is only removed and reseated in the same shelf.*

CAUTION 2:
Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **SYSCTL**.

CAUTION 3:
Initializing the **SYSCTL** *in the following steps will momentarily interrupt service if protection switches are activated.*

NOTE 1:
The **SYSCTL** circuit pack *remembers* critical parameters about its previous environment. If the previous environment was the same shelf, an *initialization* is not necessary. If the previous environment was another shelf or the **SYSCTL** is new from the factory, an *initialization* MUST be done. If a new **SYSCTL** is not *initialized* after insertion, it may affect service or cause incorrect alarms. By initializing the **SYSCTL**, it automatically *learns* all the critical parameters about its new environment and will not affect service. See the description of the **`init-sys:`** command in the "Commands and Reports" section of this manual.

NOTE 2:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ballpoint pen to operate it.

NOTE 3:
If this is the first pair of circuit packs being installed in the shelf, ignore the **MJ**, **MN**, and **NE ACTY** LEDs on the User Panel.

Seat the **SYSCTL**.

If the following responses are not correct, continue with Step 9.

Response: **FAULT** LED on **BBG5 SYSCTL** and **ABN** LED on the User Panel light. **FAULT** LEDs on the **SYSCTL** and **OHCTL** go off after about 2 seconds. After the **ABN** LED goes off, the **CR** alarm on the User Panel begins to flash.

8. Momentarily depress the **UPD/INIT** button on the **SYSCTL** while the **CR** LED is flashing (**you have 10 SECONDS** to do this).

   If the following responses are not correct, continue with Step 9.

   Response: **CR** LED on the User Panel stops flashing when the **UPD/INIT** button is pressed.

   If Release 6 or later: **FAULT** LED on **BBG5 SYSCTL** and **ABN** LED on the User Panel light again. **FAULT** LEDs on the **SYSCTL** and **OHCTL** go off after about 2 seconds. After the **ABN** LED goes off, the **CR** alarm on the User Panel will flash for 10 seconds. **DO NOT** depress **UPD/INIT** pushbutton again when the **CR** alarm LED flashes.

   If circuit packs are installed, all the LEDs on all circuit packs in the **DDM-2000** should be off. Any LEDs remaining on or flashing represent a failure condition.

9. ⇒ NOTE:
Compatible software must be installed in both the **BBG7 OHCTL** and the **BBG5 SYSCTL**. When the **SYSCTL** is installed, if software is not installed or not compatible, the letter **C**, **P**, or **d** will be displayed in the **FE ID** display. The letter displayed indicates one of the following:

   a. Nothing displayed in the **FE ID** display indicates that compatible software is installed in the **OHCTL** and **SYSCTL**.

   b. The letter **P** displayed in the **FE ID** display indicates that no software is installed in the **SYSCTL**. For Release 6 and later, if the **P** is followed by a period (**P.**), it means the software may be downloaded either locally or remotely using the **`ins-prog:tid`** command. If there is no period (**P**) the software can only be downloaded locally. For Release 5 and earlier, the **P** without the period means the software may be downloaded either locally or remotely.

   c. The letter **C** displayed in the **FE ID** display indicates that software is installed in the **OHCTL** and **SYSCTL**, but it will not support the current shelf transmission configuration.

   d. The letter **d** displayed in the **FE ID** display indicates the **OHCTL** has no software or that the software in the **OHCTL** and **SYSCTL** is incompatible.

   e. The letter **E** displayed in the **FE ID** display indicates that open systems interconnection (OSI) software is installed and the **OHCTL** is a series **S2:2** or earlier. A series **S2:3** (linear) or **S2:4A** (ring) **OHCTL** or later must be installed for Release 6 (R7) or later software.

Did the letter "**C**" appear in the **FE ID** display?

If **NO**, then continue with **Step 10**.
If **YES**, then proceed to **Step 12**.

10. Did the letter "**E**" appear in the **FE ID** display?

If **YES**, then continue with **Step 11**.
If **NO**, then proceed to **Step 15**.

11. Indications are that a series **S2:2** or earlier **OHCTL** circuit pack is installed and Release 6 or later software is installed. Replace the **OHCTL** with a series **S2:3** (linear) or **S2:4A** (ring) or later and repeat this procedure.

12. NOTE:
Indications are that the software in the **SYSCTL** you are installing will not support the system transmission configuration that you have. If this occurs, you must reload the original version of software, load another version of software, or *force* the system to run the current software that is in the **SYSCTL**

CAUTION:
If the system is in service and is forced to run the current software that is displaying a **C**, *service interruption may result.*

You must decide if you want the system to run this current version of software or if you want to download another version (original version or new version) of software.

Do you want to run the current version of software that is in the **SYSCTL**?

If **YES**, then continue with **Step 13**.
If **NO**, then proceed to **Step 16**.

13. To *force* the system to run the current software, perform the following:
    a. Ensure that a **TGS** circuit pack is installed in the **TGS-2** slot.
    b. Check that **TGS-2** circuit pack is active (**ACTIVE** LED lighted)
    c. Remove the **TGS-1** circuit pack and reset (unplug and reseat) the **SYSCTL** to force it to run the current software.
    d. After the current software is up and running (no alarm LEDs lighted or you can log into the shelf), reinstall the **TGS-1** circuit pack.
    e. Use the `switch-sync:s=circuitpack,pri=reset` command to clear any active switch request.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Did the letter "**P**" or "**d**" appear in the **FE ID** display?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 18**.

16. Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-532**.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. Retrieve generic software version ID by depressing the **ACO** button longer than 2 seconds and observing version code on the **FE ID** display. If the software version is not the correct version, you must find circuit packs with the correct software or install new software using the procedures of **DLP-532**.

19. ⇒ NOTE:
    If you are using this procedure to replace a **SYSCTL** that was already in service, there may have been some options set using the craft interface terminal (CIT).

    Refer to **DLP-512** and set any required options.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install STS1E Circuit Packs

1. ⚠ CAUTION:
   Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **STS1E**.

   ⇒ NOTE 1:
   In previous issues of this manual, this DLP-502 was used to "Install Optional TLMCTL Circuit Pack". Since the **TLMCTL** is rated Discontinued Availability (DA), this procedure number is reused to install **STS1E** circuit packs.

   ⇒ NOTE 2:
   STS1E circuit packs may be installed in function unit group slots **FN A**, **FN B**, or **FN C**. Service **STS1E** circuit packs are installed in slots labeled **FN ( ) 1**. Protection **STS1E** circuit packs are installed in slots labeled **FN ( ) 2**.

   Determine which function unit group slots (**FN A**, **FN B**, or **FN C**) are to be equipped with **STS1E** circuit packs.

2. Determine from office records the length of the STS1E cabling between the DDM-2000 and the STSX cross-connect point.

3. Refer to Table A and Figure 1. Install the STS1E option jumpers per Table A.

4. ⇒ NOTE:
The **STS1E** circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 Multiplexer. **STS1E** high speed mode, available in Release 6 or later, interfaces with the **DS1** circuit packs in a function unit group at the VT-G rate. **STS1E** low speed mode, available in Release 6, interfaces with the **OLIU** circuit packs at the STS-1 rate.

Set switch **S1** to mode of operation required (HIGH-SPEED MODE or LOW-SPEED MODE).

Table A. STS1E LBO Settings

Cable Length (Ft)			
734A Cable	Mini-Coax KS-19224	735A Cable	LBO Setting
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

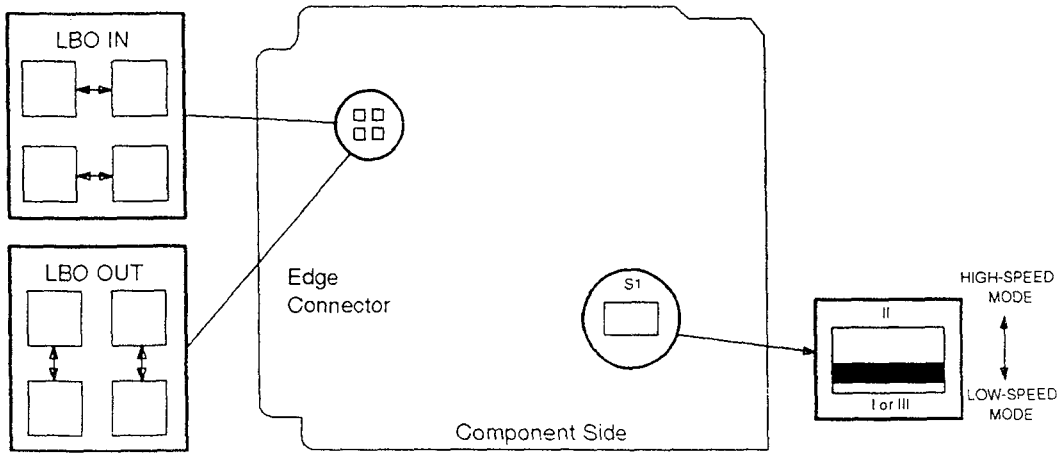


Figure 1. STS1E Option Settings

5. ⇒ NOTE:
   If the response is not correct in the following procedures, replace the **STS1E** circuit pack.

   Seat a **STS1E** circuit pack in function unit group slot **FN A-1**, **FN B-1**, or **FN C-1**.

   Response: **FAULT** LED on the **STS1E** lights for about 20 seconds then goes off. **ACTIVE** LED lights on the first **STS1E** circuit pack of the pair installed.

6. If required, seat a second (protection) **STS1E** circuit pack in function unit group slot **FN A-2**, **FN B-2**, or **FN C-2** of the same function unit group.

   Response: **FAULT** LED on the **STS1E** lights for about 20 seconds then goes off. **ACTIVE** LED remains off.

7. Repeat this procedure from Step 1 for each pair of **STS1E** circuit packs to be installed.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install TGS Circuit Packs

1. ⚠ CAUTION:
The timing mode of all nodes should be checked before a node is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to loop timed mode).

NOTE 1:
The timing mode may be provisioned as Free Running, DS1 External, or Loop Timed. In free-running mode, the **TGS** gets timing from an oscillator on the **TGS**. In DS1 external timing mode, the **TGS** gets timing from an external DS1 reference input. In loop-timed mode, the **TGS** gets timing from a reference clock recovered from a received OC-3 line rate signal. In Releases 3, 4, and 6, loop timing from the **MAIN** OC-3 line is the factory default. In Releases 5 and 7, loop timing from the **MAIN 1** OC-3 line is the factory default. In Releases 3, 4, 6 and 7, if a **BBF2B TGS** is installed, either the **MAIN OLIU**s or **FUNCTION UNIT C OLIU**s can be selected as the synchronization source using the command `set-sync:src=[main,fn-c];`.

NOTE 2:
BBF2B TGSs require Release 3 or later. In addition to the same options as the **BBF2 TGS**, the **BBF2B TGS** may be provisioned to provide a DS1 output for intershelf timing distribution (mult mode) or for network timing distribution (sync mode). When in *sync out* mode, the DS1 output signal derives its timing from the incoming OC-3 line signal from the **MAIN OLIU**s or optionally from the **FUNCTION UNIT C OLIU**s using the `set-sync:src=[main,fn-c];` command.

NOTE 3:
Tables A and B depict all the possible timing topologies for the **BBF2 TGS** and **BBF2B TGS** which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for looptiming or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table A. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other
Free Running	Loop Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality loop timing source, if available
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other
External - Mult	Loop Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously Note DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves collocated in the same bay to conserve ports on the BITS.

Table A. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Loop Timing	Loop Timing	Caution! This topology creates a timing loop and it is not supported The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult If the reference available is an optical reference provision to Loop Timing with the proper source using the `set-sync` command If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another loop timing source, if available, to prevent a timing loop.

Table B. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported Both systems are operating asynchronously from each other
Free Running	Loop Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality loop timing source, if available.
Free Running	Loop Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS. In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality loop timing source, if available
Free Running	External - Mult	This timing topology is not supported The two network elements will be operating asynchronously from each other.

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Free Running	External - Sync Out	This timing topology is not supported The two network elements will be operating asynchronously from each other
External - Mult	Loop Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS The NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	Loop Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located The NE provisioned for Loop Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE Its DS1 output could serve as a reference to distribute timing to a BITS in that CO. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS
External - Sync Out	Loop Timing	Caution! This topology might create a timing loop. In this topology the NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port NE 2 will attempt to switch to another loop timing source, if available, to prevent the timing loop

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Loop Timing - Sync Out	Caution! This topology might create a timing loop In this topology the NE provisioned for Loop Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port NE 2 will attempt to switch to another loop timing source, if available, to prevent the timing loop
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks The recommendation is to have these BITS synchronized to references which are traceable to the same PRS If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously Note· DDM-2000 systems are designed to operate in pleisiochronous timing topologies The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves collocated in the same bay to conserve ports on the BITS
External - Mult	External - Sync Out	This topology is used to distribute network timing to a target location from a location with access to a synchronization reference. The NE provisioned for External - Mult, is providing timing to the NE provisioned for External - Sync Out, which in turn generates a DS1 output reference regenerated from the optical interface shared by both NE's This DS1 output is used to provide a synchronization reference to a BITS

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's. In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal.
Loop Timing	Loop Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the `set-sync` command If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another loop timing source, if available, to prevent a timing loop

NOTE 4:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

NOTE 5:
If an invalid switch setting is selected, the **TGS FAULT** LED lights and an alarm is generated.

Refer to Table C and Figure 1 (**BBF2**) or Table D and Figure 2 (**BBF2B**). Set the timing mode as required for the **TGS** circuit pack being installed.

Table C. BBF2 TGS Timing Mode Switch Setting

	Switch S1 Settings	
Timing Mode	S1-3	S1-4
Free Running	ON	ON
DS1 External	OFF	ON
Loop Timed	ON	OFF
Invalid	OFF	OFF

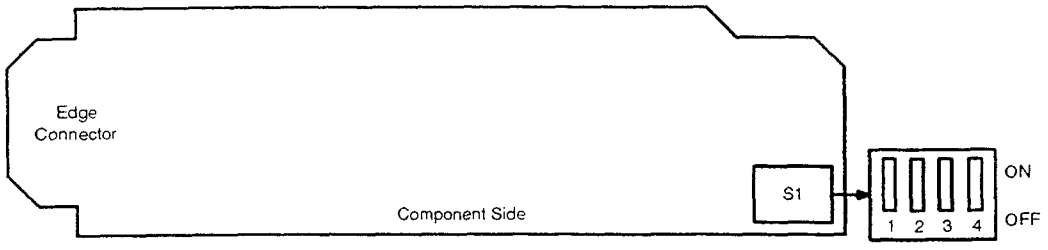


Figure 1. BBF2 TGS Option Switch

Table D. BBF2B TGS Timing Mode Switch Settings

	Switch S1 Settings		
Timing Mode	S1-3	S1-4	S1-5
Free Running	ON	ON	OFF
DS1 External, mult mode	OFF	ON	OFF
Loop Timed	ON	OFF	OFF
Loop Timed, sync out mode	ON	OFF	ON
DS1 External, sync out mode	ON	ON	ON
Invalid	OFF	OFF	ON
Invalid	OFF	OFF	OFF
Invalid	OFF	ON	ON

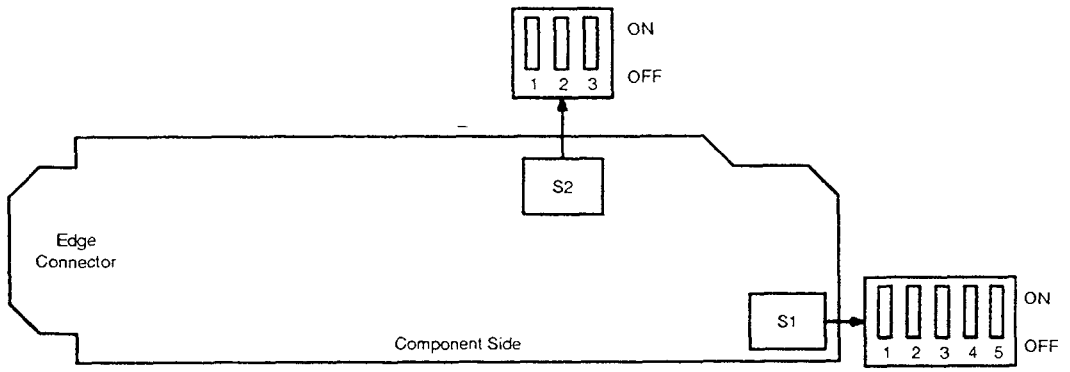


Figure 2. BBF2B TGS Option Switches

2. If the **BBF2B TGS** circuit pack is being installed and is provisioned for either *sync out* mode, refer to Table E and set the equalizer switches for proper cable length.

Table E. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid	OFF	OFF	OFF
Invalid	OFF	OFF	ON
Invalid	ON	ON	ON

3. NOTE:
   Switches **S1-1** and **S1-2** are ignored by the system unless the timing mode is set to *DS1 External* or *Loop Timed sync out mode.*

   Is timing mode set to either "*DS1 External*" or "*Loop Timed sync out mode*"?

   If **YES**, then continue with **Step 4.**
   If **NO**, then proceed to **Step 5.**

4. Refer to Table F and set the DS1 line coding and frame format as required for the **TGS** circuit pack. See Figure 1 or 2.

Table F. TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch S1-1	DS1 Frame Format	Switch S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

5. CAUTION:
   Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **TGS.**

   NOTE 1:
   If external timing mode is used and other installed shelves above this shelf are connected together with bay mult cables for DS1 timing, installing a **TGS** circuit pack causes a momentary loss of an incoming DS1 timing reference. This may result in an `inc. DS1 sync. ref. LOS` alarm on all shelves above this shelf that are connected to the same bay mult cabling. This momentary loss of timing reference does not affect transmission.

NOTE 2:
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS** circuit pack. If the information is incompatible with the controller software information, an alarm is generated.

NOTE 3:
If a signal has previously been applied to the original **BBF2B TGS** circuit pack, the **FAULT** lamp will flash when the new **BBF2B TGS** is installed until the signal tests good.

NOTE 4:
If the response is not correct in the following procedures, check option switches and replace the **TGS**. When a circuit pack is inserted, the **FAULT** LED lights immediately and remains lighted until the circuit pack tests good. The green **ACTIVE** LED lights on the first **TGS** circuit pack installed. After the **TGS** tests good, the **FAULT** LED goes off.

Install first **TGS** in **TIMING** slot **1**.

Response: **FAULT** LED on the **TGS** lights. **ACTIVE** LED lights. **FAULT** LED goes off after about 15 seconds.

6. NOTE:
If the timing mode option switches are not set the same on the two **TGS** circuit packs, the **FAULT** LED will remain lighted on the second circuit pack installed.

Install second (protection) **TGS** in **TIMING** slot **2**.

Response: **FAULT** LED on **TGS** lights for about 15 seconds then goes off. **ACTIVE** LED remains off.

7. Is timing mode set to external DS1?

   If **YES**, then continue with **Step 8.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. If the **NE ACTY** LED on the User Panel remains on, use the CIT command `rtrv-sync` to verify that the operational mode of the system is *External*. If the operational mode is *Holdover*, check the DS1 timing references.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install OLIU Circuit Packs

1. ⚠ WARNING 1:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
The **HIGH/LOW POWER** *option switch on a* **21G/21G-U OLIU** *must be set to the* **LOW POWER** *position when the* **21G/21G-U OLIU** *is looped on itself. There are no option switches on the other type OLIUs.*

⚠ CAUTION 2:
Before installing **OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned* **[DLP-527]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

NOTE:
To insure proper path protection switching in ring configurations, if optical spans terminate in **22F OLIU**s at one node and **22G-U/22G2-U OLIU**s at another node, use the `set-sts1:dgr=` command to provision the bit error ratio (BER) to 10^{-6} at all nodes in the ring network.

Are **21G/21G-U OLIU**s being installed?

If **YES**, then continue with **Step 2.**
If **NO**, then proceed to **Step 3.**

2. ⇒ NOTE:
It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

Refer to Table A and Figure 1 and set the **HIGH/LOW POWER** option switch to proper setting.

Table A. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

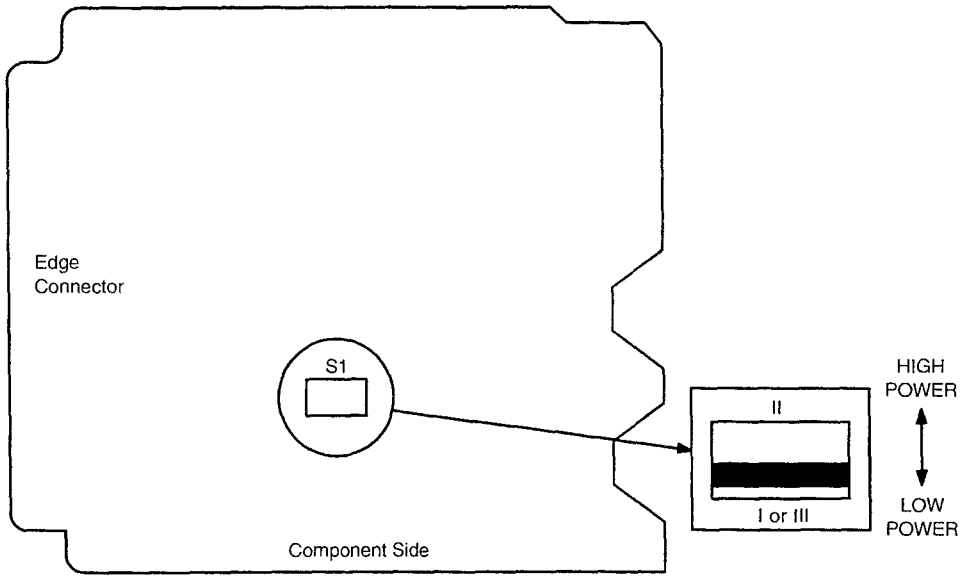


Figure 1. 21G/21G-U OLIU Option Switch

3. ⚠ CAUTION:
If optical fiber cables are routed beneath the **OLIU***s, be careful not to pinch or crush the fibers when the* **OLIU***s are inserted.*

⇒ NOTE 1:
The red **FAULT** LED flashes when no signal is present to the **OLIU**s.

⇒ NOTE 2:
When using the following procedures to install the **OLIU**s, if the responses are not correct, check option switches and connections. If switches and connections are correct, replace the **OLIU** that has the wrong response.

Install **OLIU** into required **MAIN 1** or **FN-( )-1** slot.

Response: **FAULT** LED and **ACTIVE** LED lights. **FAULT** LED begins flashing after about 10 seconds.
[**OHCTL FAULT** LED may begin flashing if far end communications (fecom) is enabled.]

Comment: Critical, major or minor alarm LEDs light depending on the version of software installed. Generally, the **CR** LED will light for linear releases, and the **MJ** (fecom enabled) or **MN** (fecom disabled) LED will light for ring releases.

4. Install second **OLIU** (if required) into **MAIN 2** or **FN-( )-2** slot.

Response: **FAULT** LED and **ACTIVE** LED lights. **FAULT** LED begins to flash after about 10 seconds. (The **FAULT** LED may go off for a few seconds before starting to flash.)

5. Have all required **OLIU**s been installed?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then repeat this procedure for all **OLIU**s being installed.

Connect Optical Loop

1. ⚠ WARNING 1:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **OLIU.**

⚠ CAUTION 2:
The level control on the **21G/21G-U OLIU** *must be set to* **LOW POWER** *when the* **21G/21G-U OLIU** *is looped on itself. Other* **OLIU**s *have no switch settings. The* **22G-U OLIU** *requires a 10 dB LBO when it is looped on itself. The* **22G2-U OLIU** *requires* **no** *attenuation when it is looped on itself.*

⚠ CAUTION 3:
Avoid excessive bending of the optical jumper used to loop the **OLIU** *on itself.*

⚠ CAUTION 4:
All optical fiber connectors and couplings should be properly cleaned **[DLP-527]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

Which **OLIU**s are being looped?

If **21G/21G-U**, then continue with **Step 2.**
If **21D/21D-U/22D-U/22F**, then proceed to **Step 3.**
If **22G-U/22G2-U**, then proceed to **Step 8.**

2. Refer to Figure 1 and set the option switch on the **21G/21G-U OLIU** to the **LOW POWER** position, if not already performed.

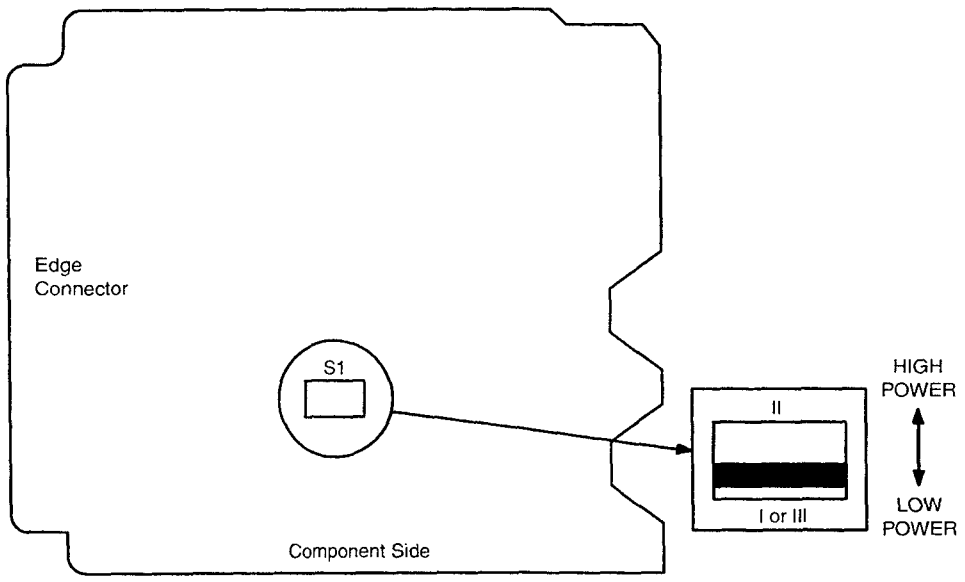


Figure 1. 21G/21G-U OLIU Option Settings

3. NOTE 1:
It may take from 15 seconds to 3 minutes and 25 seconds for the **FAULT** LEDs to stop flashing, depending on the setting of the signal degrade threshold (–5 to –9).

NOTE 2:
The lightguide jumpers used to loop the **OLIU**s must be equipped with *ST*®, FC/PC, or SC connectors at both ends, depending on the type of **OLIU** connector. See Figures 2, 3, and 4.

NOTE 3:
The **21G, 21D,** and **22F** are equipped with *ST*-type connectors.

NOTE 4:
The **21G-U, 21D-U,** and **22D-U OLIU**s are shipped with a 0 dB *ST*-type universal LBO installed (code - **A3070**, comcode - **106795354**). If an SC or FC/PC connector is required; the universal 0 dB LBOs can be ordered separately. See Table A.

NOTE 5:
The **21G/21G-U** and **22F OLIU**s require single mode lightguide jumpers (Table B). **21D/21D-U/22D-U OLIU**s require multimode lightguide jumpers (Table C).

Replace the 0 dB LBO on the **21G-U**, **21D-U**, or **22D-U OLIU**s with a 0 dB LBO with a SC or FC/PC connector on the **MAIN 1** or **FN-( )-1 OLIU**s, if required. See Table A.

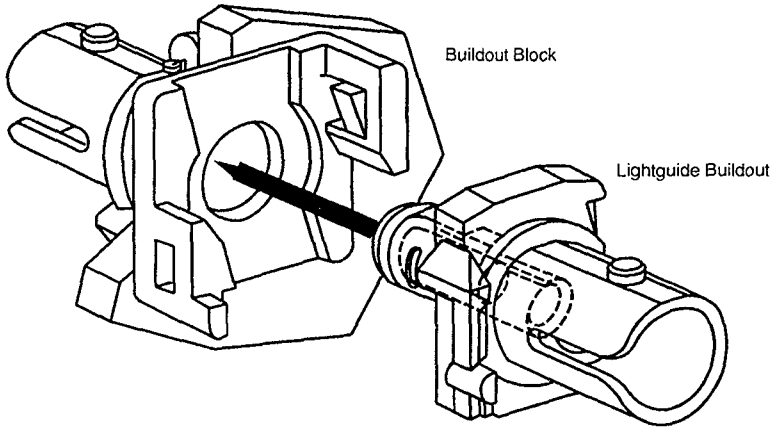


Figure 2. *ST*-Type Universal Buildout

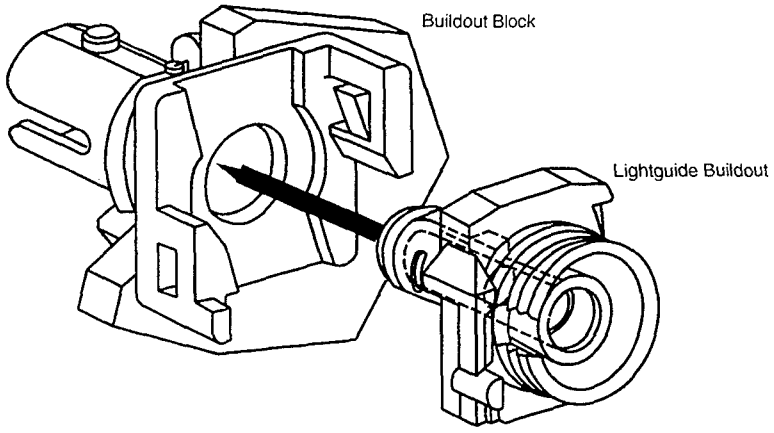


Figure 3. FC/PC-Type Universal Buildout

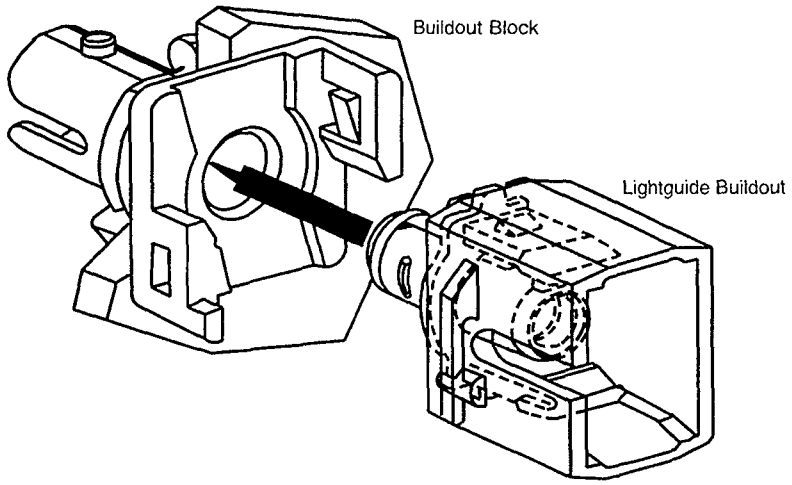


Figure 4. SC-Type Universal Buildout

Table A. Universal 0 dB Lightguide Buildouts

Code	Comcode	Connector Type	Cable Connection	Label Color
A3060	106708951	SC	SM-SM & MM-MM	None
A3070	106795354	*ST*	SM-SM & MM-MM	None
A3080	106795404	FC/PC	SM-SM & MM-MM	None

Table B. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1E-E-2	105357727	2	ST-ST
LS1SC-SC-2	106908247	2	SC-SC
LS1FP-FP-10	106593825	10	FC/PC-FC/PC

Table C. Multimode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FL1E-E-2	105351795	2	ST-ST
LL1SC-SC-2	106908668	2	SC-SC
LL1FC-FC-10	107095549	10	FC-FC

4. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 1** or **FN-( )-1 OLIU**(s). See Table B or C.

   Response: **FAULT** LED stops flashing.
   ACTIVE LED remains on.
   (If flashing, **FAULT** LED on **OHCTL** goes off after all number one **OLIU**s are looped.)

   Comment: In linear releases, critical (**CR**) LED goes off and minor (**MN**) LED lights.
   In ring releases, the lighted major (**MJ**) or minor (**MN**) LED remains lighted.

5. Replace the 0 dB LBO on the **21G-U, 21D-U,** or **22D-U OLIU**s with a 0 dB LBO with a SC or FC/PC connector on the **MAIN 2** or **FN-( )-2 OLIU**s, if required. See Table A.

6. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 2** or **FN-( )-2 OLIU**(s). See Table B or C.

   Response: **FAULT** LED stops flashing.
   In linear releases, **ACTIVE** LED goes off.
   In ring releases, **ACTIVE** LED remains on.
   Minor (**MN**) [major/minor (**MJ/MN**), if rings] alarm goes off.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. ⚠ CAUTION:
22G-U/22G2-U OLIUs *are shipped with 0 dB ST-type universal LBOs installed (code -* **A3070**, *comcode -* **106795354**). *The 0 dB LBO must be replaced with a 10 dB LBO when the* **22G-U OLIU** *is looped on itself. The* **22G2-U OLIU** *reguires* **no** *attenuation when it is looped on itself. See Table D.*

NOTE 1:
It may take from 15 seconds to 3 minutes and 25 seconds for the **FAULT** LEDs to stop flashing, depending on the setting of the signal degrade threshold (–5 to –9).

NOTE 2:
The lightguide jumpers used to loop the **OLIU**s must be equipped with *ST*®, FC/PC, or SC connectors at both ends, depending on the type of **OLIU** connector. See Figures 2, 3, and 4.

NOTE 3:
The **22G-U/22G2-U OLIU**s require single mode lightguide jumpers (Table E).

For the **22G-U OLIU only**, replace the 0 dB LBO on the **OUT** buildout block with the required 10 dB LBO on the **MAIN 1** or **FN-( )-1 OLIU**s. See Table D.

Table D. Universal 10 dB Lightguide Buildouts

Code	Comcode	Connector Type	Cable Connection	Label Color
A3060D	106708977	SC	SM-SM	Black
A3070D	106795370	*ST*	SM-SM	Black
A3080D	106795420	FC/PC	SM-SM	Black

Table E. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1E-E-2	105357727	2	ST-ST
LS1SC-SC-2	106908247	2	SC-SC
LS1FP-FP-10	106593825	10	FC/PC-FC/PC

9. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 1** or **FN-( )-1 OLIU**(s). See Table E.

   Response: **FAULT** LED stops flashing.
   ACTIVE LED remains on.
   (If flashing, **FAULT** LED on **OHCTL** goes off after all number one **OLIU**s are looped.)

   Comment: In linear releases, critical (**CR**) LED goes off and minor (**MN**) LED lights.
   In ring releases, the lighted major (**MJ**) or minor (**MN**) LED remains lighted.

10. For the **22G-U OLIU only**, replace the 0 dB LBO on the **OUT** buildout block with the required 10 dB LBO on the **MAIN 2** or **FN-( )-2 OLIU**s. See Table D.

11. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **MAIN 2** or **FN-( )-2 OLIU**(s). See Table E.

    Response: **FAULT** LED stops flashing.
    In linear releases, **ACTIVE** LED goes off.
    In ring releases, **ACTIVE** LED remains on.
    Minor (**MN**) [major/minor (**MJ/MN**), if rings] alarm goes off.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install MXRVO Circuit Packs

1. ⇒ NOTE 1:
   If the response is not correct in the following procedures, replace the **MXRVO**.

   ⇒ NOTE 2:
   MXRVO circuit packs may be installed in function unit group slots **FN A**, **FN B**, or **FN C**.

   Determine which function unit group slots (**FN A**, **FN B**, or **FN C**) are to be equipped with **MXRVO** circuit packs.

2. Seat an **MXRVO** circuit pack into function unit group slot **FN A-1**, **FN B-1**, or **FN C-1**, as required.

   Response: **FAULT** LED on the **MXRVO** lights for about 20 seconds then goes off. **ACTIVE** LED lights on first **MXRVO** installed in each function unit group slot.

3. ⇒ NOTE:
   If the group is to be equipped with any **BBF3 DS1PM** circuit packs, both service and protection **MXRVO** circuit packs must be installed.

   If required, seat a second **MXRVO** into slot **2** of the same function unit group (**FN A**, **FN B**, or **FN C**).

   Response: **FAULT** LED on protection **MXRVO** lights for about 13 seconds then goes off. **ACTIVE** LED remains off.

4. Repeat this procedure from Step 1 for each **MXRVO** circuit pack being installed.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install DS3 Circuit Packs

1. ⚠ CAUTION:
   Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **DS3**.

   ⇒ NOTE:
   DS3 circuit packs may be installed in function unit group slots **FN A**, **FN B**, or **FN C**. Service **DS3** circuit packs are installed in slots labeled **FN ( ) 1**. Protection **DS3** circuit packs are installed in slots labeled **FN ( ) 2**.

   Determine which function unit group slots (**FN A**, **FN B**, or **FN C**) are to be equipped with **DS3** circuit packs.

2. Determine from office records the length of the DS3 cabling between the DDM-2000 and the DSX-3 cross-connect point.

3. ⇒ NOTE:
   The only option settings on the DS3 circuit pack are the LBO settings shown in Figure 1. If there are other jumpers on the circuit pack similar to the LBO jumpers, they are factory test points and should be ignored.

   Refer to Table A and Figure 1. Install the DS3 option jumpers per Table A.

Table A. DS3 LBO Settings

Cable Length (Ft)			
734A	Mini-Coax KS-19224	735A 1735006A	LBO Setting
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

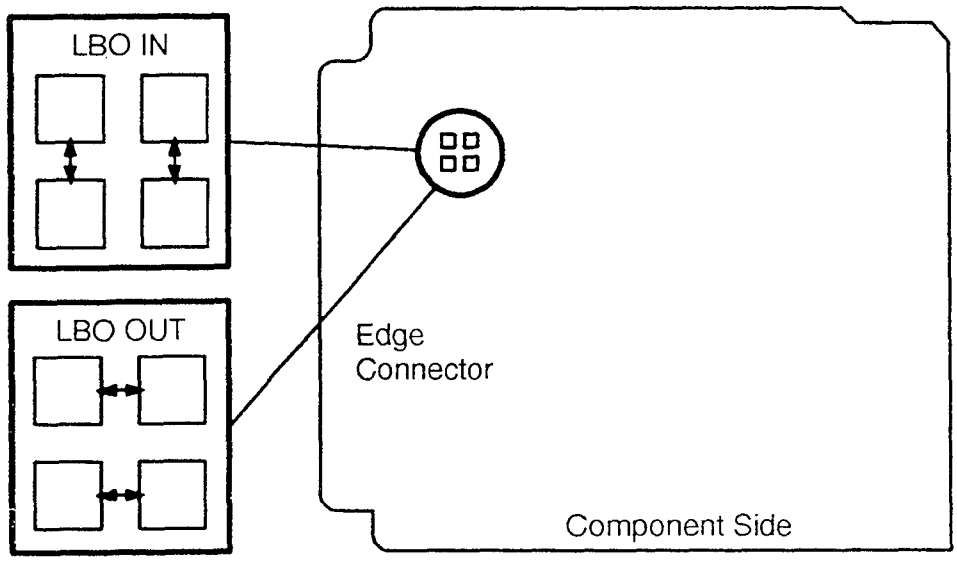


Figure 1. DS3 Option Settings

4. ⇒ NOTE:
If the response is not correct in the following procedures, replace the **DS3** circuit pack.

Seat a **DS3** circuit pack in function unit group slot **FN A-1**, **FN B-1**, or **FN C-1**.

Response: **FAULT** LED on the **DS3** lights for about 20 seconds then goes off. **ACTIVE** LED lights on the first **DS3** circuit pack of the pair installed.

5. If required, seat a second (protection) **DS3** circuit pack in function unit group slot **FN A-2**, **FN B-2**, or **FN C-2** of the same function unit group.

   Response: **FAULT** LED on the **DS3** lights for about 20 seconds then goes off. **ACTIVE** LED remains off.

6. Repeat this procedure from Step 1 for each pair of **DS3** circuit packs to be installed.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install DS1/DS1PM Circuit Packs

1. ⚠ CAUTION:
Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **DS1/DS1PM** *circuit pack.*

Determine from office records the length of the DS1 cabling between the DDM-2000 and the DSX-1 cross-connect point.

2. ⇒ NOTE 1:
Switch 1, sections 1 through 3 (**S1-1, S1-2, S1-3**), are set according to the length of DS1 cabling between the DDM-2000 and the DSX-1 cross-connection. Switch 1, sections 4 through 7 (**S1-4, S1-5, S1-6, S1-7**), are set for the type of line coding (B8ZS or AMI) required of the DS1 signal. Switch 1, section 8 (**S1-8**) is unused and ignored by the system.

⇒ NOTE 2:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Refer to Figure 1 and Table A and set LBO option switches.

Table A. DS1/DS1PM Cable LBO Settings

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 kHz	Switch S1 Settings		
			S1-1	S1-2	S1-3
0 to 133	0 to 90	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

Note: Invalid switch settings will cause the **FAULT** LED to light and a `DS1 CP failed` alarm.

3. ⇒ NOTE:
DS1 line coding may be set using either the option switches OR the `set-tl` command. It is recommended that a policy be established to set line coding using either the switches OR the command. If DS1 line code (lc) parameters are set using the `set-tl` command, a software override will be active and the circuit pack switch settings will have no effect. The software override will remain active until the `set-tl` command is executed again and the `noOverride` option is selected. The `rtrv-tl` command may be used to check line code settings.

Refer to Table B and Figure 1 and set the line code option switches, if required.

Table B. DS1/DS1PM Line Code Settings

	Switch S1 Settings				
Line Code Format	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)	S1-8 (Note)
B8ZS	OFF	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON	

Note: Switch 1, section 8 (S1-8) is unused and ignored by the system.

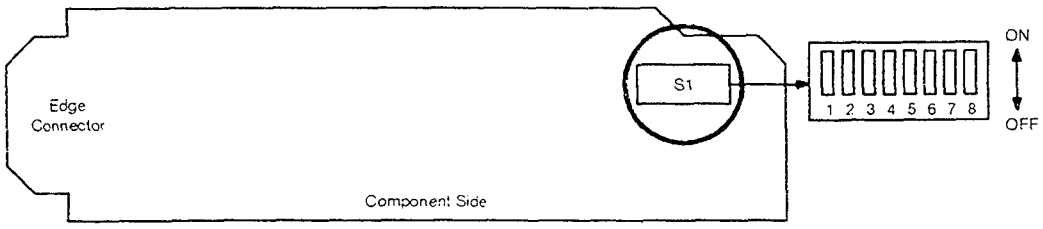


Figure 1. DS1/DS1PM Option Settings

4. ⇒ NOTE:
   If the response is not correct when the **DS1/DS1PM** circuit pack is installed, check option switch setting. If settings are correct, replace the **DS1/DS1PM** circuit pack.

   Seat **DS1/DS1PM** circuit pack in required slot of **LOW SPEED** group being equipped.

   Response: **FAULT** LED on **DS1/DS1PM** circuit pack lights and may remain lighted for about 40 seconds and then goes off.

5. Repeat this procedure from Step 1 for each service **DS1/DS1PM** circuit pack being installed.

6. ⇒ NOTE 1:
   One protection **DS1/DS1PM** circuit pack may be installed in slot **8(P)** of each **LOW SPEED** group being equipped. The **SYSCTL** automatically provisions the protection **DS1/DS1PM** circuit pack to match the line code setting (B8ZS or AMI) of any service **DS1/DS1PM** circuit pack that it protects.

   ⇒ NOTE 2:
   If **BBF3 DS1PM** circuit packs are installed in service slots, then a **BBF3 DS1PM** circuit pack must be installed in the protection slot, if protection is required.

   Is protection DS1 circuit pack being installed?

   If **YES**, then continue with **Step 7**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Refer to Figure 1 and Table A and set LBO option switches on protection **DS1/DS1PM** circuit pack.

8. Install protection **DS1/DS1PM** circuit pack into slot **8(P)** of low-speed group being equipped.

9. Install **177A** Retainer Cards into all unequipped service DS1 **LOW SPEED** slots in groups equipped with **MXRVO** and protection **DS1/DS1PM** circuit packs.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform LED Test

1. ⚠ CAUTION:
   Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the circuit packs.

   Is a CIT available?

   If **YES**, then continue with **Step 2.**
   If **NO**, then proceed to **Step 5.**

2. Connect CIT to User Panel.

   Reference: **DLP-521**

3. Use the `test-led:`*`address`*`:r=( )` command to test LEDs.

   Where address = address identifier of the system, slot, or user panel that contains the LEDs to be tested. Default is `all`.

   r = number of times (1 through 10) test is repeated.

   Response: All LEDs for the specified address identifier light. For a **SYSCTL** LED test, all segments of the **SYSCTL FE ID** display (including the period) light. After 10 seconds, all LEDs go off. After another 10 seconds, a completion message is printed and all LEDs are updated to show the current status of the system.

4. Did LED test pass?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then proceed to **Step 7.**

5. ⇒ NOTE:
   When the **ACO** button is depressed, all LEDs and the 7-segment **FE ID** display on the **SYSCTL** light. If the **ACO** button is released within 2 seconds, the LED test completes and the 7-segment display and all LEDs revert to normal operation. If the **ACO** button is depressed longer than 2 seconds, the 7-segment display goes blank for 2 seconds and then each digit of the generic software version code is scrolled through the display. The LEDs remain lighted while the code is being displayed. When the **ACO** button is released, the LEDs remain lighted until the full software version code is displayed. If the **ACO** button is still depressed when the software version code has completed cycling, the display goes blank for 2 seconds and starts cycling through the software version code again. This continues as long as the **ACO** button is depressed.

   Depress the **ACO** button on the User Panel.

   Response: All LEDs and the **SYSCTL** 7-segment display light.

6. Was response correct?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 7.**

7. Were you sent here by another procedure to perform an LED test?

   If **YES**, then continue with **Step 8.**
   If **NO**, then do **Trouble Clearing: TAP-115.**

8. Record the circuit pack(s) (LEDs) that failed the LED test and return to the procedure that sent you here.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS1 Transmission Test

1. ⇒ NOTE 1:
This procedure may be used to perform individual DS1 transmission tests in the mux (toward the fiber) or demux (toward the DSX) direction. When this procedure is being used to perform end-to-end DS1 tests, it is assumed that the complete end-to-end system has already been tested and that only a particular DS1 port is being tested at this time. It is further assumed that the DS1 options have been set correctly (using the **`set-t1:`** command) at both ends of the circuit being tested. If a CIT is available, the **`rtrv-t1:`** command may be used to check for proper DS1 option settings. Ensure proper line coding settings (AMI/B8ZS) at both ends of the circuit.

⇒ NOTE 2:
Transmission tests in the *mux* direction may be local or end-to-end tests (see Figure 1). Transmission tests in the *demux* direction may be local cross-connect tests (see Figure 2). The Commands and Reports section of this manual, under TEST-TRMSN-T1, gives an explanation of commands.

⇒ NOTE 3:
This test can be performed either with a CIT and the automated test command **`test-trmsn-t1`** or with a suitable low speed test set (such as a KS-20775, L1 DS1 Error Rate Test Set or a KS-22331, L1/KS-22332, L2 DS1/DS1C/DS2 Error Rate Test Set).

⇒ NOTE 4:
When this procedure is used to do end-to-end tests, one DDM-2000 assembly will be referred to as the near end and the other assembly as the far end. These designations are arbitrary; either assembly can be the near-end or the far-end assembly.

NOTE 5:
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS1 circuit being tested. Release 2 supports default and limited manual STS-1 cross-connections to support STS-1 drop applications. Releases 3 and 6 support default and full manual STS-1 and VT1.5 (DS1) cross-connections to support STS-1 add/drop and DS1 add/drop applications. Releases 5 and 7 have no default cross-connections and support only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the Commands and Reports section of this manual: **`cnvt-crs`**, **`dlt-crs-sts1`**, **`dlt-crs-vt1`**, **`ent-crs-sts1`**, **`ent-crs-vt1`**, **`rtrv-crs-sts1`**, **`rtrv-crs-vt1`**, **`set-ne`**, and **`rtrv-ne`**. See *Cross-Connection Provisioning* in the Administration and Provisioning section of this manual for more information on cross-connection provisioning.

NOTE 6:
A CIT is required for this test on a ring configuration or if manual cross-connections have to be made at any shelf.

Is a CIT available?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 3**.

2. At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

   Reference: **DLP-521**

3. NOTE:
   Work orders, office records, or CIT **`ent-crs`** or **`rtrv-crs`** commands may be used to make or verify cross-connections.

   At each shelf in the network, make/verify that proper STS-1/VT1(DS1) terminating and pass-through cross-connections have been made for each DS1 circuit being tested, as required.

4. Are you using CIT and **`test-trmsn-t1`** command to perform this test?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 21**.

5. ⇒ NOTE 1:
   If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS1/DS1PM** circuit packs, the DS1 transmission test is performed from the DS1 terminating end. If the CIT and **`test-trmsn-t1:`** command is being used to perform the test and you are at the EC-1 terminating end, log into the DS1 end to perform the test using the **`test-trmsn-t1:`** command.

   ⇒ NOTE 2:
   When both terminating ends are equipped with **STS1E** circuit packs, one end may be temporarily equipped with either **DS1/DS1PM** or **DS3** circuits packs and the procedures of **DLP-510** or **DLP-511** used to perform the transmission tests.

   ⇒ NOTE 3:
   Local tests cannot be performed in the DEMUX direction for **STS1E** circuit packs.

   See Figures 1 and 2. If local tests are being performed, the fiber loopbacks at the near-end **OLIU**s must be in place. If end-to-end tests are being performed, do ONE of the following:

   (a) Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-1 or STSX cross-connection associated with the DS1 channel to be tested.

   (b) Use the **`rlgn`** command to log in to the far-end terminal and use the **`opr-lpbk-t1:`***`address`* or **`opr-lpbk-ec1:`***`address`* command to loop back the DS1 or EC-1 port(s) at the far end. Use **`logout`** or **`toggle`** (ctrl t) command to return control of CIT to near end.

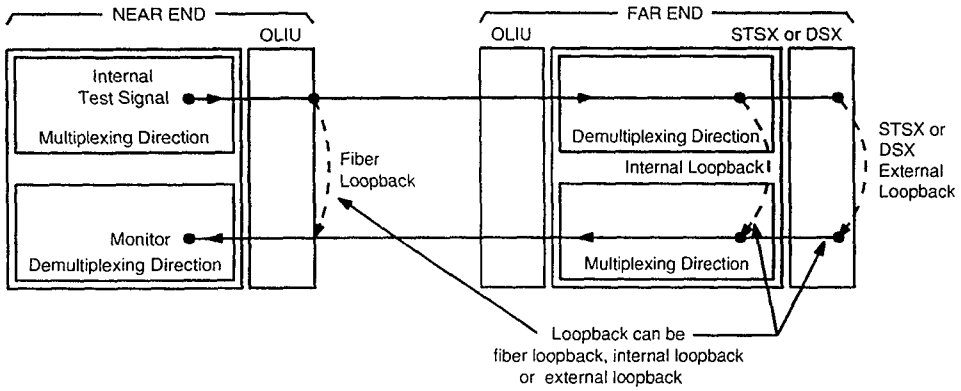


Figure 1. Transmission Test of DS1 Signal in MUX Direction

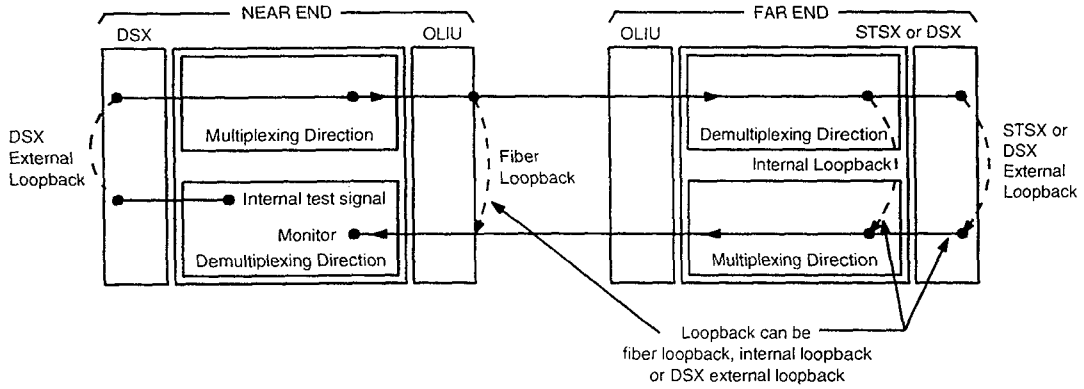


Figure 2. Transmission Test of DS1 Signal in DEMUX Direction

6. Are you doing this test in the mux or demux direction?

   If **MUX** direction, then continue with **Step 7**.
   If **DEMUX** direction, then proceed to **Step 9**.

7. At the near end, use the following command to perform a test of the DS1 loop in the fiber direction:
   test-trmsn-t1:*address***:dirn=mux:dur=( );**

Where *address* = address identifier of the DS1 signal.

dirn = direction of the test. If **dirn=mux**, direction is toward fiber.

dur = duration of the test in minutes (1-120); default is 1.

8. Was the test successful (error free)?

   If **YES**, then proceed to **Step 12**.
   If **NO**, then proceed to **Step 34**.

9. See Figure 2. At the near-end DSX-1 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS1 channel to be tested.

10. Use the following command to perform a DS1 transmission test in the demux direction to test the DS1 loop in the DSX direction:
    test-trmsn-t1:*address***:dirn=demux:dur=( );**

Where *address* = address identifier of the DS1 signal.

dirn = direction of the test. If **dirn=demux**, direction is toward DSX.

dur = duration of the test in minutes (1-120); default is 1.

11. Was the test successful (error free)?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 34**.

12. Is this first service being placed on the group and is a protection **DS1/DS1PM** circuit pack installed?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:
    switch-ls:*address*:**pri=manual;**.

14. Repeat the transmission test in the mux (or demux) direction using the following command:
    test-trmsn-t1:*address*:**dirn=mux (or demux):dur=( );**.

15. Was the test successful (error free)?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 34**.

16. Use the following command to clear active switch requests:
    switch-ls:*address*:**pri=reset;**.

17. ⇒ NOTE:
    If this is a single-ring configuration and the transmission test is being performed in the **mux** direction, use the **switch-path** command to switch the path to the other ring and then repeat this test before releasing loopbacks.

    The DS1 circuit under test has passed the DS1 transmission test. Remove the looping patch cords from the cross-connect point. Use the **rls-lpbk-t1** command to release loopback(s) at the far end, if required.

18. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** (or use the "**upd**" command) to update the **SYSCTL** and remove alarms after the loopbacks have been removed.

19. Repeat this procedure from Step 2 for any additional DS1 circuits to be tested.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLIU** must be in place. If end-to-end tests are being performed, at the far-end DSX-1 or STSX cross-connect point associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS1 channel to be tested.

22. At the near-end DDM-2000 cross-connect point, connect the DS1 test set to the **IN** and **OUT** jacks associated with the circuit under test.

23. Use the DS1 test set to test for error-free transmission.

24. Was the test successful (error free)?

    If **YES**, then continue with **Step 25**.
    If **NO**, then proceed to **Step 34**.

25. Is this first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 30**.

26. Unseat the service **DS1/DS1PM** circuit pack associated with the circuit under test.

27. Repeat the DS1 transmission test with the DS1 test set.

28. Was the test successful (error free)?

    If **YES**, then continue with **Step 29**.
    If **NO**, then proceed to **Step 34**.

29. Reseat the **DS1/DS1PM** circuit pack associated with the circuit under test.

30. The **DS1** circuit under test has passed the DS1 transmission test. Remove the looping patch cords from the cross-connections.

31. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.

32. Repeat this procedure from Step 21 for any additional DS1 circuits to be tested.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. Check for line code (AMI/B8ZS) mismatch at near end and far end. If mismatch is found, set line code [**DLP-513**] to correct value and repeat this test. If no trouble is found, continue with the next step.

35. In some releases, if **dlc=yes** as set by the **set-t1** command, loopbacks are not recognized (loopback not recognized) in this test. Use **rtrv-t1** command to check if **dlc=yes**.

36. Is dlc set to yes?

    If **YES**, then continue with **Step 37**.
    If **NO**, then proceed to **Step 38**.

37. Use **set-t1** command to temporarily set **dlc=no** and repeat this test. If the test fails again, continue with the next step.

38. Has the **DS1/DS1PM** circuit pack that failed the test been replaced?

    If **YES**, then proceed to **Step 41**.
    If **NO**, then continue with **Step 39**.

39. Replace the **DS1/DS1PM** circuit pack that failed the test.

    Reference: **DLP-523**

40. Repeat this procedure for the **DS1/DS1PM** circuit pack that failed.

41. Trouble may be in the DSX cross-connect wiring, VT1/STS1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the rtrv-crs-( ) command to ensure proper VT1/STS1 cross-connections have been made at each shelf in the ring for the DS1 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, **rtrv-alm**, **rtrv-hsty**, etc.) to check for other trouble indications.

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3 Transmission Test

1. NOTE 1:
This procedure may be used to perform DS3 transmission tests in the mux (toward the fiber) or demux (toward the DSX) direction. When this procedure is being used to perform end-to-end DS3 tests, it is assumed that the complete end-to-end system has already been tested and that only a particular DS3 channel is being tested at this time. Transmission tests in the *mux* direction may be local or end-to-end tests (See Figure 1). Transmission tests in the *demux* direction are local cross-connect tests (See Figure 2). The Commands and Reports section of this manual, under TEST-TRMSN-T3, gives an explanation of commands.

NOTE 2:
This test can be performed either with a CIT and the automated test command `test-trmsn-t3` or with a DS3 test set.

NOTE 3:
When this procedure is used to do end-to-end tests, one DDM-2000 assembly will be referred to as the near end and the other assembly as the far end. These designations are arbitrary; either assembly can be the near-end or the far-end assembly.

NOTE 4:
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3 circuit being tested. Release 2 supports default and limited manual STS-1 (DS3) cross-connections to support DS3 drop applications. Releases 3 and 6 support default and full manual STS-1 and VT1.5 (DS1) cross-connections to support DS3 add/drop and DS1 add/drop applications. Releases 5 and 7 have no default cross-connections and support only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the Commands and Reports section of this manual: `cnvt-crs`, `dlt-crs-sts1`, `dlt-crs-vt1`, `ent-crs-sts1`, `ent-crs-vt1`, `rtrv-crs-sts1`, `rtrv-crs-vt1`, `set-ne`, and `rtrv-ne`. See *Cross-Connection Provisioning* in the Administration and Provisioning section of this manual for more information on cross-connection provisioning.

NOTE 5:
A CIT is required for this test if manual cross-connections have to be made at any shelf.

Is a CIT available?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 3**.

2. NOTE 1:
If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS3** circuit packs, the DS3 transmission test is performed from the DS3 terminating end. If the CIT and `test-trmsn-t3:` command is being used to perform the test and you are at the EC-1 terminating end, the `rlgn` command may be used to log into the DS3 end to perform the test using the `test-trmsn-t3:` command.

NOTE 2:
When both terminating ends are equipped with **STS1E** circuit packs, either DS1 or DS3 transmission tests may be performed. For DS3 tests, one end may be temporarily equipped with **DS3** circuits packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **STS1E** at the near end, perform an update (`upd`), and install the **DS3** circuit pack(s). This configuration may only be tested in the MUX direction. After the tests are completed, remove the temporary circuit packs, perform an update, and reinstall the **STS1E** circuit packs.

At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-521**

3. ⇒ NOTE:
   Work orders, office records, or CIT `ent-crs-sts1` or `rtrv-crs` commands may be used to make or verify STS-1 cross-connections.

   At each shelf in the network, make/verify that proper STS-1 cross-connections have been made for each DS3 channel being tested.

4. Are you using CIT and `test-trmsn-t3` command to perform this test?
   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 21**.

5. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLIU** must be in place. If end-to-end tests are being performed, do ONE of the following:

   (a) ⇒ NOTE:
   When an end-to-end DS3 test is run in the mux direction and an external loopback is established at the far end, provision the far end DS3 for CC mode with no AIS (`set-t3:`*address*`:mode=cc,ais=no`). Otherwise, if the VMR mode is used, then only errors in the receive direction will be monitored and the system may not recognize that a loopback is up.

   Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-3 or STSX cross-connect point associated with the DS3 channel to be tested.

   (b) Use the `rlgn` command to log in to the far-end terminal and use the `opr-lpbk-t3:`*address* or `opr-lpbk-ec1:`*address* command to loop back the DS3 or EC-1 port(s) at the far end. Use `logout` or `toggle` (crtl t) command to return control of CIT to near end.

6. Are you doing this test in the mux or demux direction?

   If **MUX** direction, then continue with **Step 7.**
   If **DEMUX** direction, then proceed to **Step 9.**

7. At the near end, use the following command to perform a test of the DS3 loop in the fiber direction:

   `test-trmsn-t3:`*`address`*`:dirn=mux:dur=( );`

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If `dirn=mux`, direction is toward fiber.

dur = duration of the test in minutes (1-120), default is 1.

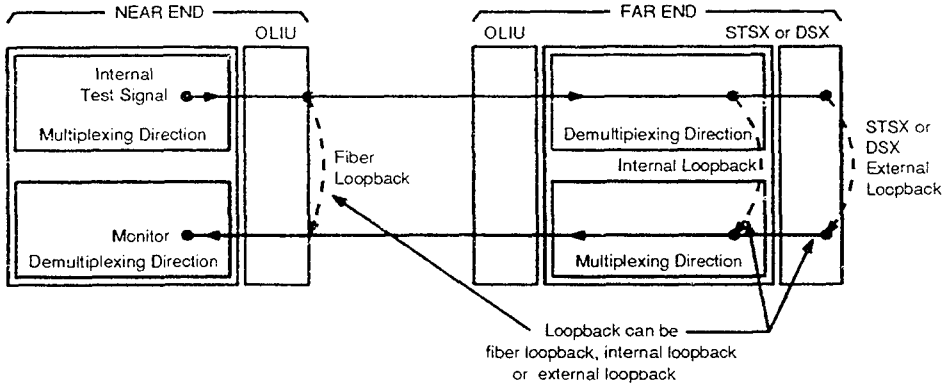


Figure 1. Transmission Test of DS3 Signal in MUX Direction

8. Was the test successful (error free)?

   If **YES**, then continue with **Step 12.**
   If **NO**, then proceed to **Step 34.**

9. See Figure 2. At the near-end DSX-3 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.

10. Use the following command to perform a DS3 transmission test in the demux direction to test the DS3 loop in the DSX direction:
`test-trmsn-t3:`*`address`*`:dirn=demux:dur=( );`

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If `dirn=demux`, direction is toward DSX.

dur = duration of the test in minutes (1-120), default is 1.

11. Was the test successful (error free)?

If **YES**, then continue with **Step 12.**
If **NO**, then proceed to **Step 34.**

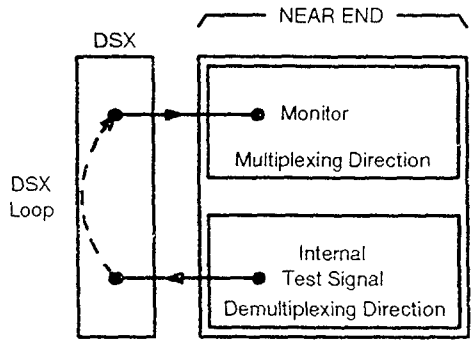


Figure 2. Transmission Test of DS3 Signal in DEMUX Direction

12. Is this the first service being placed on the group and is a protection DS3 circuit pack installed?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:
    `switch-fn:`*`address`*`:pri=manual;`.

    Response: The green **ACTIVE** LED lights on the protection circuit pack.

14. ⇒ NOTE:
    If this is a single-ring configuration and the transmission test is being performed in the **mux** direction, the `switch-path` command should be used to switch the path to the other ring and then repeat this test.

    Repeat the transmission test in the mux (or demux) direction using the following command:
    `test-trmsn-t3:`*`address`*`:dirn=mux (or demux):dur=( );`.

15. Was the test successful (error free)?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 34**.

16. Use the following command to clear active switch requests:
    `switch-fn:`*`address`*`:pri=reset;`.

17. The **DS3** circuit under test has passed the DS3 transmission test. Remove the looping patch cords from the cross-connect point. Use the `rls-lpbk-t3` command to release loopback(s) at the far end, if required.

18. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the "update" command) on the **SYSCTL** to update the **SYSCTL**.

19. If violation monitor removal mode was set differently than the original mode in Step 5, reprovision the mode to the original or required setting using the `set-t3` command. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLIU** must be in place. If end-to-end tests are being performed, at the far-end DSX-3 or STSX cross-connect point associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.

22. At the cross-connection associated with the near-end DDM-2000, connect the DS3 test set to the **IN** and **OUT** jacks associated with the circuit under test.

23. Use the DS3 test set to test for error-free transmission.

24. Was the test successful (error free)?

    If **YES**, then continue with **Step 25**.
    If **NO**, then proceed to **Step 34**.

25. Is this the first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 30**.

26. Unseat the service **DS3** circuit pack associated with the circuit under test.

27. Repeat the DS3 transmission test with the DS3 test set.

28. Was the test successful (error free)?

    If **YES**, then continue with **Step 29**.
    If **NO**, then proceed to **Step 34**.

29. Reseat the **DS3** circuit pack associated with the circuit under test.

30. The **DS3** circuit under test has passed the DS3 transmission test. Remove the looping patch cords from the cross-connections.

31. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.

32. Repeat this procedure from Step 21 for any additional DS3 circuits to be tested.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. Has the **DS3** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 37.**
    If **NO**, then continue with **Step 35.**

35. Replace the **DS3** circuit pack that failed the test.

    Reference: **DLP-523**

36. Repeat this procedure for the **DS3** circuit pack that failed.

37. Trouble may be in the DSX cross-connect wiring, STS1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the rtrv-crs-sts1 command to ensure proper STS1 cross-connections have been made at each shelf in the ring for the DS3 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, `rtrv-alm`, `rtrv-hsty`, etc.) to check for other trouble indications.

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Activate Optional System Features Using CIT

1. Connect CIT to **CIT** connector on User Panel and establish session.

   Reference: **DLP-521**

2. Refer to the Commands and Reports section of this user/service manual for the descriptions and syntax of the various optional features of the DDM-2000 that may be set using the CIT (see Table A). These optional features can be found under numerous listings.

