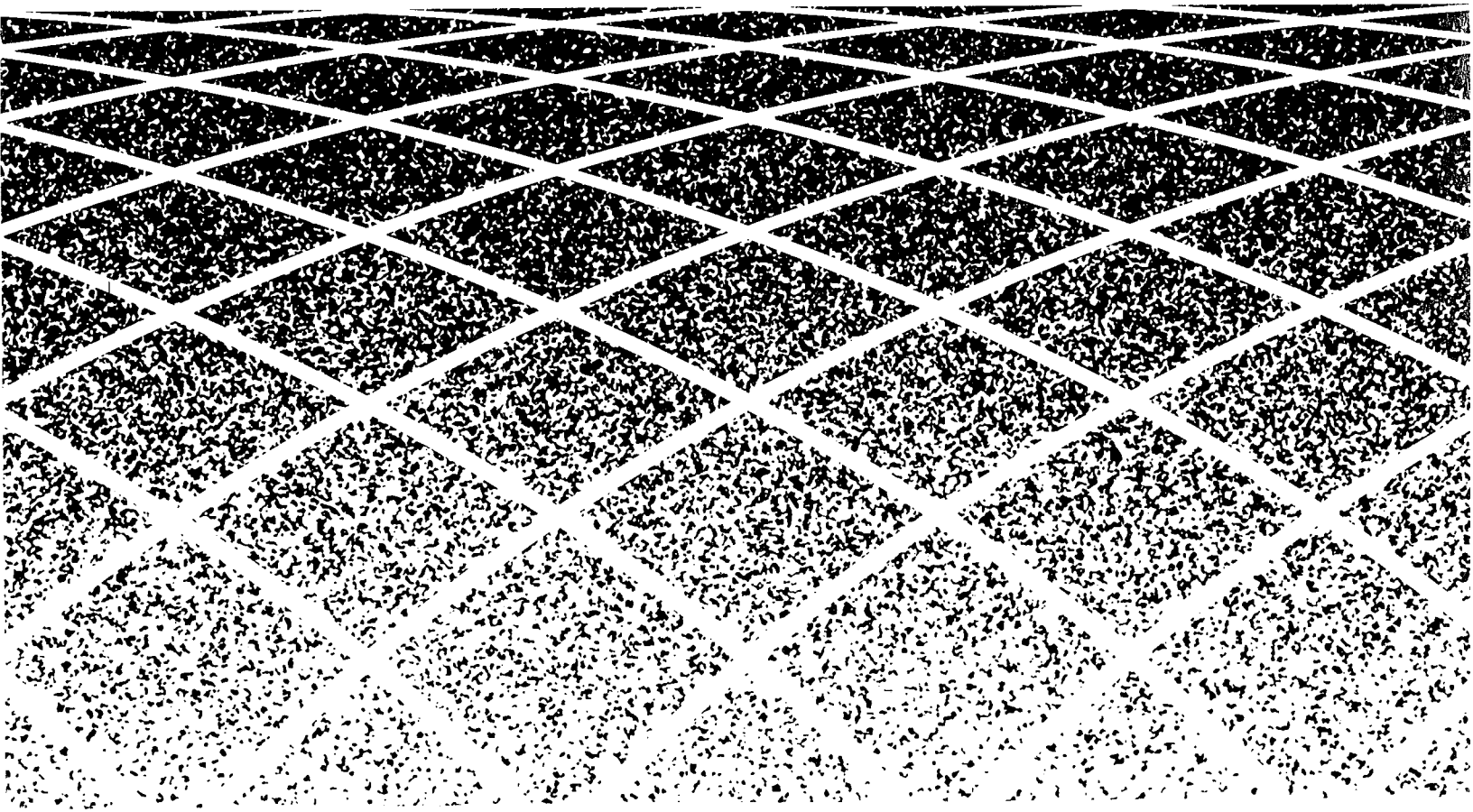
AT&T 363-206-207
Issue 3A Revision
May 1994

DDM-2000 OC-12 Multiplexer Releases 1, 2, and 3 and OC-12 Regenerator Releases 1 and 2

User/Service Manual



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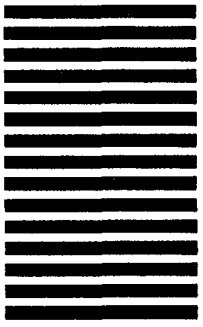
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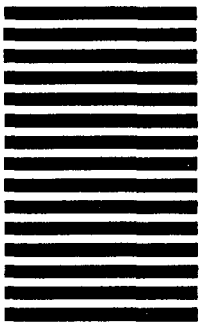
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About This Document

Purpose

This *DDM-2000 OC-12 Multiplexer User/Service Manual* includes Releases 1, 2, and 3 of the DDM-2000 OC-12 Multiplexer and Releases 1 and 2 of the OC-12 Regenerator and provides the following:

- Detailed descriptive information to circuit pack level
- Technical specifications
- Commands and reports descriptions
- 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-12 Multiplexer and the OC-12 Regenerator. It may be used by anyone desiring specific information about the DDM-2000 OC-12 Multiplexer and the OC-12 Regenerator operation and maintenance.

Reason for Reissue

This document, Issue 3, replaces the *DDM-2000 OC-12 Multiplexer User/Service Manual*, Issue 2. The document is reissued to include Release 2.1 and 3.0 features, applications, operations, and maintenance for the DDM-2000 OC-12 Multiplexer and to include Release 2.0 features, applications, operations, and maintenance for the OC-12 Regenerator. These features are listed in Section 1, "System Introduction".

Major changes in this issue are noted by bars (|) in the right margin. In most sections, OC-12 Regenerator information is placed at the end of the section to provide convenient access to the information.

Major changes include adding information for the following:

- OC-12 STS-1 path switched ring applications (Release 3.0)
- EC-1 dual ring interworking (DRI)
- Synchronization messaging
- Automatic synchronization reconfiguration
- Two new circuit packs: the BCP3 flexible time slot interchange (TSI) circuit pack and the BBG12 (3STS1E) circuit pack for the DDM-2000 OC-12 Multiplexer.
- A new 23R-U (REGENR) circuit pack and OC-12 Regenerator Release 2 software that support bipolar-8 (BIP-8) line performance monitoring for the OC-12 Regenerator
- Universal optical connector versions of the 21D, 21G, 23G, and 23H optical line interface units (21D-U, 21G-U, 23G-U, and 23H-U). These universal connector versions are being "phased into manufacture" at the time of this printing.

This Issue 3A Revision is issued to include Releases 2.2 and 3.1 of the OC-12 Multiplexer. Major changes include adding information for the following:

- OC-12 STS-1/VT1.5 path switched ring (dual 0x1) applications
- Channel state provisioning
- Enhanced DS3 performance monitoring
- EC-1 loopbacks
- SNC-2000 CPro Graphical User Interface and Provisioning Tool
- Additional 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, 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-12 Multiplexer and the OC-12 Regenerator.

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.
- 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.

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

* Registered trademark of Underwriters Laboratories, Inc

- 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.

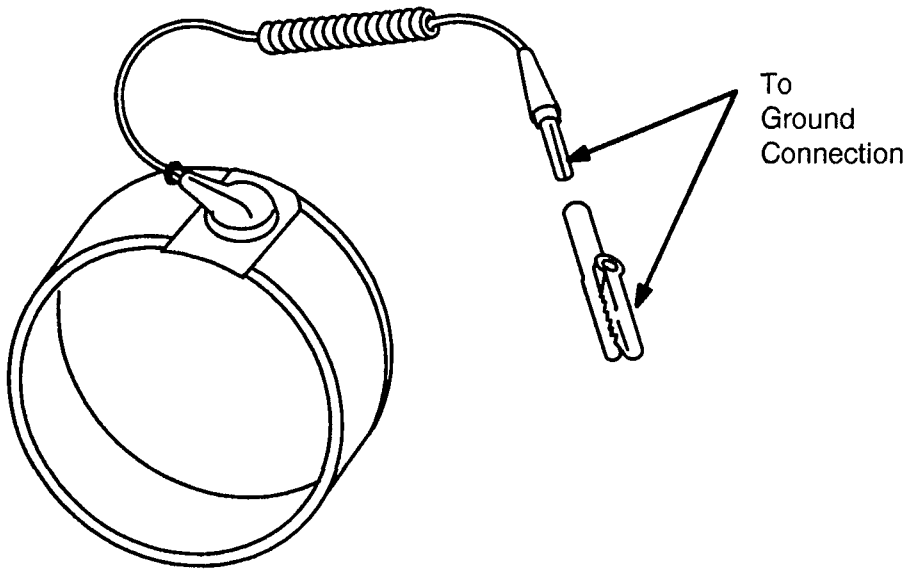


Figure A. Static Control Wrist Strap

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 363-206-208, *DDM-2000 OC-12 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 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 363-206-208, *DDM-2000 OC-12 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 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:

- Number: AT&T 363-206-200

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

  Audience: Network planners, equipment engineers, and sales teams

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

- Number: 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

- Number: AT&T 363-206-202

  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)

- 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

- 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 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.

- 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 (Rear Access)
ED-8C727-21	Cable Assemblies (Front Access)
ED-8C727-30	DDM-2000 Shelf Assembly
ED-8C727-31	User Panel Assembly
ED-8C727-33	DDM-2000 OC-12 Release 1 Software Ordering
ED-8C727-34	DDM-2000 OC-12 Release 2 Software Ordering
ED-8C727-35	DDM-2000 OC-12 Release 3 Software Ordering
ED-8C727-40	DDM-2000 OC-12 Regenerator Release 1 Software Ordering
ED-8C727-41	DDM-2000 OC-12 Regenerator Release 2 Software Ordering
ED-8C733-30	Fan, Filter, and Baffle Assemblies
SD-7C513-01	Application Schematic
T7C513-31	Interconnect Wiring (Rear Access)
T7C513-32	Interconnect Wiring (Front Access)
801-525-168	Floor Plan Data Sheets.

- Related DDM-2000 OC-3 Drawings:

ED-8C724-10	OC-3/OC-12 Typical Bay Arrangements
ED-8C724-15	Cabling Plan (Rear Access)
ED-8C724-16	Cabling Plan (Front Access)
ED-8C724-20	Cable Assemblies (Rear Access)
ED-8C724-21	Cable Assemblies (Front Access)
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-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 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 190-523-101
  Title: *Guide to Using SNC-2000 CPro*
- 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 363-206-157
  Title: *DDM-Plus Wall DT Installation Manual*
- Number: AT&T 363-206-156
  Title: *DDM-Plus Equipment Engineering and Ordering Guide*
- 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 Hickory Ridge in 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: LW1030 (2 days)

  Title: Digital SONET, DDM-1000/2000 Seminar

  Audience: Fundamental planners, current planners, account management personnel, and telecommunications managers

  Content: Practical overview of digital transmission principles and the synchronous optical network (SONET) and a working knowledge of the DDM-1000 multiplexer and the DDM-2000 multiplexers.

- Number: LW2212 (2 days)

  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. This course replaces LW2203.

- Number: LW2312 (3 days)

  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. This course replaces LW2303.

- Number: LW2603 (4 days)

  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 (Release 2 and later). On-site shelves are used for extensive hands-on experience.

- Number: LW2608 (2 days)

  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 (4 days)

  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 the DDM-2000 OC-12 Multiplexer. Includes information on DDM-2000 OC-12 Release 3.0 rings. On-site shelves are used for extensive hands-on experience.

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.

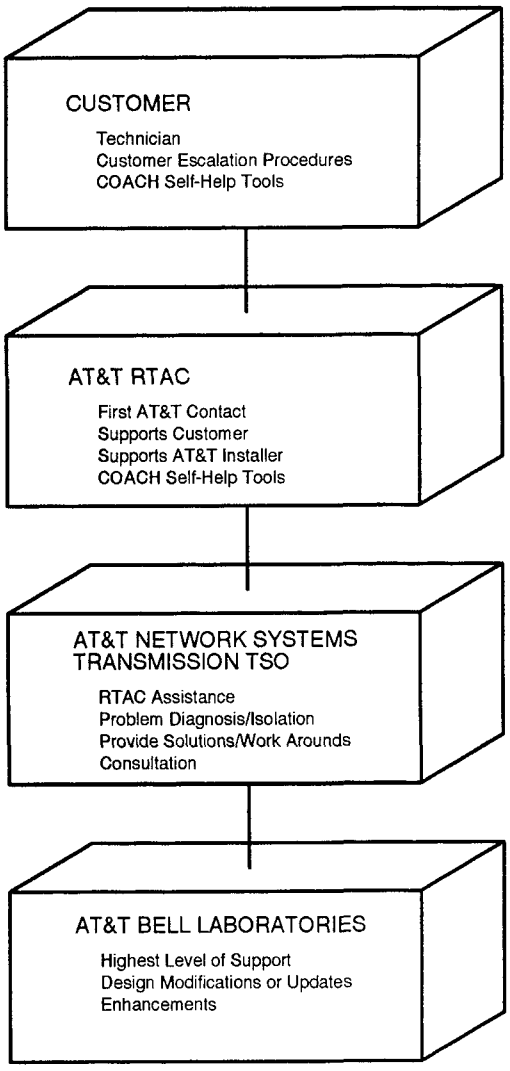


Figure B. Product Support

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: **1-508-960-2286**

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).

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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: **1-317-322-6646** 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.

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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 OC-12 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).
- 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-12 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-12 Multiplexer

The DDM-2000 OC-12 Multiplexer is a single shelf SONET digital multiplexer. A single 12-inch shelf supports a mix of digital signal 3 (DS3) and optical carrier level 3 (OC-3) signals and multiplexes them into a SONET standard 622 Mb/s optical carrier level 12 (OC-12) rate.

The OC-12 and OC-3 optical lines, all transmission-affecting circuit packs, and the –48 V DC power feeders may be optionally protected. The shelf can be equipped to serve many diverse network applications and supports a variety of operations interfaces for current and evolving network operations needs. See Section 9, "Maintenance Description", for software compatibility, inservice upgrades, and number of network elements (NEs) supported by release.

The DDM-2000 OC-12 Multiplexer is designed for loop, interoffice, and customer location applications. The DDM-2000 OC-12 Multiplexer starts with many of the proven features of AT&T's DDM-1000 and DDM-2000 OC-3 Multiplexers and extends into the future with the flexibility of the SONET standard.

The DDM-2000 OC-12 Multiplexer is designed for easy installation and operation. Installation is simplified with automatic turnup tests and default provisioning. Centralized operation is supported by a full set of single-ended control and maintenance features. Built-in maintenance capabilities support both installation and continuous system operation. A DDM-2000 OC-12 Multiplexer can be fully tested and installed without using external test equipment. Most tasks can be performed using faceplate light-emitting diode (LED) displays and controls, while an optional craft interface terminal (CIT) gives access to sophisticated maintenance, provisioning, and reporting features.

The DDM-2000 OC-12 Multiplexer has a phased release plan. Release 1 supports DS3, interconnect signal level 3 (IS-3), and OC-3 interfaces. Applications include OC-12 point-to-point, OC-12 hubbing and optical interworking with the DDM-2000 OC-3 Multiplexer. Release 2 supports OC-3/OC-12 open systems interconnections (OSI) interworking, an OC-3c (STS-3c) transport feature, synchronization messaging, and 1550 nm long reach applications using the OC-12 23H/23H-U optical line interface unit (OLIU). Release 3 supports OC-12 path switched rings, dual ring interworking (DRI), and automatic synchronization reconfiguration.

The OC-12 Regenerator extends the span length of the DDM-2000 OC-12 Multiplexer and is supported in both unbalanced and balanced modes. Diverse routing is supported in either mode, allowing one line to travel over a longer route than the other. The OC-12 Regenerator uses the same shelf and some of the same circuit packs as the OC-12 Multiplexer.

This user/service manual covers Releases 1, 2, and 3 of the DDM-2000 OC-12 Multiplexer and Releases 1 and 2 of the OC-12 Regenerator. The manual will be updated to cover additional releases as they become available.

DDM-2000 OC-12 Multiplexer Releases

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

Release 1 — Point-to-Point and Hubbing

- Software Release 1.0.4
  - — Point to point
  - — Low speed DS3
  - — Remote Software Download
- Software Release 1.1
  - — OC-12 Hubbing with OC-3 extensions
  - — OC-3/OC-12 interworking (21G OLIU)*
  - — *SLC*-2000 (R1 and R2) interworking
  - — TL1 interface to NMA
  - — DS1 timing outputs
  - — Security
- Software Release 1.2
  - — OC-3/OC-12 interworking (21D OLIU)†
  - — Low Speed IS-3 interface
  - — *SLC*-2000 (R1 and R2) interworking
- Hardware
  - — 23G OLIU
  - — 21G OLIU
  - — 21D OLIU (IS-3)
  - — BBF2 TGS
  - — BBF2B TGS (DS1 timing outputs)
  - — BBG5 SYSCTL
  - — BBG11 3DS3
  - — BCP1 OHCTL
  - — BCP2 TSI
  - — Shelf

* Requires DDM-2000 OC-3 Software Release 3.1

† Requires DDM-2000 OC-3 Software Release 3.2

Release 2 — Open Systems Interconnection (OSI) Interworking

- Software Release 2.0
  - — OC-3c (STS-3c) transport (21D or 21G OLIU)
  - — OSI 7-layer protocol stack over the DCC
  - — OC3/OC-12 OSI interworking‡
  - — Synchronization messaging
  - — OC-12 optics for long reach 1550 nm applications
- Software Release 2.1
  - — EC-1 low speed interface
  - — Linear extensions from OC-3 ring
  - — TL1 provisioning messages for OPS/INE
  - — Additional TL1 messages
- Software Release 2.2
  - — Interworking with *SLC*-2000 Release 3.0 and Release 3.1
  - — Channel state provisioning
  - — Additional TL1 messages
- Hardware
  - — 23H/23H-U OLIU (1550 nm)
  - — BBG12 3STS1E low speed interface

Release 3 — OC-12 STS-1 Path Switched Ring

- Software Release 3.0
  - — STS-1 Path switched ring
  - — DS3/EC-1 low speed interface
  - — EC-1 dual ring interworking with drop and continue
  - — DS1 timing outputs
  - — Synchronization messaging
  - — OSI on rings
  - — Automatic synchronization reconfiguration
  - — TL1
  - — Security
  - — STS-1 flexible TSA
  - — STS-1 signal degrade protection switching

‡ Requires DDM-2000 OC-3 Software Release 6.0

- Software Release 3.1
  - — Interworking with *SLC*-2000 Release 3.0
  - — OC-12 VT1.5 path switched ring (dual 0x1)
  - — OC-12 STS-1 drop and continue to DS3 interface
  - — Enhanced DS3 performance monitoring
  - — Channel state provisioning
  - — OC-3 ring to OC-12 ring inservice upgrade
  - — Low-speed EC-1 loopback
  - — Additional TL1 messages
- Hardware
  - — BBG12 3STS1E low-speed interface
  - — BCP3 TSI

Release Descriptions

The following paragraphs provide brief descriptions of the DDM-2000 OC-12 Multiplexer releases.

Release 1.0 and later features include OC-12 point-to-point with DS3 low-speed interfaces, OC-12 hubbing with OC-3 extensions, and OC-3/OC-12 interworking using the 21D optical line interface unit (OLIU). The TL-1/X.25 message-based interface to Bellcore's Network Monitoring and Analysis (NMA) operations system feature comes as part of the controller hardware and separately ordered software required with Release 1.1 and later equipment. Hardware features include 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. Release 1.0 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 2.0 new features 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 2.0 also includes optical carrier level 3 concatenated (OC-3c) transport. This OC-3c transport feature can be used to interface with broadband terminals using 21D or 21G OLIUs.

SONET synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork. The OC-12 23H/23H-U OLIU provides 1550 nm optics for long reach (100 km) central office applications.

Release 2.1 new applications include DDM-2000 OC-12/DACS IV-2000 transmission interworking with an EC-1 interface, DDM-2000 OC-12/FT-2000 transmission interworking with an EC-1 interface, and OC-12 linear extensions from OC-3 rings. New features include an EC-1 interface with a new BBG12 3STS1E low-speed interface circuit pack, TL1 interface to Bellcore's Operations Systems/Intelligent Network Elements (OPS/INE) Release 1.7, and additional TL1 messages to support provisioning, maintenance, testing, performance monitoring, and security functions.

Release 2.2 new applications and features include interworking with *SLC*-2000 Release 3.0, channel state provisioning, and additional TL1 commands and enhancements.

Channel state provisioning is a capability provided on DDM-2000 OC-12 Multiplexers that suppresses reporting of alarms and events by supporting multiple states (automatic, inservice, and not monitored) for STS-1 channels.

Release 3.0 is an OC-12 STS-1 path switched ring release featuring EC-1 dual ring interworking (DRI) with drop and continue and automatic synchronization reconfiguration. New applications include OC-12 path switched ring, DDM-2000 OC-12/DACS IV-2000 transmission interworking, and DRI interworking via an EC-1 interface. New features include DS3 low-speed interface on an OC-12 path switched ring, EC-1 low-speed interface with the BBG12 3STS1E circuit pack, two-fiber path switched ring, ten network elements maximum network from a single maintenance point, STS-1 drop and continue, nonrevertive protection switching, automatic ring synchronization reconfiguration, OSI 7-layer protocol stack on the DCC in a ring, DS1 timing outputs for timing distribution, synchronization messaging, STS-1 signal degrade, manual STS path switching, enhanced security, remote and remote software download. The new BCP3 time slot interchange (TSI FLEX) circuit pack provides flexible STS-1 bandwidth management across the entire OC-12.

Release 3.1 new applications and features include interworking with *SLC*-2000 Releases 3.1 and 3.2 ring networks, OC-12 STS-1/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), channel state provisioning, OC-3 ring to OC-12 ring inservice upgrades, low-speed EC-1 loopbacks, and additional TL1 commands and enhancements.

The OC-12 STS-1/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.

Dual 0x1 interfaces provide full VT protection switching via an OC-12 ring, bandwidth conservation, and VT bandwidth management on the OC-12 ring.

Enhanced DS3 PM provides 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.

Channel state provisioning is a capability provided on DDM-2000 OC-12 Multiplexers that suppresses reporting of alarms and events by supporting multiple states (automatic, in-service, and not-monitored) for STS-1 channels.

Electronic STS-1 loopbacks (EC-1 low-speed) are provided to loop each of the three internal STS-1 signals back toward the transmit fiber. These can be used to test a new span being added to a hub or add/drop network.

OC-12 Regenerator Releases

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

Release 1 — Regenerator *

- Software Release 1.0
  - — Balanced and unbalanced modes
  - — TBOS and parallel telemetry interface
- Hardware
  - — 23R regenerator(REGENR) circuit pack

* Release 1 will be rated discontinued availability (DA) when Release 2 is available.

Release 2 — Enhanced Maintenance Operation

- Software Release 2.0
  - — Enhanced maintenance (B2 performance monitoring for line BIP-8 errors)
  - — Line performance monitoring
  - — TL1 interface to NMA
- Hardware
  - — 23R-U REGENR circuit pack

Release Descriptions

Release 1.0 features include OC-12 Regenerator applications in the balanced or unbalanced mode, telemetry byte-oriented serial (TBOS) and parallel telemetry interfaces, and 1310 nm optics using the 23R circuit pack. Release 1 will be rated discontinued availability (DA) when Release 2 is available.

Release 2.0 features enhanced maintenance with B2 performance monitoring for line bipolar-8 (BIP-8) errors and a TL-1 message-based interface.

The 23R-U REGENR universal connector circuit pack and OC-12 Regenerator Release 2 software supports BIP-8 monitoring. The line parameters monitored include errored seconds, severely errored seconds, errored seconds (Type A and B), severely errored seconds (Type A and B), severely errored framing seconds, unavailable seconds, and framing violations.

The 23R REGENR circuit pack can be used with both Release 1.0 and 2.0 software; however, the BIP-8 monitoring is not provided. The 23R and 23R-U REGENR circuit packs cannot be mixed in the same shelf.

Applications

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OC-12 Regenerator

Like the loop feeder application, the OC-12 Regenerator (Figure 2-16) supports interoffice applications that exceed the allowed loss budget of the DDM-2000 OC-12 Multiplexer. Diverse routing of the service and protection lines is supported in the balanced mode (the same number of regenerators on each line) or unbalanced mode (different numbers of regenerators on each line).

A single 14-inch OC-12 Regenerator shelf supports up to two bidirectional lines. These lines may be the service and protection lines of a single OC-12 system. Alternatively, one shelf can independently serve one bidirectional line each from two separate OC-12 systems. This allows two separate, diversely routed OC-12 systems to share the same regenerator shelf at the diversity point, reducing equipment cost.

If access to local traffic becomes necessary in the future, an OC-12 Regenerator in a diversely routed system can be upgraded in service to a ring node.

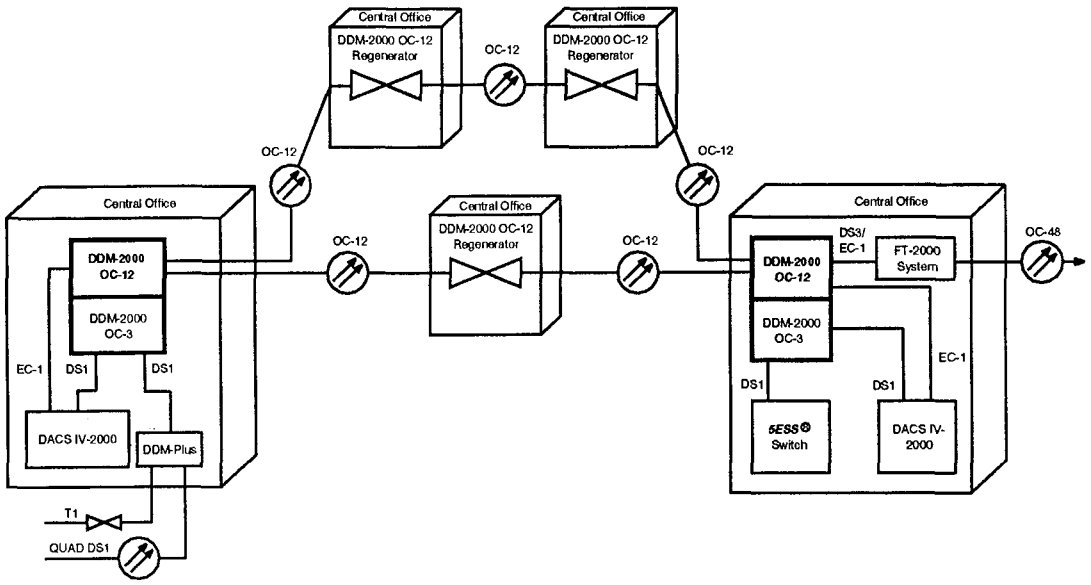


Figure 2-16. OC-12 Regenerator Interoffice Application — Diverse Routing

Ring Topologies

OC-12 Ring Topologies

The DDM-2000 OC-12 Multiplexer's STS-1 path switched ring capabilities provide cost-effective transport for small or medium cross-section interoffice networks such as outstate trunks. Such a ring, shown in Figure 2-17, provides DS1, DS3, and EC-1 transport.

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

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

OC-12 STS-1/VT1.5 Path Switched Ring (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 STS-1/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 ( )-2 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. See Section 5, "Transmission and Synchronization Interfaces" for more information on this application.

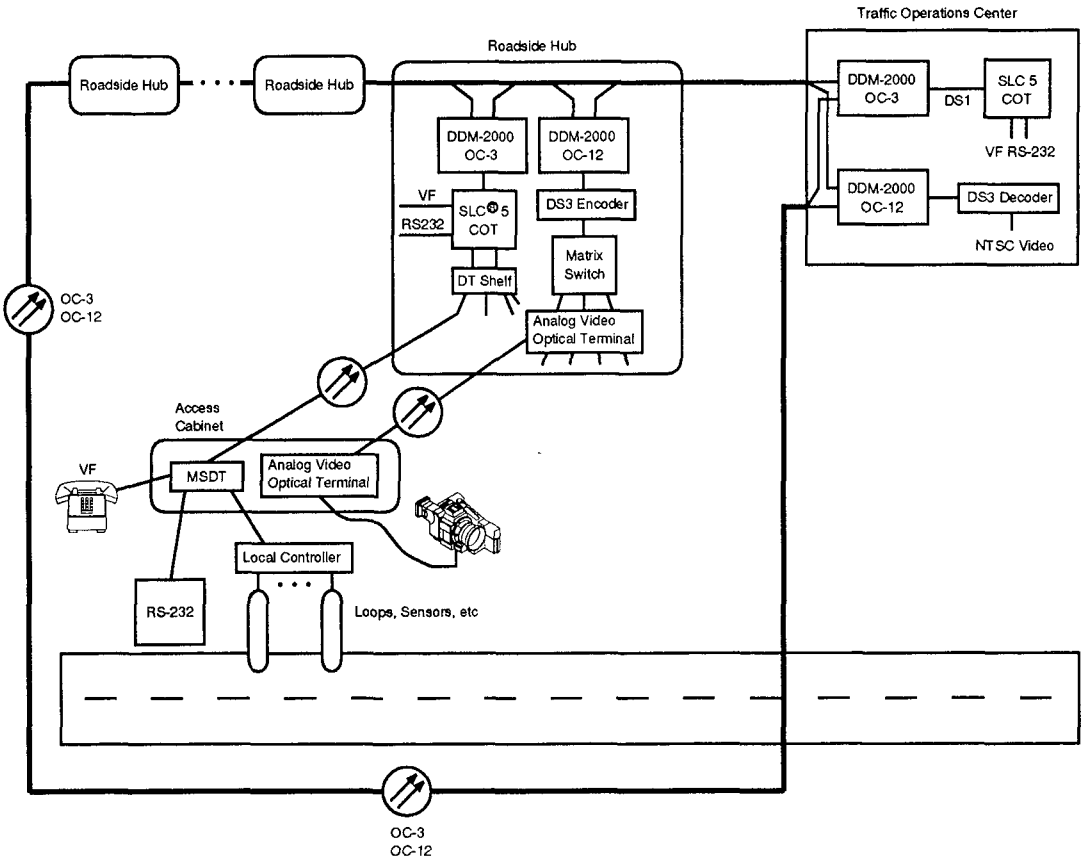


Figure 2-19. Intelligent Vehicle Highway System (IVHS) Application

OC-12 STS-1 Drop and Continue to DS3 Interface

Figure 2-20 shows an OC-12 STS-1 drop and continue to DS3 interface application for DDM-2000 OC-12 Release 3.1. The application is a dual ring interworking network with the following components and releases:

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

This configuration is a specific application for video systems where DS3 clear channel capabilities are needed.

NOTE:
Unless there is a specific application requiring DS3 interfaces such as video or DS3 clear channel, it is recommended that dual ring interworking be done with standard SONET EC-1 interfaces. This is because incoming asynchronous DS3 failures, such as loss of signal (LOS) or alarm indication signals (AIS), at drop and continue nodes will not generate SONET STS AIS if drop and continue cross-connections are made on a 3DS3 circuit pack. As a result, path protection switching will not occur on the OC-12 ring resulting in unusable signals at the terminating end.

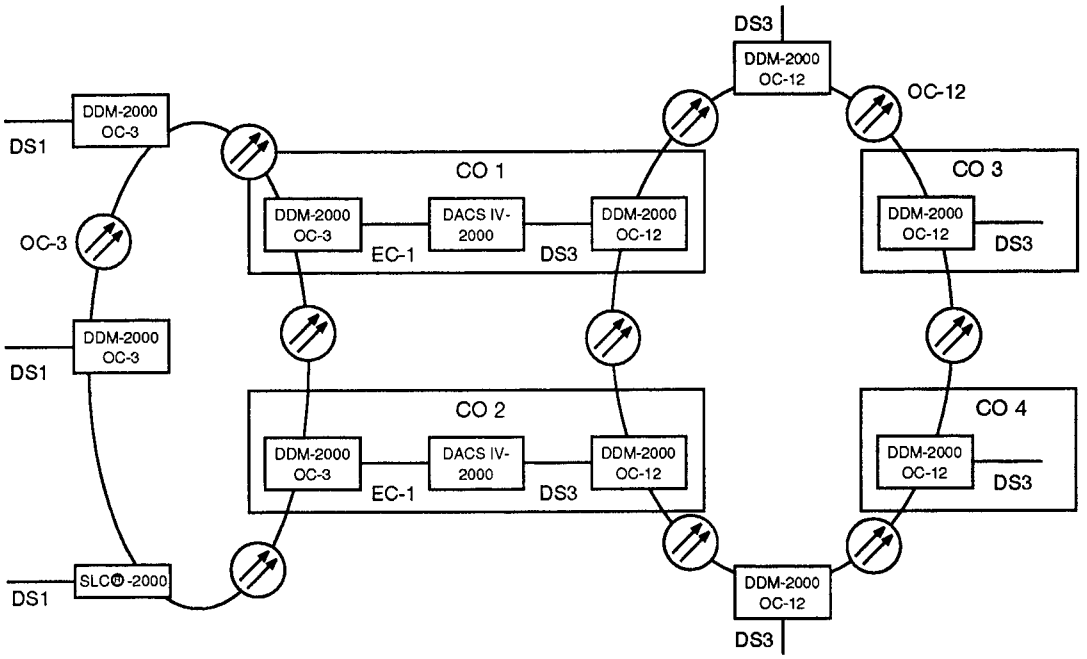


Figure 2-20. OC-12 STS-1 Drop and Continue to DS3 Interface

Shelf Descriptions and Configurations

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DDM-2000 OC-12 Multiplexer Shelf Configurations

A single DDM-2000 OC-12 shelf, together with up to four DDM-2000 OC-3 shelves, supports all the OC-12 applications.

- The following circuit packs are required in all DDM-2000 OC-12 Multiplexer applications:
  - — 177C apparatus blanks (APPBLK) in the Main A slots to control air flow through the shelf to ensure adequate cooling.
  - — 23G/23G-U or 23H/23H-U OLIU circuit packs in the Main B slots provide the OC-12 optical interfaces.
  - — TSI circuit packs in the TSI slots connect STS-1s from the Main B slots to the Function Unit slots. The TSI also distributes the timing it receives from the TGS circuit packs to circuit packs in the Main and Function Unit slots.
  - — TGS circuit packs in the TIMING slots provide timing to the TSI circuit packs.
  - — SYSCTL and OHCTL circuit packs in the SYSCTL and AUXCTL slots, respectively, provide system control functions.
- For all but the SYSCTL and OHCTL, which are not protected, installation of protection circuit packs is optional. Equipage of function unit slots depends on the application.
- Unused Function Unit slots must be equipped with 177B apparatus blanks (APPBLK) to ensure adequate cooling of the shelf.
- All applications should be equipped with a baffle as shown in ED-8C727-10.

Each of the four pairs of Function Unit slots can be equipped independently of the others with BBG11 3DS3, BBG12 3STS1E, 21D/21D-U OLIU, and 21G/21G-U OLIU circuit packs or 177B apparatus blanks.

Table 3-2 lists the possible circuit pack equipage mapped by release. See Section 7, "Circuit Pack Descriptions", for more information on these and other circuit packs. Some shelf configurations are described in the following sections.

Table 3-2. DDM-2000 OC-12 Multiplexer Circuit Packs and Releases

Release Number	Slot Name						
	Main-A	Main-B	TSI	TG	FN	SYSCTL	AUXCTL
1.0	177C	23G/23G-U	BCP2	BBF2 BBF2B*	BBG11 177B	BBG5†	BCP1
1.1	177C	23G/23G-U	BCP2	BBF2 BBF2B*	21G/21G-U BBG11 177B	BBG5†	BCP1
1.2	177C	23G/23G-U	BCP2	BBF2 BBF2B*	21G/21G-U 21D/21D-U BBG11 177B	BBG5†	BCP1
2.0	177C	23G/23G-U 23H/23H-U	BCP2	BBF2 BBF2B*	21G/21G-U 21D/21D-U BBG11 177B	BBG5†	BCP1
2.1	177C	23G/23G-U 23H/23H-U	BCP2	BBF2 BBF2B*	21G/21G-U 21D/21D-U BBG11 177B BBG12	BBG5†	BCP1
2.2	177C	23G/23G-U 23H/23H-U	BCP2	BBF2 BBF2B*	21G/21G-U 21D/21D-U BBG11 177B BBG12	BBG5†	BCP1
3.0	177C	23G/23G-U 23H/23H-U	BCP3	BBF2 BBF2B*	BBG11 BBG12 177B	BBG5†	BCP1‡
3.1	177C	23G/23G-U 23H/23H-U	BCP3	BBF2 BBF2B*	21G/21G-U 21D/21D-U BBG11 177B BBG12	BBG5†	BCP1‡

* The BBF2B circuit pack optionally provides DS1 timing outputs. In Release 1.0, the BBF2B can be used if it is provisioned to have the same functionality as the BBF2. Release 1.2 and later releases, recognize both the BBF2 and BBF2B and provide DS1 timing outputs if the BBF2B is provisioned.

† Series 2:2 or later.

‡ Series 2:5 or later

OC-12 Terminating Shelf

3DS3 and 3STS1E Low Speed Interfaces

Figure 3-4 shows an OC-12 terminating shelf with DS3 and EC-1 low speed interfaces. This configuration supports OC-12 point-to-point network applications for DS3 and EC-1 transport. BBG11 3DS3 or BBG12 3STS1E circuit packs are installed in the Function Unit slots; each pair provides three DS3 or EC-1 interfaces. If less than ten DS3 or EC-1 interfaces are required, one or more pairs of Function Unit slots must be equipped with 177B APPBLK cards instead of BBG11 or BBG12 circuit packs.

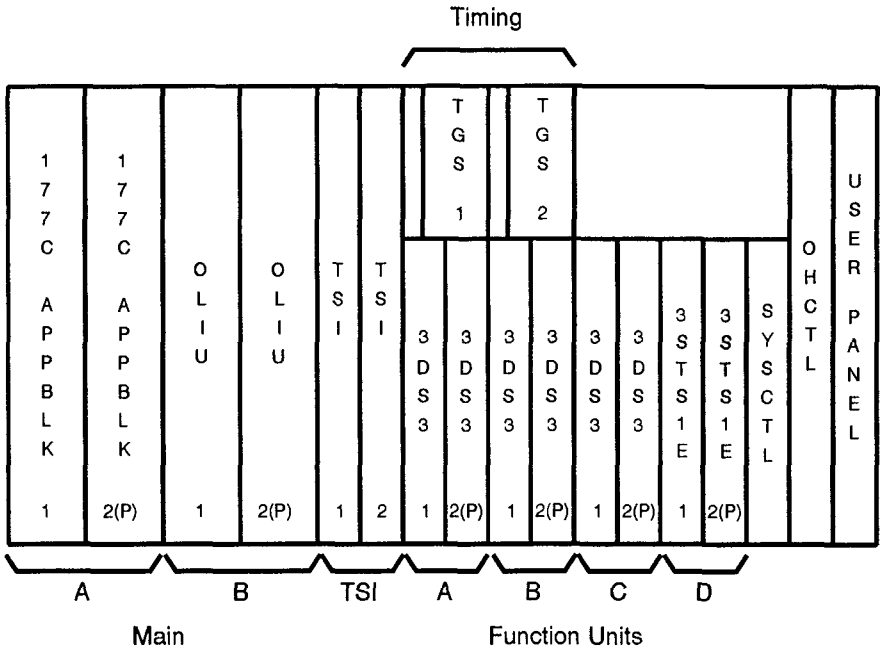


Figure 3-4. DDM-2000 OC-12 Terminating Shelf (DS3 and EC-1 Low Speed Interfaces)

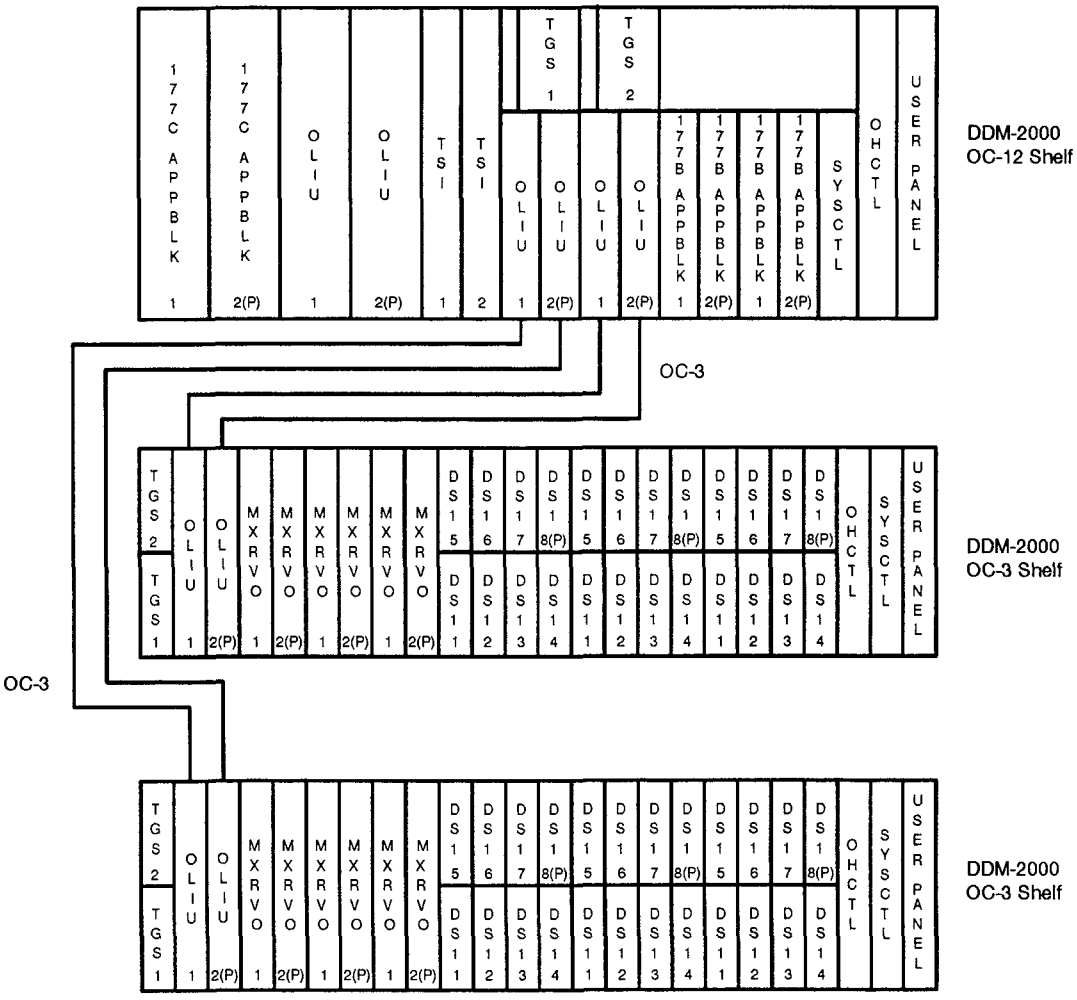


Figure 3-5. DDM-2000 OC-12 Terminating Shelf (DS1 Low Speed Interfaces)

DS1 Low Speed Interfaces

Figure 3-5 shows the DDM-2000 OC-3 and DDM-2000 OC-12 shelf configurations for an OC-12 point-to-point network with colocated OC-3 systems. Up to four OC-3 shelves may be connected to the OC-12 shelf to terminate up to 336 DS1 interfaces. DS3 or EC-1 interfaces can be added to either the OC-3 or OC-12 shelves to provide a mixed interface configuration.

OC-12 Hubbing Shelf

Figure 3-6 shows an OC-12 hubbing shelf. This shelf configuration supports OC-12 hubbing applications and OC-12 point-to-point applications with optical interfaces to OC-3 shelves. One or more of the function units can be equipped with either the 21G/21G-U OLIU, or 21D/21D-U OLIU circuit packs. The OC-3 interfaces can carry STS-1 or concatenated STS-3c signals (for OC-3c transport). The configuration shown in Figure 3-6 has no DS3 or EC-1 interfaces dropped at the hub. Local DS3 or EC-1 drops can be provided by installing a 3DS3 or 3STS1E circuit pack in one or more of the Function Unit slots.

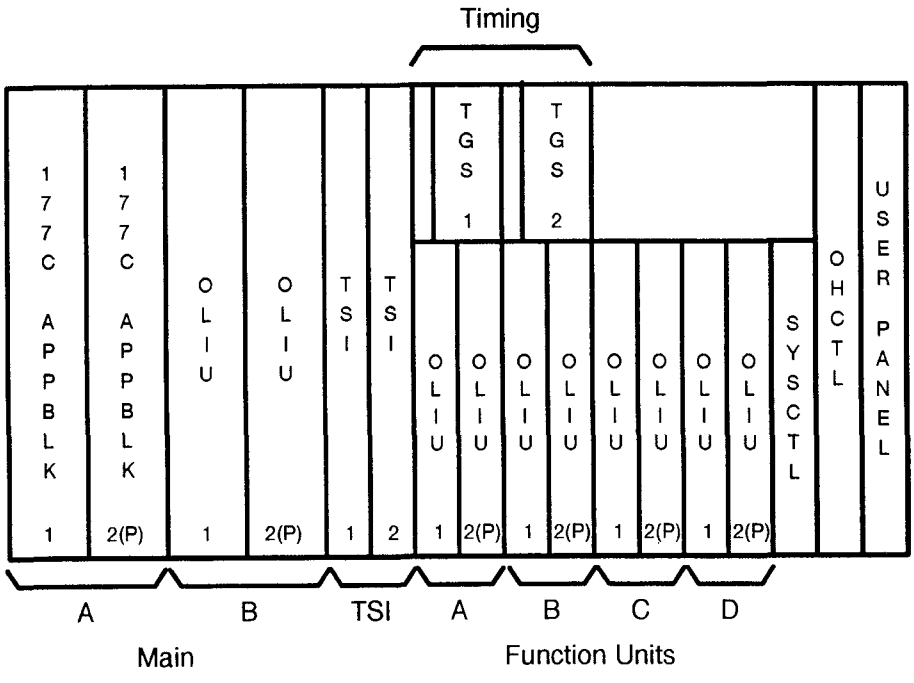


Figure 3-6. DDM-2000 OC-12 Hubbing Shelf

OC-12 STS-1 Path Switched Ring Shelf

Figure 3-7 shows the DDM-2000 OC-12 Multiplexer shelf equipped for an STS-1 path switched ring application. One pair of OC-12 OLIU circuit packs are located in the Main B slots. The Function Units can be equipped with 3STS1E or 3DS3 circuit packs and must be equipped with BCP3 (TSI FLEX) circuit packs for ring applications. Figure 3-7 shows a configuration that supports up to six STS-1 and six DS3 interfaces. Dual ring interworking (DRI) capabilities are available on STS-1 paths dropped by the 3STS1E interfaces. For certain applications, DS3 interfaces can also be used as an alternative method of ring interconnection. See Section 8, "Administration and Provisioning" for protection switching considerations.

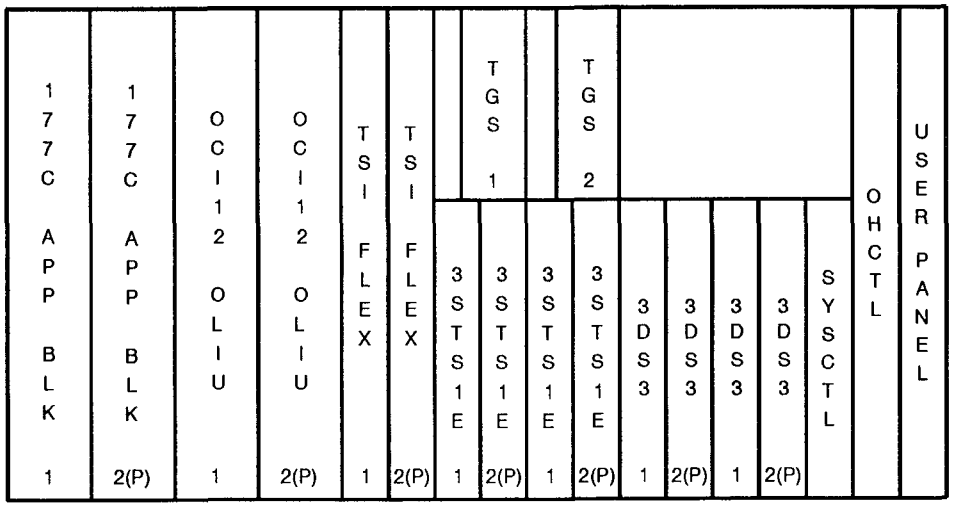


Figure 3-7. OC-12 STS-1 Path Switched Ring Shelf

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

Figure 3-8 shows a DDM-2000 OC-12 Multiplexer shelf equipped for an STS-1/VT1.5 path switched ring application (dual 0x1). One pair of OC-12 OLIUs are located in the Main B slots. The OC-12 Function Unit slots must be equipped with at least one pair of 21-type OC-3 OLIUs, using dual 0x1 protection, to support STS-1/VT1.5 ring protection in the OC-3 shelf. The OC-12 shelf must also be equipped with BCP3 (TSI FLEX) circuit packs. The remaining Function Units can be similarly equipped or equipped with any combination of 3DS3, 3STS1E, or OLIU circuit packs. The OC-3 shelf must be equipped with 22-type OLIUs in the Main slots and any combination of MXRVO/DS1, DS3, OLIU, or STS1E circuit packs in the Function Unit slots.

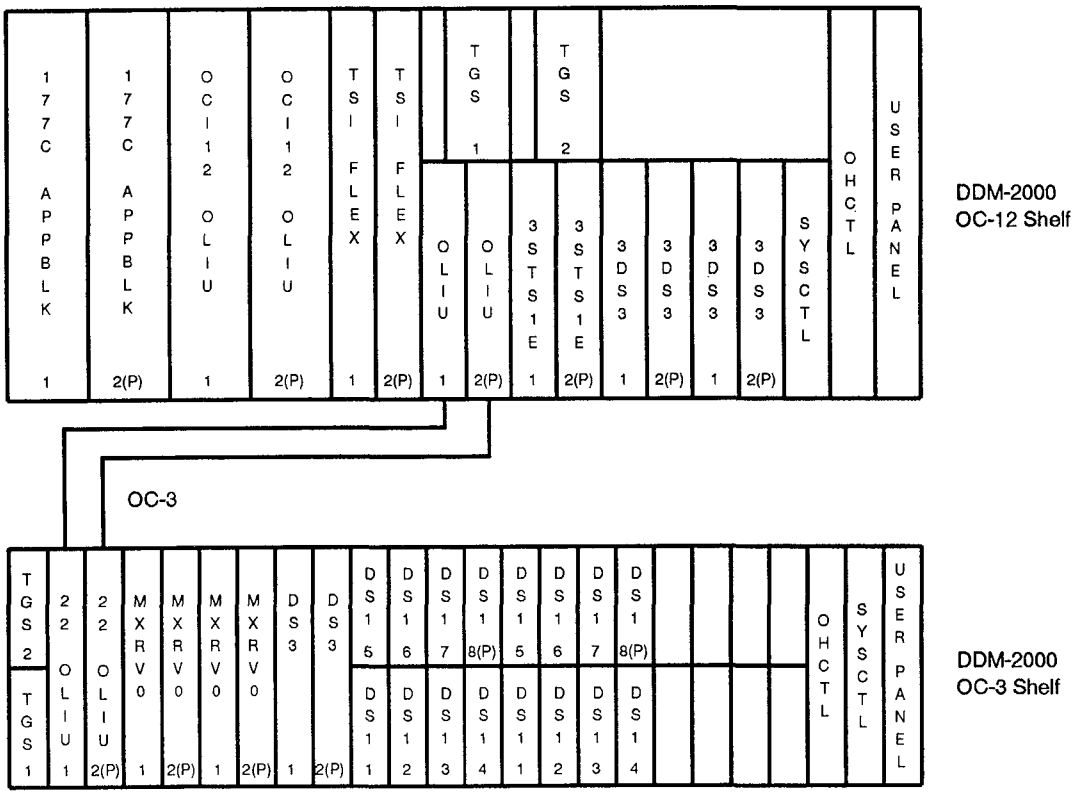


Figure 3-8. OC-12 VT1.5 Path Switched Ring (Dual 0x1) Shelf

Upgrades

Using the DDM-2000 OC-12 Multiplexer, an OC-3 point-to-point or hubbing application can be upgraded to an OC-12 point-to-point or hubbing application with a total network capacity of 12 STS-1s. Upgrades from OC-3 linear networks to OC-12 ring networks are possible with interim upgrades. These upgrades permit the user to take advantage of the low cost OC-3 network initially and use the high-capacity OC-12 network as significant growth occurs at the remote terminal (RT) sites.