   The following lists optional features which may be lost if the **SYSCTL** is replaced:

`ent-ulsdcc`	Provisions the user-settable fields of the network service access point (NSAP) address. Command parameters should **not** be changed from default values except by users who intend to provision the SONET subnetwork and partition DCC communications. The NSAP is also uniquely defined with a factory default value in each **OHCTL** without provisioning the user-settable fields of the NSAP.
`set-attr-alm`	Sets alarm delay and clear delay.
`set-attr-env`	Names and sets alarm level of miscellaneous discrete input points at RT only.
`set-attr-cont`	Names miscellaneous discrete control output points at RT only.
`set-date`	Sets date and time.
`set-fecom`	Enables or disables far end communication over the data communication channel.
`set-lgn`	Enters, edits, and deletes logins and passwords. Privileged users can change other users' passwords by using this command.
`set-link`	Sets length of page output on the CIT.

set-ne	In Release 6 and Release 7.0 and 7.1, it sets the name [Target Identifier (TID)] of the network element. Sets the shelf as a gateway network element to enable the TL1/X.25 interface. It also designates the shelf as a gateway network element which also designates it as the directory services network element (DS-NE) for OSI protocol. **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. Also sets cross-connect mode to default or manual and DCC mode to distinct or identical. In Release 7.2, it sets the name [Target Identifier (TID)] of the network element. It designates the shelf as a directory services network element (DSNE) for OSI protocol. **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. It also designates a shelf as an alarm gateway network element (AGNE) and sets alarm group numbers. Also sets cross-connect mode to default or manual and DCC mode to distinct or identical.
set-passwd	Sets or changes a users' password. All users can change their own passwords.
set-pmthres-line	Sets the thresholds of the line performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-sect	Sets the thresholds of the section performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-t1	Sets the thresholds of the DS1 performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-t3	Sets the thresholds of the DS3 performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-sts1	Sets the STS-1 path performance parameter thresholds. Available only in Release 2 or later software.

set-pmthres-vt1	Sets the thresholds of the VT1.5 path performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-secu	Sets security on each CIT port and DCC interface. Enabling security requires users to enter login and password to access the system.
set-sync	Sets synchronization mode switching to revertive or nonrevertive. After the end-to-end system is established, sets synchronization source to select the line from which shelf loop-timing and/or the DS1 sync output will be derived. Sets output mode to select the source of the DS1 sync output.

Other optional features are set from the CIT but are not lost if the **SYSCTL** is replaced.

⚠ CAUTION:
Execution of these commands may be service affecting.

These features may be found under the following listings:

ent-crs-sts1	Specifies STS-1 cross-connect routing. Used in establishing service and/or performing transmission tests.
ent-crs-vt1	Specifies VT1.5 (DS1) cross-connect routing. Used in establishing service and/or performing transmission tests.
set-ec1	Sets the characteristics of an EC-1 port.
set-feat	Enables feature options that are licensed for use: sts3c, vtpm, ds1pm.
set-oc3	Sets the characteristics of an OC-3 line pair. Sets the signal degrade threshold of the OC-3 line as a bit error rate (BER). Specifies if sync message signaling (kbyte) is enabled or disabled. Specifies if the concatenation mode (concat) of the OC-3 line is to be independent STS-1 channels or an sts-3c channel.
set-state-ec1	Sets the state of a low-speed EC-1 port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).

`set-state-t1`	Sets the state of a low-speed port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
`set-state-t3`	Sets the state of a DS3 port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
`set-state-sts1`	Sets the state of a STS-1 channel to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
`set-state-vt1`	Sets the state of a VT1.5 channel to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
`set-sts1`	Sets the signal degrade characteristics of an STS-1 channel.
`set-t1`	Sets the characteristics of a DS1 port.
`set-t3`	Sets the characteristics of a DS3 port.
`set-vt1`	Sets the signal degrade characteristics of a VT1.5 channel.

3. Determine options required from office records.
4. Set options using the syntax of the Commands and Reports section in this manual.
5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. DDM-2000 OC-3 Parameters Provisionable Via the CIT

Parameter	Range	Default (Note 1)	Command (Note 2)
Date	current value	70-01-01	set-date
Time	current value	00:00:00	set-date
Target ID (system name)	20 characters	Site#NE#*	set-ne
GNE (7.1 and earlier)	yes, no	no ¶¶	set-ne
DSNE (7.2 and later)	yes, no	no ¶¶	set-ne
AGNE (7.2 and later)	yes, no	no	set-ne
Alarm group No. (7.2 and later)	1-255	255	set-ne
Cross-connect mode	default, manual	default	set-ne
DCC mode ¶¶¶	identical, distinct	distinct	set-ne
CIT page length	0 (pager off), 3-150 rows	24	set-link
PM thresholds	See Table -15	-	set-pmthres
Alarm holdoff delay	0-30 sec	2	set-attr-alm
Alarm clear delay	0-30 sec	15	set-attr-alm
OC3 degrade threshold	10^{-5}–10^{-9}	10^{-6}	set-oc3
Kbyte Messages (sync messaging)	enabled, disabled	enabled	set-oc3
Concatenation mode	enabled, disabled	disabled	set-oc3
STS-1 path signal degrade threshold†††	10^{-5}–10^{-9}	0 (disabled)	set-sts1
STS-1 channel state***	NMON, AUTO‡	AUTO	set-state-sts1
VT1.5 path signal degrade threshold‡‡‡	10^{-5}–10^{-8}	0 (disabled)	set-vt1
VT channel state***	NMON, AUTO‡	AUTO	set-state-vt1
DS3 VMR mode†	VMR, VM, clear channel	VMR	set-t3†
Clear channel DS3 AIS insertion†	yes, no	no	set-t3†
DS3 alarm level†	CR, MJ, MN, none	CR	set-t3†
DS3 failure threshold†	10^{-3},10^{-6} BER	10^{-3}	set-t3†
DS3 port state†	NMON, AUTO‡	AUTO	set-state-t3†
DS3 PM mode¶¶¶	off, on	on	set-t3
DS3 PM format ¶¶¶	Pbit, Fmbit	Pbit	set-t3
DS1 line coding†	AMI,B8ZS,noOverride§	noOverride	set-t1†
DS1 alarm level†	MJ, MN, none	none	set-t1†
DS1 AIS insertion†	yes, no	yes	set-t1†
DS1 failure threshold†	10^{-3},10^{-6} BER	10^{-3}	set-t1†
DS1 BPV to LOS†	yes,no	no	set-t1†
DS1 port state†	NMON, AUTO‡	AUTO	set-state-t1†
DS1 PM Mode†	off, on	off	set-t1
DS1 PM Format†	sf, esf, esfn	esf	set-t1
Environmental alarm level	CR, MJ, MN, none	MN	set-attr-env
Environmental alarm description	26 characters		set-attr-env
Control point description	26 characters		set-attr-cont
Far end communication **	enabled,disabled	enabled	set-fecom**

See notes and footnotes at end of table.

Table A. DDM-2000 Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
Set security **	enabled, disabled	disabled	`set-secu**`
CIT security **	enabled, disabled	disabled	`set-secu**`
CIT timeout (minutes) **	0-120	15	`set-secu**`
DCC security **	enabled, disabled	disabled	`set-secu**`
DCC timeout (minutes) **	0-120	15	`set-secu**`
Sync Timing Source §§ ‡‡	main, fn-c,	main	`set-sync`
Sync Output Mode §§	¶ track, lock1, lock2	track	`set-sync`
Sync Timing Source †† ‡‡	main-1, main-2, fn-c	main-1	`set-sync`
SYNC mode switching	revertive, nonrevertive	revertive	`set-sync`
Auto. sync. reconfig.§§§	enabled, disabled	disabled	`set-sync`
EC-1 alarm level†	CR, MJ, MN, NA	CR	`set-ec1`
EC-1 degrade threshold†	10^{-5} to 10^{-9} BER	10^{-6}	`set-ec1`
EC-1 port state †	NMON, AUTO‡	AUTO	`set-ec1`
Feature Packaging ** VT PM, DS1 PM, or STS3c	enabled, disabled	disabled	`set-feat`
NSAP (Release 6.0 and later)			
OrganizationID (Operator ID)	6 hex digits	000000	`ent-ulsdcc`
Reserved (Reserved)	4 hex digits	0000	`ent-ulsdcc`
Routing Data (Domain/Area)	8 hex digits	00000000	`ent-ulsdcc`
X.25 packet size (7.2 and later)	128, 256	256	`set-x25`

Note 1. Default means factory default (the CIT prompts display current provisioned values).

Note 2 To view the current values, precede these commands with `rtrv-` instead of `set-`

* The # is the value set by the switches on the SYSCTL and OHCTL circuit packs.

† Parameter can be set for each port.

‡ AUTO means the port or channel is ready to be automatically provisioned via signal detection

§ noOverride means read and use switch settings on circuit pack.

¶ Track means the source for timing will be selected from the active received OC-3 line specified.

** This command is available to privileged users only.

†† Release 5.1 (rings)

‡‡ Setting this parameter also affects DS1 output source and DS1 sync output mode. See `set-sync` command in Section 11, "Commands and Reports".

§§ Release 3.2 and later linear releases.

See additional footnotes on next page.

Table A. DDM-2000 Parameters Provisionable Via the CIT (Contd)

¶¶ One and only one shelf in a subnetwork must be set to "yes" for proper DCC communications.

*** Parameters can be set for each channel. Release 6.2 and later linear releases, Release 7.1 and later ring releases.

††† Release 7.1 and later ring releases. Requires 22D-U/22G-U/22G2-U OLIUs.

‡‡‡ Release 7 0 and later ring releases. Requires 22D-U/22G-U/22G2-U OLIUs.

§§§ Release 6.1 and later linear releases, Release 7 0 and later ring releases.

¶¶¶ Release 7.1 and later ring releases.

Set Circuit Pack Options

1. ⇒ NOTE:
When a replacement circuit pack (except the **SYSCTL**) is configured the same as the original circuit pack, it may be inserted with no further action. When a replacement circuit pack is different (different code or different switch options) from the original, the **SYSCTL UPD/INIT** button must be momentarily depressed (or use the "update" command) to update the inventory.

Find the circuit pack in Table A and go to the indicated step. If you were sent here from another procedure, return to that procedure after setting options.

Table A. Circuit Packs

Circuit Pack	Step
SYSCTL	Step 2
OHCTL	Step 13
BBF2 TGS	Step 20
BBF2B TGS	Step 24
21D/21D-U/22D-U OLIU*	—
21G/21G-U OLIU	Step 29
22F/22G-U/22G2-U OLIU*	—
MXRVO*	—
BBG4/BBG4B DS3	Step 31
DS1/DS1PM	Step 34
BBG6 STS1E	Step 38

*There are no option switches on these circuit packs.

SYSCTL

2. ⚠ CAUTION:
Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE:
Before removing the **SYSCTL**, you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown (9, 8, 7, etc.) on the **FE ID** display. During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

Determine the desired **SYSCTL** option switch settings from office records and see Figure 1.

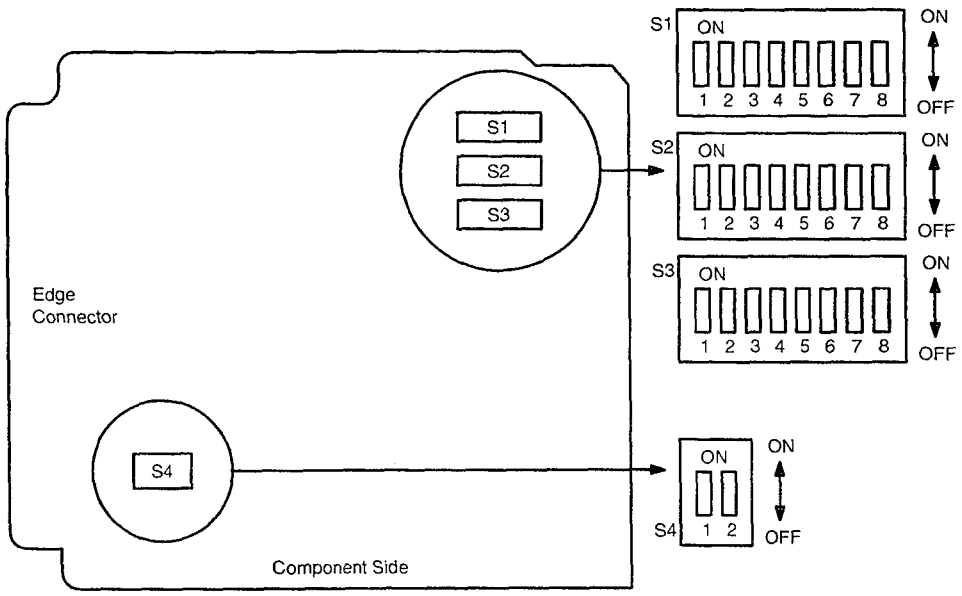


Figure 1. SYSCTL Option Settings

3. ⇒ NOTE 1:
To set switch to **ON**, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to **OFF**, depress rocker or slide switch toward side labeled **OFF** in the figure. Option switch tables list the switch number (for example, **S1**) and switch sections (for example, sections 1 and 2) as **S1-1**, **S1-2**, etc.

NOTE 2:
A single TBOS link can support up to eight displays (that is, up to four point-to-point systems). The TBOS display number switch setting identifies the TBOS display associated with a shelf and determines the TBOS poll to which a DDM-2000 will respond. The actual TBOS poll responded to is in a range from 0 to 7. For example, if the TBOS display number is set to 1 and the associated remote TBOS addresses are set to 2 and 3, the DDM-2000 will respond to TBOS polls containing addresses 0, 1, and 2.

NOTE 3:
The TBOS backup number switch settings prevent failure of a single shelf in a bay from causing a TBOS link failure (that is, if TBOS polls are not responded to, the link is declared failed by the telemetry remote and reporting of data from other shelves could be affected). The TBOS backup number identifies a shelf as primary, secondary, normal, or no TBOS. The TBOS primary setting assigns the shelf as the primary backup for a group of shelves that share the same TBOS link. The secondary setting assigns a shelf as a backup to the primary shelf. If a shelf does not respond to a TBOS poll, the primary backup responds to the next poll of the shelf display that failed. If the primary shelf does not respond to the second poll of the failed display, the secondary backup will respond. Only one shelf should be selected for primary and one for secondary. If more than two shelves are on the same TBOS link, the remaining (up to two) shelves should be set to *Normal*. If there is no TBOS link (for example, at an RT site), the TBOS backup switch setting should be set for *No TBOS*.

NOTE 4:
If TBOS is used, each shelf in the same control network should have a unique TBOS display setting. If two shelves in the same control network have the same TBOS display number, a `duplicate TBOS display` alarm will be generated.

If TBOS is used, refer to Table B and set the option switches as required for the TBOS display and backup number. If TBOS is not used, set TBOS backup number to "No TBOS".

Table B. SYSCTL Switch 1 (S1) TBOS Settings

TBOS Display Number				TBOS Backup Number		
	Switch				Switch	
Display Number	S1-1	S1-2	S1-3	Backup Number	S1-4	S1-5
1	ON	ON	ON	Primary	ON	ON
2	OFF	ON	ON	Secondary	OFF	ON
3	ON	OFF	ON	Normal	OFF	OFF
4	OFF	OFF	ON	No TBOS	ON	OFF
5	ON	ON	OFF	—	—	—
6	OFF	ON	OFF	—	—	—
7	ON	OFF	OFF	—	—	—
8	OFF	OFF	OFF	—	—	—

4. NOTE 1:
Two types of TBOS displays support central office and remote terminal applications. The CO/RT switch section identifies a shelf as either a CO shelf or an RT shelf to control the TBOS display formats and the operation of the miscellaneous discrete points and fan control relays.

NOTE 2:
Some applications may require that the TBOS information from a remote shelf be disabled. See *Remote TBOS Enable* in AT&T 824-102-148, Operations Systems Engineering Guide.

NOTE 3:
Some telemetry remotes (such as Northern Telecom's 7025) experience a problem with the DDM-2000 TBOS backup (secondary) function when less than eight displays are assigned to a TBOS link. See *TBOS Backup Function* in AT&T 824-102-148, Operations Systems Engineering Guide.

Refer to Table C. Set switch **S1-6** as indicated for the type of shelf (CO or RT). Set switch **S1-7** (Remote TBOS) to enable or disable TBOS, as required. If TBOS is not used, set Remote TBOS to disabled.

Table C. SYSCTL Switch 1 (S1) Settings

CO/RT Select		Remote TBOS		Unused
	Switch		Switch	Switch
Value	S1-6	Value	S1-7 (Note 1)	S1-8 (Note 2)
RT	OFF	Enabled	OFF	OFF
CO	ON	Disabled	ON	OFF

Notes:

1. Switch **S1-7** must be set to **OFF** on the **BBG1 SYSCTL** (Release 1). If set to the **ON** position, the **FAULT** LED will light on the **SYSCTL** and an alarm will be generated.

2. Switch 1, section 8 **(S1-8)** is not used at the present time and must be set to the **OFF** position. If set to the **ON** position, the **FAULT** LED will light on the **SYSCTL** and an alarm will be generated

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5. ⇒ NOTE 1:
SITE ID address switch settings are 1 to 8. If an invalid address is set, the setting will revert to 1, generate a Major alarm, light the **SYSCTL FAULT** LED, and set TBOS point 14.

⇒ NOTE 2:
If parallel telemetry is used, it is recommended to set the central office SITE ID to 7 to provide for a direct relationship between RT site addresses and parallel telemetry closure numbers. See Table D. Each shelf in the same control network must have a unique address made up of the network element number set on the **OHCTL** and the SITE ID number. If two shelves in the same control network have the same address, a `duplicate site/ne address` alarm will be generated.

Table D. Far End Parallel Telemetry Closures

	Parallel Telemetry Closure						
Central Office	Remote Terminal Site Address						
SITE Address	1	2	3	4	5	6	7
1	-	2	3	4	5	6	1
2	1	-	3	4	5	6	2
3	1	2	-	4	5	6	3
4	1	2	3	-	5	6	4
5	1	2	3	4	-	6	5
6	1	2	3	4	5	-	6
7	1	2	3	4	5	6	-

Refer to Table E and set the option switches as indicated for the SITE ID of this network element.

Table E. SYSCTL Switch 2 (S2) SITE ID Settings (Notes)

Site ID	Switch S2-1	S2-2	S2-3	S2-7	S2-8
1	ON	ON	ON	ON	ON
2	OFF	ON	ON	ON	ON
3	ON	OFF	ON	ON	ON
4	OFF	OFF	ON	ON	ON
5	ON	ON	OFF	ON	ON
6	OFF	ON	OFF	ON	ON
7	ON	OFF	OFF	ON	ON
8	OFF	OFF	OFF	ON	ON
9	ON	ON	ON	OFF	ON
10	OFF	ON	ON	OFF	ON
11	ON	OFF	ON	OFF	ON
12	OFF	OFF	ON	OFF	ON
13	ON	ON	OFF	OFF	ON
14	OFF	ON	OFF	OFF	ON
15	ON	OFF	OFF	OFF	ON
16	OFF	OFF	OFF	OFF	ON
17	ON	ON	ON	ON	OFF
18	OFF	ON	ON	ON	OFF
19	ON	OFF	ON	ON	OFF
20	OFF	OFF	ON	ON	OFF
21	ON	ON	OFF	ON	OFF
22	OFF	ON	OFF	ON	OFF
23	ON	OFF	OFF	ON	OFF
24	OFF	OFF	OFF	ON	OFF
25	ON	ON	ON	OFF	OFF
26	OFF	ON	ON	OFF	OFF
27	ON	OFF	ON	OFF	OFF
28	OFF	OFF	ON	OFF	OFF
29	ON	ON	OFF	OFF	OFF
30	OFF	ON	OFF	OFF	OFF
31	ON	OFF	OFF	OFF	OFF
32	OFF	OFF	OFF	OFF	OFF

Note: 1 The following table lists the maximum number of network elements in a maintenance subnetwork:

	Linear					Ring			
OC-3 Releases	R2.1.n	R3.x.n	R6.0.n	R6.1.n	R6.2.n	R5 1.n	R7.0.n	R7.1.n	R7.2.n
Number of NEs Supported	5	8	10	10	10	12	10	16	24
Site ID Settings Supported	8	8	8	32	32	8	32	32	32
OC-12 Releases	R1.1.n	R1.2.n	R2 0.n	R2 1.n	R2.2.n	R3.0.n	R3.1.n		
Number of NEs Supported	10	10	10	10	10	10	16		
Site ID Settings Supported	8	8	8	32	32	32	32		

Note 2: Site ID settings 1-32 are supported for OC-3 Release 6 1 and later linear and ring releases and OC-12 Release 2 1 and later linear and ring releases Prior to these releases only Site ID settings 1-8 are supported (if more than 8 NEs are in the network you must use unique combinations of the Site ID and NE (OHCTL) settings to prevent "`duplicate site/ne address`" alarms in the network)

Prior to OC-3 Release 6 1 and OC-12 Release 2 1, Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are not used and must be set to the **ON** position For OC-3 Release 6 1 and later and OC-12 Release 2 1 and later, Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are used in conjunction with Switch 2 sections 1, 2 and 3 (**S2-1**, **S2-2**, and **S2-3**) to support the 32 Site ID settings For Releases supporting 1-32 Site ID settings, any of the 32 possibilities may be chosen for Site ID settings for the number of NEs allowed (for example 1, 10, 20, 30, etc)

6. ⇒ NOTE:
It is recommended that the SHELF ID match the shelf position in the bay.

Refer to Table F and set the option switches as indicated for the SHELF ID of this network element.

Table F. SYSCTL Switch 2 (S2) SHELF ID Settings

	Switch		
Shelf ID	S2-4	S2-5	S2-6
1	ON	ON	ON
2	OFF	ON	ON
3	ON	OFF	ON
4	OFF	OFF	ON
5	ON	ON	OFF
6	OFF	ON	OFF
7	ON	OFF	OFF
8	OFF	OFF	OFF

7. ⇒ NOTE:
If more than one shelf is installed in a bay and the CIT ports are bussed together, the data rate of all the front CIT ports should be set the same and the data rate of all the rear CIT ports should be set the same.

From office records or work order, determine the data rate to be used for the front and rear CIT access ports.

8. Refer to Table G and set the data rate for both the front and rear CIT access ports.

Table G. SYSCTL Switch S3

CIT Front Access Data Rate				CIT Rear Access Data Rate			
	Switch				Switch		
Baud	S3-1	S3-2	S3-3	Baud	S3-4	S3-5	S3-6
300	OFF	OFF	OFF	300	OFF	OFF	OFF
1200	OFF	OFF	ON	1200	OFF	OFF	ON
2400	OFF	ON	OFF	2400	OFF	ON	OFF
4800	OFF	ON	ON	4800	OFF	ON	ON
9600	ON	OFF	OFF	9600	ON	OFF	OFF
19200	ON	OFF	ON	19200	ON	OFF	ON
Invalid	ON	ON	OFF	Invalid	ON	ON	OFF
Invalid	ON	ON	ON	Invalid	ON	ON	ON

9. From office records or work order, determine if the Power Minor (PMN) is to be a Major or Minor alarm.

10. Refer to Table H and set the PMN option switch to Major or Minor as indicated.

Table H. SYSCTL Switch 3 (S3) PMN Switch Setting

	Switch	Unused (Note)
AlarmValue	S3-7	S3-8
Office Major	ON	OFF
Office Minor	OFF	OFF

Note: Switch 3, section 8 (**S3-8**) is not used at the present time and must be set to the **OFF** position. If set to the **ON** position, the **FAULT** LED will light on the **SYSCTL** and an alarm will be generated

11. ⇒ NOTE:
Up to four shelves in a bay can be connected to a single TBOS link using the intershelf cables (TBOS, CIT, modem). If this shelf is the last (top) or only shelf on a TBOS link, section 1 of Switch 4 (**S4-1**) should be set to **ON**. If this shelf is not the last shelf on a TBOS link, section 1 of Switch 4 (**S4-1**) should be set to **OFF**. Section 2 of Switch 4 is always set to **OFF**. If there is no TBOS link (for example, at an RT site), switches **S4-1** and **S4-2** are ignored.

Refer to Table I and set the TBOS terminator switch as indicated, if TBOS is used.

Table I. SYSCTL Switch 4 (S4)
TBOS Link Terminator

Shelf Position	S4-1	S4-2
Not Last	OFF	OFF
Last	ON	OFF

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

OHCTL

13. ⇒ NOTE:
Switches **S1-1, S1-2**, and **S1-3** set the Network Element number of the shelf. The Network Element number and the Site ID set on the **SYSCTL** form a unique address for a shelf at a site.

Determine the Network Element number from work order or office records. Refer to Table J and Figure 2 and set the Network Element number for this shelf.

Table J. OHCTL Switch 1 (S1) Network Element Number

	Switch S1 Settings			Unused (Note)				
Network Element	S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	S1-8
1	ON	ON	ON	ON	ON	ON	ON	ON
2	OFF	ON	ON	ON	ON	ON	ON	ON
3	ON	OFF	ON	ON	ON	ON	ON	ON
4	OFF	OFF	ON	ON	ON	ON	ON	ON
5	ON	ON	OFF	ON	ON	ON	ON	ON
Invalid*	OFF	ON	OFF	ON	ON	ON	ON	ON
Invalid*	ON	OFF	OFF	ON	ON	ON	ON	ON
Invalid*	OFF	OFF	OFF	ON	ON	ON	ON	ON

Note: Switch 1, sections 4 through 8 (**S1-4, S1-5, S1-6, S1-7**, and **S1-8**) must be set to the **ON** position. If they are set to the **OFF** position, the **FAULT** LED will light on the **OHCTL** and an alarm will be generated.

* If an invalid setting is selected, the **FAULT** LED is lighted and an `unexpected switches` alarm is generated.

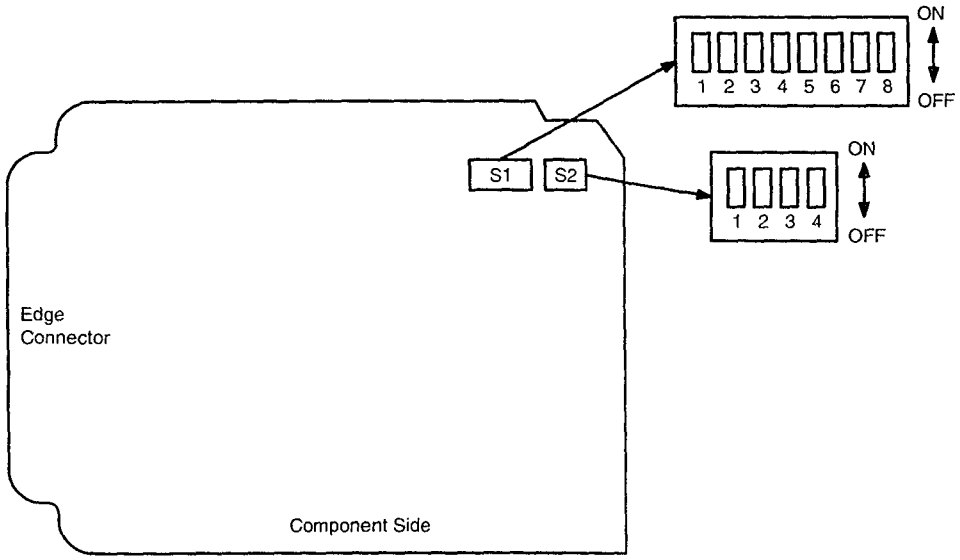


Figure 2. OHCTL Circuit Pack

14. If Release 5 or earlier, continue with **Step 15**.
    If Release 6 or later, proceed to **Step 17**.

15. Refer to Table K and Figure 2 and set unused switches on **OHCTL** circuit pack.

Table K. Unused Switch 2 (S2) Settings (Note)

Switch S2			
S2-1	S2-2	S2-3	S2-4
ON	OFF	OFF	OFF

Note: These switches are reserved for applications using the open systems interconnection protocol (OSI), Release 6 or later. The suggested settings will make future upgrades easier.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. ⇒ NOTE 1:
Switches **S2-1** through **S2-4** on the **OHCTL** are used to control the identification of the DCC for open systems interconnection (OSI) interworking. For a given optical span, the network elements that terminate on each side of the optical span must have their "network side"/"user side" parameters set to opposite values to avoid an "inconsistent DCC switches" alarm. Switch **S2** switch segments are set to **OFF** for the Network Side and **ON** for the User Side of network elements in an optical span. Figure 3 illustrates the **S2** switch settings for switches associated with **OLIU**s in the **MAIN** and **FUNCTION UNITS** slots at each end of the interconnected optical spans for linear/hub configurations. Figure 4 illustrates the **S2** switch settings for switches associated with **OLIU**s in the **MAIN** and **FUNCTION UNITS** slots at each end of interconnected optical spans in rings configurations.

⇒ NOTE 2:
Note that factory settings for switch **S2** are **S2-1 ON**, **S2-2 OFF**, **S2-3 OFF**, and **S2-4 OFF**. This will permit the establishment of a linear/hub system without changing any **S2** switch settings except on the **OHCTL** at the CO. In this case, **S2-1** on the **OHCTL** at the CO would be set to **OFF**. Factory settings also allow the establishment of a ring configuration without changing any **S2** switch settings.

Refer to Figures 3 and 4 for example system configurations. Set **S2** switches for OSI interworking using the examples and/or work order or office records. (The necessary switch settings in the example figures are highlighted in bold type. For example, in Figure 3, the optical span between RT1 and RT3 requires that switch **S2-3** at RT1 be set to **OFF** and switch **S2-1** at RT3 be set to **ON**.)

18. Set remaining unused **S2** switches to **OFF** to make future upgrades easier.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

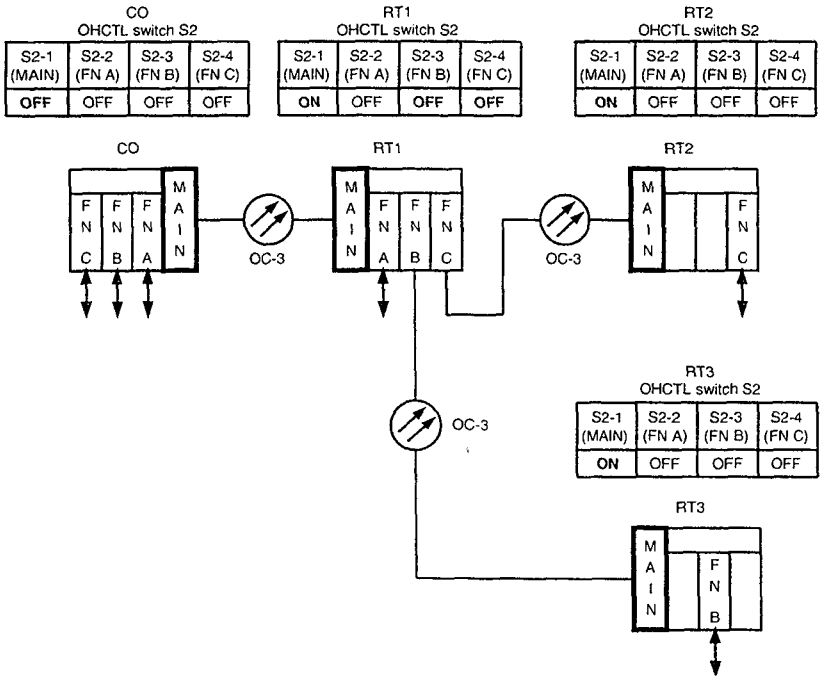


Figure 3. Example OHCTL Switch S2 Settings — OC-3 Linear/Hub Configuration Using OSI Protocol

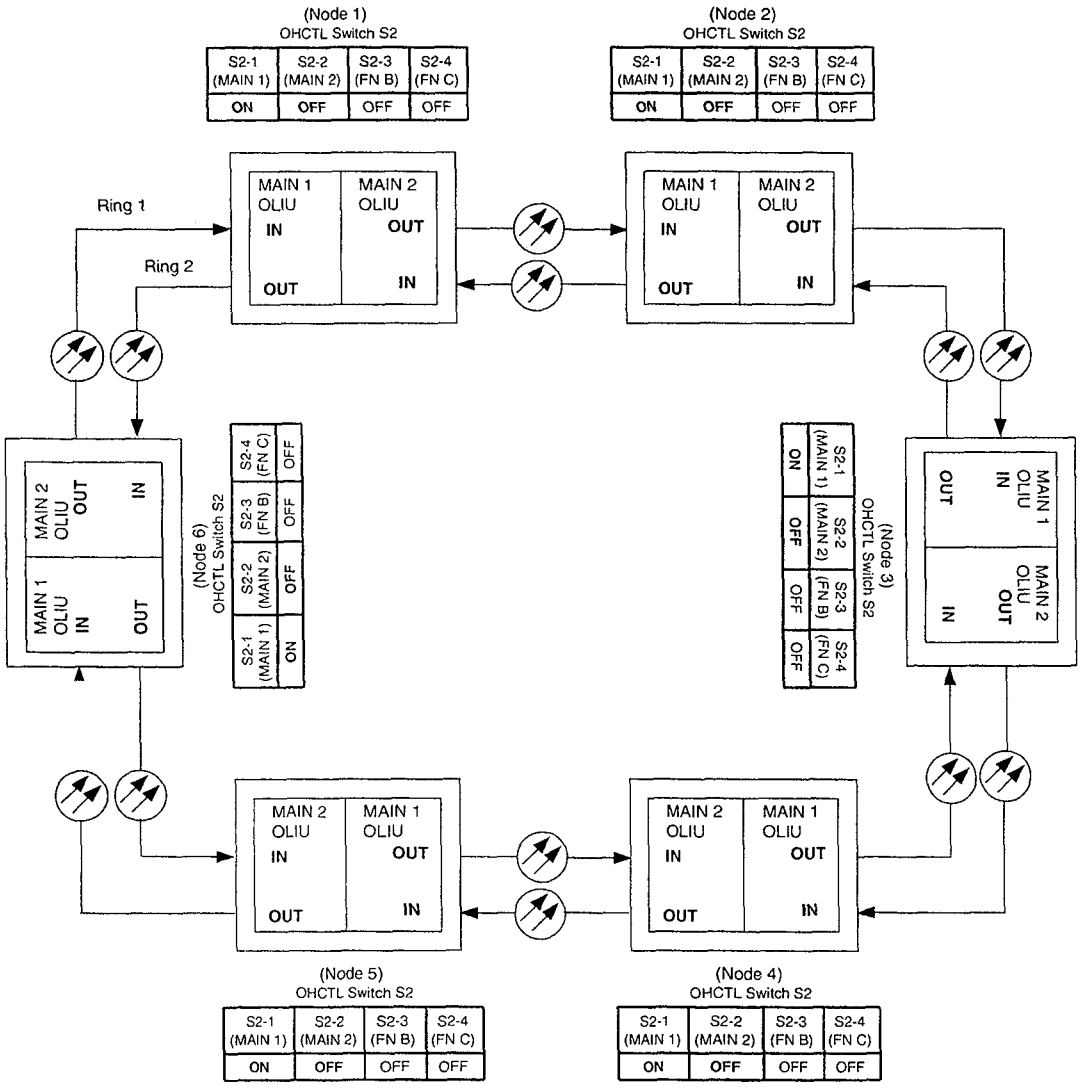


Figure 4. Example OHCTL Switch S2 Settings EM OC-3 Ring Configuration Using OSI Protocol

BBF2 TGS

20. NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to loop timed mode).

NOTE 2:
The **BBF2 TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Loop Timed.* In free-running mode, the **BBF2 TGS** gets timing from an oscillator on the **BBF2 TGS**. In external timing, the **BBF2 TGS** gets timing from an external DS1 reference input. In loop-timed mode, the **BBF2 TGS** gets timing from an **OLIU** from a reference clock recovered from the received OC-3 line rate signal.

NOTE 3:
Table L depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application.

Table L. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Loop Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality loop timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Loop Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS The NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves collocated in the same bay to conserve ports on the BITS

Table L. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Loop Timing	Loop Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the **set-sync** command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another loop timing source, if available, to prevent a timing loop

NOTE 4:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Determine the timing mode from work order or office records. Refer to Table M and Figure 5 and set the timing mode as required for the **TGS** circuit pack(s).

Table M. BBF2 TGS Timing Mode Switch Setting

	Switch S1 Settings	
Timing Mode	S1-3	S1-4
Free Running	ON	ON
DS1 External	OFF	ON
Loop Timed	ON	OFF
Invalid*	OFF	OFF

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated (`unexpected CP type/switches` or `unexpected CP switches`)

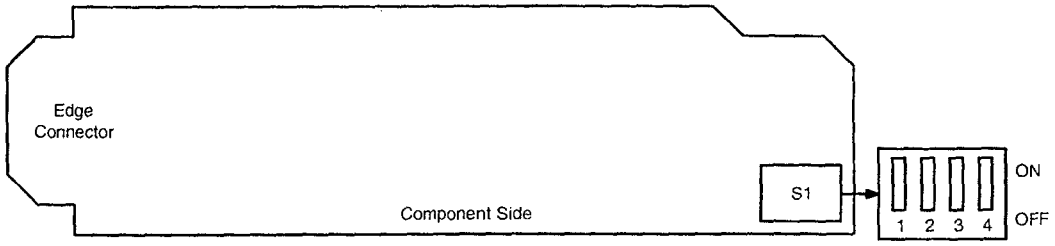


Figure 5. BBF2 TGS Option Switch

21. ⇒ NOTE:
Switches **S1-1** and **S1-2** are ignored by the system the first time the **TGS** is installed unless the timing mode is set to *DS1 External.* Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update (**upd**) command must be performed.

Is timing mode set to *DS1 External*?

If **YES**, then continue with **Step 22.**
If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

22. Refer to Table N and Figure 5 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table N. BBF2 TGS DS1 Line Coding and Frame Format Switch Settings

	Switch		Switch
DS1 Line Code	S1-1	DS1 Frame Format	S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

24. NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to loop timed mode).

NOTE 2:
The **BBF2B TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Loop Timed*. In free-running mode, the **BBF2B TGS** gets timing from an oscillator on the **BBF2B TGS**. In external timing mode, the **BBF2B TGS** gets timing from an external DS1 reference input.

NOTE 3:
In loop-timed mode, the **BBF2B TGS** gets timing from a reference clock recovered from a received OC-3 line rate signal. For Release 2, the **MAIN OLIU** is the synchronization source. For Release 5, either the **MAIN 1** or **MAIN 2 OLIU** can be selected as the synchronization source using the command `set-sync:src={main,fn-c};`. For Releases 3 and 6, either the **MAIN OLIU** or **FUNCTION UNIT C OLIU** can be selected as the synchronization source using the command `set-sync:src={main,fn-c};`. For Release 7, either the **MAIN 1**, **MAIN 2**, or **FUNCTION UNIT C OLIU** can be selected as the synchronization source using the command `set-sync:src={main-1,fn-c};`.

NOTE 4:
Table O depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for looptiming or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table O. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Loop Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality loop timing source, if available.
Free Running	Loop Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS. In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging. In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality loop timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
Free Running	External - Sync Out	This timing topology is not supported The two network elements will be operating asynchronously from each other.
External - Mult	Loop Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS

Table O. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Mult	Loop Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located. The NE provisioned for Loop Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Loop Timing	Caution! This topology might create a timing loop. In this topology the NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another loop timing source, if available, to prevent the timing loop.

Table O. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Loop Timing - Sync Out	Caution! This topology might create a timing loop. In this topology the NE provisioned for Loop Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another loop timing source, if available, to prevent the timing loop
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously Note· DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves collocated in the same bay to conserve ports on the BITS.
External - Mult	External - Sync Out	This topology is used to distribute network timing to a target location from a location with access to a synchronization reference The NE provisioned for External - Mult, is providing timing to the NE provisioned for External - Sync Out, which in turn generates a DS1 output reference regenerated from the optical interface shared by both NE's This DS1 output is used to provide a synchronization reference to a BITS

Table O. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's. In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal.
Loop Timing	Loop Timing	Caution! This topology creates a timing loop and it is not. supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the **set-sync** command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another loop timing source, if available, to prevent a timing loop.

NOTE 5:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in figure.

Determine timing mode from work order or office records. Refer to Table P and Figure 6 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table P. BBF2B TGS Timing Mode Switch Settings

	Switch S1 Settings		
Timing Mode	**S1-3**	**S1-4**	**S1-5**
Free Running	ON	ON	OFF
DS1 External, mult mode	OFF	ON	OFF
Loop Timed	ON	OFF	OFF
Loop Timed, sync out mode	ON	OFF	ON
DS1 External, sync out mode	ON	ON	ON
Invalid*	OFF	OFF	ON
Invalid*	OFF	OFF	OFF
Invalid*	OFF	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated (`unexpected CP type/switches` or `unexpected CP switches`).

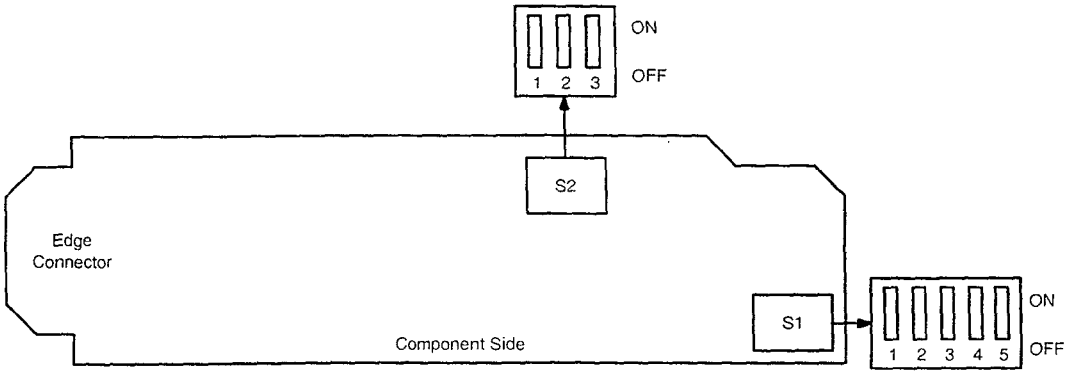


Figure 6. BBF2B TGS Option Switch

25. If the **BBF2B TGS** is provisioned for *sync out mode*, refer to Table Q and Figure 6 and set equalizer switches for the proper cable length.

Table Q. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid*	OFF	OFF	OFF
Invalid*	OFF	OFF	ON
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated (`unexpected CP type/switches` or `unexpected CP switches`).

---

26. ⇒ NOTE:
Switches **S1-1** and **S1-2** are ignored by the system the first time the **TGS** is installed unless the timing mode is set to *DS1 External* or *Loop Timing sync out mode.* Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update (**upd**) command must be performed.

Is timing mode set to either *DS1 External* or *Loop Timed sync out*?

If **YES**, then continue with **Step 27.**
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

27. Refer to Table R and Figure 6 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table R. BBF2B TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch S1-1	DS1 Frame Format	Switch S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21G/21G-U OLIU

29. ⚠ WARNING:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
Before installing **OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned* **[DLP-527]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

NOTE 1:
The **HIGH/LOW POWER** option switch on the **21G/21G-U OLIU** must be set to the **LOW POWER** position when the **OLIU** is looped on itself.

NOTE 2:
It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

Refer to Table S and Figure 7 and set the **HIGH/LOW POWER** option switch to proper setting.

Table S. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

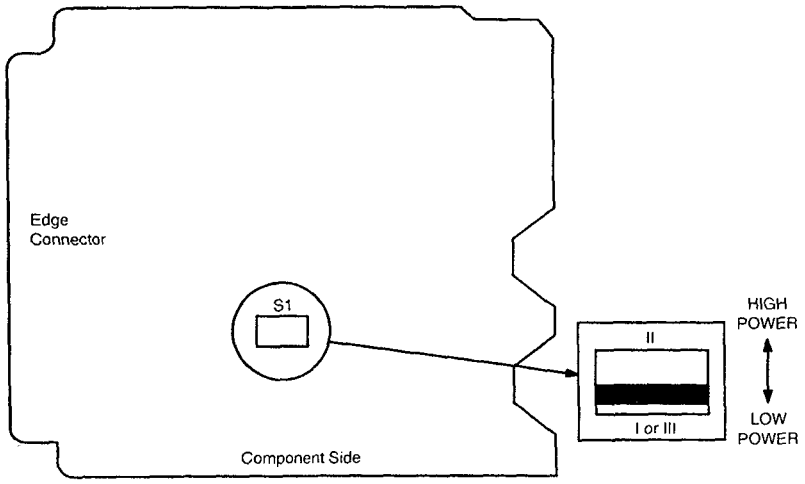


Figure 7. 21G/21G-U OLIU Option Switch

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG4/BBG4B DS3

31. Determine from office records the length of the DS3 cabling between the DDM-2000 and the DSX-3 cross-connect point.

32. ⇒ NOTE:
The only option settings on the DS3 circuit pack are the LBO settings shown in Figure 8. If there are other jumpers on the circuit pack similar to the LBO jumpers, they are factory test points and should be ignored.

Install the **DS3** option jumpers per Table T and Figure 8.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table T. DS3 LBO Settings

Cable Length (Ft)			
734A	Mini-Coax KS-19224	735A 1735006A	LBO Setting
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

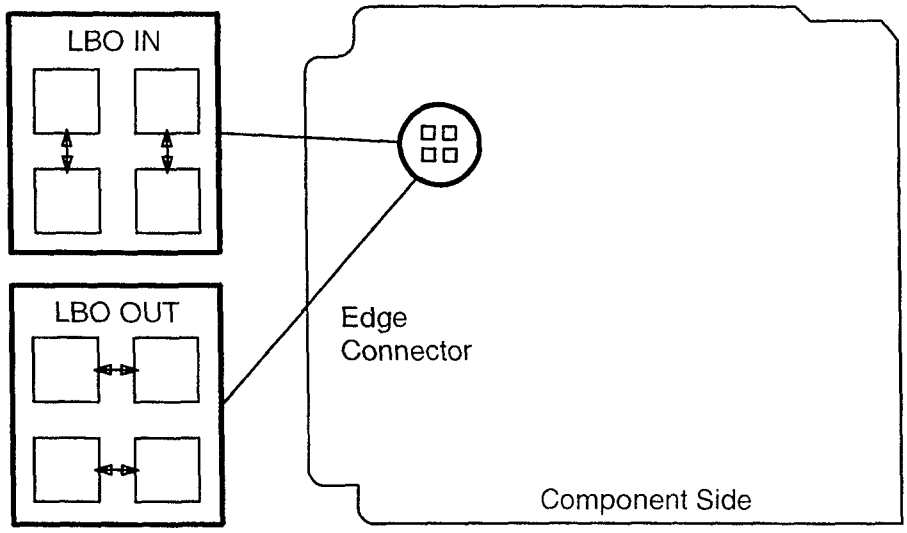


Figure 8. BBG4/BBG4B DS3 Option Settings

DS1/DS1PM

34. Determine from office records the length of the DS1 cabling between the DDM-2000 and the DSX-1 cross-connect point.

35. ⇒ NOTE 1:
Switch 1, sections 1 through 3 (**S1-1, S1-2, S1-3**), are set according to the length of DS1 cabling between the DDM-2000 and the DSX-1 cross-connection. Switch 1, sections 4 through 7 (**S1-4, S1-5, S1-6, S1-7**), are set for the type of line coding (B8ZS or AMI) required of the DS1 signal. Switch 1, section 8 (S1-8) is unused and ignored by the system.

⇒ NOTE 2:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Refer to Table U and Figure 9 and set LBO option switches.

Table U. DS1/DS1PM Cable LBO Settings (Note)

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 kHz	Switch S1 Settings		
			S1-1	S1-2	S1-3
0 to 133	0 to 90	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

Note: Invalid switch settings will cause the **FAULT** LED to light and a `DS1 CP failed` alarm.

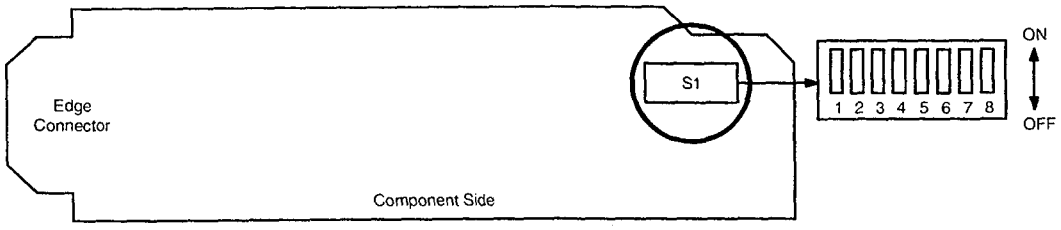


Figure 9. DS1/DS1PM Option Settings

36. ⇒ NOTE:
It is recommended that a policy be established to set line coding either using the option switches OR using the **set-t1** command. If line code (lc) parameters are set using the **set-t1** command, the circuit pack switch settings will have no effect. The **rtrv-t1** command may be used to check line code settings.

Refer to Table V and Figure 9 and set the line code option switches, if required.

Table V. DS1/DS1PM Line Code Settings

Line Code Format	Switch S1 Settings				
	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)	S1-8 (Note)
B8ZS	OFF	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON	

Note: Switch 1, section 8 (S1-8) is unused and ignored by the system.

37. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG6 STS1E

38. Determine from office records the length of the STS1E cabling between the DDM-2000 and the STSX cross-connect point.

39. Install the **STS1E** option jumpers per Table W and Figure 10.

40. ⇒ NOTE:
    The **STS1E** circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 Multiplexer. **STS1E** high speed mode interfaces with the **DS1/DS1PM** circuit packs in a function unit group at the VT-G rate. **STS1E** low speed mode interfaces with the **OLIU** circuit packs at the STS-1 rate.

    Determine **STS1E** mode of operation (high speed or low speed).

41. Set switch **S1** to mode of operation required (**HIGH-SPEED MODE** or **LOW-SPEED MODE**).

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table W. STS1E LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	- -
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

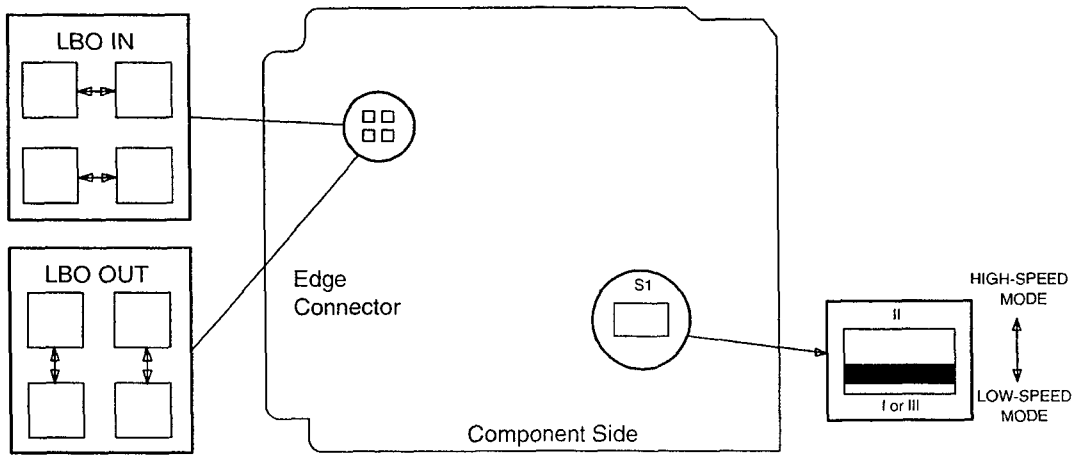


Figure 10. BBG6 STS1E Line Build-Out Jumpers and Mode Switch

Perform Optical Fiber Connections and Verification of Optical Facility

1. ⚠ WARNING 1:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
When handling optical pigtails or jumpers, take care to keep bending radius as large as possible.

NOTE 1:
This procedure is used to connect the optical fiber spans in an OC-3 network consisting of OC-3 Multiplexers only and and OC-3 network consisting of OC-3 Multiplexers and FT-2000 OC-48 Add/Drop - Rings Terminals. For each span, determine the loss of each optical fiber and install the proper LBO. Then connect the fibers to the associated **IN** and **OUT** connectors of each **OLIU** at the end of the span.

NOTE 2:
It is assumed that the optical jumpers used to connect the DDM-2000 OC-3 Multiplexer to an optical interconnection point are equipped with *ST*®, FC/PC, or SC lightguide cable connectors.

If the optical cables have not been placed into the cable tray at bottom front of the shelf, loosen three screws holding the front cover of the cable tray and slide out the front cover of the tray.

2. Route the optical jumpers up through the slotted hole(s) at the bottom left-front corner of the shelf and up to the **OLIU**s. See Tables A and B.

Table A. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1E-E-2	105357727	2	*ST-ST*
FS1E-E-10	105357768	10	*ST-ST*
FS1E-E-25	105357800	25	*ST-ST*
FS1E-E-50	105357859	50	*ST-ST*
FS1E-E-100	105357875	100	*ST-ST*
FS1E-A-2	105420905	2	*ST*-2016A Biconic
FS1E-A-10	105420947	10	*ST*-2016A Biconic
FS1E-A-25	105423958	25	*ST*-2016A Biconic
FS1E-A-50	105424006	50	*ST*-2016A Biconic
FS1E-A-100	105424022	100	*ST*-2016A Biconic
LS1SC-SC-2	106908247	2	SC-SC
LS1SC-SC-10	106908270	10	SC-SC
LS1SC-SC-25	106908304	25	SC-SC
LS1SC-SC-50	106908346	50	SC-SC
LS1SC-SC-100	106908395	100	SC-SC
LS1FP-FP-10	106593825	10	FCPC-FCPC
LS1FP-FP-25	106932908	25	FCPC-FCPC
LS1FP-FP-50	106932916	50	FCPC-FCPC
LS1FP-FP-100	106932924	100	FCPC-FCPC

Table B. Multimode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FL1E-E-2	105351795	2	*ST*-ST
FL1E-E-10	105351837	10	*ST*-ST
FL1E-E-25	105351860	25	*ST-ST*
FL1E-E-50	105351910	50	*ST-ST*
FL1E-E-100	105351936	100	*ST-ST*
FL1E-A-2	105613954	2	*ST*-2016A Biconic
FL1E-A-10	105613988	10	*ST*-2016A Biconic
FL1E-A-25	105614010	25	*ST*-2016A Biconic
FL1E-A-50	105614051	50	*ST*-2016A Biconic
FL1E-A-100	105614119	100	*ST*-2016A Biconic
LL1SC-SC-2	106908668	2	SC-SC
LL1SC-SC-10	106908692	10	SC-SC
LL1SC-SC-25	106908734	25	SC-SC
LL1SC-SC-50	106908775	50	SC-SC
LL1SC-SC-100	10690879	100	SC-SC
LL1FC-FC-10	107095549	10	FC-FC
LL1FC-FC-25	107095556	25	FC-FC
LL1FC-FC-50	107095564	50	FC-FC
LL1FC-FC-100	107095572	100	FC-FC

3. Establish communication with technician at other end of the optical span.

4. ⇒ NOTE 1:
   The optical connector labeled **OUT** is the output from the **OLIU**. The optical connector labeled **IN** is the input to the **OLIU**.

   ⇒ NOTE 2:
   For **21G/21G-U/22G-U/22G2-U** and **22F OLIU**s, the recommended optical fiber is single-mode. **21D/21D-U/22D-U OLIU**s use multimode optical fibers.

NOTE 3:
Optical fibers connecting this shelf with a far end shelf should not be connected to the **OLIU** until at least 45 seconds after an optical loopback is removed.

NOTE 4:
It may take from 15 seconds to 3 minutes and 25 seconds for the **FAULT** LEDs to stop flashing after the cables are connected, depending on the setting of the OC-3 signal degrade threshold (–5 to –9).

Remove protective covers from transmit optical jumper cables and lightguide buildout(s) [LBO(s)] and clean *ST*, FC/PC, or SC connectors and LBO(s).

Reference: **DLP-527**

5. Have you determined the value of the lightguide buildouts (LBOs) for this span?

   If **YES**, then proceed to **Step 9**.
   If **NO**, then continue with **Step 6**.

Optical Power Measurement

Steps 6 through 9 are used to measure optical power. Replace LBOs with 0 dB LBOs per Figure 1 and/or 2. Connect the optical fiber transmit cable to the **OLIU OUT** connection. Measure the optical power of the optical fiber receive cables at the other ends using an optical power meter.

6. At both ends of the optical span, replace the *ST*, FC/PC, or SC LBOs with 0 dB LBOs per Figure 1 and/or 2 [**DLP-552**].

7. ⇒ NOTE 1:
   For Ring configurations, optical fibers extend in two different directions to make up the ring. At each shelf (node) in the ring, the **MAIN 1 OLIU** will connect to the **MAIN 2(P) OLIU** in another node, and the **MAIN 2(P) OLIU** will connect to the **MAIN 1 OLIU** in a separate node. In Dual 0x1 configurations, the **MAIN 1 OLIU** will connect to the OC-12 **FN( ) 1 OLIU** and the **MAIN 2(P) OLIU** will connect to the OC-12 **FN( ) 2 OLIU**.

   ⇒ NOTE 2:
   For DDM-2000 OC-3/FT-2000 configurations, the DDM-2000 OC-3 **MAIN 1 OLIU** and/or **MAIN 2(P) OLIU** will connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1A**, **1B**, **2A**, **2B**, **3A**, **3B**, **4A**, **4B**, **5A**, **5B**, **6A**, **6B**, **7A**, **7B**, **8A**, or **8B** depending on the application.

   At each end of the span, connect the optical fiber transmit cables to the **OLIU OUT** connections.

8. At each end of the span, measure the optical power of the optical fiber receive cables using an optical power meter.

9. Replace the lightguide buildout assemblies with the correct buildout assemblies per Figure 1 and/or 2 and Tables C, D, E, F, G, H, I, and/or J. [**DLP-552**].

   Reconnect the optical fiber transmit cables at both ends.

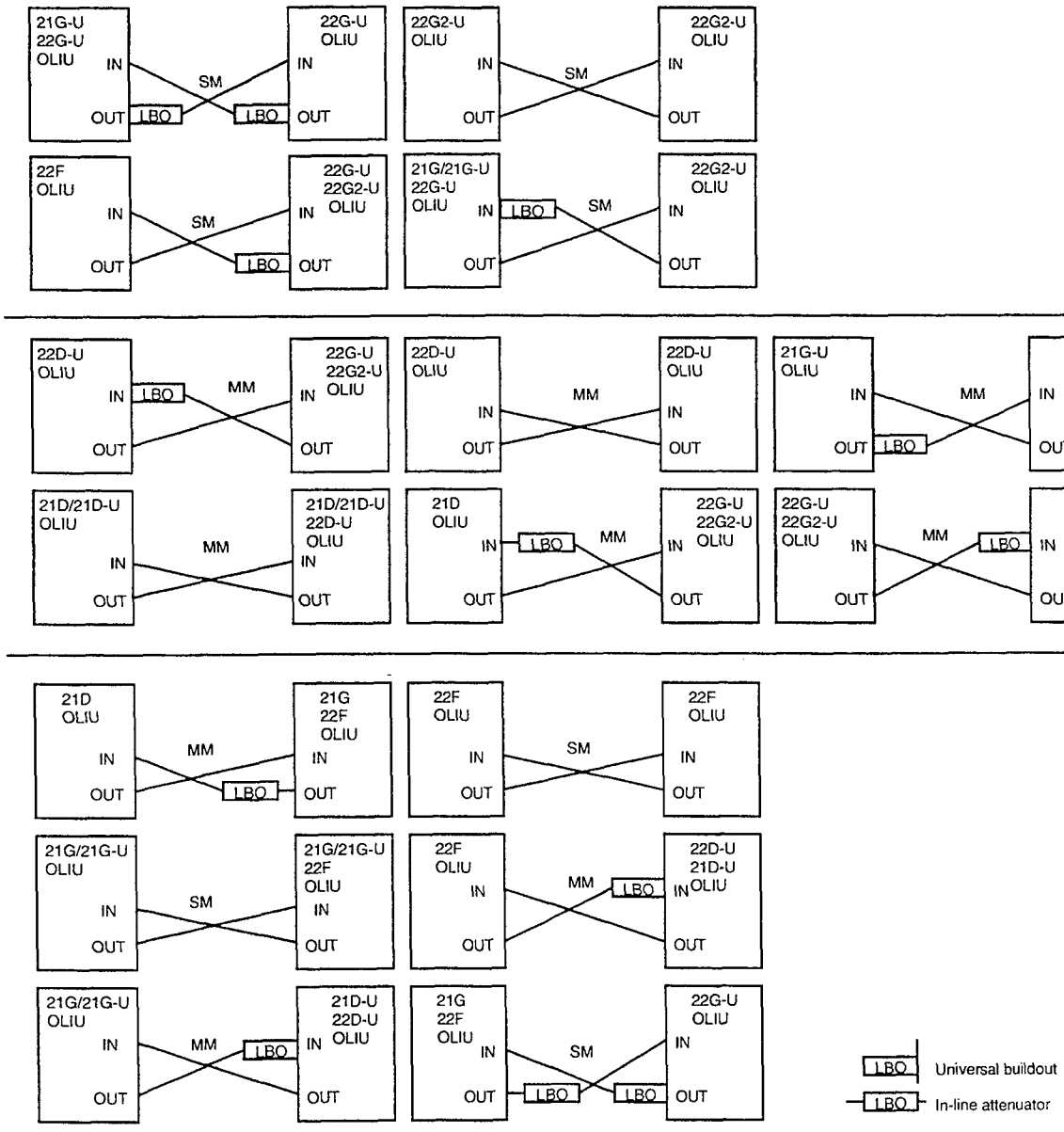


Figure 1. DDM-2000 OC-3 Fiber Optic Connections and Line Buildouts

Table C. DDM-2000 OC-3 Measured Optical Power and Required LBO

	Receiver											
	21G/21G-U OLIU (High/Low Power)		22F OLIU		22G-U OLIU		22G2-U OLIU		21D/21D-U/22D-U OLIU (Controlled Env.)		21D/21D-U/22D-U OLIU (Uncontrolled Env.)	
Transmitter	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
21G/21G-U OLIU		15		15		15		15	−2.5 to −5.0	15	−2.5 to −5.0	15
(High Power)	−2.5 to −3.0	10	−2.5 to −3.0	10	−2.5 to −3.0	10		10	−5.0 to −10.0	10	−5.0 to −10.0	10
	−3.0 to −8.0	5	−3.0 to −8.0	5	−3.0 to −8.0	5		5	−10.0 to −15.0	5	−10.0 to −15.0	5
	−8.0 to −34.0	0	−8.0 to −34.0	0	−8.0 to −34.0	0	0.0 to −34.0	0	−15.0 to −33.8	0	−15.0 to −31.8	0
21G/21G-U OLIU		10		10		10		10	−7.5 to −10.0	10	−7.5 to −10.0	10
(Low Power)	−7.5 to −8.0	5	−7.5 to −8.0	5	−7.5 to −8.0	5		5	−10.0 to −15.0	5	−10.0 to −15.0	5
	−8.0 to −34.0	0	−8.0 to −34.0	0	−8.0 to −34.0	0	0.0 to −34.0	0	−15.0 to −33.8	0	−15.0 to −31.8	0
22F OLIU		10		10		10		10	−8.0 to −10.0	10	−8.0 to −10.0	10
		5		5		5		5	−10.0 to −15.0	5	−10.0 to −15.0	5
	−8.0 to −34.0	0	−8.0 to −34.0	0	−8.0 to −34.0	0	0.0 to −34.0	0	−15.0 to −33.8	0	−15.0 to −31.8	0
22G-U/22G2-U OLIU		15		15		15		15		15	0.0 to −5.0	15
	0.0 to −3.0	10	0.0 to −3.0	10	0.0 to −3.0	10		10	−5.0 to −10.0	10	−5.0 to −10.0	10
	−3.0 to −8.0	5	−3.0 to −8.0	5	−3.0 to −8.0	5		5	−10.0 to −15.0	5	−10.0 to −15.0	5
	−8.0 to −34.0	0	−8.0 to −34.0	0	−8.0 to −34.0	0	0.0 to −34.0	0	−15.0 to −33.8	0	−15.0 to −31.8	0
21D/21D-U/22D-U OLIU (Controlled & (Uncontrolled Env.)		5		5		5		5	−14.0 to −15.0	5	−14.0 to −15.0	5
(MM Fiber Only)	−14.0 to −34.0	0	−14.0 to −34.0	0	−14.0 to −34.0	0	0.0 to −34.0	0	−15.0 to −33.8	0	−15.0 to −31.8	0

Notes:

1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.

2. The minimum measured received power allows for optical path penalty and unallocated margin. Connector loss is not allotted for; it should already be accounted for in the optical power measurement.

3. The margin for falling within the max rx power is 1.0 dB.

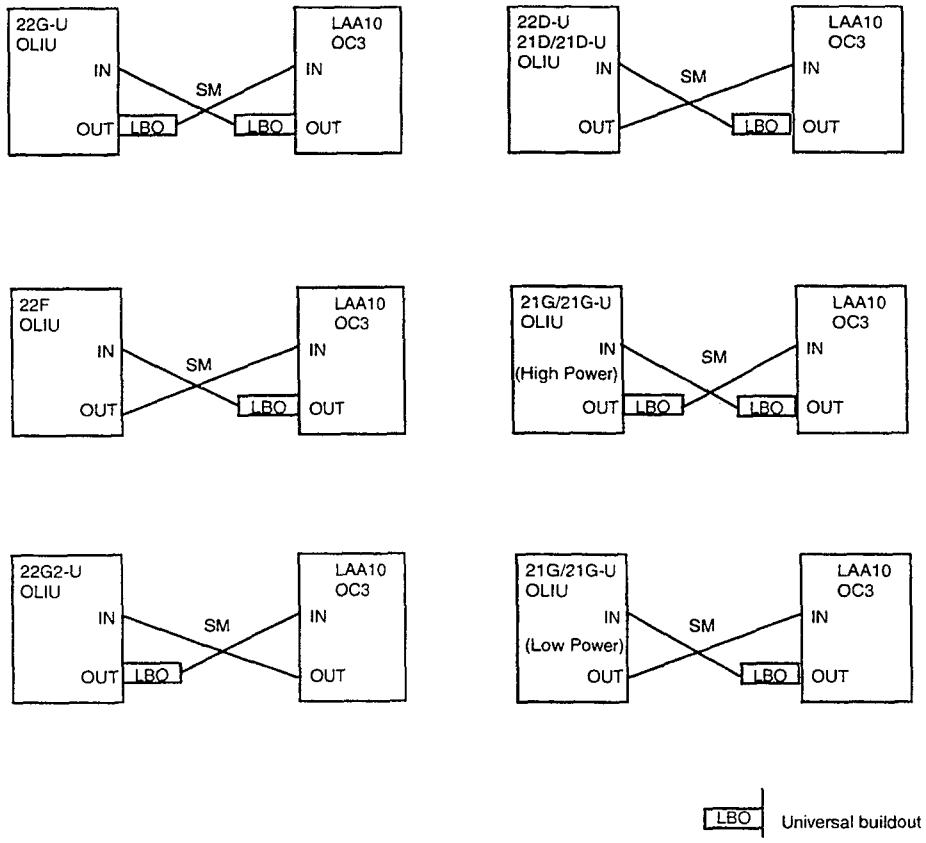


Figure 2. DDM-2000 OC-3/FT-2000 Fiber Optic Connections and Line Buildouts

Table D. DDM-2000 OC-3/FT-2000 Measured Optical Power and Required LBO

	Receiver											
	LAA10 OC3		22G-U OLIU		22G2-U OLIU		21D/21D-U/22D-U OLIU (Controlled Env.)		22F OLIU		21G/21G-U OLIU (High/Low Power)	
Transmitter	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
LAA10 OC3				15		15	-2.5 to -5.0	15		15		15
			0.0 to -3.0	10		10	-5.0 to -10.0	10	-2.5 to -3.0	10	-2.5 to -3.0	10
			-3.0 to -8.0	5		5	-10.0 to -15.0	5	-3.0 to -8.0	5	-3.0 to -8.0	5
			-8.0 to -34.0	0	0.0 to -34.0	0	-15.0 to -33.8	0	-8.0 to -34.0	0	-8.0 to -34.0	0
22G-U/22G2-U OLIU		15										
	0.0 to -3.0	10										
	-3.0 to -8.0	5										
	-8.0 to -34.0	0										
21D/21D-U/22D-U OLIU (Controlled Env.)												
	-14.0 to -34.0	0										
22F OLIU		10										
		5										
	-8.0 to -34.0	0										
21G/21G-U OLIU (High Power)		15										
	-2.5 to -3.0	10										
	-3.0 to -8.0	5										
	-8.0 to -34.0	0										
21G/21G-U OLIU (Low Power)		10										
	-7.5 to -8.0	5										
	-8.0 to -34.0	0										

Notes:

1. Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU.

2. The minimum measured received power allows for optical path penalty and unallocated margin. Connector loss is not allotted for; it should already be accounted for in the optical power measurement.

3. The margin for falling within the max rx power is 1.0 dB.

Table E. In-Line Single-Mode (SM) and Multimode (MM) Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2000B	106597297	*ST*	MM-MM	Blue
10 dB	A2000D	106597446	*ST*	MM-MM	Black
5 dB	A3000B	106060718	*ST*	SM-SM	Blue
10 dB	A3000D	106060734	*ST*	SM-SM	Black

Table F. Universal Single-Mode (SM) *ST* Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3070	106795354	*ST*	SM-SM & MM-MM	None
5 dB	A3070B1	107406183	*ST*	SM-SM	Blue
10 dB	A3070D1	107406191	*ST*	SM-SM	Black
15 dB	A3070F1	107406209	*ST*	SM-SM	Green

Table G. Universal Single-Mode (SM) FC/PC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3080	106795404	FC/PC	SM-SM & MM-MM	None
5 dB	A3080B1	107406225	FC/PC	SM-SM	Blue
10 dB	A3080D1	107406233	FC/PC	SM-SM	Black
15 dB	A3080F1	107406241	FC/PC	SM-SM	Green

Table H. Universal Single-Mode (SM) SC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3060	106708951	SC	SM-SM & MM-MM	None
5 dB	A3060B1	107406142	SC	SM-SM	Blue
10 dB	A3060D1	107406159	SC	SM-SM	Black
15 dB	A3060F1	107406167	SC	SM-SM	Green

Table I. Universal Multimode (MM) *ST* Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2070B	106795313	ST	MM-MM	Blue
10 dB	A2070D	106795321	ST	MM-MM	Black
15 dB	A2070F	106795339	ST	MM-MM	Green

Table J. Universal Multimode (MM) SC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2060B	106795271	SC	MM-MM	Blue
10 dB	A2060D	106795289	SC	MM-MM	Black
15 dB	A2060F	106795297	SC	MM-MM	Green

Fiber Connection

10. ⇒ NOTE 1:
In Release 6 and Releases 7.0 and 7.1, **one** shelf in the network **must** be designated as a gateway network element (GNE) using the **`set-ne`** command. This not only enables the physical TL1/X.25 interface, if used, but it also allows you to use the **`rtrv-nmap`** command to retrieve a listing of all active nodes in the network. Therefore, for Release 6 and Release 7.0 and 7.1, it is suggested that optical fiber connections begin at the node designated as the GNE.

⇒ NOTE 2:
In Release 7.2, **one** shelf in the network **must** be designated as a directory services network element (DSNE) using the **`set-ne`** command. This allows you to use the **`rtrv-map-network`** command to retrieve a listing of all active nodes in the network. Therefore, for Release 7.2, it is suggested that optical fiber connections begin at the node designated as the DSNE.

At far end, connect the input optical fiber to the proper **OLIU IN** (receive) connector.

11. Did **FAULT** LED go off on the far-end **OLIU**?

    If **NO**, then continue with **Step 12**.
    If **YES**, then proceed to **Step 13**.

12. Check optical fiber connections. Verify integrity of fiber connections by ensuring correct output at one end is connected to correct input at the other end. Replace **OLIU** with flashing LED. Continue with this procedure when trouble is cleared.

13. At near end, connect the input optical fiber(s) to the corresponding **OLIU IN** (receive) connector.

14. Did **FAULT** LED go off on the near-end **OLIU**?

    If **NO**, then continue with **Step 15**.
    If **YES**, then proceed to **Step 16**.

15. Check optical fiber connections at both ends of the fiber. Verify the integrity of the fiber connections by ensuring **OLIU** output at one end is connected to the correct **OLIU** input at the other end. Verify proper systems have been connected by using the **rtrv-nmap:** (R7.1 and earlier) or **rtrv-map-neighbor** (R7.2) command (Figure 2).

Fiber Verification

16. Disconnect the fiber cable from the **OUT** connector on the **OLIU** at one end of the span. At the other end, verify that the associated **FAULT** LED is flashing, indicating a loss of signal. Reconnect the fiber and repeat the process for the other direction of transmission.

17. Verify proper systems have been connected by using the **rtrv-nmap:** (R7.1 and earlier) or **rtrv-map-neighbor** and **rtrv-map-network** (R7.2) command to retrieve a map of the network (Figure 3 and 4).

```
/* Network Map for Site6NE1
   ============================================================================
    System Name (TID)      Connected     Neighbor     Communication     GNE
                             Through                      Status
   ============================================================================
   Site6NE1                                                              yes
   Site7NE1                   main          yes
   Site3NE1                   fn-c          yes
   Site4NE1                   fn-c          no            FAILED

*/
```

Figure 3. Sample Report From **rtrv-nmap** Command

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-3, R7.2.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Site6NE1
   ================================================================================
    System Name           Connected     Communication     Product
      (TID)               Through       Status            Type
   ================================================================================
   Site6NE1                                                DDM-2000 OC-3
   Site7NE1               main-1        FAILED            DDM-2000 OC-3
   Site5NE1               main-2                          DDM-2000 OC-3

 */
```

Figure 4. Sample Report From **rtrv-map-neighbor** Command

18. After all connections and tests have been made, verify optical fiber cables are placed correctly in fiber tray/rings and properly routed in bay framework. Reinstall front cover and tighten three screws.

19. Repeat this procedure for each fiber span to be connected until the end-to-end system is established.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform End-to-End OC-3 Optical Line Test

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

NOTE 1:
This test is used in ring Releases 5 and 7 to verify the integrity of the OC-3 fiber lines between two DDM-2000 shelves and may be performed with the DDM-2000 in service or out of service. It is also used in Release 2 and later linear releases when adding a shelf in the middle of an optical span. Refer to **DLP-525** for optical line tests in other cases.

NOTE 2:
It is assumed that each DDM-2000 has passed the local (looped) transmission tests and a CIT is available. If these tests have not been completed, refer to the appropriate procedure and perform the tests.

NOTE 3:
This test must be performed locally at each shelf location associated with the optical span(s) being tested. See Figure 1.

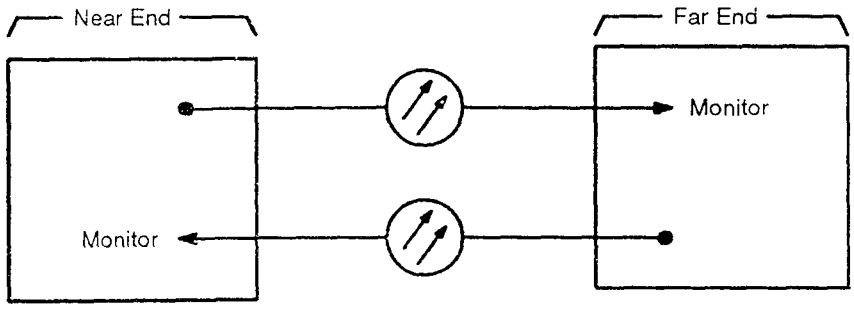


Figure 1. End-to-End Optical Line Test Monitoring

2. At test location, connect CIT to User Panel **CIT** connector and establish session.

   Reference: **DLP-521**

3. ⚠ CAUTION:
   The `init-pm:reg=all` *command initializes (clears) all current day and/or all current quarter-hour performance-monitoring storage registers.*

   ⇒ NOTE:
   If local procedures prohibit you from doing the `init-pm:reg=all` command, you may perform the following in Steps 5 and 6. Use the `rtrv-pm-line` command to obtain the line performance monitoring status report, note the readings on the `Today` line in the report, wait 20 seconds and then obtain another report. There should be no change in readings from the first report.

   Enter the command `init-pm:reg=all`, if allowed.

4. Wait 20 seconds.

5. Enter one of the following commands:
   - `rtrv-pm-line:main-1` if service line is being tested.
   - `rtrv-pm-line:main-2` if protection line is being tested.
   - `rtrv-pm-line:main-all` if both lines are being tested.

   Response: The following CIT report will indicate the status of the equipment. The `Today` line should indicate that there are no errors. Other `Time` lines may exist with numbers greater than zero. (The Commands and Reports section of this manual under **RTRV-PM-LINE** describes this report.)

```
/* Line Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh mm:ss
================================================================
Address  End      B2 CV    B2 ES  B2 ES   B2 ES    B2 SES  B2 UAS
         Time                     Type A  Type B
================================================================
address  Today    0?       0?     0?      0?       0?      0?
         ----------------------------------------------------
         Time     0?       0?     0?      0?       0?      0?
================================================================
address  Today    0?       0?     0?      0?       0?      0?
         ----------------------------------------------------
         Time     0?       0?     0?      0?       0?      0?
*/
```

6. If test is being performed on **OLIU**(s) installed in **FUNCTION UNIT** slot(s), enter one of the following commands:
   - `rtrv-pm-line:fn-{a or b or c}-1` if service line is being tested.
   - `rtrv-pm-line:fn-{a or b or c}-2` if protection line is being tested.
   - `rtrv-pm-line:fn-{a or b or c}-all` if both lines are being tested.

7. Has performance-monitoring report been obtained from all shelf locations associated with optical span(s) being tested?

   If **NO**, then continue with **Step 8.**
   If **YES**, then proceed to **Step 9.**

8. Repeat this procedure from Step 3 at other locations.

9. Did report indicate errors?

   If **YES**, then continue with **Step 10.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Trouble may be in optical fiber and/or connections. Trouble may also be in **OLIU**s. If the report indicated trouble when the report was obtained from the near end of the span, trouble may be in the receive direction (see Figure 1). If the report indicated trouble when the report was obtained from the far end of the span, trouble may be in the transmit direction. Check optical fiber and connections. Clean optical fiber connections [**DLP-527**]. If no trouble found in the optical fibers, replace **OLIU**(s) [**DLP-523**] associated with the address indicated in the report.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Local Office Alarms

1. ⚠ CAUTION:
   This test will interrupt service if it is performed without a CIT. If done with a CIT, this test can be performed on an in-service system.

   ⇒ NOTE:
   It is assumed that you were sent here by another procedure to test the DDM-2000 alarms.

   Is a CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 5**.

2. Connect CIT to **CIT** connector on the User's Panel.

3. ⇒ NOTE:
   The Commands and Reports section of this user's manual under **TEST-ALM** gives a description of the `test-alm` command.

   Use the `test-alm` command to perform alarm tests. Note the audible and visual alarm indications during the test.

4. Did the **DDM-2000** pass the alarm tests?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then proceed to **Step 17**.

5. ⇒ NOTE 1:
   It is assumed that the DDM-2000 is powered and running with loops at the low-speed cross-connections and that the high-speed terminations are either looped on themselves or connected in an end-to-end looped configuration. It is also assumed that protection circuit packs are installed and that no alarms or other diagnostic indications are activated.

   Unseat the function unit in **FUNCTION UNIT** (**FN**) group slot **FN A-1**, **B-1**, or **C-1**.

6. Wait 30 seconds.

7. Is the minor (**MN**) alarm activated?

   If **YES**, then continue with **Step** 8.
   If **NO**, then proceed to **Step 16.**

8. Leave the function unit unseated and unseat the protection function unit circuit pack in slot **FN A-2**, **B-2**, or **C-2**.

9. Wait 30 seconds.

10. ⇒ NOTE:
    In some offices the critical and major alarms may be wired together if a separate critical alarm is not available. The following step will activate a critical (**CR**) alarm on the User Panel.

    Is the critical (**CR**) or major (**MJ**) office alarm activated?

    If **YES**, then continue with **Step 11.**
    If **NO**, then proceed to **Step 16.**

11. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the circuit packs.

12. Unseat the protection **DS1/DS1PM** and a service **DS1/DS1PM** circuit pack in the same group.

13. Is the major (**MJ**) alarm activated?

    If **YES**, then continue with **Step 14**.
    If **NO**, then proceed to **Step 16**.

14. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.

17. The **DDM-2000** has failed the alarm test. The most likely source of the problem is the alarm wiring. Check that the alarms are connected correctly. If the wiring is correct and the failure persists, refer to **Trouble Clearing: TAP-108** to clear the failure.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Parallel Telemetry

1. ⚠ CAUTION:
   This test will interrupt service if it is done without a CIT. If done with a CIT, this test can be done on an in-service system.

   ⇒ NOTE 1:
   It is assumed that you were sent here by another procedure to test the DDM-2000 parallel telemetry.

   Is a CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 6**.

2. Connect the CIT to the **CIT** connector on the User Panel.

3. Refer to the Commands and Reports section of this user's manual under **TEST-TLM-PAR** for a description of the tests.

4. Contact the monitoring location and use the `test-tlm-par` command to perform the parallel telemetry tests as described in the Commands and Reports section of this manual.

5. Did the DDM-2000 pass the parallel telemetry tests?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then proceed to **Step 18**.

6. ⇒ NOTE 1:
   It is assumed that the DDM-2000 is powered and running with loops at the low-speed cross-connection and that the high speed terminations are either looped on themselves or connected in an end-to-end looped configuration. It is also assumed that the system is equipped with protection circuit packs and that no alarms or other diagnostic indications are activated.

   ⇒ NOTE 2:
   It is assumed that the DDM-2000 is connected to a telemetry system and that the state of the telemetry inputs and outputs to that system can be determined.

   Unseat the function unit in **FUNCTION UNIT** (**FN**) group slot **FN A-1**, **B-1**, or **C-1**.

7. Wait 30 seconds.

8. Is the minor (**MN**) alarm telemetry point activated?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 17**.

9. Leave the circuit pack unseated and unseat the associated protection function unit circuit pack in group slot **FN A-2**, **B-2**, or **C-2**.

10. Wait 30 seconds.

11. Is the critical (**CR**) alarm telemetry point activated?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 17**.

12. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.

13. Unseat the protection **DS1/DS1PM** and a service **DS1/DS1PM** circuit pack in the same group.

14. Is the major (**MJ**) alarm activated?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed to **Step 17**.

15. The remaining telemetry points can be tested in the same manner. For example, to check the **INC** telemetry point, disconnect one or more of the incoming DS1 signals. To test the **CLF** point, disconnect one of the receive optical fibers.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through the openings in the faceplates.

18. The **DDM-2000** has failed the parallel telemetry alarm test. The most likely source of the problem is the telemetry wiring. Check that the telemetry is connected correctly. If the wiring is correct and the failure persists, refer to **Trouble Clearing: TAP-108** to clear the failure.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check TBOS Serial Telemetry

1. ⇒ NOTE 1:
   It is assumed that the DDM-2000 under test is powered and running and that no alarms or other diagnostic indicators are activated.

   ⇒ NOTE 2:
   It is assumed that the DDM-2000 under test is connected to a serial telemetry system and that access to the central telemetry equipment is available.

   Is a CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 7**.

2. Connect the CIT to the **CIT** connector on the User Panel.

3. Refer to the Commands and Reports section of this manual under **TEST-TLM-SER** for a description of the tests.

4. Contact the monitoring location and use the `test-tlm-ser` command to perform the serial telemetry tests as described in the Commands and Reports section of this manual.

5. Did the DDM-2000 pass the serial telemetry tests?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 15**.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. At the central telemetry equipment send a message to the DDM-2000 to Lockout Switching - LS-A (Command **22**).

8. Is scan point **58** (Valid Command Received) raised?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 15**.

9. Is scan point **56** (Lockout LS Equipment Protection Switching) raised?

   If **YES**, then continue with **Step 10**.
   If **NO**, then proceed to **Step 15**.

10. At the central telemetry equipment send a message to the DDM-2000 to Reset Switching - LS-A (Command **25**).

11. Is scan point **58** (Valid Command Received) raised?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 15**.

12. Is scan point **56** (Lockout LS Equipment Protection Switching) retired?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 15**.

13. The DDM-2000 has passed the serial telemetry test.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. The DDM-2000 has failed the serial telemetry test. A likely source of the trouble is the telemetry wiring. Check the connections. If the wiring is correct and the trouble persists, refer to **Trouble Clearing: TAP-108** to clear the failure condition.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Test Protection Switching Function

1. Is a CIT available?

   If **YES**, then continue with **Step 2.**
   If **NO**, then proceed to **Step 7.**

2. To test for a switch to protection using a CIT, connect the CIT to the **CIT** connector on the User Panel. Enter the command: `rtrv-state`. The terminal will display the current protection status.

3. Use one of the switch commands (for example, `switch-ls:`*`address`*`:pri=manual`, `switch-line:`*`address`*`:pri=manual` or `switch-fn:`*`address`*`:pri=manual` to perform a switch.

4. Enter the command: `rtrv-state` to verify the switch was done.

5. Use the `switch-( ):`*`address`*`:pri=reset` command to reset switch.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. ⇒ NOTE:
   The alarm delay is provisionable from 0 to 30 seconds. This procedure assumes the alarm delay is set for the default of 2 seconds.

   To test a low-speed switch to protection, unplug one of the **DS1/DS1PM** circuit packs, if installed.

   Response: **NE ACTY** LED on User Panel lights. **MN** LED lights after 2 seconds.

8. Reseat the circuit pack that was removed.

   Response: All LEDs go OFF after 2 seconds.

9. Repeat Step 7 for each equipped muldem.

10. To test a high-speed switch to protection, unplug a **MXRVO/STS1E** circuit pack with a lighted **ACTIVE** LED.

    Response: The green **ACTIVE** LED on the companion circuit pack lights. The **NE ACTY** LED on User Panel lights. The **MN** alarm lights after 2 seconds.

11. Reseat the circuit pack that was removed.

    Response: After 2 seconds, all LEDs go OFF.

12. ⚠ WARNING:
    Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

    Are both **ACTIVE** LEDs lighted on a pair of **OLIU**s (linear releases only)?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 16**.

13. Remove and immediately reconnect the upper **IN** fiber from one **OLIU**. Wait for the red **FAULT** LED to stop flashing.

14. Did the green **ACTIVE** LED go off on the **OLIU**.

    If **NO**, then continue with **Step 15**.
    If **YES**, then proceed to **Step 16**.

15. Remove and immediately reconnect the upper **IN** fiber from the other **OLIU**. Wait for the red **FAULT** LED to stop flashing.

16. Remove the upper **IN** fiber from the **OLIU** with the lighted **ACTIVE** LED.

    Response: The **NE ACTY** LED on User Panel and **ACTIVE** LED on companion **OLIU** light. **MN** LED lights after 2 seconds. **ACTIVE** LED remains lighted on **OLIU** with fiber disconnected.

17. Reconnect the fiber.

18. Remove and immediately reconnect the upper **IN** fiber from the other **OLIU**.

    Response: **ACTIVE** LED goes off on the **OLIU** that just had the fiber removed.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Condition DS1/DS1PM Circuit Pack/Port for New DS1 Service

1. ⇒ NOTE 1:
   The commands `rtrv-alm` and `rtrv-state` may be used to check for alarms, locks, loops, and switches.

   ⇒ NOTE 2:
   If line code (lc) parameters have been previously set using the `set-tl` command, the circuit pack line code switch settings will have no effect. There will be no indication of improper switch settings until you try to establish service. It is recommended that a policy be established to set line coding either using the switches OR using CIT commands. Use the `rtrv-tl` command to check line code settings.

   Use `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

2. Is a new **DS1/DS1PM** circuit pack being installed?

   If **YES**, then proceed to **Step 12**.
   If **NO**, then continue with **Step 3**.

3. ⚠ CAUTION 1:
   To minimize hits on in-service ports on the **DS1/DS1PM** *circuit pack having a DS1 port added, it is recommended to either use a CIT to manually switch the DS1 to protection if the* **DS1/DS1PM** *circuit pack must be removed, or use the CIT to set DS1 port options without removing the circuit pack.*

   ⚠ CAUTION 2:
   If the protection **DS1/DS1PM** *circuit pack is not available for a protection switch, removing a service* **DS1/DS1PM** *circuit pack will interrupt service on all DS1 ports on that circuit pack. If a CIT is available, use the* `rtrv-state` *command to check the status of the protection switch.*

⚠ CAUTION 3:
When a **DS1/DS1PM** *is switched to protection, removal of any other* **DS1/DS1PM** *circuit pack or* **177A** *Retainer Card in the same group will result in a loss of service to the protected* **DS1/DS1PM** *and the removed* **DS1/DS1PM** *circuit pack.*

Are line code (AMI or B8ZS) settings set manually (with switches) or with a CIT?

If **MANUALLY**, then continue with **Step 4.**
If **CIT**, then proceed to **Step 10.**

4. Is protection **DS1/DS1PM** available for protection switch?

   If **YES**, then continue with **Step 5.**
   If **NO**, then proceed to **Step 8.**

5. Remove service **DS1/DS1PM** circuit pack, set option switches as required and reinstall **DS1/DS1PM** circuit pack.

   Reference: **DLP-513**

6. Momentarily depress **UPD/INIT** pushbutton on **SYSCTL** to update equipment list.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Option settings on the **DS1/DS1PM** must be set or verified as set before placing the DS1 port in service. Wait until the protection **DS1/DS1PM** is available or obtain a CIT to set the options.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Use `set-t1` command to set **DS1/DS1PM** port options.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. ⚠ CAUTION 1:
When a **DS1/DS1PM** *circuit pack is switched to protection, removal of any other* **DS1/DS1PM** *circuit pack or* **177A** *Retainer Card in the same group will result in a loss of service to the protected* **DS1/DS1PM** *circuit pack and the removed* **DS1/DS1PM** *circuit pack.*

⚠ CAUTION 2:
No service **DS1/DS1PM** *locations (slots) should be left empty.*

⇒ NOTE:
177A Retainer Cards are used to disconnect the cross-connect wiring associated with unused service DS1 **LOW SPEED** slots from the DDM-2000's internal protection bus.

- Remove **177A** Retainer Card from the DS1 slot being equipped.

13. Set option switches and install new **DS1/DS1PM** circuit pack.

    Reference: **DLP-508**

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect CIT and Establish Session

1. ⚠ CAUTION:
You must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly whenever working with the DDM-2000.

NOTE 1:
If all shelves in a bay are connected together with CIT bay mult cabling, the CIT may be connected to any shelf front or rear **CIT** connector and gain access to any other shelf by entering a shelf address. If the CIT is connected to the rear **CIT** connector, it must be connected through a null modem.

NOTE 2:
If shelves are connected together with bay mult cabling and ANY shelf in the chain becomes unpowered with the **SYSCTL** inserted, CIT communications will be lost to all shelves. Once the shelf is repowered, CIT communications are restored without established login sessions being dropped. If shelves are not powered, the **SYSCTL** should not be inserted.

NOTE 3:
With CIT baud rate set for 19200, CIT communication to a shelf may fail if the CIT bay mult cabling is connected to the shelf but not terminated on the next shelf. This condition is only present at baud rates greater than 9600 and does not affect communication at lower baud rates.

Connect CIT to the RS-232C **CIT** connector on the DDM-2000 User Panel or rear **CIT** connector.

2. Turn on CIT and set terminal parameters as follows (consult your terminal's manual for setup procedures):
   - Full duplex.
   - 8 data bits.
   - 1 start bit.
   - 1 stop bit.
   - No flow control.
   - Baud rate set same as on **SYSCTL**. (See Table A, Figure 1, and Note.)

Table A. SYSCTL Switch 3 (S3) Data Rate Settings (Note)

	CIT Front Access Data Rate Switch				CIT Rear Access Data Rate Switch		
Baud	S3-1	S3-2	S3-3	Baud	S3-4	S3-5	S3-6
300	OFF	OFF	OFF	300	OFF	OFF	OFF
1200	OFF	OFF	ON	1200	OFF	OFF	ON
2400	OFF	ON	OFF	2400	OFF	ON	OFF
4800	OFF	ON	ON	4800	OFF	ON	ON
9600	ON	OFF	OFF	9600	ON	OFF	OFF
19200	ON	OFF	ON	19200	ON	OFF	ON
Invalid	ON	ON	OFF	Invalid	ON	ON	OFF
Invalid	ON	ON	ON	Invalid	ON	ON	ON

Note: The DDM-2000 supports data rates up to 19,200 baud, but it does not provide flow control. Some terminals and personal computers (PCs) that can be set for higher data rates will not work properly at these rates with equipment like DDM-2000 that does not provide flow control. The system may appear to stop working when reports or long prompts are displayed. If this happens, try setting both the DDM-2000 and the terminal for a lower data rate.

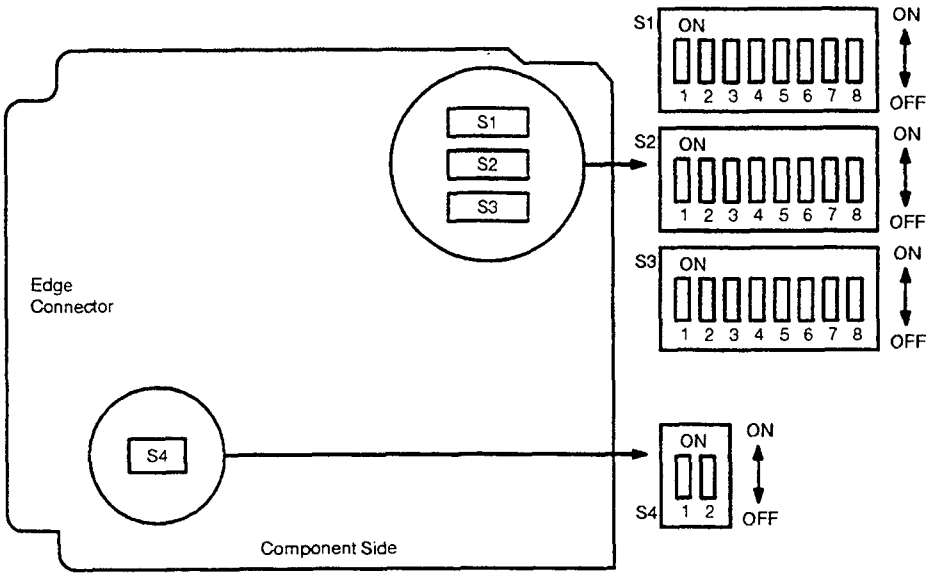


Figure 1. SYSCTL Option Settings

3. NOTE:
Characters other than a question mark (?), carriage return (<cr>), semicolon (;), dollar sign ($), or the numbers 1 through 8 are ignored. Typing a carriage return, semicolon, or dollar sign twice by mistake will cause the system to start a session with the default shelf. The default shelf is the shelf that is physically connected to the CIT.

Enter a question mark (?).

Response: CIT prompts with:

```
/* Enter a shelf number from 1 to 8 */
shelf [default] =
```

4. ⇒ NOTE:
   Entering just a carriage RETURN at the shelf prompt will connect you to the shelf physically connected to the CIT.

   Enter the shelf number and/or carriage RETURN for the shelf being accessed.

   Response: CIT prompts with `login <`

5. ⇒ NOTE 1:
   Security is available in Release 3 or later to protect against unauthorized access to the system. System security requires the defaults for the privileged user logins/password to be changed and CIT and/or DCC port security to be enabled. If security is enabled on a port, users must enter a valid login and password to access the system through that port.

   ⇒ NOTE 2:
   The system always has two privileged user logins to minimize the chance that both users will forget their passwords at the same time. You must be logged into the system as a *privileged user* to set security; add, change, or delete logins; and to execute some commands. The default *privileged user* logins are ATT01 (upper case ATT-zero-one) and ATT02 (upper case ATT-zero-two). The default *privileged user* password is DDM-2000.

   Were you sent here from **DLP-541** to connect CIT?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 6**.

6. If security has been enabled, enter your login, and then enter your password when prompted.

   If security has not been enabled, enter a carriage RETURN.

   Response. CIT prints the following message followed by an alarm and status report:

```
/************************************
*                                   *
*              AT&T                 *
*      DDM-2000 OC-3 Multiplexer    *
*                                   *
*         Release a b.c             *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

7. ⇒ NOTE 1:
   The system prompt may be something other than `<` if there is an alarm condition (for example, if there is an MJ alarm condition on the system, the prompt will be `MJ <`).

   ⇒ NOTE 2:
   After the prompt (<), the system will respond to commands entered. The command `set-link:pg=( )` may be used to set the vertical size of the displayed page on the CIT. Page (pg) length may be set from 3 to 150 lines with a default length of 24 lines. The page length is set to default each time a new CIT session is started.

   See the "Commands and Reports" section of this manual for a description of the command formats.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Establish Remote Login

1. Connect CIT and establish session with near-end DDM-2000.

   Reference: **DLP-521**

2. ⇒ NOTE 1:
   The command **`toggle`** (CTRL T) may be used to toggle back and forth between a remote DDM-2000 terminal and the near-end terminal. If no remote session is in progress, the toggle command will be rejected.

   ⇒ NOTE 2:
   A remote login within a remote login or a remote login entered to the near end while a remote session is suspended by the toggle command is not allowed. (A remote session is suspended when a remote session is under way and **`toggle`** (CTRL T) is entered to toggle control to the near end.) A remote login will also be denied if one is already in progress at the remote site.

   ⇒ NOTE 3:
   If security has been enabled, Release 3 or later, on the DCC port being accessed, a login and password is required to do the remote login.

   ⇒ NOTE 4:
   Far end communications (fecom) must be enabled in the far-end shelf in order to remote login to that shelf. The command **`rtrv-fecom`** can be used locally at the far-end shelf to determine if *fecom* is enabled or disabled. The command **`set-fecom`** can be used at the far-end shelf to enable *fecom*. In Release 3 or later, if security is enabled, the **`set-fecom`** command can be executed by privileged users only.

NOTE 5:
In Release 6, 7.0 and 7.1, one shelf in the network must be set as a GNE using the **set-ne** command to allow far-end communications. In Release 7.2 or later, at least one shelf in the network must be set as an AGNE and one shelf must be designated as a DSNE.

NOTE 6:
A remote login session may be terminated in some cases due to events in distant shelves and may not be noticeable until you begin typing in the *rlgn* session. Events such as disabling fecom, failure of the DCC, **init-sys** or **reset**, removing **OLIU**s, etc., may abruptly terminate a remote login session. This is normal because all the network elements must relearn the network after one of these events.

Enter command **rlgn:tid**

Where tid = the target identifier (shelf or site/shelf name) of the remote terminal. Required for Release 2 or later software only.

Response: **CIT** prompts with: `login <`

3. If security has been enabled, enter your login and password when you are prompted.

   If security has not been enabled, enter a carriage RETURN.

   Response: System responds with:

```
/************************************
*                                   *
*              AT&T                 *
*      DDM-2000 OC-3 Multiplexer    *
*                                   *
*         Release a.b.c             *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

4. ⇒ NOTE:
   After the prompt, the remote system will respond normally to any commands entered just as if you were physically connected to the remote terminal.

   See the Commands and Reports section of this manual for a description of the commands formats.

5. ⇒ NOTE:
   A logout entered to the remote terminal will end the remote session and return control to the near-end CIT. A logout entered to the near-end terminal will terminate the local and remote sessions.

   Use the command **`logout`** to log out of the remote terminal session and return control to the near-end terminal.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Circuit Pack

1. ⚠ CAUTION 1:
Circuit packs must not be installed or replaced if the **SYSCTL** *is not installed and operating normally. If the* **SYSCTL** *is not installed and operating normally, unpredictable provisioning of the replaced/installed circuit pack can result.*

⚠ CAUTION 2:
Ensure that protection switching is available (protection circuit pack and/or line good and no locks, inhibits, or forced switches in effect). When available, use a CIT and a protection `switch-line:` *command to do a protection switch.*

⚠ CAUTION 3:
When removing circuit packs, always remove the one without the lighted **ACTIVE** *LED first.*

NOTE:
When a replacement circuit pack (except the **SYSCTL**) is configured the same as the original circuit pack, it may be inserted with no further action. When a replacement circuit pack is different (different code or different switch options) from the original, the **SYSCTL UPD/INIT** button must be momentarily depressed to update the inventory.

Find the circuit pack in Table A and go to the indicated step.

Table A. Circuit Pack Replacement

Circuit Pack	Step
SYSCTL	Step 2
MXRVO	Step 4
OHCTL	Step 6
BBF2 TGS	Step 15
BBF2B TGS	Step 20
OLIU	Step 26
BBG4/BBG4B DS3	Step 32
DS1/DS1PM	Step 36
BBG6 STS1E	Step 42

SYSCTL

2. Refer to **DLP-501** to replace the **SYSCTL**.
3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

MXRVO

4. ⚠ CAUTION:
   To prevent errors, use the **`sw-fn:address:pri=manual`** *command to switch service to the standby slot before removing the* **MXRVO** *circuit pack being replaced.*

   There are no options to be set on the **MXRVO** circuit pack. Remove old **MXRVO** and install replacement **MXRVO**.

   Response: **FAULT** LED on the **MXRVO** lights for about 13 seconds and then goes off.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

OHCTL

6. NOTE 1:
When an **OHCTL** is removed or installed, any active login session on the *rear* access CIT port (modem port) will be dropped. The front access CIT port is not affected.

NOTE 2:
For Release 6 or later linear releases, the **OHCTL** must be a series **S2:3** or later to support the open systems interconnection protocol (OSI). Release 7 and later ring releases require series **S2:4A** or later **OHCTL**s. **S2:3** or later **OHCTL**s are factory programmed with a unique sequence number which is used as part of the network services access point (NSAP) for the shelf. If an **S2:2** or earlier **OHCTL** is installed and Release 6 or later software is installed, the software will be inoperable and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

NOTE 3:
A **BBG7 OHCTL** must have software installed and it must be compatible with the software in the **BBG5 SYSCTL**. If no software is installed or if the software is not compatible, the letter **C**, **P**, or **d** will be displayed in the **FE ID** display on the **SYSCTL** when installed. If this occurs, you must find circuit packs with compatible software or install new software in both the **OHCTL** and **SYSCTL**. The shelf must be equipped with both **OHCTL** and **SYSCTL** [**DLP-501**] circuit packs before new software can be installed [**DLP-532**].

NOTE 4:
Switches **S1-1**, **S1-2**, and **S1-3** on the **OHCTL** set the Network Element number of the shelf. The Network Element number and the Site ID (set on the **SYSCTL**) form a unique address for a shelf at a site. If two shelves within the same control network have the same address, a "`duplicate site id`" alarm is declared.

Determine the Network Element number from old **OHCTL**, work order, or office records. Refer to Table B and Figure 1 and set the Network Element number for this shelf.

Table B. OHCTL Switch 1 (S1) Network Element Number

Network Element	Switch S1 Settings			Unused (Note)				
	S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	S1-8
1	ON	ON	ON	ON	ON	ON	ON	ON
2	OFF	ON	ON	ON	ON	ON	ON	ON
3	ON	OFF	ON	ON	ON	ON	ON	ON
4	OFF	OFF	ON	ON	ON	ON	ON	ON
5	ON	ON	OFF	ON	ON	ON	ON	ON
Invalid*	OFF	ON	OFF	ON	ON	ON	ON	ON
Invalid*	ON	OFF	OFF	ON	ON	ON	ON	ON
Invalid*	OFF	OFF	OFF	ON	ON	ON	ON	ON

Note: Switch 1, sections 4 through 8 (**S1-4, S1-5, S1-6, S1-7**, and **S1-8**) must be set to the **ON** position. If they are set to the **OFF** position, the **FAULT** LED will light on the **OHCTL** and an alarm will be generated.

* If an invalid setting is selected, the **FAULT** LED is lighted and an `unexpected switches` alarm is generated.

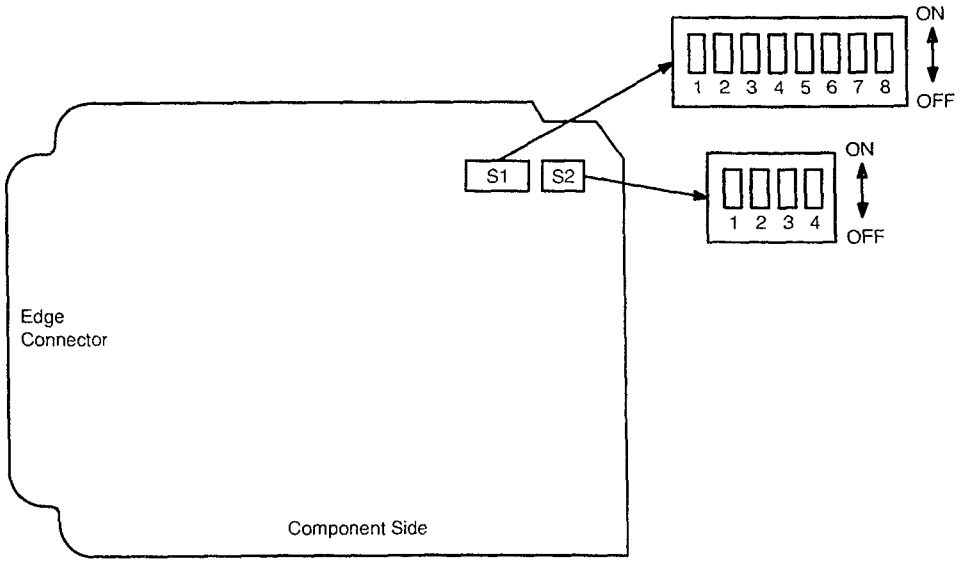


Figure 1. OHCTL Circuit Pack

7. If Release 5 or earlier, continue with **Step 8**.
   If Release 6 or later, proceed to **Step 10**.

8. Refer to Table C and Figure 1 and set unused switches on **OHCTL** circuit pack.

Table C. Unused Switch 2 (S2) Settings (Note)

Switch S2			
S2-1	S2-2	S2-3	S2-4
ON	OFF	OFF	OFF

Note: These switches are reserved for applications using the open systems interconnection protocol (OSI), Release 6 or later. The suggested settings will make future upgrades easier.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. ⇒ NOTE 1:
Switches **S2-1** through **S2-4** on the **OHCTL** are used to control the identification of the DCC for open systems interconnection (OSI) interworking. For a given optical span, the network elements that terminate on each side of the optical span must have their "network side"/"user side" parameters set to opposite values to avoid an "inconsistent DCC switches" alarm. Switch **S2** switch segments are set to **OFF** for the Network Side and **ON** for the User Side of network elements in an optical span. Figure 2 illustrates the **S2** switch settings for switches associated with **OLIU**s in the **MAIN** and **FUNCTION UNITS** slots at each end of the interconnected optical spans for linear/hub configurations. Figure 3 illustrates the **S2** switch settings for switches associated with **OLIU**s in the **MAIN** and **FUNCTION UNITS** slots at each end of interconnected optical spans in rings configurations.

⇒ NOTE 2:
Note that factory settings for switch **S2** are **S2-1 ON**, **S2-2 OFF**, **S2-3 OFF**, and **S2-4 OFF**. This will permit the establishment of a linear/hub system without changing any **S2** switch settings except on the **OHCTL** at the CO. In this case, **S2-1** on the **OHCTL** at the CO would be set to **OFF**. Factory settings also allow the establishment of a ring configuration without changing any **S2** switch settings.

Refer to Figures 2 and 3 for example system configurations. Set **S2** switches for OSI interworking using the examples and/or work order or office records. (The necessary switch settings in the example figures are highlighted in bold type. For example, in Figure 2, the optical span between RT1 and RT3 requires that switch **S2-3** at RT1 be set to **OFF** and switch **S2-1** at RT3 be set to **ON**.)

11. Set remaining unused **S2** switches to **OFF** to make future upgrades easier.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

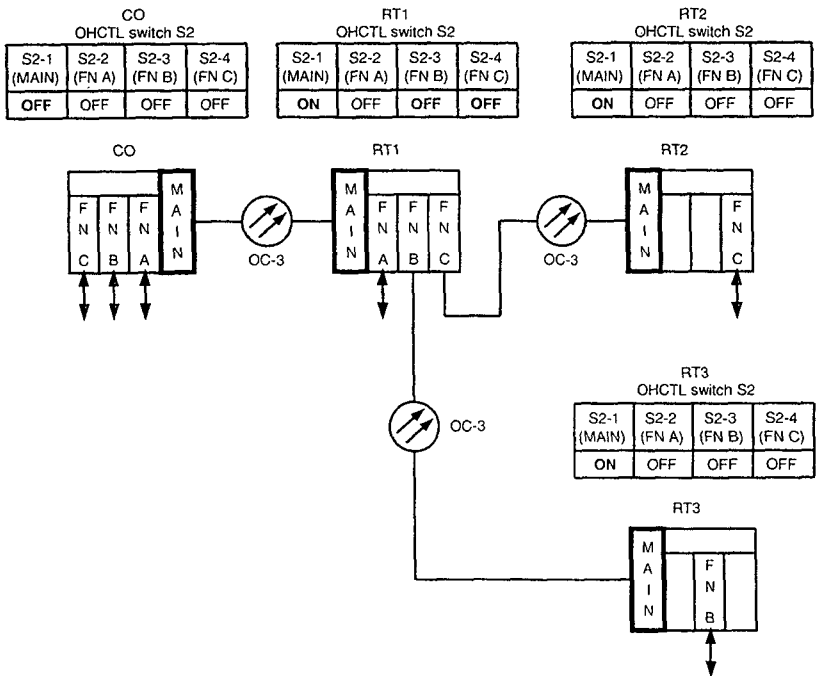


Figure 2. Example OHCTL Switch S2 Settings — OC-3 Linear/Hub Configuration Using OSI Protocol

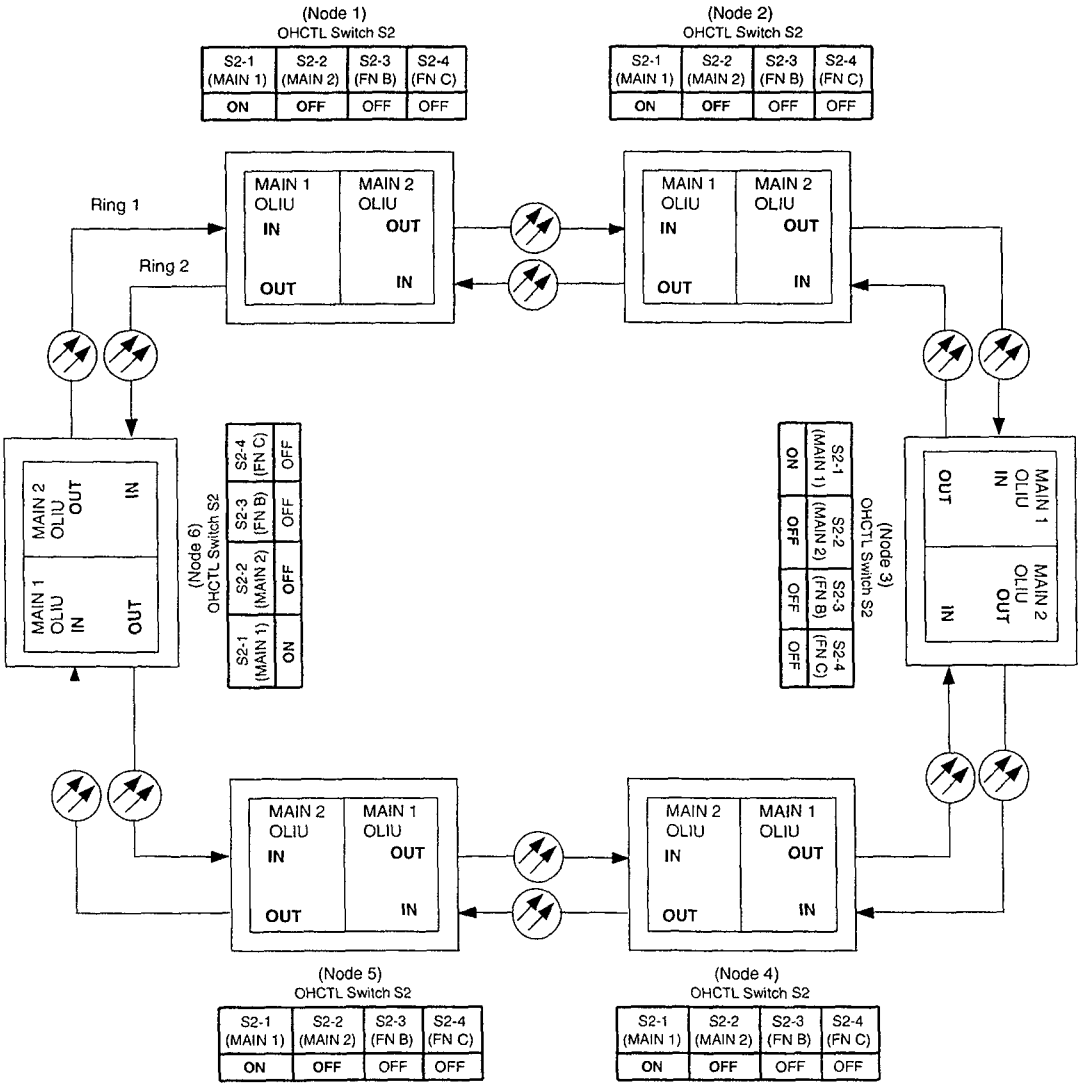


Figure 3. Example OHCTL Switch S2 Settings EM OC-3 Ring Configuration Using OSI Protocol

13. ⇒ NOTE:
If switch **S2** is set wrong in Release 6 or later, an "`inconsistent DCC switches`" alarm will occur at the near end and a "`communication failure`" alarm will occur at the other nodes. You must change the switch to proper setting to clear alarms.

Remove **OHCTL** and install replacement **OHCTL**. If response is not correct, reseat the **SYSCTL**.

Response: **FAULT** LEDs on **SYSCTL** and **OHCTL**, and **ABN** LED on the User Panel light for about 2 seconds and go off. **CR** alarm on the User Panel flashes for 10 seconds.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2 TGS

15. ⚠ CAUTION:
BBF2 TGS and **BBF2B TGS** timing mode switch settings are not set the same. Check switch settings carefully.

⇒ NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to loop timed mode).

⇒ NOTE 2:
The **BBF2 TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Loop Timed.* In free-running mode, the **BBF2 TGS** gets timing from an oscillator on the **BBF2 TGS**. In external timing, the **BBF2 TGS** gets timing from an external DS1 reference input. In loop timing, the **BBF2 TGS** gets timing from an **OLIU** from a reference clock recovered from the received OC-3 line rate signal.

⇒ NOTE 3:
Table D depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application.

Table D. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported Both systems are operating asynchronously from each other.
Free Running	Loop Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality loop timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Loop Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks The recommendation is to have these BITS synchronized to references which are traceable to the same PRS If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves collocated in the same bay to conserve ports on the BITS.

Table D. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Loop Timing	Loop Timing	Caution! This topology creates a timing loop and it is not. supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the **set-sync** command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another loop timing source, if available, to prevent a timing loop.

Refer to Table E and Figure 4 and set the timing mode as required for the new **BBF2 TGS** circuit pack(s).

Table E. BBF2 TGS Timing Mode Switch Setting

	Switch S1 Settings	
Timing Mode	**S1-3**	**S1-4**
Free Running	ON	ON
DS1 External	OFF	ON
Loop Timed	ON	OFF
Invalid*	OFF	OFF

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP type/switches` alarm is generated.

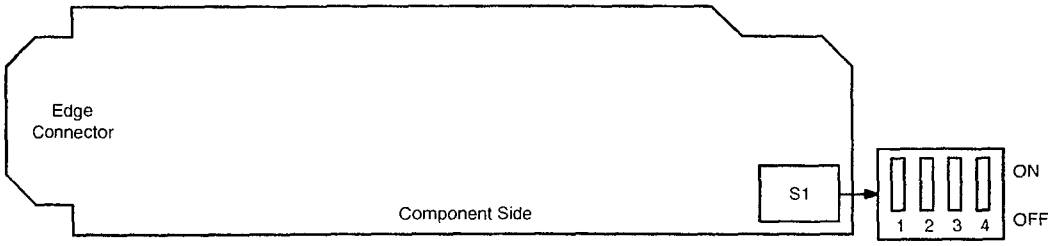


Figure 4. BBF2 TGS Option Switch

16. ⇒ NOTE:
Switches **S1-1** and **S1-2** were ignored by the system the first time the **TGS** was installed unless the timing mode was set to *DS1 External*. Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update (**upd**) must be performed.

Is timing mode set to *DS1 External*?

If **YES**, then continue with **Step 17.**
If **NO**, then proceed to **Step 18.**

17. Refer to Table F and Figure 4 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table F. TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch S1-1	DS1 Frame Format	Switch S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

18. ⚠ CAUTION:
When all OC-3 shelves in a bay are timed from a common external timing supply, removal of the bottom shelf **TGS** circuit pack will cause a momentary transmission hit on all shelves in the bay.

⇶ NOTE 1:
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS 1** circuit pack. If the information is incompatible with the controller software information, an alarm is generated.

⇶ NOTE 2:
If a signal has previously been applied to the original **TGS** circuit pack, the **FAULT** lamp will flash when the new **TGS** is installed until the signal tests good.

Remove old **TGS** and install replacement **TGS**.

Response: **FAULT** LED on the **TGS** lights (flashes) for about 15 seconds and then goes off.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

20. ⚠ CAUTION:
BBF2 TGS and **BBF2B TGS** timing mode switch settings are not set the same. Check switch settings carefully.

NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to loop timed mode).

NOTE 2:
In loop-timed mode, the **BBF2B TGS** gets timing from a reference clock recovered from a received OC-3 line rate signal. For Release 2, the **MAIN OLIU** is the synchronization source. For Release 5, either the **MAIN 1** or **MAIN 2 OLIU** can be selected as the synchronization source using the command `set-sync:src={main,fn-c};`. For Releases 3 and 6, either the **MAIN OLIU** or **FUNCTION UNIT C OLIU** can be selected as the synchronization source using the command `set-sync:src={main,fn-c};`. For Release 7, either the **MAIN 1**, **MAIN 2**, or **FUNCTION UNIT C OLIU** can be selected as the synchronization source using the command `set-sync:src={main-1,fn-c};`.

NOTE 3:
Table G depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for looptiming or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table G. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Loop Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality loop timing source, if available.
Free Running	Loop Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS. In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging. In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality loop timing source, if available.
Free Running	External - Mult	This timing topology is not supported The two network elements will be operating asynchronously from each other
Free Running	External - Sync Out	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Loop Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS The NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.

Table G. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Mult	Loop Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located. The NE provisioned for Loop Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Loop Timing	Caution! This topology might create a timing loop In this topology the NE provisioned for Loop Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another loop timing source, if available, to prevent the timing loop.

Table G. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Loop Timing - Sync Out	Caution! This topology might create a timing loop. In this topology the NE provisioned for Loop Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port NE 2 will attempt to switch to another loop timing source, if available, to prevent the timing loop.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves collocated in the same bay to conserve ports on the BITS.
External - Mult	External - Sync Out	This topology is used to distribute network timing to a target location from a location with access to a synchronization reference. The NE provisioned for External - Mult, is providing timing to the NE provisioned for External - Sync Out, which in turn generates a DS1 output reference regenerated from the optical interface shared by both NE's This DS1 output is used to provide a synchronization reference to a BITS.

Table G. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's. In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal.
Loop Timing	Loop Timing	Caution! This topology creates a timing loop and it is not. supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the **set-sync** command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another loop timing source, if available, to prevent a timing loop.

NOTE 4:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in figure.

Determine timing mode from work order or office records. Refer to Table H and Figure 5 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table H. BBF2B TGS Timing Mode Switch Settings

	Switch S1 Settings		
Timing Mode	**S1-3**	**S1-4**	**S1-5**
Free Running	ON	ON	OFF
DS1 External, mult mode	OFF	ON	OFF
Loop Timed	ON	OFF	OFF
Loop Timed, sync out mode	ON	OFF	ON
DS1 External, sync out mode	ON	ON	ON
Invalid*	OFF	OFF	ON
Invalid*	OFF	OFF	OFF
Invalid*	OFF	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated (`unexpected CP type/switches` `unexpected CP switches`).

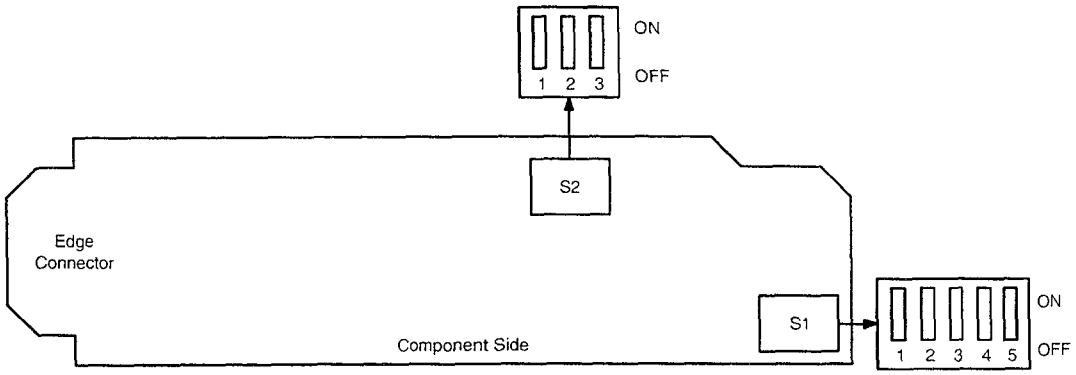


Figure 5. BBF2B TGS Option Switch

21. If the **BBF2B TGS** is provisioned for *sync out mode*, refer to Table I and Figure 5 and set equalizer switches for the proper cable length.

Table I. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid*	OFF	OFF	OFF
Invalid*	OFF	OFF	ON
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated (`unexpected CP type/switches unexpected CP switches`).

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22. ⇒ NOTE:
Switches **S1-1** and **S1-2** were ignored by the system the first time the **TGS** was installed unless the timing mode was set to *DS1 External* or *Loop Timed sync out mode*. Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update (**upd**) must be performed.

Is timing mode set to either *DS1 External* or *Loop Timed sync out*?

If **YES**, then continue with **Step 23.**
If **NO**, then proceed to **Step 24.**

23. Refer to Table J and Figure 5 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table J. BBF2B TGS DS1 Line Coding and Frame Format Switch Settings

DS1 Line Code	Switch S1-1	DS1 Frame Format	Switch S1-2
AMI	ON	SF	ON
B8ZS	OFF	ESF	OFF

24. ⚠ CAUTION:
When all OC-3 shelves in a bay are timed from a common external timing supply, removal of the bottom shelf **TGS** circuit pack will cause a momentary transmission hit on all shelves in the bay.

⇒ NOTE 1:
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS 1** circuit pack. If the information is incompatible with the controller software information, an alarm is generated.

⇒ NOTE 2:
If a signal has previously been applied to the original **BBF2B TGS** circuit pack, the **FAULT** lamp will flash when the new **BBF2B TGS** is installed until the signal tests good.

Remove old **BBF2B TGS** and install replacement **BBF2B TGS**.

Response: **FAULT** LED on the **BBF2B TGS** lights (flashes) for about 15 seconds and then goes off.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

OLIU

26. ⚠ WARNING 1:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use a CIT and the `switch-line:` *command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a* `switch-line:` *command at the near end and far end to switch both transmit and receive to the same line.*

⚠ CAUTION 2:
When removing circuit packs, always remove the one without the lighted **ACTIVE** *LED first.*

⚠ CAUTION 3:
Before installing **OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned* **[DLP-527]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

⇒ NOTE:
It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

Use **rtrv-state** command to ensure service has been switched to the other line then remove optical cables from **OLIU** to be replaced.

27. Is a **21G/21G-U OLIU** being replaced?

    If **YES**, then continue with **Step 28.**
    If **NO**, then proceed to **Step 29.**

28. Refer to Table K and Figure 6 and set the **HIGH/LOW POWER** option switch on replacement **21G/21G-U OLIU** to proper setting.

Table K. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

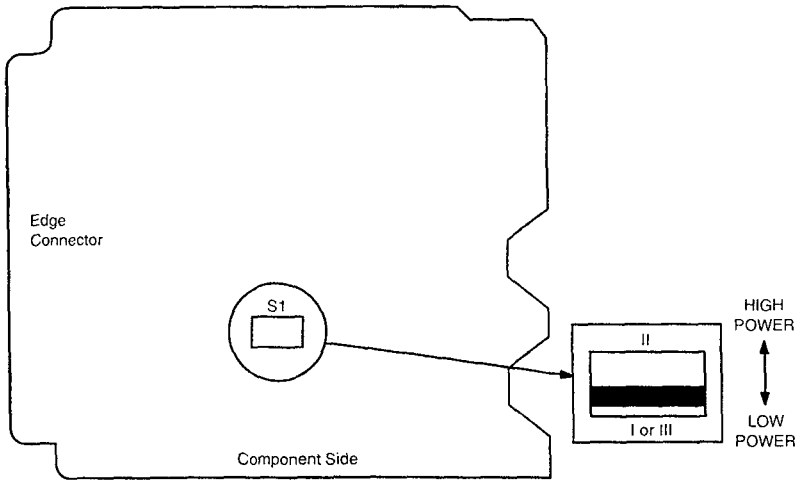


Figure 6. 21G/21G-U OLIU Option Switch

29. Remove old **OLIU** and install same type replacement **OLIU**.

    Response: **FAULT** LED on **OLIU** flashes.

30. ⇒ NOTE:
The **FAULT** LED on the **OLIU** may flash from 15 seconds to 3 minutes and 25 seconds depending on the provisioned signal degrade threshold.

Connect optical cables to replacement **OLIU**.

Response: **FAULT** LED on the **OLIU** goes off.

31. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG4/BBG4B DS3

32. Determine from office records the length of the DS3 cabling between the **DDM-2000** and the **DSX-3** cross-connect point.

33. ⇒ NOTE:
The only option settings on the DS3 circuit pack are the LBO settings shown in Figure 7. If there are other jumpers on the circuit pack similar to the LBO jumpers, they are factory test points and should be ignored.

Refer to Table L and Figure 7 and install the DS3 option jumpers.

Table L. DS3 LBO Settings

Cable Length (Ft)			
734A	Mini-Coax KS-19224	735A 1735006A	LBO Setting
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

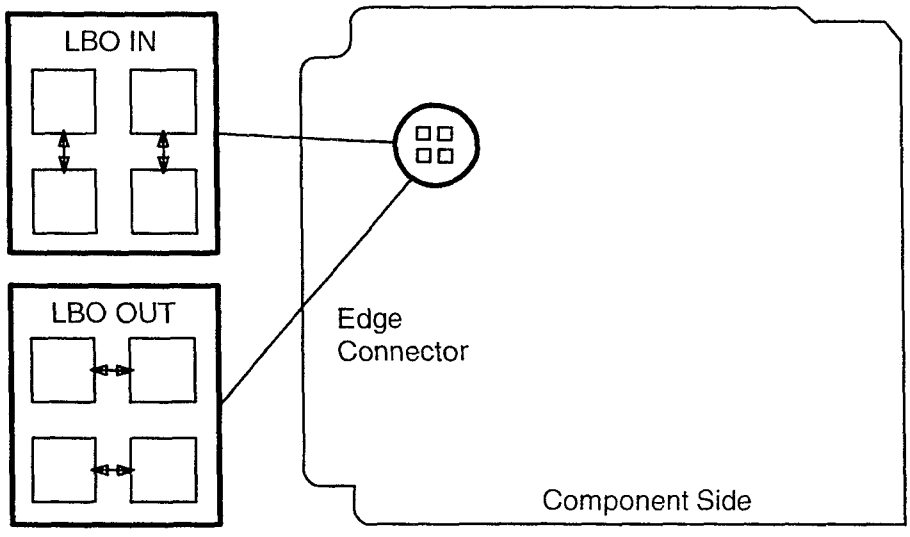


Figure 7. BBG4/BBG4B DS3 Option Settings

34. ⇒ NOTE:
If a signal has previously been applied to the original **DS3** circuit pack, the **FAULT** lamp will flash when the new **DS3** is installed until the signal tests good.

Remove old **DS3** and install replacement **DS3**.

Response: **FAULT** LED on the **DS3** flashes for about 15 seconds and then goes off.

35. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

DS1/DS1PM

36. Determine from office records the length of the DS1 cabling between the DDM-2000 and the DSX-1 cross-connect point.

37. ⇒ NOTE 1:
Switch 1, sections 1 through 3 (**S1-1**, **S1-2**, **S1-3**), are set according to the length of DS1 cabling between the DDM-2000 and the DSX-1 cross-connection. Switch 1, sections 4 through 7 (**S1-4, S1-5, S1-6, S1-7**), are set for the type of line coding (B8ZS or AMI) required of the DS1 signal. Switch 1, section 8 (S1-8) on the **BBF1/BBF1B DS1** is unused and ignored by the system. On the **BBF3 DS1PM**, S1-8 must be set to OFF.

⇒ NOTE 2:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Refer to Table M and Figure 8 and set LBO option switches.

Table M. DS1/DS1PM Cable LBO Settings (Note)

613C (608C) Cable Length (feet)	1249C Cable Length (feet)	Other Cable dB Loss at 772 kHz	Switch S1 Settings		
			S1-1	S1-2	S1-3
0 to 133	0 to 90	0 to 0.6	OFF	OFF	OFF
>133 to 267	>90 to 180	>0.6 to 1.2	OFF	OFF	ON
>267 to 400	>180 to 270	>1.2 to 1.8	OFF	ON	OFF
>400 to 533	>270 to 360	>1.8 to 2.4	OFF	ON	ON
>533 to 655	>360 to 450	>2.4 to 2.8	ON	OFF	OFF

Note: Invalid switch settings will cause the **FAULT** LED to light and a `DS1 CP failed` alarm.

38. ⇒ NOTE:
If line code (lc) parameters are generally set using the **`set-t1`** command, the circuit pack switch settings will have no effect. The **`rtrv-t1`** command may be used to check line code settings.

Refer to Table N and Figure 8 and set the line code option switches, if required.

Table N. DS1/DS1PM Line Code Settings

	Switch S1 Settings				
Line Code Format	S1-4 (Port 1)	S1-5 (Port 2)	S1-6 (Port 3)	S1-7 (Port 4)	S1-8 Unused (Note)
B8ZS	OFF	OFF	OFF	OFF	OFF
AMI	ON	ON	ON	ON	

Note: Switch 1, section 8 (S1-8) on the **BBF1/BBF1B DS1** is unused and ignored by the system. On the **BBF3 DS1PM**, S1-8 must be set to OFF.

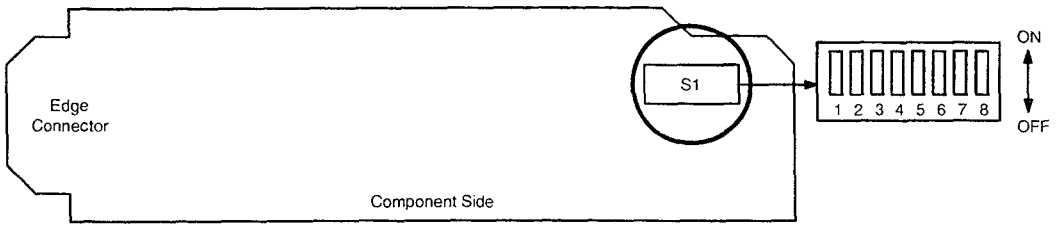


Figure 8. DS1/DS1PM Option Settings

39. ⚠ CAUTION:
When a **DS1/DS1PM** *circuit pack is switched to protection, removal of any other* **DS1/DS1PM** *circuit pack or* **177A** *Retainer Card in the same group will result in a loss of service to the protected* **DS1/DS1PM** *circuit pack and the removed* **DS1/DS1PM** *circuit pack.*

⇒ NOTE 1:
If a signal has previously been applied to the original **DS1/DS1PM** circuit pack, the **FAULT** lamp will flash when the new **DS1/DS1PM** circuit pack is installed until the signal tests good.

⇒ NOTE 2:
A **DS1PM** circuit pack must be replaced with the same type circuit pack to retain the proper feature applications. Also, if protection is required and **DS1PM** circuit packs are installed in the service slots, the protection circuit pack must be a **DS1PM** circuit pack. A "*CP not allowed (eqpt)*" alarm will be generated if a **DS1PM** circuit pack is installed in a service slot with no **DS1PM** circuit pack in the protection slot.

Remove old **DS1/DS1PM** circuit pack and install replacement **DS1/DS1PM** circuit pack.

Response: **FAULT** LED on the **DS1/DS1PM** circuit pack may light (flash) for up to 40 seconds and then goes off.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG6 STS1E

41. Determine from office records the length of the STS1E cabling between the DDM-2000 and the STSX cross-connect point.

42. Install the **STS1E** option jumpers per Table O and Figure 9.

43. ⇒ NOTE:
The **STS1E** circuit pack provides bidirectional transport of one EC-1 signal through the DDM-2000 Multiplexer. **STS1E** high speed mode interfaces with the **DS1/DS1PM** circuit packs in a function unit group at the VT-G rate. **STS1E** low speed mode interfaces with the **OLIU** circuit packs at the STS-1 rate.

Determine **STS1E** mode of operation (high speed or low speed).

44. Set switch **S1** to mode of operation required (**HIGH-SPEED MODE** or **LOW-SPEED MODE**).

45. ⇒ NOTE:
If a signal has previously been applied to the original **STS1E** circuit pack, the **FAULT** lamp will flash when the new **STS1E** is installed until the signal tests good.

Remove old **STS1E** circuit pack and install replacement **STS1E** circuit pack.

Response: **FAULT** LED on the **STS1E** may light (flash) for about 15 seconds and then goes off.

46. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table O. STS1E LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	- -
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

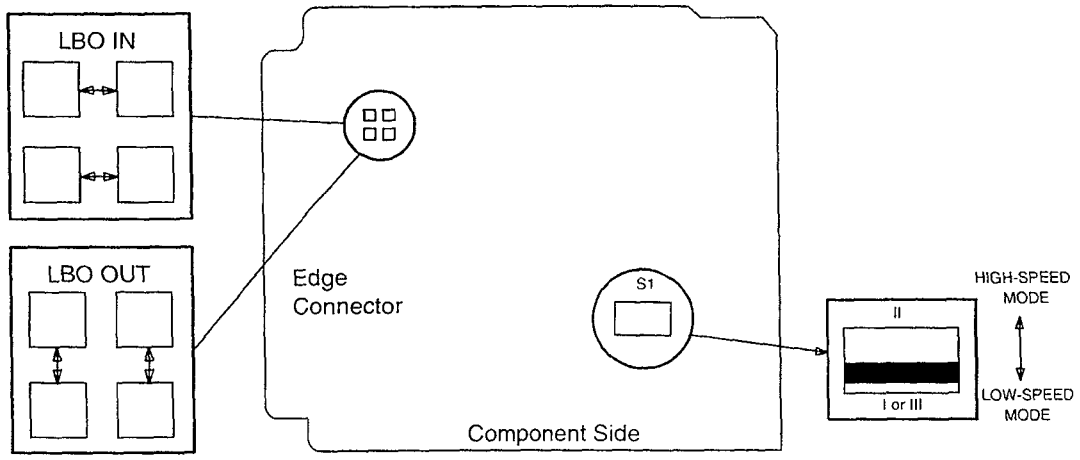


Figure 9. BBG6 STS1E Option Settings

Check –48 V DC Office Battery

1. Obtain multimeter capable of measuring DC voltage in the 40 to 60 volt range.

2. ⚠ WARNING:
   –48 V DC is present in the fuse holders and the P1 and P2 power connections at rear of User Panel.

   ⚠ CAUTION:
   If system is in service, service interruption will occur if both fuses are removed or both power feeders are disconnected while in service.

   Are fuses installed in User Panel?

   If **YES**, then continue with **Step 3.**
   If **NO**, then proceed to **Step 4.**

3. Remove ONE of the –48 V fuses at the top of the User Panel.

   Reference: **DLP-555**

4. ⚠ CAUTION:
   Exercise care not to short meter probe across fuse contacts in fuse holder.

   Use multimeter to measure DC voltage at front of fuse holder(s). Place negative probe on top fuse contact (G3 shelves) and the other probe to a solid chassis ground.

   Requirement: Voltage must be between –41.75 V and –60.0 V DC

5. Was requirement met?

   If **YES**, then proceed to **Step 8.**
   If **NO**, then continue with **Step 6.**

6. Trouble in User Panel, power feeder(s), or office battery distribution. Refer trouble to organization that installed the shelf.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Have both fuse holders been checked?

   If **YES**, then proceed to **Step 10**.
   If **NO**, then continue with **Step 9**.

9. Reinstall fuse if removed. Remove other fuse if installed and repeat this procedure from **Step 4** for other fuse holder.

10. Are fuses installed?

    If **YES**, then proceed to **Step 12**.
    If **NO**, then continue with **Step 11**.

11. ⇒ NOTE:
    The fuses on the G3 shelf User Panel are 5 amp indicator-type fuses, part number WP90247L113, COMCODE 406203976. Ensure indicator end of fuse is placed into fuse cap so the indicator can protrude through the hole in the cap if the fuse blows.

    Install –48 V DC fuses in User Panel fuse holders.

12. Is any fuse blown?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Replace blown fuse.

    Reference: **DLP-555**

14. Did fuse blow again?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed to **Step 17**.

15. Trouble in User Panel or backplane connector. Refer trouble to the organization that installed the shelf.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Is **PWR ON** LED lighted?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 18**.

18. Trouble in User Panel. Refer trouble to organization that installed the shelf.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic End-to-End OC-3 Line Test

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

NOTE 1:
This test is used to verify the integrity of the OC-3 optical fiber lines between two DDM-2000 shelves. It may be performed with the DDM-2000 in service or out of service. This test checks the transmission across the optical interfaces in the **MAIN** and function unit slots equipped with **OLIU** circuit packs. For example, this test performed at an intermediate shelf checks the optical span from both the **MAIN** and **FN-C** slots.

NOTE 2:
It is assumed that each DDM-2000 has passed the automatic local transmission tests. If these tests have not been completed, refer to the appropriate NTP procedure and perform the tests.

NOTE 3:
Far end communications (fecom) must be enabled at both shelves in the optical span being tested. See SET-FECOM in the Commands and Reports section of this manual.

At each end of the optical span being tested, ensure that both the service and protection **OLIU**s have been connected to the optical facility (a total of four connections at each end of the span). See Figure 1.

Reference: **DLP-514**

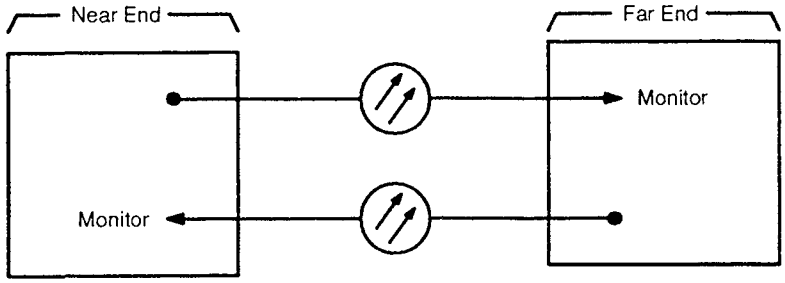


Figure 1. **Automated End-to-End Line Test** (`test-auto:md=optics`)

2. Is a CIT available?

   If **YES**, then continue with **Step 3**.
   If **NO**, then proceed to **Step 8**.

3. Connect CIT to User Panel **CIT** connector.

4. Enter the command `test-auto:md=optics`.

5. The following CIT report will indicate the status of the equipment. It should indicate that there are no failures. If report indicates a failure with **OLIU**s, do **Trouble Clearing: TAP-111**.