The following upgrades are supported in Releases 1 and 2:

- OC-3 point-to-point to OC-12 point-to-point
- OC-3 hub and STS-1 drop to OC-12 hub.

The following upgrades are supported in Release 3:

- OC-12 point-to-point to OC-12 self-healing ring (Release 3.0)
- OC-3 ring to OC-12 ring (Release 3.1)
- OC-12 ring to FT-2000 OC-48 ring (Release 3.1).

Upgrades supported in future releases will include the following:

- OC-12 point-to-point to OC-12 STS-1 add/drop
- OC-12 point-to-point to OC-48 point-to-point.

OC-12 Regenerator Shelf

Figure 3-9 shows the OC-12 Regenerator shelf configuration. The OC-12 Regenerator uses the same shelf unit as the OC-12 Multiplexer and includes up to four 23R or 23R-U regenerator (REGENR) circuit packs, a BBG5 system controller (SYSCTL) circuit pack, and a BCP1 overhead controller (OHCTL) circuit pack. Apparatus blanks and fans are not required. The OC-12 Regenerator shelf should be equipped with a baffle as shown in ED-8C727-10 for the DDM-2000 OC-12 Multiplexer shelf.

If OC-12 Regenerators are used in both lines in the balanced mode, or to serve two independent systems in the balanced mode, REGENR circuit packs must be equipped in the four Main slots. In Figure 3-9, the Main A and B shelf positions are equipped with four REGENR circuit packs. This configuration supports two bidirectional OC-12 lines.

If OC-12 Regenerators are used on only one line in the unbalanced mode, REGENR circuit packs can be equipped in any two of the four Main slots.

23R and 23R-U REGENR circuit packs cannot be mixed in the same shelf.

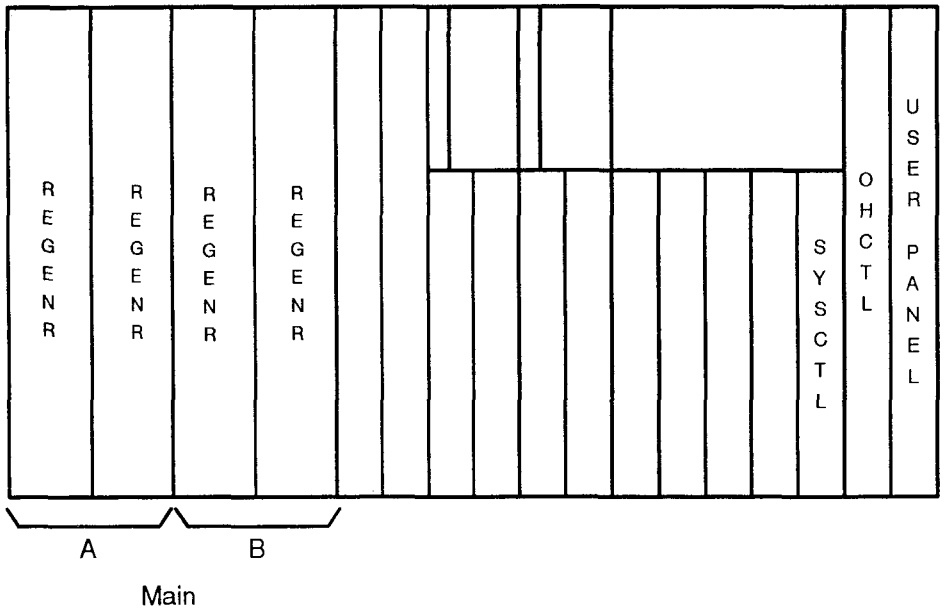


Figure 3-9. OC-12 Regenerator Shelf

Table 3-3 lists the possible circuit pack equipage mapped by OC-12 Regenerator release.

Table 3-3. DDM-2000 OC-12 Regenerator Circuit Packs and Releases

Release Number	Slot Name						
	Main-A	Main-B	TSI	TG	FN	SYSCTL	AUXCTL
1	23R	23R	empty	empty	empty	BBG5†	BCP1
2	23R-U 23R*	23R-U 23R*	empty	empty	empty	BBG5†	BCP1

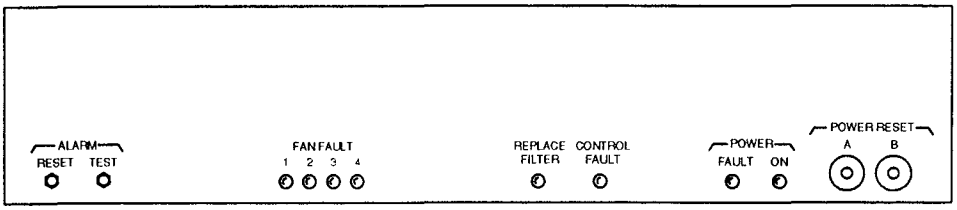
* The 23R can be used in Release 2.0 if performance monitoring features in Release 2.0 are not used. The 23R and 23R-U cannot be mixed in the same shelf.

† Must be Series 2:2 or later.

DDM-2000 Fan Shelf

The DDM-2000 Fan Shelf (Figure 3-10) 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

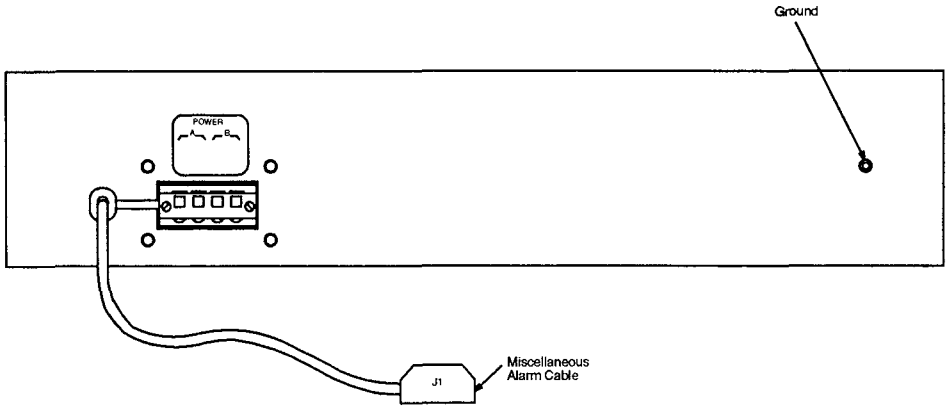


Figure 3-10. DDM-2000 Fan Shelf

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.

A DDM-2000 Fan Shelf is required for each DDM-2000 OC-12 shelf.

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 3-11. The switches should be set as shown in Table 3-4.

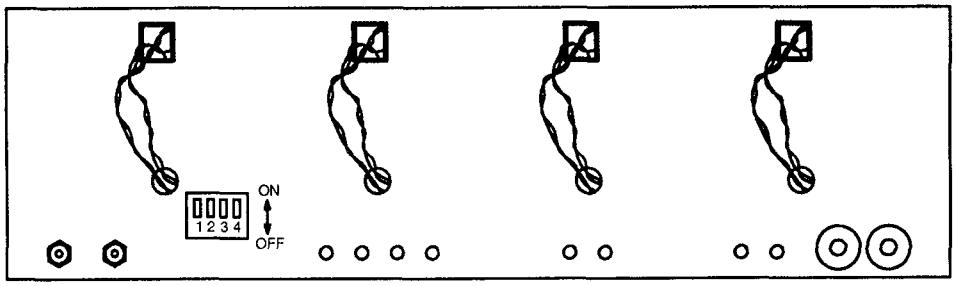


Figure 3-11. DDM-2000 Fan Shelf — Fan Switches — Front Cover Removed

Table 3-4. 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-12 shelf. The filter is secured by spring clips that hold it in place.

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.

Transmission and Synchronization Interfaces

5

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Transmission and Synchronization Interfaces

5

Overview

This section describes the DDM-2000 OC-12 Multiplexer and OC-12 Regenerator transmission and synchronization interfaces.

Transmission Interfaces

The DDM-2000 OC-12 Multiplexer supports DS3, OC-3, EC-1, and OC-3c low-speed interfaces and an OC-12 high-speed interface at both 1310 nm and 1550 nm wavelengths. The DDM-2000 OC-12 Multiplexer provides four low-speed Function Units. Each can be equipped with:

- BBG11 3DS3 circuit packs (1x1 protected)
- BBG12 3STS1E circuit packs (1x1 protected)
- 21D/21D-U OLIU circuit packs (1x1 or dual 0x1 protected)
- 21G/21G-U OLIU circuit packs (1x1 or dual 0x1 protected).

The 3DS3, 3STS1E, 21D/21D-U OLIU, and 21G/21G-U OLIU circuit packs can be mixed in any combination across the 4 Function Units to provide for termination/transport of 12 STS-1 signals or 4 concatenated STS-3c (OC-3c; Release 2) signals in the terminal or hub shelf configuration. The DS3 interfaces accept any DSX-3 compatible clear channel signal. Figure 5-1 provides an overall block diagram of a DDM-2000 OC-12 Multiplexer.

Table 5-1 summarizes the DDM-2000 OC-12 Multiplexer transmission interfaces for the current software releases.

Table 5-1. DDM-2000 OC-12 Multiplexer Application Summary Matrix

Application	Linear				Ring	
	R1.2	R2.0	R2.1	R2.2	R3.0	R3.1
DS1 Low-speed *	X	X	X	X	X †	X ‡
DS3 Low-speed	X	X	X	X	X	X
EC-1 Low-speed	—	—	X	X	X	X
OC-12 High-speed	X	X	X	X	X	X
OC-3 Low-speed	X	X	X	X	—	X§
OC-3c Low-speed	—	X	X	X	—	—
IS-3 Low-speed	X	X	X	X	—	X§

* Requires OC-3 shelf in addition to OC-12 shelf.

† Requires EC-1 interfaces between OC-3 and OC-12 shelves.

‡ Requires EC-1 interfaces or OC-3 dual 0x1 interfaces between OC-3 and OC-12 shelves.

§ As dual 0x1 OC-3 interfaces.

OC-12 STS-1 Path Switched Ring

The DDM-2000 OC-12 Multiplexer ring Release 3.0 supports DS3 and EC-1 low-speed interfaces in an STS-1 path switched ring configuration. The DDM-2000 OC-12 Multiplexer ring Release 3.1, in addition, supports dual 0x1 OC-3/IS-3 interfaces in an STS-1/VT1.5 path switched ring configuration. Figure 5-2 is an overall block diagram of a DDM-2000 OC-12 Multiplexer ring. The time slot interchange (TSI) feature provides full flexibility in assigning signals between low-speed DS3, OC-3/IS-3, and EC-1 ports and the high-speed interface. Note that each Function Unit can handle a maximum of 3 STS-1s for a total of 12 STS-1s.

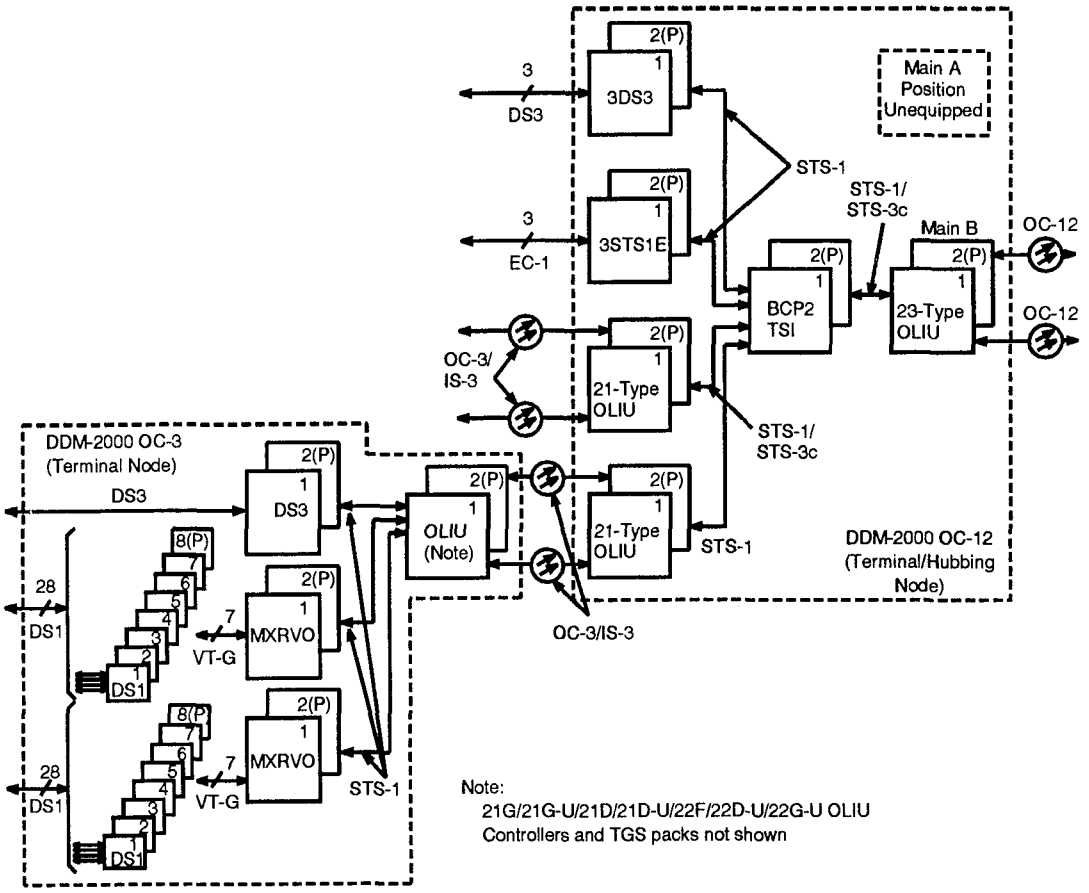


Figure 5-1. DDM-2000 OC-12 Multiplexer Block Diagram — Hubbing and Terminal Node

Dual Ring Interworking

The DDM-2000 OC-12 Multiplexer STS-1 dual ring interworking (DRI) application uses the same shelf configuration as the DDM-2000 OC-12 Multiplexer path switched ring (Figure 5-2). In this configuration, the DDM-2000 OC-12 Multiplexer can provide STS-1 dual ring interworking with another OC-12 ring, an OC-3 ring or an OC-48 ring, with redundant signal appearances at the two central offices via EC-1 interfaces. STS-1 paths are provisioned for drop and continue at the interconnecting nodes and path selection is at the STS-1 level. When used with the DDM-2000 OC-3 Multiplexer, the DDM-2000 OC-12 Multiplexer STS-1/VT1.5 (dual 0x1) DRI application can be created with the drop and continue feature implemented in the DDM-2000 OC- 3 Multiplexer shelf. The DDM-2000 path switched ring architecture allows mixing of drop and continue circuits with standard path switched circuits.

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

The OC-12 STS-1/VT1.5 path switched ring (dual 0x1) application uses the same shelf configuration as the OC-12 STS path switched ring but with optical interfaces in the desired Function Unit slots. In this configuration, the DDM-2000 OC-12 Multiplexer can provide STS-1/VT1.5 path switched interworking with a DDM-2000 OC-3 Multiplexer VT1.5 path switched ring node as shown in Figure 5-2.

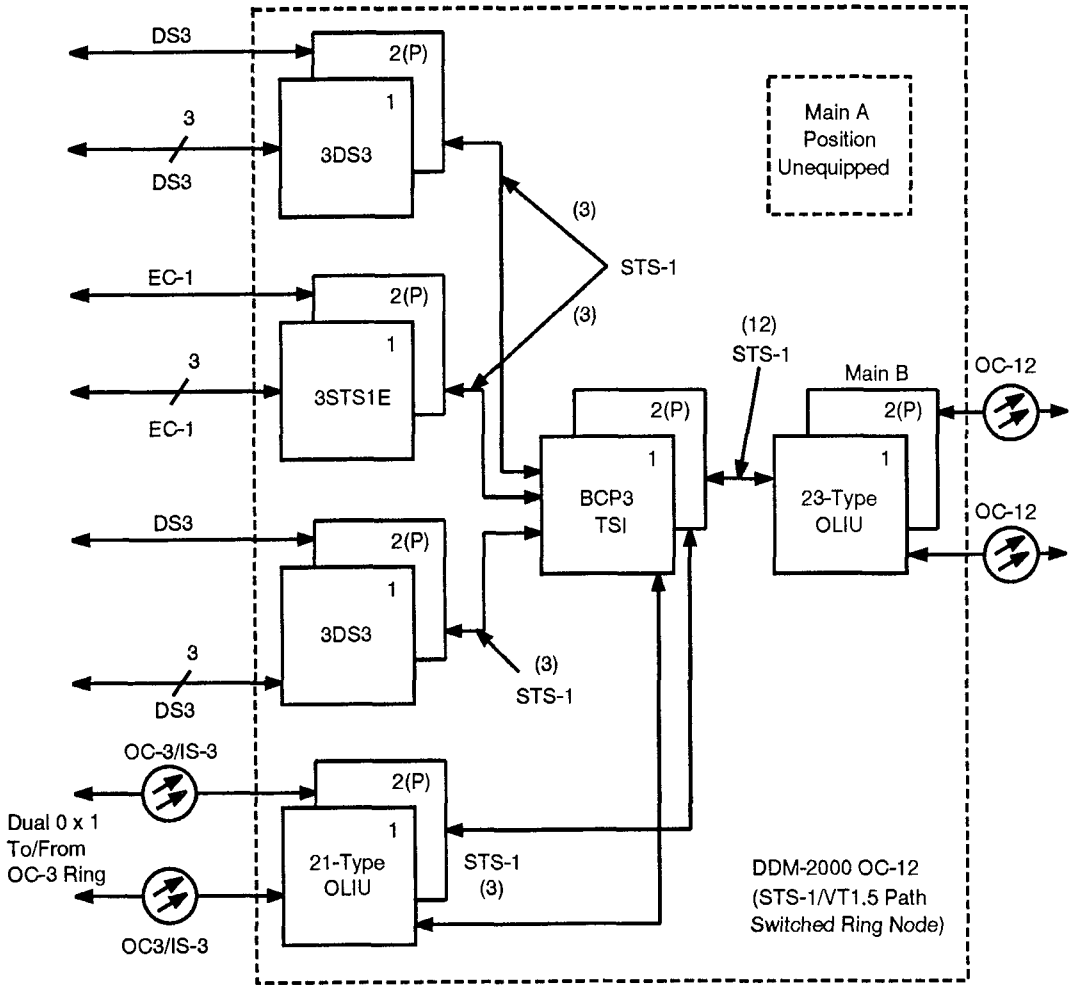


Figure 5-2. OC-12 Multiplexer Block Diagram — STS-1/VT1.5 Path Switched Ring

See Figure 5-3. When the OC-12 shelf is provisioned for dual 0x1 operation, incoming Ring 1 (incoming to Main B-1) always feeds (is locked to) Function Unit ( )-1 and, therefore, Main-1 of the OC-3 shelf. Similarly, incoming Ring 2 (incoming to Main B-2) always feeds (is locked to) Function Unit ( )-2 and, therefore, Main-2 of the OC-3 shelf.

Similarly, the TSI on the OC-12 shelf are locked so that Ring 1 output is always fed from Function Unit ( )-2, and Ring 2 output is always fed from Function Unit ( )-1. The Ring 1 input is always received on Main B-1, and the Ring 2 input is always received on Main B-2.

The two main features of a dual 0x1 application are:

- When STS-1s are dropped to a dual 0x1 Function Unit, any fiber failure detected at either the OC-3 shelf or OC-12 shelf will cause the OC-3 shelf to select all traffic from the other ring. Individual STS-1s or VT1.5s are not monitored and switched based on their signal quality as in a normal ring.
- Each OC-3 shelf in a dual 0x1 is provisioned to expect duplicate data communications channel (DCC) traffic on both Main OLIUs. In a normal ring, this would cause duplicate alarms and duplicate entries in the history report for that network element.

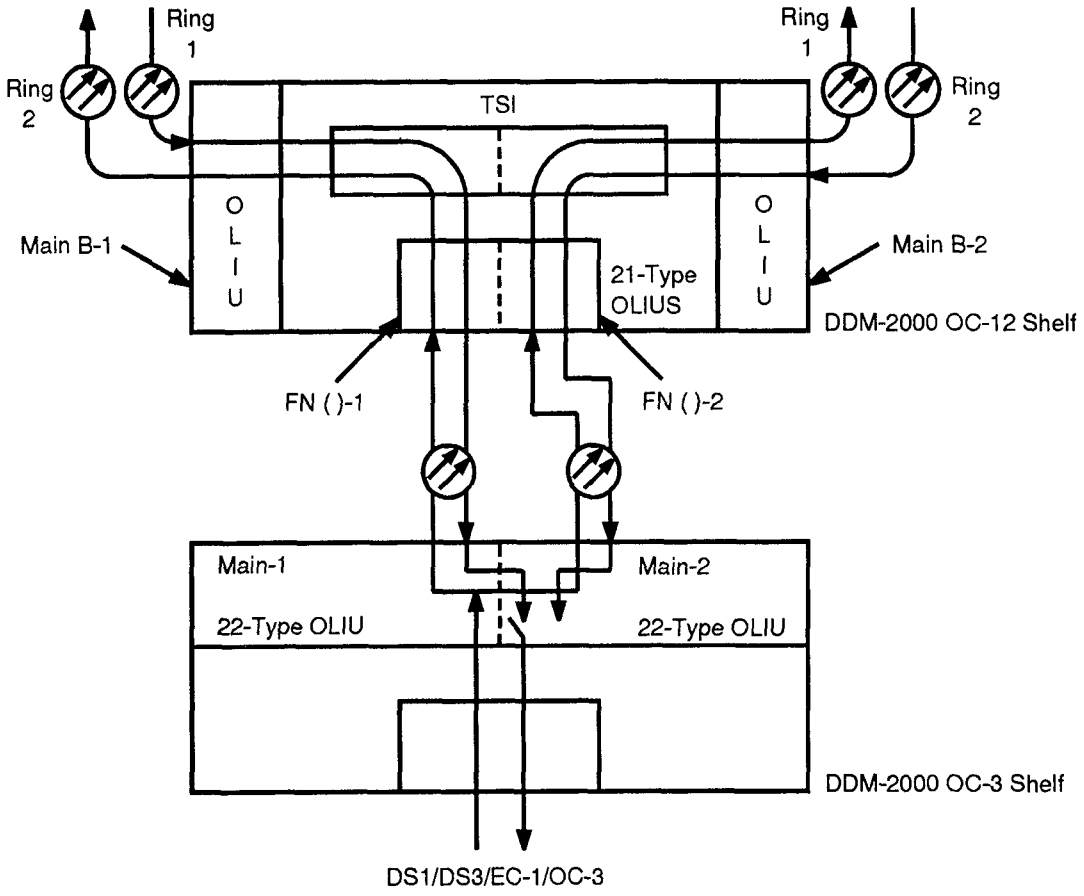


Figure 5-3. Dual 0x1 Interfaces

OC-12 Regenerator

The OC-12 Regenerator supports an OC-12 high speed interface (Figure 5-4). The OC-12 interface receives and transmits a standard long reach synchronous optical network (SONET) optical signal. In the receive direction, the attenuated OC-12 optical signal is detected, converted to an internal electrical STS-12 signal, and regenerated. The regenerated STS-12 signal is then converted back to an amplified OC-12 optical signal for retransmission over single-mode fiber. Figure 5-4 shows a typical application of four OC-12 Regenerators using the Main-A slots for the transmission direction and the Main-B slots for the receive direction.

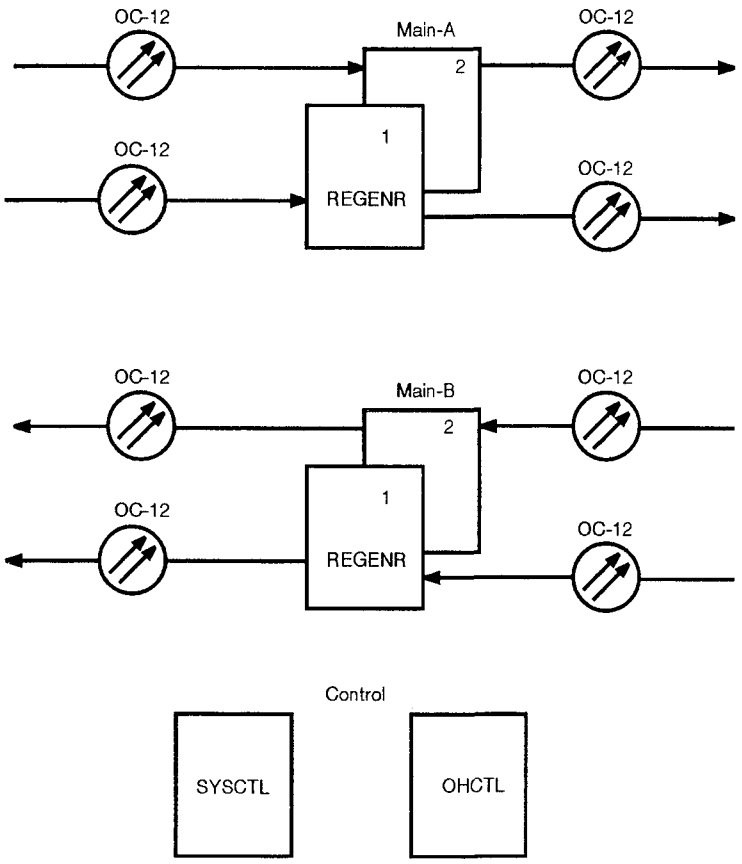


Figure 5-4. OC-12 Regenerator Block Diagram

Synchronization Interfaces

Each DDM-2000 OC-12 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.

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-12 line being selected for transmission is also selected as the timing reference.

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 5-5. 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.

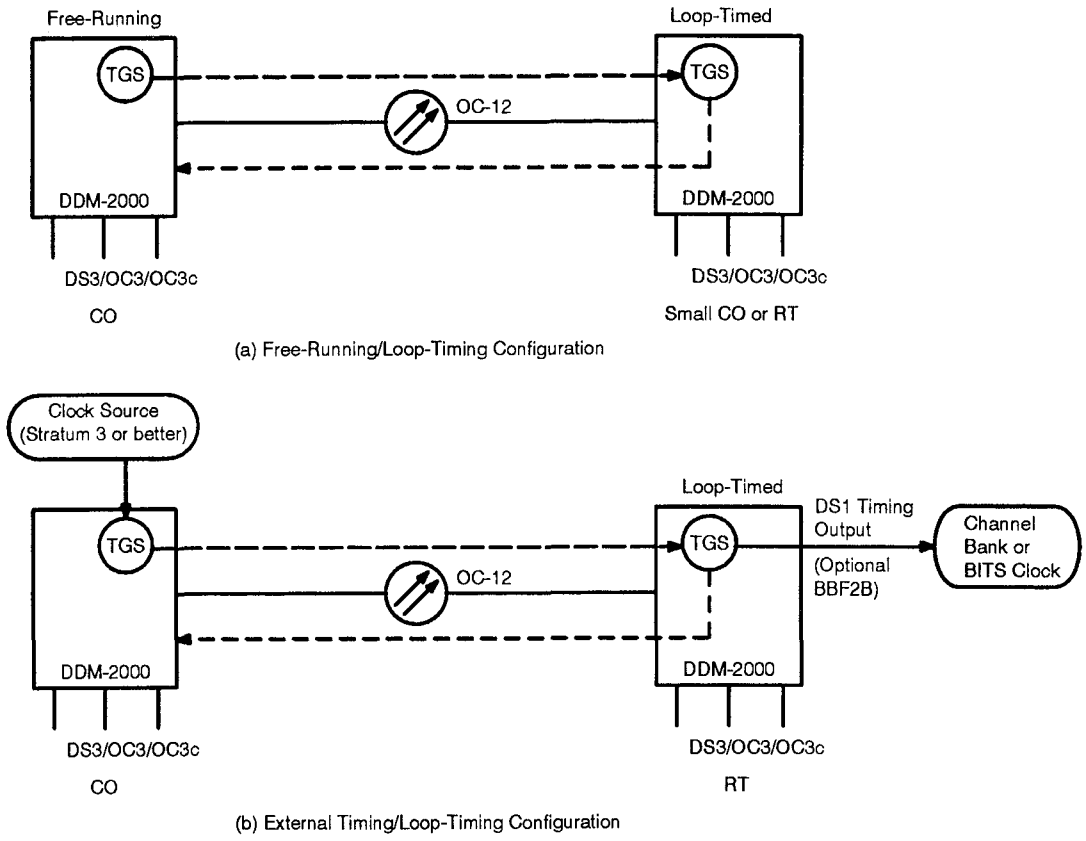


Figure 5-5. Synchronization Timing Configurations (Sheet 1 of 2)

Figure 5-5a 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 5-5b and 5c 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 5-5d) 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).

Table 5-2 summarizes the DDM-2000 OC-12 synchronization modes for the current software releases.

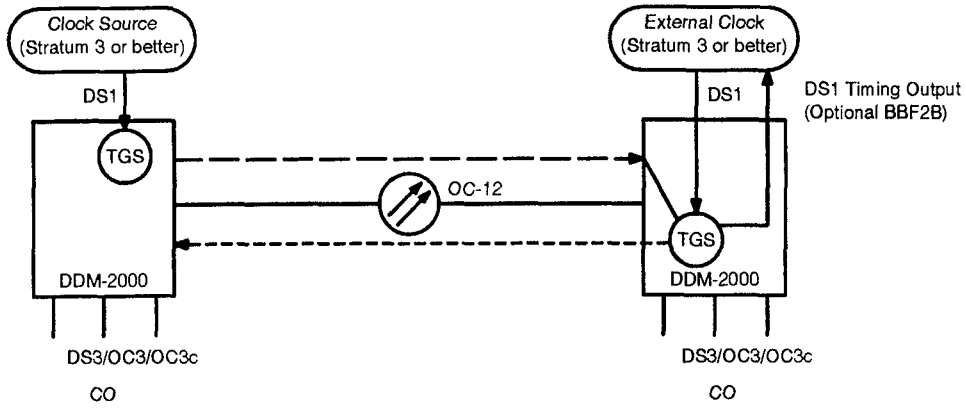
Table 5-2. DDM-2000 OC-12 Synchronization

Application	Linear				Ring	
	R1.2	R2.0	R2.1	R2.2	R3.0	R3.1
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	X
Synchronization Messaging	-	X	X	X	X	X
Automatic Synchronization Reconfiguration	-	-	-	-	X	X

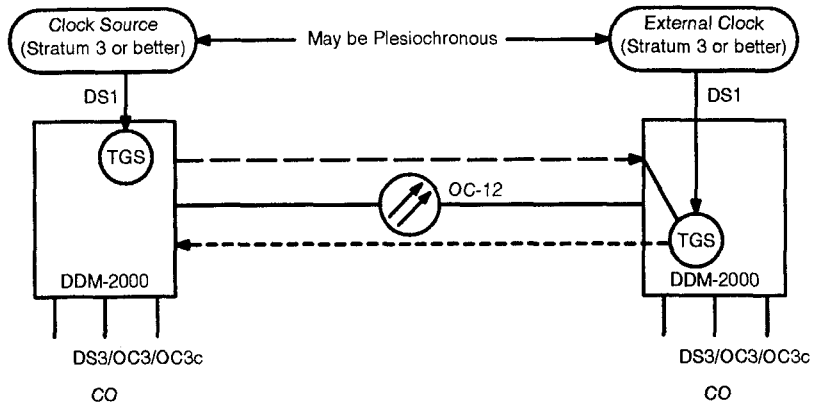
SONET synchronization messaging is used to communicate the quality of subnetwork timing, internal timing status, and timing states throughout a subnetwork. Transitions to and from holdover or between OC-12 references, for shelf timing, and to and from DS1 AIS, for the DS1 Output, are based on synchronization messages received over the OC-12 line from which the DDM-2000 system is extracting timing.

In linear networks with synchronization messaging, the BBF2B circuit pack allows loop timing and automatic switching from either of two incoming optical interfaces, Main B OLIU group.

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



(c) External Timing Configuration



(d) External Timing Plesiochronous

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

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 American National Standards Institute 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 5-6a (Figure 5-6 is an OC-3 linear application used to explain the concepts of synchronization messaging), SONET synchronization messaging notifies the DDM-2000 Multiplexer at the slave site to place alarm indication signal (AIS) on the DS1 timing output. This BITS can then enter holdover or switch to an alternate reference.

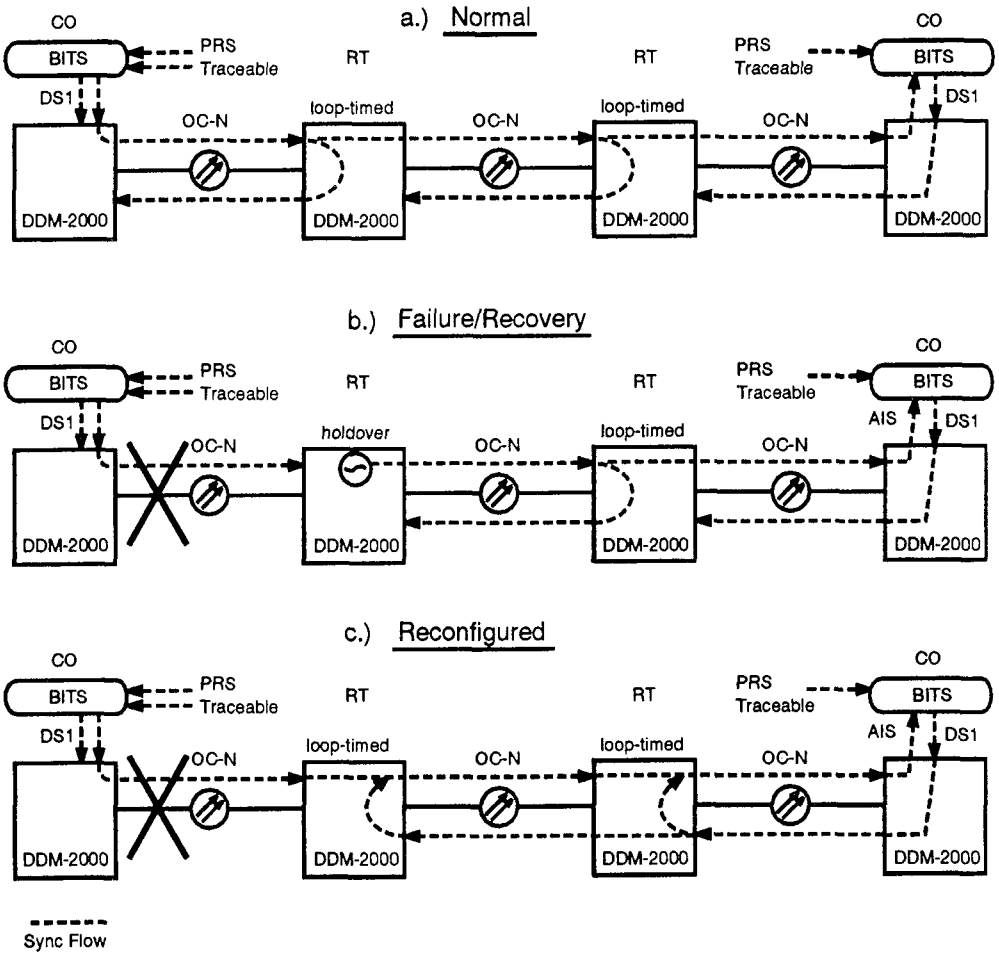


Figure 5-6. DS1 Timing Output — Dual Homing Linear

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 3.0 and later ring releases). 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 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 5-6, 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 automatic synchronization reconfiguration 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 5-7. 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 automatic synchronization reconfiguration 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.

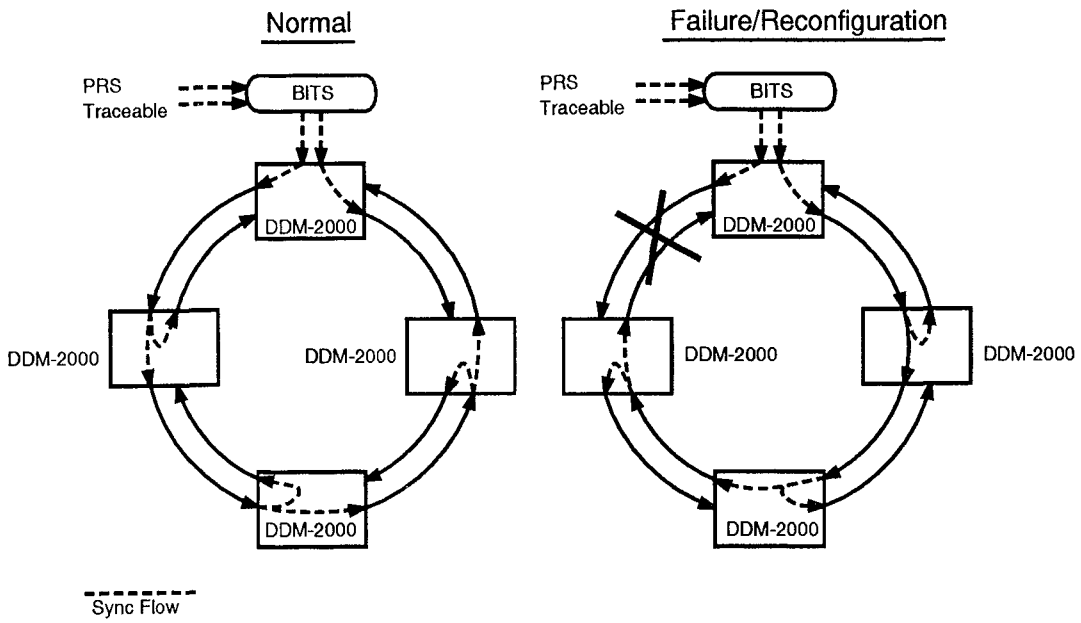


Figure 5-7. Synchronization Reconfiguration — Access Ring

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 through 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 automatic synchronization reconfiguration 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 through 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-N 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 nonrevertive operation of reconfiguration. (Release 6.2 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. 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, 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 5-8a 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 that is being 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 5-8b, 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 cannot switch to loop time from site C because it is receiving the TLB message on that interface.

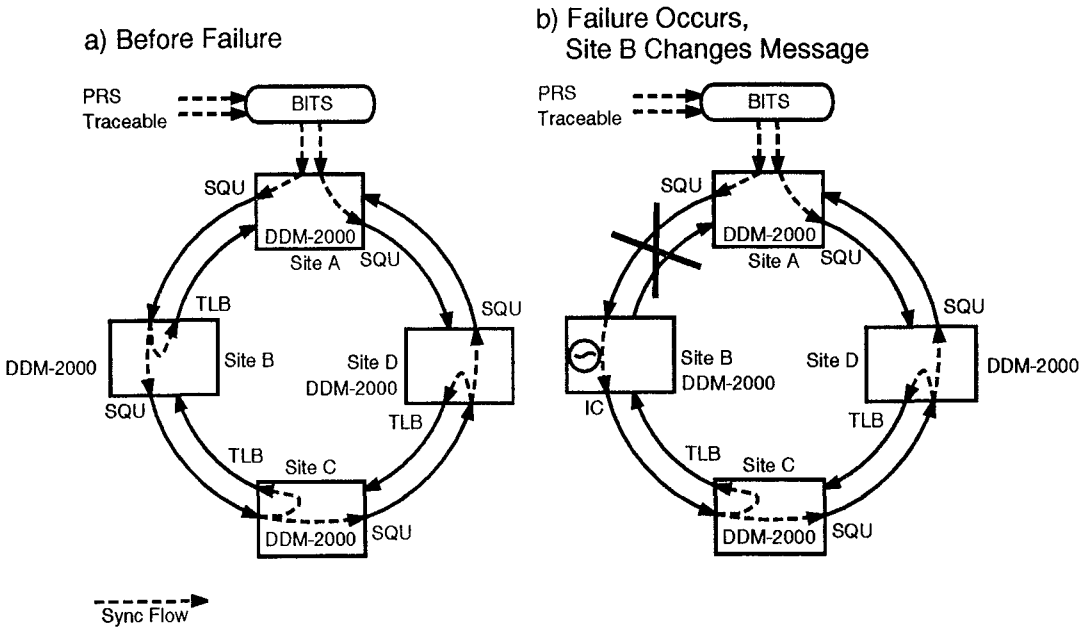


Figure 5-8. Synchronization Reconfiguration — Access Ring (Sheet 1 of 3)

In Figure 5-8c, 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 5-8d, 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.

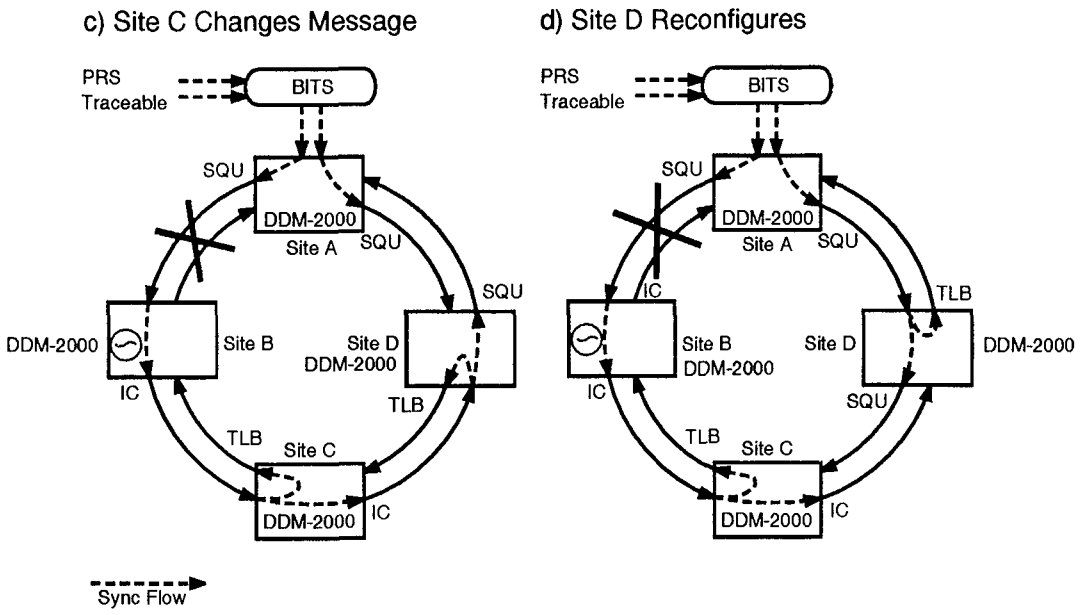


Figure 5-8. Synchronization Reconfiguration — Access Ring (Sheet 2 of 3)

In Figure 5-8e, 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 5-8f, 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 (nonrevertive operation).

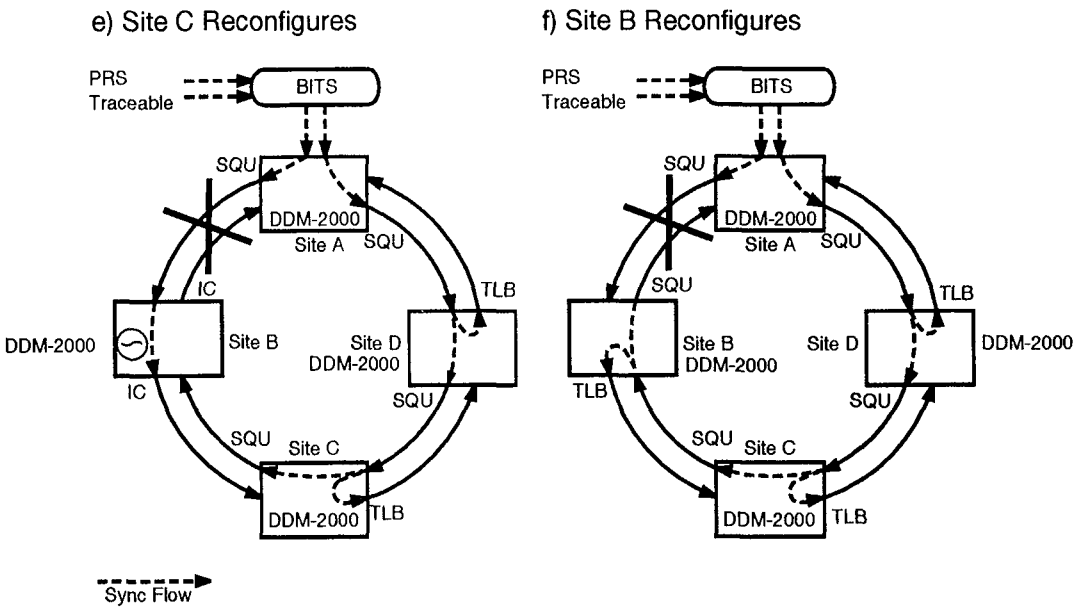


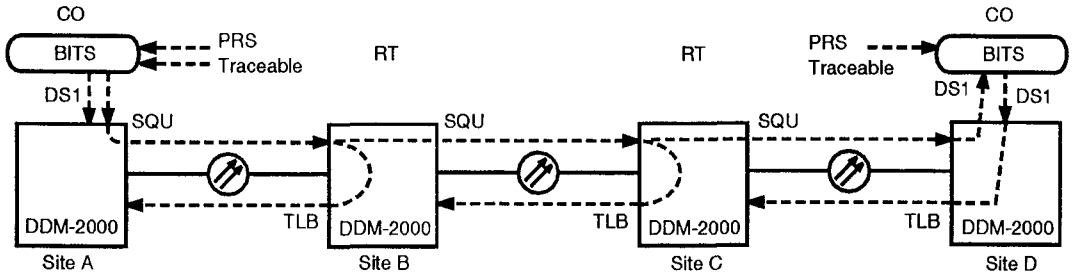
Figure 5-8. Synchronization Reconfiguration — Access Ring (Sheet 3 of 3)

Synchronization Messaging to Support DS1 Timing Outputs

Figure 5-9a (Figure 5-9 is an OC-3 linear application used to explain the concepts of synchronization messaging) 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 primary reference source (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 5-9b, 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

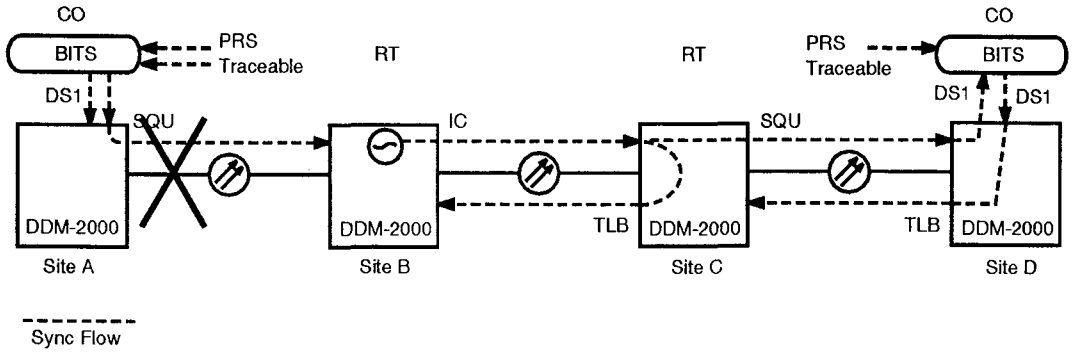


Figure 5-9. DS1 Timing Output with Fiber Failure (Sheet 1 of 2)

In Figure 5-9c, the DDM-2000 Multiplexer at site C detects the incoming IC message from site B and forwards it on to site D.

In Figure 5-9d, 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.

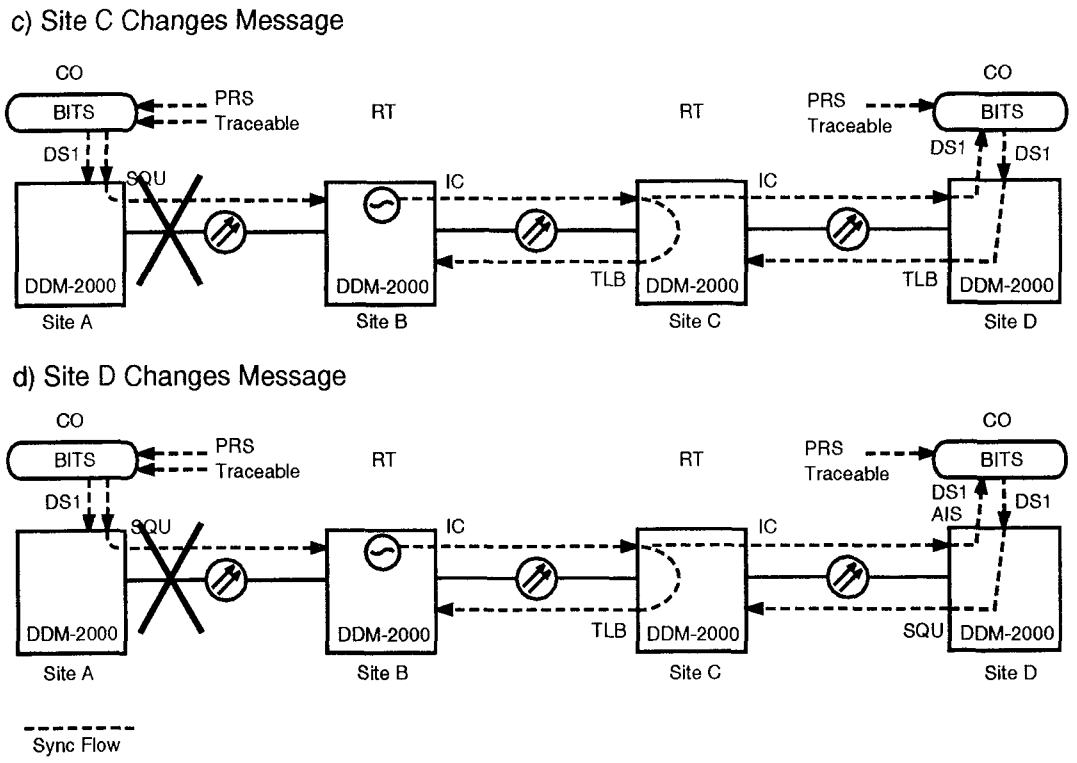


Figure 5-9. DS1 Timing Output with Fiber Failure (Sheet 2 of 2)

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.