```
/* Auto-Turnup Report -- Optical Span Test
=============================================================================
EQUIPMENT  -----Main-----  -------Function Units-------
           main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g       g     g    g    g    F    -    -

TRANSMIT   -----Main-----  -------Function Units-------
           main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g       g     g    g    g    F    -    -

RECEIVE    -----Main-----  -------Function Units-------
           main-1  main-2  a-1  a-2  b-1  b-2  c-1  c-2
              g       g     g    g    g    F    -    -

DCC        -----Main-----  -------Function Units-------
                              a         b         c
                    g         g         g         -
*/
```

where `g` stands for *good* and `F` stands for *Failed*, `?` stands for *unknown due to other failures*, and `-` stands for *not applicable* (that is, slots not equipped with **OLIU**s).

6. ⇒ NOTE:
Optical span tests for other shelves in the network may be made physically at each shelf or by remote login (`rlgn`).

If other spans are being tested, log in to other shelves in the same network and repeat this test for all optical spans.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. ⇒ NOTE 1:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to depress it.

⇒ NOTE 2:
The following five steps (9 through 13) must be performed with no unnecessary delays. Read through them to familiarize yourself with the sequence of operations and the expected responses.

Read Steps 9 through 13 before continuing.

9. On the User Panel, depress and hold the **ACO** pushbutton.

Response: All LEDs on the DDM-2000 are lighted.

10. With the **ACO** pushbutton still depressed, momentarily depress the **UPD/INIT** pushbutton. Then release both pushbuttons.

Response: All lighted **ACTIVE** LEDs remain lighted.

11. While all the LEDs are lighted, momentarily depress the **UPD/INIT** pushbutton one time. You have **1 MINUTE** to do this.

Response: On User Panel, **CR** LED is flashing. **MJ** LED is lighted. All other LEDs, except **PWR ON** LED on User Panel, go off.

12. ⇒ NOTE:
The **CR** LED will flash for 10 SECONDS. The **UPD/INIT** pushbutton must be momentarily depressed two times while the **CR** LED is flashing. You have **10 SECONDS** to do this.

While the **CR** LED is flashing, momentarily depress the **UPD/INIT** pushbutton two times.

Response: On User Panel, **CR** LED is flashing. **MJ** LED is lighted. After push button is depressed the first time, **MN** LED lights. After push button is depressed the second time, **PMN** LED lights. All other LEDs, except **ACTIVE** LEDs and **PWR ON** LED on User Panel, are off.

⇒ NOTE:
10 seconds after the **UPD/INIT** pushbutton is depressed the last time, the **CR** LED will stop flashing and remain lighted; the **MJ**, **MN** and **PMN** LEDs also remain lighted. This indicates the beginning of the automatic end-to-end transmission test. The **CR**, **MJ**, **MN**, and **PMN** LEDs remain lighted for the duration of the test. The **ACTIVE** LEDs go off. The test may take as long as 5 minutes.

13. ⇒ NOTE:
During the test, any failure will be indicated by a lighted or flashing **FAULT** LED on the affected **OLIU** circuit pack. This indication will remain on for 1 minute. If no failures are detected, the green **ACO** LED on the User Panel will be lighted for 1 minute.

Wait until the test ends as described above. Was the **ACO** LED lighted?

If **YES**, then continue with **Step 14**.
If **NO**, then proceed to **Step 16**.

14. The DDM-2000 has passed the automatic end-to-end transmission test. Repeat this procedure from Step 8 for all shelves in the network requiring optical spans to be tested.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. ⇒ NOTE:
    A lighted or flashing **FAULT** LED on an **OLIU** indicates that either an **OLIU** circuit pack is failed or there is trouble in the optical fiber line or connections between the DDM-2000 shelves.

    Clean optical fiber connections.

    Reference: **DLP-527**

17. Is **FAULT** LED lighted or flashing on any **OLIU**?

    If **YES**, then do **Trouble Clearing: TAP-111**.
    If **NO**, then continue with **Step 18**.

18. There is an inconsistent set of diagnostic indications. Refer to **Trouble Clearing: TAP-108** to clear the failure condition.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Condition and Connect Modems to Establish Communication From Remote CIT Location

1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure may be used to connect modems and a craft interface terminal (CIT) to the DDM-2000 OC-3 Multiplexer system for use in provisioning the system from a remote location.

⇒ NOTE 2:
This procedure must be performed at both the DDM-2000 location and remote CIT location to set the parameters of modems and terminal.

⇒ NOTE 3:
Modems supporting a large set of options and error detection capabilities may require other options to be set before using the modems to download generic software. Refer to manufacturer's manuals for instructions on setting modem parameters.

Verify the generic parameters of the modem are set to the following:

- 300, 1200, 2400, 4800, 9600, or 19,200 baud

  Baud rate selected must match DDM-2000 baud rate as set in the **SYSCTL** circuit pack. The AT&T 4024 and AT&T 2224 CEO modems support 1200 and 2400 baud rates. The AT&T 2296 modem supports 4800 or 9600 baud rates.
- Full duplex
- 8 data bits
- No parity bits
- 1 start bit
- 1 stop bit
- No flow control
- Transparent data mode - ON (Required for software download on some modems.)
- Direct operating mode - ON (Required for software download on some modems.).

2. Are you at the DDM-2000 location or remote CIT location?

   If **DDM-2000 LOCATION**, continue with **Step 3**.
   If **REMOTE CIT LOCATION**, proceed to **Step 11**.

DDM-2000 Location

3. Does the baud rate selected match the baud rate set in the DDM-2000 **SYSCTL** circuit pack?

   If **YES**, proceed to **Step 8**.
   If **NO**, continue with **Step 4**.

4. Depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** circuit pack at the same time. Observe the 10-second countdown on the **FE ID** display. During this countdown, remove the **SYSCTL** circuit pack.

5. Refer to Table A and set the baud rate switches on the **SYSCTL** circuit pack to the desired baud rate.

Table A. SYSCTL Switch S3

CIT Front Access Data Rate				CIT Rear Access Data Rate			
	Switch				Switch		
Baud	S3-1	S3-2	S3-3	Baud	S3-4	S3-5	S3-6
300	OFF	OFF	OFF	300	OFF	OFF	OFF
1200	OFF	OFF	ON	1200	OFF	OFF	ON
2400	OFF	ON	OFF	2400	OFF	ON	OFF
4800	OFF	ON	ON	4800	OFF	ON	ON
9600	ON	OFF	OFF	9600	ON	OFF	OFF
19200	ON	OFF	ON	19200	ON	OFF	ON
Invalid	ON	ON	OFF	Invalid	ON	ON	OFF
Invalid	ON	ON	ON	Invalid	ON	ON	ON

6. Install the **SYSCTL** circuit pack into the **SYSCTL** slot in the DDM-2000 shelf.

7. Set the modem to answer incoming calls. For example, if you are using an AT&T 2224 CEO modem, do the following to program the modem:

   a. ⇒ NOTE:
   It is assumed the PC and modem ("AT" command compatible) are powered and the PC is loaded with communications software.

   Set all front panel switches to DOWN (factory default) for AT command mode.

   b. Connect PC serial port to the modem RS-232C port using modem cable or using a null modem adapter.

   c. Establish communications between the PC and modem using the communications software set for the generic parameters in Step 2.

   d. At the prompt, enter the following "AT" commands.

PC	Response	Comment
ATH	OK	#hang-up (on-hook)
AT&F	OK	#resets to factory defaults
AT&C1	OK	#data carrier is present when on
ATS0=2	OK	answer on 2 rings
AT&W	OK	wait for second dial tone

8. Remove the connector at the PC serial port and plug into the front (requires null modem) or rear access port on the DDM-2000 shelf. Dialup access to the network element via the modem is now ready. Tables B and C show the EIA-232-D pins required for use with the DDM-2000.

Table B. Pin Connections for Modem Using DB-25 Cable

EIA-232-D Pin	Front Access CIT (DCE)	Rear Access CIT (DTE) Modem Port
Pin 2 - Circuit BA Transmitted Data	Carries data from terminal or modem to DDM-2000	Carries data from DDM-2000 to modem or terminal
Pin 3 - Circuit BB Received Data	Carries data from DDM-2000 to terminal or modem	Carries data from modem or terminal to DDM-2000
Pin 7 - Circuit AB Signal Ground	Signal ground	Signal ground
Pin 8 - Circuit CF Received Line Signal Detector	Not used	Indicates to DDM-2000 that Modem or terminal is connected
Pin 20 - Circuit CD DTE Ready	Indicates to DDM-2000 that modem or terminal is connected	Indicates to modem or terminal that DDM-2000 is connected (always ON when **SYSCTL** is powered)

Table C. Pin Connections for Modem Using DB-9 Cable

PC DB-9 Connector	CIT
Pin 1 - Carrier Detect	This modem detects carrier from the remote modem.
Pin 2 - Receive Data	Receives data from modem
Pin 3 - Transmit Data	Transmits data to the modem
Pin 4 - Data Terminal Ready	CIT notifies the modem that they are connected
Pin 5 - Signal ground	Signal ground
Pin 6 - Data Set Ready	Modem notifies the CIT that the modem is connected and ready to receive data.
Pin 7 - Request to Send	CIT is requesting clearance from the modem so it can send data.
Pin 8 - Clear to Send	Modem notifies the CIT that it is clear to send.
Pin 9 - Ring indicator	Modem notifies the CIT that ring signal is present when the modem is in an auto-answer mode.

9. Verify the telephone line is plugged into the modem.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Remote CIT Location

11. At the remote CIT location, set the terminal parameters to match those set at the DDM-2000 location. Refer to manufacturer's manual for instructions on setting modem parameters.

12. Connect the remote modem to the CIT terminal using the appropriate modem cable. Tables B and C list the pins for the DB-25 connector and DB-9 connector, respectively.

13. Verify the telephone line is plugged into the modem.

14. ⇒ NOTE 1:
Characters other than a question mark (?), carriage return (<cr>), semicolon (;), dollar sign ($), or the numbers 1 through 8 are ignored. Typing a carriage return, semicolon, or dollar sign twice by mistake will cause the system to start a session with the default shelf. The default shelf is the shelf that is physically connected to the CIT.

⇒ NOTE 2:
Security is available in Release 3 or later to protect against unauthorized access to the system. If security is enabled, users must enter a valid login and password to access the system.

Dial into the DDM-2000 system by entering the correct telephone number. When the modem at the DDM-2000 end answers, establish a login session by pressing question mark (?) until the system answers. CIT should return with the following prompt:

```
/* Enter a shelf number from 1 to 8 */
shelf [default] =
```

15. ⇒ NOTE:
Entering just a carriage RETURN at the shelf prompt will connect you to the shelf physically connected to the CIT.

Enter the shelf number and/or carriage RETURN for the shelf being accessed.

Response: CIT prompts with `login <`

16. ⇒ NOTE:
Systems with security always have two privileged user logins to minimize the chance that both users will forget their passwords at the same time. You must be logged into the system as a *privileged user* to set security; add, change, or delete logins; and to execute some commands. The default *privileged user* logins are ATT01 (upper case ATT-zero-one) and ATT02 (upper case ATT-zero-two). The default *privileged user* password is DDM-2000.

If security has been enabled, enter your login, and then enter your password when prompted.

If security has not been enabled, enter a carriage RETURN.

Response: CIT prints the following message followed by a proprietary system message and an alarm and status report:

```
/************************************
*                                   *
*              AT&T                 *
*      DDM-2000 OC-3 Multiplexer    *
*                                   *
*         Release a.b.c             *
*                                   *
************************************/

                  .
                  .
                  .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

17. ⇒ NOTE 1:
The system prompt may be something other than `<` if there is an alarm condition (for example, if there is an MJ alarm condition on the system, the prompt will be `MJ <`).

NOTE 2:
After the prompt (<), the system will respond to commands entered. The command `set-link:pg=( )` may be used to set the vertical size of the displayed page on the CIT. Page (pg) length may be set from 3 to 150 lines with a default length of 24 lines. The page length is set to default each time a new CIT session is started.

See the Commands and Reports section of this manual for a description of the command formats.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clean Optical Fibers, Connectors, and Lightguide Buildouts (LBOs)

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam.

⇒ NOTE:
All optical fiber connectors (*ST*®, FC/PC, and SC types), lightguide buildouts, and buildout blocks or equivalent should be cleaned before making initial connections or reconnections per the following instructions. Only the components being assembled at this particular time should be cleaned.

Keep all dust caps and plugs in place until time to make connections.

Clean optical fibers and connectors on **OLIU** or LBOs.

If **21G/21D/22F OLIU**, go to **Step 2**.
If **21G-U/21D-U/22G-U/22G2-U/22D-U OLIU** using universal LBOs, go to **Step 7**.
If in-line **LBO**s, go to **Step 15**.
If **lightguide fibers**, go to **Step 21**.

2. On printed wiring board side of **OLIU** faceplate, disconnect one of *ST* connectors from faceplate coupling.

3. Clean end and sides of connector tips with lint-free, optical quality tissue moistened with isopropyl alcohol.

4. Carefully wipe connector end again with clean, dry, lint-free optical quality tissue.

5. Blow any lint or dust from connector using canned air at least 3 inches (8 cm) from face of connector.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Remove lightguide connector from buildout (if necessary).

8. Remove lightguide buildout from buildout block by unlocking tab and pushing in and turning in counter-clockwise direction (if necessary).

   Reference: **DLP-552**

9. Clean the end and the sides of the connectors, buildouts, and blocks with a lint-free, optical quality tissue dampened with isopropyl alcohol.

10. Carefully wipe the connector, buildouts, and blocks again with a clean, dry, lint-free optical quality tissue.

11. Blow any lint or dust from the connectors, buildouts, and blocks using canned air held at least 3 inches (8 cm) away.

12. Clean the inside of the block using a pipe cleaner moistened with isopropyl alcohol.

13. Blow any lint or dust from inside the block, using canned air at least 3 inches (8 cm) away.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Is LBO 0 dB or attenuated?

    If **0 dB LBO**, go to **Step 16**.
    If **attenuated LBO**, go to **Step 19**.

16. Clean LBO by placing a pipe cleaner, moistened with isopropyl alcohol, inside LBO and rotating the pipe cleaner.

17. Blow any lint or dust from inside the LBO, using canned air at least 3 inches (8 cm) from LBO.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. ⚠ CAUTION:
    Attenuated LBO has lens. Do not use pipe cleaner.

    Clean LBO by canned air only. Blow any lint or dust from inside LBO, using canned air at least 3 inches (8 cm) from LBO.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. Clean fiber-end face and sides of connector with lint-free, optical quality tissue moistened with isopropyl alcohol.

22. Carefully wipe fiber-end face and sides of connector again with clean, dry, lint-free optical quality tissue.

23. Blow any lint or dust from fiber-end face and sides of connector using canned air at least 3 inches (8 cm) from connector.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic Local Transmission Test

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION 1:
This test may only be performed with the DDM-2000 out of service. No circuit packs should be inserted or removed while this test is in progress. If either the **SYSCTL** *or* **OHCTL** *is removed while the test is in progress, or if the system is reset while the test is in progress, the test must be run again and allowed to complete normally.*

⚠ CAUTION 2:
Unterminated ports should be terminated or looped back before performing this test. Reflections from unterminated low-speed cross-connections can cause low-speed circuit packs to incorrectly appear failed.

NOTE 1:
Automatic local turnup tests will **not** operate properly if a local DDM-2000 shelf is provisioned for loop-timed mode. The timing mode must be set to external or free running (**DLP-513**) before executing the `test-auto:` command. The timing mode should be returned to the correct state after these tests have been run.

NOTE 2:
It is assumed that the DDM-2000 is installed, powered, and running and that no alarms or LED indicators are activated.

NOTE 3:
This test is automatically performed on all groups and cannot be done on an individual group.

⇒ NOTE 4:
It is recommended that all group slots and signal paths be equipped and tested before the shelf is put into service. If circuit packs are not available for all groups, test one group, move the circuit packs to another group and do an update (`upd`), then repeat this test on the next group. If a group is equipped with a **DS3** or **OLIU** circuit pack, it is recommended that the group first be tested with the **DS3** or **OLIU** circuit pack, then the circuit pack be replaced with a **MXRVO** circuit pack and the test be repeated with all low-speed slots of the group equipped with **DS1/DS1PM** circuit packs. This will ensure that all low-speed slots are good if you later want to convert a group to DS1 service.

⇒ NOTE 5:
This test assumes that default STS-1 cross-connections are in place (see `ent-crs-sts1` command). If cross-connections have been manually entered prior to this test, they may have to be deleted and new ones entered before performing this test. See the Commands and Reports section of this manual for a description of the following commands: `cnvt-crs`, `dlt-crs-sts1`, `dlt-crs-vt1`, `ent-crs-sts1`, `ent-crs-vt1`, `rtrv-crs-sts1:`, `rtrv-crs-vt1:`, and `set-ne`.

Use `rtrv-crs-sts1:` command to verify proper cross-connections are in place for each group. Use `ent-crs-sts1:` command to make proper cross-connections.

2. Install optical loops on all **OLIU**s, if not already installed. See Figure 1.

   Reference: **DLP-505**

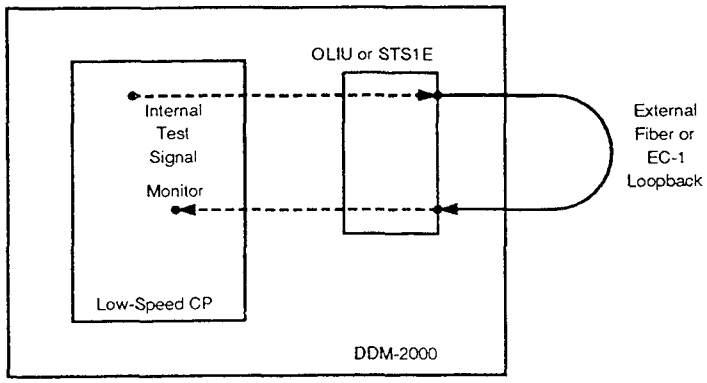


Figure 1. Automated Internal Test of Local Equipment (`test-auto:md=local`)

3. If **STS1E** circuit packs are installed, loopback the electrical EC-1 signal at the STSX cross-connect point or at the backplane BNC connectors [**J38-J39** (Group A)] [**J40-J41** (Group B)] [**J42-J43** (Group C)]. See Figure 1.

4. Is a CIT available?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 9**.

5. Connect the CIT to the **CIT** connector on the User Panel.

   Reference: **DLP-521**

6. Enter the command: `test-auto:md=local`.

7. ⇒ NOTE 1:
   If question marks appear in all places except `tg-1`, `tg-2` and `--Control--`, timing may be set for loop-timed instead of free run or external. Also, if the looping fibers on the **MAIN OLIU**s are crossed, all **OLIU**s will appear failed (`F`) and all `Low Speed` slots and `Function Units` slots will show a question mark.

   ⇒ NOTE 2:
   In Release 6 or later, an `inconsistent DCC switches` alarm will occur when the test is completed and the DDM-2000 OC-3 shelf resets. To clear the alarm, use the `set-fecom:`*`address`*`:com=disable` command to disable the DCC.

   The following CIT report will indicate the status of the equipment. It should indicate that there are no failures. If there is a failure, refer to the Trouble Clearing section of this manual. Replace any circuit pack that fails the automatic test [**DLP-523**].

```
--------Timing-------   -----Main-----   -------Function Units-------
tg-1 tg-2 ref-1 ref-2   main-1  main-2   a-1  a-2  b-1  b-2  c-1  c-2
 g    F     g     ?       g       g      g    g    g    F    -    -

Low Speed Group A  Low Speed Group B  Low Speed Group C  --Control--
 1 2 3 4 5 6 7 8    1 2 3 4 5 6 7 8    1 2 3 4 5 6 7 8     sysctl
 - - - g g F g g    - - - - - - - -    - - - - - - - -       g
*/
```

   where `g` stands for *good* and `F` stands for *Failed*, `?` stands for *unknown due to other failures*, and `-` stands for *not applicable* (that is, slots not equipped).

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. ⇒ NOTE 1:
   The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ballpoint pen to depress it.

   ⇒ NOTE 2:
   The following three steps (10 through 12) must be performed with no unnecessary delays. Read the steps first to familiarize yourself with the sequence of operations and the expected responses.

   Read Steps 10 through 12 before continuing.

10. Depress and hold the **ACO** pushbutton on the User Panel.

    Response: All LEDs on the DDM-2000 are lighted.

11. With the **ACO** pushbutton still depressed, momentarily depress the **UPD/INIT** pushbutton. Then release both pushbuttons.

    Response: All User Panel LEDs and **ACTIVE** LEDS remain lighted.

12. While all the LEDs are lighted, momentarily depress the **UPD/INIT** pushbutton ONE time. You have **1 MINUTE** to do this.

    Response: On the User Panel, **CR** LED is flashing and **MJ** LED is lighted. All other LEDs, except **PWR ON** LED and **ACTIVE** LEDs, go off. 10 seconds after the **UPD/INIT** pushbutton is depressed, **CR** LED will stop flashing and remain lighted. **MJ** LED also remains lighted. **ACTIVE** LEDs go off. This indicates the beginning of the automatic looped transmission test. **CR** and **MJ** LEDs remain lighted for duration of test. The test may take as long as 5 minutes.

    ⇒ NOTE:
    During the test, any failure will be indicated by a lighted **FAULT** LED on the affected circuit pack. This indication will remain on for 1 minute at the end of the test. If no failures are detected, the **ACO** LED on the User Panel will be lighted for 1 minute at the end of the test.

13. Wait until the test ends as described above. Was **ACO** LED lighted?

    If **YES**, then continue with **Step 14**.
    If **NO**, then proceed to **Step 16**.

14. The DDM-2000 has passed the automatic looped transmission test.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. Was any LED on the DDM-2000 lighted besides the **ACTIVE** LEDs and **CR**, **MJ**, and **ACO** LEDs on the User Panel?

    If **YES**, then continue with **Step 17**.
    If **NO**, then proceed to **Step 19**.

17. Lighted LED(s) in addition to the LEDs mentioned above indicates the circuit pack(s) that failed the automatic looped transmission test. Replace any circuit pack that failed the automatic looped transmission test.

    Reference: **DLP-523**

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. There is an inconsistent set of diagnostic indications. Refer to **Trouble Clearing: TAP-108** to clear the failure condition.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic Cross-Connect Wiring Test

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION 1:
This test may only be performed with the DDM-2000 out of service. No circuit packs should be inserted or removed while this test is in progress. If either the **SYSCTL** *or* **OHCTL** *is removed while the test is in progress, or if the system is reset while the test is in progress, the test must be run again and allowed to complete normally.*

NOTE 1:
Automatic cross-connect turnup tests will **not** operate properly if a local DDM-2000 shelf is provisioned for loop-timed mode. The timing mode must be set to external or free running (**DLP-513**) before executing the `test-auto:` command. The timing mode should be returned to the correct state after these tests have been run.

NOTE 2:
It is assumed that the DDM-2000 is installed, powered and running, connected to the cross-connect points, and that no alarms or LED indicators are activated. It is also assumed that the DDM-2000 has passed the automatic local transmission test. If this test has not been completed, refer to the appropriate installation procedure and perform that test.

NOTE 3:
This test is automatically performed on all groups and cannot be done on an individual group.

NOTE 4:
This test assumes that default STS-1 cross-connections are in place. Default cross-connections are automatically made when each function unit slot is equipped. If cross-connections have been manually entered prior to this test, they may have to be deleted and new ones entered before performing this test. See the Commands and Reports section of this manual for a description of the following commands: `cnvt-crs`, `dlt-crs-sts1`, `dlt-crs-vt1`, `ent-crs-sts1`, `ent-crs-vt1`, `rtrv-crs-sts1:`, `rtrv-crs-vt1:`, and `set-ne`.

Use `rtrv-crs-sts1:` command to verify proper cross-connections are in place for each group.

2. Install **OLIU** optical loops, if not already installed.

   Reference: **DLP-505**

3. NOTE:
   When an external loopback is established, provision for CC mode with no AIS (`set-t3:`*address*`:mode=cc,ais=no`). Otherwise, if the VMR mode is used, an `inc. DS3 OOF` alarm will be generated.

At the low-speed cross-connect point (DSX-1, DSX-3 or STSX), install a patch cord from the **OUT** jack to the **IN** jack for each DS1, DS3, or EC-1 (STS1E) circuit associated with the DDM-2000 under test. See Figure 1.

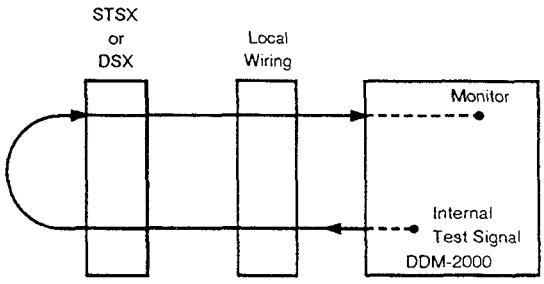


Figure 1. Automated Test of Local Wiring to Cross-Connection (`test-auto:md=dsx`)

4. Is a CIT available?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 10**.

5. Connect the CIT to the **CIT** connector on the User Panel.

   Reference: **DLP-521**

6. Enter the command: `test-auto:md=dsx`.

7. ⇒ NOTE:
   In Release 6 or later, an `inconsistent DCC switches` alarm may occur when the test is completed and the DDM-2000 OC-3 shelf resets. To clear the alarm, use the `set-fecom:`*`address`*`:com=disable` command to disable the DCC.

   The following CIT report will indicate the status of the equipment. It should indicate that there are no failures. If report indicates a failure, disconnect the cross-connect cables from the DDM-2000 and use an ohmmeter to further isolate the failure in the cross-connect wiring.

```
/* Auto-Turnup Report -- Local Wiring Cross-Connect Test
================================================================================
--Function Units--
fn-a    fn-b    fn-c
  -       F       -

      Low Speed Group A       Low Speed Group B       Low Speed Group C
port    1 2 3 4 5 6 7           1 2 3 4 5 6 7           1 2 3 4 5 6 7
 1      - - - g g ? g           - - - - - - -           - - - - - - -
 2      - - - g F ? g           - - - - - - -           - - - - - - -
 3      - - - g g ? g           - - - - - - -           - - - - - - -
 4      - - - g F ? g           - - - - - - -           - - - - - - -
*/
```

   where `g` stands for *good* and `F` stands for *Failed*, `?` stands for *unknown due to other failures*, and `-` stands for *not applicable* (that is, slots not equipped).

8. If violation monitor removal mode was set differently than the original mode in Step 3, reprovision the mode to the original or required setting using the `set-t3` command.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. ⇒ NOTE 1:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ballpoint pen to depress it.

⇒ NOTE 2:
The following four steps (11 through 14) must be performed with no unnecessary delays. Read the steps first to familiarize yourself with the sequence of operations and the expected responses.

Read Steps 11 through 14 before continuing.

11. Depress and hold the **ACO** pushbutton on the User Panel.

    Response: All LEDs on the DDM-2000 are lighted.

12. With the **ACO** pushbutton still depressed, momentarily depress the **UPD/INIT** pushbutton. Then release both pushbuttons.

    Response: All User Panel LEDs and **ACTIVE** LEDs remain lighted.

13. While all the LEDs are lighted, momentarily depress the **UPD/INIT** pushbutton one time. You have **1 MINUTE** to do this.

    Response: On the User Panel, **CR** LED is flashing and **MJ** LED is lighted. All other LEDs, except **PWR ON** LED and **ACTIVE** LEDs, go off.

14. While the **CR** LED is flashing, momentarily depress **UPD/INIT** pushbutton ONE time. You have **10 SECONDS** to do this.

    Response: On the User Panel, **MN** LED is lighted, **MJ** LED remains lighted, and **CR** LED is flashing. All other LEDs, except **PWR ON** LED and **ACTIVE** LEDs, are off. 10 seconds after the **UPD/INIT** pushbutton is depressed this last time, the **CR** LED will stop flashing and remain lighted, **MJ** and **MN** LEDs also remain lighted, and **ACTIVE** LEDs go off. This indicates the beginning of the automatic looped cross-connect test. **CR**, **MJ**, and **MN** LEDs remain lighted for duration of the test. The test may take as long as 5 minutes.

NOTE:
During the test, any failure will be indicated by a flashing **FAULT** LED on the affected circuit pack. This indication will remain on for 1 minute. If no failures are detected, the **ACO** LED on the User Panel will be lighted for 1 minute.

15. Wait until the test ends as described above. Was **ACO** LED lighted?

    If **YES**, then continue with **Step 16.**
    If **NO**, then proceed to **Step 19.**

16. The DDM-2000 has passed the automatic looped transmission test. Remove DSX/STSX patch cords and momentarily depress the **UPD/INIT** pushbutton.

17. If violation monitor removal mode was set differently than the original mode in Step 3, reprovision the mode to the original or required setting using the `set-t3` command.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. Was any **FAULT** LED on any DS1 circuit pack flashing?

    If **YES**, then continue with **Step 20.**
    If **NO**, then proceed to **Step 22.**

20. The flashing LED(s) on the DS1 circuit pack(s) indicates the circuit pack(s) that failed the automatic cross-connect transmission test. Disconnect the cross-connect cables from the DDM-2000 and use an ohmmeter to further isolate the failure in the cross-connect wiring.

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

22. There is an inconsistent set of diagnostic indications. Refer to **Trouble Clearing: TAP-108** to clear the failure condition.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Operate FE SEL Pushbutton on SYSCTL

1. ⇒ NOTE 1:
The **FE SEL** pushbutton on the **SYSCTL** can be used to display the near-end and far-end alarm/status condition. The 7-segment **FE ID** display indicates which site/shelf conditions are currently being displayed on the local User Panel. When the 7-segment display is blank, a composite of the local and far-end alarm and status conditions is displayed on the User Panel.

⇒ NOTE 2:
When the **FE SEL** pushbutton is pushed for the first time, the **FE ID** display shows **L.** and the User Panel LEDs show the conditions of the local shelf only.

If the **FE SEL** pushbutton is pushed again within 15 seconds, the **FE ID** display shows the local shelf SITE address (with the decimal point), and the User Panel LEDs show the alarm and status condition of all shelves at this site. In OC-3 applications, there will be only one shelf at each site and the set of LEDs lighted will be the same for the first and second button pushes. In OC-3/OC-12 applications, there may be up to five shelves at one site. The first button push allows isolation of a fault to a single shelf at the local site, and subsequent button pushes allow isolation of a fault to the local site or one of the remote sites.

In OC-3/OC-12 applications, each time the **FE SEL** button is pushed again within 15 seconds, the **FE ID** display and User Panel increment to display the next highest SITE address in the network and the alarm or status condition of the shelves at that site. If the local DDM-2000 OC-12 Multiplexer cannot communicate with another site due to a failure, all LEDs on the User Panel will be lighted when the FE ID display shows that site number. In OC-3 applications, each time the **FE SEL** button is pushed again within 15 seconds, the **FE ID** display increments to display the next highest SITE address in the network and the User Panel LEDs show the composite alarm and status condition of the shelves in the network at that site. If the local DDM-2000 OC-3 Multiplexer cannot communicate with another site due to a failure, then all LEDs on the User Panel will be lighted when the **FE ID** display shows that site number.

If there are more than eight sites, a dash will appear in the **FE ID** display for each site greater than eight. After cycling through the sites, **L.** and the conditions of the local shelf are again displayed.

When the **FE SEL** is released and not pushed again for 15 seconds, or if the **ACO/TST** pushbutton is pushed, the **FE ID** display will go blank and the User Panel will return to the composite display.

Momentarily depress and release the **FE SEL** pushbutton until the required SITE address and conditions are displayed.

2. Note the alarm LEDs displayed on the local User Panel. You have **15 seconds** to observe the alarm indications.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Retrieve Generic Software Version ID

1. Is a CIT available?

   If **YES**, then continue with **Step 2.**
   If **NO**, then proceed to **Step 5.**

2. Connect CIT to User Panel and establish session.

   Reference: **DLP-521**

3. Use the `rtrv-eqpt:sysctl` command to retrieve generic software version number.

   Response: System outputs an `Equipage and Version Report` which contains the program version presently loaded into the system.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. ⇒ NOTE:
When the **ACO** button is depressed, all LEDs and the 7-segment display on the **SYSCTL** light. If the **ACO** button is released within 2 seconds, the LED test completes and the 7-segment display and all LEDs will revert to normal operation. If the **ACO** button is depressed longer than 2 seconds, the 7-segment display goes blank for 2 seconds and then each digit of the generic software version code is scrolled through the display. The LEDs remain lighted while the code is being displayed. When the **ACO** button is released, the LEDs remain lighted until the full software version code is displayed. If the **ACO** button is still depressed when the software version code has completed cycling, the display goes blank for 2 seconds and starts cycling through the software version code again. This continues as long as the **ACO** button is depressed. When the **ACO** button is released the cycle will complete and the display and all LEDs go to normal operation.

Depress and hold (for longer than 2 seconds) the **ACO** button on the User Panel.

Response: All LEDs and the 7-segment display light. The display goes blank for 2 seconds and then scrolls through the full software version code.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install New Software Generic Program

1. Verify that no DCC failures or transmission failures (OC-3 LOS, flashing **OLIU FAULT** LEDs, etc.) are present on the network element or system receiving the program.

   If only the **SYSCTL** and **OHCTL** are installed (initial shelf turnup, system not in-service), proceed to Step 3, otherwise continue with Step 2.

2. ⚠ CAUTION:
   Transmission configuration information is stored on the **TGS** *circuit pack in* **TIMING** *slot* **1**. *In some instances (for example, during some upgrades or during system tests), if the version of software being installed is not compatible with the current transmission configuration (see Table A), it may be necessary to remove the* **TGS** *circuit pack in* **TIMING** *slot* **1** *to force the system to run the software you are trying to download. If both* **TGS** *circuit packs are not installed, removal of the only* **TGS** *circuit pack will cause service interruption.*

   ⇒ NOTE 1:
   If a shelf is in the STS3c mode (**`concat`** mode enabled by the **`set-oc3`** command) and a different software generic that does not have the STS3c feature is loaded, the **OLIU**s will stay in the **`concat`** mode until they are removed and reseated.

   ⇒ NOTE 2:
   The following step is recommended to protect against a loss of service because of inadvertently loading incompatible software. But, if you are sure that you want to load incompatible software (for example, Release 3 into a system with Release 5), you may elect to remove the **TGS** in **TIMING** slot **1** and allow the software to download without having to force the system to run the software.

   Before performing this procedure, it is strongly suggested that both **TGS** circuit packs be installed in the shelf and the **`switch-sync:s=circuitpack,pri=manual`** command be used to switch to the protection **TGS-2** circuit pack if not already **ACTIVE**. Use **`rtrv-sync:`** command to verify that the **TGS-2** circuit pack is **ACTIVE**. Then use the **`switch-sync:s=circuitpack,pri=inhibit`** command to "freeze" the protection switch on **TGS-2**.

Table A. DDM-2000 OC-3 In-Service Upgrade Compatibility (Note)

Current Release in Shelf (OLD)	Software Release To Be Installed (NEW)										
	Linear				Ring	Linear			Ring		
	2.1.n	3.0.n	3.1.n	3.2.n	5.1.n	6.0.n	6.1.n	6.2.n	7.0.n	7.1.n	7.2.n¶
2 1.n	OK	OK	OK	OK	C†	C‡	C‡	C‡	C†	C†	C†
3.0.n	C	OK	OK	OK	C†	C‡	C‡	C‡	C†	C†	C†
3.1 n	C	C	OK	OK	C‡	OK‡	OK‡	OK‡	C‡	C‡	C‡
3.2 n	C	C	C	OK	C‡	OK‡	OK‡	OK‡	C‡	C‡	C‡
5 1.n	C*	C*	C*	C*	OK	C*	C*	C*	OK‡	OK‡	OK‡
6.0.n	C	C	C	C	C‡	OK	OK§	OK§	C‡	C‡	C‡
6.1.n	C	C	C	C	C‡	C	OK	OK	C‡	C‡	C‡
6 2.n	C	C	C	C	C‡	C	C	OK	C‡	C‡	C‡
7.0 n	C*	C*	C*	C*	C	C*	C*	C*	OK	OK	OK‡
7.1.n	C*	C*	C*	C*	C	C*	C*	C*	C	OK	OK‡
7.2.n¶	C*	C*	C*	C*	C	C*	C*	C*	C	C	OK‡

Note. All DDM-2000 OC-3 shelves in a subnetwork should be using the same or compatible version of software. "n" is the latest point release available. When doing an upgrade, it is recommended that the latest point release of software be used, if possible.

OK - Indicates software compatibility Normal download procedures should occur without having to force the system to run the software to be installed. Other equipment/fiber changes and/or software/equipment provisioning may be required before and/or after the upgrade. See **System Turnup: IXL-001** for particular upgrade procedures and Software Release Description for software release being installed.

C - Indicates software incompatibility. The software you are installing will not support the transmission configuration that is stored in the **TGS 1** circuit pack. If required, you will have to force the system to run the software to be installed.

* When downloading a linear software release into a shelf currently containing a ring release, remove the **OLIU** circuit pack(s), reseat the **SYSCTL** circuit pack, download the linear software release, and then press the **UPD/INIT** pushbutton during the 10-second flashing **CR** LED which occurs after the last diskette is loaded. After the download is completed, reseat the **OLIU** circuit pack(s). If additional assistance is required contact the AT&T Regional Technical Assistance Center (RTAC).

† Upgrade to Release 3.1 or 3.2 required first before upgrading to desired release.

‡ Remote upgrades are not allowed. Software must be downloaded locally at each shelf. OSI upgrades require setting **OHCTL S2** user/network switches. Also, OSI releases require **ONE** shelf be set as the GNE [DSNE (R7.2)] using the **`set-ne`** command Software should be downloaded to the GNE (DSNE) (R7.2) first

§ The **`rtrv-nmap`** command is used at the GNE to sketch network. Software must be downloaded locally to the GNE first. Other shelves are then downloaded using the **`cpy-prog:tid`** command starting with the farthest shelf from the GNE and working back toward the GNE.

¶ Due to changes in OSI Protocol required for OC-3 Operations Interworking between DDM-2000 and FT-2000, Release 7.2 **DOES NOT INTERWORK** with previous OC-3 or OC-12 Releases

3. Obtain the following equipment:
   (1) AT&T PC6300 compatible personal computer (PC) running an *MS-DOS** computer program operating system, Release 2.1 or later.

   (2) RS-232 cable to connect PC **COM** port to User panel **CIT** port.

   ⇒ NOTE:
   The PC may be connected to either the front or rear CIT port, or remotely through a dial-up modem. If connected to the rear **CIT** port, a null modem is required between the RS-232 cable and the rear **CIT** port.

   (3) Working copies of the new system generic program diskette(s).

   (4) Software Release Description for software being installed.

4. Before beginning this procedure, the following is strongly suggested:
   a. Become familiar with the characteristics and operating procedures of your PC and the *MS-DOS* operating system.

      Reference: **DLP-533**

   b. Follow proper procedures in handling the diskette(s) (floppies).

      Reference: **DLP-533**

   c. Make working copies and backup copies of the original new generic program diskettes.

      Reference: **DLP-534**

   d. Obtain diskettes that have the *old* software and/or a spare **SYSCTL** and **OHCTL** with the *old* software in the unlikely event that the new program installation fails or the new software operation is unacceptable.

   e. Read the Software Release Description for software being installed.

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5. ⇒ NOTE 1:
Note that changes have been made to the **ins-prog** command for Release 6.1 and later. The following explains the use of the **ins-prog** command and the new **cpy-prog** command.

Release 6.0 or earlier

This procedure may be used to install new system software to the near-end or remote (if allowed) DDM-2000 OC-3 shelf. If you want to load new software, **Release 6.0 or earlier**, to a remote site via the DCC, log in (either physically or remotely) to a shelf containing the new software and then enter the **ins-prog:** *tid* command (where *tid* = the tid of the shelf in which you want to install the software). [The tid is the name given to a shelf (network element) using the **set-ne:** command.] If the TID entered is that of the local shelf that you are logged into (through a PC connected to the CIT port), the **ins-prog** command will load the software **from the PC** into the DDM-2000. If the TID entered is that of a remote shelf, then the **ins-prog** command will copy the software **from the local shelf** to the remote shelf. See Step 38 for remote download procedure.

Release 6.1 or later

If you want to load new software to a local or remote (if allowed) shelf directly **from a PC**, use the **ins-prog:** *tid* command where the TID entered is that of the local shelf or remote shelf where you want to install the new software. If you want to load new software, **Release 6.1 or later**, to a remote site via the DCC **from a local shelf** which already contains the new software, log in (either physically or remotely) to the shelf containing the new software, and then enter the **cpy-prog:** *tid* command (where *tid* = the tid of the shelf in which you want to install the software). [The tid is the name given to a shelf (network element) using the **set-ne:** command.] The **cpy-prog:** *tid* command will only copy software from a local controller to a remote controller; it is not used to download software from a PC.

NOTE 2:
Multi-span software download is supported for up to three spans in Release 5 and earlier. The download time will be longer (even without excessive DCC traffic) when there are additional spans between the source and target network elements. To minimize the download time and reduce DCC traffic, it is recommended that multi-span software downloading be avoided by remotely logging into the nearest shelf of the same type and remotely downloading the new program from that shelf.

NOTE 3:
When upgrading from releases without synchronization messaging to releases with this feature, it is suggested to upgrade first the shelves which are provisioned for "external timed" or "external mult" timed. This is to prevent timing "holdover" conditions at nodes that derive timing from the OC-3 line.

NOTE 4:
When upgrading to a newer generic program, the upgrade should be done in an orderly fashion as shown in Figures 1 and 2. Once the new program is installed in a shelf, a remote login (rlgn) to a shelf with an older generic cannot be done. If the correct sequence of downloading the new software is not followed, it may be impossible to continue with the upgrade remotely. This is because new generic programs may not be compatible with the old programs. For example, in Figure 1, if the new generic is first downloaded to Node 3, instead of Node 2, then you cannot remotely download software to Node 4 until Node 2 is downloaded. In Figure 2, if new software is downloaded to the OC-12 system first, then Nodes 4, 5, and 6 cannot be remotely downloaded.

Before beginning the software installation, refer to the Software Release Description for the software being installed for a description of any special considerations required when installing this version of the software.

6. ⇒ NOTE:
   This procedure may be used to install a new program because of a system upgrade, because the **BBG5 SYSCTL** or **BBG7 OHCTL** has no software, or because the current software is incompatible. **BBG5 SYSCTL** or **BBG7 OHCTL** indications may be one of the following preceding software installation:

   a. The letter **P** displayed in the **FE ID** display indicates that no software is installed in the **SYSCTL**. For Release 6 and later, if the **P** is followed by a period (**P.**), it means the software may be downloaded either locally or remotely using the `ins-prog:tid` or `cpy-prog:tid` command. If there is no period (**P**) the software can only be downloaded locally. For Release 5 and earlier, the **P** without the period means the software may be downloaded either locally or remotely.

   b. The letter **C** displayed in the **FE ID** display indicates that software is installed in the **OHCTL** and **SYSCTL**, but it will not support the current shelf transmission configuration.

   c. The letter **d** displayed in the **FE ID** display indicates the **OHCTL** has no software or that the software in the **OHCTL** and **SYSCTL** is incompatible. You must perform the button sequence in Step 26 to force a program download.

   d. Nothing displayed in the **FE ID** display indicates that compatible software is installed in the **OHCTL** and **SYSCTL**.

   e. The letter **E** displayed in the **FE ID** display indicates that open systems interconnection (OSI) software is installed and the **OHCTL** is a series **S2:2** or earlier. A series **S2:3** (linear) or **S2:4A** (ring) **OHCTL** or later must be installed for Release 6 (R7) or later software.

7. ⇒ NOTE:
At the shelf to be connected to the PC, a high baud rate setting will reduce the time required to download the new generic program. It is recommended to use 9600 baud since the default data rate for the program package is 9600 baud. At 9600 baud the program installation will take approximately 30 minutes. Not all PCs will operate properly at 19,200 baud, but if trouble is encountered during download try a different baud setting.

Ensure **SYSCTL** baud rate is set to the desired baud rate. Baud rate switch setting for 9600 at the front port is S3-1 ON, S3-2 OFF, and S3-3 OFF. Baud rate switch setting for 9600 at the rear port is S3-4 ON, S3-5 OFF, and S3-6 OFF. [**DLP-513**].

8. ⇒ NOTE 1:
The rear access CIT port is configured for a modem. A null modem is required to use this port with the PC.

⇒ NOTE 2:
The cable from the **CIT** port on the DDM-2000 must be connected to the **COM** (**COM1, COM2, COM3, or COM4**) RS-232 port of the PC.

Connect PC to **CIT** port by connecting one end of an RS-232 cable to the **COM( )** port of the PC and the other end of the cable to the front or rear DDM-2000 **CIT** port. Turn on PC.

9. ⇒ NOTE:
This procedure assumes the installation will be done using the diskette(s). Local operating procedures must be established to use a PC and a hard disk containing the necessary program files. You can **copy** all files on the source diskettes(s) to a directory [such as GEN_*ver*, where *ver* should be the program generic version, (for example, 312 for generic version 3.1.2)] on the hard disk and load the generic from that directory.

Start *MS-DOS* operating system on the PC [**DLP-534**].

Response: PC displays the prompt (`A>`, `A:/DOS>`, etc.) determined by the PC.

10. ⇒ NOTE:
The new generic program may be on many floppy disks. The PC will prompt you to insert disks as needed after the first disk is installed.

Insert the first (number 1) floppy disk into the PC drive (if not using the hard drive).

11. Use the appropriate *MS-DOS* command (for example, **a:** or **b:**) to go to the drive with the floppy disk installed (or use the **cd** command to change to the appropriate hard drive directory).

Response: PC displays the appropriate prompt (A> or B>).

Comment: If you get a disk error message, verify the drive latch is locked and that you have the proper diskette installed in the drive.

12. ⇒ NOTE:
The **checkpgm** command may take several minutes to complete.

Execute the command **checkpgm** to check the version number of the program you are installing. Insert each diskette when prompted.

approx. 3 min.

Response: `PC has DDM-2000 program version a.b.c`

13. Reinstall the first (number 1) diskette and enter **term** or **term COM***n* command, where *n* = 1, 2, 3, or 4. If **term** is entered without the **COM***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", then disregard it.

Response: A brief message is printed and you are instructed to `Press any key to continue . . .` After you press any key, the terminal emulator is loaded and the terminal responds as follows:
`CTRM ready. (Type Alt-h for help.)`
`Communications established.`

14. Was response correct?

    If **YES**, then proceed to **Step 17**.
    If **NO**, then continue with **Step 15**.

15. Ensure first (number 1) disk of program being installed is inserted. Ensure diskette is inserted in correct drive and that the right command was used to go to the drive with the diskette installed.

16. ⇒ NOTE:
    The default data rate for the CTRM terminal emulator is 9600 baud.

    If the data rate switches on the **SYSCTL** are set to other than 9600 baud, enter **`Alt-c`** and follow the instructions on the CTRM screen to set the terminal emulator data rate to match the selected data rate switch settings on the **SYSCTL**.

17. ⇒ NOTE:
    The default shelf is the shelf physically connected to the PC.

    Enter a question mark (?) or RETURN.

    Response: PC prompts with:

    ```
    /* Enter a shelf number from 1 to 8 */
    shelf [default] =
    ```

18. Was response correct?

    If **YES**, then proceed to **Step 20**.
    If **NO**, then continue with **Step 19**.

19. Check PC to **CIT** port connections. Make sure the cable is connected between the PC **COM( )** port and the **CIT** port on the DDM-2000. If the rear **CIT** port is being used on the DDM-2000, make sure a null modem is installed on the port. Ensure baud rate on **SYSCTL** and CTRM terminal emulator are the same. (CTRM communication parameters can be displayed by entering `ALT C`.) Check CTRM setup and make sure the **comm** port selected matches the port (**COM( )**) on the PC that is connected to the **CIT** port on the shelf.

    Repeat this procedure from Step 13.

20. The **FE ID** display will either be blank or display a letter. Note the **FE ID** display and continue with the following indicated step:
    a. If the display has the letter **P** displayed, continue with **Step 21**.
    b. If the letter **C** is displayed, proceed to **Step 23**.
    c. If the letter **d** is displayed, proceed to **Step 26**.
    d. If the display is blank, proceed to **Step 28**.
21. Enter the shelf number for the shelf being used for new program download.

approx. 15-45 min.
at 9600 baud

Response: PC starts download and prints the following message:

```
In progress . . . .
```

The dots continue to print until program installation is complete. Insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog:TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

22. Was response correct?

    If **YES**, then proceed to **Step 37**.
    If **NO**, then proceed to **Step 34**.

23. ⚠ CAUTION:
If the system is in service and is forced to run the current software that is displaying a **C**, *service interruption may result.*

⇒ NOTE:
Indications are that there may be a problem with the version of software you are installing or you are trying to install a version of software that will not support the system transmission configuration that you have. Under normal upgrade procedures, this indication should not occur. But, if you are downloading an older version of software or upgrading to a new version of software which is incompatible with the version that you have (for example, upgrading a Release 2 or 3 point-to-point system to a Release 5 ring configuration), this indication will occur. You can *force* the system to run the current software or back out of this procedure by loading another version of software.

You must decide if you want the system to run this current version of software or if you want to download another version (original version or new version) of software.

Do you want to run the current version of software in the **SYSCTL**?

If **YES**, then continue with **Step 24**.
If **NO**, then proceed to **Step 26**.

24. To *force* the system to run the current software, perform the following:
    a. Ensure that a **TGS** circuit pack is installed in the **TGS-2** slot.
    b. Remove the **TGS-1** circuit pack, if not already removed.
    c. Reset (unplug and reseat) the **SYSCTL** to force it to run the current software.
    d. After the current software is up and running (no alarm LEDs lighted or you can log into the shelf), reinstall the **TGS-1** circuit pack.
    e. Use the `switch-sync:s=circuitpack,pri=reset` command to clear active switch request.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. ⇒ NOTE:
If the following download fails, check that the DDM-2000 is connected to the PC through the **COM1** port. If it is not, reconnect the PC to DDM-2000 using the **COM1** port and repeat the procedure.

Find new version of software, insert first diskette (Steps 10 through 17), then unplug and reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display (approximately 15 seconds).

approx. 15-45 min.
at 9600 baud

Response: PC starts download and prints the following message:

```
In progress . . . .
```

The dots continue to print until program installation is complete. Insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog:TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

27. Was response correct?

If **YES**, then proceed to **Step 37**.
If **NO**, then proceed to **Step 34**.

28. Enter the shelf number for the shelf being used for new program download.

    Response: PC responds with:

```
/************************************
*                                   *
*              AT&T                 *
*      DDM-2000 OC-3 Multiplexer    *
*                                   *
*         Release a.b.c             *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm: all COMPLD
   /* Active Alarms and Status Report
```

29. ⇒ NOTE:
    After the system prompt (<), the system will respond normally to commands entered. The Commands and Reports section of this manual gives a description of the commands.

    Use **rtrv-nmap** (R7.1 and earlier) or **rtrv-map-network** (R7.2) command to retrieve the name (*tid*) of the shelf having new program installed. When upgrading to R7.2, if a shelf having R7.2 installed is provisioned as the GNE, use **set-ne** command to set the **gne** parameter to *no*. After the R7.2 software is downloaded to the shelf, use the **set-ne** command to set the **dsne** parameter to *yes*.

30. Check that disk is installed, then enter the command **ins-prog:***tid* (**cpy-prog:***tid*)

    Where tid = the target identifier (shelf name) for the DDM-2000 shelf having the new program installed. See response in Step 28 above or use **rtrv-ne** command to get *tid* for this shelf.

    Response: `/* Testing For Program Installation... */`

    After several seconds, the PC prints a `Caution!` message followed by the prompt:

    `Execute? y/n =.`

31. Was response correct?

    If **YES**, then continue with **Step 32**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

32. Enter a `y` or `yes` and a carriage return to execute the program.

    approx. 15-45 min. at 9600 baud

    Response: **ABN** LED lights on User Panel and a **P** is displayed in **SYSCTL FE ID** display in the shelf receiving the program. At DDM-2000 shelves connected directly to the shelf receiving the program, **MJ** and **NE ACTY** LEDs light on User Panel and **FAULT** LED flashes on **OHCTL**. At other shelves in the same control system, **MJ** and **FE ACTY** LEDs light on User Panel. PC starts download and prints the following message:

    ```
    In progress . . . .
    ```

    The dots continue to print until program installation is complete. If this is a local download, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

    ```
    ins-prog:TID COMPLD
    /* Generic a.b.c is installed */
    ```

    The **SYSCTL** resets, and the terminal is logged off the system if this is a local download. The LEDs go off on the User Panel and **SYSCTL**.

33. Was response correct?

    If **YES**, then proceed to **Step 37**.
    If **NO**, then continue with **Step 34**.

34. Did a **C** appear in the **FE ID** display after the software download?

    If **YES**, then proceed to **Step 23**.
    If **NO**, then continue with **Step 35**.

35. Did an **E** appear in the **FE ID** display after the software download?

    If **YES**, then continue with **Step 36**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

36. Indications are that a series **S2:2** or earlier **OHCTL** circuit pack is installed and Release 6 (R7) or later software is installed. Replace the **OHCTL** with a series **S2:3** (linear) or **S2:4A** (ring) or later and repeat this procedure.

37. ⇒ NOTE:
    When program installation is complete, use the **`switch-sync:s=circuitpack,pri=reset`** command to reset the **TGS-2** circuit pack protection switch, if set in Step 2 of this procedure.

    Has new program been installed to all DDM-2000 shelves in the system?

    If **NO**, then continue with **Step 38**.
    If **YES**, then proceed to **Step 41**.

38. ⚠ CAUTION:
Only one **cpy-prog** *procedure at a time should be performed in the same maintenance subnetwork. Multiple simultaneous procedures in the same network may cause the software copying procedure to fail.*

NOTE 1:
Some software must be loaded locally at each shelf. It cannot be downloaded from one shelf to another using the **ins-prog:***tid* command or **cpy-prog:***tid* command. See Table A, Page 2.

NOTE 2:
When loading **Release 6.0 and earlier software**, if remote downloading is permitted and a new program has been installed at one end, either a PC or CIT may be used to directly install the program to the far-end system(s) using the **ins-prog:***tid* command. For **Release 6.1** and later, if remote downloading is permitted, the **cpy-prog:***tid* command may be used to copy the local controller software to the remote controller, or the **ins-prog:***tid* command may be used to remotely download the software from a PC. Far end communications (fecom) must be enabled using the **set-fecom:***address***:com=enabled** command.

If remote downloading is permitted and other shelves in the system require new software, enter the command **ins-prog:***tid* or **cpy-prog:***tid* depending on the release being installed.

Where tid = the target identifier (shelf name) for the DDM-2000 shelf having the new program installed. Use **rtrv-ne** command to get the *tid* of the shelf.

Response: `/* Testing For Program Installation... */`

After several seconds, the PC prints a `Caution!` message followed by the prompt:

`Execute? y/n =.`

39. Was response correct?

    If **YES**, then continue with **Step 40**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

40. Enter a *y* or *yes* and a carriage return to execute the program.

    approx. 15-45 min. at 9600 baud

    Response: **ABN** LED lights on User Panel and a **P** is displayed in **SYSCTL FE ID** display in the far-end shelf receiving the program. At DDM-2000 shelves connected directly to the shelf receiving the program, **MJ** and **NE ACTY** LEDs light on User Panel and **FAULT** LED flashes on **OHCTL**. At other shelves in the same control system, **MJ** and **FE ACTY** LEDs light on User Panel. PC starts download and prints the following message:

    ```
    In progress . . . .
    ```

    The dots continue to print until program installation is complete. After installation is completed, the PC prints the following completion message:

    ```
    ins-prog:TID COMPLD
    /* Generic a.b.c is installed */
    ```

    The **SYSCTL** resets. The LEDs go off on the User Panel and **SYSCTL**.

41. Log out and disconnect PC.

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

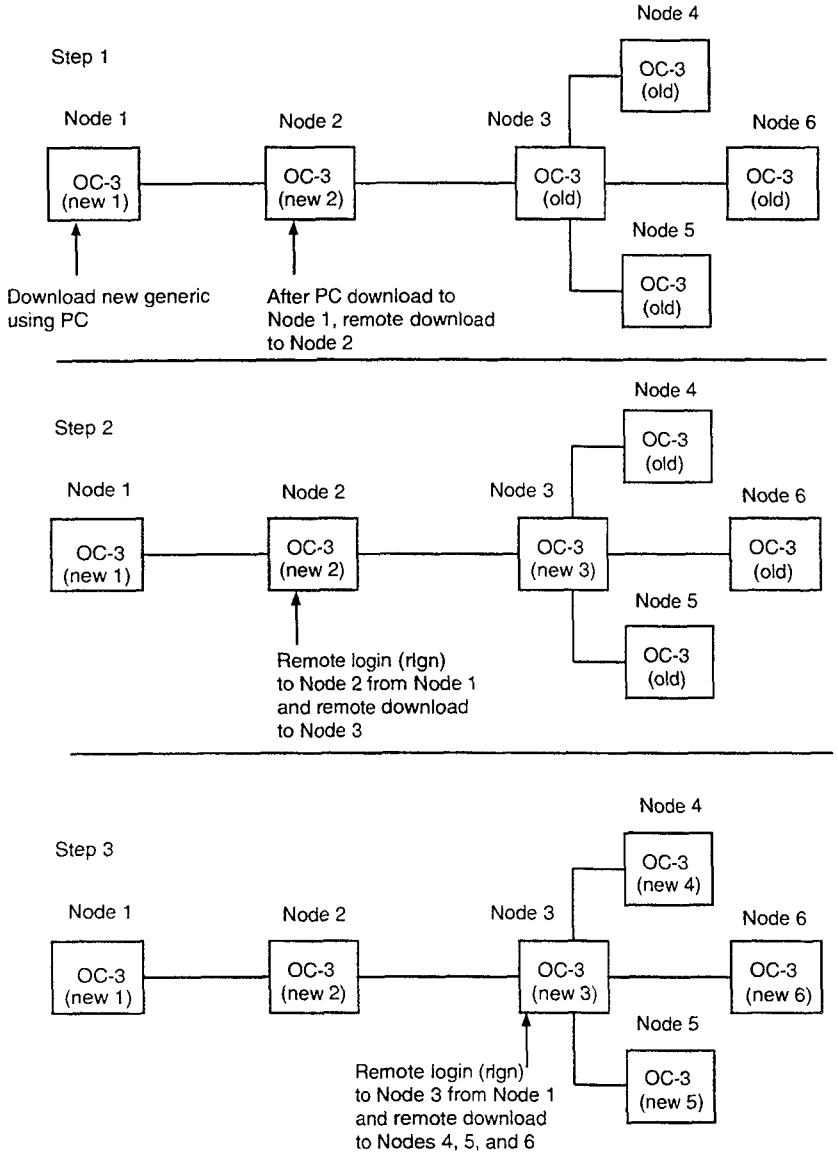


Figure 1. Example of Software Upgrade Steps for OC-3 Only Network

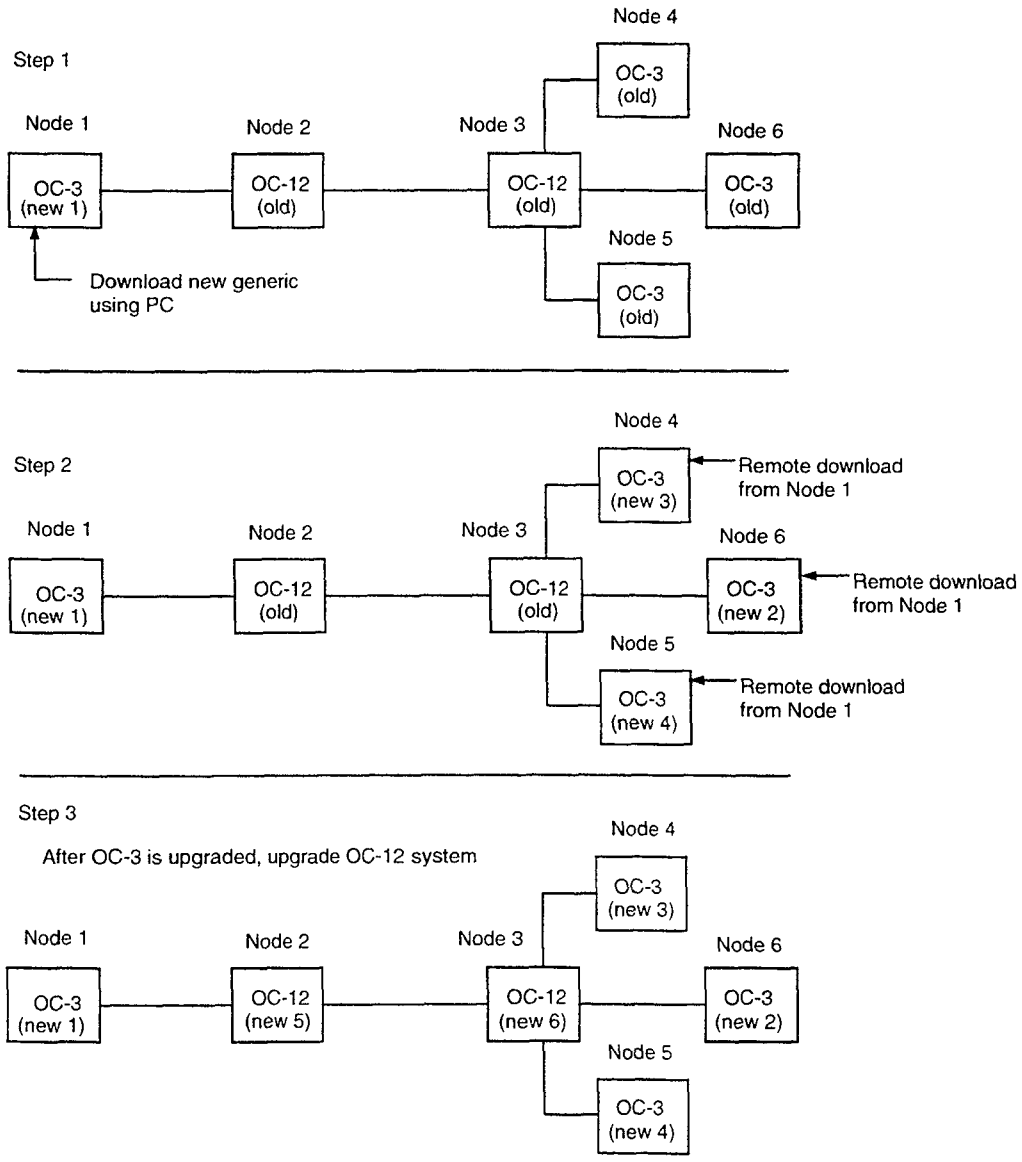


Figure 2. Example of Software Upgrade Steps for OC-3/OC-12 Network

Introduction to the PC

General

This DLP provides a brief introduction to the PC. It includes proper handling and storage of diskettes and some of the important procedures you should follow when working with your PC. This DLP is a brief review of PC concepts. Refer to your PC user's guide for a complete description.

Anatomy of a PC

PCs vary in physical appearance and size, most *IBM** compatible PCs consist of three basic parts — a main unit, a monitor, and a keyboard. Note that some PCs, particularly portables, integrate the keyboard, monitor, and main unit into a briefcase-size package. The DDM-2000 generic program may be installed with either a desktop PC or a portable PC. The diskettes may be either 3-½ inch floppy disks or 5-¼ inch floppy disks.

Main Unit

The main unit of the PC contains the CPU (central processing unit), disk drive(s), and memory, among other things. All main units have some common features which include:

- ON/OFF Switch — This switch is used to switch the PC **ON** or **OFF**. It is usually located on the back of the PC, near where the AC power cord plugs in to the PC.
- Serial Port — This is the port which the PC uses to communicate with the customer equipment. When using the PC to install a new generic program to DDM-2000, the COM1 port must be used. Refer to your PC documentation to determine which port is the COM1 port. There are two types of serial port connectors:
  - — 25-pin RS-232 connector (male)
  - — 9-pin connector (male).

---

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If your PC has the 9-pin connector, you will need a serial port adapter which converts the 9-pin connector to a 25-pin connector. This is a cable which has a 9-pin connector on one end and a 25-pin male connector on the other end.

- Parallel Port — This port is used to connect to some printers.
- Disk Drives — PCs come in several basic types, some of which are as follows:
  - — Single floppy disk, no hard disk — This type PC is the most basic configuration. The PC has a single floppy disk drive, with no hard (fixed) disk. The floppy drive is referred to as drive **A**.
  - — Dual floppy disk, no hard disk — This type PC is identified by the two floppy disk drives installed. One floppy drive is referred to as drive **A**. The second is referred to as drive **B**.
  - — Single floppy disk with hard disk — This type PC has a single floppy disk drive and a hard disk, which can typically store 10 or more megabytes of data. The single floppy disk drive is referred to as drive **A**, and the hard disk is usually referred to as drive **C** .

Other combinations of floppy and hard drives are possible but all that is required is a single floppy drive as a minimum. The procedures in this manual for installing a new generic program indicate using drive **A**.

Monitor

The monitor, sometimes called a display screen, may be either monochrome or color.

Keyboard

The keyboard is used to enter commands. This section reviews some of the features of the keyboard and points out some of the special keys.

The keyboard is divided into two different sections:

- *Typewriter section* — This area has the alphanumeric keys that resemble the layout of a typewriter. In particular, you should locate the **ENTER** key (sometimes referred to as **RETURN**). This key is located on the right side of the typewriter section. It usually has the word **ENTER** or **RETURN** printed on the key. When you are asked to select **<ENTER>** or **RETURN**, you should momentarily depress that key, or equivalent.
- *Special Keys* — The keyboard has many special keys which are interpreted differently by various software packages. Locate the **CANCEL** or **DELETE** key. This key may be used to abort a command.

Rebooting the PC

Occasionally, you may have to reboot the PC. There are three ways to accomplish this:

- Power **ON/OFF** switch — If the PC is **OFF**, you should set the **ON/OFF** switch to the **ON** position. If the PC is already **ON**, it is preferable to reset it using one of the following two methods:
- **RESET** button — Not all PCs have a **RESET** button, but if yours does, it provides an easy way to reset the PC. Alternatively, the following method may work.
- Hold down the **CTRL**, **ALT**, and **DELETE** keys all at the same time.

If **RESET** or **CTRL**, **ALT**, and **DEL** keys are not effective, turn **OFF** the PC, wait a few seconds, and turn it back **ON**. Rebooting the PC clears all data you had in memory. If the time of day clock is not indicating the current time and date, set the time of day clock.

Diskettes — Care and Handling

Diskettes are sometimes called floppy disks, or floppies for short. Diskettes are similar to cassette tapes—magnetically encoded information is stored on the diskette for later retrieval. By adhering to the following guidelines you will increase the useful life of your diskettes:

DO:

- — Keep the diskette in a protective envelope when not in use.
- — Keep the diskette in a dry place.
- — Keep the diskettes away from magnetic fields or objects (for example, magnetic screwdriver.)

DO NOT:

- — Touch any of the exposed surfaces of the diskette itself; handle it by the edge of the jacket. Very tiny scratches, fingerprints, or dust can ruin a diskette.
- — Bend a diskette.
- — Write on a diskette label with a ballpoint pen or pencil. Use a felt-tipped pen instead. Write the label before applying it to the diskette if possible.
- — Erase the diskette label with a pencil eraser. The dust may destroy the diskette. Instead, place a new label over the old one.

Inserting Diskettes

You should ***never*** remove or insert a diskette while the disk drive indicator light is on. (The computer turns the indicator light on to let you know that it is reading or writing from the disk.) Always wait for the indicator light to go off before opening the disk drive door. Failure to do this may result in damaging the diskette or loss of data on the diskette. Insert a diskette into a disk drive as follows:

1. Open the diskette drive door.
2. Gently insert the diskette with the label facing up and the notch on the left, if provided.
3. Slide the diskette in as far as it will go, but do not force it. You may hear a click when the diskette is all the way in.

   ⚠ CAUTION:
   Do not attempt to force the diskette into the drive.

   If resistance is felt or it does not slide in easily, remove the diskette and insert it again.
4. Close (latch) the disk drive door.

When you are instructed to insert a diskette into a drive, it is implied that you should open the door, slide the diskette in all the way, and close (latch) the door.

Removing Diskettes

Wait for the indicator light on the disk drive to go off. Open the disk drive door. The diskette may pop out for easy removal. (Opening up a disk drive door is similar to ejecting a cassette from a cassette recorder.) After the diskette has been removed, place it into its protective envelope or storage facility.

Copy Diskettes and Make Backups

General

If you are using new generic program diskettes for the first time, there are two things that you should do:

1. Create a working copy.
2. Make backup copies.

Before installing the program, it is a good idea to make backup copies of the working copy. If the working copy is ever lost or damaged, you will have a backup copy and will not have to create a new working copy from the original.

Create a Working Copy

The diskette(s) sent to you contains the new generic program software. However, before you can install this new program, you have to load the *MS-DOS** operating system software. (If you are not sure how to do this, instructions are given in the "Starting *MS-DOS* Software" section.) The new generic program software requires *MS-DOS* software (Release 2.1 or later).

To load the version of *MS-DOS* software, you can copy the *MS-DOS* onto the first diskette, and then copy the new generic program software to that diskette also. Once you have done that, simply insert that diskette into the drive and reboot the PC. The new diskette(s) that you create will be your working copy of the new generic program. The original diskette(s) that you received should be stored in a clean, dry place.

You will need the following to create a working copy:

- The *MS-DOS* software disk with Release 2.1 or later.
- A blank diskette(s) (this will become the working copy).
- The original diskette(s) containing the new generic program.

---

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There are three steps required to create a working copy:

1. Start *MS-DOS* software.
2. Format a new diskette(s).
3. Copy the original diskette(s) that you received with your package to the working diskette(s).

Starting *MS-DOS* Software

Insert your copy of the *MS-DOS* diskette into drive **A**, close the door, and reboot or turn on the PC. The disk drive indicator light will come on, and the PC may print out diagnostic results on the monitor. In addition, the memory size may be printed out as the memory tests are run. Typical memory sizes are 256K, 512K, and 640K. When *MS-DOS* software is ready, a prompt (for example, **A>**) appears on the display screen. This is how *MS-DOS* software lets you know it is ready for you to type a command. You are now ready to format the blank disk(s).

Formatting a New Diskette

You will need a blank diskette(s). It is a good practice to label diskettes so that you can keep track of them. You should prepare a label for the diskette(s) marked as AT&T DDM-2000 OC-3 Release a.b.c - working copy. The a.b.c is the release version that you are copying.

⚠ WARNING:
Do not write on diskette label using a ballpoint pen or pencil.

When the prompt **A>** appears, type the following command, and then press **<ENTER>**. (If you make a mistake while entering this command, you can press the **BACKSPACE** key, or equivalent, which will erase one character at a time.)

```
format a:/s <ENTER>
```

You will see a message similar to the following (the exact wording of the message may vary depending on which PC you are using):

```
Insert new diskette for drive A:
 and strike any key when ready
```

Now open the drive door and remove the *MS-DOS* diskette. Place the *MS-DOS* diskette in its envelope, and set it aside for the time being.

Next, insert the blank diskette into the drive and close the door. Depress any key on the keyboard to begin formatting. After you depress a key, a message similar to the following will appear:

```
Formatting...
```

You will see the disk drive indicator light come on. The formatting process takes several minutes. When the formatting is complete, a message appears to tell you that the format is complete. In addition, you will see several lines of messages about total disk space available. Finally, you will be prompted to format another disk with the following message:

```
Format another (Y/N)?
```

If you do not need to format another disk, type **n** and **<ENTER>**. The system will respond with a prompt **A>** display.

Remove the diskette from the disk drive and place it in a protective envelope or storage location. If you have not already done so, label the diskette(s) as AT&T DDM-2000 OC-3 Release a.b.c - working copy. You are now ready to copy the files from the original diskette(s) to the working copy diskette(s).

Copying Files — General

The process of copying files from one diskette to another varies slightly depending on whether you have one or two floppy disk drives.

If you have a dual floppy PC, *MS-DOS* software refers to one disk drive as drive **A** and the other disk drive as drive **B**. If you have a single floppy PC (one floppy drive, with or without a hard disk), *MS-DOS* software treats the floppy disk drive as both drive **A** and drive **B**. The hard disk is usually referred to as drive **C**.

To do the new generic program installation using floppy diskettes, all the following files must be on a single diskette:

CHECKPGM.EXE	CRTM.EXE	CTRM.INI	CTRM.SCR	GENERIC.0
PCLOAD.EXE	README	TERM.BAT	STAGE_1.0	STAGE_10.0

The remaining files similar to the following can be on the same diskette or on another diskette:

GENERIC.1	GENERIC.2	GENERIC.3	GENERIC.4	GENERIC.5 ...
GENERICO.0	GENERICO.1	GENERICO.2 ...		

To do the new generic program installation using the PC hard disk, all the files listed in the README file must be on the hard disk in the directory from which you will do the installation.

To read the contents of the README file, use the `more < README` command. To list the files on the hard disk or floppy diskette, use the `dir/p` command.

Copying Files — Hard Disk System

Set up your hard disk so that when you turn on your computer, it starts up using the hard disk instead of the *MS-DOS* system diskette. When prompt **C:>** appears, type the following commands:

```
mkdir ngp <ENTER>
cd ngp <ENTER>
```

Insert the original generic program diskette in drive **A**, and close the door. Type the following command:

```
copy a:*.* <ENTER>
```

This command tells *MS-DOS* software to copy all of the files from the **A** drive to the **C** drive (hard disk). Open the drive door, and remove the original diskette from the drive. Repeat this procedure for all diskettes.

Copying Files — Single Floppy System

If you have a single floppy system (with or without a hard disk), insert the original new generic program diskette into drive **A**, and close the door. Type the following command after the prompt:

```
copy  a:*.*  b: <ENTER>
```

This command tells *MS-DOS* software to copy all of the files from drive **A** to drive **B**. Since there is no drive **B** physically installed, *MS-DOS* software will pretend that there is one. It does this by copying a file from drive **A** (as much as it can fit) into the PC's memory. It then displays the following message:

```
Insert diskette for drive B:
Strike any key when ready...
```

Open the drive door, and remove the original diskette from the drive. Insert the working copy diskette into the drive, and close the door. Depress any key. The *MS-DOS* software now copies the file from the PC memory to the working copy diskette which you inserted into drive **A**. When the copy is complete, it will display the following message:

```
Insert diskette for drive A:
Strike any key when ready...
```

Open the drive door, and remove the working copy diskette from the drive. Insert the original diskette into the drive, and close the door. Depress any key. The *MS-DOS* software now begins where it left off. This process repeats until the entire diskette has been copied. In summary:

- When you are prompted to insert diskette for drive **A**, insert the original diskette into the floppy drive.
- When you are prompted to insert diskette for drive **B**, insert the working copy diskette into the floppy drive.
- Repeat until the prompt **A>** appears on the display screen.

When the process is complete, the prompt **A>** will be displayed on the screen. Repeat this procedure for all original diskettes. Before using the diskette(s) to install the new program, it is a good idea to make backup copies of the working copy. If the working copy is ever lost or damaged, you will have a backup copy and will not have to create a new working copy from the original(s).

Making Backups — Single Floppy System

Insert the *MS-DOS* diskette into drive **A**. Type:

```
diskcopy a:  b: <ENTER>
```

A message similar to the following appears:

```
Insert SOURCE diskette in drive A:
    Strike any key when ready
```

Wait for the disk drive indicator light to go off. Remove the *MS-DOS* disk from drive **A** and insert the working copy diskette (the source) into the drive. Press any key. The disk drive indicator light will come on to indicate that the copying is in progress. The *MS-DOS* software copies as much of the diskette as it can into the PC's memory and then displays the following message:

```
Insert TARGET diskette in drive A:
    Strike any key when ready
```

Remove the working copy (source) diskette, insert the new (target) diskette, and press any key. It is not necessary to preformat the new diskette; the diskcopy command will do this for you. Depending on the amount of memory in your computer, you may be prompted to repeat this several times. When the copy is complete, the following message will appear:

```
Copying complete

Copy another (Y/N)?
```

If you wish to make additional backups, type **y** and follow the same instructions. If you are done, type an **n** and **<ENTER>**. When the prompt **A>** appears, wait for the disk drive indicator light to go OFF and remove floppy. Label the backup floppy with an appropriate label (for example, AT&T DDM-2000 OC-3 Release a.b.c - working copy backup).

Copying Files — Dual Floppy System

Insert the first original new generic program diskette into drive **A** and close the door. Insert the formatted copy diskette into drive **B** and close the door. Type the following command:

```
copy  a:*.*  b: <ENTER>
```

The files from the original diskette will be copied to the working diskette one at a time. When the process is complete, the prompt **A>** will be displayed on the screen. Repeat the procedure for all remaining original diskettes. Label all diskettes.

Making Backups — Dual Floppy System

Insert the *MS-DOS* diskette into drive **A**. Type in the following command:

```
diskcopy a: b: <ENTER>
```

A message similar to the following is displayed:

```
Insert SOURCE diskette in drive A:
Insert TARGET diskette in drive B:
    Strike any key when ready
```

Wait for the disk drive indicator light to go off. Remove the *MS-DOS* disk from drive **A** and insert the working copy diskette (the source). Insert a new diskette into drive **B** (the target). It is not necessary to preformat the new diskette; the disk copy command will do this for you. Press any key when ready.

The disk drive indicators on both the **A** and **B** drives will light, indicating that the copying is in progress. Do not open a drive door while the disk drive indicator light is on. When copying is complete, a message similar to the following appears:

```
Copying complete

Copy another (Y/N)?
```

If you wish to make additional backups, type **y** and follow the same instructions. If you are done, type **n** and **<ENTER>**. When the prompt **A>** appears, wait for the disk drive indicator light to go OFF and remove both floppies. Label the backup floppy with an appropriate label (for example, AT&T DDM-2000 OC-3 Release a.b.c - working copy backup).

Upgrade BBF2 TGS To BBF2B TGS

1. ⚠ CAUTION:
If shelves in a bay are connected together with timing mult cabling, changing the timing mode on one system may affect the timing for other systems. Ensure that proper timing arrangements are made for all affected shelves.

⇒ NOTE:
This procedure may be used to replace existing **BBF2 TGS** circuit packs with **BBF2B TGS** circuit packs.

Verify that there are no alarms or protection switches present on the system.

2. Set new **BBF2B TGS** circuit pack option switches as required.

   Reference: **DLP-513**

3. Is timing mode DS1 External?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 6**.

4. Check external timing references to ensure they are good.

5. ⇒ NOTE 1:
ED-8C724-20, G339, G340, or G341 cables are used to connect timing references to shelf 1 in a bay. ED-8C724-20, G373 or G374 (rear access) or ED-8C724-21, G414 and G415 (front access) cables are used to multiple timing references to subsequent shelves in the bay (for example, from shelf 1 to shelf 2, from shelf 2 to shelf 3, etc.). The cable from the timing reference source to shelf 1 is connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). The cable from shelf 1 (or lower shelf) to the next higher shelf is connected from jack **J44** (**P237**) of the lower shelf to jack **J37** (J237) of the next higher shelf.

NOTE 2:
If the **BBF2B TGS** timing mode is set to DS1 External sync out mode, an ED-8C724-20, G394 cable must be connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). This cable has a relay to disconnect the incoming external timing supply if the **TGS** circuit pack is removed.

Make DS1 external timing reference connections as shown in Table A.

Table A. DS1 External Timing Reference Source Connections

Name	Desig.	Conn.	Term.	Color
Receive from Primary DS1 Reference	T	P37	6	BK
	R		1	O
Receive from Secondary DS1 Reference	T		7	R
	R		2	G

6. Make synchronization DS1 timing output connections as shown in Table B, if required.

Table B. DS1 Timing Output Connections

Name	Desig.	Conn.	Term.	Color
Transmit Primary DS1 Reference	T	P44	6	BK
	R		1	O
Transmit Secondary DS1 Reference	T		7	R
	R		2	G

7. CAUTION:
A momentary transmission hit (error) will occur when the **TGS** *circuit pack is switched.*

Is a CIT available?

If **YES**, then continue with **Step 8.**
If **NO**, then proceed to **Step 9.**

8. Use `switch-sync:s=circuitpack,pri=manual` command to switch timing to protection **TGS** in **TIMING** slot **2**, if not already active.

Response: **ACTIVE** LED lights on **TGS** circuit pack in **TIMING** slot 2.

9. ⇒ NOTE:
   If external timing mode is used and bay mult cables for DS1 timing references connect shelves in a bay, removing a **TGS** circuit pack causes a momentary loss of the associated incoming DS1 timing reference. This may result in a `inc. DS1 sync. ref. LOS` alarm on all shelves above this shelf that are connected to the same bay mult cabling. This momentary loss of timing reference does not affect transmission.

   Remove old **TGS** circuit pack from **TIMING** slot **1**.

10. Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

11. Insert new **BBF2B TGS** circuit pack into **TIMING** slot **1**.

    Response: **FAULT** LED lights on **TGS** circuit pack in slot **1**.

12. ⇒ NOTE:
    The critical (**CR**) alarm LED may light for up to 15 seconds after the **UPD/INIT** button is depressed on the **SYSCTL**. This does not indicate a service interruption.

    Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

    Response: **FAULT** LED lights on **TGS** circuit pack in **TIMING** slot **2**. **FAULT** LED goes off on **TGS** circuit pack in **TIMING** slot **1** after about 15 seconds. **ACTIVE** LED goes off on **TGS** circuit pack in **TIMING** slot **2** and lights on **TGS** circuit pack in **TIMING** slot **1**.

13. Remove old **TGS** circuit pack from **TIMING** slot **2**.

14. Insert new **BBF2B TGS** circuit pack into **TIMING** slot **2**.

    Response: Red **FAULT** LED on **TGS** circuit pack in slot **2** lights for about 15 seconds then goes off.

15. If a CIT is available, use the `rtrv-sync` command to display the provisioning and operational information of the synchronization interface.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Test of RT Batteries Using 197A BATTERY LOAD TEST SET

1. ⚠ CAUTION:
   Service interruption will occur if batteries are disconnected and AC power is not available.

   Obtain **197A BATTERY LOAD TEST SET (197A)** and place near batteries to be tested (Figure 1).

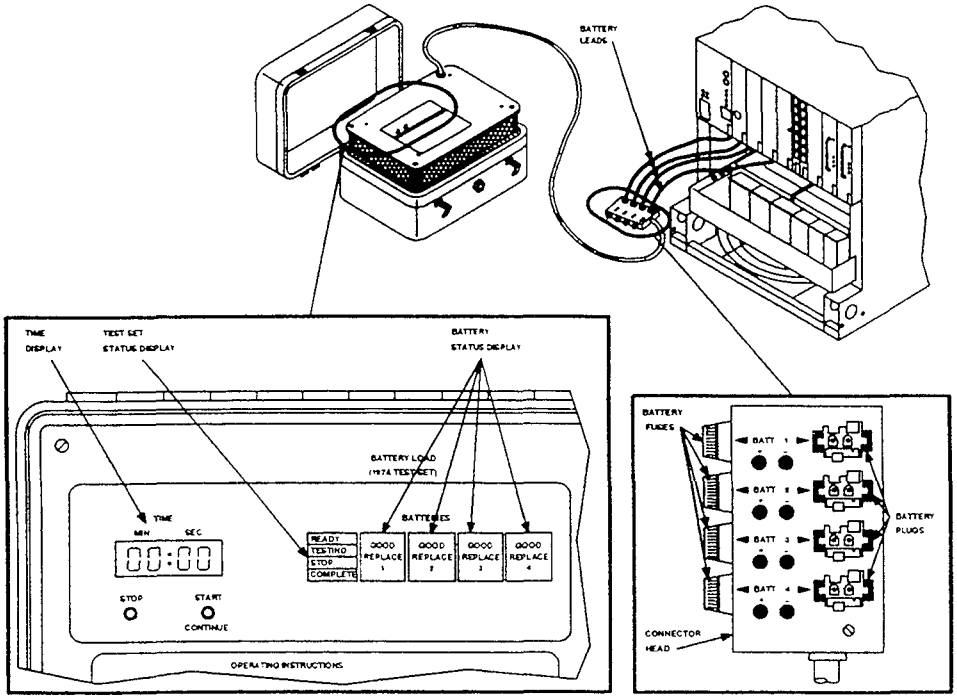


Figure 1. 197A Battery Load Test Set Test Connections

2. ⇒ NOTE:
   The **197A** test set is intended to test batteries that are fully charged. A minimum of two days must be allowed between the time the batteries (new or replacement) are put on high rate charge and this test is made. After testing is completed, the batteries must be put on high rate charge using the **337A BATTERY CHARGER**.

   Remove cover from **197A** test set.

3. Check **197A** test set for proper operation (if not already performed).

   Reference: **DLP-537**

4. Ensure that system(s) associated with batteries to be tested has AC power available (**PMN** or **P/M** indicator on **BCU** circuit pack not lighted).

5. On **337A BATTERY CHARGER** associated with batteries to be tested, is **HIGH RATE CHG/ON** indicator lighted?

   If **YES,** then continue with **Step 6.**
   If **NO,** then proceed to **Step 7.**

6. Batteries are on high charge and may require up to 24 hours to charge. Do not perform this procedure until **HIGH RATE CHG/ON** indicator on **BATTERY CHARGER** goes off.

7. ⚠ CAUTION:
   Service interruption will occur if batteries are disconnected and AC power is not available.

   Disconnect battery leads of batteries to be tested from battery shelf.

8. ⇒ NOTE:
   Under normal conditions, when the first battery is connected, the following occurs: (a) The test set **TIME** display indicates **00 MIN:00 SEC**; (b) the status display indicates which test set **BATT** plug the battery is connected to, status of the battery (**GOOD** or **REPLACE**), and the **READY** indicator lights; (c) test set fan operates.

At test set connector head (Figure 1), connect battery leads (up to four) to **BATT 1, 2, 3,** and 4 plugs.

9. ⇒ NOTE:
   If status display does not indicate battery number of battery status, **BATT** fuse may be blown, connector head or test set may be defective, or battery pack is defective.

   Does test set display indicate **REPLACE** for all batteries being tested?

   If **YES,** then continue with **Step 10.**
   If **NO,** then proceed to **Step 12.**

10. Replace all batteries and connect good batteries to battery shelf.

11. Place batteries on high charge by depressing **HIGH RATE CHG/ACTIVATE** pushbutton on **BATTERY CHARGER** and repeat from Step 6.

12. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    ⇒ NOTE:
    This test must run for a full 15 minutes to be valid or until all batteries indicate **REPLACE**. The **STOP** button should only be used if a problem occurs during the test, if the test is to be terminated early because of loss of AC power, or all batteries indicate **REPLACE**. The **START/CONTINUE** button is used to continue the test if no problem is found.

    Depress **197A** test set **START/CONTINUE** button.

    Response: At **197A** test set, **TESTING** indicator is lighted, **READY** indicator is off, and **TIME** display is counting time.

13. ⇒ NOTE:
    If one, two, or three, but not all, batteries show **REPLACE** during the test period, the remaining batteries still must be tested for the full 15 minutes.

Does test set show **REPLACE** for all batteries within the 15-minute test period shown on **TIME** display?

If **YES,** then continue with **Step 14.**
If **NO,** then proceed to **Step 15.**

14. ⚠ DANGER:
A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

Depress test set **STOP** button. Proceed to **Step 17.**

Response: **STOP** indicator on test set lights

15. After 15 minutes, the test set **COMPLETE** indicator lights.

16. Is any **REPLACE** indicator on test set lighted?

If **YES,** then continue with **Step 17.**
If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Unplug and set aside all defective batteries.

18. Install and connect replacement batteries to battery shelf. Reconnect any remaining good batteries to battery shelf.

19. Place batteries on high charge by depressing **HIGH RATE CHG ACTIVATE** pushbutton on **BATTERY CHARGER** and repeat from Step 6.

Check 197A BATTERY LOAD TEST SET

1. Obtain **197A BATTERY LOAD TEST SET**. See Figure 1.

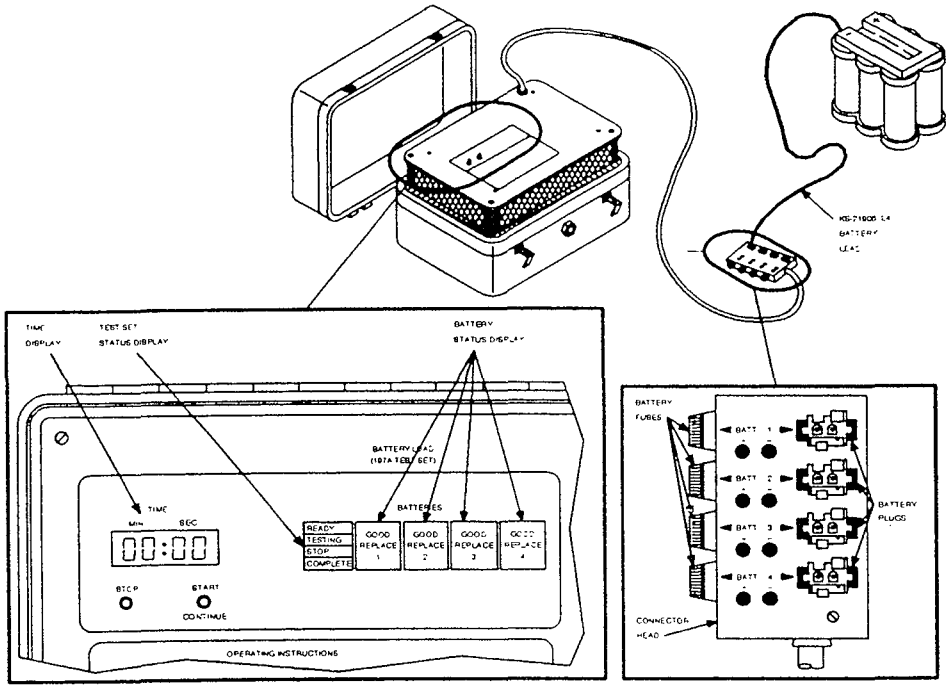


Figure 1. 197A Battery Load Test Set Arrangement

2. Remove cover from test set.
3. At test connector head, verify battery fuse holders each contain a 20 Amp fast-blow fuse.
4. Obtain one KS-21906, L4 battery.

5. ⇒ NOTE:
   Under normal conditions, when the first battery is connected, the following occurs: (a) Test set **TIME** display indicates **00 MIN: 00 SEC**; (b) status display indicates which test set **BATT** plug that battery is connected to, status of the battery (**GOOD** or **REPLACE**), and the **READY** indicator lights; (c) test set fan operates.

   At test set connector head, connect battery lead to **BATT 1, 2, 3**, or **4** plug being tested.

6. ⚠ WARNING:
   Damage will occur if test set is operated without fan operating.

   Does test set fan operate?

   If **YES,** then proceed to **Step 15.**
   If **NO,** then continue with **Step 7.**

7. Connect battery lead to remaining **BATT** plugs, one at a time, and note if fan operates.

8. Did test set fan operate for any **BATT** plug connection?

   If **YES,** then proceed to **Step 11.**
   If **NO,** then continue with **Step 9.**

9. ⇒ NOTE:
   The test set is intended to test fully charged batteries. Before new batteries or replacement batteries are tested, a minimum of two days must have passed between the time the batteries were put on high rate charge and this test is made.

   Disconnect lead. Using a different battery pack, connect battery lead to any **BATT** plug.

10. Does test set fan operate?

    If **YES,** then proceed to **Step 15.**
    If **NO,** then proceed to **Step 35.**

11. On test set connector head, remove battery lead and check for blown fuse(s).

12. Is fuse(s) blown?

    If **YES,** then continue with **Step 13.**
    If **NO,** then proceed to **Step 14.**

13. Replace fuse(s) and repeat from Step 5.

14. ⇒ NOTE:
    Test set may be used for testing using one, two, three, or all four **BATT** plug positions.

    There is a defective test set or connector head. Note defective **BATT** plug position(s). Continue with test procedures using remaining **BATT** plugs.

15. Does test set **TIME** display indicate **00 MIN:00 SEC** without blinking?

    If **YES,** then continue with **Step 16.**
    If **NO,** then proceed to **Step 35.**

16. Does status display indicate which battery was connected, status (**GOOD** or **REPLACE**) of the battery, and is **READY** indicator lighted?

    If **YES,** then continue with **Step 17.**
    If **NO,** then proceed to **Step 35.**

17. Does status display indicate **GOOD** or **REPLACE**?

    If **YES,** then proceed to **Step 19.**
    If **NO,** then continue with **Step 18.**

18. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Battery pack is defective. Ensure that **TESTING** indicator is not lighted (**READY** indicator lighted), unplug and set aside defective battery pack, and repeat from Step 5.

19. Have **TIME** display and **STATUS** indicators been tested for each good **BATT** plug position?

    If **YES,** then proceed to **Step 21.**
    If **NO,** then continue with **Step 20.**

20. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Ensure that **TESTING** indicator is not lighted. (**READY** indicator lighted). Unplug battery pack and repeat from Step 5.

21. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Depress test set **START/CONTINUE** button.

22. Does test set **TESTING** indicator light, **READY** indicator go off, and **TIME** display start counting time?

    If **YES,** then proceed to **Step 24.**
    If **NO,** then continue with **Step 23.**

23. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    There is a defective test set. Depress **STOP** button, unplug battery, and return test set for repair.

24. Depress test set **STOP** button.

25. Does test set **STOP** indicator light and **TIME** display stop counting time?

    If **YES,** then proceed to **Step 27.**
    If **NO,** then continue with **Step 26.**

26. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    There is a defective test set. Allow test to run for 15 minutes as shown on **TIME** display. When **COMPLETE** indicator lights, unplug battery, and return test set for repair.

27. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Depress test set **START/CONTINUE** button.

28. Does test set **TESTING** indicator light, **STOP** indicator go off, and **TIME** display start counting time?

    If **YES,** then continue with **Step 29.**
    If **NO,** then proceed to **Step 34.**

29. Allow test set to run for 15 minutes as shown on **TIME** display.

30. During 15-minute test period, does test set show **REPLACE**?

    If **YES,** then continue with **Step 31.**
    If **NO,** then proceed to **Step 32.**

31. Note that battery being used is defective.

32. After 15 minutes, does **COMPLETE** indicator light?

    If **YES,** then continue with **Step 33.**
    If **NO,** then proceed to **Step 34.**

33. Unplug battery. Store connector head in test set cover. Reinstall cover.

    STOP. YOU HAVE COMPLETED THIS PROCEDURE

34. ⚠ DANGER:
A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

Defective test set. Depress **STOP** button, unplug battery, and return test set for repair.

35. There is a defective test set. Return for repair.

Upgrade TBOS/Parallel Telemetry to TL1/X.25

1. ⇒ NOTE:
   The Technical Specifications section of this manual, under TL1/X.25 Telemetry, describes the parameters and connections for the TL1/X.25 telemetry interface.

   At central office operations interface shelf, connect the TL1/X.25 cable to **J45** on the shelf backplane.

2. Connect CIT and establish session.

   Reference: **DLP-521**

3. ⇒ NOTE 1:
   In Release 6, 7.0, or 7.1, the "**set-ne:tid=*TID*:gne=yes**" command designates a shelf as the X.25 gateway network element (GNE) and as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a GNE. If there is no GNE (DSNE) in the network, all DCC communication can become disabled. If more than one shelf is provisioned as GNE (DSNE), a "duplicate GNE" alarm will occur. In Release 6, 7.0, or 7.1, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

   ⇒ NOTE 2:
   In Release 7.2, the "**set-ne:tid=*TID*:DSNE=yes**" command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a "duplicate DSNE" alarm will occur. In Release 7.2, one or more shelves may automatically be designated as a GNE by plugging in an active X.25 operations support interface.

   If Release 6, 7.0, or 7.1, use **set-ne:gne=yes** command to turn on TL1/X.25 interface.

4. Are you upgrading TBOS or parallel telemetry to TL1/X.25.

   If **PARALLEL**, continue with **Step 5**.
   If **TBOS**, proceed to **Step 7**.

5. Disconnect parallel telemetry and discrete cables from **P54**, **P55**, and **P61** on the shelf backplane.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. ⚠ CAUTION:
   Removing the **SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display* **(Note)** *may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

   ⇒ NOTE:
   Before removing the **SYSCTL** you must momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE ID** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown (9, 8, 7, etc.) on the **FE ID** display. During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

   Remove **SYSCTL** and set TBOS backup switch setting to "no TBOS" (See Table A).

   Reference: **DLP-513**

Table A. TBOS Backup Number

Backup Number	Switch S1	
	S1-4	S1-5
No TBOS	ON	OFF

8. Reinstall **SYSCTL**.

9. Disconnect TBOS cable from **J53** on shelf backplane, if required.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Test ED-8C733-30, G7 Fan Shelf

1. On fan shelf, verify that only green **POWER ON** LED is lighted. If other LEDs are lighted, refer trouble to organization that installed shelf.
2. Depress and hold **ALARM TEST** button.

   Response: All LEDs, except **CONTROL FAULT**, light. All fans slow down during time button is depressed.
3. Release **ALARM TEST** button.
4. Momentarily depress **ALARM RESET** button to reset alarms.
5. ⚠ CAUTION:
   Exercise care in removing the fiber tray or fiber support bracket to prevent damage to the optical fibers.

   ⇶ NOTE:
   To remove the front cover of a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 shelf.

   Remove front cover of fan shelf.
6. Locate 4-part switch to left of center on front of fan shelf. See Figure 1.

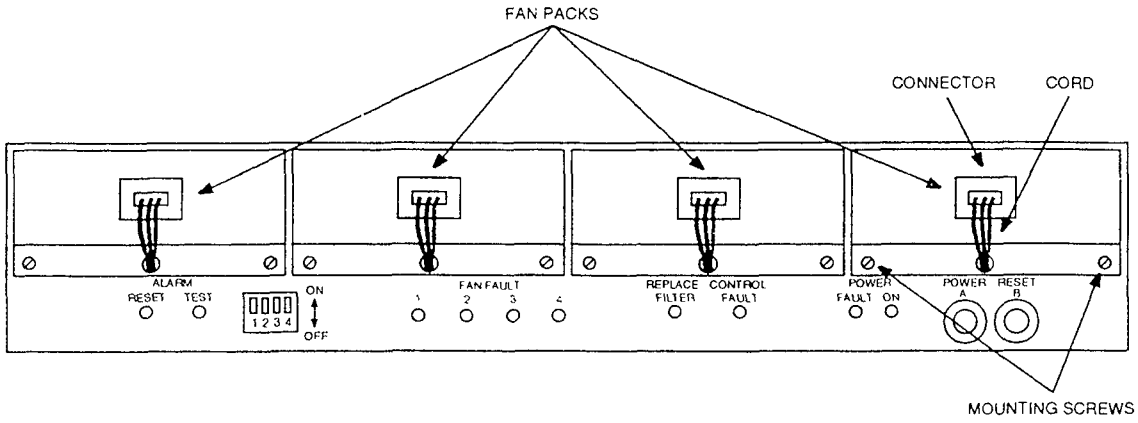


Figure 1. DDM-2000 Fan Shelf — Front Cover Removed

7. Set switches as shown in Table A.

Table A. DDM-2000 Fan Shelf Switch Settings

Cooling Arrangement	Set Point	Switch Settings			
		S1	S2	S3	S4
DDM-2000 OC-3	400 fpm	ON	OFF	ON	ON
DDM-2000 OC-12	400 fpm	ON	OFF	ON	ON

8. If switch settings are changed, depress and hold the **RESET** button on the fan shelf for 5 seconds to allow the fan shelf controller to recognize the change in switch setting.

9. ⇒ NOTE:
   The fan filter is located on the bottom of the DDM-2000 OC-3 shelf that is installed immediately below the fan shelf. Magnetic strips around the perimeter of the filter hold the filter in place in the bottom cavity of the DDM-2000 OC-3 shelf.

   Verify that fan filter is properly installed.

10. Reinstall front cover of shelf.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace ED-8C733-30, G4 Fan Filter

1. ⇒ NOTE:
   The fan filter is located on the bottom of the DDM-2000 OC-3 shelf that is installed immediately below the fan shelf. Magnetic strips around the perimeter of the filter hold the filter in place in the bottom cavity of the DDM-2000 OC-3 shelf.

   Remove fan filter by pulling on it.

2. Install new filter, with magnetic strips facing up, into the bottom cavity of the DDM-2000 shelf.

3. Momentarily depress the **ALARM RESET** button to reset alarms, if required.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Enable or Disable System Security and/or Edit, Delete, or Enter a User's Login (Release 3 or Later)

1. ⚠ CAUTION:
You must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly whenever working with the **DDM-2000.**

⇒ NOTE:
If all shelves in a bay are connected together with CIT bay mult cabling, the CIT may be connected to any shelf front or rear **CIT** connector and gain access to any other shelf by entering a shelf address. If the CIT is connected to the rear **CIT** connector, it must be connected through a null modem.

Connect CIT and establish session.

Reference: **DLP-521**

2. Are you going to enable or disable system security or are you going to edit, delete, or enter a user's login?

If **Enable or Disable System Security**, continue with **Step 3.**
If **Edit, Delete, or Enter a User's Login**, proceed to **Step 15.**

3. ⇒ NOTE 1:
You must be logged into the system as one of the two privileged users to enable or disable system security. Initially, the defaults for the privileged user logins are ATT01 (upper case ATT-zero-one) and ATT02 (upper case ATT-zero-two); however, these defaults may have been changed.

⇒ NOTE 2:
System security requires the defaults for the privileged user logins/password to be changed and CIT and/or DCC port security to be enabled.

At the `login<` prompt, enter a valid privileged user login (provided by your DDM-2000 administrator).

Response: `password<`

4. ⇒ NOTE 1:
Initially, the default for the privileged user password is DDM-2000; however, this default may have been changed.

⇒ NOTE 2:
Passwords are not displayed on the CIT.

At the `password<` prompt, enter a valid privileged user password (provided by your DDM-2000 administrator).

Response: CIT prints the following message followed by an alarm and status report:

```
/************************************
*                                   *
*              AT&T                 *
*      DDM-2000 OC-3 Multiplexer    *
*                                   *
*         Release a b.c             *
*                                   *
************************************/

                  .
                  .
                  .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

5. ⇒ NOTE:
After the prompt (<), the system will respond to commands entered. The `set-link:pg=( )` command may be used to set the vertical size of the displayed page on the CIT. Page (`pg`) length may be set from 3 to 150 lines with a default length of 24 lines.

Did you use the default privileged user login (ATT01 or ATT02) and password (DDM-2000) to log into the system?

If **YES**, continue with **Step 6**.

If **NO**, proceed to **Step 8**.

6. ⇒ NOTE:
The defaults for privileged user logins (ATT01 and ATT02) and password (DDM-2000) must be changed for system security. There are always two privileged user logins. (Privileged user logins cannot be added or deleted.) See the "Commands and Reports" section of this manual for a description of the `set-lgn` command format.

Use the `set-lgn:` command to change the defaults for the privileged user logins (ATT01 and ATT02) and password (DDM-2000).

7. ⇒ NOTE:
The `rtrv-lgn:` command retrieves the `Login Configuration Report`. This report lists each user's login and authorization level (user type). The report does not contain passwords. See the "Commands and Reports" section of this manual for a description of the `rtrv-lgn:` command format.

Use the `rtrv-lgn:` command to obtain the `Login Configuration Report` and verify that the privileged user logins have been changed.

8. ⇒ NOTE:
The `rtrv-secu:` command retrieves the `Port Security Configuration Report`. This report provides CIT and DCC port security and timeout information. See the "Commands and Reports" section of this manual for a description of the `rtrv-secu:` command format.

Use the `rtrv-secu:` command to obtain the `Port Security Configuration Report` and note the CIT/DCC port security and timeout information.

9. ⇒ NOTE 1:
The `set-secu:` command enables or disables security on each CIT and DCC interface using one or more CIT and/or DCC port addresses [cit-{1,2,all} or dcc-{m,a,b,c,all}]. This command is also used to specify the timeout period for each port address. The timeout period is the time, in minutes, before an inactive session is automatically terminated. See the "Commands and Reports" section of this manual for a description of the command format. For example, `set-secu:cit-1:sec=enabled` enables security on the front CIT port.

⇒ NOTE 2:
When security is enabled for a CIT or DCC port address, a valid login and password must be entered by all users to access the system through that port.

⇒ NOTE 3:
For applications that have a remote terminal located on a customer premise site, you may want to disable security on the DCC interface at the remote terminal. This allows the user at the terminal in the central office to login remotely (via the DCC) to the remote terminal without a login/password. At the terminal in the central office, you may want to enable security on the DCC. This means that a user at the remote terminal must have a valid login/password to login remotely (via the DCC) to the terminal at the central office.

Use the `set-secu:` command to enable or disable security on each CIT and/or DCC port and specify the corresponding timeout period, as required.

10. Use the `rtrv-secu:` command to obtain the `Port Security Configuration Report` and verify the security and timeout information for the CIT and/or DCC ports.

11. ⇒ NOTE 1:
    There are three types of users:

    Privileged users may execute any command, including restricted commands.

    General users may execute any commands that are not restricted to privileged users.

    Reports-only users may only execute commands that obtain nonprivileged system reports (Release 5 and later).

    Refer to *Security* in the "Administration and Provisioning" section of this manual for more information about restricted commands.

    ⇒ NOTE 2:
    In releases prior to Release 5, two privileged and up to ten nonprivileged (general) logins are supported. For Release 5 and later, two privileged and up to fifty nonprivileged (general and/or reports-only) logins are supported. If a user attempts to enter another login when the maximum supported logins already exist, the command will be denied. See the "Commands and Reports" section of this manual for a description of the `set-lgn` command format.

    Use the `set-lgn:` command to enter, edit, or delete nonprivileged (general and/or reports-only) logins/passwords and user types, as required.

12. Use the `rtrv-lgn:` command to obtain the `Login Configuration Report` and verify the nonprivileged user logins and user types.

13. See the "Commands and Reports" section of this manual for descriptions of related security commands: `set-passwd`, `rtrv-lgn`, and `rtrv-secu`.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. ⇒ NOTE:
You must be logged into the system as one of the two privileged users to edit, delete, or enter a user's login. Initially, the defaults for the privileged user logins are ATT01 (upper case ATT-zero-one) and ATT02 (upper case ATT-zero-two); however, these defaults may have been changed.

At the `login<` prompt, enter a valid privileged user login (provided by your DDM-2000 administrator).

Response: `password<`

16. ⇒ NOTE 1:
Initially, the default for the privileged user password is DDM-2000; however, this default may have been changed.

⇒ NOTE 2:
Passwords are not displayed on the CIT.

At the `password<` prompt, enter a valid password (provided by your DDM-2000 administrator).

Response: CIT prints the following message followed by an alarm and status report:

```
/************************************
*                                   *
*              AT&T                 *
*      DDM-2000 OC-3 Multiplexer    *
*                                   *
*         Release a.b c             *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

17. NOTE 1:
After the prompt (<), the system will respond to commands entered. The `set-link:pg=( )` command may be used to set the vertical size of the displayed page on the CIT. Page (pg) length may be set from 3 to 150 lines with a default length of 24 lines.

NOTE 2:
There are three types of users:

Privileged users may execute any command, including restricted commands.

General users may execute any commands that are not restricted to privileged users.

Reports-only users may only execute commands that obtain nonprivileged system reports (Release 5 and later).

Refer to *Security* in the "Administration and Provisioning" section of this manual for more information about restricted commands.

NOTE 3:
In releases prior to Release 5, two privileged and up to ten nonprivileged (general) logins are supported. For Release 5 and later, two privileged and up to fifty nonprivileged (general and/or reports-only) logins are supported. If a user attempts to enter another login when the maximum supported logins already exist, the command will be denied.

NOTE 4:
Both privileged user logins may be edited to change the login name and/or password, but privileged user logins cannot be added or deleted. See the "Commands and Reports" section of this manual for a description of the `set-lgn` command format.

Use the `set-lgn:` command to edit, delete, or enter logins/passwords and user types, as required.

18. ⇒ NOTE:
    The `rtrv-lgn:` command retrieves the `Login Configuration Report`. This report lists each user's login and authorization level (user type). The report does not contain passwords. See the "Commands and Reports" section of this manual for a description of the `rtrv-lgn:` command format.

    Use the `rtrv-lgn:` command to obtain the `Login Configuration Report` and verify the user logins and user types.

19. ⇒ NOTE:
    Setting logins/passwords does not set system security. In addition to assigning valid logins/passwords, CIT and/or DCC port security must be enabled to secure a system.

    Repeat this procedure to enable system security, if required.

20. See the "Commands and Reports" section of this manual for descriptions of related security commands: `set-passwd`, `rtrv-lgn`, and `rtrv-secu`.

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Existing OLIU With Different Type OLIU

1. ⚠ WARNING 1:
Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Circuit packs must not be installed or replaced if the **SYSCTL** *is not installed and operating normally. If the* **SYSCTL** *is not installed and operating normally, unpredictable provisioning of the replaced/installed circuit pack can result.*

⚠ CAUTION 2:
*Ensure that protection switching is available (***OLIU** *installed in slot 2, protection line good, and no locks, inhibits, or forced switches in effect).*

⚠ CAUTION 3:
Before installing **OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned* **[DLP-527]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

⚠ CAUTION 4:
Ensure that necessary optical power levels will be met with different type of **OLIU** *installed. Use optical line power measurements and check* **OLIU** *output specifications.*

NOTE 1:
This procedure may be used to replace existing **OLIU**s with **22-type OLIU**s to convert a shelf to a DS1 add/drop shelf. It may also be used to replace existing **OLIU**s with **21D/21D-U/22D-U OLIU**s to provide a cost effective interconnect for intraoffice applications such as OC-3 optical extensions from an OC-12 shelf.

NOTE 2:
Not all **OLIU**s are supported by every software release. For example, **21G/21G-U OLIU**s are supported by all releases, but **21D/21D-U**, **22D-U**, **22G-U/22G2-U** and **22F OLIU**s are supported only by Release 3 and later.

NOTE 3:
If this procedure is being used to replace **OLIU**s with **21D/21D-U/22D-U OLIU**s, note that the **21D/21D-U/22D-U OLIU** uses only multimode optical fiber connections.

If new software is required to support the **OLIU** being installed, download the required new software to the system.

Reference: **DLP-532**

2. NOTE:
When available, use a CIT and the **`switch-line:`***`address`***`pri=manual`** (linear) or **`switch-path-(sts1/vt1):`***`address`***`pri=manual`** (rings) command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a switch command at both the near end and far end to switch both transmit and receive to the same line.

Is a CIT available?

If **YES**, then continue with **Step 3.**
If **NO**, then proceed to **Step 5.**

3. ⇒ NOTE:
   The **rtrv-state** command may be used to verify that only the protection line is active. In the `rtrv-state` report, the `Switch State` should show `active` only for the protection **OLIU**. Also, the green **ACTIVE** LEDs should be lighted only on protection **OLIU**s in slot **2(P)**.

   Use the **switch-line:** or **switch-path:** command to switch service to protection slot **2(P)**, if not already performed.

4. Use the **rtrv-state** command to ensure that service is switched to protection slot **2(P)**.

5. Disconnect optical fiber from **OLIU** in service slot **1** of **MAIN** or **FUNCTION UNIT** slots being equipped.

6. Remove service **OLIU** from slot **1**.

7. ⇒ NOTE 1:
   The optical connector labeled **OUT** is the output from the **OLIU**. The connector labeled **IN** is the input to the **OLIU**.

   ⇒ NOTE 2:
   Optical fibers connecting the system with the other end should not be connected to the **OLIU** until at least 45 seconds after an optical loopback is removed.

   Remove the protective covers from the new **OLIU** connectors. Clean the fibers and connectors with optical quality, lint-free tissue and a compressed air duster.

   Reference: **DLP-527**

8. ⇒ NOTE:
   When a different **OLIU** replaces an existing **OLIU**, the **FAULT** LED on the new **OLIU** will light until the **UPD/INIT** button is momentarily depressed in the following step.

   Install new **OLIU** into service slot **1** and connect optical fibers. Ensure **OLIU** output at one end is connected to the correct **OLIU** input at the other end.

   Reference: **DLP-514**

9. Momentarily depress the **UPD/INIT** button on the **SYSCTL**.

   Response: **FAULT** LED lights on **OLIU** in slot **2(P)**. **FAULT** LED goes off on **OLIU** in slot **1**.

10. Did **FAULT** LED go off on **OLIU** in service slot **1**?

    If **YES**, then continue with **Step 11**.
    If **NO**, then do **TAP-111**.

11. ⇒ NOTE:
    If existing cross-connections to the new circuit pack are not supported, the new circuit pack will be declared bad and the switch to the new circuit pack will not be completed. For example, if a **22-type OLIU** is being replaced by a **21D/21D-U OLIU** and DS1 cross-connections exist, the new **21D/21D-U OLIU** circuit pack will fail and service will continue on the old circuit pack in slot **2**. All cross-connections not supported by the new circuit pack have to be deleted before the switch will be successful.

    Ensure service has switched to **OLIU** in service slot **1**.

12. Disconnect optical fiber from **OLIU** in protection slot **2(P)** and remove the **OLIU**.

13. Remove the protective covers from the new **OLIU** connectors. Clean the fibers and connectors with optical quality, lint-free tissue and a compressed air duster.

    Reference: **DLP-527**

14. Install new **OLIU** into protection slot **2(P)** and connect optical fibers. Ensure **OLIU** output at one end is connected to the correct **OLIU** input at the other end.

    Reference: **DLP-514**

15. Did **FAULT** LED go off on **OLIU** in protection slot **2(P)**?

    If **YES**, then continue with **Step 16**.
    If **NO**, then do **TAP-111**.

16. Verify optical fiber cables are placed correctly in the fiber tray and are properly routed in the bay framework.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Change Timing Mode on TGS Circuit Pack

1. ⚠ CAUTION:
If shelves in a bay are connected together with timing mult cabling, changing the timing mode on one system may affect the timing for other systems. Ensure that proper timing arrangements are made for all affected shelves.

   ⇒ NOTE:
   This procedure may be used to change the timing mode on an installed **TGS** circuit pack. For example, you may want to change the timing mode on an installed **TGS** from Free Running to DS1 External, or you may want to provision the DS1 timing output on the **BBF2B** to *sync out mode*. The DS1 timing output on the **BBF2B** can be provisioned for *sync out mode* only when the timing mode is set to *DS1 External sync out* or *Loop Timing sync out.* See the Transmission and Synchronization Interfaces section of this manual for a description of DS1 timing outputs.

   Verify that there are no alarms or protection switches present on the system.

2. Are you changing timing mode to *DS1 External*?

   If **YES**, then continue with **Step 3**.
   If **NO**, then proceed to **Step 5**.

3. Check external timing references to ensure they are good.

4. ⇒ NOTE 1:
   ED-8C724-20, G339, G340, or G341 cables are used to connect timing references to shelf 1 in a bay. ED-8C724-20, G373 or G374 (rear access) or ED-8C724-21, G414 and G415 (front access) cables are used to multiple timing references to subsequent shelves in the bay (for example, from shelf 1 to shelf 2, shelf 2 to shelf 3, etc.). The cable from the timing reference source to shelf 1 is connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). The cable from shelf 1 (or lower shelf) to the next higher shelf is connected from jack **J44** (**P237**) of the lower shelf to jack **J37** (**J237**) of the next higher shelf.

NOTE 2:
If **BBF2B TGS** circuit packs are installed and the timing mode is set to DS1 External sync out mode, an ED-8C724-20, G394 cable must be connected to jack **J37** on the shelf backplane (or **J237** of the front access cable). This cable has a relay to disconnect the external timing supply if the **TGS** circuit pack is removed.

Make DS1 external timing reference connections as shown in Table A.

Table A. DS1 Timing Reference Source Connections

Name	Desig.	Conn.	Term.	Color
Receive from Primary DS1 Reference	T R	P37	6 1	BK O
Receive from Secondary DS1 Reference	T R		7 2	R G

5. Make synchronization DS1 timing output connections as shown in Table B, if required.

Table B. DS1 Timing Output Connections

Name	Desig.	Conn.	Term.	Color
Transmit Primary DS1 Reference	T R	P44	6 1	BK O
Transmit Secondary DS1 Reference	T R		7 2	R G

6. CAUTION:
A momentary transmission hit will occur whenever the **TGS** *circuit pack is switched.*

Is a CIT available?

If **YES**, then continue with **Step 7**.
If **NO**, then proceed to **Step 8**.

7. Use the `switch-sync:s=circuitpack,pri=manual` command to switch timing to **TIMING** slot **2**, if not already active.

Response: **ACTIVE** LED lights on **TGS** circuit pack in **TIMING** slot **2**.

8. If Sync Autoreconfiguration has been enabled ^(**rtrv-sync**) on a loop-timed shelf and you are changing timing to DS1 External, use the ^(**set-sync**) command to disable Sync Autoreconfiguration.

9. Remove **TGS** circuit pack from **TIMING** slot **1** and set option switches to timing mode required.

   Reference: **DLP-513**

10. Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

11. Reinsert **TGS** circuit pack into **TIMING** slot **1**.

    Response: **FAULT** LED lights on **TGS** circuit pack in **TIMING** slot **1**.

12. ⇒ NOTE:
    The critical (**CR**) alarm LED may light for up to 15 seconds after the **UPD/INIT** button is depressed on the **SYSCTL**. This does not indicate a service interruption.

    Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

    Response: **FAULT** LED goes off on **TGS** circuit pack in **TIMING** slot **1** and lights on **TGS** circuit pack in **TIMING** slot **2**. **ACTIVE** LED goes off on **TGS** circuit pack in **TIMING** slot **2** and lights on **TGS** circuit pack in **TIMING** slot **1**.

13. Remove **TGS** circuit pack from **TIMING** slot **2** and set option switches to timing mode required.

    Reference: **DLP-513**

14. Reinsert **TGS** circuit pack into **TIMING** slot **2**.

    Response: **FAULT** LED on **TGS** circuit pack in **TIMING** slot **2** lights for about 15 seconds then goes off.

15. If a CIT is available, use the **rtrv-sync** command to display the provisioning and operational information of the synchronization interface.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform OC-3c (STS-3c) Transmission Test

1. ⇒ NOTE 1:
Ensure that the OC-3c feature has been enabled.

⇒ NOTE 2:
This procedure may be used to perform OC-3c transmission tests in the mux (toward the fiber) direction. When this procedure is being used to perform end-to-end OC-3c tests, it is assumed that the complete end-to-end system has already been tested and that only the OC-3c signal is being tested at this time. Transmission tests in the *mux* direction may be local or end-to-end tests (see Figure 1).

⇒ NOTE 3:
This test is performed with a SONET test set.

⇒ NOTE 4:
When this procedure is used to do end-to-end tests, one DDM-2000 OC-3 Multiplexer will be referred to as the near end and the other assembly as the far end. These designations are arbitrary; either assembly can be the near-end or the far-end assembly.

2. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **21G/21G-U** or **21D/21D-U OLIU** must be in place. If end-to-end tests are being performed, at the far-end LGX cross-connection associated with the DDM-2000 OC-3 Multiplexer being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the OC-3c signal to be tested.

3. At the cross-connection associated with the near-end DDM-2000 OC-12 Multiplexer, connect the SONET test set to the **IN** and **OUT** jacks associated with the circuit under test.

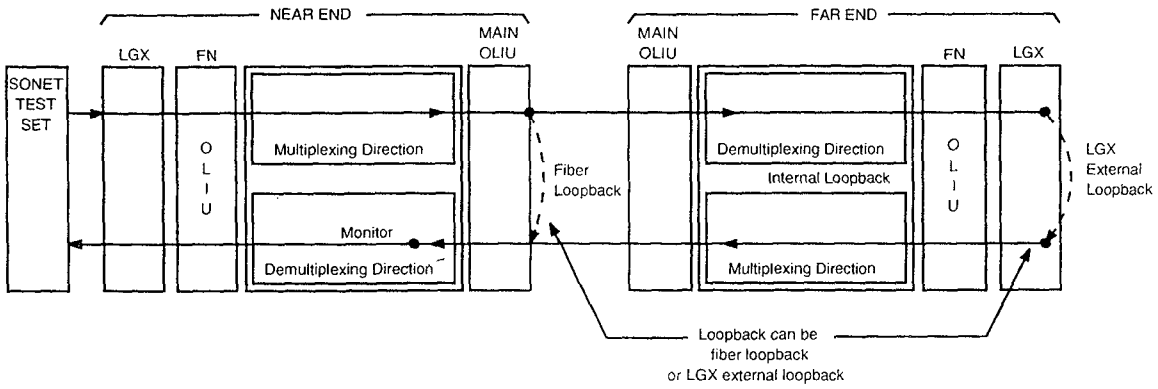


Figure 1. Transmission Test of OC-3c Signal in MUX Direction

4. Use the SONET test set to test for error-free transmission.

5. Was the test successful (error free)?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 15**.

6. Is this first service being placed on the group and is protection circuit pack installed?

   If **YES**, then continue with **Step 7**.
   If **NO**, then proceed to **Step 11**.

7. Unseat the service **21G/21G-U** or **21D/21D-U OLIU** circuit pack associated with the circuit under test.

8. Repeat the OC-3c transmission test with the SONET test set.

9. Was the test successful (error free)?

   If **YES**, then continue with **Step 10**.
   If **NO**, then proceed to **Step 15**.

10. Reseat the **21G/21G-U** or **21D/21D-U OLIU** circuit pack associated with the circuit under test.

11. The **21G/21G-U** or **21D/21D-U OLIU** circuit pack under test has passed the OC-3c transmission test. Remove the looping patch cords from the cross-connections.

12. At the near-end (and the far-end) DDM-2000 OC-3 Multiplexer, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** to update the **SYSCTL**.

13. Repeat this procedure from Step 1 for any additional OC-3c circuits to be tested.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Has the **21G/21G-U** or **21D/21D-U OLIU** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 18**.
    If **NO**, then continue with **Step 16**.

16. Replace the **21G/21G-U** or **21D/21D-U OLIU** circuit pack that failed the test.

    Reference: **DLP-518**

17. Repeat this procedure for the **21G/21G-U** or **21D/21D-U OLIU** circuit pack that failed.

18. Trouble may be in the LGX cross-connections or the shelf backplane. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the **RETRIEVE** commands (for example, `rtrv-alm`, `rtrv-hsty`, etc.) to check for other trouble indications.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Linear or Add/Drop Configuration

1. ⇒ NOTE 1:
   If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual: `ent-crs-sts1`, `ent-crs-vt1`, `rtrv-crs-sts1`, `rtrv-crs-vt1`, `dlt-crs-sts1`, `dlt-crs-vt1`, `set-ne`, and `cnvt-crs`.

   ⇒ NOTE 2:
   You may have to login to more than one node to get a complete map of the network using the `rtrv-nmap` command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

   Login to any node in the network and use the `rtrv-nmap:` command to retrieve a map of the network which lists all the systems and how they are connected to each other.