Interoffice Timing Distribution

One way SONET can be used to improve the quality of interoffice network timing is through the use of OC-N timing distribution. DDM-2000 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 5-10).

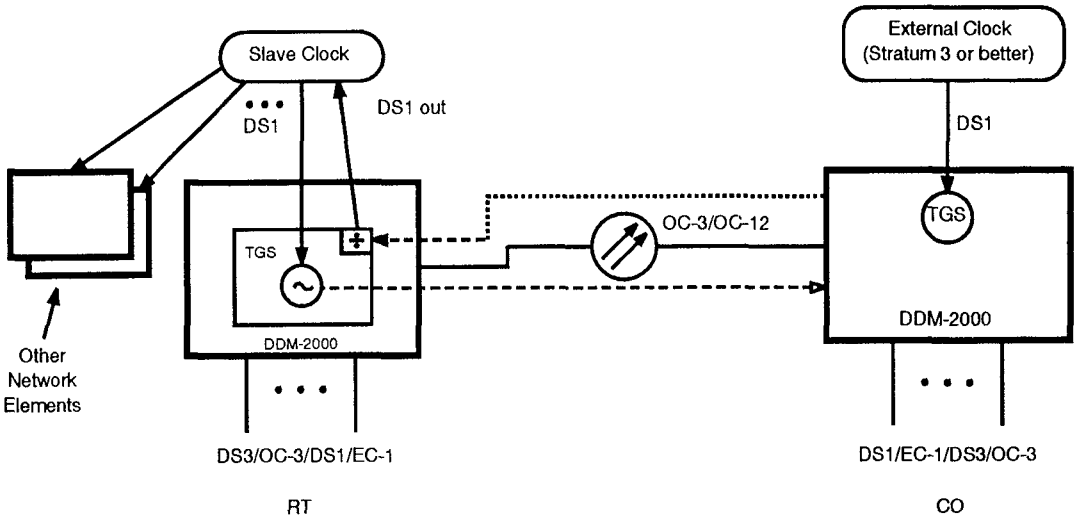


Figure 5-10. OC-N Derived DS1 Timing Reference

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 5-11) and synchronizing an end-office remote switch to a larger office's host switch.

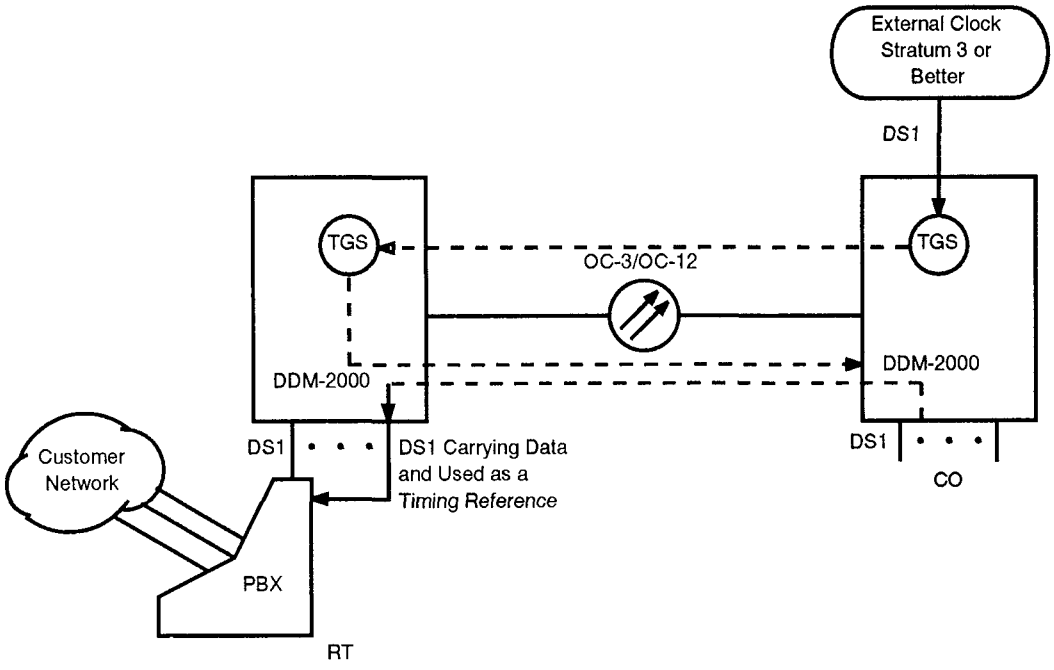


Figure 5-11. Timing from Multiplexed DS1

OC-12 Regenerator Synchronization

OC-12 Regenerators are through-timed (timing is recovered from the signal incoming to each OC-12 Regenerator and used to retime the outgoing signal). External timing references or BBF2/BBF2B circuit packs are not allowed in OC-12 Regenerator shelves. Synchronization protection switching or holdover is not required since the loss of incoming signal means the loss of data, as well as timing.

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-12 Multiplexer and OC-12 Regenerator and allow alarms and status information generated by the system to be reported. Differences between the DDM-2000 OC-12 Multiplexer and OC-12 Regenerator applications are noted where applicable.

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 [telemetry byte-oriented serial (TBOS)]
- Parallel telemetry
- User definable miscellaneous discrete environmental alarms and controls
- Orderwire.

Releases 1 and 2 of the OC-12 Regenerator supports a TBOS or parallel telemetry interface. In addition, Release 2 supports a TL1/X.25 interface to a NMA. The OC-12 Regenerator does not support miscellaneous discretes or 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-12 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 or a modem to the front DCE interface. CIT access via a modem connection is identical to local CIT access.

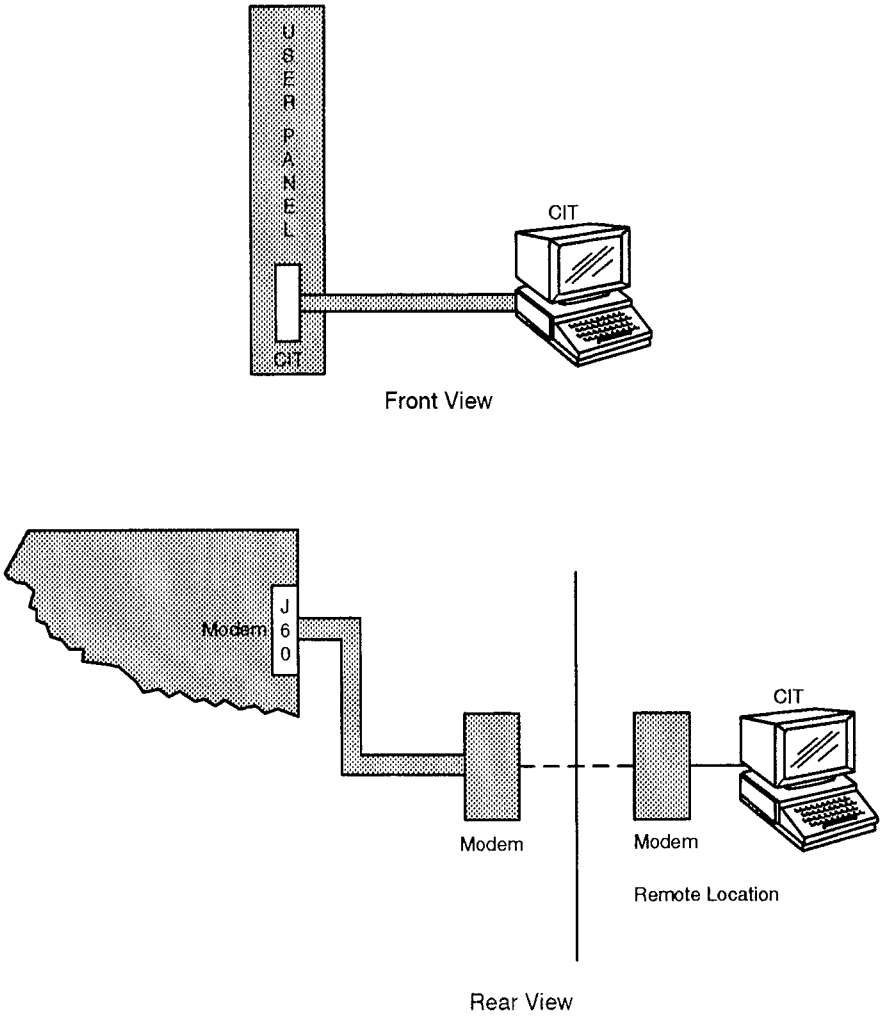


Figure 6-1. CIT Connectors

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.

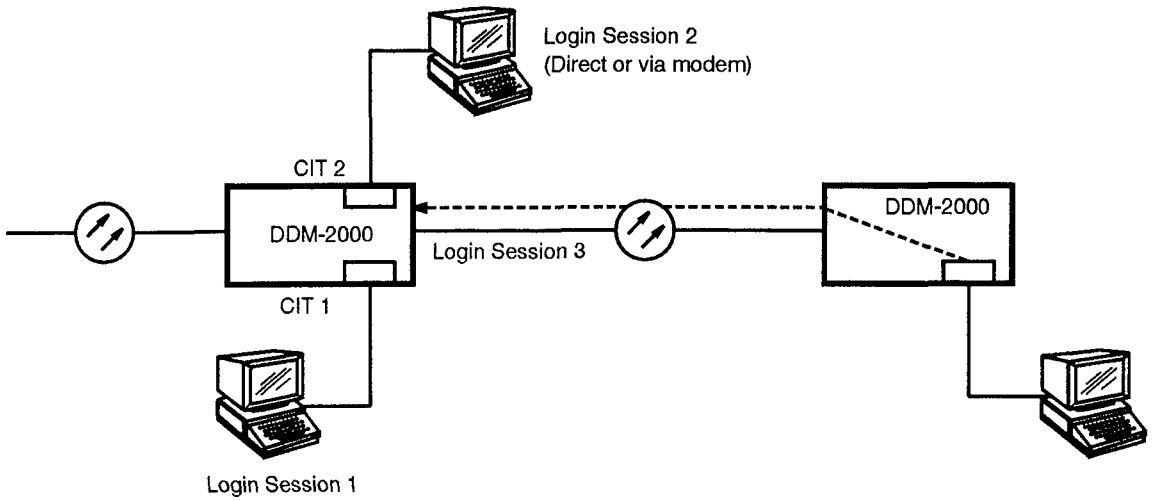


Figure 6-2. CIT Login Sessions

The DDM-2000 OC-12 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-12 Multiplexer shelves:

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

CIT access to the OC-12 Regenerator is by direct connection only.

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 3 shelves per bay and 8 bays in a subnetwork, access to 24 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-12 Multiplexer needs very efficiently. In addition, the DDM-2000 OC-12 Multiplexer user interface can be accessed from within *Windows** (Version 3.0 or later) on an *MS-DOS* PC.

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

The DDM-2000 OC-12 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 or a modem to the front DCE 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-12 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-12 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 OC-12 Multiplexer and the terminal for a lower data rate. The data rate for the DDM-2000 OC-12 Multiplexer is set by switches on the SYSCTL circuit pack and is described in the Task Oriented Practice (TOP) section of this manual.

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.

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

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.

SNC-2000 CPro Graphical User Interface and Provisioning Tool

The SNC-2000 CPro Graphical User Interface and Provisioning Tool has a phased release plan. The initial release supports DDM-2000 OC-3 Multiplexer rings. Future releases will support DDM-2000 OC-12 Multiplexer rings and FT-2000 OC-48 systems. The SNC-2000 CPro Graphical User Interface and Provisioning Tool is a *Microsoft* Windows* based user interface. Future releases of the tool will optionally be used with the DDM-2000 OC-12 Multiplexer to simplify and mechanize administration, maintenance, and provisioning operations of 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.
- Back up and restore provisioning information including cross-connections, DS3 port options, EC-1 port options, and OC-12 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.

* Microsoft is a registered trademark of Microsoft Corporation.

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.

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

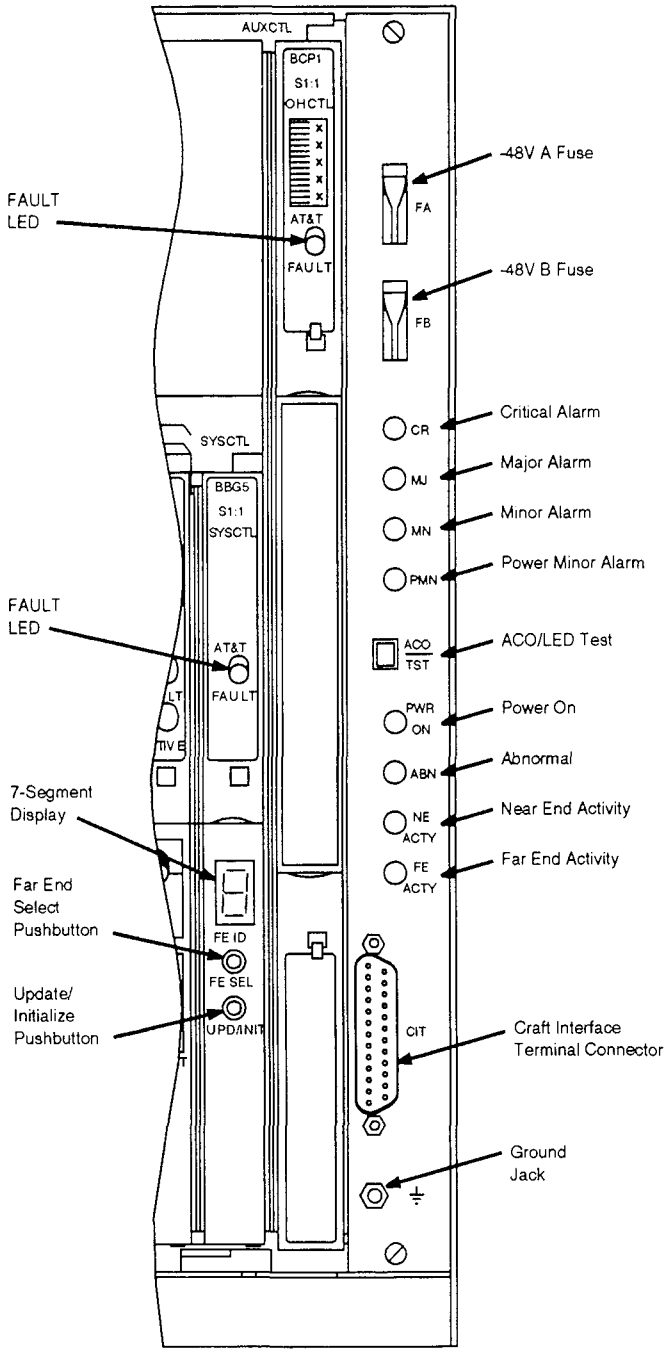


Figure 6-3. User Panel

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/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 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.

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.

Since the OC-12 Regenerator is not intended as a centralized network maintenance and operations center, the FE ACTY LED and the FE SEL LED pushbuttons are not operational.

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 document.

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	—	—
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 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-12 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.

High- and low-speed transmission interface and timing circuit packs cause the FAULT indicator to blink when a failure (for example, loss of signal, loss of frame, loss of pointer, or crossing of the signal fail or signal degrade threshold) of the signal incoming to that circuit pack is detected. The BCP1 OHCTL circuit pack causes its fault LED to blink 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.

Office Alarms

The DDM-2000 OC-12 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-12 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-12 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-12 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-12 Multiplexer Release 2.1 (linear), 3.0 (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-12 Multiplexer Release 2.2 (linear), 3.0 (rings), and later, also supports a provisioning interface to Raynet's RIDES operations systems for remote *SLC* ®-2000 Access Systems.

The TL1 maintenance messages of the DDM-2000 OC-12 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-12 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 2.1 (linear), 3.1 (ring), and later releases]

REPORT DATABASE CHANGE (`REPT DBCHG`) —
autonomous reports of provisioning changes
[Release 2.1 (linear), 3.1 (ring), and later releases]

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 2.1 (linear), 3.1 (ring), and later releases]

REPORT SWITCH (`REPT SW`) —
autonomous reports of automatic circuit pack protection switches
[Release 2.1 (linear), 3.1 (ring), and later releases]

The following command/response messages are supported:

ACTIVATE-USER (ACT-USER) —
establishes a user login session
[Release 2.1 (linear), 3.1 (ring), and later releases]

ALLOW-MESSAGE (ALW-MSG) —
allows autonomous message reporting
[Release 2.1 (linear), 3.1 (ring), and later releases]

CANCEL-USER (CANC-USER) —
terminates a user login session
[Release 2.1 (linear), 3.1 (ring), and later releases]

DELETE-CROSS CONNECT (DLT-CRS) —
deletes a cross connection
(Release 3.1 and later ring releases)

DELETE-USER-SECURITY (DLT-USER-SECU) —
deletes a user login
[Release 2.1 (linear), 3.1 (ring), and later releases]

EDIT-DATE (ED-DAT) —
changes the date and/or time
[Release 2.1 (linear), 3.1 (ring), and later releases]

EDIT-PRIVATE IDENTIFIER (ED-PID) —
changes a user's password
[Release 2.1 (linear), 3.1 (ring), and later releases]

EDIT-USER-SECURITY (ED-USER-SECU) —
edits the security parameters associated with a user
[Release 2.2 (linear), 3.1 (ring), and later releases]

ENTER-CROSS CONNECT (ENT-CRS) —
enters a cross connection
(Release 3.1 and later ring releases)

ENTER-EC1 (ENT-EC1) —
enters EC1 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

ENTER-OC3 (ENT-OC3) —
enters OC3 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

ENTER-OC12 (ENT-OC12) —
enters OC12 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

ENTER-STS1 (ENT-STS1) —
enters STS1 ring path signal degrade threshold
[Release 2.2 (linear), 3.1 (ring), and later releases]

ENTER-SYSTEM (ENT-SYS) —
modifies system attributes
[Release 2.2 (linear), 3.1 (ring), and later releases]

ENTER-T3 (ENT-T3) —
enters DS3 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

ENTER-USER-SECURITY (ENT-USER-SECU) —
enters a user login
[Release 2.1 (linear), 3.1 (ring), and later releases]

INHIBIT-MESSAGE (INH-MSG) —
inhibits autonomous message reporting
[Release 2.1 (linear), 3.1 (ring), and later releases]

INITIALIZE-REGISTER (INIT-REG) —
initializes (resets) current performance-monitoring storage registers
[Release 2.1 (linear), 3.1 (ring), and later releases]

INITIALIZE-SYSTEM (INIT-SYS) —
initializes (resets) provisionable parameters to their default values
[Release 2.1 (linear), 3.1 (ring), and later releases]

OPERATE-ALARM CUTOFF (OPR-ACO) —
operates the alarm cutoff (ACO) to silence office audible alarms
[Release 2.1 (linear), 3.1 (ring), and later releases]

OPERATE-LOOPBACK (OPR-LPBK) —
operates a loopback
[Release 2.1 (linear), 3.1 (ring), and later releases]

OPERATE-PROTECTION SWITCH (OPR-PROTNSW) —
operates OC-N line protection switching capabilities
(Release 2.1 and later linear releases)
and operates ring path protection switching capabilities
(Release 3.1 and later ring releases)

OPERATE-SYNCHRONIZATION SWITCH (OPR-SYNCNSW) —
operates DS1 synchronization input reference protection switching capabilities
(Release 2.1 and later linear releases)

RELEASE-LOOPBACK (RLS-LPBK) —
releases a loopback
[Release 2.1 (linear), 3.1 (ring), and later releases]

RELEASE-PROTECTION SWITCH (RLS-PROTNSW) —
releases OC-N line protection switching requests
(Release 2.1 and later linear releases)

RELEASE-SYNCHRONIZATION SWITCH (RLS-SYNCNSW) —
releases DS1 synchronization input reference protection switching requests
(Release 2 and later)

RETRIEVE-ALARM (RTRV-ALM) —
retrieves current alarm conditions

RETRIEVE-ALARM-ENVIRONMENT (RTRV-ALM-ENV) —
retrieves current environmental alarm conditions
[Release 2.1 (linear), 3.1 (ring), and later releases]

RETRIEVE-AUTONOMOUS OUTPUT (RTRV-AO) —
retrieves autonomous messages
[Release 2.1 (linear), 3.1 (ring), and later releases]

RETRIEVE-ATTRIBUTE (RTRV-ATTR) —
retrieves alarm level attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

RETRIEVE-ATTRIBUTE-ENVIRONMENT (RTRV-ATTR-ENV) —
retrieves environmental alarm/status point attributes
[Release 2.2 (linear), 3.1 (ring), and later releases]

RETRIEVE-CONDITION (RTRV-COND) —
retrieves current standing status conditions

RETRIEVE-CROSS CONNECT (RTRV-CRS) —
retrieves cross connections
(Release 3.1 and later ring releases)

RETRIEVE-EC1 (RTRV-EC1) —
retrieves EC1 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

RETRIEVE-EQUIPMENT (RTRV-EQPT) —
retrieves circuit pack information
[Release 2.1 (linear), 3.1 (ring), and later releases]

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

RETRIEVE-MAP (RTRV-MAP) —
retrieves topological map of the SONET subnetwork
[Release 2.2 (linear), 3.1 (ring), and later releases]

RETRIEVE-OC3 (RTRV-OC3) —
retrieves OC3 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

RETRIEVE-OC12 (RTRV-OC12) —
retrieves OC12 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

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

RETRIEVE-PERFORMANCE MONITORING SCHEDULE (RTRV-PMSCHED) —
retrieves active PM report schedules
[Release 2.1 (linear), 3.1 (ring), and later releases]

RETRIEVE-STS1 (RTRV-STS1) —
retrieves STS1 ring path signal degrade threshold
[Release 2.2 (linear), 3.1 (ring), and later releases]

RETRIEVE-SYSTEM (RTRV-SYS) —
retrieves system attributes associated with a specific network element
[Release 2.2 (linear), 3.1 (ring), and later releases]

RETRIEVE-T3 (RTRV-T3) —
retrieves DS3 line attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

RETRIEVE-USER-SECURITY (RTRV-USER-SECU) —
retrieves user logins
[Release 2.1 (linear), 3.1 (ring), and later releases]

SCHEDULE-PERFORMANCE MONITORING REPORT (SCHED-PMREPT) —
schedules a PM report
[Release 2.1 (linear), 3.1 (ring), and later releases]

SET-ATTRIBUTE (SET-ATTR) —
sets alarm level attributes
[Release 2.1 (linear), 3.1 (ring), and later releases]

SET-ATTRIBUTE-ENVIRONMENT (SET-ATTR-ENV) —
sets the environmental alarm/status point attributes
[Release 2.2 (linear), 3.1 (ring), and later releases]

SET-SYSTEM IDENTIFICATION (SET-SID) —
sets the system ID, that is, System Identification (SID)/
Target Identifier (TID)
[Release 2.1 (linear), 3.1 (ring), and later releases]

SWITCH-TO PROTECTION-EQPT (SW-TOPROTN-EQPT) —
operates circuit pack protection switching capabilities
[Release 2.1 (linear), 3.1 (ring), and later releases]

SWITCH-TO WORKING-EQPT (SW-TOWKG-EQPT) —
releases circuit pack protection switching requests
[Release 2.1 (linear), 3.1 (ring), and later releases]

TEST-TRANSMISSION-T3 (TEST-TRMSN-T3) —
sets up automated transmission test at DS3 level
[Release 2.2 (linear), 3.1 (ring), and later releases]

OC-12 Regenerator TL1/X.25 Messages

The following autonomous and command/response messages are supported by the OC-12 Regenerator Release 2.0 software and hardware (23R-U REGENR circuit pack).

The following autonomous messages are supported at the local OC-12 Regenerator shelf only. Not end-to-end:

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

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

The following command/response messages are supported:

RETRIEVE-ALARM (`RTRV-ALM`) —
retrieves current alarm conditions

RETRIEVE-CONDITION (`RTRV-COND`) —
retrieves current standing status conditions

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

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

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-12 Multiplexer or OC-12 Regenerator 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-12 or OC-12 Regenerator 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.

The OC-12 Regenerator only supports a CO TBOS display. The hardware switch settings on the SYSCTL circuit pack must be set to CO for OC-12 Regenerator applications.

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-12 Multiplexer. Tables 6-5 and 6-6 define the meaning of each point in the alarm and status displays and in the control displays for the OC-12 Regenerator. 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-12 Multiplexer TBOS alarm and status display.

Table 6-3. DDM-2000 OC-12 TBOS Alarm and Status Points

Point	Type (Note)	Central Office Condition	Type (Note)	Remote Terminal Condition
1	SA	Incoming DS3/EC1* Signal Failure (LOS+LOF* +SF/SD +STS1 LOP* +EC1 AIS*)		
2	NSA	Incoming OC-3 Signal Failure (LOS+LOF+SF +STS1/STS3c** LOP)		
3	SA	Incoming OC-3 Signal Failure (LOS+LOF+SF+AIS)		
4	NSA	Incoming OC-12 Signal Failure (LOS+LOF+SF +STS1/STS3c** LOP)		
5	SA	Incoming OC-12 Signal Failure (LOS+LOF+SF+AIS)		
6	SA	Incoming STS1/STS3c** LOP (on OC-3/OC-12)		
7	NSA	Incoming OC-3/OC-12 Signal Degrade		
8	SA	Incoming OC-3/OC-12 Signal Degrade/STS Path AIS† /Signal Failure‡/ Degrade‡/STS Unequipped ††		
9	NSA	Synchronization Equipment Failure/Frequency Error¶		
10	SA			
11	NSA	TSI 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	DS3/EC1* Terminating Equipment Failure		
18	SA			
19	NSA	OC-3/OC-12§ APS Channel Failure		
20	Alarm	Reserved for Future Alarm Use		
21	NSA	Section Data Comm. Channel (DCC) Failure/Provisioning Error		
22	NSA	Protected DS1 Sync. Ref. Failure		
23	NSA	Unprotected DS1 Sync. Ref. Failure		
24	NSA	PM Summary TCA		
25	NSA	Incoming OC-3 Line AIS		
26	NSA	Incoming OC-12 Line AIS		
27	NSA	Incoming STS Path AIS/Signal Failure‡ /Degrade‡/STS Unequipped ††		
28	NSA	Invalid TBOS Command Received		
29	SA	Excessive Sync. Holdover		
30	Alarm	Reserved for Future Alarm Use		
31	Alarm	Reserved for Future Alarm Use		
32	Alarm	Reserved for Future Alarm Use		
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

See note and footnotes at end of table.

Table 6-3. DDM-2000 OC-12 TBOS Alarm and Status Points (Contd)

Point	Type (Note)	Central Office Condition	Type (Note)	Remote Terminal Condition
38	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 6
39	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 7
40	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 8
41	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 9
42	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 10
43	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 11
44	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 12
45	Alarm	Reserved for Future Alarm Use	NSA	Misc. Discrete Env. Alarm/Status 13
46	NSA	Fan Shelf Failure	NSA	Misc. Discrete Env. Alarm/Status 14
47	Alarm	Reserved for Future Alarm Use	NSA	External Minor
48	Alarm	Reserved for Future Alarm Use	NSA	Fan Control Relay Failure
49	Status	Inhibit Sync. Equipment Protection Switching		
50	Status	Inhibit DS1 Sync. Ref. Protection Switching		
51	Status	Holdover Mode Active		
52	Status	Incoming OC-3/OC-12 Line FERF		
53	Status	Manual Forced/Inhibit/Lockout OC-3 Line Prot. Switching		
54	Status	Manual Forced/Inhibit/Lockout OC-12 Line Prot. Switching §		
55	Status	Manual Forced/Inhibit TSI Equipment Prot. Switching		
56	Status	Manual Forced/Inhibit DS3/EC1* Terminating Equipment Prot. Switching		
57	Status	Abnormal Condition		
58	Status	Valid TBOS Command Received		
59	Status	Communication Failure		
60	Status	Incoming STS Path Yellow		
61	Status	Reserved for Future Status Use		
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-12 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

Table 6-3. DDM-2000 OC-12 TBOS Alarm and Status Points (Contd)

* Release 2.1 and later EC-1 interfaces only.

† Release 1.2 and later.

‡ Release 3.0 and later ring releases.

§ Not applicable to the Main OC-12 lines in ring applications.

¶ Releases 2.2 (linear), 3.1 (ring), and later releases.

** Release 2.0 and later STS3c signals only.

†† Release 3.1 and later ring releases.

DDM-2000 OC-12 TBOS Control Points

Table 6-4 lists the TBOS control points for the DDM-2000 OC-12 Multiplexer.

Table 6-4. DDM-2000 OC-12 TBOS Control Points

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
1	57&58 & 56 & 53	Forced Switch - FN-A (`switch-fn:fn-a:pri=forced`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-a:pri=forced`) (if OC3 equipped)
2	57&58 & 56 & 53	Forced Switch - FN-B (`switch-fn:fn-b:pri=forced`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-b:pri=forced`) (if OC3 equipped)
3	57&58 & 56 & 53	Forced Switch - FN-C (`switch-fn:fn-c:pri=forced`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-c:pri=forced`) (if OC3 equipped)
4	57&58 & 56 & 53	Forced Switch - FN-D (`switch-fn:fn-d:pri=forced`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-d:pri=forced`) (if OC3 equipped)
5	58	Manual Switch - FN-A (`switch-fn:fn-a:pri=manual`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-a:pri=manual`) (if OC3 equipped)
6	58	Manual Switch - FN-B (`switch-fn:fn-b:pri=manual`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-b:pri=manual`) (if OC3 equipped)
7	58	Manual Switch - FN-C (`switch-fn:fn-c:pri=manual`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-c:pri=manual`) (if OC3 equipped)
8	58	Manual Switch - FN-D (`switch-fn:fn-d:pri=manual`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-d:pri=manual`) (if OC3 equipped)
9	57&58 & 56 & 53	Inhibit Switching - FN-A (`switch-fn:fn-a:pri=inhibit`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-a:pri=inhibit`) (if OC3 equipped)
10	57&58 & 56 & 53	Inhibit Switching - FN-B (`switch-fn:fn-b:pri=inhibit`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-b:pri=inhibit`) (if OC3 equipped)
11	57&58 & 56 & 53	Inhibit Switching - FN-C (`switch-fn:fn-c:pri=inhibit`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-c:pri=inhibit`) (if OC3 equipped)
12	57&58 & 56 & 53	Inhibit Switching - FN-D (`switch-fn:fn-d:pri=inhibit`) (if 3DS3/3STS1E † equipped) (`switch-line:fn-d:pri=inhibit`) (if OC3 equipped)
13	53&57&58	Lockout Switching - FN-A (only if OC3 equipped) (`switch-line:fn-a:pri=lockout`)
14	53&57&58	Lockout Switching - FN-B (only if OC3 equipped) (`switch-line:fn-b:pri=lockout`)

See note and footnotes at end of table.

Table 6-4. DDM-2000 OC-12 TBOS Control Points (Contd)

Control Point	CO and RT Verification Status Point (Note)	CO and RT Control Function (Equivalent CIT Command)
15	53&57&58	Lockout Switching - FN-C (only if OC3 equipped) (switch-line:fn-c:pri=lockout)
16	53&57&58	Lockout Switching - FN-D (only if OC3 equipped) (switch-line:fn-d:pri=lockout)
17	57 clears & 58 & 56 clears & 53 clears	Reset Switching - FN-A (switch-fn:fn-a:pri=reset) (if 3DS3/3STS1E † equipped) (switch-line:fn-a:pri=reset) (if OC3 equipped)
18	57 clears & 58 & 56 clears & 53 clears	Reset Switching - FN-B (switch-fn:fn-b:pri=reset) (if 3DS3/3STS1E † equipped) (switch-line:fn-b:pri=reset) (if OC3 equipped)
19	57 clears & 58 & 56 clears & 53 clears	Reset Switching - FN-C (switch-fn:fn-c:pri=reset) (if 3DS3/3STS1E † equipped) (switch-line:fn-c:pri=reset) (if OC3 equipped)
20	57 clears & 58 & 56 clears & 53 clears	Reset Switching - FN-D (switch-fn:fn-d:pri=reset) (if 3DS3/3STS1E † equipped) (switch-line:fn-d:pri=reset) (if OC3 equipped)
21	55&57&58	Forced Switch - TSI (switch-tsi:pri=forced)
22	58	Manual Switch - TSI (switch-tsi:pri=manual)
23	55&57&58	Inhibit Switching - TSI (switch-tsi:pri=inhibit)
24	55&57 clear & 58	Reset Switching - TSI (switch-tsi:pri=reset)
25	28	Reserved for Future Control Use
26	54&57&58/28 ‡	Forced Switch - Main-B ‡ (switch-line:main-b:pri=forced)
27	28	Reserved for Future Control Use
28	58/28 ‡	Manual Switch - Main-B ‡ (switch-line:main-b:pri=manual)
29	28	Reserved for Future Control Use
30	54&57&58/28 ‡	Inhibit Switching - Main-B ‡ (switch-line:main-b:pri=inhibit)
31	28	Reserved for Future Control Use
32	54&57&58/28 ‡	Lockout Switching - Main-B ‡ (switch-line:main-b:pri=lockout)
33	28	Reserved for Future Control Use
34	54&57 clear & 58/28 ‡	Reset Switching - Main-B ‡ (switch-line:main-b:pri=reset)
35	28	Reserved for Future Control Use
36	28	Reserved for Future Control Use
37	28	Reserved for Future Control Use
38	28	Reserved for Future Control Use
39	28	Reserved for Future Control Use
40	28	Reserved for Future Control Use
41	28	Reserved for Future Control Use

See note and footnotes at end of table.

Table 6-4. DDM-2000 OC-12 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)
42	28	Reserved for Future Control Use	
43	28	Reserved for Future Control Use	
44	28	Reserved for Future Control Use	
45	28	Reserved for Future Control Use	
46	28	Reserved for Future Control Use	
47	28	Reserved for Future Control Use	
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)	
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	

See note and footnotes at end of table

Table 6-4. DDM-2000 OC-12 TBOS Control Points (Contd)

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 2.1 and later EC-1 interfaces only.

‡ These TBOS control points for Main-B do not apply for the Main OC-12 lines for path switched rings.

OC-12 Regenerator TBOS Alarm and Status Points

Table 6-5 summarizes the OC-12 Regenerator TBOS alarm and status display.

Table 6-5. OC-12 Regenerator TBOS Alarm and Status Points

Point	Type (Note)	Central Office Condition
1	Alarm	Reserved for Future Alarm Use
2	Alarm	Reserved for Future Alarm Use
3	Alarm	Reserved for Future Alarm Use
4	Alarm	Reserved for Future Alarm Use
5	SA	Incoming OC-12 Signal Failure (LOS)
6	Alarm	Reserved for Future Alarm Use
7	Alarm	Reserved for Future Alarm Use
8	Alarm	Reserved for Future Alarm Use
9	NSA	Illegal CP Type (in TG slot)
10	Alarm	Reserved for Future Alarm Use
11	NSA	Illegal CP Type (in TSI slot)
12	Alarm	Reserved for Future Alarm Use
13	NSA	Fuse/Power Circuit Failure
14	NSA	Controller Failure/Provisioning Error
15	NSA	Illegal CP Type (in OLIU slot)
16	SA	Optical Terminating Equipment Failure
17	NSA	Illegal CP Type (in FN slot)
18	Alarm	Reserved for Future Alarm Use
19	Alarm	Reserved for Future Alarm Use
20	Alarm	Reserved for Future Alarm Use
21	Alarm	Reserved for Future Alarm Use
22	Alarm	Reserved for Future Alarm Use
23	Alarm	Reserved for Future Alarm Use
24	NSA	PM Summary TCA
25	Alarm	Reserved for Future Alarm Use
26	Alarm	Reserved for Future Alarm Use
27	Alarm	Reserved for Future Alarm Use
28	NSA	Invalid Command Received
29	Alarm	Reserved for Future Alarm Use
30	Alarm	Reserved for Future Alarm Use
31	Alarm	Reserved for Future Alarm Use
32	Alarm	Reserved for Future Alarm Use
33	Alarm	Reserved for Future Alarm Use
34	Alarm	Reserved for Future Alarm Use
35	Alarm	Reserved for Future Alarm Use
36	Alarm	Reserved for Future Alarm Use
37	Alarm	Reserved for Future Alarm Use

See note at end of table

Table 6-5. OC-12 Regenerator TBOS Alarm and Status Points (Contd)

Point	Type (Note)	Central Office Condition
38	Alarm	Reserved for Future Alarm Use
39	Alarm	Reserved for Future Alarm Use
40	Alarm	Reserved for Future Alarm Use
41	Alarm	Reserved for Future Alarm Use
42	Alarm	Reserved for Future Alarm Use
43	Alarm	Reserved for Future Alarm Use
44	Alarm	Reserved for Future Alarm Use
45	Alarm	Reserved for Future Alarm Use
46	Alarm	Reserved for Future Alarm Use
47	Alarm	Reserved for Future Alarm Use
48	Alarm	Reserved for Future Alarm Use
49	Status	Reserved for Future Status Use
50	Status	Reserved for Future Status Use
51	Status	Reserved for Future Status Use
52	Status	Reserved for Future Status Use
53	Status	Reserved for Future Status Use
54	Status	Reserved for Future Status Use
55	Status	Reserved for Future Status Use
56	Status	Reserved for Future Status Use
57	Status	Reserved for Future Status Use
58	Status	Valid TBOS Command Received
59	Status	Reserved for Future Status Use
60	Status	Reserved for Future Status Use
61	Status	Reserved for Future Status Use
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-12 Regenerator TBOS points as follows:

Points 1 - 48 = alarms

Points 49 - 63 = status.

LOS = Loss of Signal
TCA = Threshold Crossing Alert

OC-12 Regenerator TBOS Control Points

Table 6-6 lists the TBOS control points for the OC-12 Regenerator.

Table 6-6. OC-12 Regenerator TBOS Control Points

Control Point	CO Verification Status Point (Note)	CO Control Function (Equivalent CIT Command)
1	28	Reserved for Future Control Use
2	28	Reserved for Future Control Use
3	28	Reserved for Future Control Use
4	28	Reserved for Future Control Use
5	28	Reserved for Future Control Use
6	28	Reserved for Future Control Use
7	28	Reserved for Future Control Use
8	28	Reserved for Future Control Use
9	28	Reserved for Future Control Use
10	28	Reserved for Future Control Use
11	28	Reserved for Future Control Use
12	28	Reserved for Future Control Use
13	28	Reserved for Future Control Use
14	28	Reserved for Future Control Use
15	28	Reserved for Future Control Use
16	28	Reserved for Future Control Use
17	28	Reserved for Future Control Use
18	28	Reserved for Future Control Use
19	28	Reserved for Future Control Use
20	28	Reserved for Future Control Use
21	28	Reserved for Future Control Use
22	28	Reserved for Future Control Use
23	28	Reserved for Future Control Use
24	28	Reserved for Future Control Use
25	28	Reserved for Future Control Use
26	28	Reserved for Future Control Use
27	28	Reserved for Future Control Use
28	28	Reserved for Future Control Use
29	28	Reserved for Future Control Use
30	28	Reserved for Future Control Use
31	28	Reserved for Future Control Use
32	28	Reserved for Future Control Use
33	28	Reserved for Future Control Use
34	28	Reserved for Future Control Use

Table 6-6. OC-12 Regenerator TBOS Control Points (Contd)

Control	CO Verification Status Point	CO Control Function (Equivalent CIT Command)
35	28	Reserved for Future Control Use
36	28	Reserved for Future Control Use
37	28	Reserved for Future Control Use
38	28	Reserved for Future Control Use
39	28	Reserved for Future Control Use
40	28	Reserved for Future Control Use
41	28	Reserved for Future Control Use
42	28	Reserved for Future Control Use
43	28	Reserved for Future Control Use
44	28	Reserved for Future Control Use
45	28	Reserved for Future Control Use
46	28	Reserved for Future Control Use
47	28	Reserved for Future Control Use
48	28	Reserved for Future Control Use
49	28	Reserved for Future Control Use
50	28	Reserved for Future Control Use
51	28	Reserved for Future Control Use
52	28	Reserved for Future Control Use
53	28	Reserved for Future Control Use
54	28	Reserved for Future Control Use
55	28	Reserved for Future Control Use
56	28	Reserved for Future Control Use
57	28	Reserved for Future Control Use
58	28	Reserved for Future Control Use
59	28	Reserved for Future Control Use
60	28	Reserved for Future Control Use
61	28	Reserved for Future Control Use
62	58	Alarm Cut Off (opr-aco)
63	58	Processor Reset (reset)
64	28	Reserved for Future Control Use

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 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-12 Multiplexer provides user-definable miscellaneous discrete environmental alarms and controls accessed through the parallel telemetry interface.

The OC-12 Regenerator does not have the Incoming (INC) status and System Identification (SID) status contact closures.

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-12 Multiplexer in a remote site, a set of user-definable miscellaneous discrete environmental alarms and controls is provided.

The OC-12 Regenerator does not support miscellaneous discretes environmental alarms and controls.

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-12 Multiplexers and the CO DDM-2000 OC-12 Multiplexer 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:

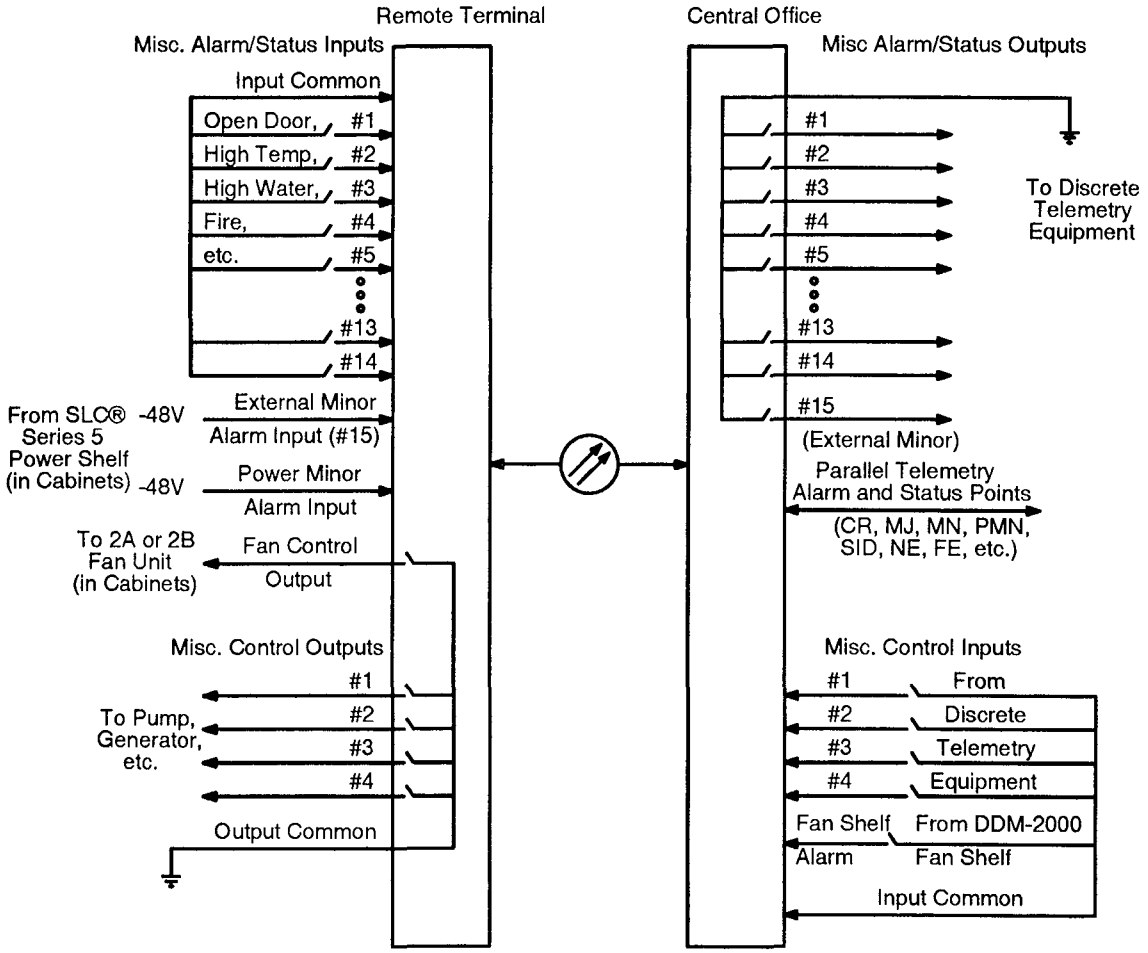
  — In addition to the parallel telemetry alarm, status, and control points described previously, the DDM-2000 OC-12 Multiplexer provides user-definable miscellaneous discrete environmental alarms and controls. A set of 15 alarm/status outputs, from the DDM-2000 OC-12 Multiplexer to an OS, and 4 control inputs, from the OS to the DDM-2000 OC-12 Multiplexer are provided. These can be

transmitted between an OS and remote DDM-2000 OC-12 Multiplexers through a parallel telemetry interface on the DDM-2000 OC-12 Multiplexer in the CO as shown in Figure 6-4.

— In multispan applications (for example, hubbing), the control points operated through the parallel telemetry interface at the DDM-2000 OC-12 Multiplexer in the CO are "broadcast" to all remote terminals connected to that DDM-2000 OC-12 Multiplexer.

— In multispan applications, the miscellaneous discrete environmental alarm and status points from all remote terminals connected to one DDM-2000 in the CO are "ORed" by the DDM-2000 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.

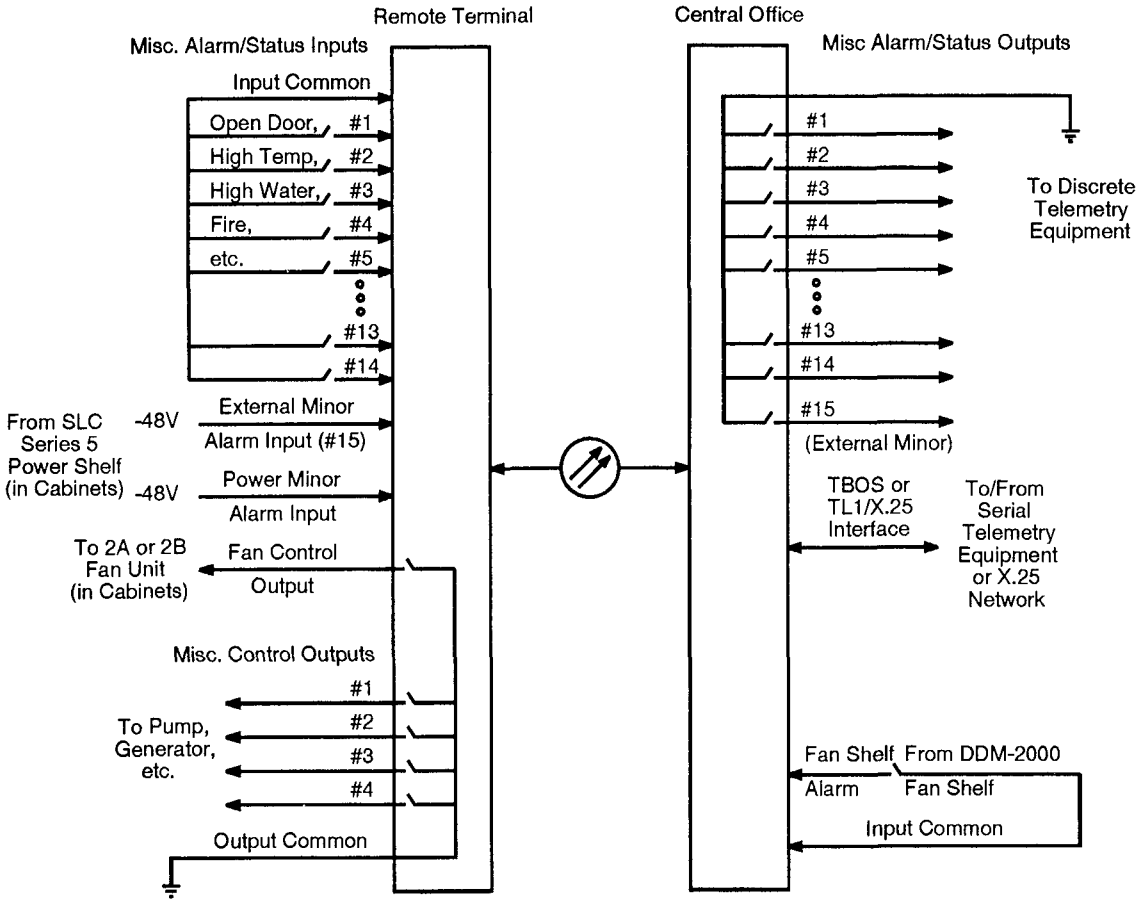
— Unlike the other parallel telemetry alarm, status, and control points described previously, the miscellaneous discretes are not ORed among shelves in a bay. Each shelf in a bay has its own set of miscellaneous discrete environmental alarms and controls.



Notes:

1. In a remote terminal, the output common must be wired to ground in all applications.
2. Miscellaneous alarm input #1 is typically wired to open door alarm in AT&T cabinets.
3. Miscellaneous alarm input #14 is typically wired to DDM-2000 fan shelf alarm in controlled environment remote terminal applications where the DDM-2000 fan shelf is required.

Figure 6-4. Miscellaneous Discrete Environmental Alarms and Controls (Parallel Telemetry at Central Office)



Notes:

1. In a remote terminal, the output common must be wired to ground in all applications.
2. Miscellaneous alarm input #1 is typically wired to open door alarm in AT&T cabinets.
3. Miscellaneous alarm input #14 is typically wired to DDM-2000 fan shelf alarm in controlled environment remote terminal applications where the DDM-2000 fan shelf is required.

Figure 6-5. Miscellaneous Discrete Environmental Alarms and Controls (TBOS or TL1/X.25 at Central Office)

Orderwire

The DDM-2000 OC-12 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 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-12 Multiplexers connected to each other via 23G/23G-U or 23H/23H-U OLIUs in the main-b slots. Orderwire is not currently available in ring applications.

The DDM-2000 OC-12 Multiplexer has been tested with the DANTEL* Orderwire Assembly A18-04588-02.

The OC-12 Regenerator does not support orderwire.

* DANTEL is a registered trademark of Dantel, Inc.

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-12 Multiplexer and OC-12 Regenerator. The following topics are described in addition to the administration and provisioning features:

- Multiplexing and mapping
- Cross-connection provisioning for ring networks
- Listing of provisionable parameters with their ranges and default values.