   The output report is similar to the following:

```
/* Network Map for <Site3NE1>
   ================================================================
    System Name (TID)  Connected     Neighbor   Communication  GNE
                       Through                     Status
   ================================================================
   Site2NE1              main         yes
   Site4NE1              fn-c         yes
   Site5NE1              fn-b         yes
   Site1NE1              main         no                        yes
   Site6NE1              fn-b         no

*/
```

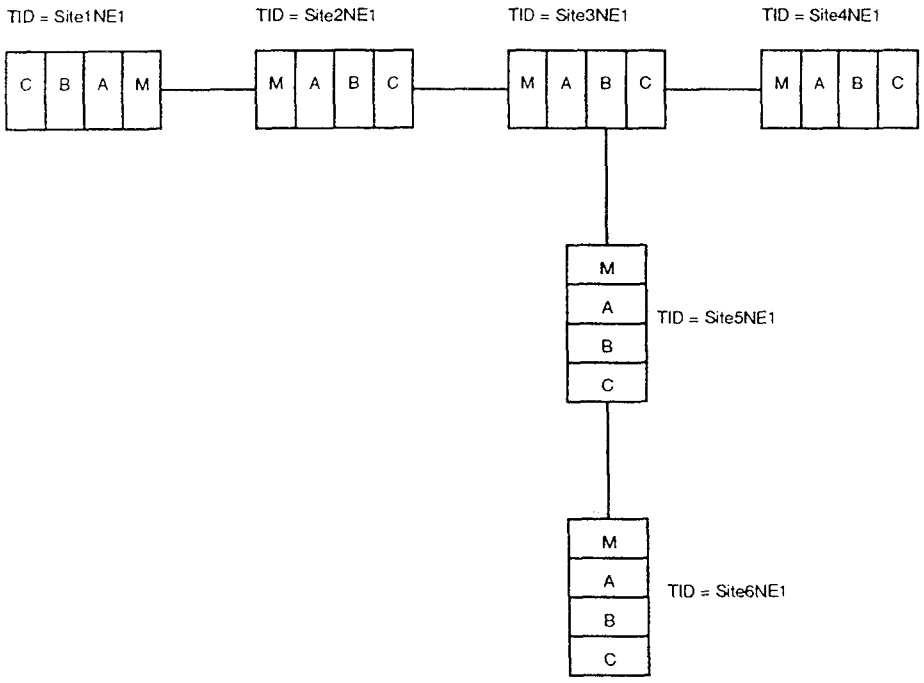


Figure 1. Sample Network Schematic

2. Verify system configuration is same as specified on work order or circuit order.

3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. ⇒ NOTE:
   In configurations other than point-to-point, cross-connections may consist of pass-through cross-connections in addition to the terminating cross-connections. For example in Figure 1, if the terminating nodes are at Site1NE1 and Site5NE1, then pass-through cross-connections will have to be made at Site2NE1 and Site3NE1.

   From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the `rtrv-eqpt:` command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **MXRVO** and/or **DS1** circuit packs?

6. ⇒ NOTE 1:
Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS-1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group (see `ent-crs-sts1` command). In order to make manual cross-connections, the cross-connect mode must be set to manual using the `set-ne:crs=manual` command. If STS-1 cross-connections are already made and individual VT1.5 cross-connections are required, the `cnvt-crs:` command may be used to convert the STS-1 cross-connection to 28 individual VT1.5 cross-connections. Certain restrictions and requirements must be followed before converting an STS-1 cross-connect to individual VT1.5 cross-connections. See **NTP-020** to convert an OC-3 shelf to a DS1 add/drop shelf. Also see the descriptions of the `set-ne` and `cnvt-crs` commands in the "Commands and Reports" section of this manual.

⇒ NOTE 2:
The following commands may be used to delete, enter, and retrieve cross-connections: `dlt-crs-vt1`, `ent-crs-sts1`, `ent-crs-vt1`, `ent-crs-sts1`, and `rtrv-crs-vt1`. and `rtrv-crs-sts1`. See the "Commands and Reports" section of this manual for a description of commands.

From work order or circuit order, determine the cross-connections to be made at each node associated with the service being established.

7. Starting at one of the terminating nodes for the DS1/DS3 circuit being established, use the `rtrv-crs-( ):` command at each node to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #2 low speed port in the **DS1** circuit pack in slot #1 of LOW SPEED group A (a-1-2) is to be connected to timeslot m-1-1-2 and the `rtrv-crs-vtl` command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

   If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the `dlt-crs-( )` commands.

8. ⇒ NOTE 1:
   In Release 6.2 or later, channel state provisioning provides IS, AUTO, and NMON channel states for VT1.5 and STS-1 channels similar to the port states for DS1 and DS3 ports. At installation or when a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from the fiber to cause the channel to transition to in-service (IS).

   ⇒ NOTE 2:
   In Release 6.1 or earlier, until all cross-connections are made for the service being established, `ne-acty` alarms will be present in the system. The alarms will indicate (using the `rtrv-alm` command) `inc. STS1 AIS` or `inc. VT AIS`. After all proper cross-connections are made, the alarm(s) will clear. If Release 6.2 or later with channel state provisioning, alarming is disabled.

   At the first terminating node, use the `ent-crs-vtl:` or `ent-crs-sts1:` command to make the terminating cross-connection. For example, `ent-crs-vtl:a-1-2,m-1-1-2`.

9. Use the `rtrv-crs-vtl:` or `rtrv-crs-sts1:` command to verify that the proper connection has been made. If an improper cross-connection is made, use the `dlt-crs-vtl:` or `dlt-crs-sts1:` command to delete the improper cross-connection, then reenter the cross-connection.

10. At the next node closest to the terminating node, use the `ent-crs-vtl:` or `ent-crs-sts1:` command to make the pass-through cross-connection, as required. For example, `ent-crs-vtl:m-1-1-2,c-1-1-2.`

11. Continue logging into each node in the path of the service being established and using the `ent-crs-vtl:` command to make the required cross-connections.

12. After all cross-connections are made, use the `rtrv-alm:` command to verify no alarms are present.

13. If `ne-acty inc. VT AIS` or `inc. STS1 AIS` alarms are present, look for missing or improperly made cross-connections. Use **TAP-121** to locate missing cross-connections, if required.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Single Ring Configuration

1. ⇒ NOTE 1:
   If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual: **`ent-crs-sts1`**, **`ent-crs-vt1`**, **`rtrv-crs-sts1`**, **`rtrv-crs-vt1`**, **`dlt-crs-sts1`**, **`dlt-crs-vt1`**, and **`cnvt-crs`**.

   ⇒ NOTE 2:
   You may have to login to more than one node to get a complete map of the network using the **`rtrv-nmap`** (R7.1 and earlier) or **`rtrv-map-network`** and **`rtrv-map-neighbor`** (R7.2) command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

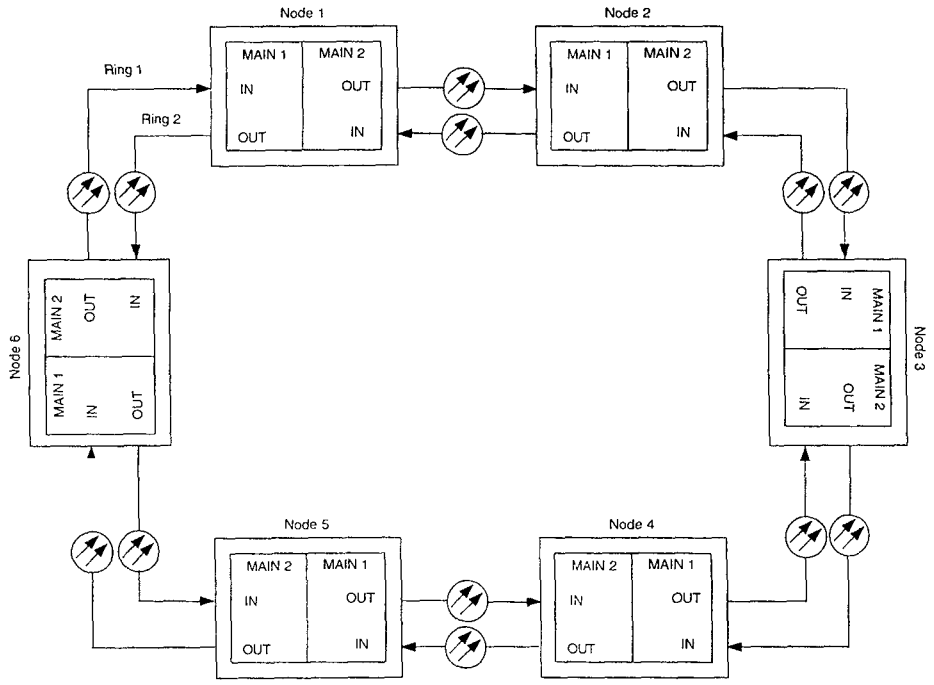


Figure 1. Sample Network Schematic

Login to any node in each ring in the network and use the **`rtrv-nmap:`** (R7.1 and earlier) or **`rtrv-map-network`** and **`rtrv-map-neighbor`** (R7.2) command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2, 3, and 4:

```
    Site6NE1 94-11-27 13:09:53  DDM-2000 OC-3, R7.1.2
M   rtrv-nmap:  COMPLD
    /* Network Map for Site6NE1
   ================================================================================
    System Name (TID)      Connected     Neighbor     Communication     GNE
                             Through                      Status
   ================================================================================
   Site6NE1                                                                yes
   Site7NE1                  main-1       yes
   Site3NE1                  main-2       yes
   Site4NE1                    -          no            FAILED
   Site2NE1                    -          no
   Site5NE1                    -          no

 */
```

Figure 2. Sample Report From **rtrv-nmap** Command

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-3, R7.2.1
M   rtrv-map-network:  COMPLD
    /* Network Map for Site6NE1
   ================================================================================
    System Name           Comm      Product          NE             Alarm
      (TID)               Status    Type             Type           Group
   ================================================================================
   Site6NE1                        DDM-2000 OC-3                     5
   Site7NE1               FAILED   DDM-2000 OC-3                     5
   Site5NE1                        DDM-2000 OC-3    DSNE             5
   Site4NE1                        DDM-2000 OC-3                     5
   Site3NE1                        DDM-2000 OC-3                     5
   Site2NE1                        DDM-2000 OC-3                     5

 */
```

Figure 3. Sample Report From **rtrv-map-network** Command

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-3, R7.2.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Site6NE1
   ================================================================================
    System Name           Connected     Communication     Product
      (TID)               Through       Status            Type
   ================================================================================
   Site6NE1                                                DDM-2000 OC-3
   Site7NE1               main-1        FAILED            DDM-2000 OC-3
   Site5NE1               main-2                          DDM-2000 OC-3

 */
```

Figure 4. Sample Report From `rtrv-map-neighbor` Command

2. Verify system configuration is same as specified on work order or circuit order.

3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. **NOTE 1:**
   In single ring configurations, cross-connections consist of pass-through cross-connections in addition to the terminating cross-connections. For example in Figure 1, if the terminating nodes are at Node 1 and Node 5, then pass-through cross-connections will have to be made at Nodes 2, 3, 4 and 6.

   NOTE 2:
   In ring configurations, you should use the following rules in establishing cross-connections in each ring:

   1. All drop connections from the same ring must be provisioned the same, either all VT1.5 or all STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 Releases 7.0 and earlier do not support the command (**cnvt-crs**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the **rtrv-eqpt:** command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **MXRVO** and/or **DS1/DS1PM** circuit packs if DS1 service is being established?

6. ⇒ NOTE 1:
   Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group (see **ent-crs-sts1** command). If STS1 cross-connections are already made and individual VT1.5 cross-connections are required, the **cnvt-crs:** command (Release 7.1 and later) may be used to convert the STS1 cross-connection to 28 individual VT1.5 cross-connections. Certain restrictions and requirements must be followed before converting an STS1 cross-connection to individual VT1.5 cross-connections. See the description of the **cnvt-crs** command in the Commands and Reports section of this manual.

   ⇒ NOTE 2:
   The following commands may be used to delete, enter, and retrieve cross-connections: **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **ent-crs-sts1**, and **rtrv-crs-vt1**. and **rtrv-crs-sts1**. See the "Commands and Reports" section of this manual for a description of commands.

   From work order or circuit order, determine the cross-connections to be made at each node associated with the service being established. See Figures 5 through 9 for examples.

7. Starting at one of the terminating nodes for the DS1/DS3 circuit being established, use the **rtrv-crs-( ):** command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #3 low speed port in the **DS1** circuit pack in slot #2 of LOW SPEED group A (a-2-3) is to be connected to timeslot m-1-2-3 and the **rtrv-crs-vt1** command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

   If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the **dlt-crs-( )** commands.

8. ⇒ NOTE 1:
In Release 6.2 or later, the channel state provisioning feature provides IS, AUTO, and NMON states for VT and STS channels similar to the channel states for DS1 and DS3 ports. At installation, or when a cross-connection is made to a point of termination, the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

⇒ NOTE 2:
If Release 5 software, `ne-acty` alarms will be present in the system until all cross-connections are made for the service being established. The alarms will indicate (using the **`rtrv-alm`** command) `inc. STS1 AIS` or `inc. VT AIS`. After all proper cross-connections are made, the alarm(s) will clear. If Release 7.1 or later with channel state provisioning, alarming is disabled.

⇒ NOTE 3:
In Release 5, pass-through cross-connections at nonterminating nodes should be established first to minimize alarms. If this is the first (1 out of 28) DS1 circuit being established on an incoming STS1 (1 of 3), a Critical alarm will be generated if the terminating DS1 cross-connections are established first. This is because "`inc. STS1 AIS`" will be detected on both rings at the terminating node until through cross-connections are set up at the remaining nodes. Therefore, establish pass-through node cross-connections first. For more information on cross-connections, see "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual.

At all nonterminating nodes in the network, use the **`ent-crs-vt1:`** or **`ent-crs-sts1:`** command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-2-3, use the **`ent-crs-vt1:m-1-2-3,m-1-2-3`** command. To make pass-through cross-connections for STS-1 #1, use the **`ent-crs-sts1:m-1,m-1`** command.]

9. ⇒ NOTE 1:
   If Release 5, when the first terminating VT1.5 cross-connection is made for a circuit, a Major alarm will be generated until the other terminating cross-connection is established. "inc. VT AIS" will be detected on both rings at this node until both cross-connections are made. If Release 7.1 or later with channel state provisioning, alarming is disabled.

   ⇒ NOTE 2:
   If Release 5 software, when the first terminating STS1 cross-connection is made for a circuit, a Critical alarm will be generated until the other terminating cross-connection is established. "inc. STS1 AIS" will be detected on both rings at this node until both cross-connections are made. If Release 7.1 or later with channel state provisioning, alarming is disabled.

   At the terminating (drop) nodes of the circuit being established, use the **ent-crs-vt1:** or **ent-crs-sts1:** command to make the terminating cross-connections (for example, **ent-crs-vt1:m-1-2-3,a-2-3**) or **ent-crs-sts1:m-1,a**)

10. Use the **rtrv-crs-vt1:** or **rtrv-crs-sts1:** command to verify that the proper connection has been made. If an improper cross-connection is made, use the **dlt-crs-vt1:** or **dlt-crs-sts1:** command to delete the improper cross-connection and reenter the cross-connection.

11. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

12. If ne-acty inc. VT AIS or inc. STS1 AIS alarms are present, look for missing or improperly made cross-connections. Use **TAP-120** to locate missing cross-connections, if required.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

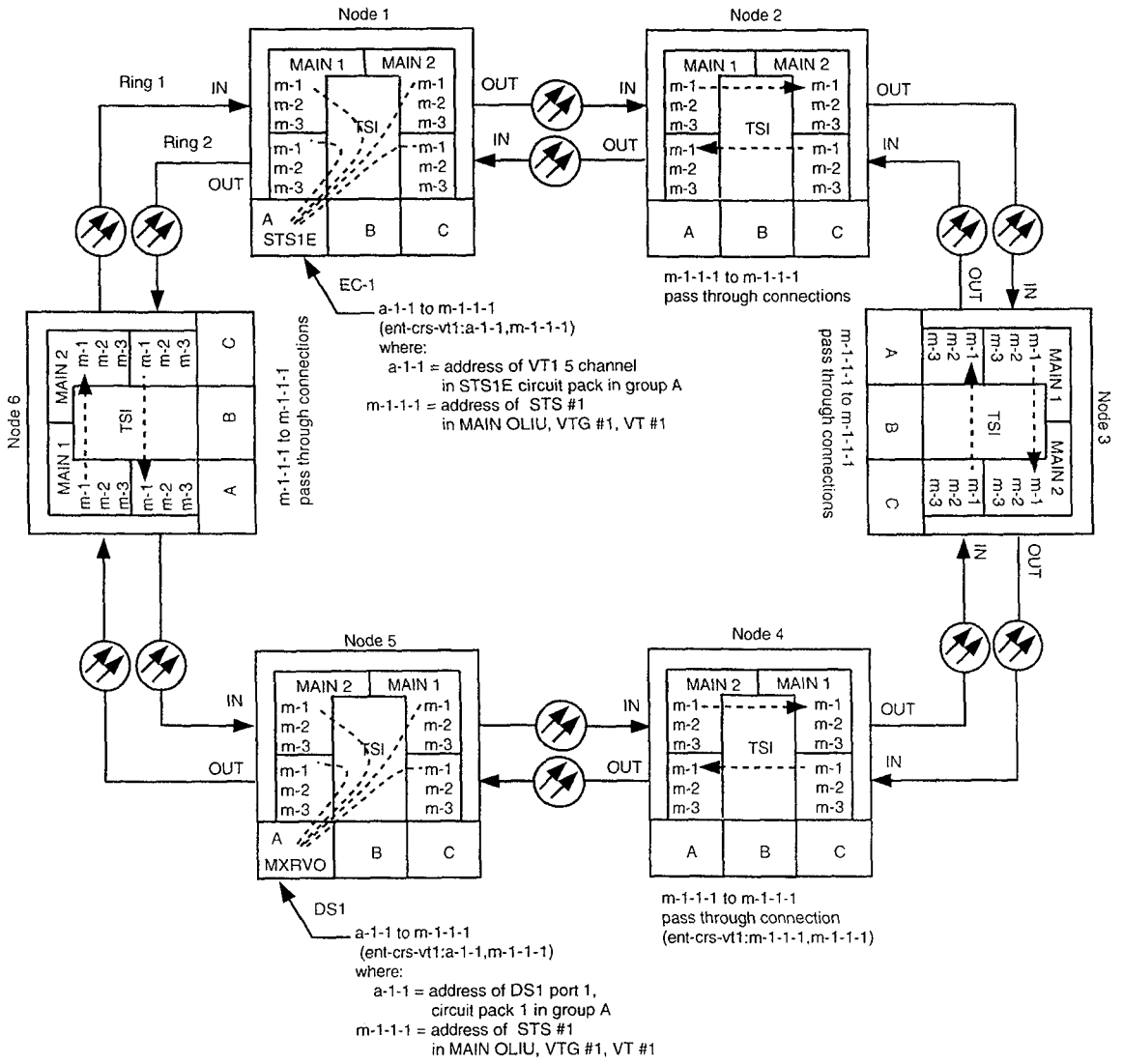


Figure 5. Path Protected Ring Network (DS1 to DS1) with VT1.5 Cross-Connections

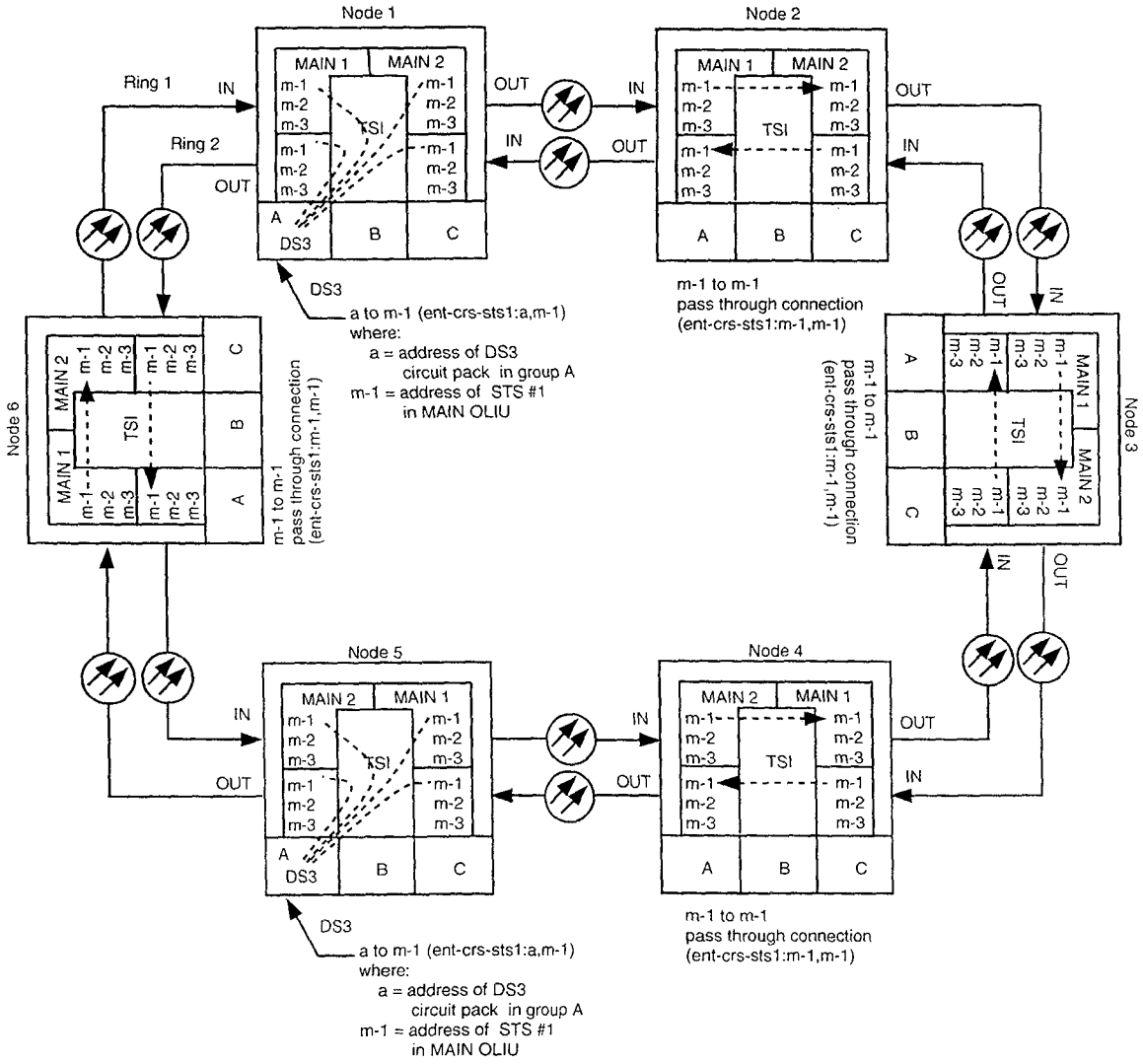


Figure 6. Path Protected Ring Network (DS3 to DS3) with STS1 Cross-Connections

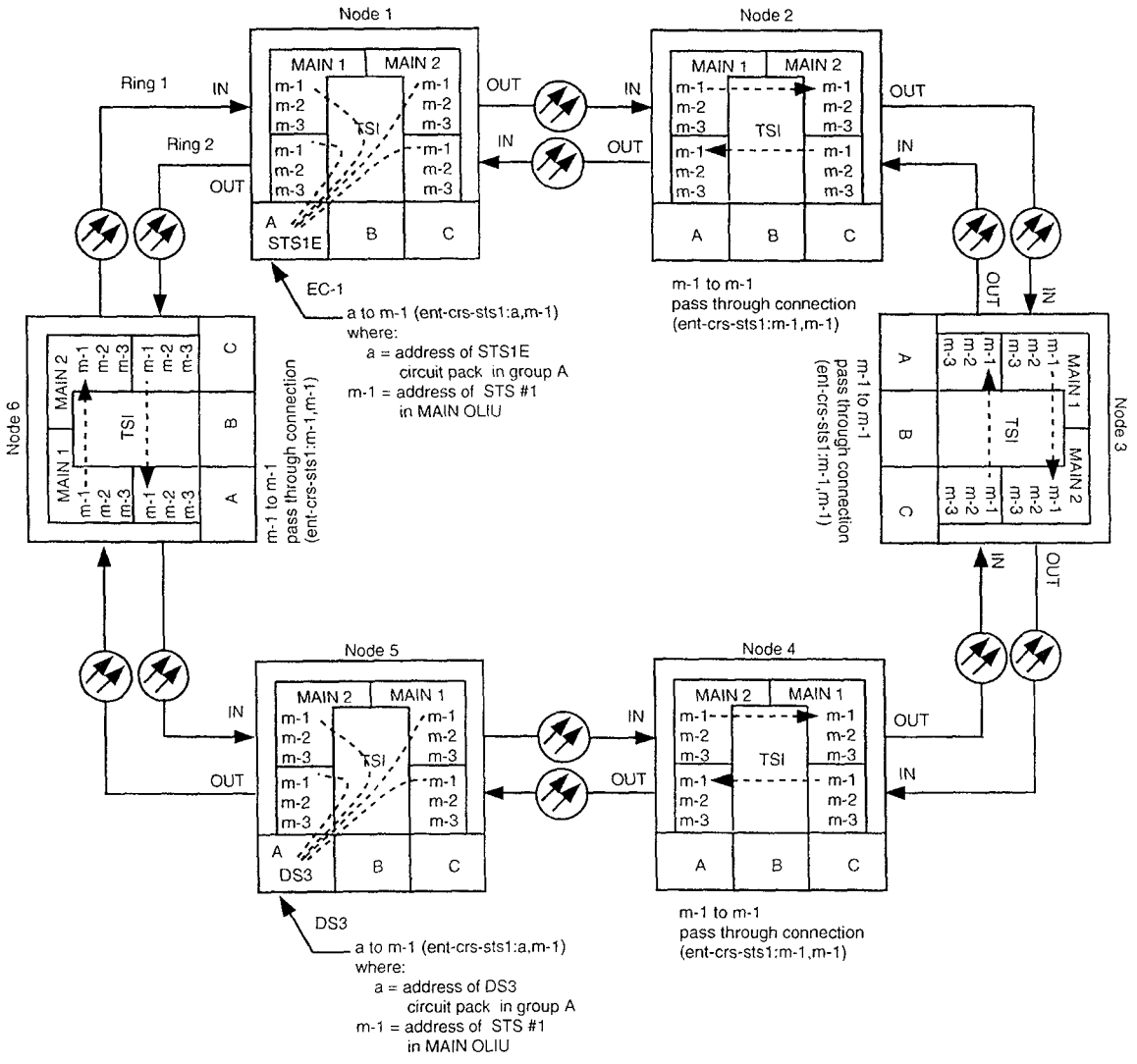


Figure 7. Path Protected Ring Network (DS3 to EC-1) with STS1 Cross-Connections

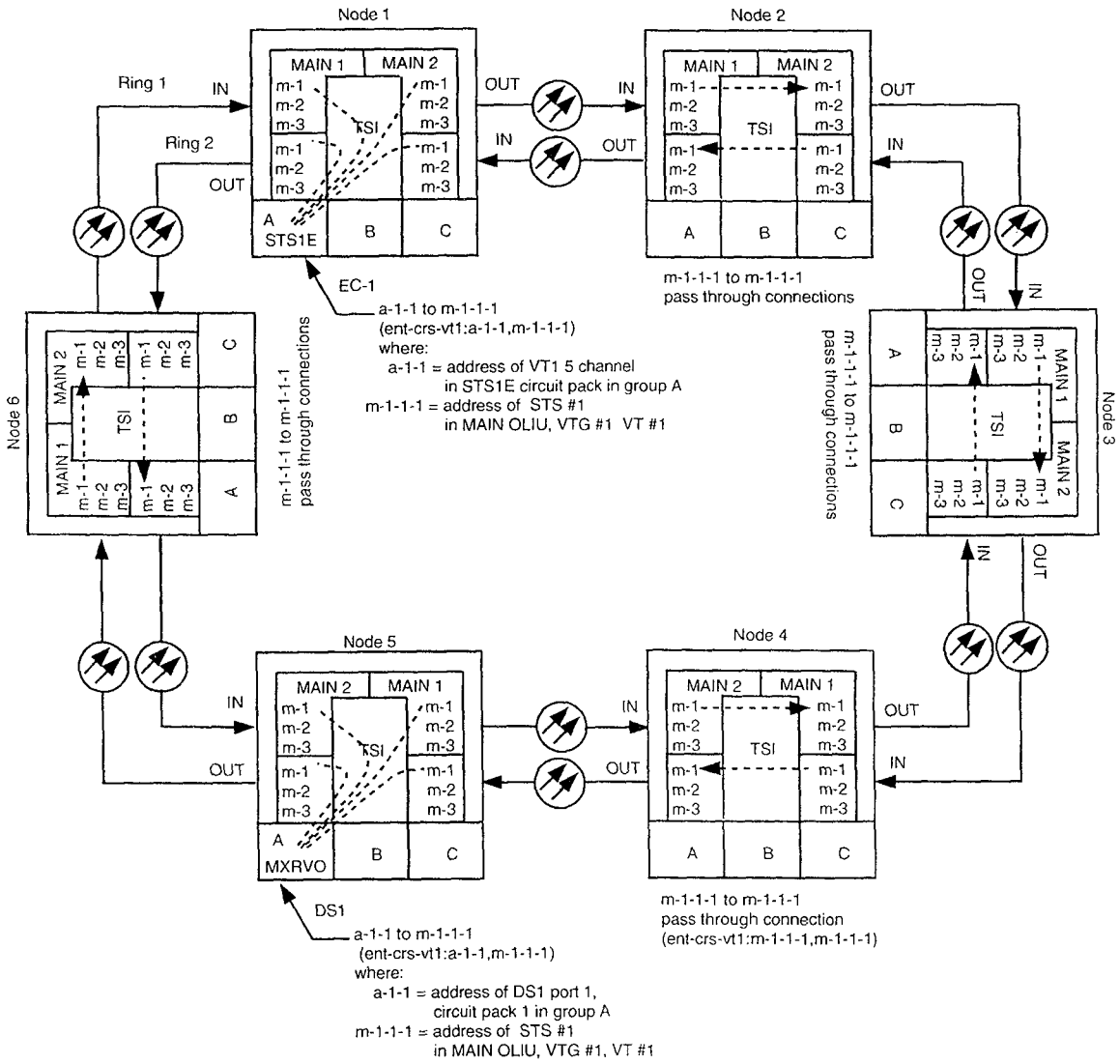


Figure 8. Path Protected Ring Network (one DS1 to EC-1) with VT1.5 Cross-Connections

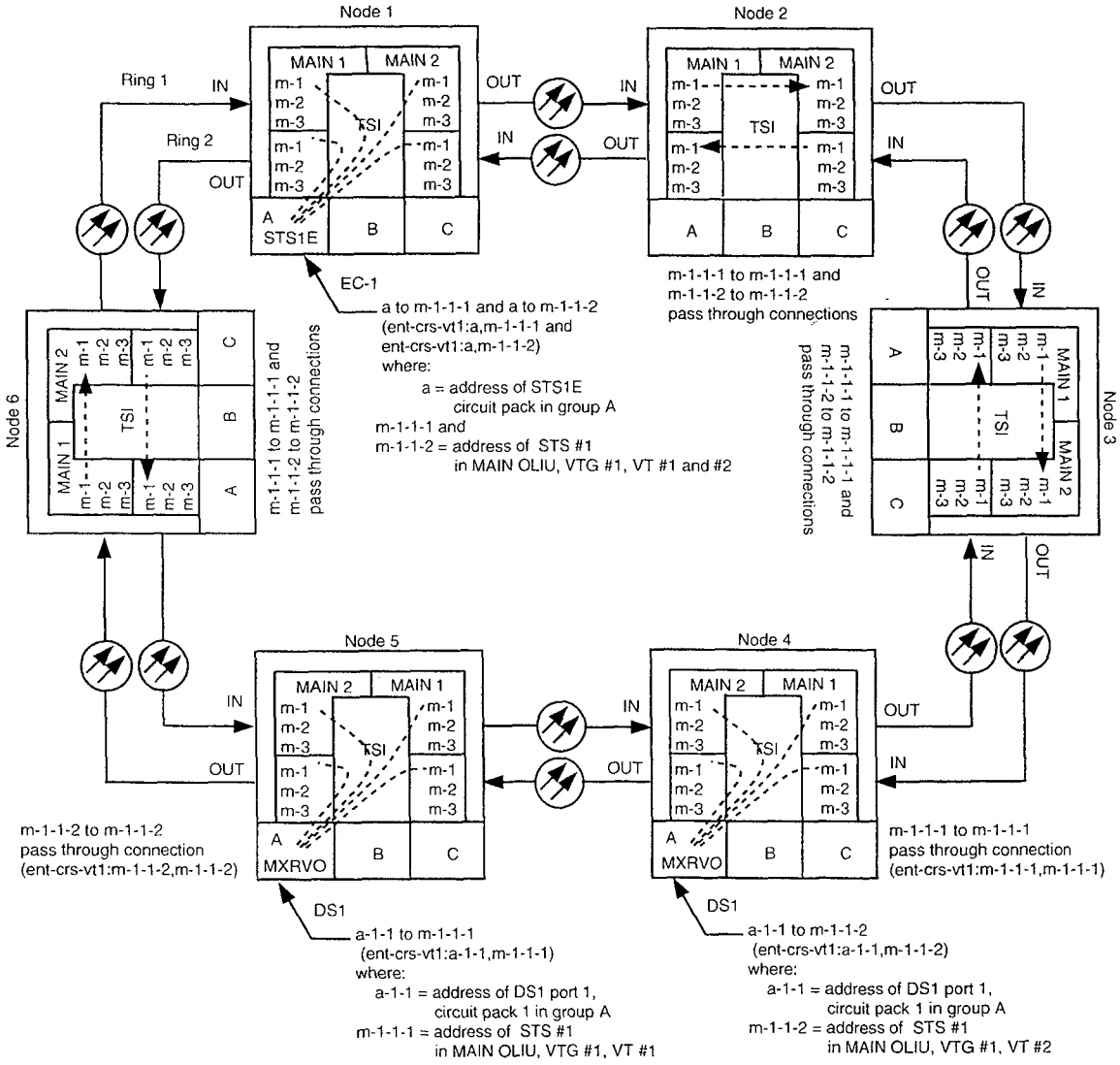


Figure 9. Path Protected Ring Network (two DS1s to EC-1) with VT1.5 Cross-Connections

DDM-2000 Receiver Sensitivity Test

1. ⚠ WARNING 1:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam.

⚠ WARNING 2:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Take care to avoid damaging LEDs that protrude through opening in faceplate of **OLIU**.

⚠ CAUTION 2:
Avoid excessive bending of optical jumper and cables.

⚠ CAUTION 3:
*All optical fiber connectors, couplings, and buildouts should be properly cleaned [***DLP-527***]. Signal performance may be degraded if connectors, couplings, or buildouts are not cleaned properly.*

⇒ NOTE 1:
It may take from 15 seconds to 3 minutes and 25 seconds for **FAULT** LEDs to stop flashing, depending on setting of signal degrade threshold (–5 to –9).

NOTE 2:
Lightguide jumpers used to loop **OLIU**s must be equipped with *ST*® connectors at both ends. These connectors are spring-loaded and have notches that must be aligned with **OLIU** optical connector tabs before pushing in and turning connector.

NOTE 3:
This test may be accomplished with one shelf by simply using an optical loopback after the optical splitter.

Configure the DDM-2000 shelf and test equipment as shown in Figure 1.

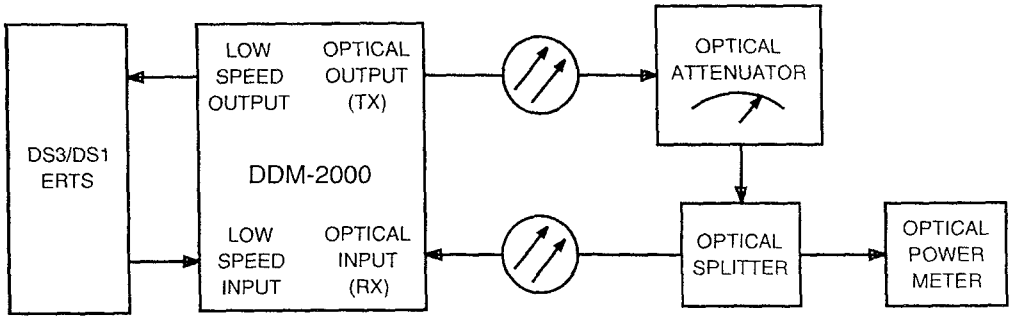


Figure 1. DDM-2000 Receiver Sensitivity Test Configuration

2. Set variable optical attenuator to obtain power level reading on optical power meter as required from Table A.

Table A. Variable Optical Power Settings for OC-3

OC-3 OLIU Power Levels	
OLIU	**Power Level (dBm)**
21G, 21G-U, 22G-U, 22G2-U, 22F	–34
21D, 21D-U, 22D-U	–33.8

3. Monitor the DS1/DS3 received signal with the DS1/DS3 Error Rate Test Set (ERTS) for 30 minutes and insure a bit error rate (BER) result of 10^{-10} or better.

4. Did **OLIU** pass BER test?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 5**.

5. Clean optical attenuators and connectors and repeat test. If test fails again, replace **OLIU**.

Replace Defective Fan Pack

1. ⚠ CAUTION:
   Exercise care in removing the fiber tray or fiber support bracket, if required, to prevent damage to the optical fibers.

   ⇒ NOTE 1:
   Fan packs are numbered from left to right as viewed from front of fan shelf.

   ⇒ NOTE 2:
   This procedure is the same for both front and rear access arrangements.

   ⇒ NOTE 3:
   Fan pack removal does not require the removal of the fan shelf.

   ⇒ NOTE 4:
   To remove the front cover of a fan shelf located between two OC-3 shelves it may be necessary to remove either the fiber tray from the top OC-3 shelf, if it is a G1 shelf, or the fiber support bracket, if the shelf is a G3 shelf.

   Remove fan shelf front cover by turning front latch assemblies according to the markings on the front cover.

2. Disconnect the fan pack cable and unscrew the two mounting screws holding the fan pack in place. See Figure 1.

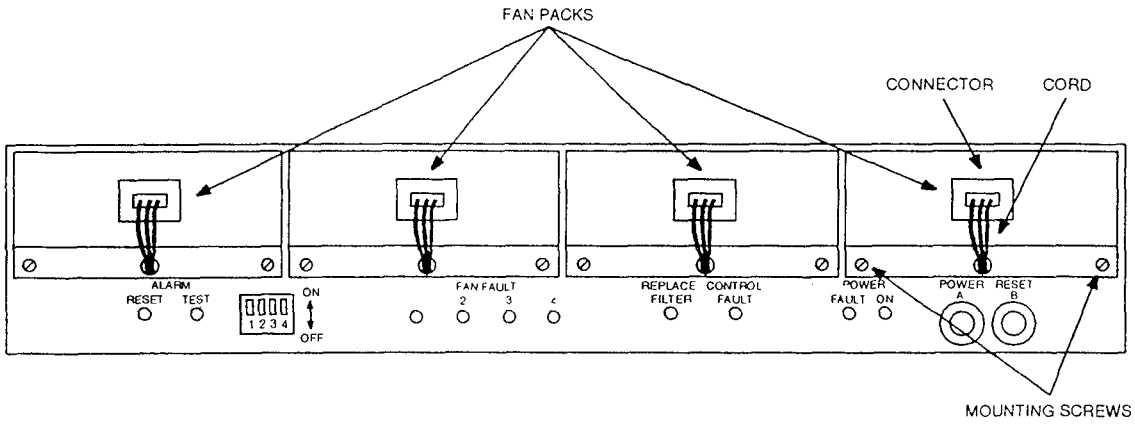


Figure 1. DDM-2000 Fan Shelf — Front Cover Removed

3. Slide out defective fan pack and install new fan pack (ED-8C733-30, G6).
4. Reinstall fan pack screws and reconnect the fan cable.
5. Remount fan shelf front cover and tighten latch assemblies.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Condition System Operating on OC-3 Release 1 Software for an Upgrade to OC-3 Release 2 or Release 3 Software

1. ⚠ CAUTION 1:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⚠ CAUTION 2:
Service may be affected if this conditioning procedure is not performed prior to upgrading from Release 1 software to Release 2 or Release 3 software.

NOTE 1:
This procedure conditions a DDM-2000 OC-3 System operating with Release 1 software so that it can be upgraded to operate with Release 2 or Release 3 software. This procedure must be used at a local (as opposed to a remote) terminal.

NOTE 2:
A system reset will occur during this procedure. This will not affect service, but it will reset the performance monitoring (PM) data.

NOTE 3:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Verify that no alarms, locks, loops, or switches are present.

2. Obtain the following equipment:
   (1) *IBM* compatible personal computer (PC) with *MS-DOS* Release 2.1 or later.

   (2) RS-232 Cable to connect the PC to the DDM-2000 OC-3 shelf.

   (3) DDM-2000 OC-3 Release 1 UPGRADE TOOL diskette.

3. Before beginning this procedure, the following is strongly suggested:
   a. Become familiar with the characteristics and operating procedures of your PC and the *MS-DOS* operating system.

      Reference: **DLP-533**

   b. Follow proper procedures in handling the diskette(s) (floppies).

      Reference: **DLP-534**

4. ⇒ NOTE 2:
   At the shelf to be connected to the PC, a high baud rate setting will reduce the time required to download the program from the UPGRADE TOOL diskette. It is recommended to use 9600 baud since the default data rate for the program package is 9600 baud. At 9600 baud this program installation will take about 30 minutes.

   Ensure **SYSCTL** baud rate is set to the desired baud rate. Baud rate switch settings for 9600 at the front port is **S3-1** ON, **S3-2** OFF, and **S3-3** OFF. Baud rate switch settings for 9600 at the rear port is **S3-4** ON, **S3-5** OFF, and **S3-6** OFF.

   Reference: **DLP-513**

5. ⇒ NOTE 1:
The rear access CIT port is configured for a modem. A null modem is required to use this port with the PC.

⇒ NOTE 2:
The cable from the **CIT** port on the DDM-2000 must be connected to the **COM** (**COM1**, **COM2**, **COM3**, or **COM4**) RS-232 port of the PC.

Connect PC to **CIT** port by connecting one end of an RS-232 cable to the **COM** port of the PC and the other end of the cable to the front or rear DDM-2000 **CIT** port. Turn on PC.

6. If applicable, start *MS-DOS* by inserting *MS-DOS* diskette into drive A. Close the door and reboot or turn on the PC. When the *MS-DOS* software is ready, a prompt (for example, `A>`) appears.

7. Remove *MS-DOS* diskette, if applicable, and insert DDM-2000 OC-3 Release 1 UPGRADE TOOL diskette.

8. Type `a:` or `b:` to go to the drive with the DDM-2000 OC-3 Release 1 UPGRADE TOOL diskette installed.

   Response: CIT prompts with `A>` or `B>`.

9. Type `term` or `term COMn`, where `n`=1, 2, 3, or 4. If `term` is entered without the `COMn` option, then **COM1** will be selected by default.

   Response: A brief message is printed and you are instructed to `Press any key to continue . . .` After you press any key, the terminal emulator is loaded and the system responds with:

   ```
   CTRM ready. (Type Alt-h for help.)
   Communications established
   ```

10. Enter a `<carriage return>` or `?`.

    Response: System responds with:

    ```
    /* Enter a shelf number from 1 to 8 */
    Shelf [default]=
    ```

11. Enter a shelf number from 1 to 8.

    Response: System responds with:

```
/************************************
*                                   *
*              AT&T                 *
*      DDM-2000 OC-3 Multiplexer    *
*                                   *
*         Release 1.0.5             *
*                                   *
************************************/

SiteX 70-01-01 00:00:20
```

12. Note Site number (for example, SiteX) and enter `ins-prog:SiteX`.

    Response: System responds with:

```
/* Testing For Program Installation    */

/* Caution!  Execution of this command will erase
the current generic 1 0.5 at Site1 and replace it
with generic 99 0.1   If this fails prior to
completion the control system will likely become
inoperable until another install program attempt is
successful.  This command will terminate any other
active CIT sessions.  This command will take about
30 minutes to install the new program at 9600 baud
Lower data rate will take proportionally longer. */

Execute? (y/n)
```

13. ⇒ NOTE:
    This will NOT overwrite the running generic, but it is the same procedure as running a software install. While the UPGRADE TOOL software is active, the **ACO** LED flashes.

    At the `Execute` prompt enter `y`.

14. Standby (about 5 minutes) until the DDM-2000 OC-3 Release 1 UPGRADE TOOL software download is complete. The software will download, run, print an action summary, and automatically reboot the R1 generic program.

15. Observe system response.

Response:

```
In Progress. ..   .   .  ..  ..      .. . .
M  ins-prog:SiteX COMPLD
/* Generic program 99.0 1 is installed. */

/************************************
 **                                **
 **     R1 UPGRADE TOOL PROGRAM    **
 **         Version 99.0.1         **
 **      RAM resident version      **
 **     Copyright (c) 1992 AT&T    **
 **       All rights reserved      **
 **                                **
 ************************************/
```

If the procedure is successful, the system will respond as follows:

```
/* The Release 1 software is now conditioned for direct
upgrade to Release 2 or Release 3   This must be done while
the conditioned TGS and OLIU packs remain in this shelf */
```

If the procedure is unsuccessful, the system will respond as follows:

```
/* The process to condition the software for upgrade was
unsuccessful   This step must be successful before an
upgrade from Release 1 to Release 2 or Release 3 is
attempted */
```

16. ⇒ NOTE:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Was the conditioning procedure successful?

If **YES**, continue with **Step 17**.
If **NO**, correct "ERROR" condition and repeat this procedure from **Step 11**.

17. ⇒ NOTE 1:
The R1 software system is now conditioned for a direct upgrade to R2 or R3 software.

⇒ NOTE 2:
If a system is converted from R2 or R3 software to R1 software, this conditioning procedure and the DDM-2000 Release 1 UPGRADE TOOL must again be used to upgrade back to R2 or R3 software.

To condition another shelf, repeat this procedure. If not, remove the DDM-2000 OC-3 Release 1 UPGRADE TOOL diskette from the PC and return to the procedure that sent you here or use **NTP-013** to upgrade to Release 2 or 3.

Make VT1.5 (DS1) or STS1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration Release 7

1. ⇒ NOTE 1:
This procedure assumes that the "drop and continue" feature will be used to interconnect two rings at two locations to support service between nodes in each ring. The two rings interface through EC-1 connections at two interworking nodes.

⇒ NOTE 2:
If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual: **`ent-crs-sts1`**, **`ent-crs-vt1`**, **`rtrv-crs-sts1`**, **`rtrv-crs-vt1`**, **`dlt-crs-sts1`**, and **`dlt-crs-vt1`**.

⇒ NOTE 3:
You will have to login to more than one node in each ring to get a complete map of the network using the **`rtrv-nmap`** (R7.1 and earlier) or **`rtrv-map-network`** and **`rtrv-map-neighbor`** (R7.2) command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

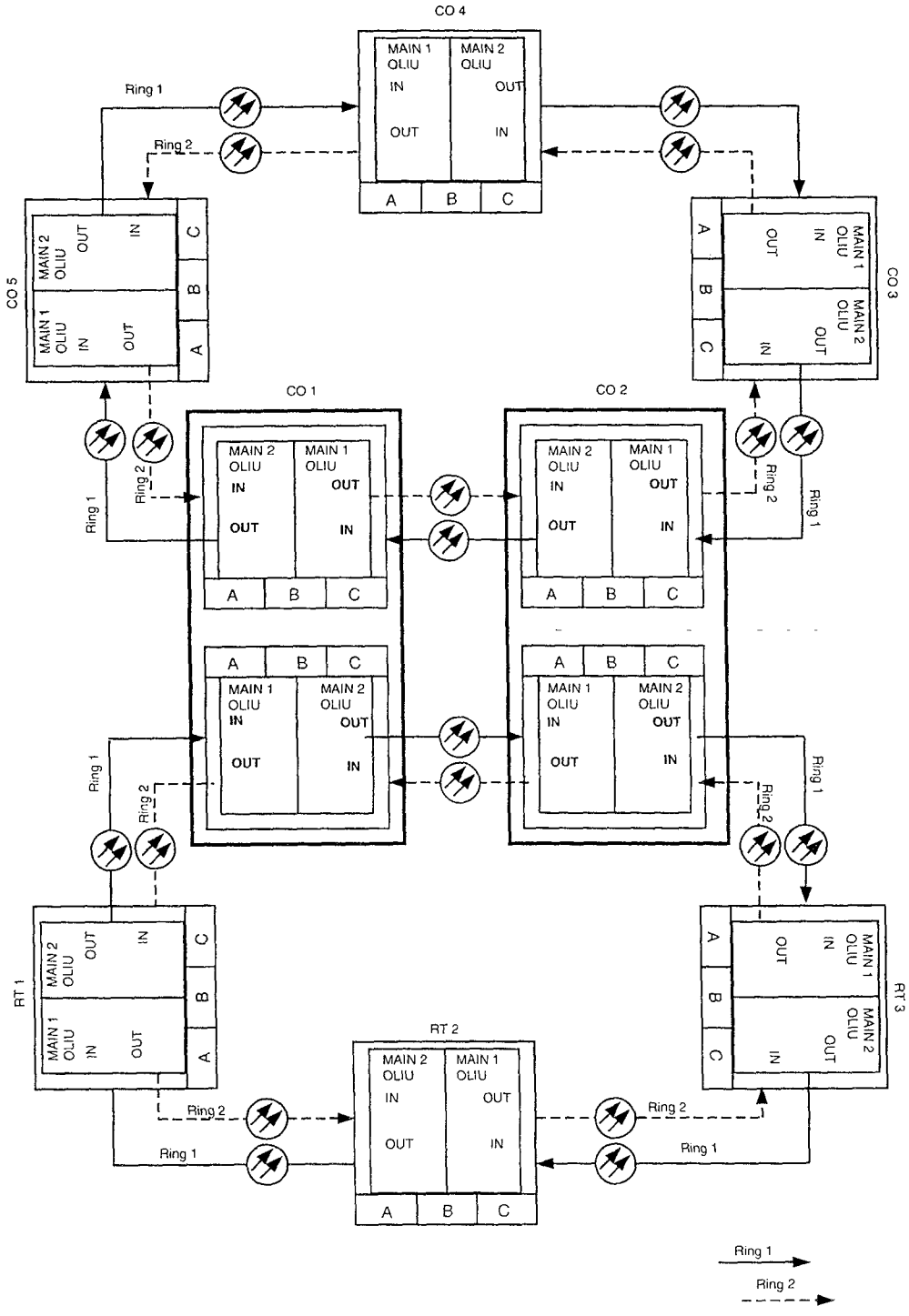


Figure 1. Sample Network Schematic

Login to any node in each ring in the network and use the **rtrv-nmap:** (R7.1 and earlier) or **rtrv-map-network** and **rtrv-map-neighbor** (R7.2) command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2, 3, and 4:

```
    Site6NE1 94-11-27 13:09:53  DDM-2000 OC-3, R7.1.2
M   rtrv-nmap:  COMPLD
    /* Network Map for Site6NE1
   ================================================================================
    System Name (TID)      Connected     Neighbor     Communication     GNE
                             Through                      Status
   ================================================================================
   Site6NE1                                                                yes
   Site7NE1                  main-1       yes
   Site3NE1                  main-2       yes
   Site4NE1                    -          no            FAILED
   Site2NE1                    -          no
   Site5NE1                    -          no

 */
```

Figure 2. Sample Report From **rtrv-nmap** Command

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-3, R7.2.1
M   rtrv-map-network:  COMPLD
    /* Network Map for Site6NE1
   ================================================================================
    System Name           Comm.     Product          NE             Alarm
      (TID)               Status    Type             Type           Group
   ================================================================================
   Site6NE1                         DDM-2000 OC-3                     5
   Site7NE1               FAILED    DDM-2000 OC-3                     5
   Site5NE1                         DDM-2000 OC-3    DSNE             5
   Site4NE1                         DDM-2000 OC-3                     5
   Site3NE1                         DDM-2000 OC-3                     5
   Site2NE1                         DDM-2000 OC-3                     5

 */
```

Figure 3. Sample Report From **rtrv-map-network** Command

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-3, R7.2.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Site6NE1
   ================================================================================
    System Name           Connected     Communication     Product
      (TID)               Through       Status            Type
   ================================================================================
   Site6NE1                                               DDM-2000 OC-3
   Site7NE1               main-1        FAILED            DDM-2000 OC-3
   Site5NE1               main-2                          DDM-2000 OC-3

 */
```

Figure 4. Sample Report From **rtrv-map-neighbor** Command

2. Verify system configuration is same as specified on work order or circuit order.

3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. ⇒ NOTE 1:
   In dual ring configurations, cross-connections consist of "drop and continue" connections in addition to pass-through and terminating cross-connections. For example in Figure 5, drop and continue connections are made at the four nodes in CO 1 and CO 2 located between the two rings. Also, cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and FT-2000 OC-48 rings, as required.

   ⇒ NOTE 2:
   In ring configurations, you should use the following rules in establishing cross-connections in each ring:

   1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

   2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. OC-3 ring Releases 7.0 and earlier do not support the command (**`cnvt-crs`**) for converting an STS-1 to a VT1.5 cross-connect. Also, provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

   3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the **rtrv-eqpt:** command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **MXRVO** and/or **DS1/DS1PM** circuit packs if DS1 service is being established?

6. ⇒ NOTE 1:
   Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group (see **ent-crs-sts1** command).

   ⇒ NOTE 2:
   The following commands may be used to delete, enter, and retrieve cross-connections: **dlt-crs-vt1**, **ent-crs-sts1**, **ent-crs-vt1**, **ent-crs-sts1**, and **rtrv-crs-vt1**. and **rtrv-crs-sts1**. See the "Commands and Reports" section of this manual for a description of commands.

   From work order or circuit order, determine the cross-connections (STS-1 or VT1.5) to be made at each node associated with the kind of service being established.

7. Starting at one of the terminating nodes for the DS1/DS3 circuit being established, use the **rtrv-crs-( ):** command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #3 low speed port in the **DS1** circuit pack in slot #2 of LOW SPEED group A (a-2-3) is to be connected to timeslot m-1-2-3 and the **rtrv-crs-vt1** command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

   If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the **dlt-crs-( )** commands.

8. ⇒ NOTE:
   In Release 6.2 and 7.1 or later, channel state provisioning provides IS, AUTO, and NMON states for VT and STS channels similar to the port states for DS1 and DS3 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

   At all nonterminating nodes in the network, use the **ent-crs-vt1:** or **ent-crs-sts1:** command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-2-3, use the **ent-crs-vt1:m-1-2-3,m-1-2-3:cct=twoway** command. To make pass-through cross-connections for STS-1 #1, use the **ent-crs-sts1:m-1,m-1:cct=twoway** command.]

9. At the terminating (drop) nodes of the circuit being established, use the **ent-crs-vt1:** or **ent-crs-sts1:** command to make the terminating cross-connections (for example, **ent-crs-vt1:m-1-2-3,a-2-3:cct=twoway**) or **ent-crs-sts1:m-1,b:cct=twoway**)

10. From work order or circuit order, determine the dual ring interworking node sites where the two rings are being interconnected.

11. From work order or circuit order at each dual ring interworking node, determine the "drop and continue" cross-connections to be made at each node.

12. At the dual ring interworking node sites, make or verify proper backplane EC-1 cable connections [**J38-J39** (FN A), **J40-J41** (FN B), **J42-J43** (FN C)] between function groups used for service being provided. See CO 1 and CO 2 in Figure 5.

13. ⇒ NOTE:
    Ring 1 is the ring being received on the **MAIN 1 OLIU**. Ring 2 is the ring being received on the **MAIN 2 OLIU**. The ***ring*** parameter of the **ent-crs** commands is used to identify which ring rotation will be continued as well as dropped at a node. For example, if Ring 2 continues to the next node, then ***ring***=*m2*

    At the dual ring interworking node sites, determine the ring (Ring 1 or Ring 2) rotation that will be continued to each node. For example, in Figure 5, note that at CO 1 in the top ring configuration, Ring 2 is continued to CO 2. In the bottom ring configuration, Ring 1 is continued from CO 1 to CO 2.

14. ⇒ NOTE:
If VT1.5 cross-connections in the same STS-1 are made at a dual ring interworking node site, all VT1.5 "drop and continue" cross-connections at that node must be made in the same direction.

At the dual ring interworking node sites, make proper "drop and continue" cross-connections. For example, at the top node at CO 1 if STS-1 #1 in MAIN OLIU (m-1) is to be cross-connected to function group B (b) then the command **ent-crs-sts1:m-1,b:cct=dc,ring=m2** would be used to make the cross-connection. This command makes both the drop cross-connection as well as the continue cross-connection.

15. Use the **rtrv-crs-vt1:** or **rtrv-crs-sts1:** command to verify that the proper connection has been made. If an improper cross-connection is made, use the **dlt-crs-vt1:** or **dlt-crs-sts1:** command to delete the improper cross-connection and reenter the cross-connection.

16. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

17. If `ne-acty inc. VT AIS` or `inc. STS1 AIS` alarms are present, look for missing or improperly made cross-connections. Use **TAP-121** to locate missing cross-connections, if required.

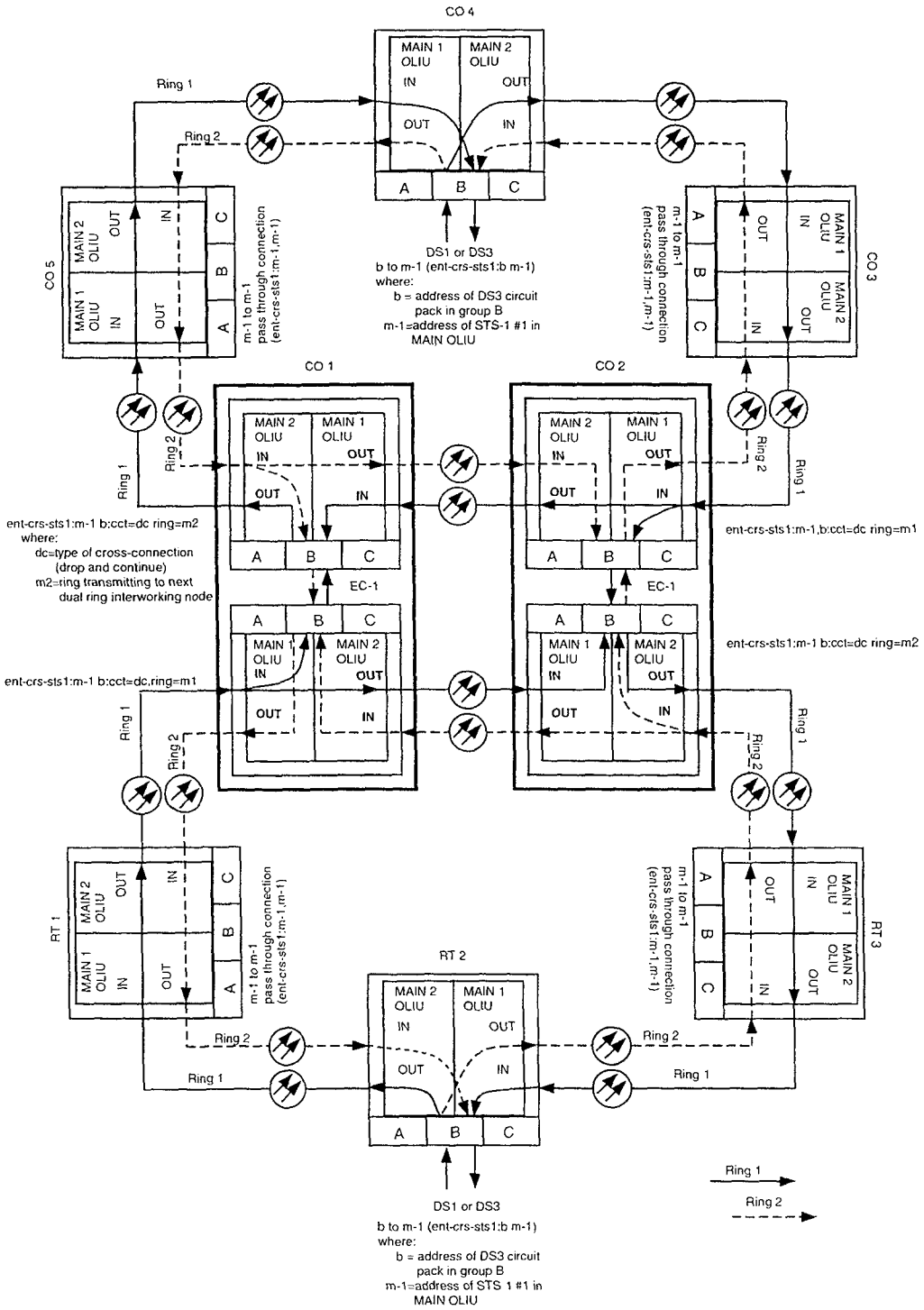


Figure 5. Example of Dual Ring Interworking Cross-connections

Replace DDM-2000 OC-3 Shelf User Panel Out of Service

1. ⚠ CAUTION:
For an in-service shelf, it will be necessary to remove service prior to performing this procedure.

NOTE 1:
The **ED-8C724-31**, **G1** User Panel in the **ED-8C724-30**, **G1** DDM-2000 OC-3 Shelf can **not** be replaced in the field.

NOTE 2:
This procedure provides instructions for replacement of the User Panel in an **ED-8C724-30**, **G3** or **G4** DDM-2000 OC-3 Shelf.

Tools, Accessories, and Material

The following is required:

Table A. Tools, Accessories, and Material

Quantity	Description
1	ED-8C724-31, G2 or G3 User Panel
1	Screwdriver
1	Pliars
1	Wrist Strap*

* A grounded wrist strap must be worn when handling circuit packs

Preparation

2. If the shelf is in service, verify that the shelf is free of alarms and that no protection switches are active. Remove service from the shelf.

Modification Procedure

3. Remove the **OHCTL** and **SYSCTL** circuit packs from the shelf.
4. Disconnect the shelf power lead connectors **P1** and **P2** from the bay power riser connectors **J1** and **J2**. The green **PWR ON** LED on the front of the user panel should gradually extinguish.
5. Unseat the remaining circuit packs in the shelf.
6. Remove the screw at the top of the User Panel faceplate.
7. Unscrew the **ESD** jack at the bottom of the User Panel faceplate.
8. Slide out the User Panel and disconnect the three cable plugs from the connectors on the User Panel printed wiring board.
9. Install the new User Panel, reconnecting the three cable plugs. (Cable plug **J4** connects to the top connector, **J5** to the middle connector, and **J6** to the bottom connector.)
10. Reconnect shelf power lead connector **P1** to the bay power riser connector **J1** and verify that the **PWR ON** LED on the User Panel lights.

Verification and Completion

11. Disconnect shelf power lead connector **P1**. Reconnect shelf power lead connector **P2** to bay power riser connector **J2** and verify that the **PWR ON** LED on the User Panel lights.
12. Reconnect power lead connector **P1** to bay power riser connector **J1**.
13. Install the **OHCTL** circuit pack and then the **SYSCTL** circuit packs in the shelf.
14. Reseat the remaining circuit packs in the following order: **TGS**, **OLIU**, **MXRVO**, **DS3**, **STS1E**, and **DS1/DS1PM**.

15. After about 10 minutes the shelf should be free of alarm indications.

16. Depress the **ACO/TST** pushbutton on the User Panel and verify that all LEDs on the User Panel light. Continue to depress the **ACO/TST** pushbutton and the release number of the software installed in the shelf should be displayed in the **SYSCTL** window.

17. Use CIT and verify that you can log into the shelf. If you cannot establish a session, check cable connections.

    Reference: **DLP-521**

18. Service may now be restored to the shelf.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install/Remove Lightguide Buildout

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to beam.

⚠ CAUTION:
Use static ground wrist strap whenever handling circuit packs or working on DDM-2000 terminal to prevent electrostatic discharge damage to sensitive components.

Is buildout being installed or removed?

If **Installing**, then continue with Step 2.
If **Removing**, then continue with Step 5.

2. Remove protector caps and plugs (if equipped) from buildout and buildout block.

3. Align lightguide buildout locking tab with slot in buildout block (unlocked position), push in, and rotate clockwise until locked into position. Refer to the appropriate figure for the specific buildout type.

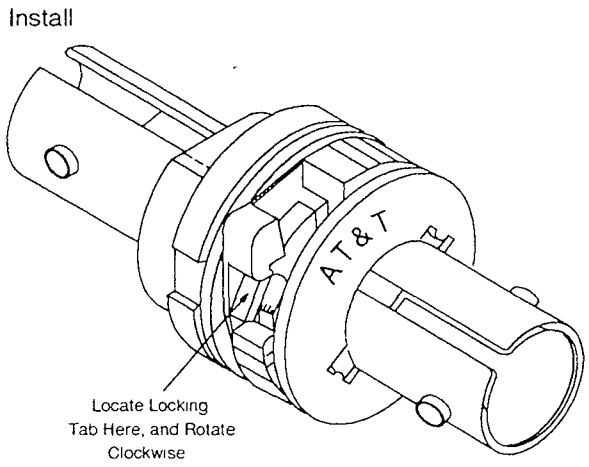


Figure 1. *ST*®-Type Buildout (Old Version)

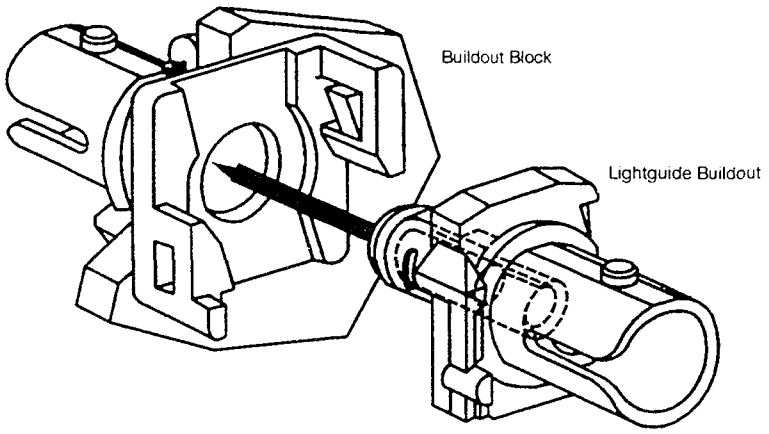


Figure 2. *ST*-Type Universal Buildout

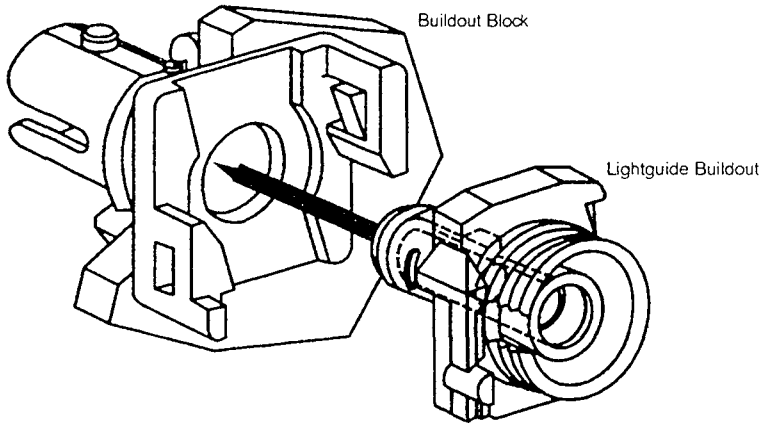


Figure 3. FC/PC-Type Universal Buildout

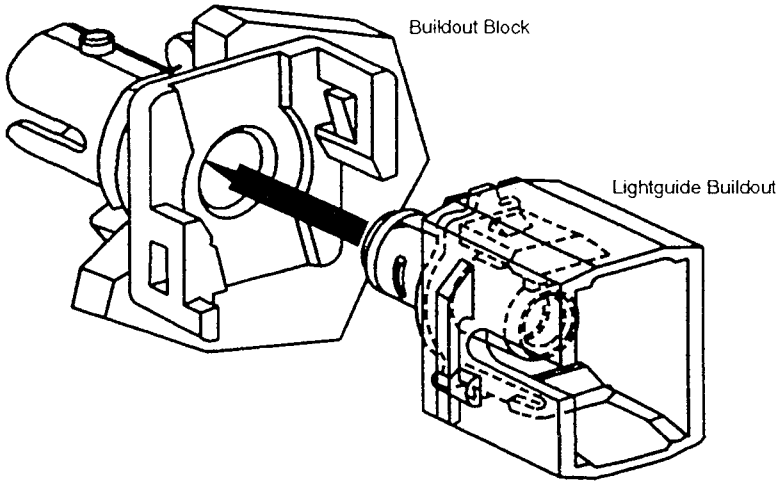


Figure 4. SC-Type Universal Buildout

4. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

5. Depress locking tab on the buildout until locking tab is free from the locked position, rotate the buildout counterclockwise to the stop position, and separate the buildout block by pulling it toward you. Only the old version of the *ST*-type buildout is shown. Refer to the appropiate figure in Step 3 for the specific buildout type.

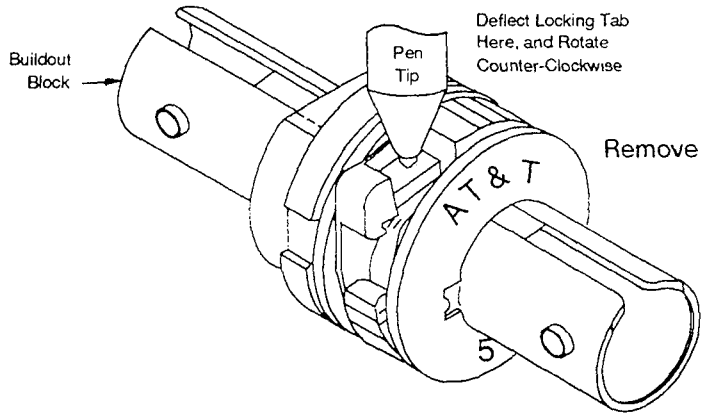


Figure 5. *ST*-Type Buildout (Old Version)

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3 Transmission Test
Dual Ring Interconnection

Overview: This procedure is performed on one or more out-of-service circuits to test the dual ring interconnections (DRI) from a DDM-2000 ring network to another DDM-2000 ring network or to an FT-2000 ring network. Numerous configurations are possible when interconnecting DDM-2000 networks. Therefore, this procedure provides you with typical examples and explanations of some of the possible configurations and instructs you on the procedures used in testing these configurations.

1. ⇒ NOTE 1:
   This procedure may be used to perform DS3 transmission tests for a Dual Ring Interconnection (DRI) between DDM-2000 networks and FT-2000 ring networks. When this procedure is being used to perform end-to-end DS3 tests, it is assumed that the complete end-to-end systems have already been tested and that only a particular DS3 channel is being tested at this time.

   ⇒ NOTE 2:
   A CIT is required for this test to make/verify cross-connections and to switch paths of the DS3 being tested. The transmission test can be performed either with a CIT and the automated test command `test-trmsn-t3` or with a DS3 test set.

   ⇒ NOTE 3:
   The DS3 circuit being tested is assumed to originate at equipment external to the DDM-2000 source node and is carried around the DDM-2000 ring to the dual ring interconnection nodes where it is connected to the corresponding DDM-2000 DRI nodes or to the primary and secondary FT-2000 DRI nodes. The DS3 is then carried around the next ring network to the final destination node where it is terminated on external equipment. If more than two rings are interconnected, the DS3 signal may be passed through another set of DRI nodes.

NOTE 4:
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3 circuit being tested. Release 7 has no default cross-connections and supports only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the Commands and Reports section of this manual: `cnvt-crs`, `dlt-crs-sts1`, `dlt-crs-vt1`, `ent-crs-sts1`, `ent-crs-vt1`, `rtrv-crs-sts1`, `rtrv-crs-vt1`, `cnvt-crs-sts1`, `set-ne`, and `rtrv-ne`. See *Cross-Connection Provisioning* in the Administration and Provisioning section of this manual for more information on cross-connection provisioning.

NOTE 5:
If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS3** circuit packs, the DS3 transmission test is performed from the DS3 terminating end. If the CIT and `test-trmsn-t3:` command is being used to perform the test and you are at the EC-1 terminating end, the `rlgn` command may be used to log into the DS3 end to perform the test using the `test-trmsn-t3:` command.

NOTE 6:
When both terminating ends are equipped with **STS1E** circuit packs, DS3 transmission tests may be performed. For DS3 tests, one end may be temporarily equipped with **DS3** circuits packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **STS1E** at the near end, perform an update (`upd`), and install the **DS3** circuit pack(s). After the tests are completed, remove the temporary circuit packs, perform an update, and reinstall the **STS1E** circuit packs.

At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-521**

2. ⇒ NOTE:
   Work orders, office records, or CIT `ent-crs-sts1` or `rtrv-crs` commands may be used to make or verify STS-1 cross-connections.

   At each shelf in the network, make/verify that proper pass-through, terminating, and "drop and continue" STS-1 cross-connections have been made for each DS3 channel being tested.

3. Do one of the following:

   (a) ⇒ NOTE:
   When an end-to-end DS3 test is run in the mux direction and an **external** loopback is established at the far end, provision the far end DS3 for CC mode with no AIS (`set-t3:`*`address`*`:mode=cc,ais=no`). Otherwise, if the VMR mode is used, then only errors in the receive direction will be monitored and the system may not recognize that a loopback is up.

   Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-3 or STSX cross-connect point associated with the DS3 channel to be tested.

   (b) Log into the far-end DDM-2000 terminal, either locally or by using the `rlgn` command, if possible, and use the `opr-lpbk-t3:`*`address`* or `opr-lpbk-ec1:`*`address`* command to loop back the DS3 or EC-1 port(s) at the far end. Use `logout` or `toggle` (crtl t) command to return control of CIT to near end.

4. ⚠ CAUTION:
Execution of switch commands may affect service. Check local procedures before performing switch commands.

NOTE 1:
If this transmission test is to be performed for each path in the end-to-end network, the `switch-path-sts1` command must be used at some of the DDM-2000 nodes to switch paths for each test. If FT-2000 is part of the network, the `FAULT-Switch-Path-STS3` command must be used at the FT-2000 Primary DRI node(s) if the FT-2000 secondary path and the DDM-2000 DRI connections to the FT-2000 secondary node are to be tested. Up to four tests may have to be performed for each DS3 circuit if all protection paths are required to be tested. See Figures 3-14.

NOTE 2:
For configurations not shown in the examples, local procedures should be developed to test the DS3 circuits being equipped. A sketch of the network may need to be made and the paths to be tested should be determined as shown in the examples in this procedure.

Use the necessary switch commands to set up the DS3 path being tested. [For example, if the configuration looks like Figure 3, use the `switch-path-sts1` command for test 1 to make Ring 1 active at both terminating nodes and all DDM-2000 DRI nodes. Other DS3 path tests for the same configuration would be set up as follows (Figures 4-6)]:

Test	Terminating Nodes	DRI Nodes	Figure
Test 1	Ring 1 active	Ring 1 active	Figure 3
Test 2	Ring 2 active	Ring 1 active	Figure 4
Test 3	Ring 2 active	Ring 2 active	Figure 5
Test 4	Ring 1 active	Ring 2 active	Figure 6

5. Are you using CIT and `test-trmsn-t3` command to perform this test?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 23**.

6. Are you doing this test in the mux or demux direction?

   If **MUX** direction, then continue with **Step 7.**
   If **DEMUX** direction, then proceed to **Step 9.**

7. At the near end DDM-2000, use the following command to perform a test of the DS3 loop in the fiber direction:
   `test-trmsn-t3:`*`address`*`:dirn=mux:dur=( );`

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If `dirn=mux`, direction is toward fiber.

dur = duration of the test in minutes (1-120), default is 1.

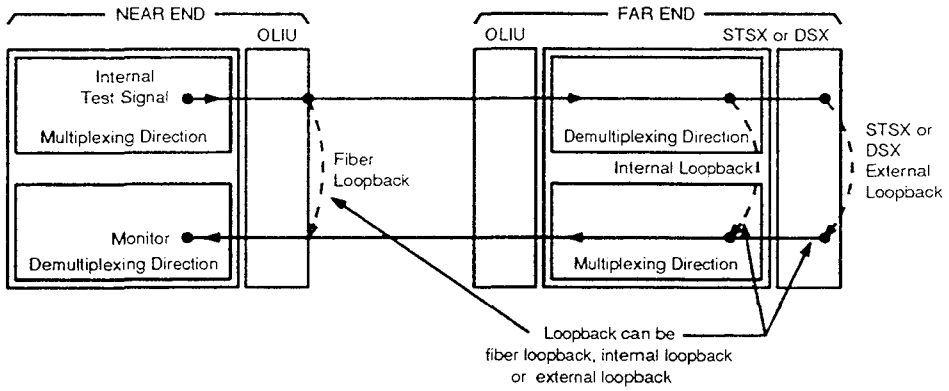


Figure 1. Transmission Test of DS3 Signal in MUX Direction

8. Was the test successful (error free)?

   If **YES**, then continue with **Step 12.**
   If **NO**, then proceed to **Step 37.**

9. See Figure 2. At the near-end DSX-3 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.

10. Use the following command to perform a DS3 transmission test in the demux direction to test the DS3 loop in the DSX direction:
    `test-trmsn-t3:`*`address`*`:dirn=demux:dur=( );`

    Where *address* = address identifier of the DS3 signal.

    dirn = direction of the test. If `dirn=demux`, direction is toward DSX.

    dur = duration of the test in minutes (1-120), default is 1.

11. Was the test successful (error free)?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 37**.

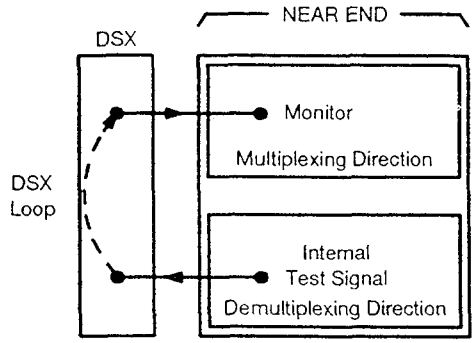


Figure 2. Transmission Test of DS3 Signal in DEMUX Direction

12. Is this the first service being placed on the group and is a protection circuit pack installed?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:
    `switch-fn:`*`address`*`:pri=manual;`.

    Response: The green **ACTIVE** LED lights on the protection circuit pack.

14. Repeat the transmission test in the mux (or demux) direction using the following command:
    `test-trmsn-t3:`*`address`*`:dirn=mux (or demux):dur=( );`.

15. Was the test successful (error free)?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 37**.

16. Use the following command to clear active switch requests on the protection circuit pack:
    `switch-fn:`*`address`*`:pri=reset;`.

17. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 18**.
    If **YES**, then proceed to **Step 19**.

18. Repeat this procedure from Step 4 for the next path to be tested.

19. Remove the looping patch cords from the cross-connect point. Use the `rls-lpbk-t3` command to release loopback(s) at the far end, if required.

20. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the "update" command) on the **SYSCTL** to update the **SYSCTL**.

21. If violation monitor removal mode was set differently than the original mode in Step 3, reprovision the mode to the original or required setting using the `set-t3` command. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. At the cross-connection associated with the near-end DDM-2000, connect the DS3 test set to the **IN** and **OUT** jacks associated with the circuit under test.

24. Use the DS3 test set to test for error-free transmission.

25. Was the test successful (error free)?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 37**.

26. Is this the first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 27**.
    If **NO**, then proceed to **Step 31**.

27. Unseat the service **DS3** circuit pack associated with the circuit under test.

28. Repeat the DS3 transmission test with the DS3 test set.

29. Was the test successful (error free)?

    If **YES**, then continue with **Step 30**.
    If **NO**, then proceed to **Step 37**.

30. Reseat the **DS3** circuit pack associated with the circuit under test.

31. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 32**.
    If **YES**, then proceed to **Step 33**.

32. Repeat this procedure from Step 4 for the next path to be tested.

33. Remove the looping patch cords from the cross-connections.

34. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.

35. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. Has the **DS3** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 40**.
    If **NO**, then continue with **Step 38**.

38. Replace the **DS3** circuit pack that failed the test.

    Reference: **DLP-523**

39. Repeat this procedure for the **DS3** circuit pack that failed.

40. Trouble may be in the DSX cross-connect wiring, STS1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the rtrv-crs-sts1 command to ensure proper STS1 cross-connections have been made at each shelf in the ring for the DS3 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, `rtrv-alm`, `rtrv-hsty`, etc.) to check for other trouble indications.

41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

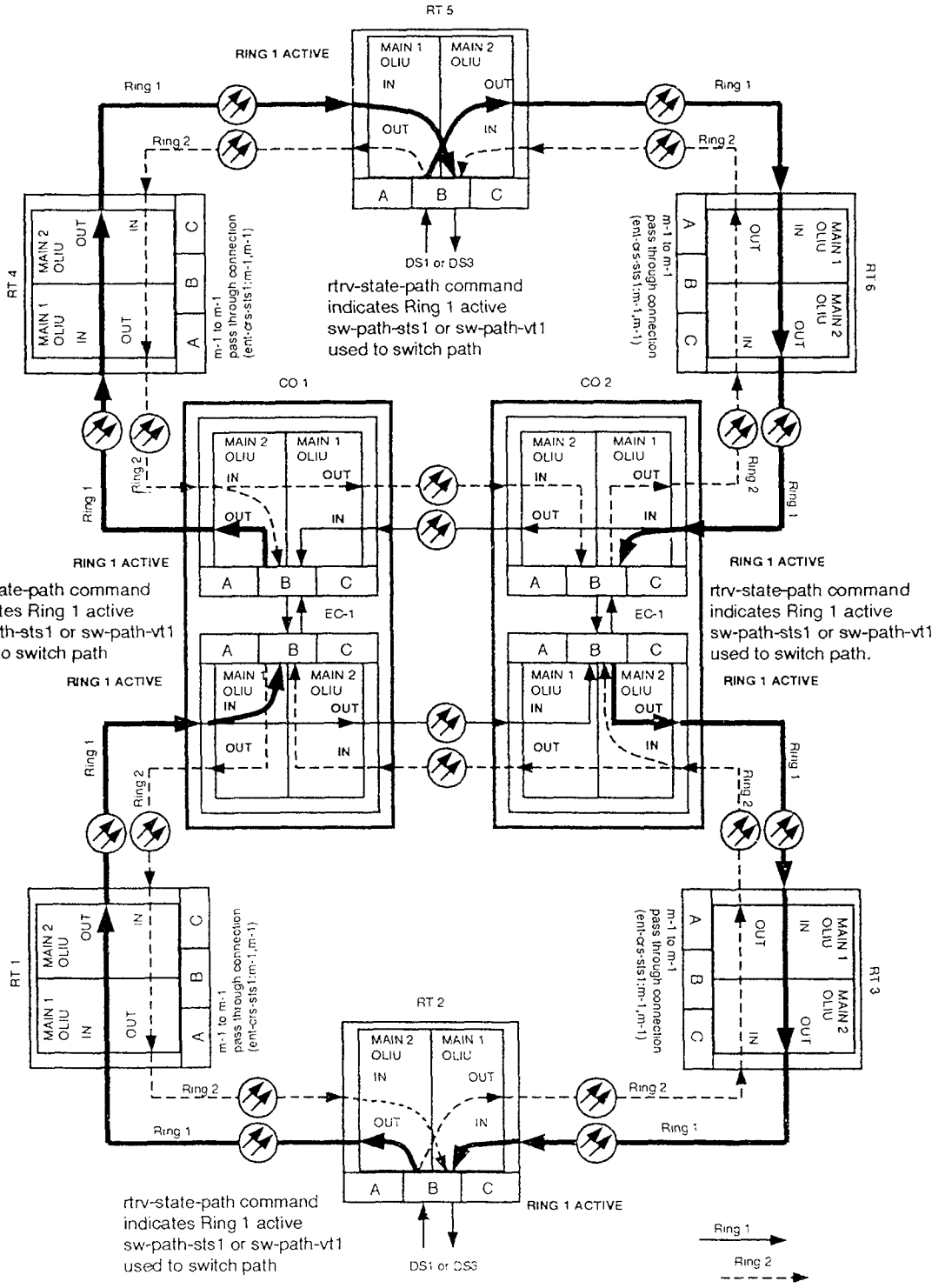


Figure 3. Example of DS3 Transmission Test in Dual Ring Interworking Network

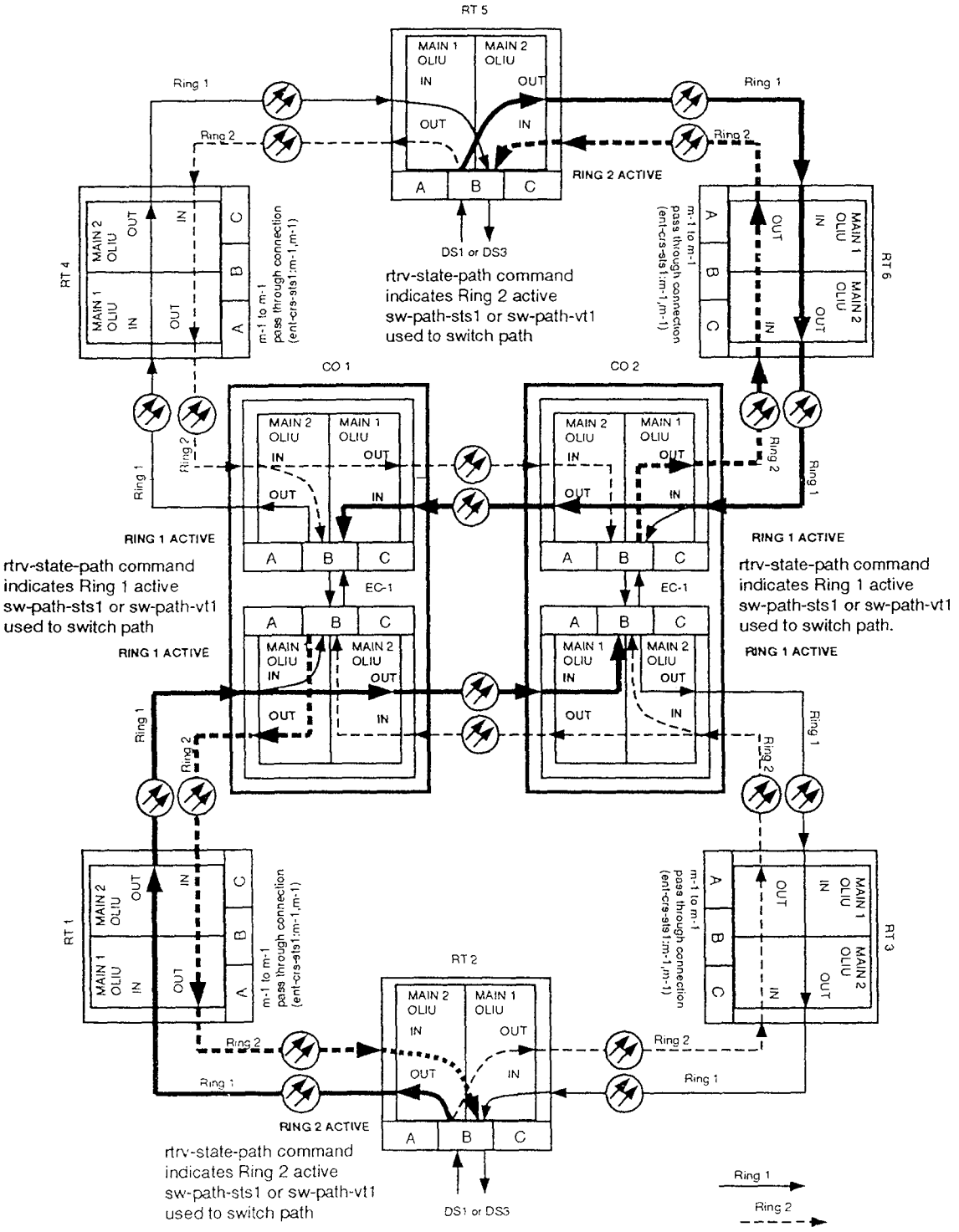


Figure 4. Example of DS3 Transmission Test in Dual Ring Interworking Network

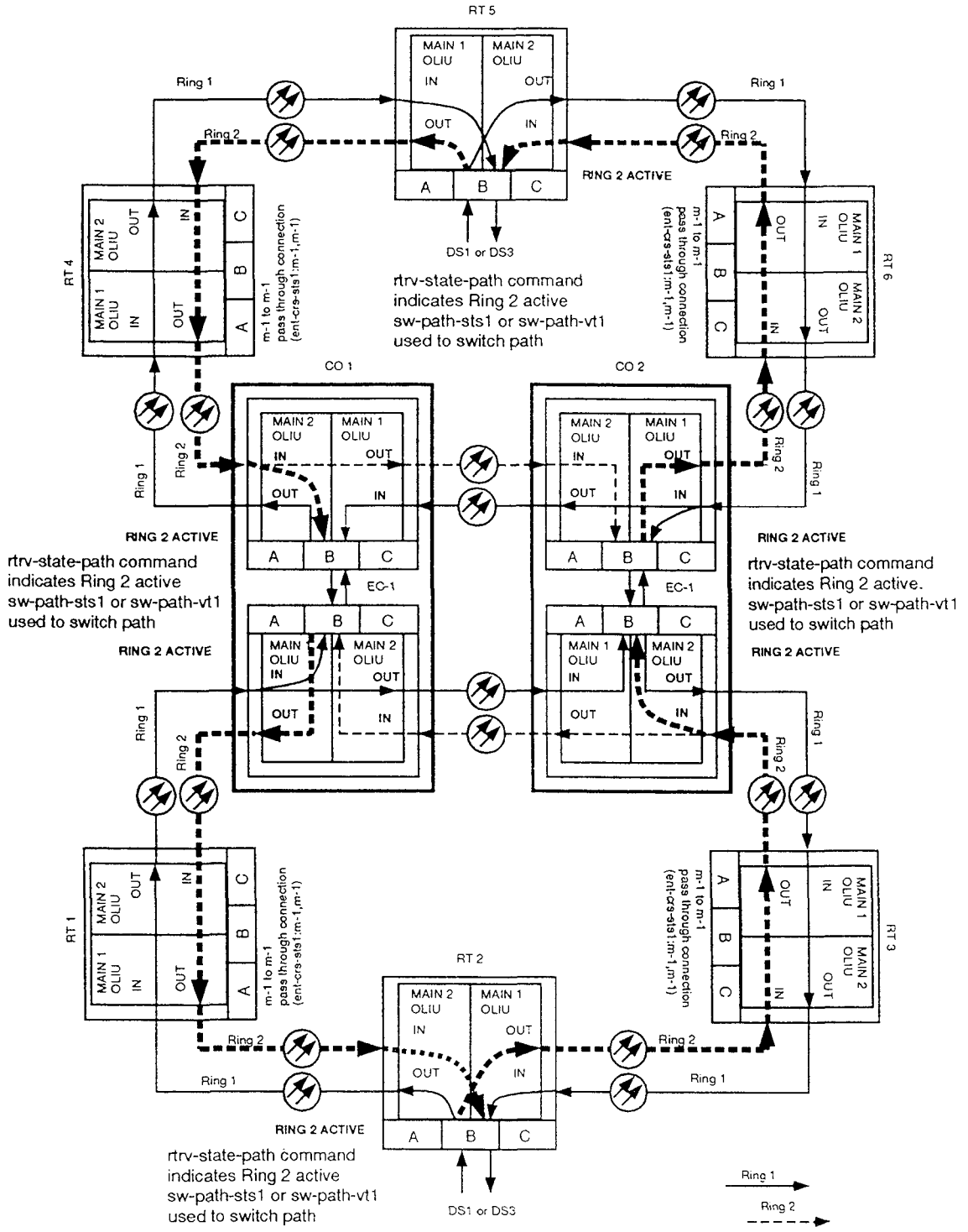


Figure 5. Example of DS3 Transmission Test in Dual Ring Interworking Network

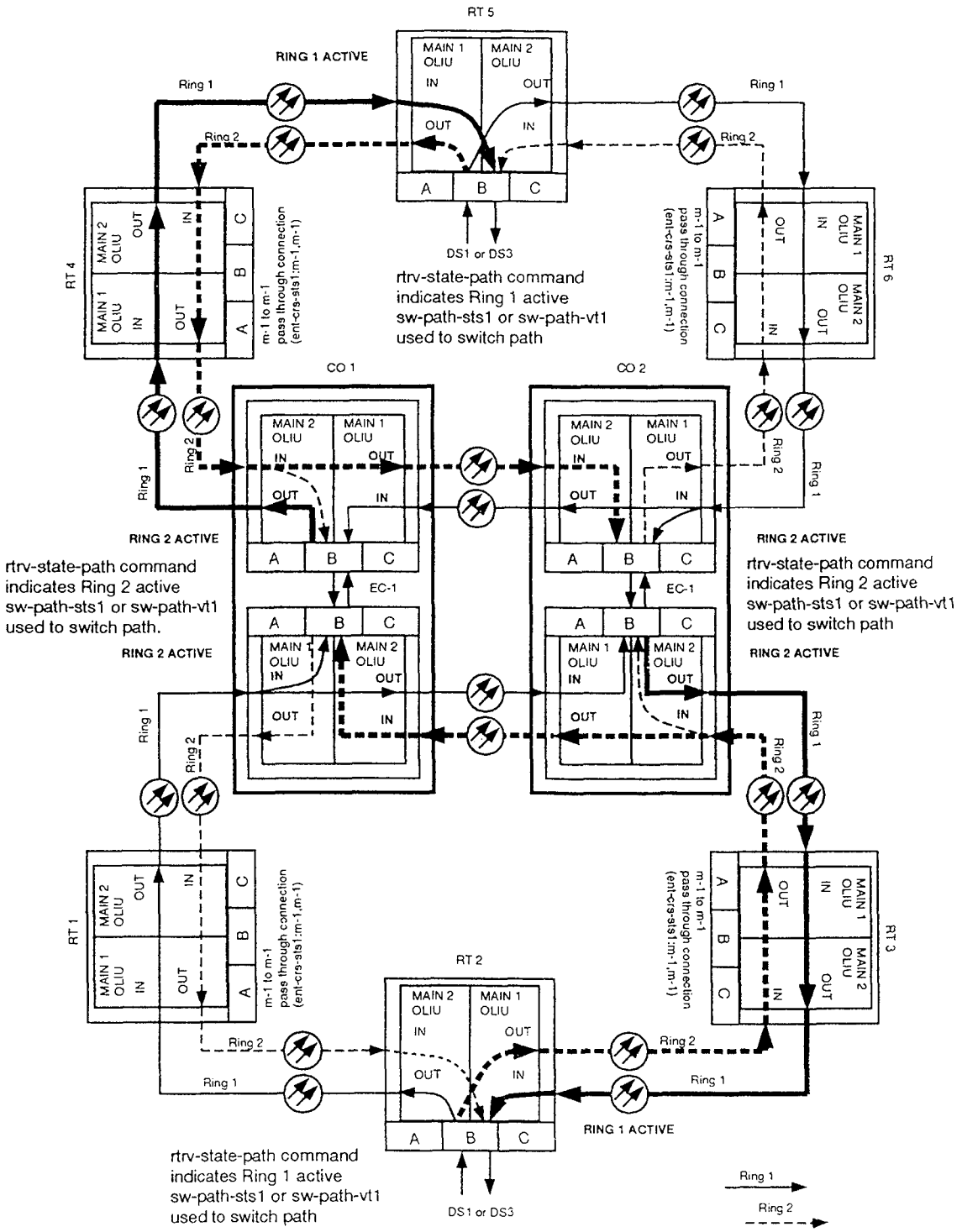


Figure 6. Example of DS3 Transmission Test in Dual Ring Interworking Network

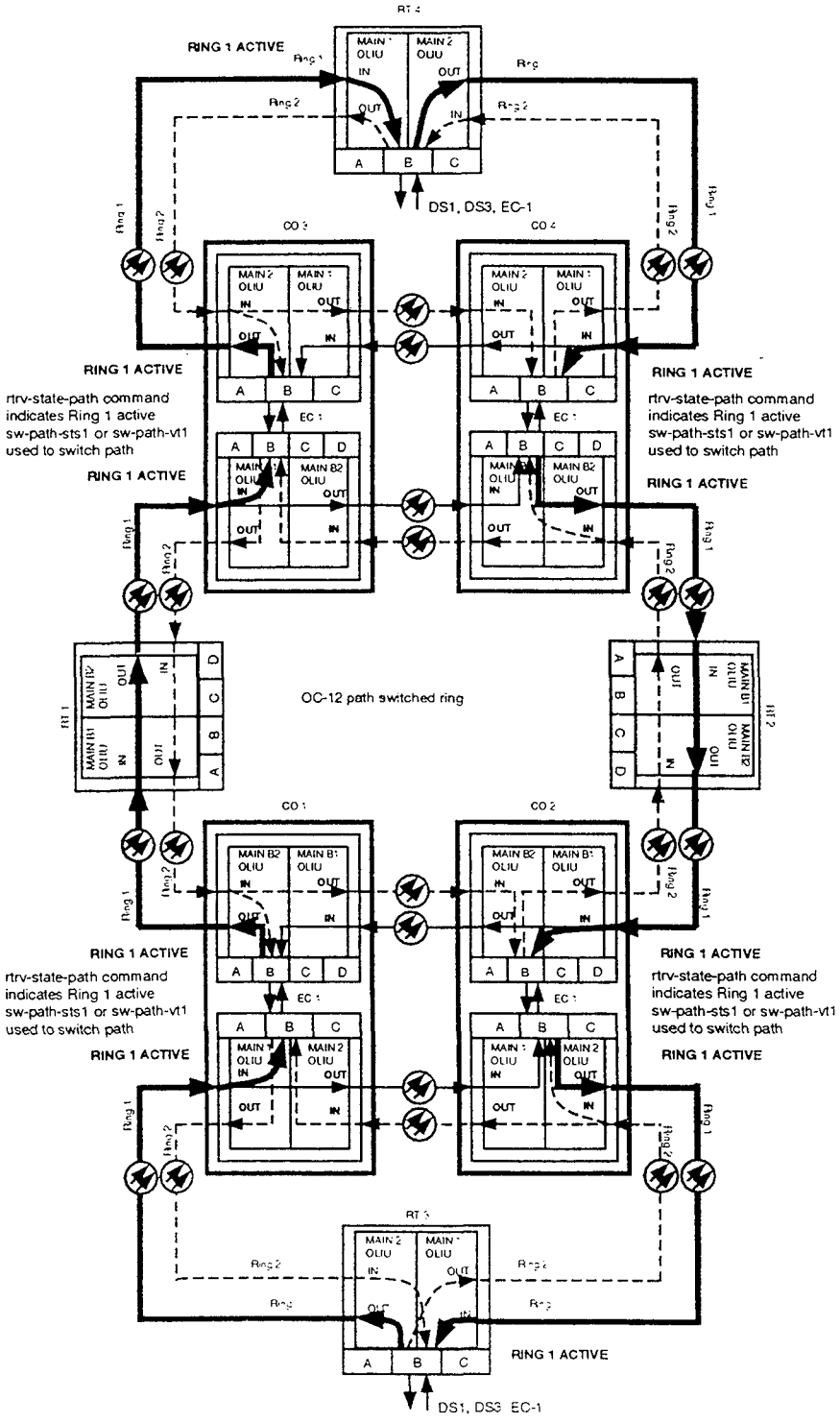


Figure 7. Example of DS3 Transmission Test in Dual Ring Interworking Network

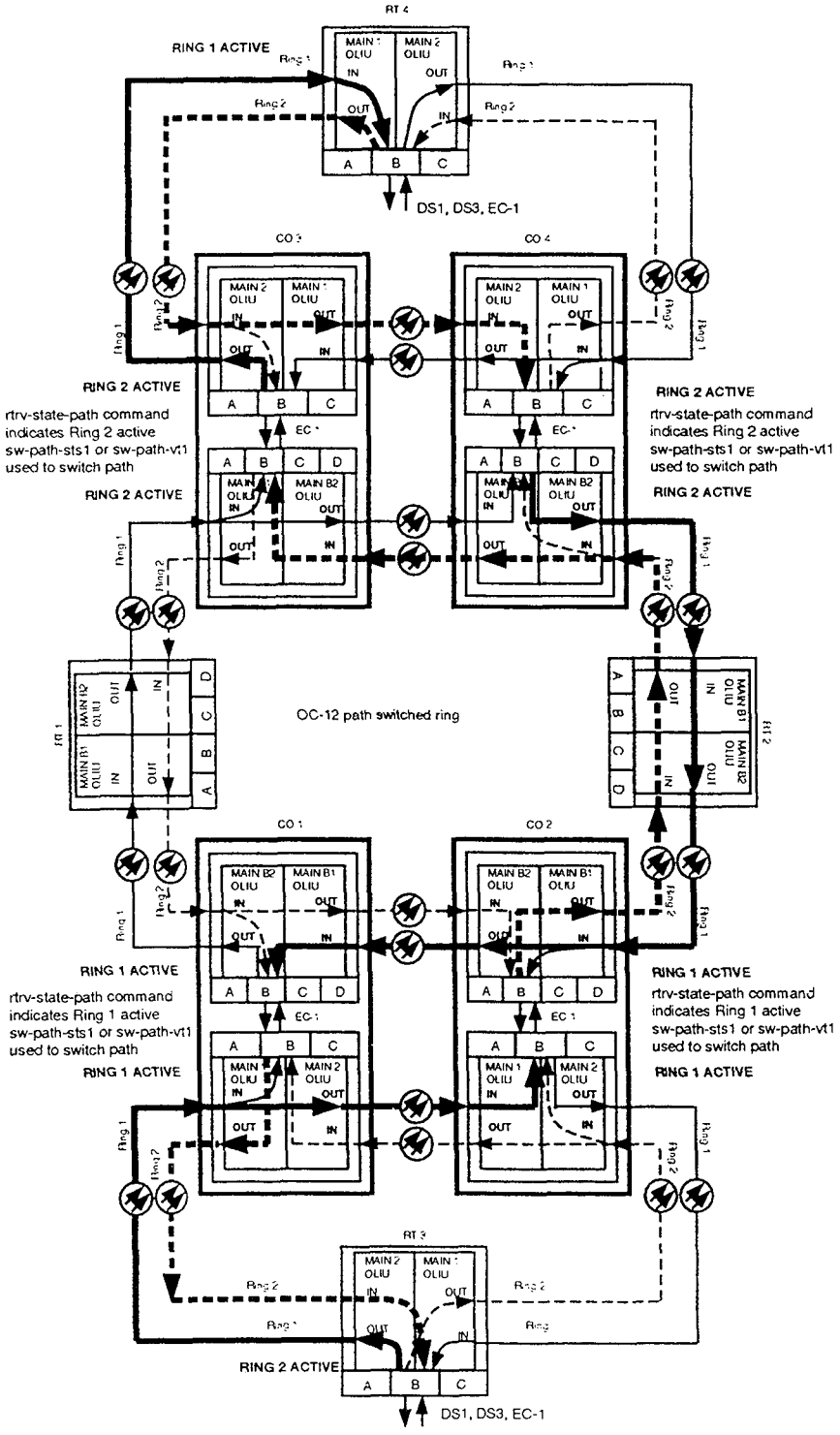


Figure 8. Example of DS3 Transmission Test in Dual Ring Interworking Network

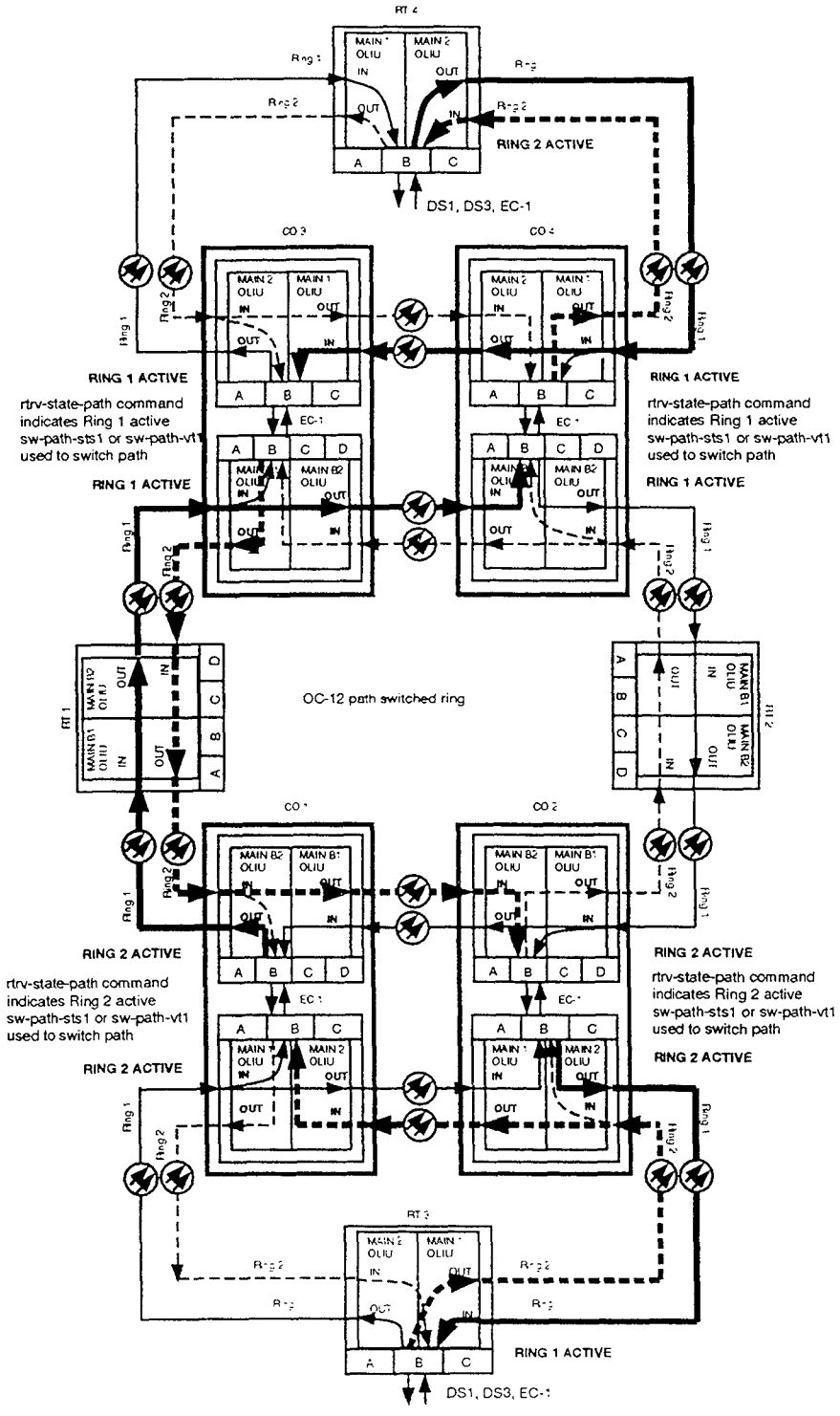


Figure 9. Example of DS3 Transmission Test in Dual Ring Interworking Network

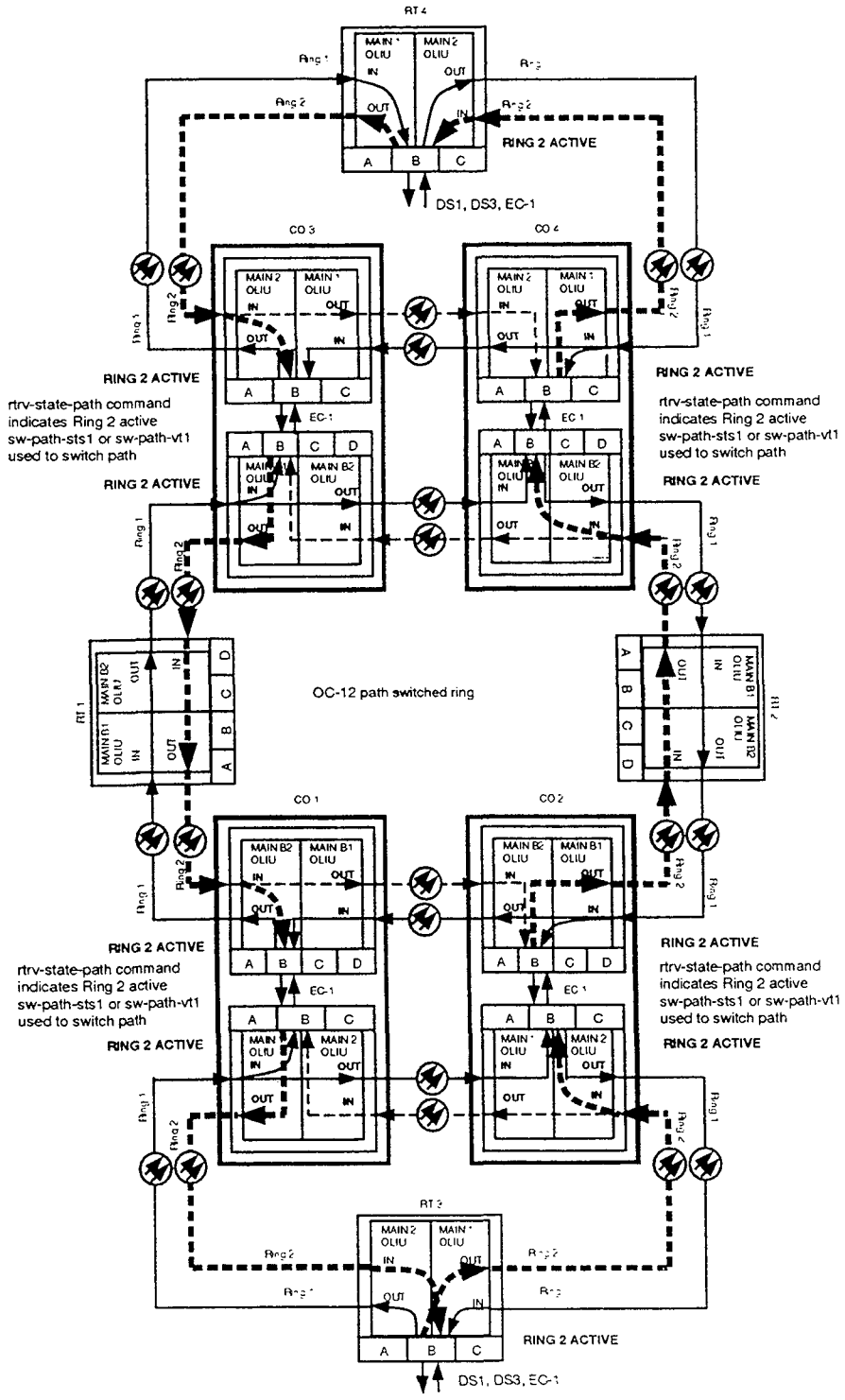


Figure 10. Example of DS3 Transmission Test in Dual Ring Interworking Network

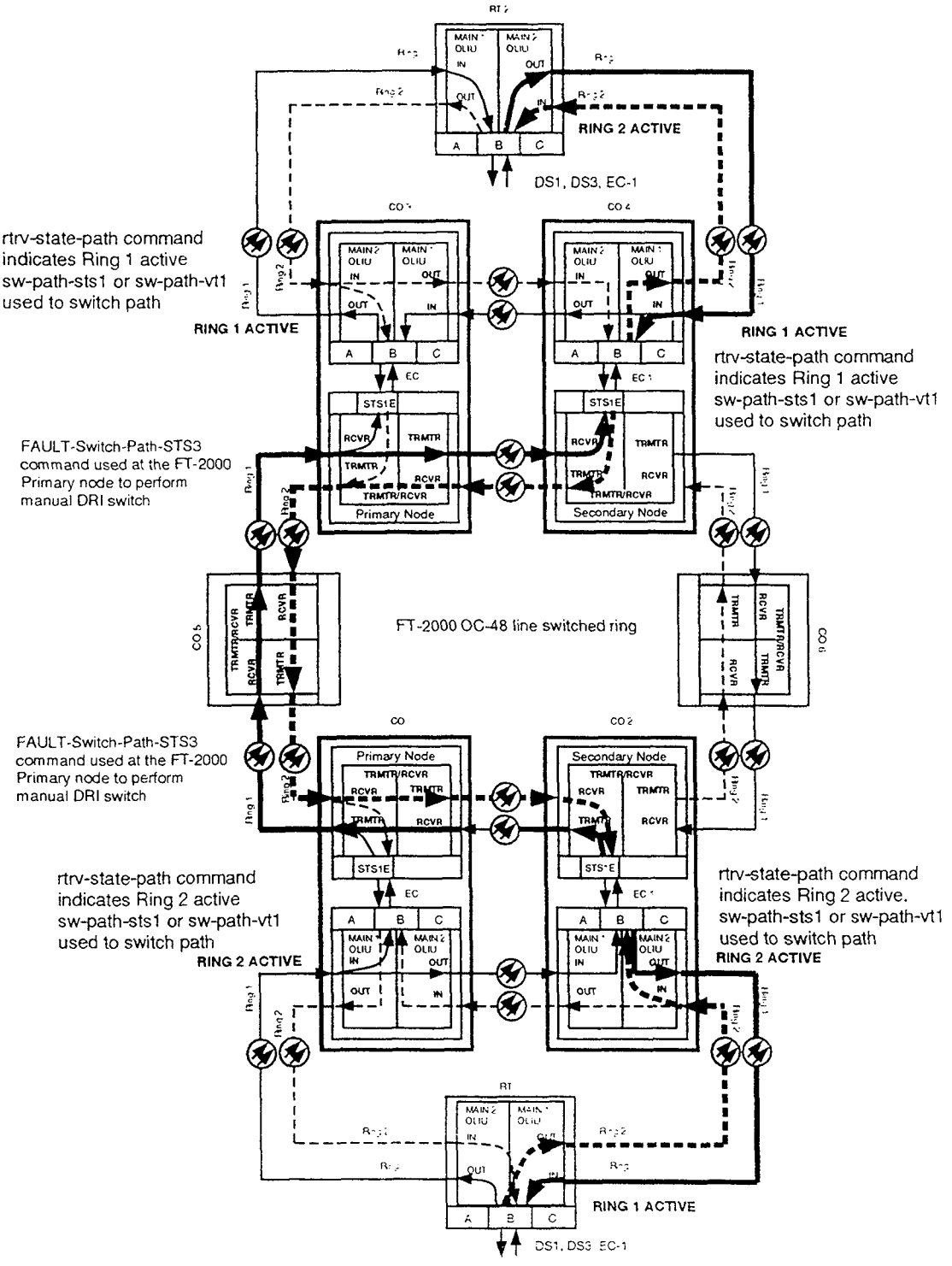


Figure 11. Example of DS3 Transmission Test in Dual Ring Interworking Network

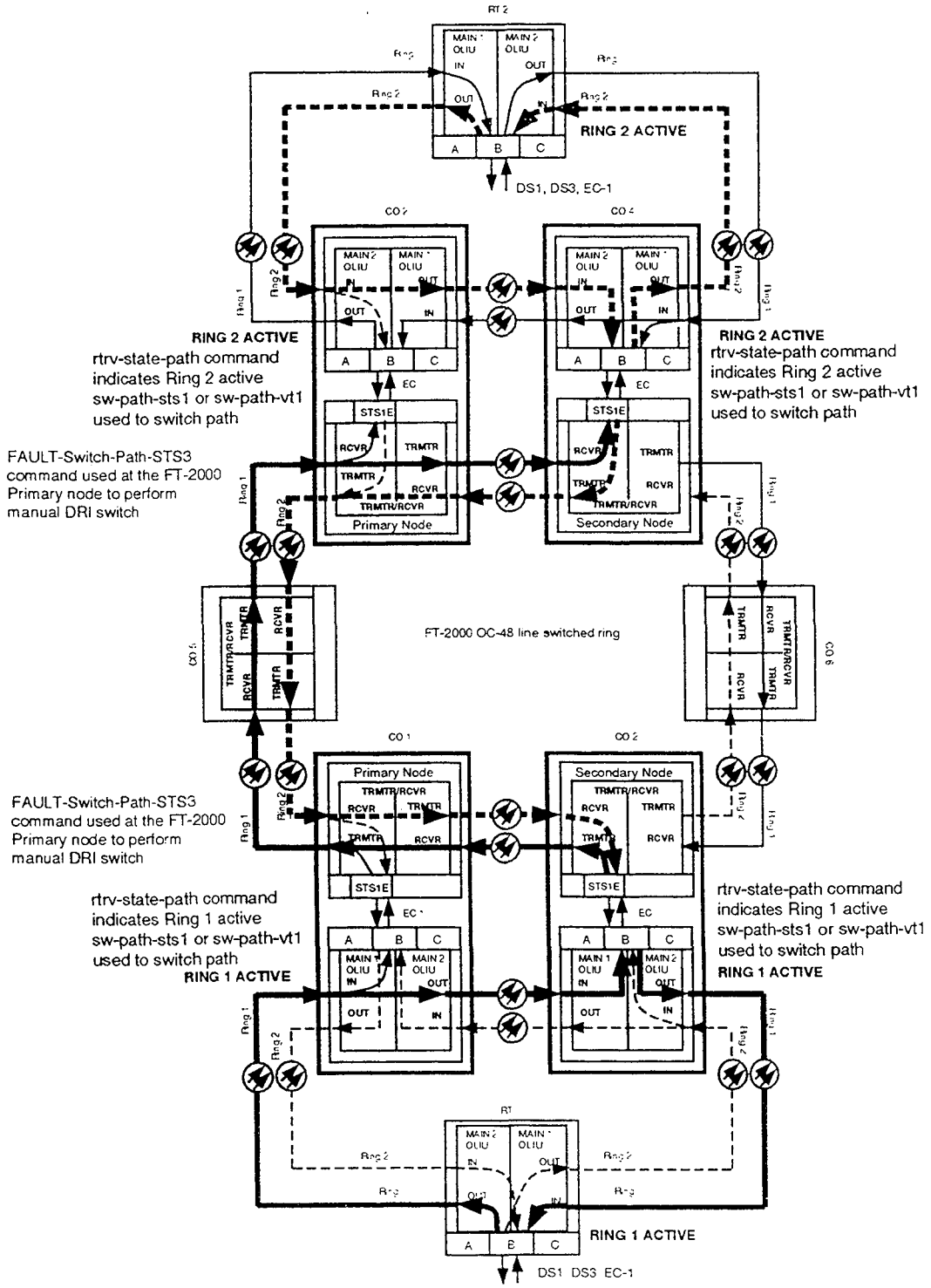


Figure 12. Example of DS3 Transmission Test in Dual Ring Interworking Network

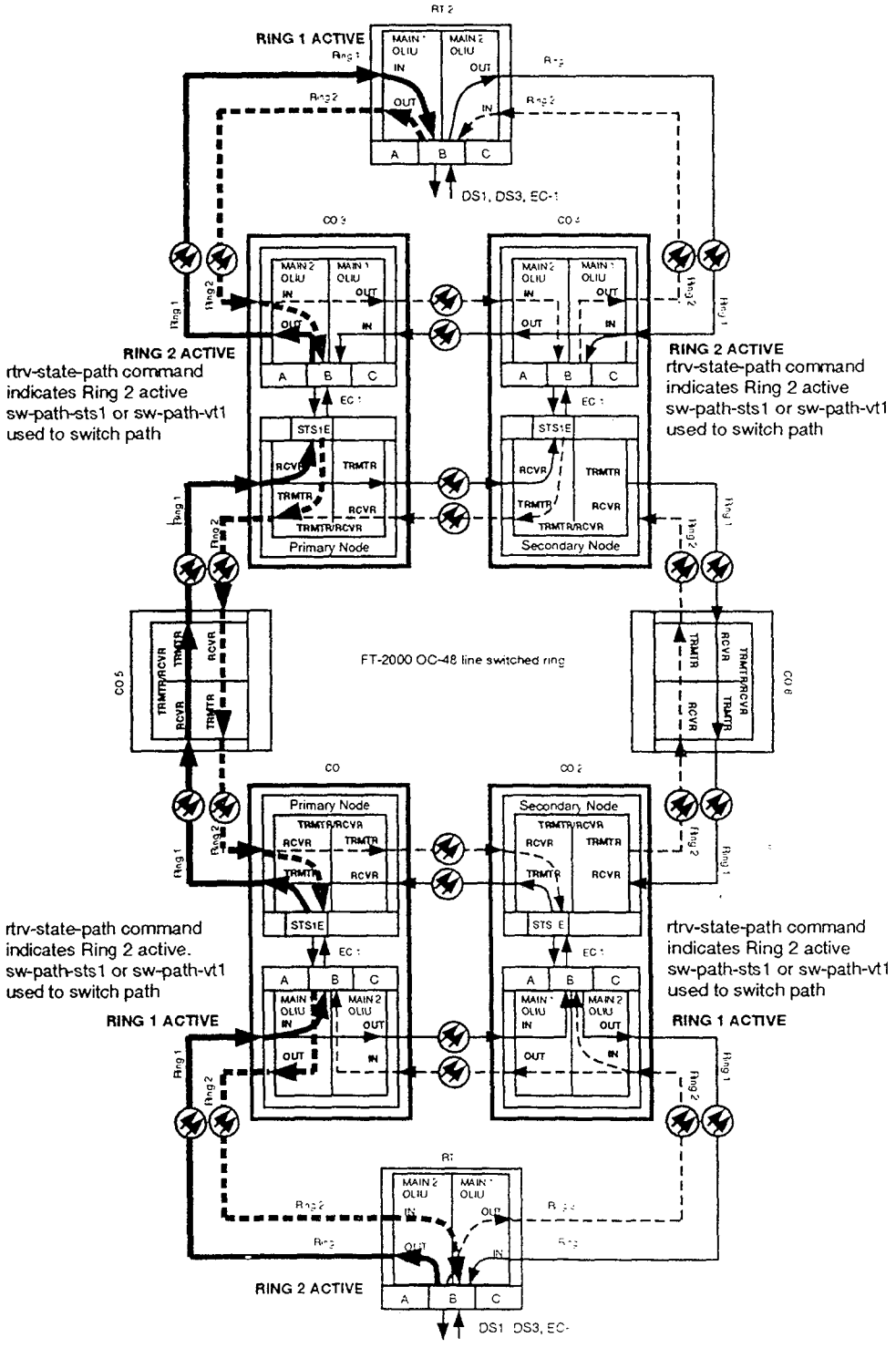


Figure 13. Example of DS3 Transmission Test in Dual Ring Interworking Network

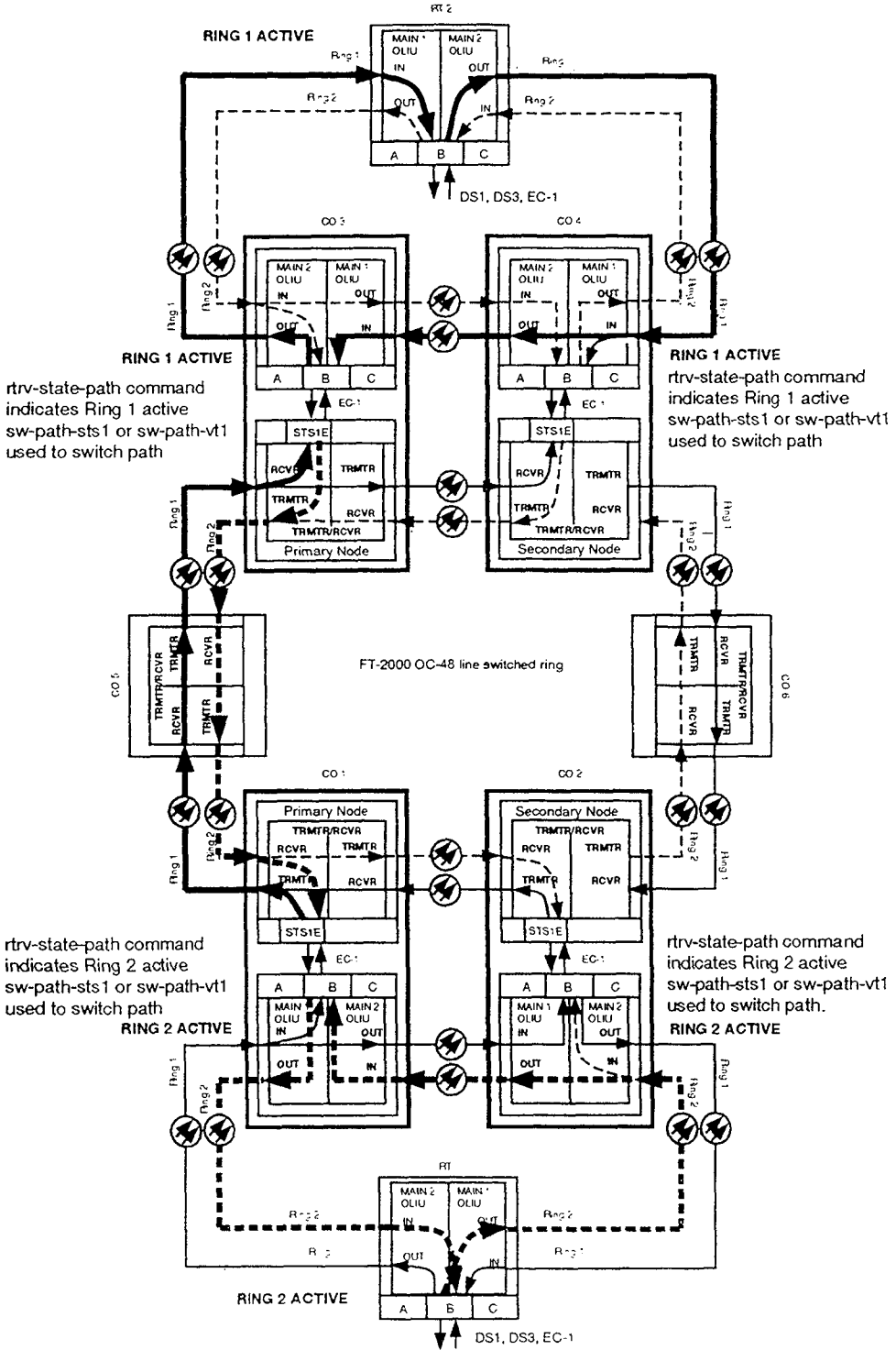


Figure 14. Example of DS3 Transmission Test in Dual Ring Interworking Network

Perform DS1 Transmission Test
Dual Ring Interconnection

Overview: This procedure is performed on one or more out-of-service circuits to test the dual ring interconnections (DRI) from a DDM-2000 ring network to another DDM-2000 ring network or through an FT-2000 ring network. Numerous configurations are possible when interconnecting DDM-2000 networks. Therefore, this procedure provides you with typical examples and explanations of some of the possible configurations and instructs you on the procedures used in testing these configurations.

1. ⇒ NOTE 1:
   This procedure may be used to perform DS1 transmission tests for a Dual Ring Interconnection (DRI) between DDM-2000 networks and FT-2000 ring networks. When this procedure is being used to perform end-to-end DS1 tests, it is assumed that the complete end-to-end systems have already been tested and that only a particular DS1 channel is being tested at this time.

   ⇒ NOTE 2:
   A CIT is required for this test to make/verify cross-connections and to switch paths of the DS1 being tested. The transmission test can be performed either with a CIT and the automated test command `test-trmsn-tl` or with a DS1 test set.

   ⇒ NOTE 3:
   The DS1 circuit being tested is assumed to originate at equipment external to the DDM-2000 source node and is carried around the DDM-2000 ring to the dual ring interconnection nodes where it is connected to the corresponding DDM-2000 DRI nodes or to the primary and secondary FT-2000 DRI nodes. The DS1 is then carried around the next ring network to the final destination node where it is terminated on external equipment. If more than two rings are interconnected, the DS1 signal may be passed through another set of DRI nodes.

NOTE 4:
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS1 circuit being tested. Release 7 has no default cross-connections and supports only manual VT1.5 and STS-1 cross-connections. See the description of the following commands in the Commands and Reports section of this manual: `cnvt-crs`, `dlt-crs-sts1`, `dlt-crs-vt1`, `ent-crs-sts1`, `ent-crs-vt1`, `rtrv-crs-sts1`, `rtrv-crs-vt1`, `cnvt-crs-sts1`, `set-ne`, and `rtrv-ne`. See *Cross-Connection Provisioning* in the Administration and Provisioning section of this manual for more information on cross-connection provisioning.

NOTE 5:
If one terminating end is equipped with **STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **DS1/DS1PM** circuit packs, the DS1 transmission test is performed from the DS1 terminating end. If the CIT and `test-trmsn-tl:` command is being used to perform the test and you are at the EC-1 terminating end, you may be able to use the `rlgn` command to log into the DS1 end to perform the test using the `test-trmsn-tl:` command.

NOTE 6:
When both terminating ends are equipped with **STS1E** circuit packs, one end may be temporarily equipped with **DS1/DS1PM** and **MXRVO** circuits packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **STS1E** at the near end, perform an update (`upd`), and install the **DS1/DS1PM** and **MXRVO** circuit pack(s). After the tests are completed, remove the temporary circuit packs, perform an update, and reinstall the **STS1E** circuit packs.

At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-521**

2. ⇒ NOTE:
Work orders, office records, or CIT `ent-crs-sts1`, `ent-crs-vt1` or `rtrv-crs` commands may be used to make or verify STS-1 cross-connections.

At each shelf in the network, make/verify that proper pass-through, terminating, and "drop and continue" STS-1 cross-connections have been made for each DS1 channel being tested.

3. ⇒ NOTE:
Local tests cannot be performed in the DEMUX direction for **STS1E** circuit packs.

See Figures 1 and 2. If local tests are being performed, the fiber loopbacks at the near-end **OLIU**s must be in place. If end-to-end tests are being performed, do ONE of the following:

(a) Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-1 or STSX cross-connection associated with the DS1 channel to be tested.

(b) Log into the far-end terminal and use the `opr-lpbk-tl:`*address* or `opr-lpbk-ec1:`*address* command to loop back the DS1 or EC-1 port(s) at the far end. Use `logout` or `toggle` (ctrl t) command to return control of CIT to near end.

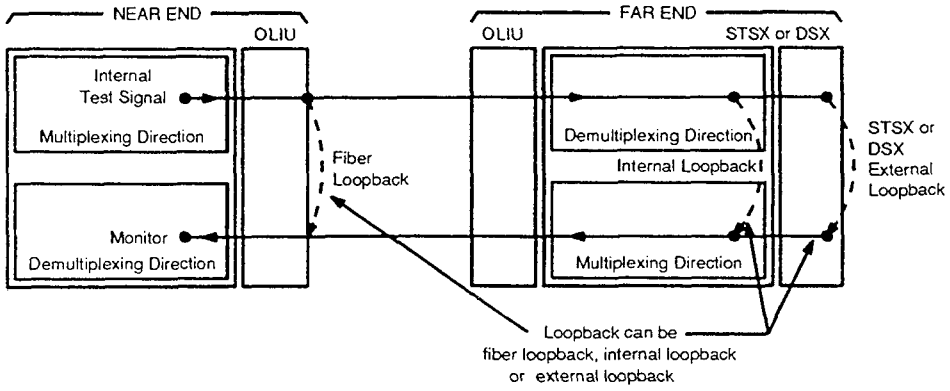


Figure 1. Transmission Test of DS1 Signal in MUX Direction

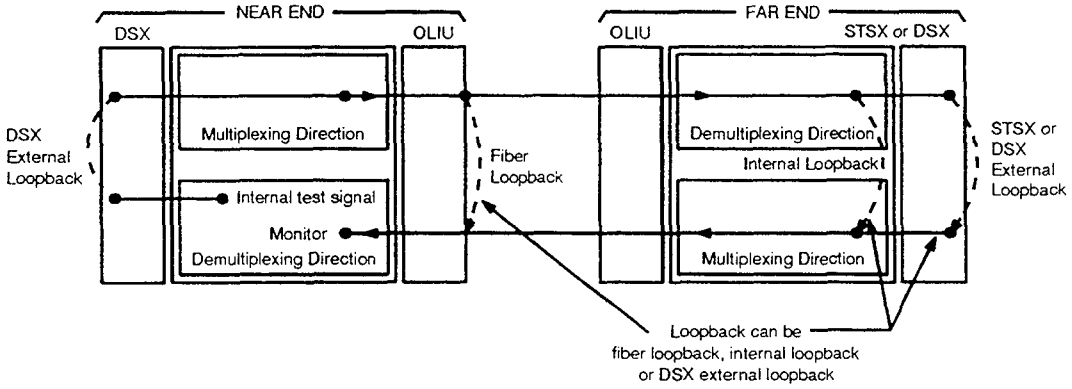


Figure 2. Transmission Test of DS1 Signal in DEMUX Direction

4. ⚠ CAUTION:
Execution of switch commands may affect service. Check local procedures before performing switch commands.