Administration

Version Recognition

The DDM-2000 OC-12 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-12 Multiplexers Release 1.1 and later provide security capabilities to protect against unauthorized access to the system through the CIT, TL1/X.25, and data communications channel (DCC) interfaces. 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 2.0 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 1.1) or 50 (Release 2.0 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.

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 Enginering Guide* for TL1/X.25 command access privileges.

- `init-sys`—Initialize System
- `rtrv-lgn`—Retrieve Login
- `set-feat`—Set Features; Release 2.0 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 2.0 and later)
- `ent-ulsdcc`—Enter Upper Layer Section DCC (Release 2.0 and later)
- `init-pm`—Initialize Performance Monitoring
- `ins-prog`—Install Program
- `cpy-prog`—Copy Program (Release 2.1 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-12 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-12 network.

For Release 2.1 and later, 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` and `cpy-prog` commands in Section 11, "Commands and Reports," and to "Install New Generic Program" in the TOP section of this manual. For more information on software upgrade compatibility, refer to the software compatibility tables in Section 9, "Maintenance Description."

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-12 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-12 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 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. 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 has a phased release plan. The initial release supports DDM-2000 OC-3 Multiplexer rings. Future releases will support DDM-2000 OC-12 Multiplexer rings and FT-2000 OC-48 systems. The SNC-2000 CPro Graphical User Interface and Provisioning Tool will include 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
- DS3 port options
- EC-1 port options
- OC-12 line options.

See the SNC-2000 CPro Graphical User Interface and Provisioning Tool on-line user's guide, when available, for more information on this feature.

Service Affecting Actions

Although the DDM-2000 OC-12 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.
- 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 DS3 to OC-12, OC-3 to OC-12, EC-1 to OC-12, and OC-3c to OC-12 (feature package option) multiplexing and mapping.

DS3 to OC-12

Each DS3 signal received by a 3DS3 circuit pack is mapped to an STS-1 signal via the asynchronous mapping as specified in the synchronous optical network (SONET) standard. The three STS-1 signals associated with a 3DS3 circuit pack are then multiplexed with the STS-1 signals from the other Function Units to form the STS-12 high-speed signal. (See Table 8-1.) The STS-12 signal is then converted to an OC-12 signal for transport on the high-speed optical line.

In ring networks, this default mapping can be overriden using the `ent-crs-sts1` command. See Section 11, "Commands and Reports", for more information on this command.

In the reverse direction, a received OC-12 signal is converted to an electrical STS-12 signal which is demultiplexed to 12 STS-1 signals. The STS-1 signals are routed to the Function Units where they are converted back into DS3 signals by the 3DS3 circuit packs.

Table 8-1. Default STS-1 Mapping

STS-1 Port Address	STS-1 within OC-12
a-1	1
a-2	2
a-3	3
b-1	4
b-2	5
b-3	6
c-1	7
c-2	8
c-3	9
d-1	10
d-2	11
d-3	12

OC-3 to OC-12

When a Function Unit is equipped with a 21D/21D-U or 21G/21G-U OLIU circuit pack, the received optical signal is converted to an electrical STS-3 signal which is demultiplexed into three STS-1 signals. The three STS-1 signals are multiplexed with the STS-1 signals from the other Function Units to form an STS-12 signal, which is converted to an OC-12 signal for transport on the OC-12 line.

In the reverse direction, the received OC-12 signal is converted to an electrical STS-12 signal which is demultiplexed to 12 STS-1 signals. The STS-1 signals are routed to the Function Units where they are multiplexed to an STS-3 signal, which is converted to an OC-3 optical signal for transport on the optical line.

For ring nodes, the OLIUs in the Function Units are provisioned as dual 0x1 interfaces using the `ent-crs-sts1` command. See Section 11, "Commands and Reports", for more information on this provisioning.

OC-3c to OC-12 (Optional Feature)

This application for linear systems 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/21G-U (or 21D/21D-U) OLIU functions the same as other applications.

In linear systems, a Function Unit can be optionally equipped with 21D/21D-U or 21G/21G-U OLIUs for OC-3c transport. The incoming OC-3c signal is electrically converted into an STS-3c signal. Four STS-3c or a mix of STS-3c and STS-1 (see Tables 8-1 and 8-2) signals are multiplexed into an STS-12 signal and converted into an OC-12 signal for transport over the OC-12 line.

Table 8-2. STS-3c Mapping

STS-1 Port Address	STS-3c within OC-12
a-1	1
a-2	1
a-3	1
b-1	4
b-2	4
b-3	4
c-1	7
c-2	7
c-3	7
d-1	10
d-2	10
d-3	10

EC-1 to OC-12

The 3STS1E low-speed interface receives an EC-1 signal from the backplane coaxial connector which is then routed as an internal STS-1. This signal is STS-1 cross-connected to the OC-12 interface (see Table 8-1 for default cross-connections). At the OC-12 interface, these internal STS-1 signals are multiplexed into an STS-12 and converted to an optical OC-12 signal.

In default mapping, there is a direct relationship between physical low-speed slot and port on that slot and the STS-1 time slot within the OC-12. 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) will always leave on a different shelf but will use the same slot and port position (a-1). For example:

a-1, a-2, a-3
b-1, b-2, b-3
c-1, c-2, c-3
d-1, d-2, d-3

In ring networks, this default mapping can be overriden using the `ent-crs-sts1` command. See Section 11, "Commands and Reports," for more information on this command.

In the opposite direction, a received OC-12 is converted into an electrical STS-12 and demultiplexed. After STS-1 cross-connections, the resulting STS-1 internal signal is converted to an EC-1 signal by the 3STS1E interface. The following are examples of STS-1 cross-connections in ring networks:

a-1 to mb-1
c-3 to mb-5
d-2 to mb-7

Provisioning

General

The DDM-2000 OC-12 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 (for example, DS3 line buildouts) and parameters that will not change in service (for example, OC-3 optical power) 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-12 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. The OC-3c (STS-3c) feature is 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-12 Multiplexers Release 2.0 and later 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 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.

Port State Provisioning

Port state provisioning is a feature provided on DDM-2000 OC-12 Multiplexers that suppresses alarm reporting and performance monitoring by supporting multiple states (automatic, in-service, and not-monitored) for DS3 ports and EC-1 ports.

Ports without signals (undriven) are in the automatic state until changed to the in-service state when a signal is present. The `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-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-12 Multiplexers (Release 2.2 and later linear releases and 3.1 and later ring releases) that suppresses reporting of alarms and events for STS-1 channels by

supporting multiple states at the OC-12 ports (automatic, in-service, and not-monitored) for these channels. The `rtrv-state-sts1` command allows a user to retrieve current channel states.

While an end-to-end circuit is being set up, particularly during 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-12 Multiplexers provide automatic channel state provisioning.

An STS-1 channel stays in the default automatic (AUTO) state until a valid signal [a framed signal that is not alarm indication signal (AIS) or unequipped (Release 3.1 and later ring releases)] 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 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`, `rtrv-state-sts1`, and `upd` commands.

Cross-Connection Provisioning

The DDM-2000 OC-12 Multiplexer can be provisioned for cross-connect routing of signals. In linear applications, STS-1 signal cross-connections are established to route traffic in a default manner. All cross-connections are bidirectional.

In ring applications, STS-1 signals may be manually cross-connected in several ways. For bidirectional drop services, the normal "two way" cross-connection is used to connect a signal in the high-speed slot to any available time slot in any Function Unit equipped with low-speed 3STS1E or 3DS3 circuit packs. For dual 0x1 interfaces, a manual "two way" cross-connection command is used to connect a signal in the high speed slot to any available time slot in any Function Unit equipped with 21-type OLIU circuit packs. See "OC-12 STS-1/VT1.5 Path Switched Ring (Dual 0x1) Provisioning." The bidirectional pass through cross-connection 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" cross-connection provides, in a single command (`ent-crs`), the proper bidirectional cross-connection to "drop" a copy of the high-speed signal in the Main-B 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-12 Multiplexer has two cross-connect modes of operation, default and manual. On linear systems, this mode is "default" only. On ring systems, this mode is "manual" only.

Linear Application Default Cross-Connection Mode

In the default cross-connection mode for linear systems, 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-12 Multiplexer. If slots are unequipped, then no cross-connection is made.

DDM-2000 OC-12 linear systems support a fixed mapping between STS-1 signals embedded in the OC-12 line signal and the STS-1s associated with signals dropped on the shelf. This "default" STS-1 signal mapping is shown in Table 8-3.

Table 8-3. DDM-2000 OC-12 Default STS-1 Cross-Connections (Termination)

From		To	"To" CP Type	CIT Command
mb-1	<-->	a-1	3STS1E, 3DS3, OLIU	-not required-
mb-2	<-->	a-2	3STS1E, 3DS3, OLIU	-not required-
mb-3	<-->	a-3	3STS1E, 3DS3, OLIU	-not required-
mb-4	<-->	b-1	3STS1E, 3DS3, OLIU	-not required-
mb-5	<-->	b-2	3STS1E, 3DS3, OLIU	-not required-
mb-6	<-->	b-3	3STS1E, 3DS3, OLIU	-not required-
mb-7	<-->	c-1	3STS1E, 3DS3, OLIU	-not required-
mb-8	<-->	c-2	3STS1E, 3DS3, OLIU	-not required-
mb-9	<-->	c-3	3STS1E, 3DS3, OLIU	-not required-
mb-10	<-->	d-1	3STS1E, 3DS3, OLIU	-not required-
mb-11	<-->	d-2	3STS1E, 3DS3, OLIU	-not required-
mb-12	<-->	d-3	3STS1E, 3DS3, OLIU	-not required-

Manual Ring Cross-Connections

In the manual ring cross-connection mode, the cross-connections are changed using the following commands:

- `ent-crs-sts1:Address1,Address2[:cct=CrsType] [,ring=RingId];`
  This command creates STS-1 signal cross-connections.
  - — `Address1, Address2` are the cross-connection addresses. All cross-connections are bidirectional.
  - — `CrsType` has two possible parameters: `twoway` (default) for add/drop and pass through cross-connections and `dc` for drop and continue applications. If `dc` is entered, a ring must be specified.
  - — `RingId` has two parameters `mb1` (received on main-b-1 OLIU and transmitted on main-b-2 OLIU) or `mb2` (received on main-b-2 OLIU and transmitted on main-b-1 OLIU) .
- `dlt-crs-sts1:Address1,Address2[:cct=CrsType];` (Delete Cross-Connection STS-1). This command deletes STS-1 signal cross-connections.

All nodes in the ring must be provisioned for STS-1 cross-connections. Refer to Section 11, "Commands and Reports", for more information on these commands.

DDM-2000 OC-12 ring systems provide flexible routing of STS-1 signals between high speed and Function Unit interfaces for ring applications. These "manual" cross-connections are entered using the CIT and are shown in Tables 8-4 through 8-6.

Tables 8-4, 8-5, and 8-6 list the various type cross-connections supported. After the tables are descriptions of applications and the types of cross-connections each application requires.

Table 8-4. DDM-2000 OC-12 Manual STS-1 Cross-Connections (Termination)

From		To	"To" CP Type	Example Command
mb-{1-12}	<-->	a-{1-3}	3STS1E, 3DS3, OLIU	ent-crs-sts1:mb-1,a-1
mb-{1-12}	<-->	b-{1-3}	3STS1E, 3DS3, OLIU	ent-crs-sts1:mb-2,b-3
mb-{1-12}	<-->	c-{1-3}	3STS1E, 3DS3, OLIU	ent-crs-sts1:mb-3,c-2
mb-{1-12}	<-->	d-{1-3}	3STS1E, 3DS3, OLIU	ent-crs-sts1:mb-4,d-2

Table 8-5. DDM-2000 OC-12 Manual STS-1 Cross-Connections (Rings Pass Through)

From		To	"To" CP Type	Example Command (Note)
mb-1	<-->	mb-1	OLIU	ent-crs-sts1:mb-1,mb-1
mb-2	<-->	mb-2	OLIU	ent-crs-sts1:mb-2,mb-2
mb-3	<-->	mb-3	OLIU	ent-crs-sts1:mb-3,mb-3
mb-4	<-->	mb-4	OLIU	ent-crs-sts1:mb-4,mb-4
mb-5	<-->	mb-5	OLIU	ent-crs-sts1:mb-5,mb-5
mb-6	<-->	mb-6	OLIU	ent-crs-sts1:mb-6,mb-6
mb-7	<-->	mb-7	OLIU	ent-crs-sts1:mb-7,mb-7
mb-8	<-->	mb-8	OLIU	ent-crs-sts1:mb-8,mb-8
mb-9	<-->	mb-9	OLIU	ent-crs-sts1:mb-9,mb-9
mb-10	<-->	mb-10	OLIU	ent-crs-sts1:mb-10,mb-10
mb-11	<-->	mb-11	OLIU	ent-crs-sts1:mb-11,mb-11
mb-12	<-->	mb-12	OLIU	ent-crs-sts1:mb-12,mb-12

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 8-6. DDM-2000 OC-12 Manual STS-1 Cross-Connections (Rings Drop and Continue)

From		To	"To" CP Type	Example Command (Note)
mb-{1-12}	<-->	a-{1-3}	3STS1E, 3DS3 *	ent-crs-sts1:mb-1,a-1:cct=dc,ring=mb1
mb-{1-12}	<-->	b-{1-3}	3STS1E, 3DS3 *	ent-crs-sts1:mb-2,b-3:cct=dc,ring=mb1
mb-{1-12}	<-->	c-{1-3}	3STS1E, 3DS3 *	ent-crs-sts1:mb-3,c-2:cct=dc,ring=mb2
mb-{1-12}	<-->	d-{1-3}	3STS1E, 3DS3 *	ent-crs-sts1:mb-4,d-2:cct=dc,ring=mb2

Note: The "ring" parameter defines the ring carrying the continue signal. This ring directly connects to the other drop and continue shelf.

* Release 3.1 and later ring releases. See "Note" in "Ring Drop and Continue Cross-Connection Provisioning."

Optical Point-to-Point Application

This is a linear application with two NEs. Valid mapping is provided by default cross-connections.

OC-12 Path Protected Ring Application

This is a path protected ring application with multiple NEs in a 2-fiber ring. The Main optical units of each node in the ring are equipped with ring OLIU circuit packs, the 23G/23G-U or 23H/23H-U, 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-12 Path Protected Ring Drop and Continue Application

This is a path protected ring application with multiple NEs in a 2-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 may or may not be neighbors (no intermediate nodes). 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 3STS1E low-speed and 3DS3 circuit packs are 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-12 STS-1/VT1.5 Path Switched Ring (Dual 0x1) Provisioning

The OC-12 STS-1/VT1.5 path switched ring (dual 0x1) application uses an OC-3 shelf with Release 7.1 and later ring software and an OC-12 shelf with Release 3.1 and later ring software to drop VT1.5 services and automatically protect the services with VT1.5 protection switching. Dual 0x1 means two service lines (no protection lines) are used between the DDM-2000 OC-12 Multiplexer ring and the DDM-2000 OC-3 Multiplexer ring [(OC-3 Main-1 OLIU to OC-12 Function Unit ( )-1 OLIU and OC-3 Main-2 OLIU to associated OC-12 Function Unit ( )-2 OLIU)]. The only difference between DS3 and 3STS1E dual 0x1 drop connections is that Slot 1 in the Function Unit will carry the channel from Ring 1 and Slot 2 will carry the channels from Ring 2. Along with the necessary cross-connections, the OC-3 shelf must be provisioned to recognize that the two data communications channels (DCC) on the OC-3 interfaces from the OC-12 shelf are not distinct but should be set to identical using the `set-ne` command. See Section 8, "Administration and Provisioning", in AT&T 363-206-202, *DDM-2000 OC-3 Multiplexer User/Service Manual - Volume I*, for provisioning details.

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 23G/23G-U or 23H/23H-U OLIUs in the Main-B1 and Main-B2 slots and 3DS3s in the Function Unit slots, and all shelves are properly installed and provisioned. This example is for DS3 services. See "System Turnup/Circuit Order" in the TOP section of this manual. Figure 8-1 shows the six nodes with dashed lines, indicating the cross-connections.

Ring configurations support manual 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 DS3 services but can be used for STS-1 services if the Function Units are properly equipped with 3STS1E circuit packs. The 3STS1E circuit pack can support three STS-1 cross-connections.

Pass through cross-connections should be established first to minimize alarms. The example assumes that the drop cross-connections are made shortly after the pass through cross-connections are made. This is the preferred method since it assures that all cross-connections are associated with services.

An alternate method is also possible. Before service is established, all shelves can be defaulted to set up all pass through cross-connections in the ring. This method has the advantage of only having to delete pass through and establish drop cross-connections at the add/drop nodes. However, this method may introduce the possibility of affecting service when cross-connections are deleted. This is because it will not be possible to distinguish between pass through cross-connections that are in use carrying service from those that are available. Use of this default pass through provisioning method is only recommended if the accuracy of the cross-connection information on the work order is assured.

The following commands may be used to delete, enter, and retrieve cross-connections: `dlt-crs-sts1`, `ent-crs-sts1`, and `rtrv-crs-sts1`. See Section 11, "Commands and Reports," for a description of these commands.

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 `mb-1` 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 `mb` designation as `m1`). If the work order does not designate an STS-1 ring channel to use, use the `rtrv-crs-sts1:all;` to identify all unused ring channels. The output report will show only active cross-connections. In the example, we will cross-connect a DS3 from Node 1 through the ring and drop the DS3 at Node 5 using `mb-1`.
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-sts1:` command to cross-connect the DS3 channel time slots between Main B-1 and Main B-2. For example, to cross-connect the channel time slots associated with STS-1 #1, use the `ent-crs-sts1:mb-1,mb-1)` command.

   ⇒ NOTE:
   Only one command is required to establish the pass through cross-connection on **both** rings (Main B-1 to Main B-2 for Ring 1 and Main B-2 to Main B-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 DS3 circuit being established, use the `ent-crs-sts1:` command to cross-connect the DS3 channel time slot to the proper group, slot, and port; for example, `ent-crs-sts1:mb-1,a-2`

   ⇒ NOTE:
   Only one command is required to establish the drop cross-connections on **both** rings between Main B and Fn-A. At exit nodes, assuming normal operation, the same signal is present on both rings. The system monitors the input from each ring and selects one to drop to Fn-A.

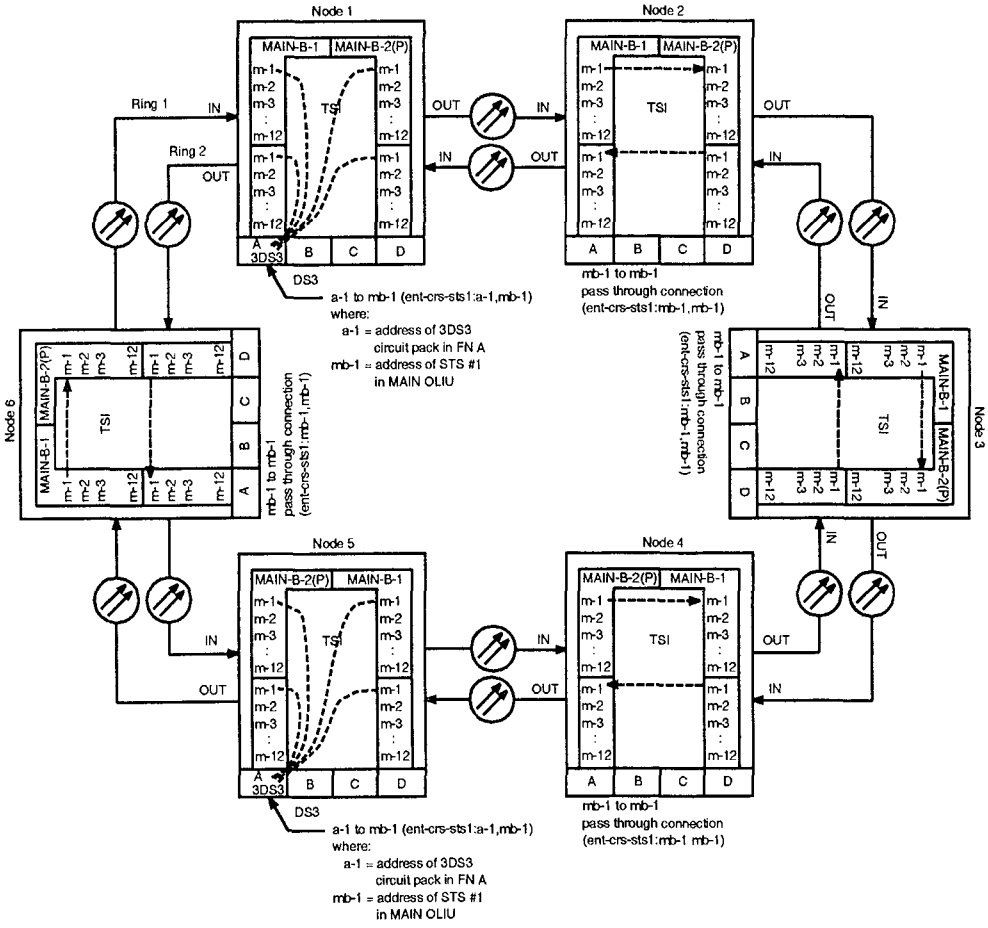


Figure 8-1. OC-12 Ring Configuration Cross-Connections — DS3 to DS3 With STS-1 Cross-Connections

5. Status and alarm conditions can be present during the provisioning operation but will clear once the last ring cross-connection for this DS3 service is completed. If they do not, the `rtrv-alm;` and `rtrv-crs-sts1;` commands can be used to isolate the problem. See the TOP section of this manual.
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-12 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-sts1` commands to test both ring paths around the ring network at the drop nodes of the new service. The `sw-path-sts1` command should be limited to the addresses that are being tested. For the example, the commands are `sw-path-sts1:mb1-1` and `sw-path-sts1:mb2-1`.

   The `rtrv-state-path` and `sw-path-sts1` commands use slightly different STS-1 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 STS-1 channel are being received on Main B-1, the active ring channel designation for the `rtrv-state-path` and `sw-path-sts1` commands will be `mb1-1`, where the `mb1` is the path received on Main B-1. If the ring path and selected STS-1 channel are being received on Main B-2, the ring channel designation for the `rtrv-state-path` and the `sw-path-sts1` commands will be `mb2-1`, where the `mb2` is the path received on Main B-2. The DDM-2000 OC-12 allows a per path designation on the `switch-path-sts1` command. This assures that only the new DS3 service being provisioned will be subject to protection switch hits. If this is not the first DS3 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 DS3 services to protection switch hits.

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 STS-1 traffic. Only the cross-connection addresses are different.

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 should be neighbors (no intermediate nodes), and all "drop and continue" traffic must be continued on the ring connecting the two nodes. If the two nodes are not "neighbors", special procedures are required at the intermediate node. See the TOP section of this manual.

In Figure 8-2 (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 used 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 3STS1E low-speed or 3DS3 circuit packs. These circuit pack types are the interface for drop and continue applications.

NOTE:
Unless you have a specific application requiring DS3 interfaces such as video or DS3 clear channel, it is recommended that dual ring interworking be done with standard SONET EC-1 interfaces. This is because incoming asynchronous DS3 failures, such as loss of signal (LOS) or alarm indication signals (AIS), at drop and continue nodes will not generate SONET STS AIS if drop and continue cross-connections are made on a 3DS3 circuit pack. As a result, path protection switching will not occur on the OC-12 ring resulting in unusable signals at the terminating end. See "OC-12 STS-1 Drop and Continue to DS3 Interfaces" in Section 2, "Applications", for an example of this application.

The cross-connection command for drop and continue at CO 1 has two parameters. They are cross-connection type (cct) and ring identification (ring). The cct is "dc" for drop and continue. The parameter ring defines the direction of the continued signal. At CO 1 the ring is "mb1", which means to continue the signal on Ring 1 toward CO 2.

Similarly at CO 2, the other drop and continue node, the cross-connection command requires the same two new parameters. The cct is "dc" and the parameter ring is "mb2", which means to continue the signal on Ring 2 toward CO 1.

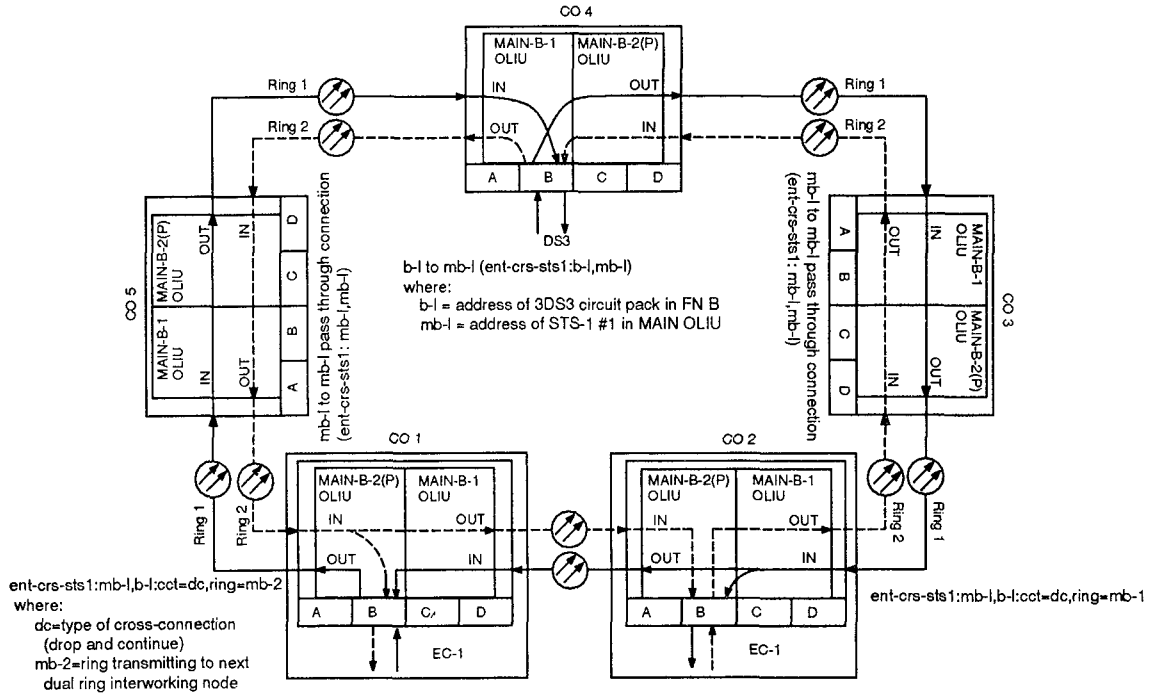


Figure 8-2. Drop and Continue Nodes

Ring Network Drop and Continue Cross-Connection Example

Figure 8-3 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 require the same release of drop and continue ring software. The two terminating nodes (CO 4 and RT2) require low-speed 3DS3 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 3STS1E low-speed circuit packs. The figure shows these connections in Function Unit B of both NEs, but any available Function Unit can be used.
4. Note in the figure the identification of Ring 1 (clockwise) and Ring 2 (counterclockwise). This identification is a key to correct provisioning and needs to be checked before cross-connections are made.
5. The work order will specify the low-speed channel of the DS3 service, the available high-speed channel on the lower ring, and the low-speed channel assigned at the drop and continue nodes. While it is not required by DDM-2000 that the low-speed channel of the drop and continue nodes be the same, it is recommended to simplify record keeping.
6. For this example, the cross-connections are:

   ent-crs-sts1:b-1,mb-1 at RT2 (twoway drop)
   ent-crs-sts1:mb-1,mb-1 at RT3 and RT1 (pass through)
   ent-crs-sts1:mb-1,b-1:cct=dc,ring=mb1 at CO 1 (lower NE)
   ent-crs-sts1:mb-1,b-1:cct=dc,ring=mb2 at CO 2 (lower NE).

   The continued signal at CO 1 must be assigned to Ring 1 ("mb1") and the continued signal at CO 2 must be assigned to Ring 2 ("mb2").
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. For this example, the cross-connections are:

   ent-crs-sts1:mb-1,b-1:cct=dc,ring=mb2 at CO 1 (upper NE)
   ent-crs-sts1:mb-1,b-1:cct=dc,ring=mb1 at CO 2 (upper NE)
   ent-crs-sts1:mb-1,mb-1 at CO 3 and CO 5 (pass through)
   ent-crs-sts1:b-1,mb-1 at CO 4 (twoway drop).

   The continued signal at CO 1 must be assigned to Ring 2 ("mb2") and the continued signal at CO 2 must be assigned to Ring 1 ("mb1").

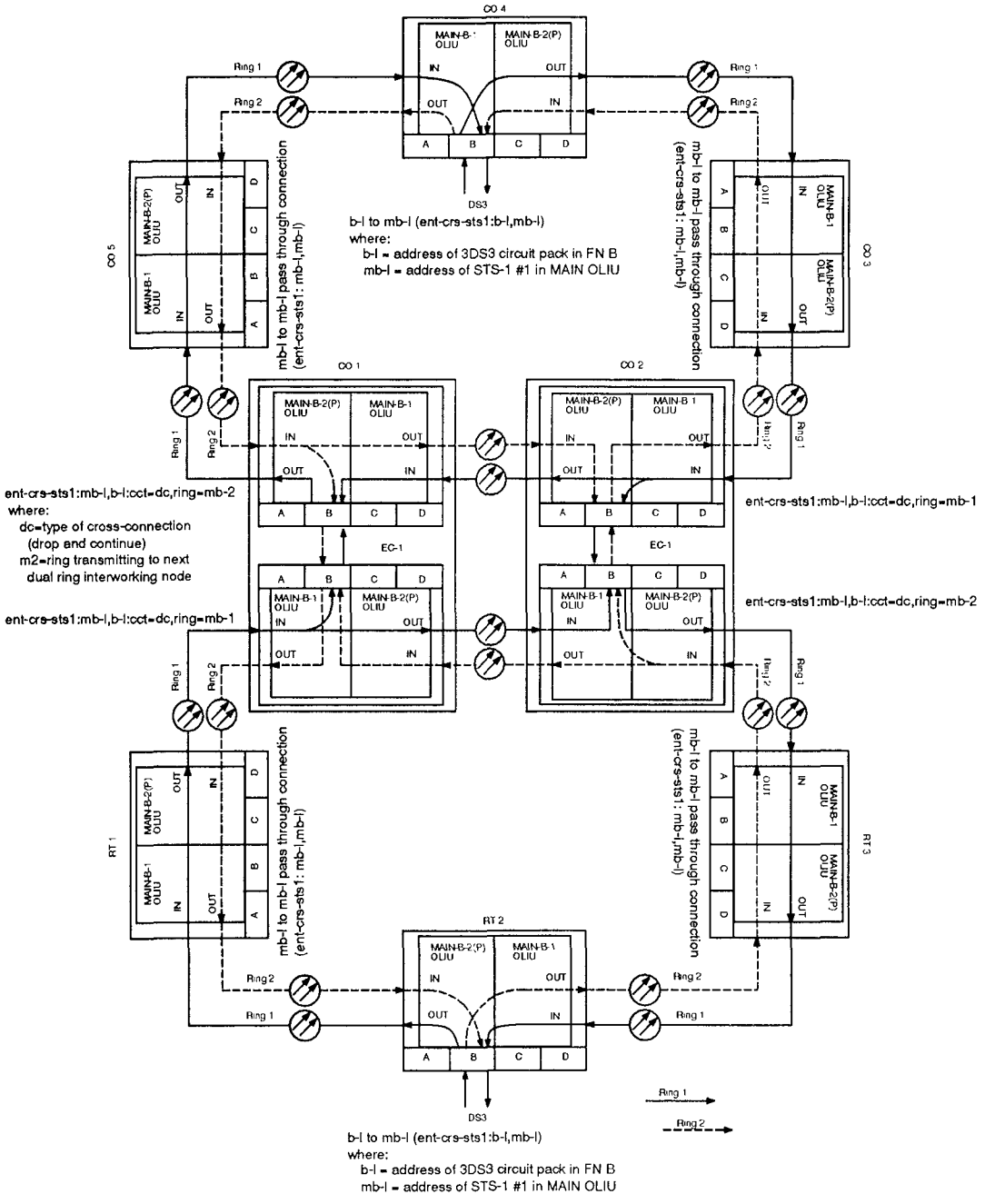


Figure 8-3. Example Dual Ring Configuration Cross-Connections

Switch Selectable Parameters

Table 8-7 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 8-8.

CIT Selectable Parameters

Table 8-8 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 8-8.

Table 8-7. Parameters Provisionable via Hardware Switches

Parameter	Range	Pack	Command (Note)
Site No. (par. telem., 7 seg. LED)	1-8 (1-32‡)	SYSCTL	rtrv-ne
Shelf No. in bay	1-8	SYSCTL	rtrv-ne
Network Element No.	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/21G-U 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)	rtrv-sync
DS1 Output	MULT/SYNC OUT	TGS (BBF2B)	rtrv-sync
DS3 LBO	2 settings (cable dependent)	DS3	
3STS1E LBO	2 settings (cable dependent)	3STS1E	

Note: Current switch settings except 3STS1E LBO, SYNC Output LBO, DS3 LBO, and TBOS termination can be reported using CIT.

* For both DS1 in and out.

† Operational only when in SYNC OUT mode.

‡ 1-32 for Release 2.1 and later linear releases and 3.0 and later ring releases.

Table 8-8. 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 No.,NE No.*	set-ne
Gateway network element	yes,no	no**	set-ne
CIT page length	3-150 rows	24	set-link
PM thresholds	See PM Table	-	set-pmthres
Alarm holdoff delay	0-30 sec	2	set-attr-alm
Alarm clear delay	0-30 sec	15	set-attr-alm
OC-3 degrade threshold	10^{-5}—10^{-9}	10^{-6}	set-oc3
OC-3 interface applications¶¶	dual 0x1	dual 0x1	set-oc3
Kbyte Messages (sync messaging)‡	enabled, disabled	enabled	set-oc3/set-oc12
Concatentation mode (STS3c or OC3c)‡	enabled, disabled	disabled	set-oc3
STS-1 signal degrade††	10^{-5}—10^{-9}	10^{-6}	set-sts1
STS-1 channel state‡‡ ¶¶	NMON, AUTO †	AUTO †	set-state-sts1
OC-12 degrade threshold	10^{-5}—10^{-9}	10^{-6}	set-oc12
DS3 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	MJ (R1.0 and 1.1) CR (R1.2 and later)	set-t3
DS3 failure threshold	10^{-3},10^{-6} BER	10^{-3}	set-t3
DS3 PM mode¶¶	off,on	on	set-t3
DS3 PM format¶¶	pbit,fmbit	pbit	set-t3
DS3 port state	NMON, AUTO†	AUTO †	set-state-t3
EC-1 alarm level ***	CR, MJ, MN, none	MJ	set-ec1
EC-1 failure threshold ***	10^{-3},10^{-6} BER	10^{-3}	set-ec1
EC-1 port state ***	NMON, AUTO†	AUTO †	set-state-ec1
Environmental alarm level	CR, MJ, MN, none	MN	set-attr-env
Environmental alarm name	26 characters	environment No.	set-attr-env
Environmental alarm type ‡‡ ¶¶	10 characters	MISC	set-attr-env
Control point name	26 characters	control No.	set-attr-cont
Far end communication‡	enabled, disabled	enabled	set-fecom‡
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‡

See notes and footnotes at end of table.

Table 8-8. Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
SYNC mode switching	revertive, nonrevertive	revertive	`set-sync`
DS1 Output Source (linear) (SYNC OUT mode)	main-b-track§, main-b-1, main-b-2	main--b-track	`set-sync`
DS1 Output Source (rings) (SYNC OUT mode)	main-b-1, main-b-2	main-b-1	`set-sync`
Sync Timing Source (linear)¶	main-b	main-b	`set-sync`
Sync Timing Source (rings)¶	main-b-1, main-b-2	main-b-1	`set-sync`
Sync Output Mode (linear)¶	track§, lock1, lock2	track	`set-sync`
Auto. Synch. Reconfig.§§	enabled, disabled	disabled	`set-sync`
Feature Packaging ‡ OC-3c (STS3C)	enabled, disabled	disabled	`set-feat`
NSAP			
OrganizationID (Operator ID)	6 hex digits	000000	`ent-ulsdcc`
Reserved (Reserved)	4 hex digits	0000	`ent-ulsdcc`
Routing Data (Domain/Area)	8 hex digits	00000000	`ent-ulsdcc`

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 No. is the value set by the switches on the SYSCTL and OHCTL circuit packs.

† AUTO means the port or channel is ready to be automatically provisioned via signal detection.

‡ This command is restricted to privileged users only.

§ Track means the source for timing will be selected from the active received optical line specified.

¶ Setting this parameter also affects DS1 output source and sync output mode. See `set-sync` command in Section 11, Commands and Reports.

** One and only one shelf in a maintenance subnetwork must be set to "yes" for proper DCC communications.

†† Release 3.0 and later.

‡‡ Release 2.2 and later linear releases.

§§ Release 3.0 and later ring releases.

¶¶ Release 3.1 and later ring releases.

*** Release 2.1 linear, 3.0 ring and later releases.

Identifiers

The following identifiers (ID) are used for the shelf, site, network element (NE), target (TID), network services access point (NSAP) address, and gateway network element (GNE):

- **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 (1 to 32 for Release 2.1 and later linear releases and 3.0 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 larger than 8, the 7-segment display displays a dash. The site ID, along with the shelf ID, uniquely identifies each DDM-2000 shelf served by a common telemetry byte-oriented serial (TBOS) port with a telemetry remote. The same site ID should be assigned to all shelves in the same bay or cabinet. If parallel telemetry is used, the CO site should be assigned as site 7 and the remote sites should be assigned consecutively numbers 1 through 6.

  Although 10 sites are possible, only site addresses 1 through 8 are supported **prior** to OC-12 Release 2.1 (linear) and OC-12 Release 3.0 (ring). For releases prior to OC-12 Release 2.1 (linear) or Release 3.0 (ring), 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 settings in the same maintenance subnetwork. Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are not used prior to OC-12 Release 2.1 (R3.0) and must be set to the **ON** position. Although site addresses 1 through 32 are supported for OC-12 Release 2.1 (linear) and OC-12 Release 3.0 (ring), or later, only 10 site addresses (for example 1, 10, 20, and 30) may be chosen out of the 32 possibilities. 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 settings in the same maintenance subnetwork.
- **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 maintenance 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 maintenance subnetwork at each site.

Therefore, all the shelves in the maintenance 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 maintenance 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 establish a remote login session. The TID is also used by an OS such as the 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 served by a common NMA. Therefore, the default TID must be changed using the `set-ne` command to a 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 maintenance 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.

- **GNE:** 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.

Performance Monitoring Parameters

Table 8-9 describes the performance monitoring parameters provisionable via the CIT.

Table 8-9. 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)	enabled/disabled	enabled/disabled	sect
OC-12 Optics	Laser Bias Current*	enabled/disabled	enabled/disabled	sect
OC-3 Section	SEFS	1-63[10]	1-4095[30]	sect
OC-12 Section	SEFS	1-63[10]	1-4095[30]	sect
OC-12 Line	B2 Coding Violations (CV)	1-55365[5537]	1-5315040[531504]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	(1-255)[4]	line
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
STS-1 Path	B3 Coding Violations (CV)	1-4510[451]	1-432960[43296]	stsl
	B3 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	stsl
	B3 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	stsl
	B3 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	stsl
	B3 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	stsl
	B3 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	stsl

See footnotes at end of table.

Table 8-9. Performance Monitoring Parameters Provisionable via the CIT (Contd)

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres
DS3	P-bit Error Counts	1-4026[403]	1-386500[38650]	t3
	SEFS	1-63[10]	1-4095 [30]	t3
DS3 Path †	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[10]	1-4095[40]	t3
	UAS-P Unavailable Seconds	1-63[10]	1-4095[10]	t3
	SEFS	1-63[10]	1-4095[30]	t3

* Threshold is set once for both current quarter-hour and current day.

† Release 3.1 and later releases.

OC-12 Regenerator

Provisioning

For the OC-12 Regenerator, the BBG5 SYSCTL option switches are set the same as for the DDM-2000 OC-12 Multiplexer except for the following:

- The telemetry byte-oriented serial (TBOS) CO/RT select switch should be set to CO.
- The remote TBOS switch should be set to OFF. See the TOP section of this manual for provisioning details.

Table 8-10 lists the OC-12 Regenerator parameters provisionable by the CIT.

Table 8-10. OC-12 Regenerator 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	SiteXNEY*	`set-ne`
CIT page length	3-150 rows	24	`set-link`
Alarm holdoff delay	0-30 sec	2	`set-attr-alm`
Alarm clear delay	0-30 sec	15	`set-attr-alm`
OC-12 (REGENR) degrade threshold	10^{-5}—10^{-9}	10^{-6}	`set-ocl2`
Gateway NE (gne)	yes, no	yes†	`set-ne`

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 X is the value of Site switches; Y is the Network Element switch setting. For example, Site3NE5.

† One and only one shelf in a maintenance subnetwork must be set to "yes" for proper DCC communications.

Table 8-11 lists the OC-12 Regenerator performance monitoring parameters provisionable by the CIT.

Table 8-11. OC-12 Regenerator Performance Monitoring Parameters Provisionable Via the CIT

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres-
OC-12 Optics	Laser Bias Current *	enabled/disabled	enabled/disabled	sect
OC-12 Section †	SEFS	1-63[10]	1-4095[30]	sect
OC-12 Line †	B2 Coding Violations (CV)	1-55365[5537]	1-5315040[531504]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line

* Threshold is set once for both current quarter-hour and current day.

† Release 2.0 (23R-U REGENR).

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-12 Multiplexer and the OC-12 Regenerator. Specific trouble clearing and maintenance procedures are provided in the operation and maintenance (TOP) section of this manual.

Three-Tiered Maintenance

The DDM-2000 OC-12 Multiplexer maintenance procedures are built on three levels of system information and control, spanning operations needs from summary-level status to detailed reporting. Three-tiered maintenance is shown in Figure 9-1.

The first maintenance 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 maintenance tier uses the CIT. Detailed information and system control can be obtained through a terminal or *MS-DOS** personal computer (PC) both locally and remotely. Command mode and menu-driven prompt mode are available.

* Registered trademark of Microsoft Corporation

The third tier consists of the remote operations system (OS) interfaces. These OS interfaces include parallel telemetry, telemetry byte-oriented serial (TBOS), and TL1/X.25 interfaces.

The CIT interface supports provisioning, maintenance, configuration, administration, and performance-monitoring activities from one centralized location.

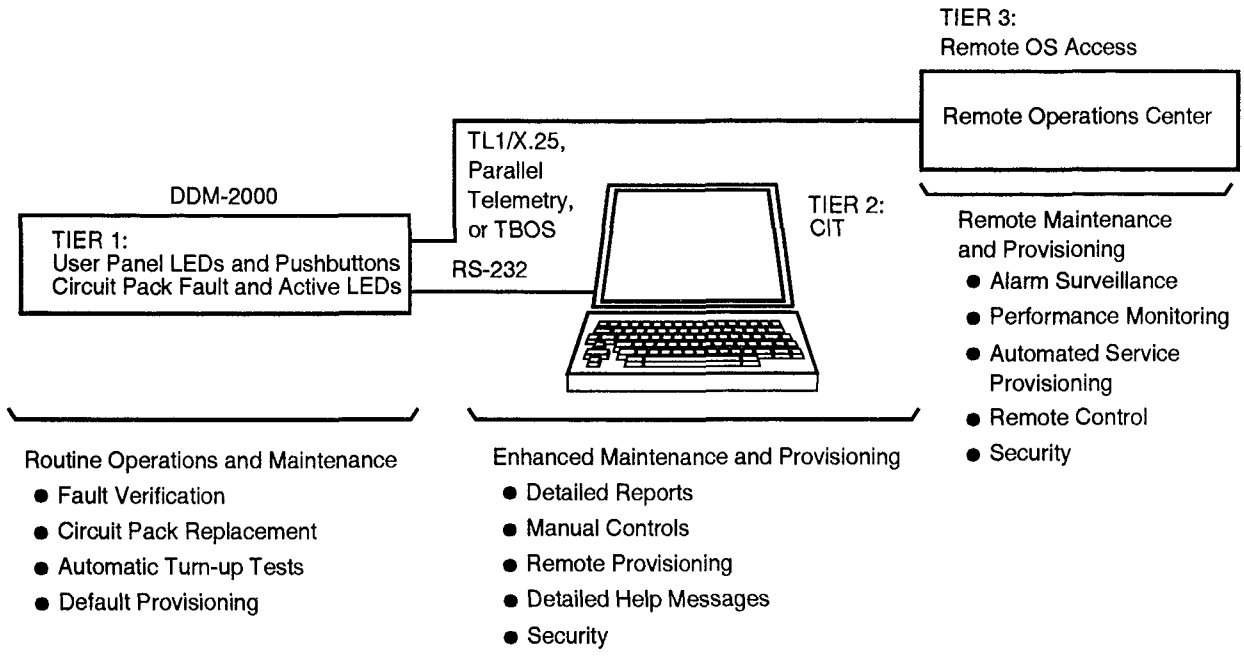


Figure 9-1. Three-Tiered Maintenance

Single-Ended Maintenance Philosophy

As a loop-optimized product, the DDM-2000 OC-12 Multiplexer allows operation and maintenance of all remote systems in an OC-12 or OC-3/OC-12 Multiplexer maintenance subnetwork from the central office shelf. A maintenance 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-12 Multiplexer, as well as with other remote sites in the same maintenance subnetwork. The DDM-2000 OC-12 Multiplexer uses the SONET DCC to provide craft interface terminal remote access, user panel remote access, and operations systems remote access. Release 2.0 of the DDM-2000 OC-12 Multiplexer introduces the international standards organization (ISO) compliance open systems interconnection (OSI) protocol for communicating between DDM-2000 shelves over the DCC.

Single-Ended Operations

The single-ended operations (SEO) capability that provides remote access to all DDM-2000 systems in a maintenance subnetwork from a single location is shown in Figure 9-2 (maintenance subnetworks must be logged into individually for maintenance purposes). The ability to do many maintenance, provisioning, and administration tasks on a remote or centralized basis minimizes technician travel.

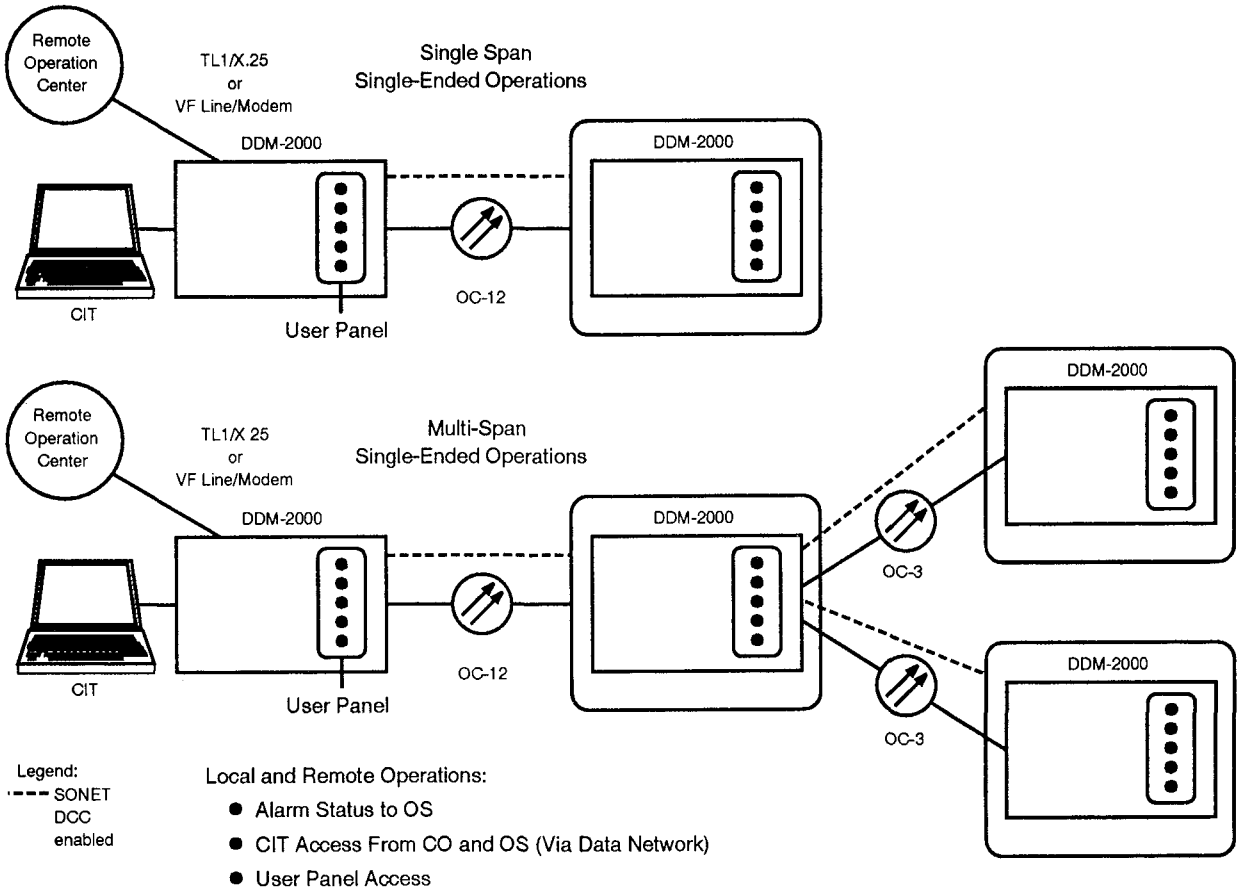


Figure 9-2. Single-Ended Operations

Tables 9-1 and 9-2 list the maximum number of DDM-2000 network elements (NEs) that each software release can support in a single maintenance 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 maintenance subnetwork contains more than 8 NEs, see Section 8, "Administration and Provisioning," for information on assigning Site IDs and NE IDs. Note that the DDM-2000 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
Number of NEs	5	8	10	10	10	12	10	16

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-12 Multiplexer that can be directly upgraded inservice. Specific procedures for upgrades are provided in the TOP section of this manual. Remote upgrades from pre-OSI releases to OSI releases are not allowed. All DDM-2000 OC-12 shelves in a maintenance subnetwork should be using the same version of software.

For Release 3.0 and later ring releases, the BCP1 overhead controller (OHCTL) circuit pack must be Series 2:5 or later.

If you have BCP1 OHCTL circuit packs with earlier vintages than Series 2:5 and you plan to upgrade to ring releases, you should upgrade the BCP1 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 CCN N41017-MV"

Table 9-3. DDM-2000 OC-12 Inservice Upgrade Compatibility (Note)

	Upgrade to*					
Current Release	1.2.n	2.0.n	2.1.n	2.2.n	3.0.n †	3.1.n ‡
1.1.n	X	NS	NS	NS	NA	NA
1.2.n	X	S	S	S	C	C
2.0.n	NA	X	U	U	C	C
2.1.n	NA	NA	X	X	C	C
2.2.n	NA	NA	NA	X	C	C
3.0.n †	NA	NA	NA	NA	X	U
3.1.n ‡	NA	NA	NA	NA	NA	X

Note
All DDM-2000 OC-12 shelves in a maintenance subnetwork should be using the same version of software. "n" is the latest point release available.
Remote upgrades from pre-OSI releases to OSI releases, are not allowed.

NS Not supported.

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 for upgrade procedures.

X Requires software download only to upgrade the system.

C Requires an upgrade procedure with on-site equipment/fiber changes as well as software download to upgrade the system. Additional changes to software and equipment provisioning may be needed to use features of the new release. See TOP section of this manual for upgrade procedures.

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 for upgrade procedures.

* When doing an upgrade, it is recommended that the latest point release of software be used, if possible.

† Release 3.0 only supports electrical (EC-1 and DS3) interfaces.

‡ Optical OLIUs in Function Unit slots can not be upgraded inservice.

OSI Upgrades

For Release 2.0 and later OSI releases, the electrically erasable programmable read-only memory (EEPROM) on the BCP1 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. BCP1 OHCTL circuit packs Series 2:3 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 2.0 to other OSI releases, a special procedure is required. See the TOP section of this manual.

NOTE:
If you download Release 2.0 and later releases to a system that has an OHCTL circuit pack Series 2:3 or earlier, 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 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 maintenance subnetwork must be running either pre-OSI or OSI software. If pre-OSI and OSI software are mixed un the same maintenance subnetwork, there will be no alarm reporting, no protection switching, and no CIT communications.

If the shelves are using OSI software, one shelf and only one shelf in the maintenance 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 for provisioning procedures.

DDM-2000 OC-12 and OC-3 Software Compatibility

Table 9-4 lists the software compatibility within a maintenance subnetwork for the DDM-2000 OC-3 and OC-12 Multiplexers. All configurations listed support single ended operations (SEO). The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-4. 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.
6.1.n and 6.2.n	2.1.n and 2.2.n	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	Supports OSI interworking.
7.0.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.n	3.1.n	21D/21D-U‡, 22-type† or 21G/21G-U OLIU	Supports OC-12 STS-1/VT1.5 path switched ring (dual 0x1).

Note: All NEs in a ring network, which may be part of a larger network, must be running the same software. Similarly, all NEs in a linear network, which may be part of a larger network, must be running the same software. In a maintenance 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 must be used in DDM-2000 OC-12 shelves.

† The 22F, 22G-U, and 22D-U 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 higher. The 22F, 22G-U, and 22D-U 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 higher. 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 higher.

Table 9-5 lists the ring and linear software compatibility for the DDM-2000 OC-3 Multiplexers. All configurations listed support single ended operations (SEO). The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-5. 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 OLIUs	Supports OC-3/IS-3 interworking between OC-3 ring and linear networks.

* Requires 22-type OLIUs in Main and Function Unit slots for DDM-2000 OC-3 ring shelves.

Table 9-6 lists the dual ring interworking (DRI) software compatibility for the DDM-2000 Multiplexers using EC-1 interfaces. DRI can also be done within the same product line; for example, DDM-2000 OC-3 Release 7.0 to DDM-2000 OC-3 Release 7.0.

Table 9-6. DDM-2000 DRI Software Compatibility (EC-1 Interfaces)

Release	Release
OC-3 Release 7.1	OC-12 Release 3.1
OC-3 Release 7.1	FT-2000 Release 4.1
OC-12 Release 3.1	FT-2000 Release 4.1

OC-12 Regenerator Operations and Maintenance

The following paragraphs provide operations and maintenance information for the OC-12 Regenerator. Specific trouble clearing and maintenance procedures are provided in the task oriented practice (TOP) section of this manual.

Figure 9-3 shows the OC-12 Regenerator interfaces. Operations and maintenance of a system with OC-12 Regenerators are similar to that of a point-to-point DDM-2000 OC-12 Multiplexer system. Since the OC-12 Regenerator accesses only the physical layer of the SONET signal, maintenance is simplified compared to the DDM-2000 OC-12 Multiplexer. Both local and remote maintenance of the OC-12 Regenerator are possible. As with the DDM-2000 OC-12 Multiplexer, local maintenance is provided by the circuit pack LEDs, the user panel, office alarms, and CIT access.

Since an OC-12 Regenerator site is not intended as a centralized network maintenance and operations center, the FE ACTY LED and the FE SEL pushbuttons are not operational.

An OC-12 Regenerator shelf can be maintained by remoting serial or parallel telemetry information. In addition, a modem can be connected to the rear access CIT port to provide remote CIT dial-up.

The OC-12 Regenerator uses the SONET optical performance parameters to detect local circuit pack failures as well as incoming signal failures. An OC-12 Regenerator circuit pack failure causes the FAULT LED on the failed circuit pack to light, as well as the NE ACTY LED and the critical alarm on the user panel. The appropriate office alarm will be activated, and the failure reported to the message-based operations system (OS) via the telemetry byte-oriented serial (TBOS) or parallel telemetry interface.

Incoming loss of signal (LOS) or alarm indication signal (AIS) are detected at the OC-12 Regenerator and cause the FAULT LED on the affected circuit pack to flash. The LOS and AIS are passed through the OC-12 Regenerator transparently and are detected and alarmed at the downstream terminal multiplexer. The terminal multiplexer performs the line protection switching if required. The OC-12 Regenerator does not insert line AIS, since it only accesses the physical layer of the OC-12 signal. Also, since the OC-12 signal is passed through the OC-12 Regenerator transparently without accessing the SONET overhead, the DCC bytes are not processed.

For OC-12 Regenerator Release 2.0 (23R-U REGENR circuit pack), BIP-8 errors (BIP-8 is part of the SONET line overhead) are detected at each OC-12 Regenerator and used to produce counts of BIP-8, errored seconds, and severely errored seconds for each 15-minute interval. Along with current and previous day counts, 15-minute counts are stored for the last 8 hours. Threshold crossing alerts (TCAs) can be defined for each of these counts and used to detect degraded signal conditions. This performance monitoring information can be retrieved by the OS or remote dial-up. TCAs are automatically passed to the OS over the TBOS or TL1/X.25 (Release 2.0) telemetry link.

Fault isolation can be performed manually by determining which sites have reported LOS, AIS, or circuit pack failure. For example, if an OC-12 Regenerator detects LOS or AIS, but no upstream circuit pack failures are reported, the failure is likely caused by a cable cut.

Regenerator circuit packs cannot be individually looped back on themselves since they require a valid incoming OC-12 optical signal from the DDM-2000 OC-12 Multiplexer.

Optical span tests between DDM-2000 OC-12 Multiplexers and OC-12 Regenerators are done at the OC-12 Regenerator site by looping each optical span from the receiving OC-12 Regenerator in one direction to the transmitting OC-12 Regenerator in the other direction. See the TOP section of this manual.

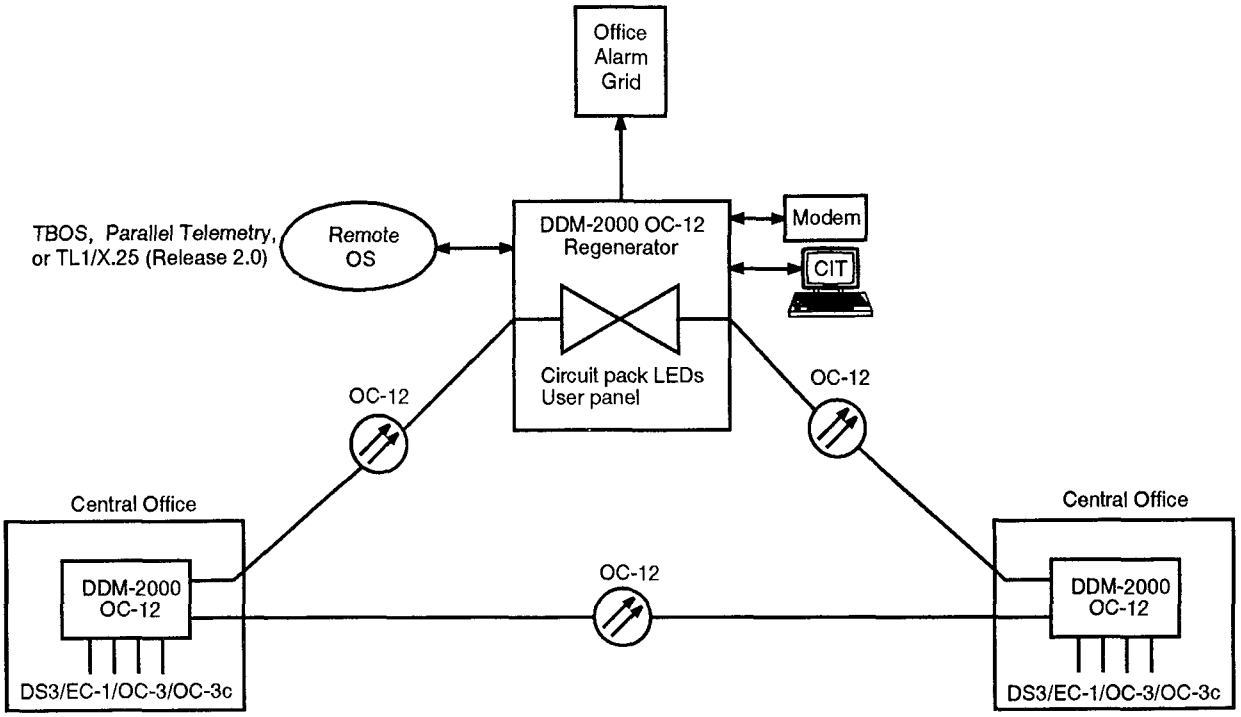


Figure 9-3. OC-12 Regenerator — Operations Interfaces

DDM-2000 OC-12 Multiplexer Maintenance Signaling

The DDM-2000 OC-12 Multiplexer provides maintenance signaling compliant with the SONET standard (TR-253). The DDM-2000 OC-12 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
- DS3 AIS.

The DDM-2000 OC-12 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.

Figure 9-4 is an example of the AIS, yellow, and FERF signals generated in response to an unprotected incoming OC-12 line failure.

Figures 9-5 and 9-6 illustrate the maintenance signals used by the DDM-2000 OC-12 Multiplexer for non-ring applications. In these figures, the labels on the arrows pointing into the DDM-2000 OC-12 Multiplexer indicate the maintenance signals and failure conditions recognized by the DDM-2000 OC-12 Multiplexer. The labels on the arrows pointing out of the DDM-2000 OC-12 Multiplexer indicate the signals generated by the DDM-2000 OC-12 Multiplexer in response to the indicated incoming signals or failure conditions. The Xs indicate points of failure, either within the DDM-2000 OC-12 Multiplexer or in upstream equipment. Unlabeled arrows indicate normal transmission.

Figure 9-7 shows maintenance signals used by the DDM-2000 OC-12 Multiplexer in an STS path switched ring application.

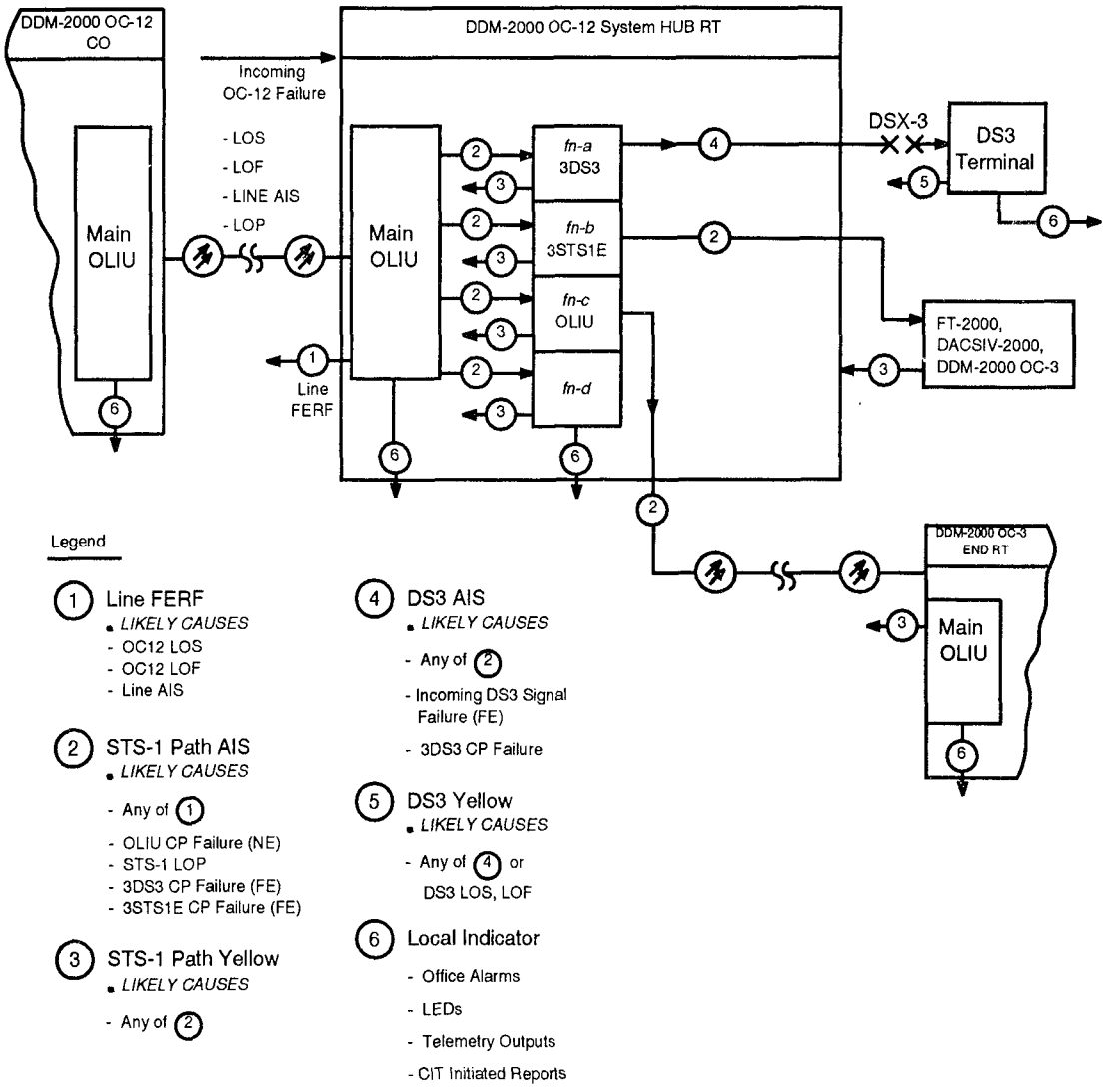


Figure 9-4. Example of Main Signal as a Result of Unprotected Incoming OC-12 Failure

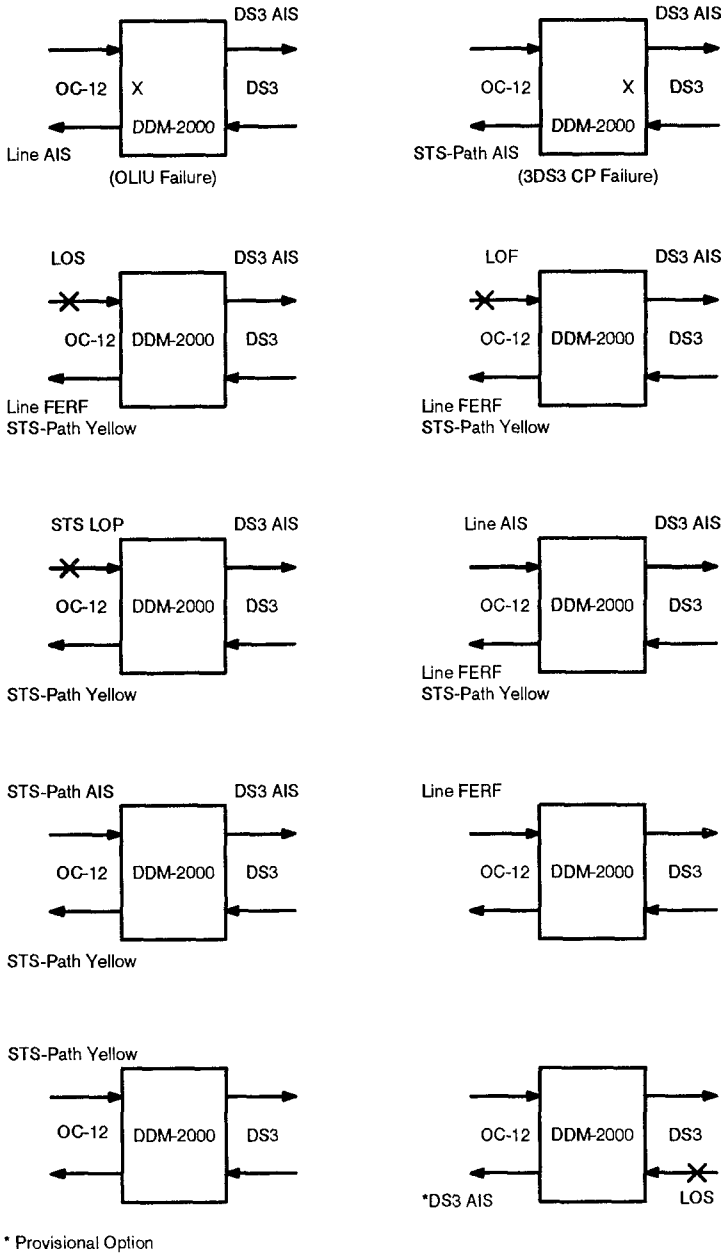


Figure 9-5. DS3 Maintenance Signaling — Non-Ring Applications

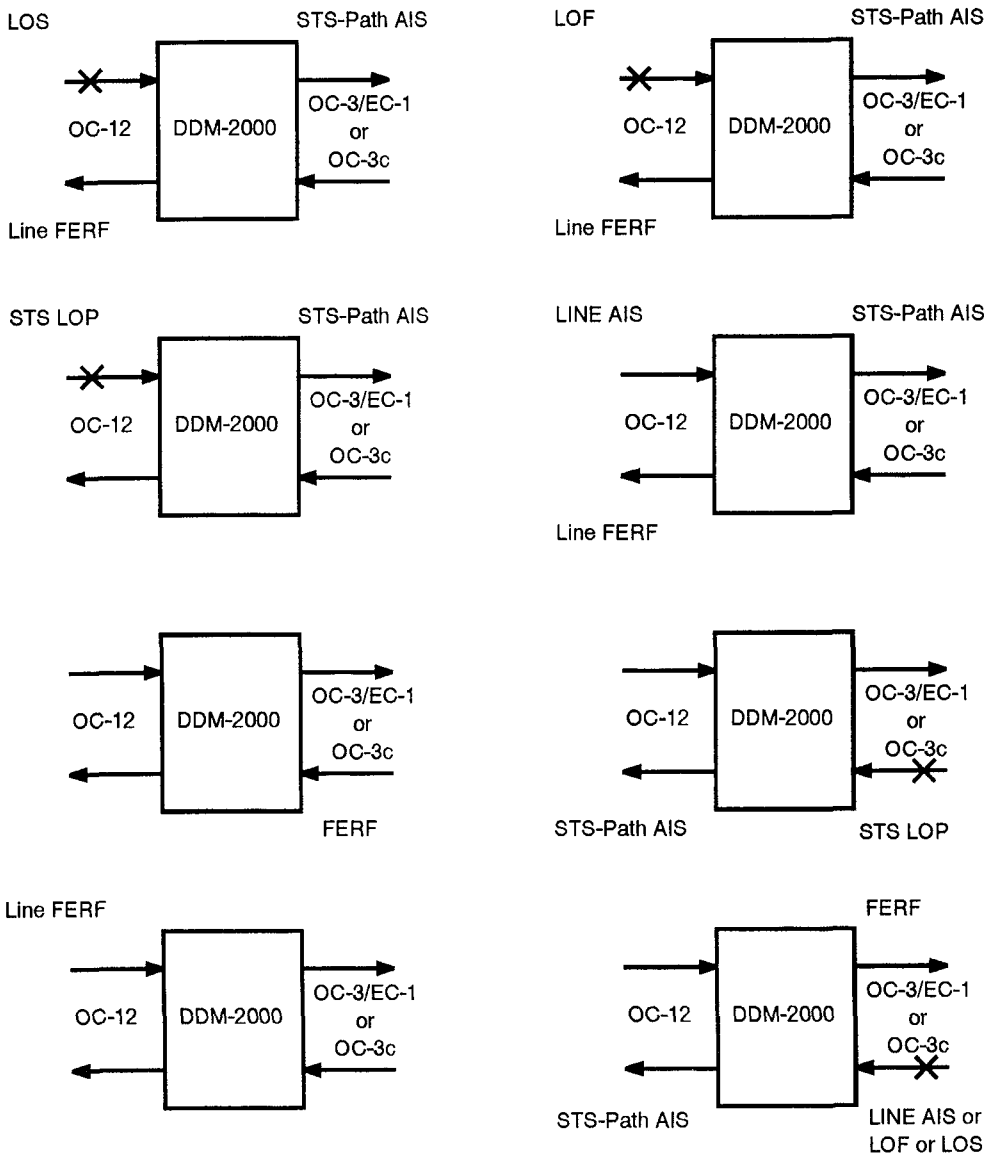
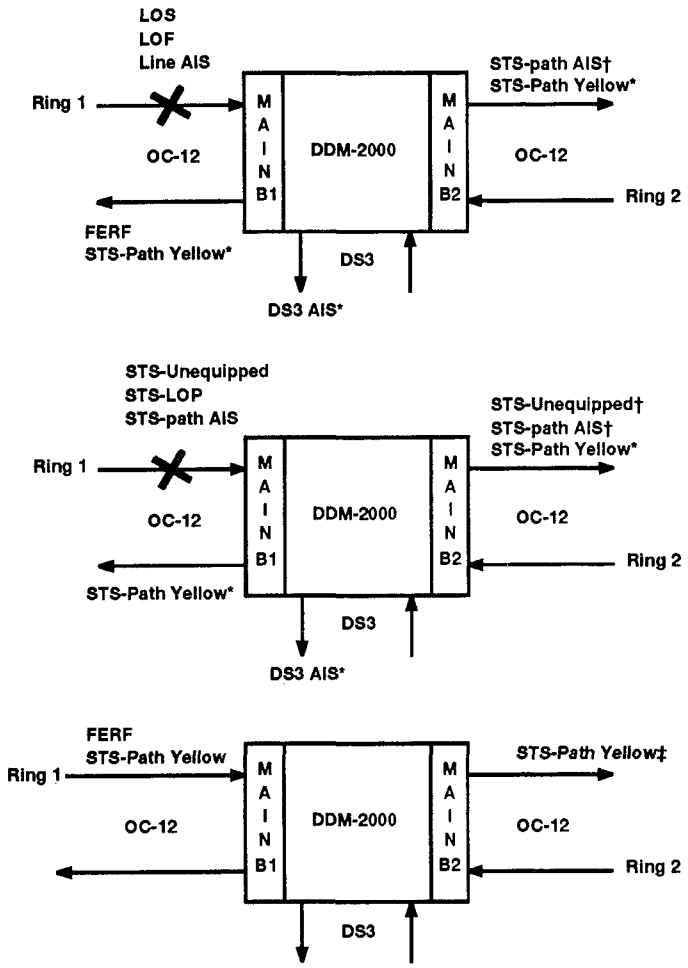


Figure 9-6. SONET OC-3/OC-3c/EC-1/OC-12 Line Maintenance Signaling — Non-Ring Applications



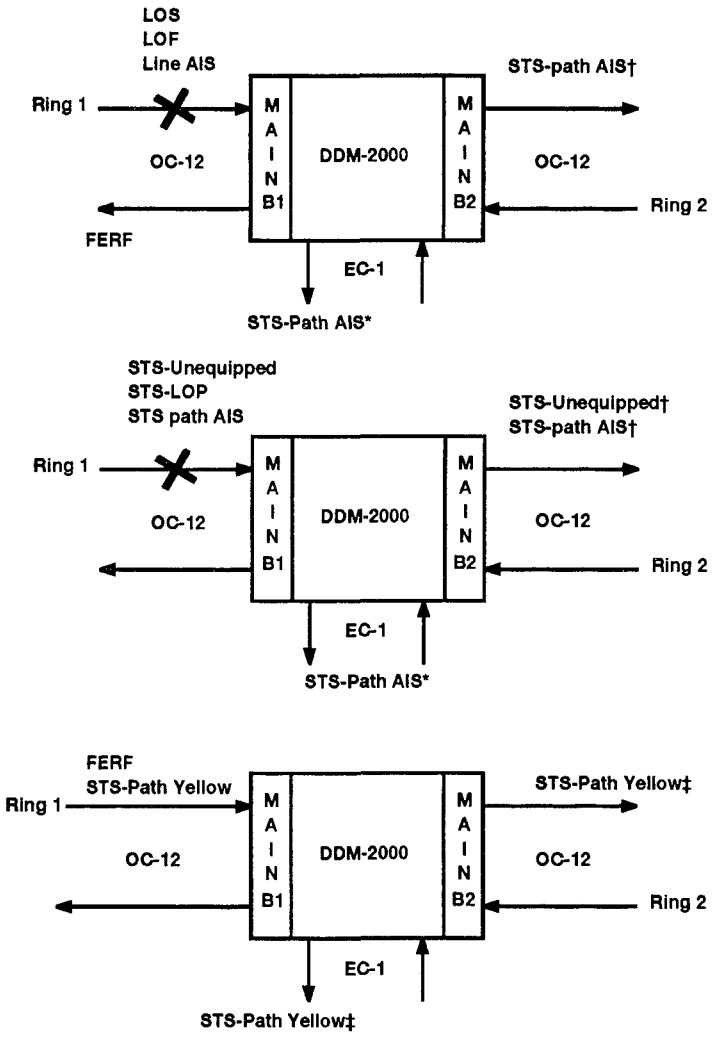
* **STS-path yellow, DS3 AIS and STS-path AIS are sent on STS-1 paths selected from the failed ring (ring 1)**

† **STS-path AIS is sent on pass-through and continue paths only**

‡ **STS path yellow appears on pass-through and continue paths only**

§ **STS path yellow is passed to the EC-1 or OC-12 interface depending on whether the STS-1 path is a drop or pass-through connection**

Figure 9-7. Line Maintenance Signaling — Path Switched Ring Applications (Sheet 1 of 2)



* **STS-path yellow, DS3 AIS and STS-path AIS are sent on STS-1 paths selected from the failed ring (ring 1)**

† **STS-path AIS is sent on pass-through and continue paths only**

‡ **STS path yellow is passed to the EC-1 or OC-12 interface depending on whether the STS-1 path is a drop or pass-through connection**

Figure 9-7. Line Maintenance Signaling — Path Switched Ring Applications (Sheet 2 of 2)

DDM-2000 OC-12 Multiplexer Fault Detection, Isolation, and Reporting

Detection

The DDM-2000 OC-12 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 DS3 signals are monitored for LOS and BER thresholds. 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-12 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-12 Multiplexer also stores a history of the past 500 (60 in Release 1.0) 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-12 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."

DDM-2000 OC-12 Multiplexer Protection Switching

The DDM-2000 OC-12 Multiplexer provides equipment protection switching of all transmission and synchronization circuit packs and uses SONET standard automatic protection switching for the OC-3 and OC-12 lines. Installation of protection switching equipment is optional. Protection switching occurs in response to automatically detected faults in the circuit packs or OC-3 and OC-12 lines as well as external commands from a technician at a local/remote CIT or TBOS or TL1/X.25 message-based OS interface. The DDM-2000 OC-12 Multiplexer uses SONET protection switching priorities for all transmission protection groups. Refer to the `switch-line`, `switch-fn`, `switch-sync`, and `switch-tsi` commands in Section 11, "Commands and Reports."

Automatic Line Protection

The DDM-2000 OC-12 Multiplexer uses the optional SONET 1+1 unidirectional nonrevertive automatic 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.

Status of ACTIVE LED on OLIUs

Figure 9-8 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 9-8(a) and 9-8(b) are associated with the Service (S) OLIU and Figures 9-8(d) and 9-8(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 9-8(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 Figure 9-8(a) 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 9-8(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 **will not** switch back (revert) and select the service set as its active fiber/OLIU set. This example, Figure 9-8(c), illustrates the SONET standard of nonrevertive APS.

Figures 9-8(d) and 9-8(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-12 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.

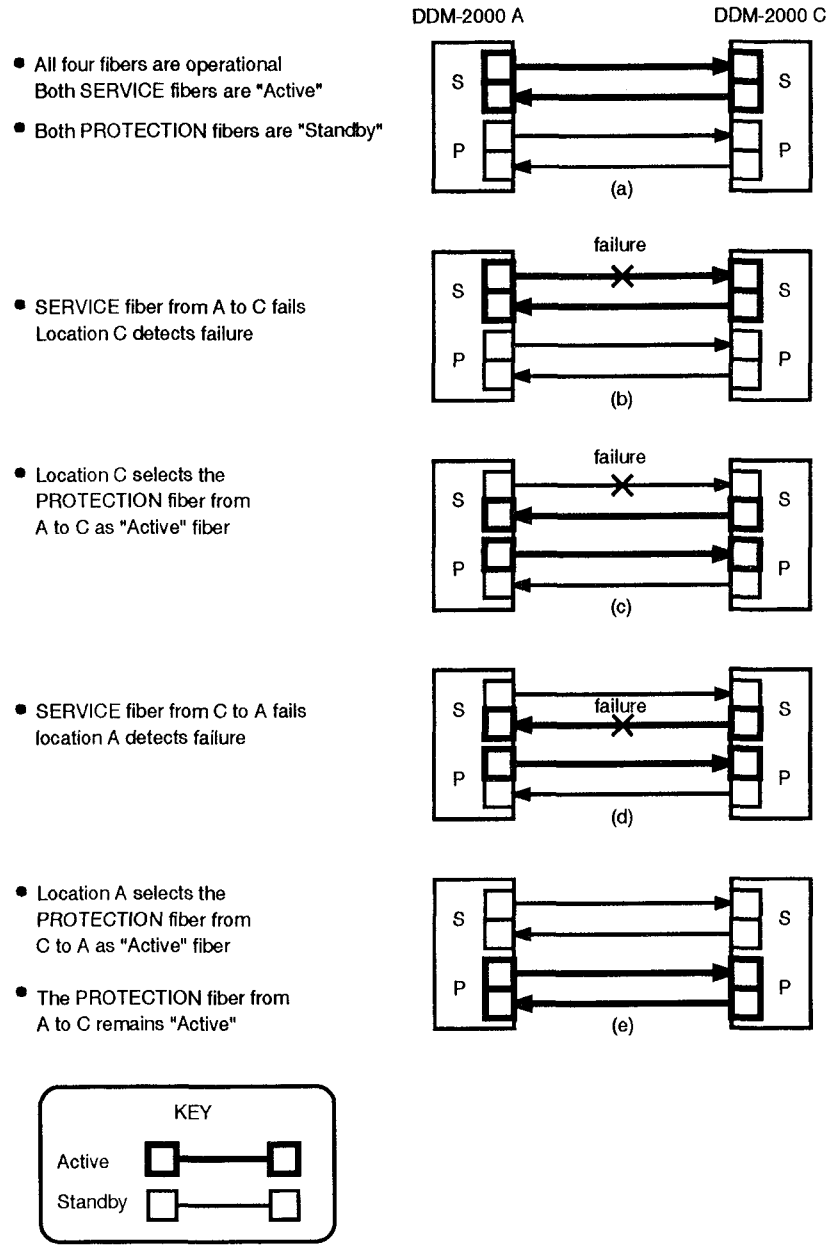


Figure 9-8. Unidirectional Line Protection Switching

Equipment Protection

The 3DS3, 3STS1E, TSI (BCP2 and BCP3), and TGS circuit packs are 1x1 protected and use nonrevertive switching. Green ACTIVE LEDs are provided on the faceplates of these circuit packs to indicate which circuit packs are active (carrying service).

Synchronization Reference Protection

In external timing and loop timing modes, the synchronization references are 1x1 protected. If neither reference is available, the system automatically switches to "holdover" timing mode.

When the TGS is provisioned for synchronization messaging (Release 2.0 and later linear releases and 3.0 and later ring releases), the system can determine the quality of the loop timing references by reading the synchronization messages in the OC-12 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 (Release 3.0 and later ring releases), 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."

Path Protection Switching (Path Switched Rings)

The path switched ring application is based on the Bellcore TR-TSY-000496 path protection switching scheme.

The path protection switched ring has two single-fiber, counter-rotating rings as shown in Figure 9-9. 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 DDM-2000 OC-12 ring provides STS-1 path protection switching to support DS3 and EC-1 interfaces.

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.

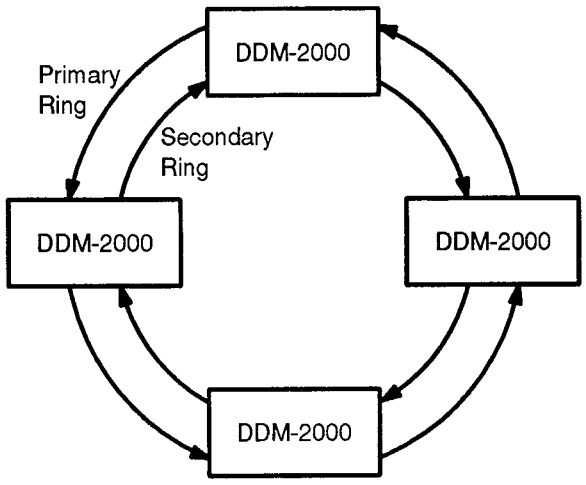


Figure 9-9. Two-Fiber Unidirectional Ring

Path Protection Scheme

Path protection rings feed a SONET payload (STS) from the ring entry point, simultaneously in both rotations of the ring, to the signal's ring exit point as shown by traffic AC and CA in Figure 9-10a. This duplication of the signal that enters the ring is called a "head-end bridge." The node that terminates the signal from the ring monitors both ring rotations and is responsible for selecting the signal that has the highest quality based on LOS/LOF, path alarm indication signal (AIS), path unequipped (Release 3.1 and later ring releases) and path bit error ratio (BER) performance. This function at the ring exit point is called a "tail-end switch." On pass-through paths, all detected hard failures [LOS, LOF, LOP, line AIS, STS-1 path AIS, and STS unequipped (Release 3.1 and later ring releases)] result in AIS insertion in the outgoing signals. This allows the terminating node to detect path failure and to switch to protection.

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 9-10b shows how traffic is switched when a dual-fiber cut occurs. Release 3.0 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` command in Section 11, "Commands and Reports."

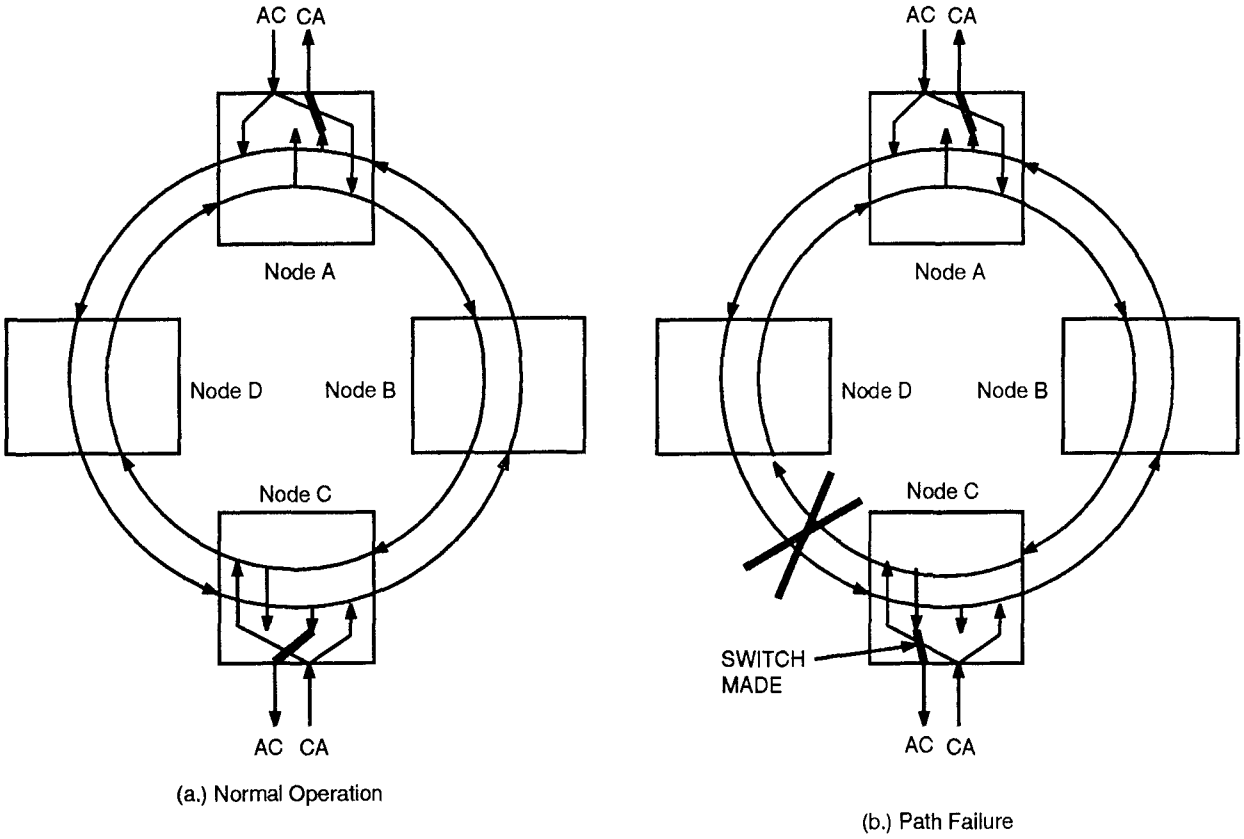


Figure 9-10. Path Protection Switching

Dual Ring Interworking Path Protection Scheme

Interconnected rings or dual ring interworking (DRI) is a topology that connects two rings together at two geographically separate nodes to provide an alternate route if a catastrophic failure occurs at one of the interconnecting nodes. See Section 2, "Applications", for more information on DRI. Figure 9-11 shows DRI path protection switching. 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 to the Function Unit 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 9-11.

This routing is to only one rotation or "disabled bridge" as distinguished from how an ordinary path switched ring bridges incoming low-speed traffic onto both rotations.

The drop and continue disabled bridge routing necessary for DRI is established with a time slot provisioning command.

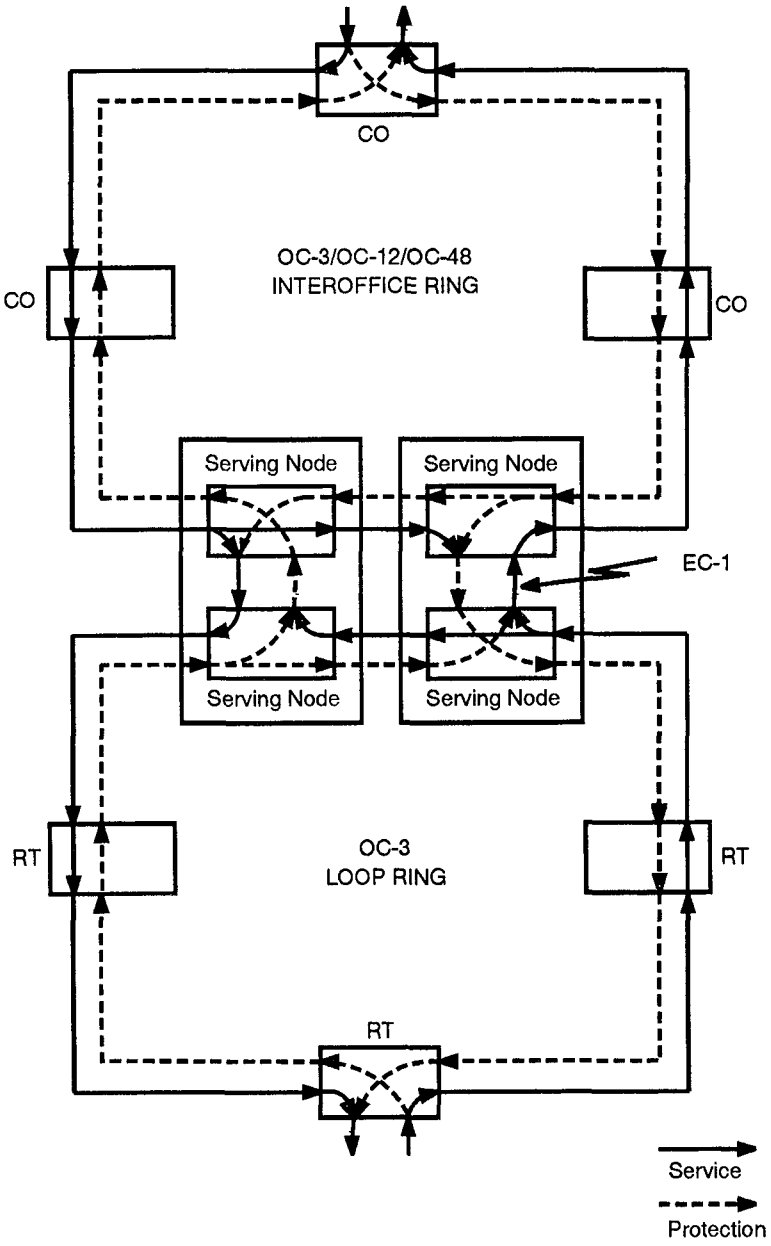


Figure 9-11. DRI Path Protection Switching

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

The OC-12 STS-1/VT1.5 path switched ring application, also referred to as dual 0x1, consists of an OC-3 ring shelf with Release 7.1 software with VT1.5 or STS path protection switching that connects to an OC-12 ring shelf with 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. The application is referred to as dual 0x1 since two service (no protection) lines are used on the OC-12 ring.

Status of ACTIVE LED on Rings

In 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.

DDM-2000 OC-12 Multiplexer Loopbacks

The DDM-2000 OC-12 Multiplexer allows technicians to perform loopbacks on all low-speed DS3 interfaces. Low-speed DS3 electronic loopbacks, directed toward the high-speed OC-12, are individually controllable from the CIT. Active electronic loopbacks are noted by the user panel's abnormal (ABN) indicator and in the alarm and status report.

Front access to the OLIU optical connectors allows an easy manual OC-3 and OC-12 optical loopback. This loopback is performed by connecting a fiber jumper from the OLIU output to its input. On the 21D/21D-U and 21G/21G-U OLIUs, no optical attenuator is required for this loopback. However, the optical output power switch on the 21G/21G-U OLIU circuit pack must be set for low output power to prevent receiver overload when an optical loopback is set up. On the 23G/23G-U OLIU, an external optical attenuator is required to prevent receiver overload during manual optical loopback.

Electronic STS-1 loopbacks are provided to loop each of the three internal STS-1 signals back toward the transmit fiber. These can be used to test a new span being added to a hub or add/drop network. See the `opr-lpbk-ecl` and `rls-lpbk-ecl` commands in Section 11, "Commands and Reports".

DDM-2000 OC-12 Multiplexer Tests

Transmission Tests

Technicians can use DDM-2000 OC-12 Multiplexer internal testing capabilities for installation and manual troubleshooting. DS3 test signal generators and detectors are integrated in the system, eliminating the need for external test equipment to do DS3 transmission testing.

The DDM-2000 OC-12 Multiplexer lets technicians test specific signals and system components. For example, technicians can manually enable the integrated test signal generators and detectors for a DS3 low-speed interface. These signal tests can be run selectively in the multiplex or demultiplex direction. Refer to the `test-trmsn-t3` command in Section 11, "Commands and Reports."

Automatic Turnup Tests

Automatic turnup tests are mechanisms that allow rapid turnup of DDM-2000 OC-12 systems without the use of external test equipment.

Automatic turnup tests are not currently available for self-healing ring applications, but software for any nonring release can be used to perform local equipment and local wiring cross-connect tests. Manual turnup tests can be done using the procedures listed in the TOP section of this manual.

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 backplane. In the test, high-speed signals are looped back (manual optical loopback) towards the low-speed interfaces. See Figure 9-12.
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 and high-speed signals are looped back (optical loopback and manual loopbacks at the STSX or DSX). See Figure 9-13.
3. Optical Span Test — The optical span test verifies the end-to-end transmission across an optical span. In this test, the OC-12 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 9-14.

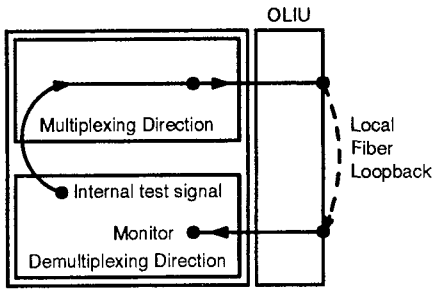


Figure 9-12. Local Equipment Test

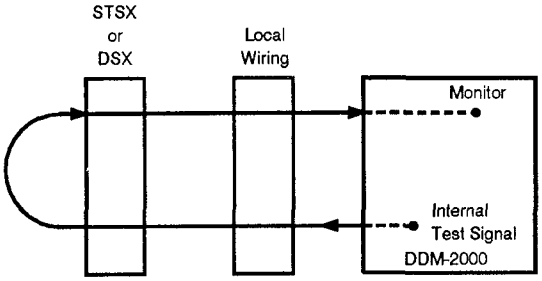


Figure 9-13. Local Wiring Cross-Connect Test

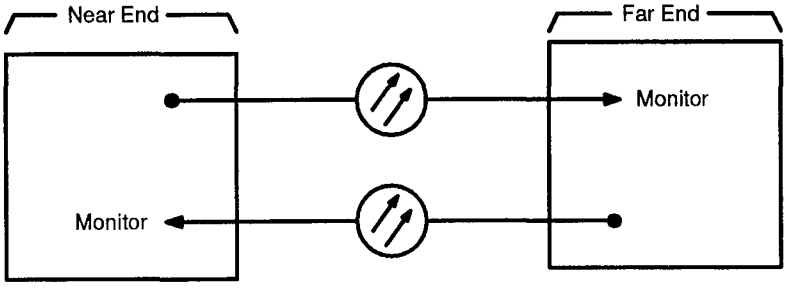


Figure 9-14. Optical Span Test

Each of the tests described 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."

Operations Interface Tests

The DDM-2000 OC-12 Multiplexer also provides tests for LED indicators, serial and parallel telemetry 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."

DDM-2000 OC-12 Multiplexer Performance Monitoring

The DDM-2000 OC-12 Multiplexer uses performance monitoring (PM) to support proactive maintenance and tariff verification of the network. Proactive maintenance refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming but indicative of an impending hard or soft failure. Hard and soft failures result in reactive maintenance.

Proactive maintenance consists of monitoring performance parameters associated with the SONET sections, lines, and paths within the SONET network. Table 9-7 lists the SONET performance parameters monitored by the DDM-2000 OC-12 Multiplexer. 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. 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.

Tariff verification refers to the process of collecting PM data on end-to-end path services (for example, DS1 and DS3). This data can be used to verify whether or not a customer is receiving the quality of service requested.

Refer to Appendix A, "A SONET Overview", for more information on SONET PM.

Table 9-7 lists the performance parameters monitored by the DDM-2000 OC-12 Multiplexer The collection of performance parameters depends directly on slot state transitions, port states, and cross-connections.

Table 9-7. DDM-2000 OC-12 Multiplexer Performance Monitoring Parameters

Facility	Measured Parameter
OC-3 Optics	Laser Bias Current (21G/21G-U OLIU only) Optical Transmit Power (21G/21G-U OLIU only)
OC-12 Optics	Laser Bias Current (23G/23G-U and 23H/23H-U OLIUs only)
OC-3 and OC-12 Sections	Severely Errored Frame Seconds (SEFS)
OC-3 and OC-12 Line	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS) Line Protection Switch Counts (PSC-L)
EC-1 Line *	B2 Coding Violations (CV) EC-1 B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS)
STS-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)
DS3	P-Bit Coding Violations Severely Errored Frame Seconds (SEFS)
DS3 Path †	CV-P Coding Violations ES-P Errored Seconds SES-P Severely Errored Seconds UAS-P Unavailable Seconds SEFS

* Release 3.0 and later.

† Release 3.1 and later.

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 by the 21G/21G-U, 23G/23G-U, and 23H/23H-U OLIUs.

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 and OC-12 Section Parameters

Performance Monitoring Enabling

Collection of section 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.

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 and OC-12 Line Parameters

Performance Monitoring Enabling

Collection of line 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.

Line Coding Violations (B2 Parity)

To monitor the performance of the OC-3 and OC-12 lines, the line BIP-8 (B2 parity) is calculated, written, and checked for errors. The line B2 parity violation counter is incremented for each line BIP error detected. Each line BIP-8 can detect up to eight errors per STS-1 frame. The contents of the three or 12 line B2 parity violation counters associated with the OC-3 and OC-12 line are added to form a composite B2 parity violation count. 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 more than one and less than 124 for OC-12, 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, 124 or more for OC-12, B2 parity violations are detected or one in which a loss of signal, loss of frame or line AIS occurs. 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 or OC-12 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 alarm hold-off delay, whichever is smaller. Y is equal to 10

seconds or the alarm clear-delay whichever is larger. If there is an unprotected circuit pack failure, 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 independently for the service and protection lines.

Line Protection Switch Counts

Line protection switch count is the count of the number of protection switches FROM the working line. The count is independently counted and thresholded for both the service and the protection line. This does not apply to Main OC-N lines in ring releases.

EC-1 Line Parameters

Performance Monitoring Enabling

Collection of line parameters for EC-1 low-speed interfaces is initiated when a slot is equipped with a 3STS1E circuit pack 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 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. 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 for the EC-1 line.

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 12 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 for the EC-1 line.

Severely Errored Seconds

A severely errored second is a second in which 12 or more 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 for the EC-1 line.

Unavailable Seconds

An unavailable second is a second during which the EC-1 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 alarm hold-off delay, whichever is smaller. Y is equal to 10 seconds or the alarm clear delay, whichever is larger. Unavailable seconds are counted and thresholded for the EC-1 line.

Line Protection Switch Counts

Line protection switch counts do not apply to EC-1 interfaces.

STS-1 Path Parameters

Performance Monitoring Enabling

Collection of STS-1 path parameters is initiated only when a slot is equipped with a 3DS3 circuit pack. Parameters continue to be available in reports and generate appropriate threshold crossing alerts until the 3DS3 circuit pack is removed and the `update` command or the UPD/INIT button is pressed. Path parameters are monitored only on active circuit packs.

STS-1 Path Coding Violations (B3 Parity)

The performance of the STS-1 path is monitored by writing the "B3" byte in the STS-1 path overhead when the path is originated and checking the "B3" byte 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). The B3 parity violations are counted and thresholded for each STS-1 path terminated by the system.

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 alarm hold-off delay, whichever is smaller. Y is equal to 10 seconds or the alarm clear delay, whichever is larger. If there is an unprotected STS-1 path terminating equipment failure (3DS3 or OLIU), unavailable seconds are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery.

DS3 Parameters

Performance Monitoring Enabling

Collection of DS3 path parameters are initiated only when a slot is equipped with a 3DS3 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 3.1 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.

The DS3 performance monitoring modes are specified in Table 9-8 for releases prior to 3.1 and Table 9-9 for enhanced DS3 performance monitoring (Release 3.1 and later releases).