⇒ NOTE 1:
If this transmission test is to be performed for each path in the end-to-end network, the `switch-path-sts1` or `switch-path-vt1` command must be used at some of the DDM-2000 nodes to switch paths for each test. If FT-2000 is part of the network, the `FAULT-Switch-Path-STS3` command must be used at the FT-2000 Primary DRI node(s) if the FT-2000 secondary path and the DDM-2000 DRI connections to the FT-2000 secondary node are to be tested. Up to four tests may have to be performed for each DS1 circuit if all protection paths are required to be tested. See Figures 3-14.

⇒ NOTE 2:
For configurations not shown in the examples, local procedures should be developed to test the DS1 circuits being equipped. A sketch of the network may need to be made and the paths to be tested should be determined as shown in the examples in this procedure.

Use the necessary switch commands to set up the DS1 path being tested. [For example, if the configuration looks like Figure 3, use the `switch-path-sts1` command for test 1 to make Ring 1 active at both terminating nodes and all DDM-2000 DRI nodes. Other DS1 path tests for the same configuration would be set up as follows (Figures 4-6)]:

Test	Terminating Nodes	DRI Nodes	Figure
Test 1	Ring 1 active	Ring 1 active	Figure 3
Test 2	Ring 2 active	Ring 1 active	Figure 4
Test 3	Ring 2 active	Ring 2 active	Figure 5
Test 4	Ring 1 active	Ring 2 active	Figure 6

5. Are you using CIT and `test-trmsn-t1` command to perform this test?

If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 23**.

6. Are you doing this test in the mux or demux direction?

   If **MUX** direction, then continue with **Step 7.**
   If **DEMUX** direction, then proceed to **Step 9.**

7. At the near end DDM-2000, use the following command to perform a test of the DS1 loop in the fiber direction:
   `test-trmsn-tl:`*`address`*`:dirn=mux:dur=( );`

Where *address* = address identifier of the DS1 signal.

dirn = direction of the test. If `dirn=mux`, direction is toward fiber.

dur = duration of the test in minutes (1-120), default is 1.

8. Was the test successful (error free)?

   If **YES**, then continue with **Step 12.**
   If **NO**, then proceed to **Step 37.**

9. See Figure 2. At the near-end DSX-1 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS1 channel to be tested.

10. Use the following command to perform a DS1 transmission test in the demux direction to test the DS1 loop in the DSX direction:
    `test-trmsn-tl:`*`address`*`:dirn=demux:dur=( );`

Where *address* = address identifier of the DS1 signal.

dirn = direction of the test. If `dirn=demux`, direction is toward DSX.

dur = duration of the test in minutes (1-120), default is 1.

11. Was the test successful (error free)?

    If **YES**, then continue with **Step 12.**
    If **NO**, then proceed to **Step 37.**

12. Is this the first service being placed on the group and is a protection circuit pack installed?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:
    `switch-ls:`*`address`*`:pri=manual;`.

    Response: The green **ACTIVE** LED lights on the protection circuit pack.

14. Repeat the transmission test in the mux (or demux) direction using the following command:
    `test-trmsn-tl:`*`address`*`:dirn=mux (or demux):dur=( );`.

15. Was the test successful (error free)?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 37**.

16. Use the following command to clear active switch requests on the protection circuit pack:
    `switch-ls:`*`address`*`:pri=reset;`.

17. The **DS1** circuit path under test has passed the DS1 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 18**.
    If **YES**, then proceed to **Step 19**.

18. Repeat this procedure from Step 4 for the next path to be tested.

19. Remove the looping patch cords from the cross-connect point. Use the `rls-lpbk-tl` command to release loopback(s) at the far end, if required.

20. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the "update" command) on the **SYSCTL** to update the **SYSCTL**.

21. Repeat this procedure from Step 2 for any additional DS1 circuits to be tested.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. At the cross-connection associated with the near-end DDM-2000, connect the DS1 test set to the **IN** and **OUT** jacks associated with the circuit under test.

24. Use the DS1 test set to test for error-free transmission.

25. Was the test successful (error free)?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 37**.

26. Is this the first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 27**.
    If **NO**, then proceed to **Step 31**.

27. Unseat the service **DS1/DS1PM** circuit pack associated with the circuit under test.

28. Repeat the DS1 transmission test with the DS1 test set.

29. Was the test successful (error free)?

    If **YES**, then continue with **Step 30**.
    If **NO**, then proceed to **Step 37**.

30. Reseat the **DS1/DS1PM** circuit pack associated with the circuit under test.

31. The **DS1** circuit path under test has passed the DS1 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 32**.
    If **YES**, then proceed to **Step 33**.

32. Repeat this procedure from Step 4 for the next path to be tested.

33. Remove the looping patch cords from the cross-connections.

34. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.

35. Repeat this procedure from Step 2 for any additional DS1 circuits to be tested.

36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. Check for line code (AMI/B8ZS) mismatch at near end and far end. If mismatch is found, set line code [**DLP-513**] to correct value and repeat this test. If no trouble is found, continue with the next step.

38. In some releases, if `dlc=yes` as set by the `set-tl` command, loopbacks are not recognized (`loopback not recognized`) in this test. Use `rtrv-tl` command to check if `dlc=yes`.

39. Is `dlc` set to `yes`?

    If **YES**, then continue with **Step 40**.
    If **NO**, then proceed to **Step 41**.

40. Use `set-tl` command to temporarily set `dlc=no` and repeat this test. If the test fails again, continue with the next step.

41. Has the **DS1/DS1PM** circuit pack that failed the test been replaced?

    If **YES**, then proceed to **Step 44**.
    If **NO**, then continue with **Step 42**.

42. Replace the **DS1/DS1PM** circuit pack that failed the test.

    Reference: **DLP-523**

43. Repeat this procedure for the **DS1/DS1PM** circuit pack that failed.

44. Trouble may be in the DSX cross-connect wiring, VT1/STS1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the rtrv-crs-( ) command to ensure proper VT1/STS1 cross-connections have been made at each shelf in the ring for the DS1 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, `rtrv-alm`, `rtrv-hsty`, etc.) to check for other trouble indications.

45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

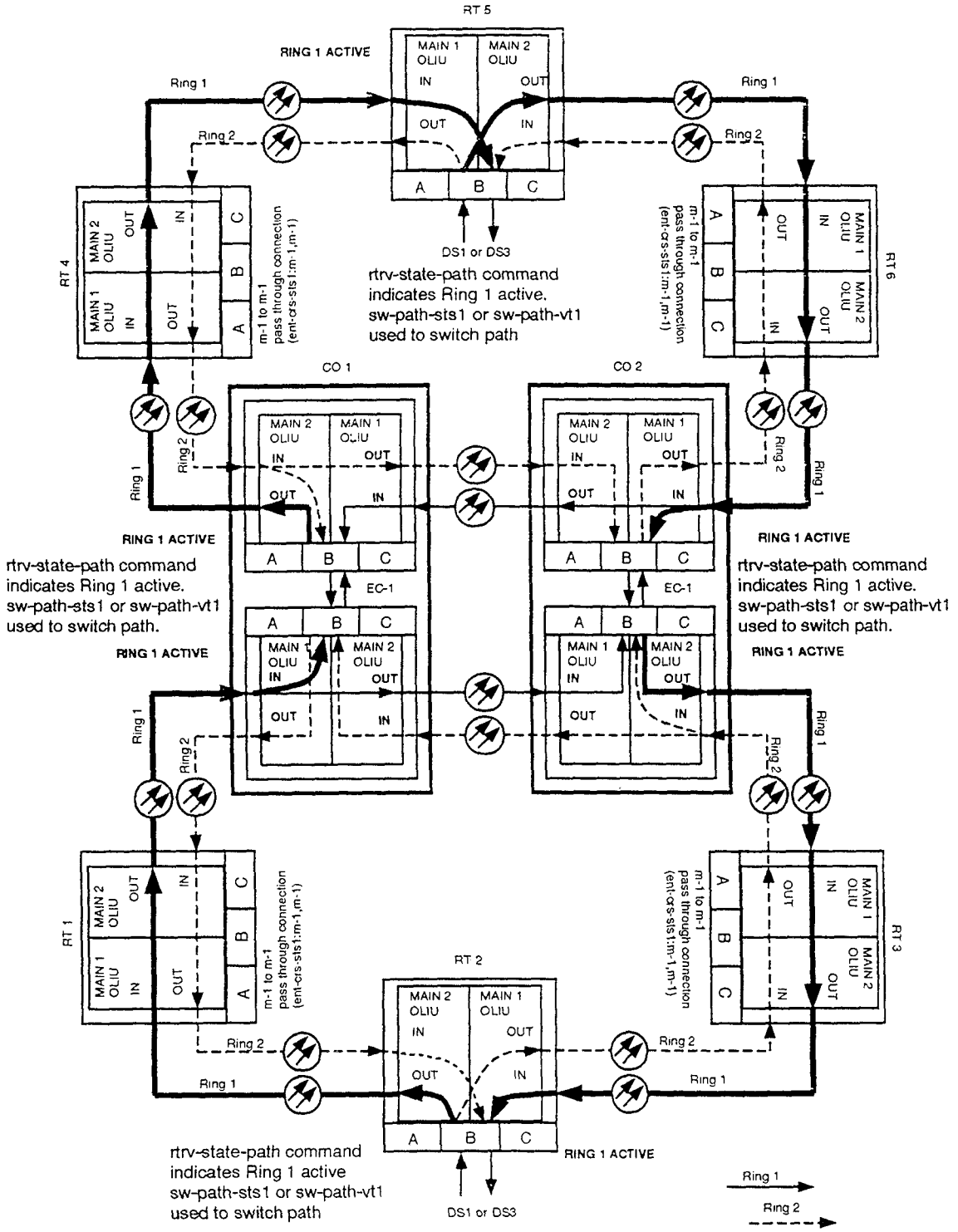


Figure 3. Example of DS1 Transmission Test in Dual Ring Interworking Network

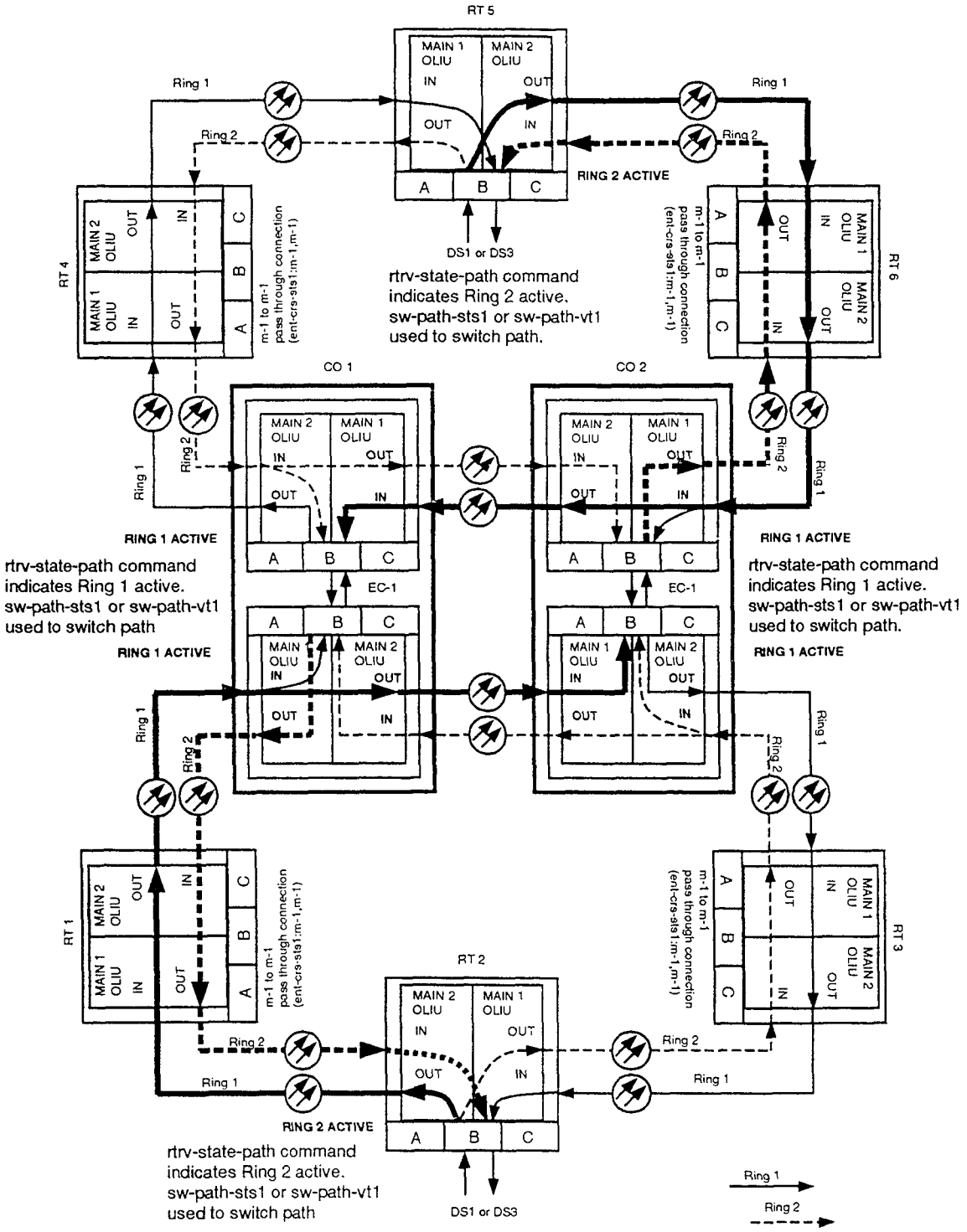


Figure 4. Example of DS1 Transmission Test in Dual Ring Interworking Network

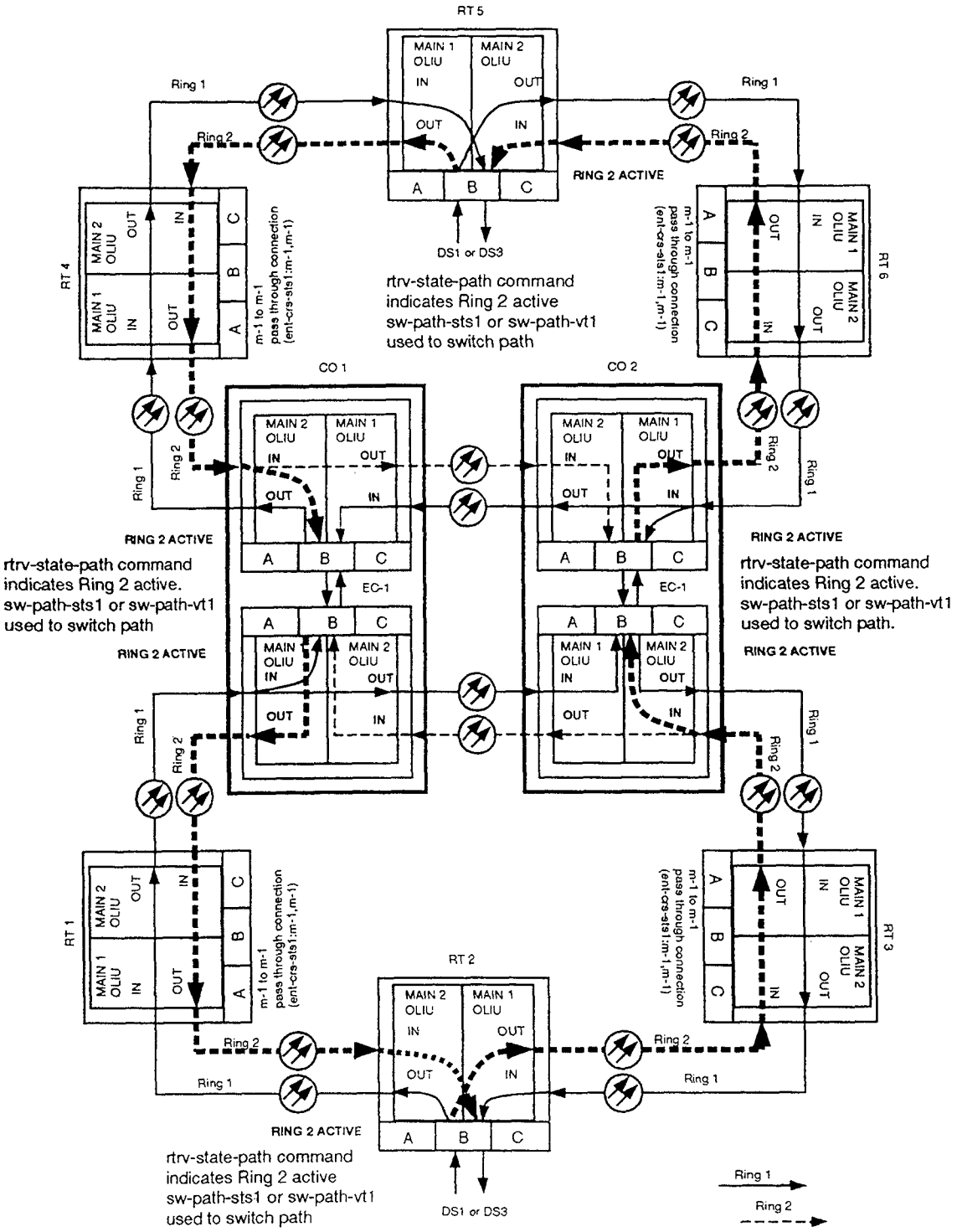


Figure 5. Example of DS1 Transmission Test in Dual Ring Interworking Network

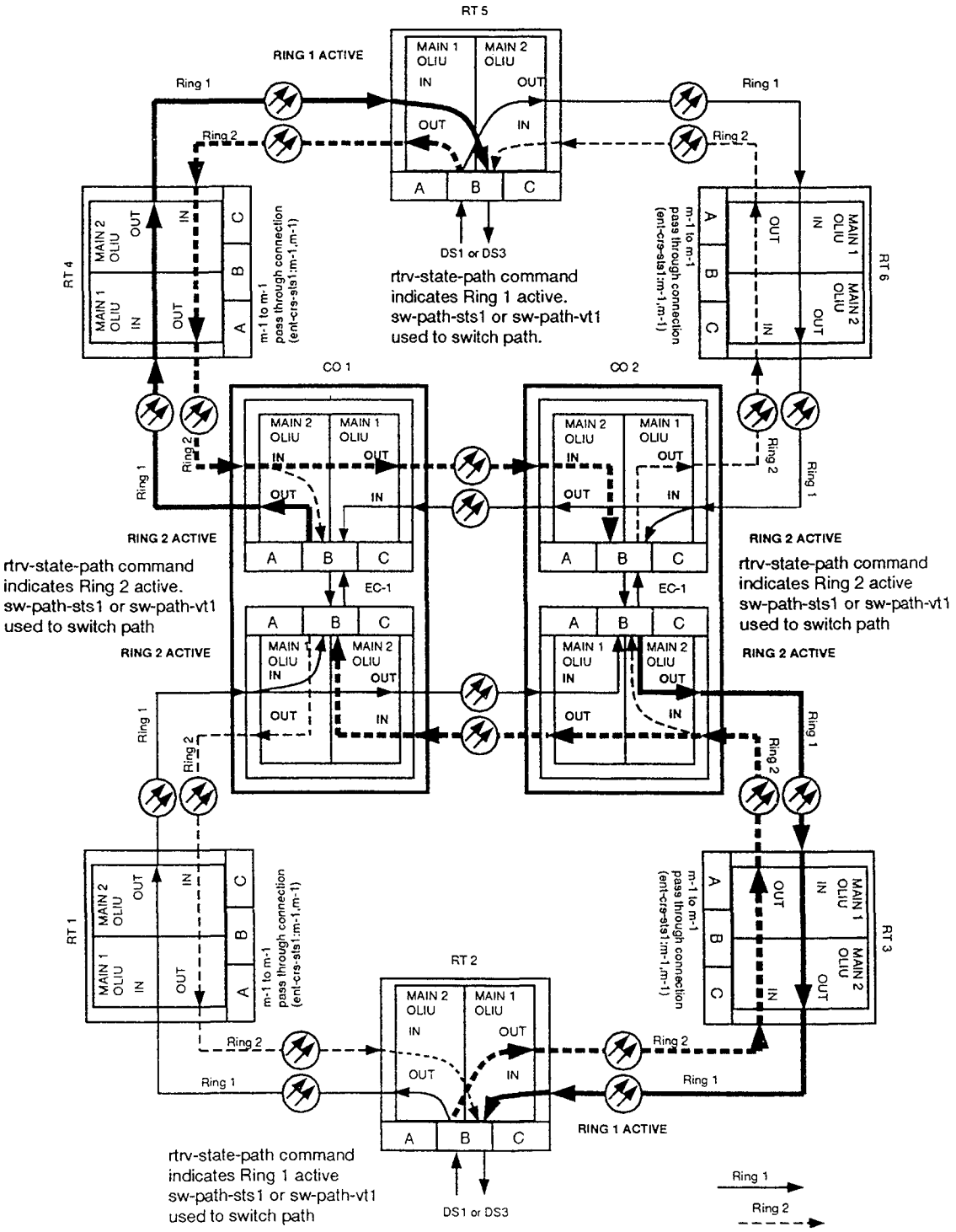


Figure 6. Example of DS1 Transmission Test in Dual Ring Interworking Network

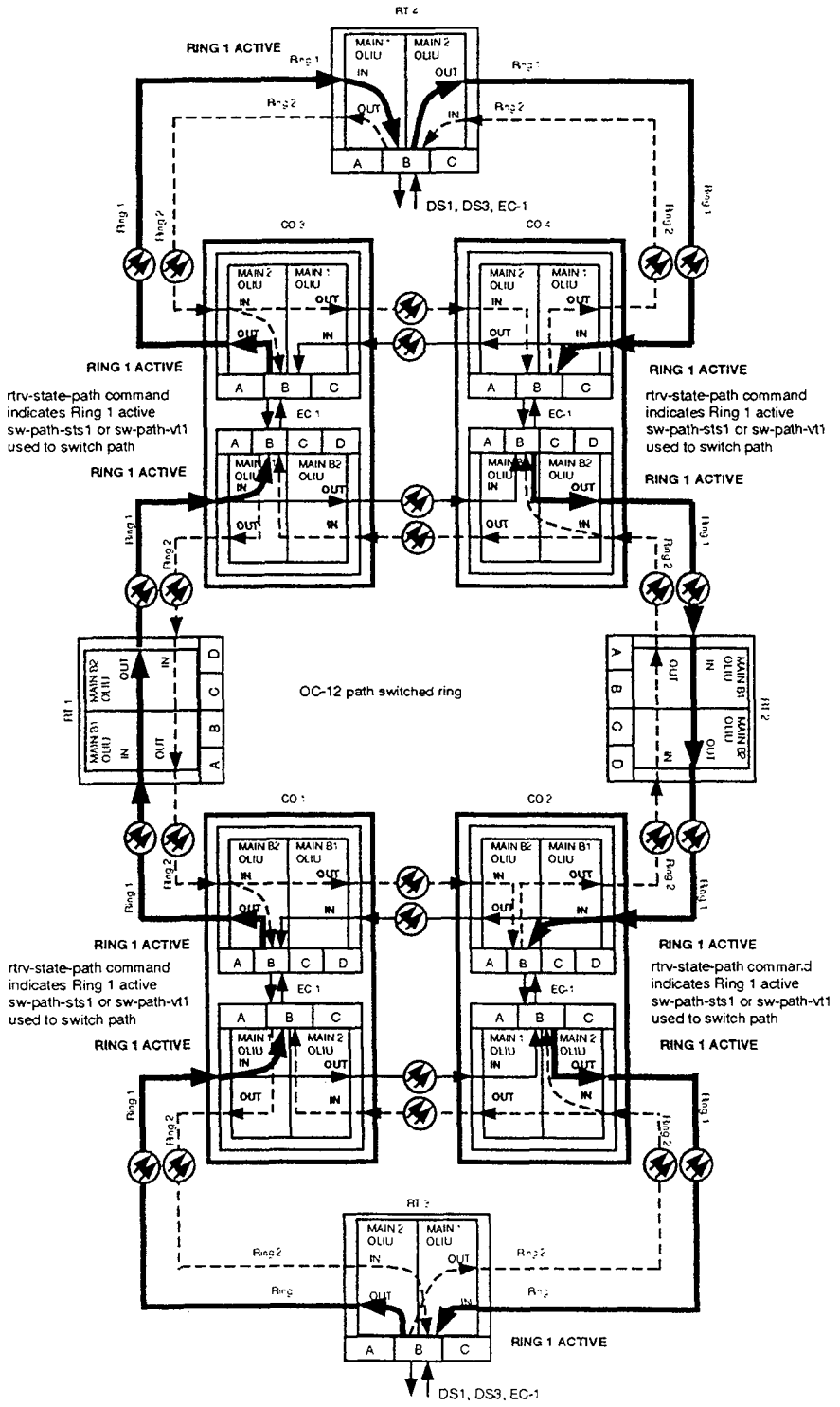


Figure 7. Example of DS1 Transmission Test in Dual Ring Interworking Network

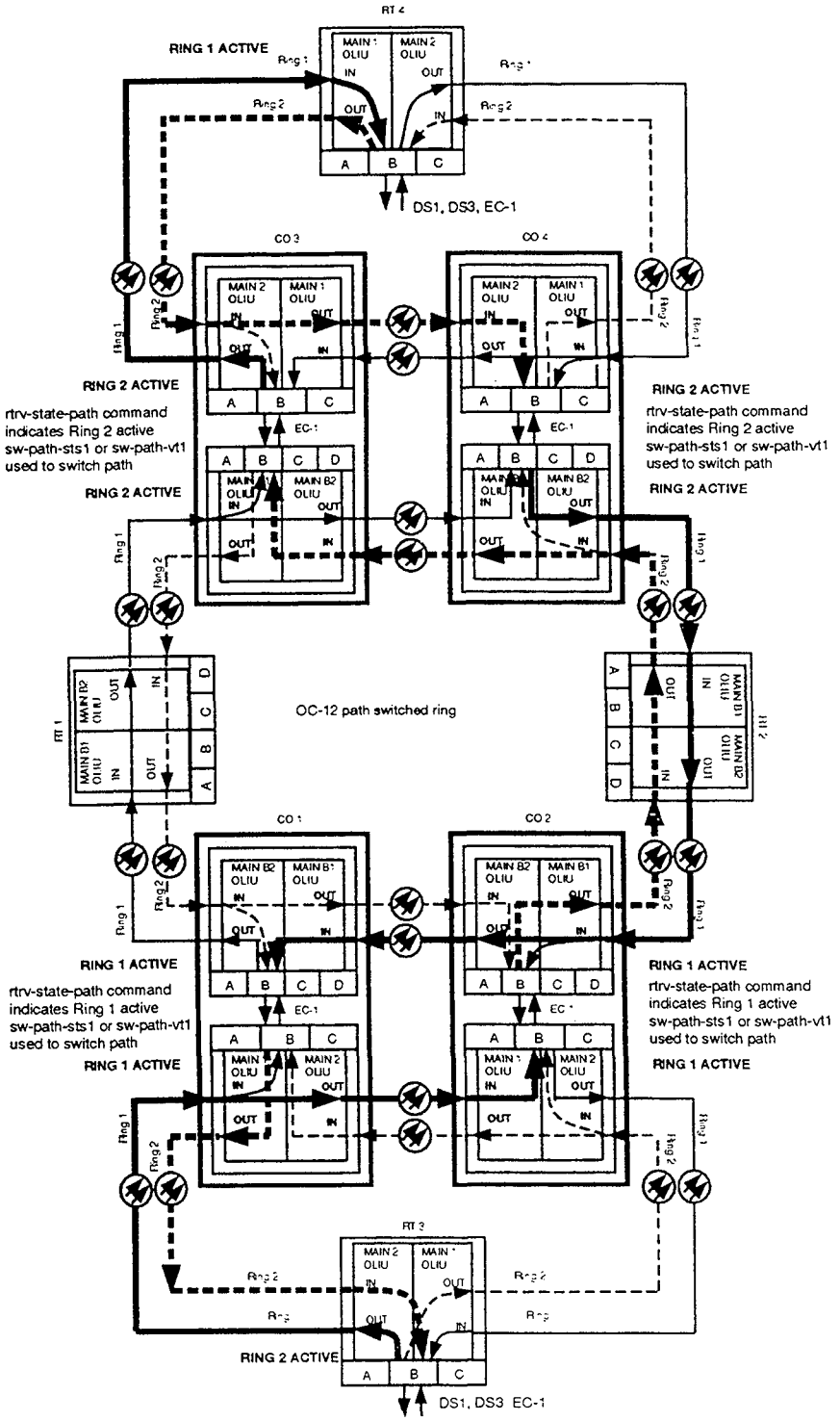


Figure 8. Example of DS1 Transmission Test in Dual Ring Interworking Network

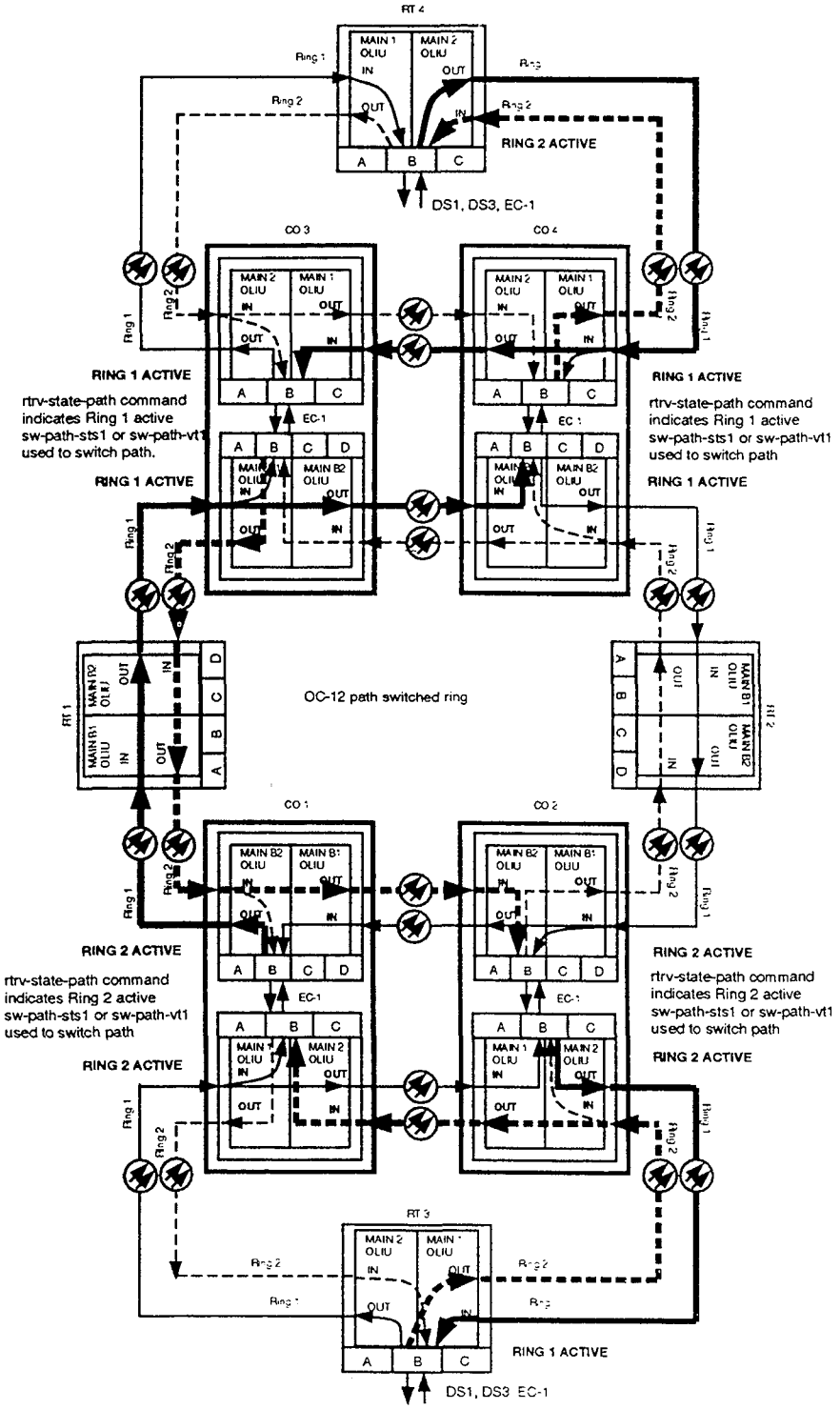


Figure 9. Example of DS1 Transmission Test in Dual Ring Interworking Network

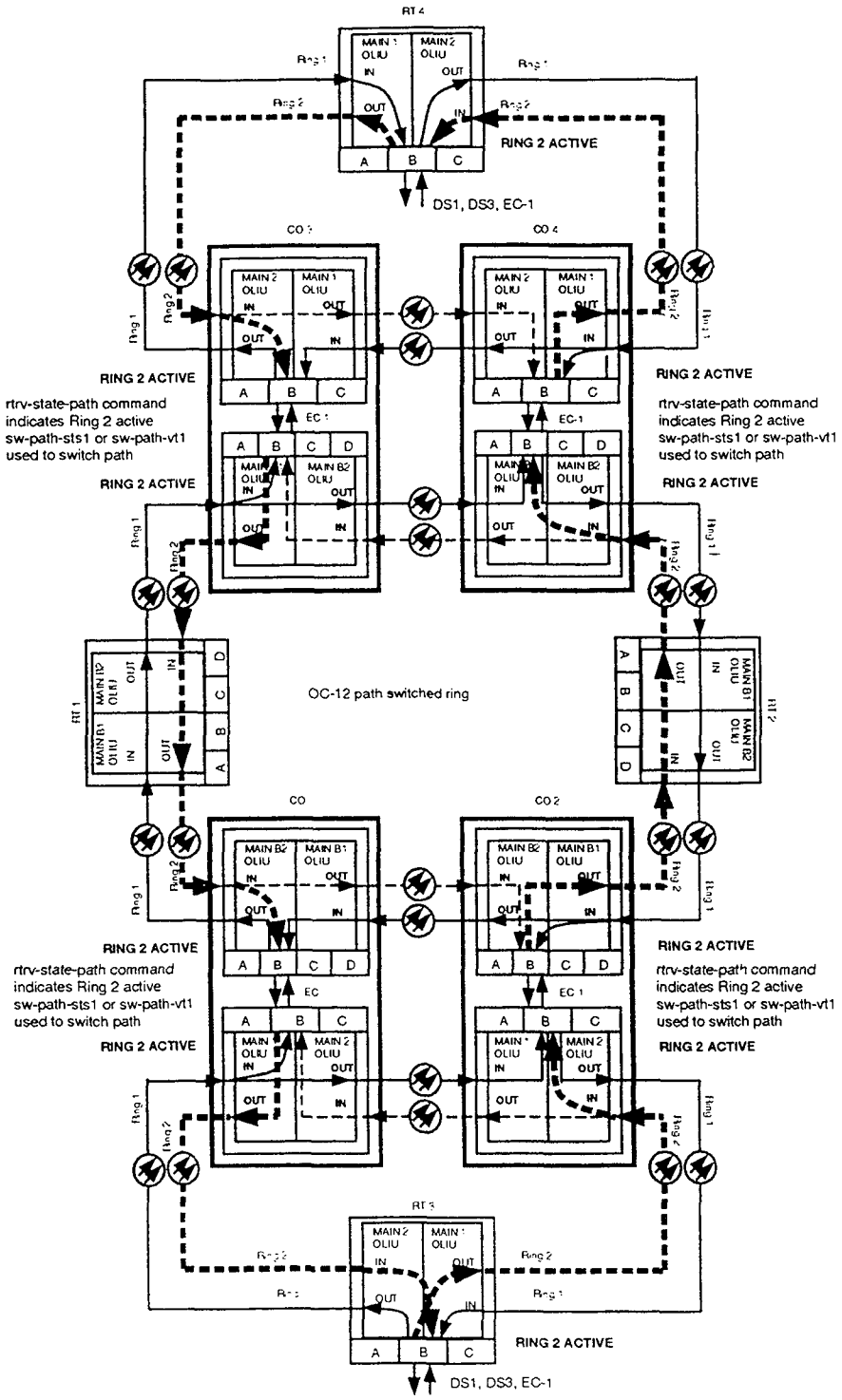


Figure 10. Example of DS1 Transmission Test in Dual Ring Interworking Network

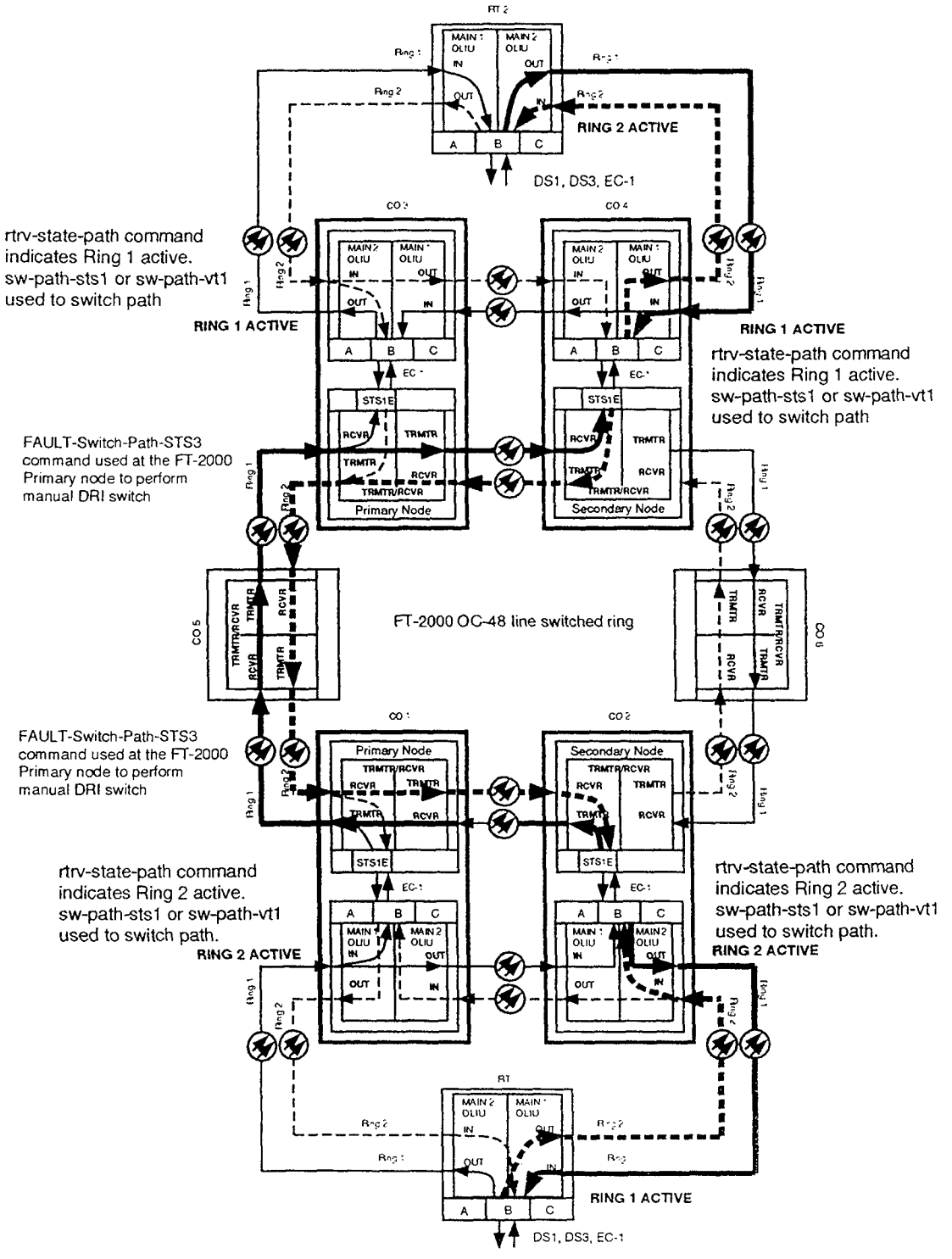


Figure 11. Example of DS1 Transmission Test in Dual Ring Interworking Network

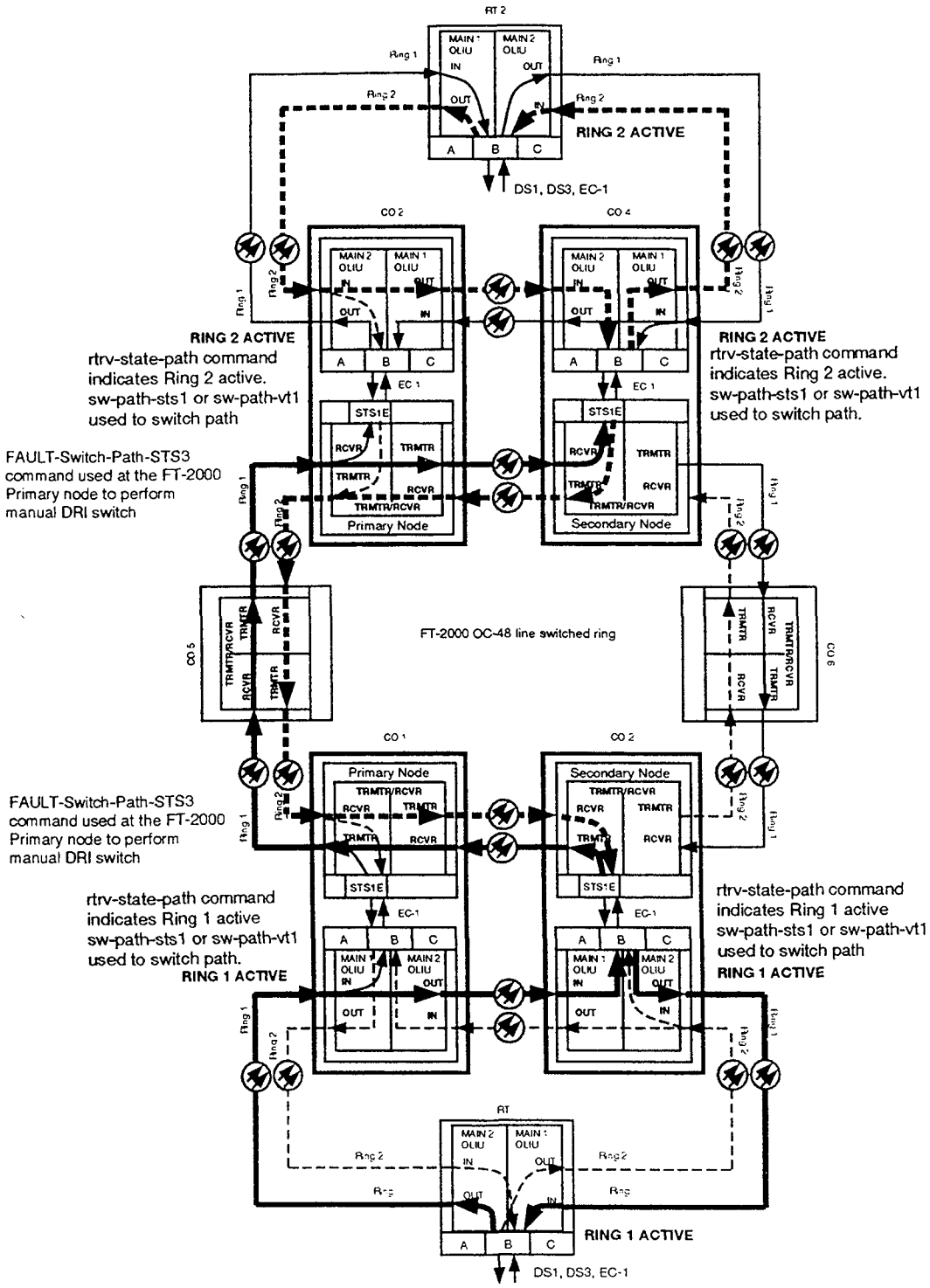


Figure 12. Example of DS1 Transmission Test in Dual Ring Interworking Network

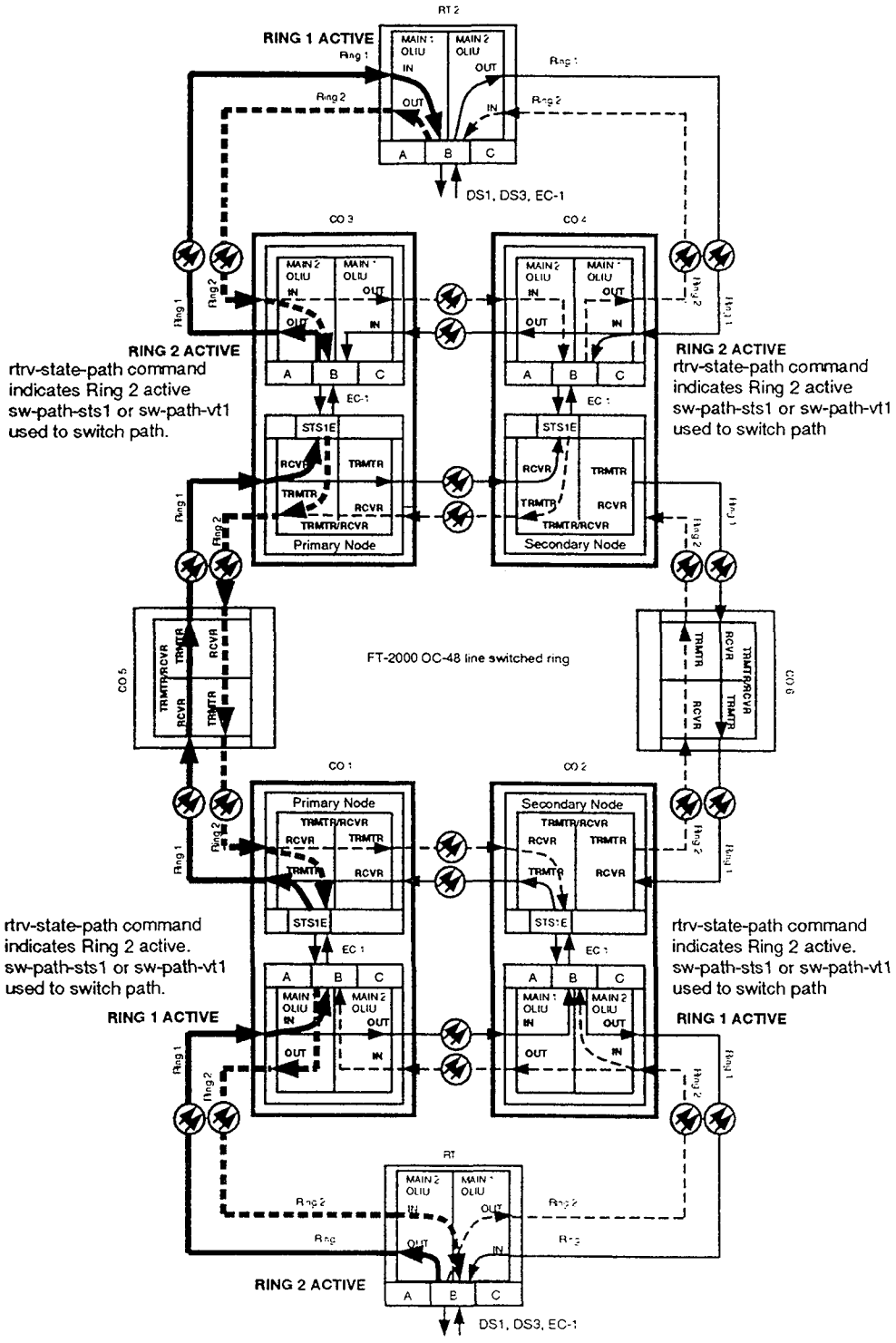


Figure 13. Example of DS1 Transmission Test in Dual Ring Interworking Network

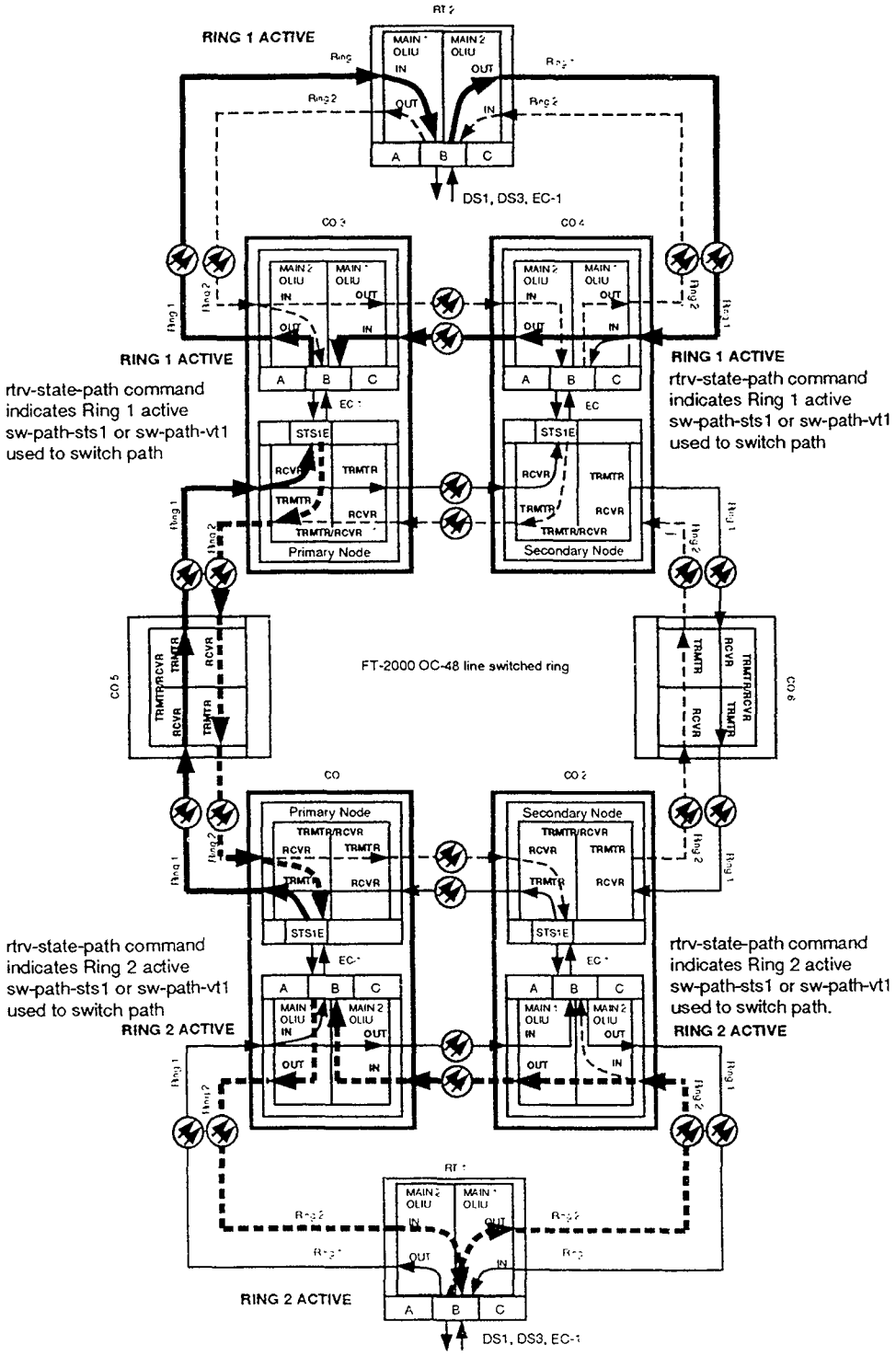


Figure 14. Example of DS1 Transmission Test in Dual Ring Interworking Network

Remove –48 V DC User Panel Fuse

1. Obtain multimeter capable of measuring DC voltage in the 40 to 60 volt range.

2. ⚠ WARNING:
   –48 V DC is present in the fuse holders and the P1 and P2 power connections at rear of User Panel.

   ⚠ CAUTION:
   If system is in service, service interruption will occur if both fuses are removed or both power feeders are disconnected. Do not remove any User Panel fuse that does not indicate blown without first verifying that –48 V is present on the other incoming power feeder.

   Does fuse indicator indicate blown fuse?

   If **YES**, then continue with **Step 3**.
   If **NO**, then proceed to **Step 7**.

3. Replace –48 V blown fuse.

4. Did fuse blow again?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. Trouble in User Panel or backplane connector. If you need assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions. If User Panel needs to be replaced, see **DLP-551**.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. ⚠ CAUTION:
   Before removing a fuse that does not have a failure indicator activated, you must first verify that –48 V is available to the shelf through the fuse that is not going to be removed.

   Momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown (9, 8, 7, etc.) on the **FE ID** display. During this countdown, remove the **SYSCTL**, then the **OHCTL**.

8. Refer to Figures 1, 2, and 3. Is your shelf an ED-8C724-30, G1 shelf (Figure 1) or an ED-8C724-30, G3 or G4 shelf (Figure 2 or 3)?

   If **ED-8C724-30**, **G1**, then continue with **Step 9**.
   If **ED-8C724-30**, **G3** or **G4**, then proceed to **Step 14**.

9. See Figure 1.
   If fuse **FA** is being removed, verify that –48 V DC is present between pin **8** of Filter A6257 (positive lead) and terminal **E1** of terminal board **TB1** (negative lead).

   If fuse **FB** is being removed, verify that –48 V DC is present between pin **6** of Filter A6257 (positive lead) and terminal **E2** of terminal board **TB1** (negative lead).

   Requirement: Voltage must be between –41.75 V and –60.0 V DC

10. Was requirement met?

    If **YES**, then continue with **Step 11**.
    If **NO**, then proceed to **Step 19**.

11. Reinstall **SYSCTL** and **OHCTL**.

12. You can safely remove one fuse as required, if power is maintained to the shelf through the other fuse.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. See Figure 2 or 3.
    If fuse **FA** is being removed, verify that –48 V DC is present between pin **3** (positive lead) and pin **4** (negative lead) of **P2**.

    If fuse **FB** is being removed, verify that –48 V DC is present between pin **2** (positive lead) and pin **1** (negative lead) of **P2**.

    Requirement: Voltage must be between –41.75 V and –60.0 V DC

15. Was requirement met?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 19**.

16. Reinstall **SYSCTL** and **OHCTL**.

17. You can safely remove one fuse as required, if power is maintained to the shelf through the other fuse.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. Trouble in User Panel, power feeder(s), or office battery distribution. If you need assistance, notify your supervisor, your local technical support organization, or call AT&T RTAC, per local operating instructions. If User Panel needs to be replaced, see **DLP-551**.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

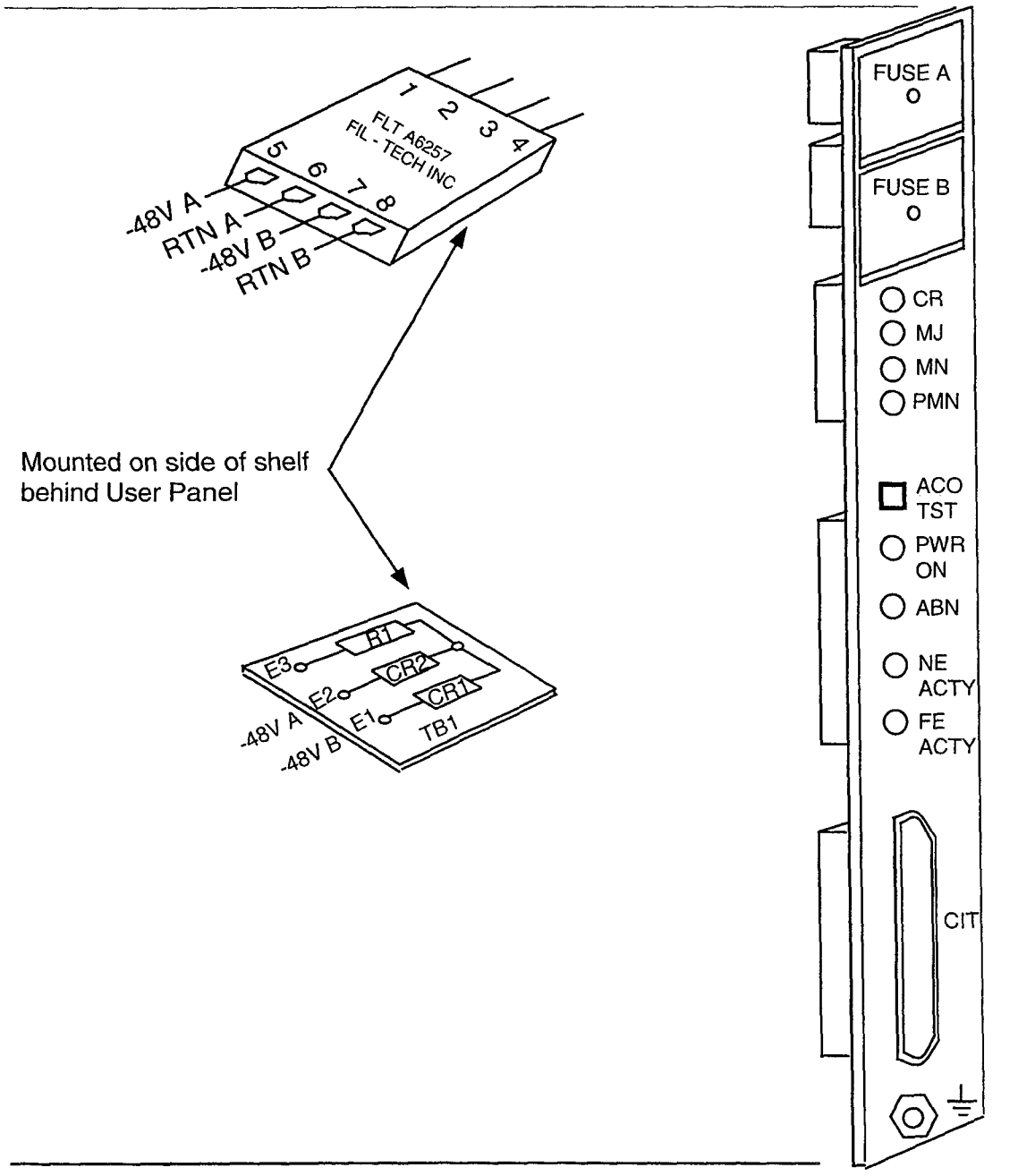


Figure 1. ED-8C724-31, G1 User Panel for ED-8C724-30, G1 DDM-2000 OC-3 Shelf

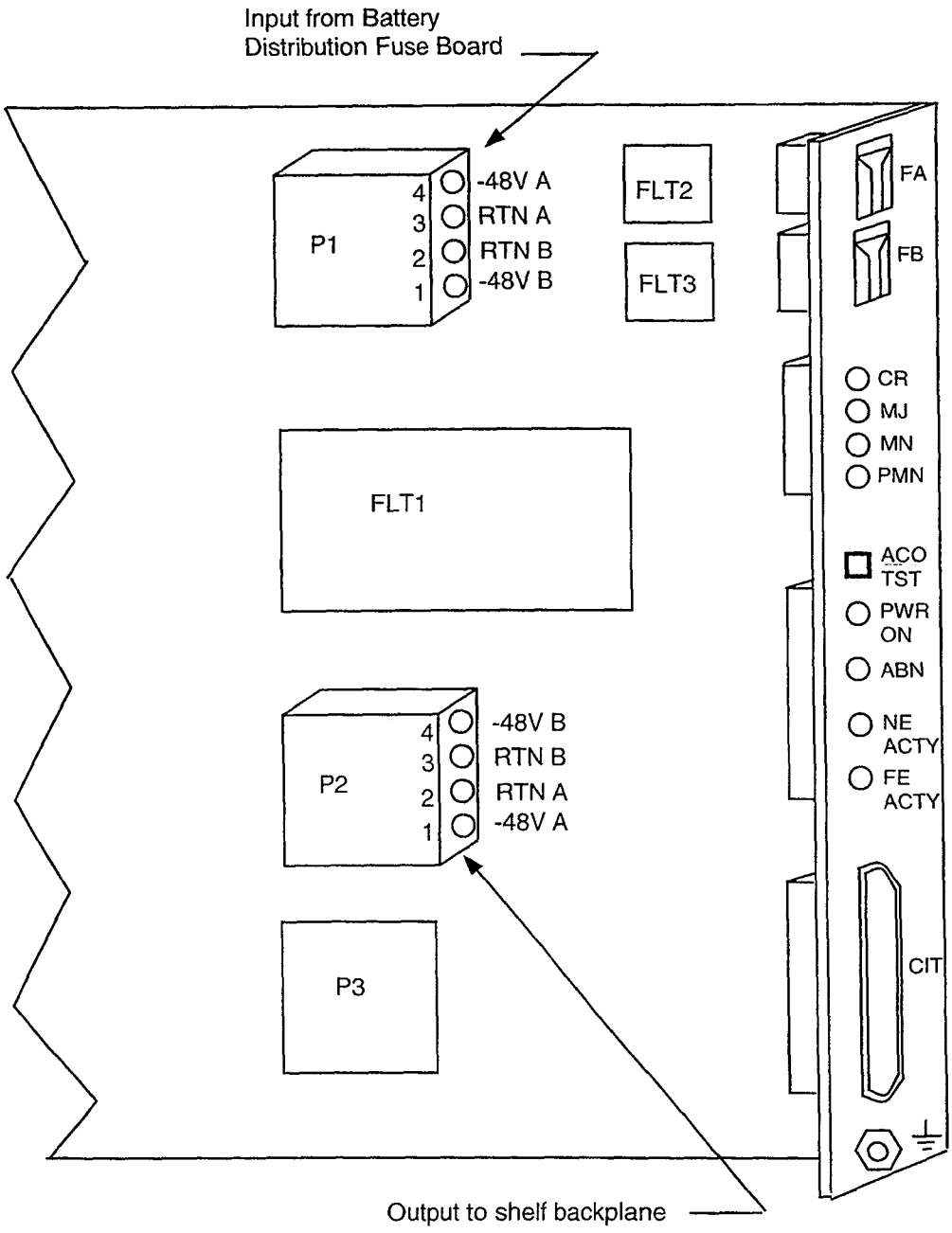


Figure 2. ED-8C724-31, G2 User Panel for ED-8C724-30, G3 DDM-2000 OC-3 Shelf

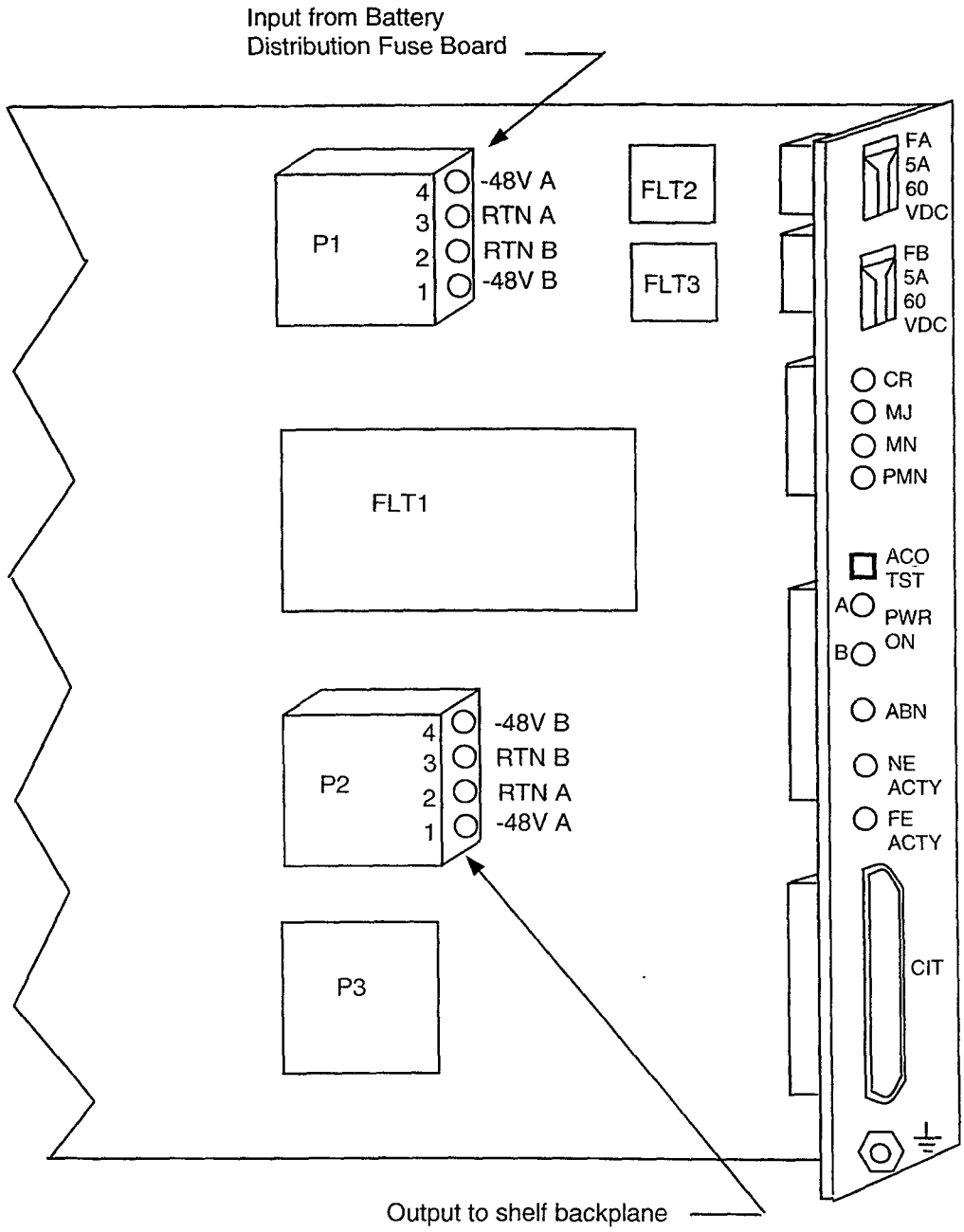


Figure 3. ED-8C724-31, G3 User Panel for ED-8C724-30, G4 DDM-2000 OC-3 Shelf

Software Release Description

Purpose

This section is provided as a holding place for the Software Release Description (SRD) document. The SRD will be reissued with each new generic of software.