DS3 Performance Monitoring

Table 9-8. DS3 Performance Monitoring Modes

DS3 Port State	DS3 Mode		
	VM	VMR	CC
IS (In Service)	Yes	Yes	No
AUTO	No	No	No
NMON (Not Monitored)	Yes	Yes	No

Table 9-9. Enhanced DS3 Performance Monitoring Modes

Mode	PM Format	Monitor P-Bits	Monitor F&M Bits	Correct P-Bits	Correct F&M Bits
VMR	P-bit	Yes	No	Yes	No
VMR	F&M-bit	No	Yes	Yes	No
VM	P-bit	Yes	No	No	No
VM	F&M-bit	No	Yes	No	No
CC	P-bit	No	No	No	No
CC	F&M-bit	No	No	No	No

Enhanced DS3 Performance Monitoring

Release 3.1 and later releases provide two DS3 PM formats: enhanced P-bit (parity bit) and adjusted F&M bit (frame and multiframe bit). The format is selected using the `set-t3` command. The command is also used to set the PM mode to "on" (default) or "off", which enables or disables the monitoring and reporting of DS3 PM data. See Table 9-7.

Enhanced P-Bit

When provisioned for enhanced 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.

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. To detect degradation of the signal incoming from the fiber, 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 format is selected. When the F&M bit format is selected, network elements could be provisioned in VMR or VM mode.

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 alarm holdoff delay, whichever is smaller. Y is equal to 10 seconds or the alarm clear delay whichever is larger. Unavailable seconds are counted and thresholded independently for each DS3 path terminated by the system. This applies to both P-bit and adjusted F&M bit formats.

Severely Errored Frame Seconds (SEFS)

Severely errored frame seconds are a count of the number of seconds during which an out-of-frame or AIS condition exists for a DS3 signal received from the fiber, or during an unprotected DS3 circuit pack failure. SEFSs are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode.

Performance Monitoring Data Storage and Reports

The DDM-2000 OC-3 Multiplexer provides current quarter-hour and current day registers for all accumulated performance parameters. Previous quarter-hour registers for the preceding 8 hours and previous day registers also are provided.

The DDM-2000 OC-12 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-stsl`, `rtrv-pm-t3`, and `rtrv-pm-tca` commands in the "Commands and Reports" section of this manual.

Performance Monitoring During Failed Conditions

When the DDM-2000 OC-12 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-12 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` commands in Section 11, "Commands and Reports."

TCA Transmission to OS

To trigger proactive maintenance activity at the OS, each DDM-2000 OC-12 Multiplexer TBOS display contains one summary level performance monitoring TCA point. When the TL1/X.25 interface is used, threshold crossings are reported to the OS via `REPT EVT` messages.

OC-12 Regenerator Performance Monitoring

The OC-12 Regenerator provides performance monitoring (PM) to support proactive maintenance of the network. 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 and line signals within the network. These parameters are thresholded to indicate degraded performance. When a performance-monitoring threshold is crossed, it is reported to the operations system as a threshold crossing alert (TCA). At the operations system, all threshold crossings can be analyzed, and the likely source of the degradation can be identified.

Performance Parameters

Table 9-10 lists the OC-12 Regenerator performance monitoring parameters.

Table 9-10. OC-12 Regenerator Performance Monitoring Parameters

Facility	Measured Parameter
OC-12 Optics	Laser Bias Current
OC-12 Sections *	Severely Errored Frame Seconds (SEFS)
OC-12 Line *	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS)

* OC-12 Regenerator Release 2.0 (23R-U REGENR circuit pack).

DDM-2000 OC-12 Multiplexer Reports

The following paragraphs provide information in reports available through the CIT. For reports available through other links, 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-fecom`, `rtrv-lgn`, `rtrv-link`, `rtrv-ne`, `rtrv-oc3`, `rtrv-oc12`, `rtrv-pmthres-line`, `rtrv-pmthres-sect`, `rtrv-pmthres-sts1`, `rtrv-pmthres-t3`, `rtrv-secu`, `rtrv-state`, `rtrv-state-ec1`, `rtrv-state-path`, `rtrv-crs-sts1`, `rtrv-sync`, and `rtrv-t3` commands `rtrv-sync`, and `rtrv-t3` commands in Section 11, "Commands and Reports."

Performance Monitoring Reports

TCA Summary Report

The TCA summary report lists the number of threshold crossings within the last 8 hours for quarter-hour thresholds and the number of threshold crossings for the current and previous day 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 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`, and `rtrv-pm-t3` commands in Section 11, "Commands and Reports."

Maintenance History Report

A maintenance history report containing the past 500 (60 in Release 1.0) 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. 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."

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 maintenance subnetwork. The report also identifies the gateway network element (GNE) for the subnetwork. Refer to the `rtrv-nmap` command in Section 11, "Commands and Reports."

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Technical Specifications

10

Overview

This section contains the technical specifications for the DDM-2000 OC-12 Multiplexer and OC-12 Regenerator.

External Transmission Interfaces

The DDM-2000 OC-12 Multiplexer transmission interfaces adhere to industry standards as listed in Table 10-1.

Table 10-1. Transmission Interface Standards

Interface	Standard	Comments
DS3 low-speed	*ANSI** T1.102-1992 (Draft), TR-499 Iss. 5	VMR, VM, or clear channel
EC-1	*ANSI* T1.102-1992 (Draft) & TR-253, Iss. 2	—
OC-3	*ANSI* T1.106/88, *ANSI* T1.105/88 & T1.105a/90 TR-253, Iss. 2, TR-496, Iss. 3	—
OC-12	*ANSI* T1.106/88, *ANSI* T1.105/88 & T1.105a/90 TR-253, Iss. 2, TR-496, Iss. 3	—

* Registered trademark of American National Standards Institute.

Electrical Interfaces

The DDM-2000 OC-12 Multiplexer supports DS3 and EC-1 electrical low-speed interfaces.

DS3 Low Speed (BBG11 3DS3)

- Electrical Specification

  The low-speed DS3 interface transmits/receives a standard electrical DS3 signal as specified in *ANSI* * T1.102-1992, draft, 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 build-out is provisionable as follows:

  — 734A: Up to 450 ft.

  — Mini-Coax (KS-19224, L2): 0 to 150 ft.

  — 735A: Up 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} bit error ratio (BER).

* Registered trademark of American National Standards Institute.

- Performance Monitoring (see Table 10-14)
  - — DS3 Parity Errors (P-bits)

    DDM-2000 OC-12 Multiplexers provide for DS3 P-bit violation monitoring and removal based on the provisioning mode of the DS3 low-speed interface. Table 10-2 defines P-bit monitoring and correction actions in each of the DS3 modes.
  - — Severely Errored Frame Seconds

    DDM-2000 OC-12 Multiplexers count the number of seconds during which an out-of-frame condition exists for DS3 signals received from the fiber.

Table 10-2. DS3 Performance Monitoring 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 count is 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 format 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 Format	Monitor P-Bits	Monitor F&M Bits	Correct P-Bits	Correct F&M Bits
VMR	P-bit	Yes	No	Yes	No
VMR	F&M-bit	No	Yes	Yes	No
VM	P-bit	Yes	No	No	No
VM	F&M-bit	No	Yes	No	No
CC	P-bit	No	No	No	No
CC	F&M-bit	No	No	No	No

— 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 alarm holdoff delay, whichever is smaller. Y is equal to 10 seconds or the alarm clear delay, whichever is larger. Unavailable seconds are counted and thresholded independently for each DS3 path terminated by the system. This applies to both P-bit and adjusted F&M bit formats.

— 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 during an unprotected DS3 circuit pack failure. SEFSs are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode.

EC-1 Low-Speed (BBG12 3STS1E)

- Electrical Specification

  The EC-1 low-speed interface transmits and receives a standard electrical EC-1 signal as specified in *ANSI* T1.102-1992 (draft) [51.844 Mb/s rate, STSX-1 interconnect specification, bipolar 3-zero substitution (B3ZS) encoded and scrambled].

  Line buildout is provisionable as follows:

  — 734A: 0 to 450 ft.

  — Mini-Coax (KS-19224, L2): 0 to 150 ft.

  — 735A: 0 to 250 ft.

- Format Specification

  The EC-1 low-speed interface provides transport of any STSX-1 compatible signal.

- 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 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-12 Multiplexer supports OC-12 long-reach applications at 1310 nm using the 23G/23G-U OLIU and at 1550 nm applications using the 23H/23H-U OLIU. The DDM-2000 OC-12 Multiplexer also supports OC-3 optical extensions using the 21G/21G-U and 21D/21D-U (IS-3) OLIUs. The 21G/21G-U OLIU is fully synchronous optical network (SONET) compliant. The 21D/21D-U OLIU is a low cost optical interconnect signal level 3 (IS-3) low-speed interface used primarily to interconnect the DDM-2000 OC-3 Multiplexer to the DDM-2000 OC-12 Multiplexer at the same site. The nominal OC-3 and IS-3 line rates are 155.520 Mb/s.

Lightguide Jumpers

To prevent potential degradations, the DDM-2000 OC-12 lightguide interface requires single-mode jumpers for connecting to and from the outside plant *LGX* ® panel and the DDM-2000 OC-12 for all optical line interface units (OLIUs), except the 21D/21D-U OLIU.

The 21D/21D-U OLIU, used for intershelf OC-3/OC-12 interconnection, must use multimode jumpers on the transmit and receive sides.

Lightguide jumpers can be ordered from AT&T. See AT&T 363-206-200, *DDM-2000 Multiplexer Applications, Planning, and Ordering Guide.*

Long Reach OC-3 Interface (21G/21G-U OLIU)

- Optical Specification

  The 21G/21G-U OLIU optical line interface unit photonics meet or exceed SONET specifications (TR 253, Iss. 2 - LR-1 MLM category). The multilongitudinal laser transmitter supplies an nonreturn-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 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 10-5 and 10-6 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.

IS-3 Interface (21D/21D-U OLIU)

- Optical Specification

  The 21D/21D-U OLIU is a 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 10-6 provide detailed specifications and link budget information for the 21D/21D-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

  — B2 parameters.

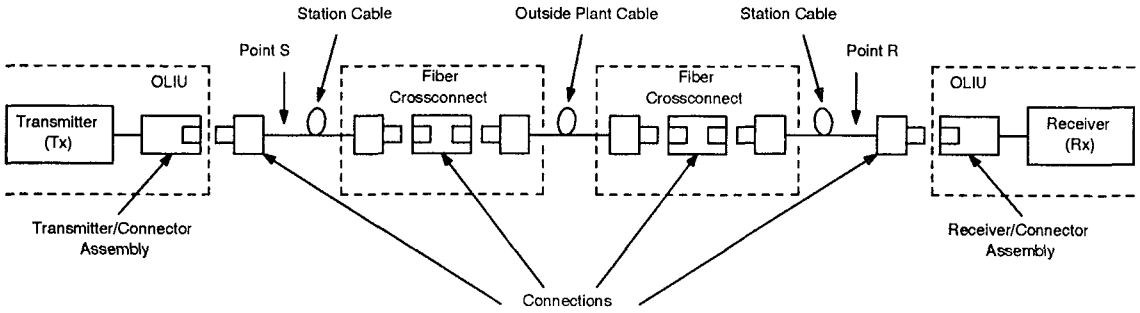


Figure 10-1. Optical System Interfaces (Points S and R)

Table 10-4 lists the 21G/21G-U and 21D/21D-U OLIU specifications.

Table 10-4. 21G/21G-U and 21D/21D-U OLIU Specifications

System Information:		
Terminal Equipment Identification	21G/21G-U OLIU	21D/21D-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) 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) 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 OLIU Link Budgets (Note 1)

Parameter	21G/21G-U		21D/21D-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 FWHM ¶¶
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 10-6.

* 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.

§ 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.

Table 10-6. OC-3 OLIUs Link Budget — Multimode Operation

	Maximum Span Length (km)	
Fiber Bandwidth	21G/21G-U (Note 1)	21D/21D-U (Note 2)
1000 MHz-km	6.5	3.6/3.4
800 MHz-km	5.1	3.4/3.3
500 MHz-km	3.1	2.7
300 MHz-km	1.8	1.9

Note:

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. 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.

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 (22 dB, 15.6 dB, and 12 dB, respectively) can be used to determine if the loss budget is sufficient for that fiber.

The system is dispersion limited for all the fiber bandwidths listed in this table.

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).

Long Reach 1310 nm OC-12 Interface (23G/23G-U OLIU)

The DDM-2000 OC-12 Multiplexer supports a 1310 nm OC-12 high-speed interface that is fully SONET-compliant. The nominal OC-12 line rate is 622.08 Mb/s.

- Optical Specification

  The OLIU photonics meet or exceed SONET long reach specifications (TR - LR-1 MLM category). The multilongitudinal mode laser transmitter supplies an NRZ-coded signal. The receiver requires the use of an external attenuator for direct optical loopback.

  The 23G/23G-U OLIU long reach OC-12 interface supports span lengths up to 51 km, assuming 0.45 dB/km single-mode fiber (including splices) and the span engineering rules outlined in Table 10-8. Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.

- Laser bias current is monitored on the 23G/23G-U OLIU.

Long Reach 1550 nm OC-12 Interface (23H/23H-U OLIU)

The DDM-2000 OC-12 Multiplexer supports a 1550 nm OC-12 long reach high-speed interface for controlled environments. The nominal OC-12 line rate is 622.08 Mb/s.

- Optical Specification

  The single longitudinal mode laser transmitter supplies an NRZ-coded signal. The receiver requires the use of an external attenuator for direct optical loopback.

  The 23H/23H-U OLIU long reach OC-12 interface supports span lengths up to 100 km, assuming single-mode fiber with total dispersion of less than 1800 ps/nm and the span engineering rules outlined in Table 10-8. Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.

Table 10-7 lists the 23G/23G-U and 23H/23H-U OLIU specifications.

Table 10-7. 23G/23G-U and 23H/23H-U OLIU Specifications

System Information:		
Terminal Equipment Identification	23G/23G-U OLIU	23H/23H-U OLIU
Optical Line Rate (Mb/s)	622.080 Mb/s	622.08 Mb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1310 nm	1550 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	InGaAs Laser SLM Structure
Faceplate Optical Connector	AT&T Buildout Assembly* (23G) UOC Buildout Assembly † (23G-U) Single Mode	AT&T Buildout Assembly (23H)* UOC Buildout Assembly † (23H-U) Single Mode
Receiver Information:		
Optical Device Temperature Controller	None	None
Optical Detector	Ge APD	InGaAs APD
Faceplate Optical Connector	*ST* C2000-A-2 (23G) UOC Buildout Assembly † (23G-U) Multimode	AT&T *ST* C2000-A-2 (23H) UOC Buildout Assembly † (23H-U) Multimode

* Buildout assembly consists of A3001 *ST* lightguide buildout block assembly and one of the following: A3010 (0 dB), A3010B (5 dB), A3010D (10 dB), and A30310F (15 dB). For 23H loopback testing requiring 19 dB, use the 4C Test Cable.

† 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 10-8. 23G/23G-U and 23H/23H-U OLIU Link Budgets (Note 1)

Parameter	23G/23G-U (Note 2)	23H/23H-U (Note 3)
Minimum Wavelength (λ_{Tmin})	1298 nm	1530 nm
Maximum Wavelength (λ_{Tmax})	1325 nm	1570 nm
Spectral Width* ($\delta\lambda_{rms}$)	2.0 nm	<1.0 nm
Maximum Transmitter Power† (P_{Tmax})	+2.0 dBm	+2.0dBm
Minimum Transmitter Power (P_{Tmin})	–2.5/–3.0 dBm‡	–2.8 dBm
Maximum Received Power (P_{Rmax})	–8.0 dBm	–17.0 dBm
Receiver Sensitivity (P_{Rmin})	–30.5/–27.5 dBm‡	–34.0 dBm
Minimum System Gain (S-R)§	28.0/24.5 dBm‡	31.2 dBm
Optical Path Penalty (P_O)¶	2.0 dB	1.0 dB
Connector Loss**	1.5 dB	1.5 dB
Unallocated Margin††	1.5 dB	1.5 dB
Minimum Loss Budget‡‡	10.0 dB	19.0 dB
Maximum Loss Budget§§	**23.0/19.5 dB‡**	**27.2 dB‡**
Maximum Span Length¶¶	51/43 km	100 km

Note:

1. All terminology is consistent with TR-253, Iss. 2. All values are worst-case end of life.
2. All specifications for the 23G/23G-U meet or exceed long reach (LR) values described in TR-253, Iss. 2.
3. This loss budget applies to 1550 nm optical signals transmitted and received by the 23H/23H-U.

* RMS spectral width for the 23G/23G-U. Maximum –20 dB down spectral width for the 23H/23H-U.

† Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.

‡ 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 (23G/23G-U only). The 23H/23H-U operates under controlled environmental conditions only.

§ 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 10-8. 23G/23G-U and 23H/23H-U OLIU Link Budgets (Contd)

¶ Optical path penalty includes effects of dispersion, reflection and jitter that occur on the optical path. The 23G/23G-U has 5.0 dB of total margin. Optical path penalty is normally 1.0 dB. This allows for a maximum dispersion of 92 psec/nm in the 1310 nm wavelength range. To allow for span lengths greater than 40 km, 2.0 dB is allocated for optical path penalty. This allows a maximum dispersion of 120 ps/nm.
1.0 dB is allocated for the optical path penalty for the 23H/23H-U for operation in the 1550 nm wavelength range. This allows a maximum dispersion of 1800 ps/nm.

** One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.

†† Unallocated margin, or safety margin, is typically specified from 0 dB to 3 dB.

‡‡ The 23G/23G-U requires an external lightguide buildout as part of the connector assembly for loopbacks and for loss budgets less than 10 dB. The 23H/23H-U requires an external lightguide buildout as part of the connector assembly for loopbacks and for loss budgets less than 19 dB.

§§ Budget available for both station and transmission cable and splices.

¶¶ Attenuation and dispersion can be the limiting factors in span length. 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 operating in the 1310 nm wavelength range is 0.45 dB/km. This estimate includes typical cable loss (0.4 dB/km) and splice loss (0.2 dB per splice, 11 total splices) associated with single-mode fiber in the 1310 nm range. A rough rule of thumb for systems operating in the 1550 nm wavelength range on modern nondispersion shifted fiber is 0.25 dB/Km.

Allowing 2.0 dB for the optical path penalty implies 120 ps/nm total dispersion in the 1310 nm wavelength range. Typical maximum slope for single-mode fiber in this wavelength is 0.092 ps/nm squared per km. Typical nondispersion shifted fiber has a zero dispersion wavelength between 1300 and 1320 nm. Given these assumptions, the maximum span length for the 23G/23G-U is 51km.

For OC-12 systems operating in the 1550 nm wavelength range, the maximum distance is dispersion limited. Allowing 1 dB for the optical path penalty implies 1800 ps/nm total dispersion. Typical modern nondispersion shifted fiber has 18 ps/nm km dispersion in the 1550 nm wavelength range. Given these assumptions, the maximum span length for the 23H/23H-U is 100 km.

Maximum span length can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

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 (High Power)	21G/21G-U (Low Power)	22F	22G-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	4.5	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	7.0	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 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 (High Power)	21G/21G-U (Low Power)	22F	22G-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	25.0	24.8	22.8
21G/21G-U (low power)	18.6	18.6	18.6	18.6	18.4	16.4
22F	15.0	15.0	15.0	15.0	14.8	12.8
22G-U*	23.0	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	n/a
21D/21D-U/22D-U (unctrld. env.)	n/a	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). 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 (High Power)	21G/21G-U (Low Power)	22F	22G-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	22.0	21.8	19.8
21G/21G-U (low power)	15.6	15.6	15.6	15.6	15.4	13.4
22F	12.0	12.0	12.0	12.0	11.8	9.8
22G-U*	20.0	20.0	20.0	20.0	19.8	17.8
21D/21D-U/22D-U (ctrld. env.)	8.2	8.2	8.2	8.2	9.9	7.9
21D/21D-U/22D-U (unctrld. env.)	5.2	5.2	5.2	5.2	6.9	4.9

* The LAA10 FT-2000 OC-3 Optical Interface has the same optical loss budget as the 22G-U and therefore should follow the same optical mixing rules.

Universal Optical Connector Attenuators

The 21D-U, 21G-U, 22G-U, 22D-U, 23G-U, 23H-U, and 23R-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 10-12. 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
A3060B SC 5 dB buildout	SM-SM	5	106708969
A3060D SC 10 dB buildout	SM-SM	10	106708977
A3060F SC 15 dB buildout	SM-SM	15	106708985
A3070 *ST*® 0 dB buildout	SM-SM & MM-MM	0	106795354
A3070B *ST*® 5 dB buildout	SM-SM	5	106795362
A3070D *ST*® 10 dB buildout	SM-SM	10	106795370
A3070F *ST*® 15 dB buildout	SM-SM	15	106795388
A3080 FC 0 dB buildout	SM-SM & MM-MM	0	106795404
A308B FC 5 dB buildout	SM-SM	5	106795412
A308D FC 10 dB buildout	SM-SM	10	106795420
A308F FC 15 dB buildout	SM-SM	15	106795438
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 only use of SONET overhead bytes for proprietary signaling is the K2 byte for synchronization messaging. See Section 5, "Transmission and Synchronization Interfaces", for more information on synchronization messaging.

Performance

Wander/Jitter

- The OC-12 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, Iss. 2 and TR-499, Iss. 5.
- The SONET interface meets the T1.101 OC-N output short term stability mask.

Signal Performance

- 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 BER is less than 10^{-9} for DS3 rates. Burst error seconds are excluded.
- The frequency of burst errored seconds, other than those caused by protection switching induced by hard equipment failures, average less than 4 per day.

Synchronization

Synchronous Timing Generator (BBF2/BBF2B)

The TGS circuit pack meets the specifications of TR-253, Iss. 2 SONET Transport Systems Generic Criteria. The TGS circuit pack supports three timing modes:

- External timing (phase-locked mode): Locked to external Stratum 3 (±4.6 ppm) or better DS1 reference.
- Loop-timing: Locked to recovered clock from an OC-12 signal.
- Free-running: Timing derived from high-stability temperature-compensated voltage-controlled crystal oscillator (TCVCXO) with a long-term accuracy of ±15 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). 24-hour holdover stability is accurate to ±4.6 ppm.

The DS1 timing output used for network synchronization (BBF2B only) provides long-term accuracy traceable to the OC-12 line. SONET synchronization messaging is used to output DS1 alarm indication signals (AIS) when clock traceability is lost (Release 2.0). 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-12 signals. This signal's BER is calculated from violations of the SONET line overhead B2 parity byte. 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. Line protection will be completed within 50 milliseconds of the onset of a signal fail or a hard failure such as a fiber cut and within 60 milliseconds of the declaration of a signal degrade condition. For a protection switch in response to an external command, the interrupt interval is less than 10 milliseconds.

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 BER performance. On pass-through paths, all detected hard failures (LOS, LOF, LOP, line AIS, STS path AIS, or STS unequipped) result in STS AIS insertion in the outgoing signals. This allows the terminating node to be aware of the failure and to switch to protection. Protection switching is completed within 50 milliseconds of failure detection.

Under normal conditions, both incoming SONET path signals to the switch selection point are of high quality, and the signal can be selected from either ring. A failure or a transmission degradation on one of the rings requires that the other ring path be selected. Release 3.1 provides nonrevertive switching to minimize the impact on critical customer services by giving the service provider control when, and if, the critical service should revert to a particular ring. A manual path protection switching command allows switching back to the original path for ease of ring maintenance.

The protection switching interrupt interval in response to an equipment failure is 60 milliseconds for all 1x1 protected circuit packs. The interrupt interval is measured at the DSn interface.

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 or at any nonhierarchical interface, will exhibit a 2-second error free transmission interval which begins within 5 seconds of the reapplication of a signal.

Delay

The average 1-way transmission delay within a DDM-2000 OC-12 shelf between DS3/OC-3 and OC-12 interfaces is less than 50 microseconds. Table 10-13 lists the worst-case measured 1-way delay within a DDM-2000 OC-12 Multiplexer and OC-12 Regenerator.

Table 10-13. OC-12 Multiplexer and OC-12 Regenerator Transmission Delay in Microseconds

Mode	Drop Interface			
	OC-12	OC-3/OC-3c	DS3	EC-1
Terminal	-	4	5	4
Ring	4	4	5	4
OC-12 Regenerator	2	-	-	-

Performance Monitoring

Table 10-14 shows the provisionable range of the thresholds for monitored parameters and, in parentheses, 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)	enabled/disabled	enabled/disabled	sect
OC-12 Optics	Laser Bias Current*	enabled/disabled	enabled/disabled	sect
OC-3 Section	SEFS	1-63[10]	1-4095[30]	sect
OC-12 Section	SEFS	1-63[10]	1-4095[30]	sect
OC-12 Line	B2 Coding Violations (CV)	1-55365[5537]	1-5315040[531504]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line
	Line Protection Switch Counts (PSC-L)	1-63[2]	(1-255)[4]	line
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
STS-1 Path	B3 Coding Violations (CV)	1-4510[451]	1-432960[43296]	sts1
	B3 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	sts1
	B3 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	sts1
	B3 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	sts1
	B3 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	sts1
	B3 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	sts1

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
DS3	P-bit Error Counts	1-4026[403]	1-386500[38650]	t3
	SEFS	1-63[10]	1-4095 [30]	t3
DS3 Path †	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[10]	1-4095[40]	t3
	UAS-P Unavailable Seconds	1-63[10]	1-4095[10]	t3
	SEFS	1-63[10]	1-4095[30]	t3

* Threshold is set once for both current quarter-hour and current day.

† Release 3.1 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. DDM-2000 multiplexers support 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 a data communications equipment (DCE), and a rear access CIT interface, configured as a data terminal equipment (DTE)—to allow a permanent modem connection without requiring a null modem. A null modem is required to connect an American standard code (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	carries data from DDM-2000 to modem or terminal
Pin 3 - Circuit BB Received Data	carries data from DDM-2000 to terminal	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)

Although not required for routine installation and maintenance, a CIT is recommended for more sophisticated maintenance and administrative activities. A personal computer (PC) is required for software download. The DDM-2000 OC-12 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-12 Multiplexer although some may not be as convenient to use with the DDM-2000 OC-12 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-12 Multiplexer. The following terminals have been tested with the DDM-2000 OC-12 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 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 from 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-12 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

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* 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-12 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.

SNC-2000 CPro Graphical User Interface and Provisioning Tool

The SNC-2000 CPro Graphical User Interface and Provisioning Tool has a phased release plan. The initial release supports DDM-2000 OC-3 Multiplexer rings. Future releases will support DDM-2000 OC-12 Multiplexer rings and FT-2000 OC-48 systems.

* Registered trademark of Penril Corporation.

† Trademark of Hayes Microcomputer Products, Inc.

The SNC-2000 CPro Graphical User Interface and Provisioning Tool is a *Microsoft Windows** based user interface that will optionally be used with the DDM-2000 OC-12 Multiplexer. The tool simplifies and mechanizes administration, maintenance, and provisioning operations for ring networks. A minimum platform configuration is:

- 386SX with 4 MB RAM and two COM ports (one for the mouse)
- 3.5 inch floppy disk drive
- Hard disk drive with at least 2.5 MB of available space
- *MS-DOS* and *Windows* 3.1
- *CrossTalk*† for *Windows* 1.2.2 Revision J or K for communications with the network elements and to provide an ASCII interface
- 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.

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 –48V power. A green ACO LED is lighted when the alarm cutoff (ACO) function is active.

The FE SEL test, ACO/TEST, and UPD/INIT pushbuttons are provided to control system operation.

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* Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation.

† CrossTalk is a registered trademark of Digital Communications Associates, Inc

‡ 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

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.

- A 2400 baud RS-422 port is needed
- A TBOS link can support up to eight displays
- A TBOS display is required for each DDM-2000 OC-12 Multiplexer.

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, as failures on received OC-12 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 Discretes -Environmental Alarms and Controls

The user-definable miscellaneous discrete environmental alarm and control interface allows the DDM-2000 multiplexers 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 temperature); these inputs are activated by contact closures. A fifteenth 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 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-12 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. This interface can be used with an external orderwire shelf to provide point-to-point voice communication between DDM-2000 OC-12 systems via the SONET overhead channel. The orderwire shelf must be installed within 3 feet of the DDM-2000 system to which it is connected.

The orderwire is available only between DDM-2000 OC-12 Multiplexers connected to each other via OLIUs in the main-b slots. In multispan applications (for example, hubbing), orderwire communication is available only between the CO and the first RT.

The DDM-2000 OC-12 Multiplexer has been tested with the *DANTEL* * Orderwire Assembly A18-04588-02.

* DANTEL is a registered trademark of Dantel, Inc

TL1/X.25 Interface

The DDM-2000 OC-12 Multiplexer supports a TL1/X.25 interface for communication between local and remote DDM-2000 Multiplexers 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-12 Multiplexer TL1/X.25 interface is based on Bellcore TR-TSY-000831, Issue 2. The DDM-2000 OC-12 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	Command/Response Messages

* Release 2.0 and later linear releases.
† Release 2.1 (linear), 3.1 (ring) and later releases.
‡ Release 2.2 (linear), 3.1 (ring) and later releases.

At the packet layer, DDM-2000 multiplexers are 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	256 bytes
Window Size	2 packets
D bit support	NO
M bit support	YES

At the link layer, the DDM-2000 OC-12 Multiplexer uses the standard 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
Modulo	8
Window Size	7 frames
n2	7 retires
T1	3 seconds
T3*	20 seconds

* DDM-2000 OC-12 Multiplexer Release 2.0 and later.

DDM-2000 OC-12 uses synchronous, full duplex, and continuous carrier communication. Data rates of 1200, 2400, 4800, 9600, and 19,200 are supported. The EIA-232-D interfaces 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 system is powered.

Physical Specifications

OC-12 Shelf Physical Characteristics

- Dimensions: 14 in. H x 21.25 in. W x 12 in. D
- Weight (Max.): 83 lb. (38 kg)
- Appearance: Coordinated with other equipment in the AT&T 2000 Product Family.

Fan Shelf Physical Characteristics

- Dimensions: 4 in. H x 21.25 in. W x 9 in. D
- Weight (Max.): 20 lb. (9 kg)
- Appearance: Coordinated with other equipment in the AT&T 2000 Product Family.

Network Bay and Cabinet Mounting

DDM-2000 OC-12 Multiplexers can be mounted in ED-8C500, ED-8C501 and ED-8C800, ED-8C801 (seismic) network bay frames. A maximum of three DDM-2000 OC-12 shelves may be mounted in a 7-foot bay. One OC-12 shelf and four OC-3 shelves can be mounted in a 7 foot bay. In addition to bay mounting, DDM-2000 OC-12 can be packaged with other equipment in 80A, 80D, and 80E cabinets, 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-12 Multiplexer meets Bellcore's Network Equipment Building System (NEBS) requirements.* A DDM-2000 fan shelf is required in central office environments above every DDM-2000 OC-12 Multiplexer. Refer to ED-8C724-10 and ED-8C727-10, "Typical Bay Arrangements" for detailed information on placement of fans and heat baffles in typical bay arrangements.

The DDM-2000 OC-12 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 in all applications. A DDM-2000 OC-12 Multiplexer provides alarming of the 2-type fan units used in AT&T cabinets and alarming of the DDM-2000 fan shelf in controlled environments.

1550 nm Systems

A DDM-2000 OC-12 Multiplexer shelf equipped for 1550 nm applications, using the 23H/23H-U OLIU, must operate in controlled environments at temperatures of 0°C to +49°C and humidity of 5 to 95 percent (noncondensing).

EMC Requirements

The DDM-2000 OC-12 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. The DDM-2000 OC-12 Multiplexer has been tested and fully meets all Bellcore EMC requirements of TR-NWT-001089, Issue 1.

* "NEBS Generic Equipment Requirements," TR-NWT-000063, Issue 4.

Earthquake Requirements

The DDM-2000 OC-12 Multiplexer meets the earthquake requirements defined in Bellcore TR-NWT-000063, Issue 4 and Pacific Bell Standard PBS-000-102PT. Installation in Zone 4 regions requires 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-12 Multiplexer meets the ignitability requirements specified in T1Y1.4/88-014. In addition, the DDM-2000 OC-12 Multiplexer meets the fire resistance requirements of *UL* 1459, 2nd Edition.

Underwriters Laboratories

The DDM-2000 OC-12 Multiplexer is *UL* listed 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-12 Multiplexer has been certified by the Canadian Standards Association per standard C22.2 Number 225-M90.

Power Requirements

Shelf Fuses

The two –48 V feeders (A and B) are required for each DDM-2000 OC-12 shelf. Shelf power is protected by 10-amp fuses provided with the shelf. It is recommended that a supply of spare fuses be provided at DDM-2000 OC-12 Multiplexer locations.

Fuses and a fuse extraction tool can be ordered through AT&T, using Comcode 406203190 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, 10-amp, Part No. AX-1-10A or
Fuse Extraction Tool, Part No. F-0431.

Power Dissipation

The power dissipation figures in Table 10-20 represent **fully loaded** shelves.

- DDM-2000 OC-12 shelf accommodates two –48 V power feeders ("A" and "B" office power feeders).
- Table 10-20 lists the List 1 and List 2 power drains.

Table 10-20. Power Dissipation and Current Drains

Configuration	Power Dissipation (Watts)	DC Current Drains (Amps) L1 (–48V)	L2 (–40V)
Pt-Pt DS3 Terminal * (12 DS3)	177	3.7	4.4
21G/21G-U Optical Hub * (4 OC-3)	201	4.2	5.0
21D/21D-U Optical Hub * (4 OC-3)	193	4.0	4.8
OC-12 Regenerator (4 REGENR circuit packs)	60	1.3	1.5
Pt-Pt EC-1 Terminal * (12 EC-1)	177	3.7	4.4
Ring Shelf * (12 EC-1)	187	3.9	4.7
Ring Shelf * (12 DS3)	187	3.9	4.7
DDM-2000 Fan Shelf	53	1.1	1.3

* These configurations require the DDM-2000 Fan Shelf. Fan power dissipation is listed separately.

- Loss of one power feeder does not cause a loss of service.
- All supply voltages other than –48 V required by the DDM-2000 OC-12 Multiplexer are generated by DC-to-DC converters within the DDM-2000 OC-12 shelf.
- The DDM-2000 OC-12 Multiplexer meets all performance requirements when the DC input voltage varies between –41.75 V and –60.0 V.
- The DDM-2000 OC-12 Multiplexer tolerates DC input voltages between 0 V and –60 V without damage.
- The DDM-2000 OC-12 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 T-82046-30, Power Systems DC Distribution Circuit for Digital Transmission System for proper engineering of battery plant and feeders.

DDM-2000 OC-12 Reliability

Summary

This section describes the Bellcore reliability requirements that apply to the DDM-2000 OC-12 Multiplexer and the calculations used to predict how the DDM-2000 OC-12 Multiplexer meets those standards.

The DDM-2000 OC-12 Multiplexer meets all the applicable Bellcore reliability requirements that cover transmission availability, operation system (OS) availability, silent failures, optical module maintenance, and infant mortality. Table 10-21 summarizes the reliability predictions and requirements. The applicable Bellcore requirements and objective were clarified through interactions with Bellcore during their audit of the DDM-2000 OC-12 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 the DDM-2000 OC-12 Multiplexer reliability predictions are described in the following sections. Each section 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 2-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 (DS3 to OC-12 or OC-12 to DS3). 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-12 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-12 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 packs that perform the electrical-to-optical and optical-to-electrical conversion. The failure rate of the 23G/23G-U OLIU is 11400 FITS according to the RPP method. This translates to a MTBF of 10 years, which meets the objective.

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‡.

* TA-NWT-000418, Issue 3, November 1991, p 36

‡ TA-NWT-000418, Issue 3, November 1991, p 40.

AT&T places all DDM-2000 OC-12 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.

DDM-2000 OC-12 System Reliability Predictions

Table 10-21. DDM-2000 OC-12 System Reliability Prediction (Note 1)

Application	Environment (Note 2)	Bellcore Criteria (Note 3)		Prediction (Outage, min/yr)	MTBF Years (Note 4)
		Requirement	Objective		
DS3 to OC-12	CO	1.75	0.25	0.163	736
DS3 to OC-12	RT	5.25	0.75	0.499	483
EC-1 to OC-12	CO	1.75	0.25	0.253	473
EC-1 to OC-12	RT	5.25	0.75	0.764	314
OC3 to OC-12	CO	1.75	0.25	0.0015	61,900
OC3 to OC-12	RT	5.25	0.75	0.0131	13,760
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-12 system configured to multiplex DS3 to OC-12, located in an uncontrolled environment, is 0.499 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 483 years (that is, average length of time until a DS3 outage occurs).

Notes:

1. Hardware failure rates are calculated per the RPP method, TR-NWT-000332, Issue 4, "*Reliability Prediction Procedure.*"
2. The environmental factor for the CO = 1.0 and for the RT = 1.5, per TR-NWT-000332, Issue 4, "*Reliability Prediction Procedure.*"
3. Bellcore criteria (Outage Requirements and Objectives) is based on TA-TSY-000418, Issue 3, "*Generic Reliability Assurance Requirements for Fiber Optic Transport Systems.*" Outage is in minutes per year.
4. Mean time to repair is assumed to be 2 hours for the CO and 4 hours for RT environments.

Table 10-22. DDM-2000 OC-12 Circuit Pack Reliability (Note 1)

	CO		RT	
Circuit Pack	FITS (Note 2)	MTBF (Years)	FITS (Note 2)	MTBF (Years)
BBF2 (TGS)	2739	41.68	4109	27.79
BBF2B (TGS)	2311	49.40	3467	32.93
BBG5 (SYSCTL)	5284	21.60	7926	14.40
BCP1 (OHCTL)	5050	22.61	7575	15.07
BCP2 (TSI)	2922	39.07	4383	26.05
BCP3 (TSI)	2692	42.41	4038	28.27
BBG11 (3DS3)	3144	36.31	4716	24.21
BBG12 (3STS1E)	2586	44.14	3879	29.43
21D/21D-U (OLIU)	1959	58.27	2939	38.85
21G/21G-U (OLIU)	6949	16.43	10424	10.95
23G/23G-U (OLIU)	10029	11.38	15044	7.59
23H/23H-U (OLIU)	12836	8.89	Not applicable	Not applicable

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,G8 Fan Shelf	9879 *	11.56
ED-8C733-30,G6 Fan Unit	2000	57.08

* This includes failure rates for individual fan units.

OC-12 Regenerator

This section provides technical specifications for the OC-12 Regenerator.

The OC-12 Regenerator transmission interfaces adhere to industry standards as listed in Table 10-24.

Table 10-24. Transmission Interface Standards

Interface	Standard
OC-12	*ANSI* * T1.106/88, *ANSI* T1.105/88 & T1.105a/90 TR-253, Iss. 2, TR-496, Iss 3

Registered trademark of American National Standards Institute.

External Transmission Interfaces

Long Reach OC-12 Interface (23R/23R-U REGENR)

- Optical Specification

  The 23R/23R-U REGENR photonics meet or exceed SONET long reach specifications (TR - LR-1 MLM category). The multilongitudinal laser transmitter supplies an NRZ-coded signal. The receiver requires the use of an external attenuator for direct optical loopback and short spans.

  The 23R/23R-U REGENR long reach OC-12 interface supports span lengths up to 51 km (32 miles), assuming 0.45 dB/km single-mode fiber (including splices) and the span engineering rules outlined in Table 10-26. Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.

  The 23R/23R-U REGENR supports spans of 43 km (27 miles) at a 10^{-10} BER using single-mode fiber and NRZ line coding in an uncontrolled environment.

- Laser bias current is monitored on the 23R/23R-U REGENR.

Table 10-25 lists the 23R/23R-U REGENR circuit pack specifications.

Table 10-25. 23R/23R-U REGENR Circuit Pack Specifications

System Information:	
Terminal Equipment Identification	23R/23R-U REGENR
Optical Line Rate (Mb/s)	622.080 Mb/s
Optical Line Coding	Scrambled NRZ
Optical Wavelength	1310 nm
Performance	SONET LR-1 MLM (Long Reach)
Transmitter Information:	
Optical Device Temperature Controller	TEC
FDA Classification	Class I
Optical Source	InGaAsP Laser, MLM Structure
Faceplate Optical Connector	AT&T Buildout Assembly*, Single-Mode (23R) UOC Buildout Assembly † (23R-U)
Receiver Information:	
Optical Device Temperature Controller	None
Optical Detector	Ge APD
Faceplate Optical Connector	*ST*® C2000-A-2, Multimode UOC Buildout Assembly † (23R-U)

* Buildout assembly consists of A3001 *ST* lightguide buildout block assembly and one of the following: A3010 (0 dB), A3010B (5 dB), A3010D (10 dB), and A30310F (15 dB).

† 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 10-26. OC-12 Regenerator Link Budgets (Note 1)

Parameter	23R/23R-U (Note 2)
Minimum Wavelength (λ_{Tmin})	1298 nm
Maximum Wavelength (λ_{Tmax})	1325 nm
Spectral Width* ($\delta\lambda_{rms}$)	2.0 nm
Maximum Transmitter Power† (P_{Tmax})	+2.0 dBm
Minimum Transmitter Power (P_{Tmin})	–2.5/–3.0 dBm‡
Maximum Received Power (P_{Rmax})	–8.0 dBm
Receiver Sensitivity (P_{Rmin})	–30.5/–27.5 dBm‡
Minimum System Gain (S-R)§	28.0/24.5 dBm‡
Optical Path Penalty (P_O)¶	2.0 dB
Connector Loss**	1.5 dB
Unallocated Margin††	1.5 dB
Minimum Loss Budget‡‡	10.0 dB
Maximum Loss Budget§§	**23.0/19.5 dB‡**
Maximum Span Length¶¶	51/43 km

Note:

1. All terminology is consistent with TR-253, Iss. 2. All values are worst-case end of life.
2. All specifications for the 23R/23R-U meet or exceed long reach (LR) values described in TR-253, Iss. 2. This loss budget applies to 1310 nm optical signals transmitted and received by the 23R/23R-U.

* RMS spectral width for the 23R/23R-U.

† Transmit and receive powers are referenced to points S and R as shown in Figure 10-1.

‡ 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 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 10-26. OC-12 Regenerator Link Budgets (Contd)

¶ Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path. The 23R/23R-U has 5.0 dB of total margin. Optical path penalty is normally 1.0 dB. This allows for a maximum dispersion of 92 psec/nm in the 1310 nm wavelength range. To allow for span lengths greater than 40 km, 2.0 dB is allocated for optical path penalty. This allows a maximum dispersion of 120 ps/nm.

** One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.

†† Unallocated margin, or safety margin, is typically specified from 0 dB to 3 dB.

‡‡ The 23R/23R-U requires an external lightguide buildout as part of the connector assembly for loopbacks and for OSP budgets less than 10 dB. 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-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 operating at the 1310 nm wavelength range is 0.45 dB/km. This estimate includes typical cable loss (0.4 dB/km) and splice loss (0.2 dB per splice, 11 total splices) associated with single-mode fiber in the 1310 nm range.

Allowing 2.0 dB for the optical path penalty implies 120 ps/nm total dispersion in the 1310 nm wavelength range. Typical maximum slope for single-mode fiber in this wavelength is 0.092 ps/nm squared per km. Typical nondispersion shifted fiber has a zero dispersion wavelength between 1300 and 1320 nm. Given these assumptions, the maximum span length for the 23R/23R-U is 51km.

Maximum span length can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

SONET Overhead Bytes

The OC-12 Regenerator does not use any reserved or unused bytes in the SONET format for proprietary end-to-end signaling on OC-12 interfaces.

Performance

Wander/Jitter

- The REGENR circuit pack accommodates at least 10 microseconds of wander per 24-hour period.
- Jitter transfer, tolerance, and generation requirements are met as specified in TR-253, Iss. 2 and TR-499, Iss. 5 (Category II).

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.

Performance Monitoring

Table 10-27 shows the provisionable range of the thresholds for monitored parameters and, in parentheses, the default thresholds. Thresholding of any parameter can be disabled.

Table 10-27. OC-12 Regenerator Performance Monitoring Parameters Provisionable Via the CIT

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres-
OC-12 Optics	Laser Bias Current *	enabled/disabled	enabled/disabled	sect
OC-12 Section †	SEFS	1-63[10]	1-4095[30]	sect
OC-12 Line †	B2 Coding Violations (CV)	1-55365[5537]	1-5315040[531504]	line
	B2 Errored Seconds (ES)	1-900[40]	(1-65535)[900]	line
	B2 Errored Seconds Type A (ESA)	1-900[30]	(1-65535)[90]	line
	B2 Errored Seconds Type B (ESB)	1-900[30]	(1-65535)[90]	line
	B2 Severely Errored Seconds (SES)	1-63[20]	(1-4095)[60]	line
	B2 Unavailable Seconds (UAS)	1-63[30]	(1-4095)[90]	line

* Threshold is set once for both current quarter-hour and current day.

† Release 2.0 (23R-U REGENR).

User Panel

Since the OC-12 Regenerator is not intended as a centralized network maintenance and operations center, the FE ACTY LED and the FE SEL LED pushbuttons are not operational.

OC-12 Regenerator TL1/X.25 Interface

The OC-12 Regenerator Release 2.0 supports a TL1/X.25 interface for communication with 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 OC-12 Regenerator TL1/X.25 interface is based on Bellcore TR-TSY-000831, Issue 2. The OC-12 Regenerator supports two X.25 permanent virtual circuits (PVCs). assigned as shown in Table 10-28.

Table 10-28. OC-12 Regenerator 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

At the packet layer, OC-12 Regenerators are configured as a passive DTE with the following parameters as shown in Table 10-29.

Table 10-29. OC-12 Regenerator TL1/X.25 Interface — X.25 Packet Layer Parameters

Parameter	Value
Packet Size	256 bytes
Window Size	2 packets
D bit support	NO
M bit support	YES

At the link layer, the OC-12 Regenerator uses the standard LAPB protocol with the following parameters as shown in Table 10-30.

Table 10-30. OC-12 Regenerator TL1/X.25 Interface — LAPB Link Layer Parameters

Parameter	Value
Maximum Frame Size	2104 bits
Modulo	8
Window Size	7 frames
n2	7 retires
T1	3 seconds
T3	20 seconds

The OC-12 Regenerator uses synchronous, full duplex, and continuous carrier communication. Data rates of 1200, 2400, 4800, 9600, and 19,200 are supported. The EIA-232-D interfaces is configured as DTE, using the pin connections specified in Table 10-31.

Table 10-31. OC-12 Regenerator 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 system is powered.

Physical Specifications

OC-12 Regenerator Shelf Physical Characteristics

- Dimensions: 14 in. H x 21.25 in. W x 12 in. D
- Weight: approximately 60 lb. (27 kg) with a full complement of circuit packs
- Appearance: coordinated with other equipment in the AT&T 2000 Product Family.

Network Bay Mounting

OC-12 Regenerators can be mounted in ED-8C500, ED-8C501, ED-8C800 (seismic), and ED-8C801 (seismic) network bay frames. A maximum of three OC-12 Regenerator shelves can be mounted in a 7-foot bay.

OC-12 Regenerator Reliability

Summary

The OC-12 Regenerator meets all the applicable Bellcore reliability requirements that cover transmission availability, operations system (OS) availability, optical module maintenance, and infant mortality. The basis for these requirements comes from TA-TSY-000418, "*Generic Reliability Assurance Requirements for Fiber Optic Transport Systems.*"

Circuit Pack Reliability

Table 10-32 lists the circuit pack reliability for the OC-12 Regenerator.

Table 10-32. OC-12 Regenerator Circuit Pack Failure Rates (Note 1)

	CO		RT	
Circuit Pack	FITS (Note 2)	MTBF (Years)	FITS (Note 2)	MTBF (Years)
BBG5 (SYSCTL)	5284	21.60	7926	14.40
BCP1 (OHCTL)	5050	22.61	7575	15.07
23R (REGENR)	8364	13.65	12546	9.10
23R-U (REGENR)	9807	11.64	14711	7.76

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).

System Reliability Predictions

Table 10-33 lists the system reliability predictions for the OC-12 Regenerator.

Table 10-33. OC-12 Regenerator System Reliability Predictions

		Prediction	
Criteria	Bellcore Objective	Controlled Environment	Uncontrolled Environment
OC-12 transmission outage using 4 REGENRs (minutes/year)	0.1	0.00095	0.00859
MTBF of Regenerator System with 4 REGENRs, 1 SYSCTL, and 1 OHCTL (years)	1.5	7	8
MTBF Optical TX/RX Module (years)	4	13.65	9.1

Commands and Reports

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Commands and Reports

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-12 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-12 Linear Release 2.2 and Rings Release 3.1. Significant changes to this section are noted by change bars (|) in the right margin.

The following new commands are included in this section:

`rtrv-state-sts1`

`set-state-sts1`

In addition to the new commands listed above, significant changes were made to the following commands: `rtrv-pmthres-t3`, `rtrv-t3`, `set-t3`, `set-pmthres-t3`, and `update`.

The following commands are used with the DDM-2000 OC-12 Regenerator and are presented later in this section. The same commands that are used with the DDM-2000 OC-12 Multiplexer are also used with the OC-12 Regenerator. However, the commands used with the Regenerator may have different parameters than the commands used with the DDM-2000 OC-12 Multiplexer. The OC-12 Regenerator command pages include the following commands:

`rtrv-alm`	`rtrv-pmthres-line` (Release 2)
`rtrv-eqpt`	`rtrv-pmthres-sect`
`rtrv-hsty`	`rtrv-secu`
`rtrv-oc12` (Release 2)	`set-oc12` (Release 2)
`rtrv-pm-line` (Release 2)	`set-pmthres-line` (Release 2)
`rtrv-pm-sect`	`set-pmthres-sect`
`rtrv-pm-tca`	`set-secu`

Other commands operate the same for the DDM-2000 OC-12 Regenerator as they do for the DDM-2000 OC-12 Multiplexer. They are listed later in this section.

Some commands that are used with the DDM-2000 Multiplexer are *not* used with the DDM-2000 OC-12 Regenerator. They are also listed later in this section.

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 "`ml-all`" and "`ml- 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. Table 11-1a lists the valid addresses for the DDM-2000 OC-12 Regenerator. 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-12 Address Table

Object	Entity	Address	Example
Slots	Entire system	all	all
	Main slot	main-{a,b,all*}-{1,2,all}	main-all
	TSI unit slot	tsi-{1,2,all}	tsi-1
	Function unit slot	fn-{a,b,c,d,all*}-{1,2,all}	fn-all fn-b-all fn-d-1
	Timing slot	tg-{1,2,all}	tg-all
	Sys. control slot	sysctl	sysctl
	Aux. control slot	auxctl	auxctl
Lines	OC-12 line pair	main-{b,all}	main-b
	OC-12 line	main-b-{1,2,all}	main-b-1
	OC-3 line pair	fn-{a,b,c,d}	fn-b
	OC-3 line	fn-{a,b,c,d,all*}-{1,2,all}	fn-c-2
Ports	DS3 Port	{a,b,c,d}-{1-3,all}	a-2
	DS1 Sync. Ref. Port	ref-{1,2,all}	ref-1
	EC-1 Port	{a,b,c,d,all}-{1-3}	b-3
Channels	STS-1 Channel (within OC-12)	m-b-{1-12,all} (Release 2 and earlier) mb-{1-12,all} (Release 2.1 and later)	m-b-4 mb-4
	STS-1 Channel (within OC-3)	{a,b,c,d}-{1-3,all}	c-1 b-3
STS-1 Cross-Connections	Main port	mb-{1-12}	mb-4
	Function unit slot	{a,b,c,d}-{1-3}	b-1
	3STS1E channel	{a,b,c,d}-{1-3}	a-2
	3DS3 channel	{a,b,c,d}-{1-3}	c-3
	Function unit (OLIU)	{a,b,c,d}-{1-3}	d-2
Operation Interfaces	User Panel	userpanel	userpanel
	CIT	cit-{1,2,all}	cit-1
	Section Data Comm. Channel	dcc-{m-b,a,b,c,d,all} (Release 2 and earlier) dcc-{mb,a,b,c,d,all} (Release 2.1 and later) dcc-{mb1,mb2,a,b,c,d} (Rings only)	dcc-b dcc-mb dcc-mb2
	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.

Table 11-1a. DDM-2000 OC-12 Regenerator Address Table

Object	Entity	Address	Example
Slots†	Entire system	all	all
	Main slot	main-{a,b,all*}-{1,2,all}	main-all
	TSI unit slot	tsi-{1,2,all}	tsi-1
	Function unit slot	fn-{a,b,c,d,all*}-{1,2,all}	fn-all fn-b-all fn-d-1
	Timing slot	tg-{1,2,all}	tg-all
	Sys. control slot	sysctl	sysctl
	Aux. control slot	auxctl	auxctl
Lines	OC-12 line	main-{a,b,all*}-{1,2,all}	main-b-1
Operation Interfaces	User Panel	userpanel	userpanel
	CIT	cit-{1,2,all}	cit-1
	TBOS	tbos-1	tbos-1
	Parallel Telemetry	partlm	partlm

* If `all` is chosen as any part of an address, no subsequent address fields should be defined.

† The SYSCTL, OHCTL, and Main slots are normally the only equipped slots in the DDM-2000 OC-12 Regenerator. Addresses for other slots may be entered, but the DDM-2000 Regenerator will respond with a message that the shelf is not equipped properly.

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 o)tion of system security is provided for DDM-2000 OC-12 Release 1.1 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 2 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.

Future releases of SNC-2000 CPro will be available for use with DDM-2000 OC-12 multiplexers.

* Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation.

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-12 Release 2.2 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-12 Release 2.2.

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-12 Release 4.0 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 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.

This command is available with OC-12 Release 3.0 and later ring releases.

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 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-12 STS-1 Addresses:
mb-{1-12}, {a,b,c,d}-{1-3}

cct CrsType specifies whether the cross-connection is two-way or drop and continue. The valid values are:

twoway Two way applies to add/drop and pass through cross-connections. 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 3STS1E low-speed interface.

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 can not be deleted. */
```

RELATED COMMANDS

ent-crs-sts1

rtrv-crs-sts1

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` 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` may be used to list the communication status of a network element.

This command is available with OC-12 Release 2 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), an alarm will result. If a user attempts to remove a network element while the network has more than one GNE (DSNE) 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 in OC-12 ring applications. All cross-connections are done via the TSI circuit packs in the TSI slots. BCP3-type TSI circuit packs must be used to establish STS-1 cross-connections.

This command is available with OC-12 Release 3.0 and later ring releases.

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-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 whether the cross-connection is two-way or drop and continue. The valid values are:

- `twoway` Two-way cross-connections apply 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 2OC1 circuit packs.
- `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 3STS1E or 3DS3 interface.

`ring` RingId is the ring identification for drop and continue or locked drop and continue connections and specifies which ring rotation will be continued as well as dropped at this network element. The valid values are:

- `mb1` Ring `mb1` is defined as the ring that is received on the main-b-1 OLIU and is transmitted on the main-b-2 OLIU.

`mb2` Ring `mb2` is defined as the ring that is received on the main-b-2 OLIU and is transmitted on the main-b-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 OC-12 ring releases, the cross-connect mode is automatically set to manual (`crs=manual`) and cannot be changed. 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:

`mb-[1-12] to [a,b,c,d]-[1-3]`
Allowed when function groups A and/or B and/or C and/or D are equipped with 3DS3 or 3STS1E or OLIU (Release 3.1 and later) circuit packs.

`mb-[1-12] to mb-[1-12]`
Allowed to cross-connect pass through signals. 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. */
```

The following denial message will be displayed if both MAIN-B and/or both TSI slots are not equipped:

```
   SNVS
   /* Status, Not in Valid State */
   /* Both main-b and both tsi slots must be equipped */
```

If this command is issued and the low-speed address is for a function unit where the *application* parameter (for the `set-oc3` command) is set to "dual0x1", and one of the function unit slots is not equipped, the following denial message will be displayed:

```
   SNVS
   /* Status, Not in Valid State */
   /* Both function unit slots must be equipped */
```

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) =
```

If this command is issued for a drop and continue type of cross-connection and the low-speed address is for a function unit equipped with a 3DS3 circuit pack, the following caution message will be added to the confirmation message:

```
/* Caution!  Asynchronous DS3 failures, such as LOS or AIS,
   will not be mapped into SONET STS AIS and therefore will
   not result in a path protection switch within the OC-12
   ring network. */

/* 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

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-12 Release 2 and later software.

NOTE:
This command is available to privileged users only.

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) =
```

RELATED COMMANDS

rtrv-ulsdcc

NAME

help: Provide In-context Help

INPUT FORMAT

?

DESCRIPTION

Help (?) provides help within a craft dialog or 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-12 Release 1.1 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 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 and GNE status
set-ne

NSAP
ent-ulsdcc (Release 2 and later)

Security
set-lgn/fP
set-passwd/fP
set-secu

CIT link configuration
set-link

Protection Switching
(inhibit, forced, lockout, manual)
switch-fn
switch-line
switch-ls
switch-sync

Performance monitoring thresholds
set-pmthres-sect
set-pmthres-line
set-pmthres-t3
set-pmthres-sts1

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 2.1 and later)
- `opr-lpbk-t3`

Cross-connections
- `dlt-crs-sts1` (Release 3 and later)
- `ent-crs-sts1` (Release 3 and later)

OC-12/OC-3 signal degrade thresholds
- `set-oc12`
- `set-oc3`
- `set-ec1` (Release 3 and later)
- `set-sts1` (Release 3 and later)

Signal failure thresholds
- `set-t3`
- `set-ec1` (Release 3 and later)
- `set-state-ec1` (Release 3 and later)
- `set-state-t3`

Protection Switching (`manual`)
- `switch-fn`
- `switch-line`
- `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-12 Releases 2.2 and 3.1, 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-12 Release 1.1 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.

The input parameter is:

TID The Target Identifier (system name) of the shelf into which the program will be loaded. TIDs are case insensitive.

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-12 Release 2.0 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-12 Release 2.1 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 wi l 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) =
```

See "Install New Generic Program" in the TOP section 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. 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 collocated 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 OC-12 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-12 Release 2.1 (linear), Release 3.1 (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,d}-{1-3,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,d,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-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,d]-[1-3,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 "rediscovered" from the far end 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-12 Release 1.1 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.

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 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-12 Release 2.1 (linear), Release 3.1 (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,d,all}-{1-3,all}`

RELATED COMMANDS

opr-lpbk-ec1

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,d,all}-{1-3,all}`

RELATED COMMANDS

opr-lpbk-t3

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

rtrv-alm:[*Address*]:[**alm=***AlarmLevel*]; (Release 2.0 and earlier)
rtrv-alm[:alm=*AlarmLevel*]; (Release 2.1 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 2.1 and later, this paramter is not used and all slots are always reported.
Valid Slot Addresses: **all, main-{a,b,all}-{1-2,all}, tsi-{1,2,all}, fn-{a,b,c,d,all}-{1,2,all}, tg-{1,2,all}, sysctl, auxctl**

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. This parameter does not apply to the OC-12 regenerator.

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
env-21    MN    Misc            generatorOn
*/
```

The output parameters are:

`Address` The address of the environmental alarm/status point.

`Alarm` Alarm is the provisioned alarm level of the environmental input and has the following values:

- `CR` Critical alarm
- `MJ` Major alarm
- `MN` Minor alarm
- `NA` Not alarmed, but reported

`Alarm-Type` This report parameter is available with Release 2.2 (linear), Release 3.1 (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 OC-12 Release 3.0 and later ring 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-12 ring STS-1 Addresses: **all, mb-{1-12,all}, {a,b,c,d}-{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
=============================================================
mb-1     mb-1         twoway          -
mb-3      a-2         dc              mb1
mb-4      b-1         dc              mb1
mb-5      b-2         twoway          -
mb-6      b-3         twoway          -
 a-2     mb-3         dc              mb1
 b-1     mb-4         dc              mb1
 b-2     mb-5         twoway          -
 b-3     mb-6         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 column specifies whether the cross-connection is two way (**twoway**) or drop and continue (**dc**).

`Ring for Drop&Cont`
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 **mb1** and **mb2**.

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

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-12 Release 3 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: `all, {a,b,c,d}-{1-3}`

The output report appears as follows:

```
/* EC1 Port Provisioning Report
================================================================================
 Port          Alarm  Signal Degrade  State
Address        Level     Threshold
================================================================================
address        alarm        nn          state
address        alarm        nn          state
        .              .          .            .
        .              .          .            .
        .              .          .            .
        .              .          .            .
*/
```

The output parameters are:

`Port Address` This column lists the address of one or more EC-1 ports.

`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. For OC-12 systems, this parameter may also be set to -3 as a loss-of-signal threshold. However, the OC-12 system always reports a threshold crossing as a signal degrade.

`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-{a,b,all}-{1-2,all}, tsi-{1,2,all}, fn-{a,b,c,d,all}-{1,2,all}, tg-{1,2,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
--------------------------------------------------------------------------------
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
*/
```

The output parameters are:

`Address`	This is the address of the slot.
`Circuit Pack`	Circuit pack is the mnemonic name that identifies the general type function provided by a circuit pack. For example, Optical Line Interface Units are all named "OLIU"; SYStem ConTroLlers are named "SYSCTL".
`Apparatus Code`	Apparatus code uniquely identifies the specific function provided by a circuit pack. Circuit packs with different apparatus codes are not interchangeable, even if they have the same name.
`Series Number`	This is used to indicate interchangeability among circuit packs with the same circuit pack name and apparatus code, but different manufacturing versions. In general, a circuit pack can be replaced by another circuit pack that has the same apparatus code and the same or later series number.
`CLEI Code`	*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.

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).

---

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

If an incorrect circuit pack is inserted in a slot, the report will show the expected circuit pack for that slot and indicate that the current circuit pack does not match inventory.

If a faulty circuit pack with unreadable version recognition information is placed in a slot, the report will indicate that the circuit pack is failed and version information is unrecognizable.

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 2 software and later linear releases.

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 DCC Linear Addresses: `dcc-{m-b,a,b,c,d,all}`
Valid Ring Addresses: `dcc-{mb1,mb2,a,b,c,d,all}`

In Release 2.1, 2.2, and 3.1, 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-b           enabled
 dcc-b             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 (pvc)      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 2.1 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 2.1 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 2.1 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 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

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 2, this report will contain up to 60 events. For Release 2 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-12 Release 1.1 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 2 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-b, dcc-a, dcc-b, dcc-c,** or **dcc-d**).

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-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. SYSCTL circuit pack.

The output report appears as follows:

```
/* DDM-2000 System Provisioning Report
============================================================
TID=system_name
GNE=x
GNE Address=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-b=networkside (hw)
                           dcc-a=userside (hw)
                           dcc-b=userside (hw)
                           dcc-c=networkside (hw)
                           dcc-d=networkside (hw)
PMN=level (hw)
*/
```

The (hw) after a parameter value indicates that the parameter is set by hardware switches on the BBG5 system controller or BCP4 overhead controller circuit pack.

For ring applications only, the DCC UserSide/NetworkSide switches on the BCP1 OHCTL will be reported as follows:

```
DCC UserSide/NetworkSide:  dcc-mb1=networkside (hw)
                           dcc-mb2=userside (hw)
                           dcc-a=userside (hw)
                           dcc-b=userside (hw)
                           dcc-c=networkside (hw)
                           dcc-d=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.

> **NOTE:**
> Changing the TID (system name) does not change the network address, which is determined by the Site and NE parameters, but does affect proper TL1 message reporting.

GNE — GNE indicates whether this system is a gateway network element (GNE), providing a TL1 interface. It has a value of yes or no. For OSI systems, (OC-12 Release 2 and later), this is also the directory services network element (DSNE).

GNE Address — GNE Address is the TID 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.

Site — Site is the site address. For Release 2.0 and earlier, the value is 1 through 8 (1-8). For Release 2.1 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.

`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 2.1, 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 BCP1 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-12 Release 2 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.

RELATED COMMANDS

rtrv-link

rtrv-nmap

set-ne

NAME

rtrv-nmap: Retrieve Network Map

INPUT FORMAT

```
rtrv-nmap;
```

DESCRIPTION

This command retrieves a map of the SONET network, including 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-b        yes
   Site3NE1             fn-a          yes
   Site4NE1             main-b        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-3 or OC-12 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`.

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 2 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-12 Release 2 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 for additional information.

NOTE 2:
For Releases 2.2 and 3.1, the pager function is disabled for the report output.

RELATED COMMANDS

rtrv-fecom

rtrv-ne

set-fecom

set-ne

NAME

rtrv-oc12: Retrieve OC12

INPUT FORMAT

rtrv-oc12[:*Address*];

DESCRIPTION

This command displays the configuration of OC-12 lines provisioned by the **set-oc12** command.

The input parameter is as follows:

Address Address identifies the OC-12 line(s). The default is **all**.
Valid OC-12 linear addresses: **main-{b,all}**
Valid OC-12 ring addresses: **main-b-{1,2,all}**

The output report appears as follows:

```
/* OC-12 Line Provisioning Report
=============================================================
 Line     Signal Degrade    Kbyte
Address     Threshold      Message
=============================================================
address          -n        message
address          -n        message
  .               .           .
  .               .           .
  .               .           .

*/
```

The output parameters are:

Line Address Address of the OC-12 line.

Signal Degrade Threshold
This is the bit error rate (BER) threshold as a logarithm to the base 10. The value of *n* is an integer with a range of -5 through -9 corresponding to BERs of 10^{-5} through 10^{-9}. If a slot is empty or equipped with something other than an OC-12 optical unit, a hyphen (-) will appear in this column.

`Kbyte Message`	This parameter is available with Release 2.0 software and later. This is the current provisioned state of each OC-12 line to support the synchronization message using the K2 bytes in the SONET overhead. The valid values are **`enabled`**, indicating that proprietary Sync messages are used, and **`disabled`**, indicating proprietary Sync messages are not used.

RELATED COMMANDS

set-oc12

set-oc3

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: `all, fn-[a,b,c,d,all]`

The output report appears as follows:

```
/* OC-3 Line Provisioning Report
================================================================================
 Line     Signal Degrade  Optical       Kbyte     Concatenation  Application
Address     Threshold     Power (hw)    Message       Mode
================================================================================
address         n             x          message       mode        application
address         n             x          message       mode        application
   .            .             .             .          .              .
   .            .             .             .          .              .
   .            .             .             .          .              .
*/
```

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 2 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.

`Concatenation Mode`
This parameter is available with Release 2 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`.

`Application` This parameter is available with Release 3.1 and later ring releases only. This report parameter defines additional behavior assigned to this function unit. If this parameter is set to `dual0x1`, the function unit is part of an OC-12 dual 0x1 ring application (also called a virtual VT1.5 ring).

RELATED COMMANDS

rtrv-sync

set-oc3

NAME

rtrv-pm-line: Retrieve Performance Monitoring Line

INPUT FORMAT

rtrv-pm-line:*Address*;

DESCRIPTION

This command displays performance-monitoring data associated with the OC-3 or OC-12 lines terminated on the system.

The input parameters are:

Address Address of the OC-3, OC-12, or EC-1 lines.
Valid OC-12 Line Addresses: **main-b-{1,2,all}**
Valid OC-3 Line Addresses: **fn-{a,b,c,d,all}-{1,2,all}**
Valid EC-1 Line Addresses: **{a,b,c,d,all}-{1-3,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.

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-12 severely errored second contains 124 or more errors.
B2 UAS	This parameter shows the number of unavailable seconds.
PSC-L	This parameter shows the number of protection switches from this line. This parameter does not apply to EC-1 lines.

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.

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 and OC-12 optics and the STS-3 and STS-12 section.

The input parameter is:

Address Address of the OC-3 or OC-12 line's). The address **all** or **main-all** may be used to retrieve all performance-monitoring information.
Valid OC-12 Line Addresses: **main-b-{1,2,all}**
Valid OC-3 Line Addresses: **fn-{a,b,c,d,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 or OC-12 line.
Start Time	This indicates the time on the system clock when the data collection started.

`Transmit Power -1dB`	This column shows whether a -1 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack, and has a value of yes or no.
`Transmit Power -2dB`	This column shows whether a -2 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack, and has a value of yes or no.
`Laser Bias`	This column indicates the TCA of the OLIU laser bias threshold setting, 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 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).

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-b]-[1-12,all]` (to OLIU from 3DS3)

Valid Ring Addresses:

`all, mb-[1-12,all]` (to OLIU from 3DS3)

The address "`mb`" is the active path just as "`m-b`" 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.
`B3 CV`	This column shows the number of coding violations.
`B3 ES`	This column shows the number of errored seconds.
`B3 ES Type A`	This column shows the number of Type A errored seconds. A Type A errored second is a second with a single error.
`B3 ES Type B`	This column shows the number of Type B errored seconds. A Type B errored second is a second with more than one error but less than the number of errors in a severely errored second.
`B3 SES`	This column shows the number of severely errored seconds. A severely errored second contains 9 or more errors.
`B3 UAS`	This column shows the number of unavailable seconds of service. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred.



NOTE:
Rows that are all zeros are not printed except for current day and current quarter hour, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a reset or set-date command is entered into the system or if the DS3 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-t3: Retrieve Performance Monitoring T3

INPUT FORMAT

rtrv-pm-t3:*Address*;

DESCRIPTION

This command displays performance-monitoring data associated with one or more DS3 signals passing through the system.

The input parameters are:

Address Address of the DS3 port(s).
Valid DS3 Port Addresses: **{a,b,c,d}-{1-3,all}**

The output report appears as follows:

```
/* DS3 Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
=============================================================================
 Address        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 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.
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-12 Release 3.1, this column is labeled P CV and will only show the DS3 P bit coding violation counts.
ES-P	This shows the number of errored seconds.
SES-P	This shows the number of severely errored seconds. 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.



NOTE:
Rows that are all zeros are not printed except for current day and current quarter, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a reset or set-date command is entered into the system or if the DS3 circuit pack is inserted or removed. 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.

The 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
```

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-3 or OC-12 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).

`DS-3` 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).

NOTE:
Rows that are all zeros are not printed except for current day and current quarter hour, which are always printed.

A greater-than symbol (>) following a count indicates that the register has overflowed and that the indicated count is the register maximum.

A hyphen (-) indicates that the count for that parameter is not available due to a trouble condition.

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a reset or set-date command is entered into the system or if the DS3 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-line

rtrv-pm-sect

rtrv-pm-t3

set-pmthres-line

set-pmthres-sect

set-pmthres-t3

NAME

rtrv-pmthres-line: Retrieve Performance Monitoring Threshold Line

INPUT FORMAT

```
rtrv-pmthres-line;
```

DESCRIPTION

This command displays the system's current and OC-12 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 OC12 (B2CVOC12)        n         n
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 OC12` — This parameter displays the threshold values for the B2 coding violation counts for OC-12 lines.

`B2 Coding Violations OC3` — This parameter displays the threshold values for the B2 coding violation counts for OC-3 lines.

`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 3 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. This parameter applies only to the 21G OLIU circuit pack.

`Transmit Power 2dB` — OLIU transmit power threshold setting. This parameter applies only to the 21G OLIU circuit pack.

`Laser Bias` — OLIU laser bias threshold setting.

`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. This parameter applies only to the 21G OLIU circuit pack.

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-t3: Retrieve Performance Monitoring Threshold T3

INPUT FORMAT

rtrv-pmthres-t3;

DESCRIPTION

This command displays the system's current DS3 performance parameter thresholds, as s *t* by the **set-pmthres-t3** command.

The output report 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:

SEFS — These parameters display the threshold values for severely errored frame seconds.

CVP — These parameters display 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}.

ESP — These parameters display the threshold for the DS3 P-bit or Adjusted F&M-bit errored seconds counts. These parameters are available with OC-12 Release 3.1 and later.

SESP — These parameters display the threshold for the DS3 P-bit or Adjusted F&M-bit severely errored seconds counts. These parameters are available with OC-12 Release 3.1 and later.

UASP — These parameters display the threshold for the DS3 P-bit or Adjusted F&M-bit unavailable seconds counts. These parameters are available with OC-12 Release 3.1 and later.

RELATED COMMANDS

init-pm

rtrv-pm-t3

rtrv-pm-tca

set-pmthres-t3

set-t3

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-12 Release 1.1 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-b       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 2.2 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-{b,all}-{1,2,all}, tsi-{1,2,all}, fn-{a,b,c,d,all}-{1,2,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

`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 and OC-12 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 3DS3, 3STS1E, TGS, and TSI 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 and OC-12 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 and OC-12 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 and OC-12 lines.)

`standby` The circuit pack , OC-3, or OC-12 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.

`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.

`-` Not applicable or not equipped

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-t3

switch-fn

switch-line

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, beginning with Release 3.0, and should be used instead of the **rtrv-state** command with Release 2.2 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-12 Addresses: **all, main-b-{1,2,all}, fn-all, fn-{a,b,c,d}-{1,2,all}, tsi-{1,2,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)` 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 from the DSX 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.

`-` Not applicable (not equipped)

blank

The port state is always blank for timing circuits, high speed interfaces, and for protection slots for 1x1 and 1xn protected circuit packs. The port state is always blank for both OLIU circuit packs in function units provisioned for the dual 0x1 application.

`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-3 lines in function unit slots, 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-b slot and the TSI in the tsi slot 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 TSI 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-b OLIUs and TSIs. For function units provisioned for the dual 0x1 application, the switch state will always be active for both OLIUs.

`Switch Priority` Switch priority is the currently active protection switch request. Only a higher priority protection switch request can cause a protection switch to be done. For ring applications, the switch priority in this report applies only to the equipment switching of the main to function unit signals. See the **`rtrv-state-path`** command for path protection switching information. Switch priority may be one of the following:

`inhibit` No protection switches will be done until the switch is reset.

`lockout of protection`
This prevents access to the protection pack for the group.

`lockout of service`
This prevents access to the protection circuit pack for the specified service slot.

`forced` No automatic or manual switches will be done until the forced switch is reset.

`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-pack failure-HIGH`
: Automatic protection switching has occurred due to a circuit pack failure for 1xn protected circuit packs only.

`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 TSIs to function unit signals. See the **`rtrv-state-path`** command for path protection switching information. The switch priority is always blank for protection slots.

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-t3

switch-fn

switch-line

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.

Pass-through signals on the high-speed ring channels are not reported. Signals that drop to a function unit that is provisioned for the dual 0x1 application are not reported.

This command is available in OC-12 Release 3.0 and later ring releases.

The input parameter is:

Address — For Release 3 and later, *address* is any drop or drop and continue STS-1 path. The default is **all** for all paths in the system.
Valid OC-12 STS-1 Addresses: **all, [mb1,mb2]-[1-12,all]**

The output report appears as follows:

```
/* Path Protection Switch State Report
   ================================================================
   ---------- Ring 1 -----------  ---------- Ring 2 -----------
   Address  Act   APS Condition   Address  Act   APS Condition
   ================================================================
   address   x     condition      address   x     condition
   address   x     condition      address   x     condition
      .      .        .             .      .        .
      .      .        .             .      .        .
      .      .        .             .      .        .
   */
```

The output parameters are:

Address — In Release 3.0 and later, address is any STS-1 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-b-1) or Ring 2 path (receive into local main-b-2) is active. A `Y` indicates the path is active, and a blank indicates the path is standby.

`APS Condition`	This column lists the condition that caused the automatic protection switch to occur and appears on the path where the condition was detected. (The manual protection switch request is not shown because the system is nonrevertive.) The condition may be one of the following:
	`signal failure`
	`pack removal`
	`pack failure`
	`signal degrade`
	Only manual or automatic protection switch (APS) requests that are higher priority than the currently active requests will cause a protection switch to occur. Currently, only the `manual` protection switch request is allowed, and because it is a lower priority than the APS requests, only APS requests will appear in the report. The APS conditions will remain active while the condition that caused the switch still exists. When that failure clears, the APS condition is changed to blank if no other APS requests exist.

RELATED COMMANDS

rtrv-state-eqpt

switch-path-sts1

switch-path-sts3c

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 2.2 and later linear applications and Release 3.1 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:
{mb}-{1-12,all}.

The output report appears as follows.

```
/* STS-1 Channel State Report
================================================================
Address      Channel State
================================================================
mb-1         auto
mb-2         is
mb-3         nmon
  .            .
  .            .
  .            .
*/
```

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

set-state-sts1

update

NAME

rtrv-sts1: Retrieve STS1

INPUT FORMAT

rtrv-sts1

DESCRIPTION

This command retrieves information about the dropped STS-1 channels. This information consists of the provisioned signal degrade threshold.

This command is available with Release 3.0 and later ring releases.

The output report appears as follows:

```
/* STS-1 Channel Provisioning Report
================================================
SignalDegrade = value
*/
```

RELATED COMMANDS

set-sts1

NAME

rtrv-sync: Retrieve Synchronization

INPUT FORMAT

```
rtrv-sync;
```

DESCRIPTION

This cor mand 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-12 Release 1.2 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-b` OC-12 linear line address

`main-b-1, main-b-2` OC-12 ring line addresses

— (dash) Timing mode is hardware provisioned to be FreeRunning or External without DS1 sync outputs (i.e. `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-12 payload-carrying signal in the main-b slots.

Active Timing Mode

Active timing mode is the active timing synchronization mode of the timing generator circuit packs. 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 neither external or looped timing references are 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-b-1`

`main-b-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-12 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.

`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-12 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-b-1`

`main-b-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 2.1 software and later and only if the `kbyte` message parameter is set to **`enabled`** (using the **`set-oc3/oc12`** commands).

`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 section of the report is available with Release 3.0 and later. 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-12 Release 2.0 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

Sync Message Information
   Sync Message Protocol      protocol
   Active Ref Output          ref
   Active Ref Input           ref
   OC-N Output               ref
 */
```

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.

`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 2 software and only if the `kbyte` message parameter is set to **`enabled`** (using the **`set-oc3/oc12`** commands).

`OC-N Line` This parameter identifies the address of the active reference line.

`Sync Message Protocol`
This parameter identifies the synchronization message protocol for messages being transmitted and received over the interfaces. The only possible value is `kbyte`, indicating that proprietary messaging is being used.

`Active Reference Input`
This identifies the input message received on the active reference 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.
`-`	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).

`Active Reference Output`
This identifies the output message sent out on the active reference line. The valid values for this parameter are the same as those listed for `Active Reference Input`.

`Other OC-`*N* `Output`
This identifies the message sent out on all other lines enabled for sync messages. The valid values for this parameter are the same as those listed for `Active Reference Input`.

RELATED COMMANDS

rtrv-state

set-sync

switch-sync

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,d]-[1-3,all]`

The output report appears as follows:

```
/* T3 Port Provisioning Report
NEW REPORT FOR OC-3 RELEASE 7.1, OC-12 RELEASE 3.1, and BEYOND
=============================================================================
 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 or OC-12 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-12 Release 3.1 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)
-	Indicates no DS3 PM because `cc` was selected for `Mode`

`PM Format`

This column is available with OC-12 Release 3.1 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.
-	Indicates no DS3 PM because `cc` was selected for `Mode`

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-12 Release 2 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 `39/840` 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

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.

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}`
Valid Addresses for OC-12 Release 4 and later software: `env-{1-21}, 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 2.2 (linear), Release 3.1 (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. Executing this command will corrupt the current quarter hour and day performance monitoring (PM) bins.

NOTE:
For OC-12 Release 2 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 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 the EC-1 ports.

This command is available with OC-12 Release 3 software or later.

The input parameters are:

address Address is the address of one or more EC-1 ports. For OC-12, the alarm and signal degrade thresholds are set for all three ports.
Valid OC-12 Addresses: **{all, a-all, b-all, c-all, d-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. OC-12 systems also support a value of -3, which sets a signal failure threshold for this parameter.

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-12 Release 2 and later linear 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. This feature is available with OC-12 Release 2.0 software and later linear 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

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 DCC Addresses:* **dcc-{m-b,a,b,c,d,all}** *Valid Rings Addresses:* **dcc-{mb1,mb2}**
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**.

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   */

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 2 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-12 Release 1.1 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.

For Release 1.1, a maximum of 10 logins are supported. For Release 2 and later, a maximum of 50 logins are 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 2 and 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 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		

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. */
```

For Release 1.1, a maximum of 10 logins are supported. For Release 2 and later, a maximum of 50 logins are supported.

If a user attempts to enter another login when the maximum supported logins already exist, 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 confi juration 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*`];`

DESCRIPTION

This command sets the Target IDentifier (name) of the DDM-2000.

NOTE:
For OC-12 Release 1.1 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 parameter is:

`tid` TID is a string of up to twenty alphanumeric characters, and may include upper and lower case letters, numbers and dash ("-"). 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 element are set by switches on the BBG5 SYSCTL and BCP1 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 Releases 1 and 1.1) or by the NSAP (in Release 2.0 and later), but does affect proper TL1 message reporting.

`gne` 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 2 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 2 and later), *one* (and only one) network element may be designated the `gne` for proper DCC communication between nodes.

When this command is entered, the following confirmation message will be displayed:

```
/* Caution! Network Element access is affected by this command
   You have selected the set-ne command with these parameters:

    TID = SitenNEn
    GNE = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

For Release 2 and later releases, if the **gne** 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 */
```

If more than one network element is designated as the GNE, a 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-oc12: Set OC-12 Characteristics

INPUT FORMAT

set-oc12:*Address*[:**dgr=***SignalDegrade*][,**kbyte=***Kbyte*];

DESCRIPTION

This command sets the Signal Degrade (DGR) threshold and the K byte message status of the specified OC-12 line pair.

The input parameters are:

Address Address identifies the OC-12 line pair.
Valid OC-12 linear line pair address: **main-b**
Valid OC-12 ring addresses: **main-b-{1,2,all}, all**

dgr SignalDegrade specifies the signal degrade threshold as a BER in terms of a logarithm to the base 10. The value of this parameter has a range of -5 to -9. The default value is -6. For ring releases, the degrade values for main-b-1 and main-b-2 must be the same. Any change to one address will also be made automatically to the other by the software.

kbyte This parameter is available with OC-12 Release 2 and later software. Kbyte specifies the usage of the K byte overhead for Sync Messages. Both the sending and receiving messages are affected. If Kbyte is **enabled** (default), proprietary Sync Messages are used. If Kbyte is **disabled**, proprietary Sync Messages are not used.

When input, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds are affected by this command
    You have selected the set-oc12 command with these parameters:

    Address = x
    SignalDegradeThreshold = -n
    Kbyte = x */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-oc12

NAME

set-oc3: Set OC-3 Characteristics

INPUT FORMAT

set-oc3:*Address*[:**dgr**=*SignalDegradeThreshold*][,**kbyte**=*Kbyte*]
[,**concat**=*ConcatenationMode*]; (Linear Only)
[,**app**=*Application*]; (OC-12 Rings 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 Ring and Linear Addresses: **fn-[a,b,c,d,all], all**

dgr SignalDegradeThreshold specifies the signal degrade threshold as a BER in terms of a logarithm to the base 10. When this threshold is crossed, an alarm will be raised 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.

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-12 Release 2.0 and later and applies to both linear and ring releases.

concat ConcatenationMode provisions the concatenation mode of the OC-3 line from MAIN-B to the addressed function unit 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 of the MAIN-B slots normally default connected to the addressed function unit are recovered from the OC-12 signal and are passed as an STS-3c signal to the addressed function unit slots where they are converted to an OC-3 signal. Both the addressed function unit and MAIN-B slots must be equipped before ConcatenationMode can be enabled.

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.

`app` Application is a keyword that further characterizes the behavior of the function unit in complex networks. This parameter is available in OC-12 Release 3.1 and later ring releases. This parameter cannot be changed if any cross-connection exists to this function slot. Parameter value is one of the following:

dual0x1 The function unit is part of an OC-12 dual 0x1 ring application. This is the default. The automatic protection switching and alarms will follow the rules for the dual 0x1 application. Both slots must be equipped with OLIUs. The Application *dual0x1* must be the same for both slots of a function unit pair. Therefore, a change to *dual0x1* for one address will automatically be made to the other by the software.

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
   Application = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-oc3

rtrv-sync

NAME

set-passwd: Set Password

INPUT FORMAT

```
set-passwd;
```

DESCRIPTION

This co nmand 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-12 Release 1.1 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:[QHB2CVOC12=*nnnnn*][,DayB2CVOC12=*nnnnnn*]
[,QHB2CVOC3=*nnnnn*][,DayB2CVOC3=*nnnnnnn*][,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 or OC-12 lines and activates and deactivates the processing of threshold crossings for performance parameters.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHB2CVOC12 This parameter sets the threshold for the OC-12 coding violations count on a quarter-hourly basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 55365. The default value is 5537. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10.

DayB2CVOC12 A positive value of this parameter sets the threshold for the OC-12 coding violation count on a daily basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 5315040. The default value is 531504. A negative value of this parameter sets the parity count threshold in terms of an equivalent BER expressed as a logarithm to the base 10.

QHB2CVOC3	This parameter sets the threshold for the OC-3 coding violations count on a quarter-hourly basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 13841. The default value is 1384. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10.
DayB2CVOC3	A positive value of this parameter sets the threshold for the OC-3 coding violation count on a daily basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 1328736. The default value is 132874. A negative value of this parameter sets the parity count threshold in terms of an equivalent BER expressed as a logarithm to the base 10.
QHB2CVEC1	This parameter sets the threshold for EC-1 coding violation counts on a quarter-hourly basis. This parameter is available with Release 3 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 displays show the error counts equivalent to different BER thresholds for OC-3, EC-1 and OC-12.

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

B2 OC12 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVOC12)	Equivalent Day Threshold (DayB2CVOC12)
-7	55364	5315052
-8	5537	531505
-9	554	53151
-10	55	5315

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

rtrv-pmthres-line

set-pmthres-sect

NAME

set-pmthres-sect: Set Performance Monitoring Threshold Section

INPUT FORMAT

`set-pmthres-sect:[TxPwr1dB=`*n*`][,TxPwr2dB=`*n*`][,LaserBias=`*n*`]`
`[,Qhsefs=`*nn*`][,Daysefs=`*nnnn*`];`

DESCRIPTION

This command sets the performance-monitoring thresholds of an OC-12 and 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-t3: Set Performance Monitoring Threshold T3

INPUT FORMAT

```
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:

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.

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.

QHCVP 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 typ 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-12 Release 3.1 and later 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-12 Release 3.1 and later 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-12 Release 3.1 and later 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.

DaySESP This parameter is available with OC-12 Release 3.1 and later 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-12 Release 3.1 and later 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-12 Release 3.1 and later 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.

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-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-12 Release 1.1 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-{m-b,a,b,c,d,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 2 and later.

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-12 Release 3 and later software.

The input parameters are:

Address Address identifies the EC-1 port(s).
Valid Addresses: **all, {a,b,c,d}-{1-3,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-monitored".

NOTE:
If a port is in the **nmon** state, it must be returned to the **auto** state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If a primary state of **nmon** is entered, the following message will be displayed:

```
/*  Port(s) address will not be monitored or alarmed in this state */
```

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

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 2.2 and later linear applications and Release 3.1 and later ring applications.

The input parameters are:

Address Address identifies the STS-1 channel(s). Valid addresses are:

all, {mb}-{1-12,all}

Channel states can be set for STS-1 channels within OC-12 interfaces that are cross-connected to DS3 interfaces and for STS-1 channels that are dropped from an OC-12 ring interface to an OC-3, EC-1, or DS3 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. 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.

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

dlt-crs-sts1

rtrv-crs-sts1

rtrv-state-sts1

update

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 monitoring of signal failures from a specified port.

The input parameters are:

`Address` Address identifies the DS3 port(s).
Valid DS3 Port Addresses: `{a,b,c,d}-{1-3,all},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-monitored".

NOTE:
If a port is in the `nmon` state, it must be returned to the `auto` state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the UPD command.

If a port state of `nmon` is entered, the following message will be displayed:

```
/*  Port(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 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-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.

This command is used only for path protected ring applications. The BCP3 TSI circuit pack supports the provisionable signal degrade function.

This command is available with Release 3.0 and later ring releases.

The input parameter is:

dgr SignalDegrade specifies the bit error rate (BER) threshold for the active 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 of the service channel will be initiated. For OC-12, the signal degrade is an integer with range -5 through -9 and original value of -6. 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) =
```

The command requires that the TSI slot(s) be equipped with BCP3 TSI circuit packs. 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 three timing modes:

- Free running from an internal oscillator
- Loop timed from an incoming optical interface. This timing reference is used to generate all outgoing timing signals. If the optical line is protected, the line selected for transmission is also the line selected as 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 3.0 (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 1.2 and 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`*`]`
`[,auto=`*`SyncAutoreconfiguration`*`];` (BBF2 or BBF2B pack type)

When using the BBF2B TGS circuit pack, the *SynchronizationSource* parameter is used to select the optical line for *shelf* timing.

LINEAR SYSTEMS - EXTERNAL TIMING

`set-sync:[mdsw=`*`ModeSwitching`*`];` (BBF2 pack type)

`set-sync:[mdsw=`*`ModeSwitching`*`][,src=`*`SynchronizationSource`*`]`
`[,omd=`*`OutputMode`*`];` (BBF2B pack type)

When using the BBF2B TGS circuit pack, the *SynchronizationSource* parameter is used to select the optical line for the DS1 output mode.

RING SYSTEMS - EXTERNAL TIMING

`set-sync:[mdsw=`*`ModeSwitching`*`];` (BBF2 pack type)

`set-sync:[mdsw=`*`ModeSwitching`*`][,src=`*`SynchronizationSource`*`];`
(BBF2B pack type)

NOTE:
For all applications, if the 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-12 linear Release 1.2, rings Release 3.0, and later. This parameter selects the line from which shelf loop-timing and/or the DS1 synchronization output will be derived. For linear releases, the BBF2B TGS circuit pack must be used. For ring releases, the BBF2 or BBF2B TGS circuit packs may be used. **src** may have one of the following values:

- **main-b** Linear Releases (default)
- **main-b-1** Ring Releases (default)
- **main-b-2** Ring Releases

omd OutputMode. This parameter is available with OC-12 Release 1.2 and later. This parameter is not available with OC-12 ring releases. 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-12 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).

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. Use the **switch-sync** command to manually switch the timing source. This is available with OC-12 ring applications only.

enabled SyncAutoreconfiguration is active. The valid values are **main-b-1** and **main-b-2**.

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** and/or **set-oc12** commands) 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. */
```

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

In a linear application, if the TGS slots are equipped with BBF2-type circuit packs, the request will be denied with the following message:

```
EQWT
/* EQuipage, Wrong Type*/
/* TGS slots are not equipped with proper hardware. */
```

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 (in ring applications only), 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
   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
   SyncAutoreconfiguration = disabled */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-sync

switch-sync

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,d}-{1-3,all},all`

md Mode is the violation monitor removal mode of the DS3 signal. This parameter may have one of the following values:

- **vmr** Monitor and remove DS3 P bit errors (default value).
- **vm** Monitor but do not remove DS3 P bit errors.
- **cc** Clear channel — Do not monitor or remove DS3 P bit errors.

If this parameter is set to **vmr** or **vm**, the **ais** parameter will not be prompted for.

If this parameter is set to **cc**, the **pmmd** parameter is set to **off**. Also in this case, the **fmt** parameter will keep its current value (pbit/fmbit).

If this parameter is set to **cc**, the **pmmd** and **fmt** parameters will not be used.

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 or OC-12 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`.

NOTE:
If `md` value was set to `vmr` or `vm`, and it is set to `cc` the AIS always defaults to `off` value.

`alm` AlarmLevel sets the alarm level for an incoming DS3 Signal Failure and may be one of the following:

`cr`	Critical Alarm
`mj`	Major Alarm
`mn`	Minor Alarm
`na`	No Alarm

For releases prior to Release 1.2, the default alarm level is major. For Release Release 1.2 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 be reported in the alarm and status report as a near

`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-12 Release 3.1 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-12 Release 3.1 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:

```
/* 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-12 Release 3.1 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

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 3STS1E, or 3DS3 circuit packs. (The **switch-line** command is used for protection switching of non-ring system OC-3 and OC-12 lines.)

The input parameters for this command are:

Address Address of the function unit slot pair.
Valid Addresses: **fn-{a,b,c,d}**

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 and OC-12 line protection switching. DDM-2000 provides unidirectional (one-way) line switching. This command affects only the selection of the incoming OC-3 and OC-12 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 or OC-12 lines.
Valid linear Addresses: **main-b, fn-{a,b,c,d}**
Valid ring Addresses: **fn-{a,b,c,d}**

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-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-12 Release 3 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 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. Traffic that drops to a function unit provisioned for the dual 0x1 application cannot be switched.
Valid OC-12 Addresses: **mb{1,2}-{1-12,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.

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. */
```

If the path address specified in the command is a dropped path to a dual 0x1 function unit, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is provisioned for dual0x1  */
```

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.

```
/* sts1 address equal or higher priority switch exists
   sts1 address not properly cross-connected
       .
       .
*/
```

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-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-12 ring Release 3.1 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-b-1** and **main-b-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 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 you enter **`reference`** 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) =
```

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`**.

RELATED COMMANDS

rtrv-sync

set-sync

rtrv-state

NAME

switch-tsi: Protection Switch Time Slot Interchange

INPUT FORMAT

switch-tsi:pri=*x*;

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command controls operation of the TSI protection switching. This command is not available with ring applications.

The input parameter is:

pri Priority indicates the priority of the protection switching request. Valid values for this parameter are:

reset	Clear active protection switch requests
inhibit	Prevent further switches until the switch is reset.
forced	Switch to the standby slot, whether it is good or not, and prevent any further switches until the switch is reset.
manual	Switch to the standby slot only if it is good.

On entry, the following confirmation message is displayed:

```
/* Caution!  Execution of this command may affect service.
   You have selected the switch-tsi command with these parameters:

   Priority = pri */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-state

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 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 2 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 Figu e 11-1.

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.

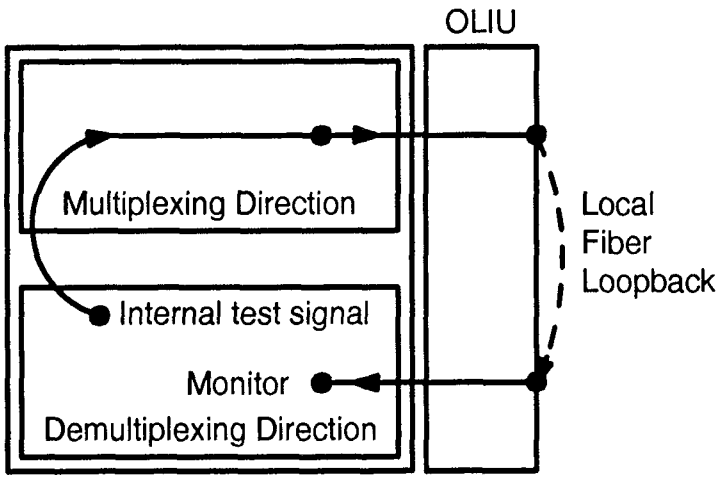


Figure 11-1. Automated Internal Test of Local Equipment (`test-auto:md=local`)

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-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  a-1 a-2 b-1 b-2  a-1 a-2 b-1 b-2 c-1 c-2 d-1 d-2
 g    F     g     ?     g   g   F   g    g   g   g   g   F   -   -   -

---- TSI ----  --- Control ---
tsi-1   tsi-2   sysctl auxctl
  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 DS3 interfaces to detect cross-connect wiring or internal equipment problems. Loopbacks must be set up at the DSX before this test is run as shown in Figure 11-2. 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.

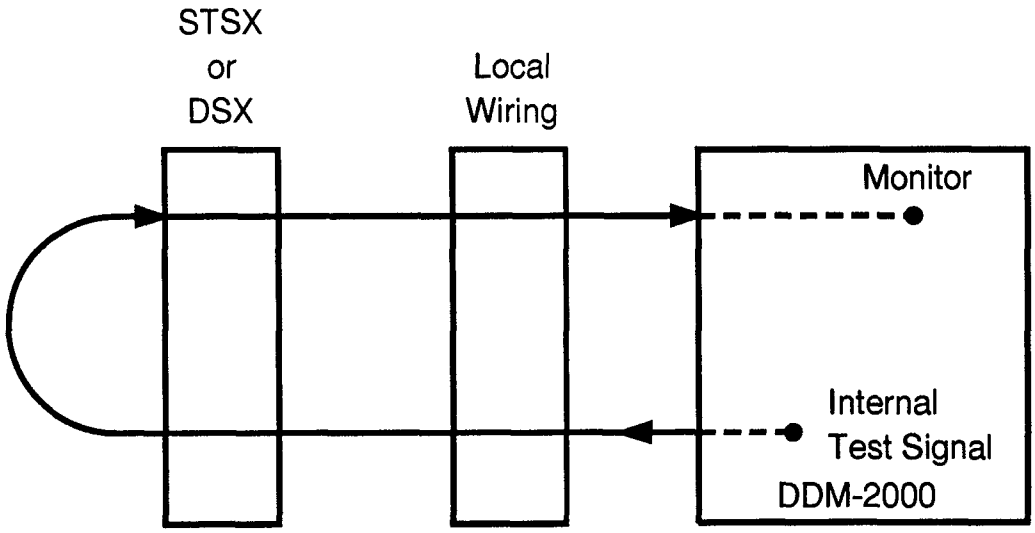


Figure 11-2. Automated Test of Local Wiring to Cross-Connect (`test-auto:md-dsx`)

The cross-connect test report appears as follows:

```
/* Auto-Turnup Report -- Local Wiring Cross-Connect Test
================================================================================
----------------------Function Units----------------------
a-1  a-2  a-3  b-1  b-2  b-3  c-1  c-2  c-3  d-1  d-2  d-3
 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 11-3.

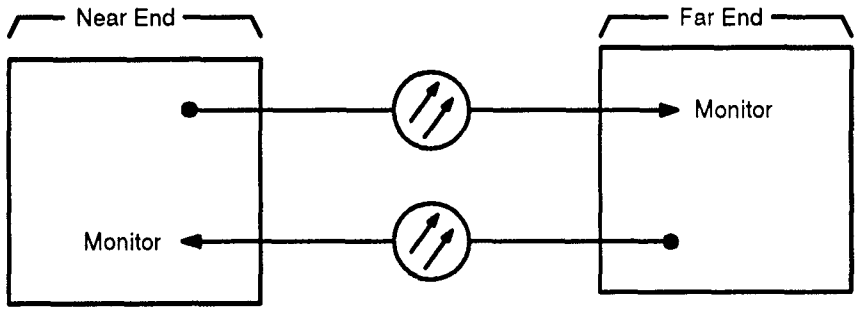


Figure 11-3. Automated Optical Span Test (`test-auto:md=optics`)

The output for the optical span test is as follows:

```
/* Auto-Turnup Report -- Optical Span Test
================================================================================
EQUIPMENT  -------Main-------  ------------Function Units------------
           a-1  a-2  b-1  b-2  a-1  a-2  b-1  b-2  c-1  c-2  d-1  d-2
            -    -    g    g    g    g    g    F    -    -    -    -

TRANSMIT   -------Main-------  ------------Function Units------------
           a-1  a-2  b-1  b-2  a-1  a-2  b-1  b-2  c-1  c-2  d-1  d-2
            -    -    g    g    g    g    g    F    -    -    -    -

RECEIVE    -------Main-------  ------------Function Units------------
           a-1  a-2  b-1  b-2  a-1  a-2  b-1  b-2  c-1  c-2  d-1  d-2
            -    -    g    g    g    g    g    F    -    -    -    -

DCC        -------Main-------  ------------Function Units------------
           main-a    main-b      a          b          c          d
              -         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-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,d,all}-{1,2,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-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-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. A PRBS (psuedo-random bit sequence) signal is used for testing. 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.

NOTE:
For OSI releases (Release 2 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,d]-[1-3]`

`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 11-4.
- `demux` The test signal is inserted in the DEMUX direction and the received signal is monitored from the DEMUX direction as shown in Figure 11-5.

`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.

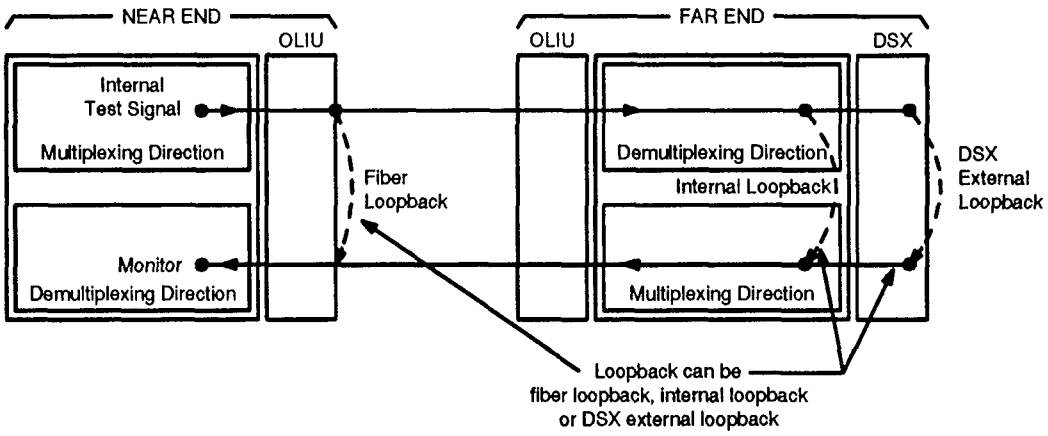


Figure 11-4. Automated Transmission Test of DS3 Signal in MUX Direction

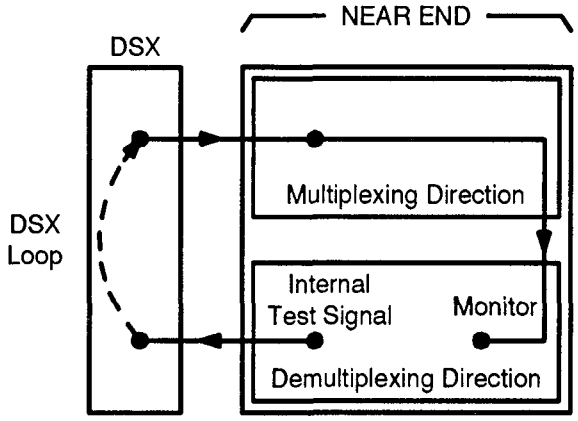


Figure 11-5. Automated Transmission Test of DS3 Signal in DEMUX Direction

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
   Directior = 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 2 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 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 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 timing slots — between BBF2 and BBF2B TGS packs.
  2. 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.

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-t3` or `set-state-ec1` command, before the circuit pack can be removed and the system can be updated. If an incoming signal is present, it must first be removed, then the circuit pack can be removed, and the system can be updated.

- **Manual cross-connection exists**
  A manual cross-connection is entered into the system when an arrangement other than the default is desired and to support various applications.
  Corrective Action: The system will not recognize a circuit pack removal until the manual cross-connection to the addressed circuit pack is deleted. (See the `dlt-crs-stsl`, and `rtrv-crs-stsl` 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-B and TSI circuit packs are special, and all cross-connections in the system must be deleted before the addressed circuit pack can be removed.

  For function units that are provisioned for the dual 0x1 application, neither circuit pack of the pair can be removed until the manual cross-connection to the addressed circuit pack is deleted.

- **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.

- **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 updat_ 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

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-eqpt

rtrv-state

set-state-t3

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 2.0 and earlier)
rtrv-alm[:alm=*AlarmLevel*]; (Release 2.1 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 2.1 and later, this parameter is not used and all slots are always reported.
Valid Slot Addresses:
all, main-b-{1-2,all},
tsi-{1,2,all}, fn-{a,b,c,d,all}-{1,2,all},
tg-{1,2,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)`

`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 11-3 lists the meanings and likely causes of the conditions reported in the alarm and status report. For conditions with more than one possible cause, the most likely causes are listed first.

Table 11-2. RTRV-ALM Descriptions

Description	Meaning
`-48V power/fuse failed`	A –48 volt power feeder or a fuse on the user panel has failed.
`3DS3 CP failed`	Internal equipment failure of the specified 3DS3 CP.
`3STS1E CP failed`	Internal equipment failure of the specified 3STS1E CP.
`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.
`APS channel failed`	The SONET automatic protection switching (APS) channel on the protection OC-3 or OC-12 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.
`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.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
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.
2OC1 CP failed	Internal equipment failure of the specified 2OC1 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 GNE	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. 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).
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.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`environmentn`	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.
`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.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`forced switch`	When associated with an OC-3 or OC-12 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 or TSI 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-tsi`** 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. 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.
`inc. DS1 sync. ref. LOF`	The system is unable to frame on the DS1 synchronization reference signal. Likely causes: Upstream failure in the clock providing the reference signal; high bit error ratio on the received signal, caused by failure of the office timing supply that provides the DS1 timing reference; the system is provisioned for SF format on the specified DS1 synchronization reference signal and the received DS1 signal is in ESF format.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
inc. DS1 sync. ref. LOS	At least 128 consecutive zeros were received in the DS1 synchronization reference signal, or the energy at the DS1 input is below a preset threshold. Likely causes: Failure of the office timing supply that provides the DS1 timing reference or failure of the connection to the timing supply.
inc. DS1 sync. ref. OOL	The incoming DS1 synchronization reference signal is out of lock (OOL). The frequency of the clock providing the DS1 reference signal is out of specification. Likely causes: Failure of the office timing supply that provides the DS1 timing reference.
inc. (from OC-12) 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.
inc. (from OC-12) 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.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
inc. EC1 FERF	The system has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal. Likely causes: The 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.
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. OC12 FERF	The system has detected the OC-12 far end receive failure (FERF) signal in the incoming OC-12 signal. Likely causes: The far end has detected an incoming signal failure on the specified OC-12 line. This may be caused by failure of the 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. OC12 line AIS`	The system has detected OC-12 line alarm indication signal (AIS) on an incoming OC-12 line. Likely cause: Failure of an OLIU CP at the far end.
`inc. OC12 LOF`	The system has detected a loss-of-frame (LOF) condition in an incoming OC-12 signal. LOF is defined as an out-of-frame (OOF) condition (four 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. OC12 LOS`	The system has detected a loss-of-signal (LOS) condition on the OC-12 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. OC12 sig. degrade (BER)`	The bit error ratio (BER) in the specified OC-12 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but is 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 optical attenuator is being used when it should not be, or is not being used when it should be.
`inc. OC12 sig. failed (BER)`	The bit error ratio (BER) in the received OC-12 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 BER`	The bit error ratio (BER) in the received OC-3 signal exceeds 10^{-3}. Likely causes: Failure of the OLIU CP at the near end, failure of the receive fiber, or failure of the OLIU CP at the far end.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`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.
`inc. OC3 LOP STS1` *x*	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of a MXRVO or DS3 CP at the far end. If this condition occurs only on one OC-3 line, the likely cause is failure of the OLIU CP at the near end or far end.
`inc. OC3 LOS`	The system has detected loss-of-signal (LOS) condition on the OC-3 line. Likely causes: Failure of the OLIU CP at near end, failure of the OLIU CP at far end, or failure of the receive fiber.
`inc. OC3 line AIS`	The system has detected OC-3 line alarm indication signal (AIS) on an incoming OC-3 line. Likely cause: Failure of an OLIU CP at the far end.
`inc. OC3 sig. degrade (BER)`	The bit error ratio (BER) in the specified OC-3 line exceeds the provisioned soft error threshold (10^{-9} to 10^{-5}) but below the hard error threshold of 10^{-3}. Likely causes: Failure of the OLIU CP at the near end, failure of the OLIU CP at the far end, failure of the receive fiber, or incorrect setting of the optical power switch on the OLIU CP.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`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. STS1 AIS`	The system has detected an incoming STS-1 alarm indication signal (AIS) in the active OC-3 or OC-12 line. The system responds by transmitting 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 3DS3 or OLIU CP at the far end.
`inc. STS1 LOP EC1 x`	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: Failure of the far end or near end STS1E or 3STS1E circuit pack.
`inc. STS1 LOP OC12 x`	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-12 lines, the likely cause is an unprotected failure of a 3DS3 CP at the far end. If this condition occurs on only one OC-12 line, the likely cause is failure of the OLIU CP at the near end or far end.
`inc. STS1 LOP OC3 x`	The system has detected a loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. Likely causes: If this condition occurs on the STS-1 on both OC-3 lines, the likely cause is an unprotected failure of an MXRVO or a DS3 CP at the far end. If this condition occurs on only one OC-3 line, the likely cause is failure of the OLIU CP at the near end or far end.
`inc. STS1 sig. degrade (BER)`	For STS-1 path switched ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold. Likely Causes: Failure at a fiber or failure of an OLIU circuit pack at some point in the STS-1 path.

Table 11-2. RTRV-ALM Descriptions. (Contd)

Description	Meaning
`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.
`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}). 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 failure of a 3DS3 CP at the far end, unprotected failure of a 3DS3 CP at the near end,
`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 or OC-12 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, TSI 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`**, **`switch-tsi`**, 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.
`lockout of protection`	When associated with an OC-3 or OC-12 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. _ `manual sync. mode switch`!T{ 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.
`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.
`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) data base at the GNE has been exceeded. Likely cause: Network elements have been removed from the network but not from the DSNE data base 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.
TSI CP failed	Internal equipment failure of the TSI CP.
unexpected CP present	A circuit pack has been installed into the main-a slot. The circuit pack should be removed from the shelf.
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 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. When associated with a function unit (FN) slot, this message means that the optical power switch on the 21G OLIU CP is different from what it was before the 21G OLIU 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 an OC12 system, this message means that a OLIU, 3DS3, or 3STS1E CP is inserted in a slot provisioned for a different type of circuit pack.
`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.)

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 2, this report will contain up to 60 events. For Release 2 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 Release 1, 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 11-4 lists the meaning and likely cause of each of the messages that appear in the maintenance history report.

In addition to the messages listed here, any of the messages that appear in the alarm and status report can appear in the history report to record the onset of alarm and status conditions.

Also, all CIT and TL1 commands that affect the state of the system (provisioning commands; protection switching commands; loopbacks; transmission, alarm, and telemetry tests) will appear in the report.

Table 11-3. RTRV-HSTY Descriptions

Description	Meaning
-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.
3DS3 CP good	The failure of the specified circuit pack has cleared.
3DS3 CP inserted	A circuit pack was inserted into the shelf.
3STS1E CP inserted	A circuit pack was inserted into the shelf.
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.
APS channel failed	An automatic protection switch was done because the system detected a failure of the SONET automatic protection switching channel.
APS - CP failed	An automatic protection switch was done because the system detected a circuit pack failure.
APS - K1/K2 byte failure	An automatic protection switch was done because the system detected a failure of the K1 and/or K2 bytes in the SONET automatic protection switching channel.
APS - sig. degraded	An automatic protection switch was done because the system detected a degraded signal on the OC-3 line.
APS - sig. failed	An automatic protection switch was done because the system detected a failure of the OC-3 or OC-12 line (incoming OC-3 or OC-12 line 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.

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.
controln 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 controln part of this message.
disconnect	The craft interface terminal has been disconnected.
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.
DS3 port in service	A DS3 port was put in the "in service" state. This happens automatically when an incoming signal is detected (coming from the DSX) unless the port has been provisioned to the "not monitored" state.
DSNE communication good	Communication has been restored between the DSNE and other network elements in the subnetwork.
duplicate GNE clrd	A shelf has been renamed and no longer has the same GNE as any other shelf in the network.
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.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
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 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.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
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. OC12 FERF clrd	The system is no longer detecting the OC-12 far end receive failure (FERF) signal.
inc. OC12 good	A failure of the OC-12 signal from the DSX has been cleared.
inc. OC12 LOP STS1 #x clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. OC12 sig. degrade clrd	A failure of the specified OC-12 signal has cleared. OC-12 line AIS and/or OC-12 line FERF conditions may still be present on the specified OC-12 line. The OC-12 LOP condition may still be present for one or more of the STS-1 signals in the OC-12 line.
inc. OC12 line AIS clrd	The system is no longer detecting the OC-12 alarm indication signal (AIS) on the specified OC-12 line.
inc. OC3 FERF clrd	The system is no longer detecting the OC-3 far end receive failure (FERF) signal.
inc. OC3 good	A failure of the OC-3 line has been cleared.
inc. OC3 LOP STS1 #x clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. OC3 sig. degrade clrd	A failure of the specified OC-3 signal has cleared. OC-3 line AIS and/or OC-3 line FERF conditions may still be present on the specified OC-3 line. The OC-3 LOP condition may still be present for one or more of the STS-1 signals in the OC-3 line.
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. A downstream 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 yellow clrd	The STS-1 yellow signal is no longer being received.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
`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.
`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.
`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 abnmormal termination at the far end NE.
`reset`	DDM-2000 has reset the system software program.
`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.

Table 11-3. RTRV-HSTY Descriptions. (Contd)

Description	Meaning
switch 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-line, switch-sync, switch-fn, or switch-tsi 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.
TSI CP good	The failure of the specified circuit pack has cleared.
TSI CP inserted	A circuit pack was inserted into the shelf.
X.25 communication restored	Communication over the X.25 communication channel has been restored.

Introduction

This part provides the details of the commands used with the DDM-2000 OC-12 Regenerator, Releases 1 and 2. Command pages are provided here because some of the Regenerator commands have different parameters from the commands presented for the DDM-2000 OC-12 Multiplexer. The command pages are presented in the same format as the commands for the DDM-2000 OC-12 Multiplexer.

DDM-2000 OC-12 Regenerator Commands

The following DDM-2000 OC-12 Regenerator commands are presented in this part:

```
rtrv-alm                    rtrv-pmthres-line (Release 2)
rtrv-eqpt                   rtrv-pmthres-sect
rtrv-hsty                   rtrv-secu
rtrv-ocl2 (Release 2)       set-ocl2 (Release 2)
rtrv-pm-line (Release 2)    set-pmthres-line (Release 2)
rtrv-pm-sect                set-pmthres-sect
rtrv-pm-tca                 set-secu
```

The following list of commands operate the same for the DDM-2000 OC-12 Regenerator as they do for the DDM-2000 OC-12 Multiplexer. Refer to the command pages presented earlier in this section for details on these commands.

```
help            set-date
init-pm         set-lgn
init-sys        set-link
ins-prog        set-ne
logout          set-passwd
opr-aco         test-alm
reset           test-led
rtrv-attr-alm   test-sysctl
rtrv-lgn        test-tlm-par
rtrv-link       test-tlm-ser
rtrv-ne         update
set-attr-alm
```

The remaining commands are not used with the DDM-2000 OC-12 Regenerator, Releases 1 or 2. They include the following:

```
opr-lpbk-t3          set-attr-env
rlgn                 set-fecom*
rls-lpbk-t3          set-nmap
rtrv-attr-cont       set-oc3*
rtrv-attr-env        set-pmthres-sts1
rtrv-fecom*          set-pmthres-t3
rtrv-nmap            set-state-t3
rtrv-oc3             set-sync
rtrv-pm-sts1         set-t3
rtrv-pm-t3           switch-fn*
rtrv-pmthres-sts1    switch-line*
rtrv-pmthres-t3      switch-sync
rtrv-state           switch-tsi
rtrv-sync            test-auto
rtrv-t3              test-trmsn-t3
set-attr-cont        toggle
```

If a command is entered that is not used with the DDM-2000 OC-12 Regenerator, the user will, in most cases, be prompted for all command parameters and then the command request will be denied with the following message:

```
DENY
NIMP
/* Not Implemented  */
/* This is not implemented. */
```

* If this command is entered, the user will not receive a denial message after entering all command parameters. Instead, this command must be aborted using the DELETE key.

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

`rtrv-alm:[`*`Address`*`]:[alm=`*`AlarmLevel`*`];`

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 of one or more slots.*
Valid Slot Addresses:
`all, main-{a,b}-{1-2,all},`
`tsi-{1,2,all}, fn-{a,b,c,d,all}-{1,2,all},`
`tg-{1,2,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.

---

* The SYSCTL, OHCTL, and Main slots are normally the only equipped slots in the DDM-2000 OC-12 Regenerator. Addresses for other slots may be entered, but the DDM-2000 Regenerator will respond with a message that the shelf is not equipped properly.

Table 11-3, located in this section, provides a complete description of the report output produced by this command. In addition to the alarm conditions listed in Table 11-3, the following alarm is associated with the DDM-2000 OC-12 Regenerator and may also appear in the alarm report:

Message Description	Meaning
`23R CP failed`	Internal equipment failure of the 23R Regenerator circuit pack.

RELATED COMMANDS

rtrv-hsty

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-{a,b,all}-{1-2,all}, tsi-{1,2,all}, fn-{a,b,c,d,all}-{1,2,all}, tg-{1,2,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
================================================================================
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
*/
```

The output parameters are:

`Address` This is the address of the slot.

`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".

---

* The SYSCTL, OHCTL, and Main slots are normally the only equipped slots in the DDM-2000 OC-12 Regenerator. Addresses for other slots may be entered, but the DDM-2000 Regenerator will respond with a message that the shelf is not equipped properly

Apparatus Code	Apparatus code uniquely identifies the specific function provided by a circuit pack. Circuit packs with different apparatus codes are not interchangeable, even if they have the same name.
Series Number	This is used to indicate interchangeability among circuit packs with the same circuit pack name and apparatus code, but different manufacturing versions. In general, a circuit pack can be replaced by another circuit pack that has the same apparatus code and the same or later series number.
CLEI Code	*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.

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 a faulty circuit pack with unreadable version recognition information is placed in a slot, the report will indicate that the circuit pack is failed and version information is unrecognizable.

---

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

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-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 the DDM-2000 OC-12 regenerator, this report contains up to 60 of the most recent events. The events are listed in last-in, first-out order and are date- and time-stamped.

Table 11-4, located in this section, provides complete description of the history report output produced by this command. In addition to the history conditions listed in Table 11-4, the following messages are associated with the DDM-2000 OC-12 Regenerator and may also appear in the history report:

Message Description	Meaning
REGENR CP good	A failure of the 23R Regenerator circuit pack has been cleared.
REGENR CP inserted	A 23R Regenerator circuit pack has been inserted into the shelf.

RELATED COMMANDS

rtrv-alm

NAME

rtrv-oc12: Retrieve OC12

INPUT FORMAT

`rtrv-oc12`[:*Address*];

DESCRIPTION

This command displays the configuration of OC-12 lines provisioned by the `set-oc12` command.

This command is available with Release 2 software.

The input parameter is as follows:

Address Address identifies the OC-12 line(s). The default is `all`.
Valid addresses: `main-[b,all]`

The output report appears as follows:

```
/* OC-12 Line Provisioning Report
==========================================================
 Line     Signal Degrade
Address     Threshold
==========================================================
address          -n
address          -n
   .              .
   .              .

*/
```

The output parameters are:

`Line Address` Address of the OC-12 line.

`Signal Degrade Threshold`
This is the bit error rate (BER) threshold as a logarithm to the base 10. The value of *n* is an integer with a range of -5 through -9 corresponding to BERs of 10^{-5} through 10^{-9}. If a slot is empty or equipped with something other than an OC-12 optical unit, a hyphen (-) will appear in this column.

RELATED COMMANDS

set-oc12

NAME

rtrv-pm-line: Retrieve Performance Monitoring Line

INPUT FORMAT

`rtrv-pm-line:`*`Address`*`;`

DESCRIPTION

This command displays performance-monitoring data associated with the OC-12 Regenerator lines terminated on the system.

This command is available with Release 2 software.

The input parameters are:

`Address` Address of the regenerator lines.
Valid Addresses: `main-b-[1,2,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
         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.

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-12 severely errored second contains 124 or more errors.
B2 UAS	This parameter shows the number of unavailable seconds.

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.

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-12 Regenerator.

The input parameter is:

`Address` Address of the OC-12 Regenerator line(s). The address `all` may be used to retrieve all performance-monitoring information.
Valid Addresses: `fn-{a,b,c,d,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   Laser   SEFS
         Time    Bias
                 TCA
================================================================
address  time     aaa     aaa
   .      .       .       .
   .      .       .       .

----------------------------------------------------------------
address  time     aaa     aaa
   .      .       .       .
   .      .       .       .
   */
```

The output parameters are:

`Address`	This indicates the address of the OC-3 or OC-12 line.
`Start Time`	This indicates the time on the system clock when the data collection started.
`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-tca

rtrv-pmthres-sect

set-pmthres-sect

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.

The output report appears as follows:

```
/* TCA Performance Monitoring Summary Report
================================================================
Address       Optics
================================================================
address         n
address         n
address         n
address         n
```

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-12 Regenerator.
`Optics`	This shows the total number of TCAs associated with optical performance-monitoring parameters (Laser Bias).

RELATED COMMANDS

init-pm

rtrv-pm-sect

set-pmthres-sect

NAME

rtrv-pmthres-line: Retrieve Performance Monitoring Threshold Line

INPUT FORMAT

```
rtrv-pmthres-line;
```

DESCRIPTION

This command displays the system's current line performance parameter thresholds, as set by the **set-pmthres-line** command. This command is available with Release 2 software.

The output report appears as follows:

```
/* Line Performance Monitoring Thresholds Report
================================================================
Parameter                                    Thresholds
                                          Quarter    Day
                                           Hour
================================================================
B2 Coding Violations OC12 (B2CVOC12)         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
*/
```

The first column of the report contains the names of the line performance monitoring parameters. The second and third columns contain the quarter hour and day thresholds for each parameter. The output parameters are:

`B2 Coding Violations OC12`	This parameter displays the threshold values for the B2 coding violation counts for OC-12 lines.
`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.

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}.

NOTE:
The DDM-2000 Regenerator software will allow the user to enter values for quarter-hour and day OC-3 coding violations and quarter-hour and day line protection switch counts. These values may appear in the in the `rtrv-pmthres-line` report. However, these parameters are not used by the DDM-2000 Regenerator and any values entered and/or reported are ignored by the system.

RELATED COMMANDS

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
================================================================
Laser Bias = x
================================================================
Parameter                                    Thresholds
                                          Quarter    Day
                                           Hour
================================================================
Severely Errored Frame Seconds (SEFS)     n          n
```

The output parameters are:

`Laser Bias` OLIU laser bias threshold setting.

`Severely Errored Frame Seconds`
This report parameter is available in Release 2. 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-secu: Retrieve Security

INPUT FORMAT

```
rtrv-secu;
```

DESCRIPTION

This command retrieves CIT security and timeout information.

The output report appears as follows:

```
/* Port Security Configuration Report
================================================================
Access        Security        Timeout,
 Link                         minutes
================================================================
cit-1         disabled         0
cit-2         enabled          60
*/
```

The output parameters are:

`Access Link`	Access link is the address of a CIT interface. See Table 11-1a for a list of valid addresses.
`Security`	Security shows whether security is enabled or disabled on the selected CIT. 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. If timeout is zero (0), then there is no timeout.

RELATED COMMANDS

rtrv-lgn

set-secu

NAME

set-oc12: Set OC-12 Characteristics

INPUT FORMAT

`set-oc12:`*`Address`*`[:dgr=`*`SignalDegrade`*`];`

DESCRIPTION

This command sets the Signal Degrade (DGR) threshold status of the specified OC-12 line pair.

This command is available with Release 2 software.

The input parameters are:

`Address` Address identifies the OC-12 line pair.
Valid address: `main-b-[1,2]`

`dgr` SignalDegrade specifies the signal degrade threshold as a BER in terms of a logarithm to the base 10. The value of this parameter has a range of -5 to -9. The default value is -6.

When input, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint  thresholds are affected by this command.
    You have selected the set-oc12 command with these parameters:

    Address = x
    SignalDegradeThreshold = -n

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-oc12

NAME

set-pmthres-line: Set Performance Monitoring Threshold Line

INPUT FORMAT

```
set-pmthres-line:[QHB2CVOC12=nnnnn][,DayB2CVOC12=nnnnnn]
  [,QHB2ES=nnn][,DayB2ES=nnnnn][,QHB2ESA=nnn]
  [,DayB2ESA=nnnnn][,QHB2ESB=nnn][,DayB2ESB=nnnnn]
  [,QHB2SES=nn][,DayB2SES=nnnn][,QHB2UAS=nn]
  [,DayB2UAS=nnnn];
```

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 lines and activates and deactivates the processing of threshold crossings for performance parameters.

This command is available with Release 2 software.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

`QHB2CVOC12` This parameter sets the threshold for the OC-12 coding violations count on a quarter-hourly basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 55365. The default value is 5537. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10.

`DayB2CVOC12` A positive value of this parameter sets the threshold for the OC-12 coding violation count on a daily basis. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 5315040. The default value is 531504. A negative value of this parameter sets the parity count threshold in terms of an equivalent BER expressed as a logarithm to the base 10.

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.

NOTE:
The DDM-2000 Regenerator software will allow the user to enter values for quarter-hour and day OC-3 coding violations and quarter-hour and day line protection switch counts. However, these parameters are not used by the DDM-2000 Regenerator and any values entered will be ignored by the system.

SET-PMTHRES-LINE
DDM-2000 OC-12 Regenerator

RELATED COMMANDS

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`:[,`LaserBias`=*n*][,`Qhsefs`=*nn*][,`Daysefs`=*nnnn*];

DESCRIPTION

This command sets the performance monitoring parameters of the DDM-2000 OC-12 Regenerator.

The input parameters are:

`LaserBias` This parameter enables/disables the laser bias threshold. The valid values are `enabled` (default value) and `disabled`.

`Qhsefs` This parameter is available with Release 2 software. 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 is available with Release 2 software. 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-secu: Set Security

INPUT FORMAT

`set-secu:`*`address`*`[:sec=`*`Security`*`][,to=`*`Timeout`*`];`

DESCRIPTION

This command configures system security on each craft interface terminal (CIT) associated with the DDM-2000 OC-12 Regenerator.

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.

NOTE:
This command is available to privileged users only.

The input parameters are:

`address` Address is the address of one or more CITs. There is no default address.
Valid Addresses: `cit-[1,2,all]`

`sec` Security determines whether security is enabled or disabled on the specified CIT. 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.

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

Operation and Maintenance (TOP)

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Operation and Maintenance (TOP)

Overview

This section supports operation and maintenance of the DDM-2000 OC-12 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:

- Equipping (turning up) a shelf in a looped-back condition for the first time.
- Establishing an end-to-end system after both ends have been equipped.
- Establishing initial end-to-end DS3, EC-1, or OC-3c service.
- Adding, converting, or discontinuing DS3, EC-1, or OC-3c service to an in-service system.

- Adding new shelves or spans to existing configurations.
- Upgrading software to a new release.
- Upgrading an OC-3 system to an OC-12 system.
- Upgrading an OC-12 point-to-point system to path switched ring.
- Establish an OC-3 system dual 0X1 path switched ring.
- Upgrade an OC-3 path switched ring system to an OC-12 path switched ring system.

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. Locate your job in the appropriate colored tab and go to the referenced procedure, for example, **Acceptance IXL-001**. Or you may use the Master Task Index (**Operation and Maintenance: IXI-001**).
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 (NTP or TAP) 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 DLP by another DLP. All DLPs are in the Detailed Level Procedures tab section of this manual.
4. **IMPORTANT**: Unless otherwise directed, when you complete a DLP, you **MUST** return to the procedure which 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 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-12 Installation

AT&T 363-206-208, *DDM-2000 OC-12 Multiplexer/Regenerator 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" section.

Safety Instructions

Admonishments

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**. These admonishments have the following definitions:

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

The alert symbol ⚠ is used on product labels and in this manual to alert the user to important operating and maintenance (servicing) instructions.

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.*

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.

* Registered trademark of F.J W Industries, Inc

- 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 1) 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.

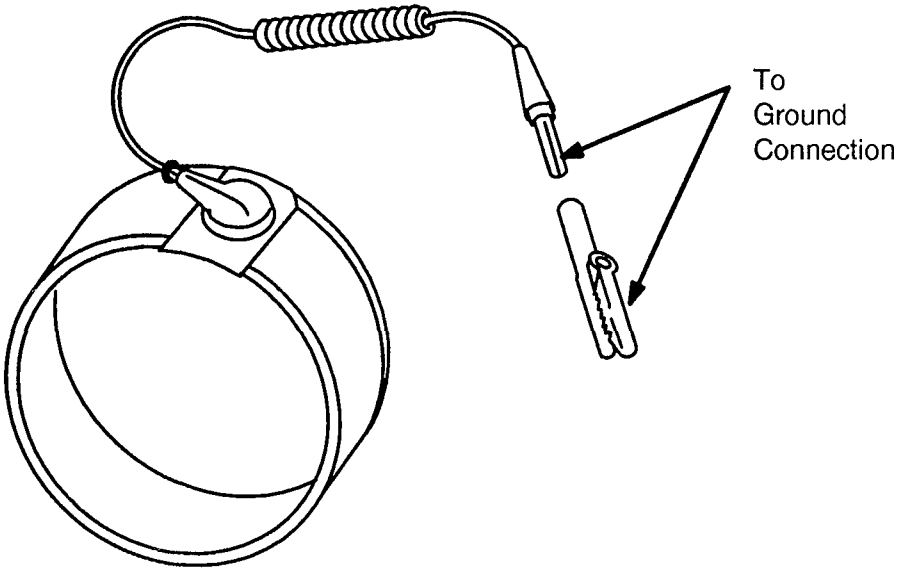


Figure 1. Static Control Wrist Strap

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's back and 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 363-206-208, *DDM-2000 OC-12 Multiplexer/Regenerator 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 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 power connectors when removing power from the system.
9. Use only AT&T manufactured *UL** recognized circuit packs in this system. The ***UL*** recognized circuit packs for use in the DDM-2000 OC-12 Multiplexer are BBG5 (SYSCTL), BCP1 (OHCTL), BBF2 (TGS), BBF2B (TGS), BCP2 (TSI), BCP3 (TSI), BBG11 (3DS3), BBG12 (3STS1E), 21G/21G-U (OLIU), 21D/21D-U (OLIU), 23G/23G-U (OLIU), 23H/23H-U (OLIU), 23R/23R-U (REGENR), 177B and 177C (APPBLK).
10. The DDM-2000 OC-12 Multiplexer is *UL* listed 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.

SAVE THESE INSTRUCTIONS.

* Registered trademark of Underwriters Laboratory, 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 DS3, EC-1, or OC-3c 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 363-206-208, *DDM-2000 OC-12 Multiplexer/Regenerator 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 DS3, EC-1, or OC-3c interface.
8. Use caution when installing or modifying telecommunication lines.

SAVE THESE INSTRUCTIONS.

Master Task Index

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Accept DDM-2000 OC-12 Multiplexer (Equipped) —
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Accept DDM-2000 OC-12 Regenerator Shelf — . . . . . Acceptance: NTP-005

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Add New DS3 Group for DS3 Service —
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In Service . . . . . Circuit Order: NTP-018

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In Service . . . . . Circuit Order: NTP-028

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Alarm - DDM-2000 OC-12 Regenerator Major (MJ) - Clear	Trouble Clearing: TAP-120
Alarm - DDM-2000 OC-12 Multiplexer Minor (MN) - Clear	Trouble Clearing: TAP-112
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CIT - Set (Upgrade) Login/Password Security DLP-541

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Numerical List of TOP Procedures

Table 1. Numerical List of TOP Procedures (Note)

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NTP-003	Accept (Test) DDM-2000 OC-12 Multiplexer (Looped-Back) Optical Operation
NTP-004	Accept (Test) End-to-End System (Network) OC-12 Point to Point
NTP-005	Accept (Test) DDM-2000 OC-12 Regenerator Shelf
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Table 1. Numerical List of TOP Procedures (Contd) (Note)

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Table 1. Numerical List of TOP Procedures (Contd) (Note)

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IXL-001	Task Index
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TAP-105	Clear Trouble Report
TAP-106	Isolate and Clear Failure
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Table 1. Numerical List of TOP Procedures (Contd) (Note)

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DLP-504	Connect FUNCTION UNITS OLIU Optical Loop
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DLP-513	Check Parallel Telemetry
DLP-514	Check TBOS Serial Telemetry
DLP-515	Test Protection Switching Function
DLP-516	Connect CIT and Establish Session
DLP-517	Establish Remote Login
DLP-518	Replace Circuit Pack
DLP-519	Check –48 V DC Office Battery
DLP-520	Perform Automatic End-to-End Optical Line Test
DLP-521	Condition and Connect Modems Establish Communication from Remote CIT Location
DLP-522	Clean Optical Fibers, Connectors and Lightguide Buildouts (LBOs)
DLP-523	Perform Automatic Local Transmission Test
DLP-524	Perform Automatic Cross-Connect Wiring Test
DLP-525	Operate FE SEL Pushbutton on SYSCTL
DLP-526	Retrieve Generic Software Version ID
DLP-527	Install New Generic Program
DLP-528	Introduction to the PC
DLP-529	Copy Diskettes and Make Backups
DLP-530	Upgrade Timing
DLP-531	Perform Test of RT Batteries Using 197A BATTERY LOAD TEST SET
DLP-532	Check 197A BATTERY LOAD TEST SET
DLP-533	Upgrade TBOS/Parallel Telemetry to TL1/X.25
DLP-534	Connect Optical Loop for 23( ) OLIU
DLP-535	Install 23( ) OLIU or 23( ) REGENR Circuit Packs
DLP-536	Test ED-8C733-30, G8 Fan Shelf

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab	
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DLP-538	Install/Remove Lightguide Buildout
DLP-539	Change Timing Mode on TGS Circuit Pack
DLP-540	Replace Existing OLIU With Different Type OLIU
DLP-541	Enable or Disable Security and/or Edit, Delete, or Enter a User's Login
DLP-542	Upgrade BBF2 TGS to BBF2B TGS
DLP-543	Perform OC-3c (STS-3c) Transmission Test
DLP-544	DDM-2000 Receiver Sensitivity Test
DLP-545	Procedure For Replacing Defective Fan Pack
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DLP-547	Install 3STS1E Circuit Packs
DLP-548	Perform End-to-End OC-12 Optical Line Test
DLP-549	Make STS-1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration
DLP-550	Replace DDM-2000 OC-12 User Panel
DLP-551	Perform Optical Fiber Connections and Verify Integrity of Optical Facility for FUNCTION UNITS OLIUs

Table 1 is provided as a reference only, and should not be used alone in finding instructions for performing tasks.

Accept (Test) DDM-2000 OC-12 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 OC-12 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 OC-12 Multiplexer is being tested or accepted by an organization that did not install it.

NOTE 2:
It is assumed that the DDM-2000 OC-12 Multiplexer is installed, powered, equipped, and free of alarms. If it was not left in that condition, notify the organization that installed the DDM-2000 OC-12 Multiplexer that they have not completed the installation, or use **Trouble Clearing: IXL-001.**

NOTE 3:
If the DDM-2000 OC-12 Multiplexer fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-2000 OC-12 Multiplexer, 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-t3`) may be used to retrieve switch settings except for LBO settings on **3DS3** and **3STS1E** circuit packs.

Verify all circuit pack option switches have been set correctly, if not already performed.	**DLP-510**

2. NOTE 1:
In Release 2 and 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.

NOTE 2:
Releases 1 and 2 support **OLIU**s in **FUNCTION UNITS** and **MAIN** slots. Release 3.0 supports **OLIU**s in **MAIN** slots only. Release 3.1 supports **OLIU**s in **MAIN** slots and **FUNCTION UNITS** slots for the dual 0X1 application.

Verify that all **OLIU**s have optical loops installed between their respective **IN** and **OUT** optical connectors.

A. **21G/21G-U** or **21D/21D-U OLIU**	**DLP-504**
B. **23G/23G-U** or **23H/23H-U OLIU**	**DLP-534**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

3. ⇒ NOTE 1:
If the **ACO** button is depressed longer than 2 seconds, the **SYSCTL** display will scroll through the software version code and all LEDs will remain lighted until the code is displayed.

⇒ NOTE 2:
If a **BBG5 SYSCTL** and **BCP1 OHCTL** is installed, 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**, 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 **ACO** pushbutton on user panel. Verify that all user panel and circuit pack LEDs and **SYSCTL** display light. Verify that correct software version is installed.	**DLP-507**

4. Release **ACO** pushbutton. Verify that all LEDs on DDM-2000 OC-12 Multiplexer go off.

5. ⇒ NOTE 1:
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000 OC-12 Multiplexer.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to their default values. STS-1 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 to default values.

NOTE 3:
In Release 2 and 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, but not for Release 3. 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-510**) before executing the `test-auto:` command. The timing mode should be returned to the correct state after these tests have been run. For Release 3, perform the DS3 transmission tests.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

NOTE 2:
These procedures assume that the DDM-2000 has been connected to the DSX-( ) and/or STSX-( ) cross-connect points, as required. **3DS3** and/or **3STS1E** circuit packs must be inserted, as required, before performing these tests.

Perform transmission or automatic turnup tests for each group, as required. Refer any failures to organization that installed the DDM-2000.

Rings (R3)

DS3 transmission test in **demux** direction — **DLP-508**

Linear (R1, R2)

A. Automatic turnup local (looped-back) test — **DLP-523**
B. Automatic turnup cross-connect test — **DLP-524**

7. Test ED-8C733-30, G8 fan shelf. — **DLP-536**

8. NOTE:
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000 OC-12 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-509**

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
9. After each DDM-2000 OC-12 shelf on the system has been optioned and looped-back tested, then the DDM-2000 OC-12 system is ready for end-to-end testing. [**Acceptance: NTP-004**]	

Accept (Test) End-to-End DDM-2000 OC-12 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 1:
There are no option switches on **23G/23G-U**, **23H/23H-U**, or **21D/21D-U OLIUs**.

⇒ NOTE 2:
The **23H/23H-U OLIU** cannot be used with the **23R/23R-U REGENR**.

⇒ NOTE 3:
Releases 1 and 2 support **OLIUs** in **FUNCTION UNITS** and **MAIN** slots. Release 3.0 supports **OLIUs** in **MAIN** slots only. Release 3.1 supports **OLIUs** in **MAIN** slots and **FUNCTION UNITS** slots for the dual 0X1 application.

If **21G OLIUs** are installed in function unit slots, ensure **HIGH/LOW POWER** option switches are set to agree with the loss of the optical facility. **DLP-510**

3. ⇒ NOTE:
In Release 2 and later, 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 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 2 and later, 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 2 or later software is installed, use the `set-ne:`*`TID`*`:gne=yes` command to designate ONE shelf as the GNE.

4. ⇒ NOTE:
The section data communication channel (DCC) used for far end communications must be enabled at each network element (shelf) for the `rtrv-nmap` command 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. 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-12 shelves (**OLIU**s and **REGENR**s) in the network have been connected to the optical facility. Verify the integrity of each optical span.

A. **MAIN OLIU**s and/or **REGENR**s — **DLP-511**
B. **FUNCTION UNITS OLIU**s — **DLP-551**

5. 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`*.

6. ⚠ CAUTION:
The `init-sys:all` *command should NOT be used on an in-service system.*

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 1:
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to their default values. STS-1 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. Some parameters will have to be set again later before service is established.

⇒ NOTE 2:
In Release 2 and 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.

7. ⇒ 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 used.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Perform end-to-end OC-12 line test on all optical spans. Report any failures to the organization that installed the DDM-2000.	
A. Rings (R3)	**DLP-548**
B. Linear (R1, R2)	**DLP-520**
8. Perform end-to-end DS3 transmission test in the **mux** and **demux** directions for each function unit group, as required.	**DLP-508**
9. ⇒ NOTE: In Release 3, STS-3c transmission is **not** supported.	
Perform end-to-end OC-3c (STS-3c) transmission test in the **mux** direction for each function unit group, as required.	**DLP-543**
10. Check local office alarm interface as required.	**DLP-512**
11. Check office telemetry interface as required.	
A. Parallel telemetry	**DLP-513**
B. Serial telemetry	**DLP-514**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. Test DDM-2000 OC-12 Multiplexer protection switching function, if required.	**DLP-515**
13. The system is ready for service to be established.	
14. Activate optional features as required.	**DLP-509**

System Turnup/Circuit Order Task Index

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-12 Multiplexers, establish end-to-end OC-12 systems, and establish initial end-to-end DS3 and/or OC-3c service after all necessary bay, shelf, and cable installation has been done.

Shelf — Equipping

Equip DDM-2000 OC-12 Multiplexer —
(Looped Back) . . . . . System Turnup: NTP-002

Equip DDM-2000 OC-12 Regenerator Shelf —
Initial Turnup . . . . . System Turnup: NTP-010

System — Establish End-to-End

Establish End-to-End DDM-2000 OC-12 System —
DDM-2000 OC-12 Point to Point . . . . . System Turnup: NTP-003

Establish End-to-End DDM-2000 OC-12 System —
Path Switched Ring Network . . . . . System Turnup: NTP-020

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FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Establish End-to-End DDM-2000 OC-3 System — Optical Fiber Spans Dual 0X1 Path Switched Ring Network	System Turnup: NTP-033
Service — Establish Initial DS3	
Establish Initial End-to-End DS3 Service — Linear or Hub Configuration Group Equipped But Not In Service	System Turnup: NTP-004
Establish Initial End-to-End DS3 Service — Path Switched Ring Group Equipped But Not In Service	System Turnup: NTP-017
Establish Initial Low Speed EC-1 Interface — Path Switched Ring Group Equipped But Not In Service	System Turnup: NTP-023
Establish Initial Low Speed EC-1 Interface — Linear or Hub Configuration Group Equipped But Not In Service	System Turnup: NTP-027
Service — Establish Initial OC-3c	
Establish Initial End-to-End OC-3c (STS-3c) Service — Linear or Hub Configuration Group Equipped But Not In Service	System Turnup: NTP-013
Circuit Order/Work Order Procedures	

NOTE:
Some of these procedures are used to add or discontinue DS3 and/or OC-3c service after the system is running with initial service. Other procedures are used to add new optical spans, upgrade system configuration, and upgrade system telemetry.

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Service — Adding New DS3

Add New DS3 Service/Group —
Linear or Hub Configuration
In Service . . . . . Circuit Order: NTP-005

Add New DS3 Service/Group —
Path Switched Ring
In Service . . . . . Circuit Order: NTP-018

Service — Adding New OC-3c

Add New Group for OC-3c (STS-3c) Service —
Linear or Hub Configuration
In Service . . . . . Circuit Order: NTP-014

EC-1 Interface — Adding

Add New STS1E Low Speed Service/Group for EC-1 Interface —
Path Switched Ring
In Service . . . . . Circuit Order: NTP-024

Add New STS1E Low Speed Service/Group for EC-1 Interface —
Linear or Hub Configuration
In Service . . . . . Circuit Order: NTP-028

Conversions

Convert In Service OC-12 Point-to-Point Network
to Diverse Routing Point-to-Point Network . . . . . System Turnup: NTP-011

Convert (Upgrade) OC-3 System to OC-12 System —
Linear or Hub Configuration . . . . . Circuit Order: NTP-007

Convert DS3 Group Service to EC-1 Group Service —
Path Switched Ring . . . . . Circuit Order: NTP-026

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Convert DS3 Group Service to EC-1 Group Service — Linear or Hub Configuration	Circuit Order: NTP-030
Service — Discontinue DS3	
Discontinue End-to-End DS3 Service/Group — Linear or Hub Configuration	Circuit Order: NTP-006
Discontinue End-to-End DS3 Service/Group — Path Switched Ring	Circuit Order: NTP-019
Service — Discontinue OC-3c	
Discontinue End-to-End OC-3c (STS-3c) Service — Linear or Hub Configuration	Circuit Order: NTP-015
Service — Discontinue EC-1 Interface	
Discontinue EC-1 Interface — Path Switched Ring	Circuit Order: NTP-025
Discontinue EC-1 Interface — Linear or Hub Configuration	Circuit Order: NTP-029
Span — Add OC-3	
Add OC-3 Optical Span — Linear or Hub Configuration	Circuit Order: NTP-008
Span — Discontinue	
Discontinue OC-3 Optical Span	Circuit Order: NTP-009
Discontinue OC-12 Optical Span	Circuit Order: NTP-012

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Shelf (Node) — Add

Add DDM-2000 OC-12 Node (Shelf) —
Path Switched Ring . . . . . Circuit Order: NTP-021

Shelf (Node) — Discontinue

Discontinue DDM-2000 OC-12 Node (Shelf) —
Path Switched Ring . . . . . Circuit Order: NTP-022

Discontinue OC-12 Optical Span —
Linear or Hub Configuration . . . . . Circuit Order: NTP-012

Upgrades

Upgrade DDM-2000 OC-12 Release 1 to Release 2
In Service . . . . . Circuit Order: NTP-016

Upgrade DDM-2000 OC-3 Ring Network to
OC-12 Ring Network —
In Service . . . . . Circuit Order: NTP-034

Upgrade DDM-2000 OC-12 Point-to-Point Network to
Path Switched Ring —
Out of Service . . . . . Circuit Order: NTP-031

Upgrade DDM-2000 OC-12 Point-to-Point Network to
Path Switched Ring —
In Service . . . . . Circuit Order: NTP-032

Upgrade TBOS/Parallel Telemetry to TL1/X.25 . . . . . DLP-533

Upgrade Timing DLP-530

Equip DDM-2000 OC-12 Multiplexer (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 OC-12 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 OC-12 Multiplexer 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-519**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

2. ⇒ NOTE 1:
For Release 2, the **OHCTL** must be a series **S2:3** or later to support open systems interconnection (OSI) protocol and *linear* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *linear* applications. **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 2 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

⇒ NOTE 2:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and *ring* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *ring* applications. **S2:5** 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 3 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

Install **BCP1 OHCTL** circuit pack.	**DLP-500**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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 display` alarm.

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 OC-12 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.

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.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Install **TGS** timing circuit packs.	**DLP-502**

5. ⇒ NOTE 1:
In Release 2, the **BCP2 TSI** circuit pack is required for fixed internal STS-1 cross-connections in linear applications.

⇒ NOTE 2:
In Release 3, the **BCP3 TSI** circuit pack is required for manual internal STS-1 cross-connections in path switched ring applications.

Install **BCP2 TSI** or **BCP3 TSI** circuit packs, as required. **DLP-505**

6. Install **23G/23G-U** or **23H/23H-U OLIU** circuit packs. **DLP-535**

7. Install **177C** apparatus blanks (**APPBLK**) in the **MAIN-A-1** and **MAIN-A-2(P)** slots to ensure adequate cooling by controlling air flow through the shelf.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE:
Releases 1 and 2 support **OLIU**s in **FUNCTION UNITS** and **MAIN** slots. Release 3.0 supports **OLIU**s in **MAIN** slots only. Release 3.1 supports **OLIU**s in **MAIN** slots and **FUNCTION UNITS** slots for the dual 0X1 application.

Install **21G/21G-U OLIU** circuit packs (if required) with **HIGH/LOW POWER** switches set to **LOW**. **DLP-503**

9. ⇒ NOTE:
Releases 1 and 2 support **OLIU**s in **FUNCTION UNITS** and **MAIN** slots. Release 3.0 supports **OLIU**s in **MAIN** slots only. Release 3.1 supports **OLIU**s in **MAIN** slots and **FUNCTION UNITS** slots for the dual 0X1 application.

Install **21D/21D-U OLIU** circuit packs (if required). **DLP-503**

10. ⇒ NOTE:
In Release 2 or later software, 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 **FUNCTION UNITS** and **MAIN OLIU** optical loops.

A. **21G/21G-U** or **21D/21D-U OLIU** **DLP-504**
B. **23G/23G-U** or **23H/23H-U OLIU** **DLP-534**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Perform DDM-2000 OC-12 receiver sensitivity test (if required). Optional test.	**DLP-544**
12. ⇒ NOTE: Use `set-t3:`*`address`*`:mode=cc,ais=no` to set any undriven channels to clear channel to prevent **FAULT** lights on the **3DS3** circuit packs. Install **BBG11 3DS3** circuit packs (if required).	**DLP-506**
13. Install **BBG12 3STS1E** circuit packs (if required).	**DLP-547**
14. Install **177B** apparatus blanks (**APPBLK**) in all unused function unit slots to ensure adequate cooling by controlling air flow through the shelf.	
15. ⚠ 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 to their default values.*	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
In Release 2 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.

If a CIT is available, use the **`init-sys:all`** command to initialize all provisionable parameters to their original default values.

16. Perform LED test. **DLP-507**

17. 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 3.

Perform automatic local (looped back) transmission test.

A. Release 3 DS3 transmission test **DLP-508**
B. Releases 1 and 2 **DLP-523**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
18. ⇒ NOTE: This procedure assumes that the DDM-2000 has been connected to the low-speed DSX and/or STSX cross-connection as required. Automatic cross-connect tests (looped back), using the `test-auto` command, are not available for Release 3. Perform automatic local wiring cross-connect test (looped back).	
A. Release 3 DS3 transmission test	**DLP-508**
B. Releases 1 and 2	**DLP-524**
19. Check office alarm interface as required.	**DLP-512**
20. Check telemetry interface as required.	
A. Parallel telemetry	**DLP-513**
B. Serial telemetry	**DLP-514**
21. Test protection switching function, if required.	**DLP-515**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

22. ⚠ CAUTION:
The command `init-sys:all` *may affect service. It should never be used on an in-service system. It should be used only after a shelf has been equipped to reset all provisionable parameters to their default values.*

NOTE:
In Release 2 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.

If a CIT is available, use the `init-sys:all` command to initialize all provisionable parameters to their original default values.

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23. NOTE 1:
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000 OC-12 Multiplexer, such as system name and GNE status, security and logins, date and time, far end communication (fecom), etc.

NOTE 2:
In Release 3, if you choose to make STS-1 cross-connections at this time using the `ent-crs-sts1` command, 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-509**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

24. After all shelves in the network have been tested, you can establish the end-to-end DDM-2000 OC-12 system.

    A. DDM-2000 OC-12 Point-to-Point [**NTP-003**]
    B. DDM-2000 OC-12 Path Switched Rings [**NTP-020**]

Establish End-to-End System
DDM-2000 OC-12 Point to Point

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 OC-12 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 OC-12 Multiplexer (or Regenerator) fails to respond in the indicated manner, you should refer to **Trouble Clearing: IXL-001.**

NOTE 2:
It is assumed that the DDM-2000 OC-12 Multiplexers at both ends of the system have passed the looped transmission test(s) [**System Turnup: NTP-002**].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
This procedure assumes that DDM-2000 OC-12 Regenerators are used in the optical facility. Each must be properly equipped before the end-to-end system can be established. Also, the optical loss must be known or measured for each optical span between the multiplexers and regenerators and between regenerators. The proper lightguide buildouts (LBOs) must be available.

NOTE 4:
23R/23R-U REGENR circuit packs cannot be individually looped back because they do not generate a valid OC-12 optical signal. Therefore, the **FAULT** LEDs will be *flashing* on installed **23R/23R-U REGENR** circuit packs, and critical **CR** alarms will be present until a valid OC-12 optical signal from an OC-12 Multiplexer is received. The **23R/23R-U REGENR** circuit packs will be tested during end-to-end tests to verify that the **FAULT** LEDs go off.

NOTE 5:
The **23H/23H-U OLIU** cannot be used with the **23R/23R-U REGENR**.

Determine the optical loss of the optical facility from office records or by making the required measurements.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE 1:
For Release 2, the **OHCTL** must be a series **S2:3** or later to support open systems interconnection (OSI) protocol and *linear* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *linear* applications. **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 2 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-510**

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.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Verify no duplicate TBOS, site/ne, or TID settings exist. The `rtrv-ne:` command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches to new settings or use the `set-ne` command for the TID.	**DLP-510**

4. ⇒ NOTE:
In Release 2 or later, the `set-ne:`*TI D*`: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 2 or later, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

If Release 2 or later software is installed, use the `set-ne:`*TI D*`:gne=yes` command to designate ONE shelf as the GNE.

5. Remove optical loops from the **23G/23G-U** or **23H/23H-U** **OLIU**s in the DDM-2000 OC-12 Multiplexer, 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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

At each shelf, use the `set-fecom:`*`address`*`:com=enable` command to ensure far end communications (fecom) is enabled.

7. NOTE:
Optical span tests (using the `test-auto` command) between multiplexers and regenerators or between regenerators are not available. Therefore, each optical span must be looped back at the regenerator site during turnup to ensure that the span is good.

Perform optical fiber connections and verification of the optical facility. **DLP-511**

8. NOTE 1:
At the OC-12 Multiplexers, 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** packs.

NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** pushbutton on the **SYSCTL** after the **TGS** 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** 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 timing mode specified in work order or office records.	**DLP-510**
9.	Perform automatic end-to-end optical line test.	**DLP-520**
10.	Perform end-to-end DS3 transmission test for each group, if required.	**DLP-508**
11.	Perform end-to-end OC-3c (STS-3c) transmission test for each OC-3c (STS-3c) being put into service, if required.	**DLP-543**
12.	The system is now ready for initial DS3, OC-3c, or EC-1 service to be established. [**System Turnup: NTP-004**] (DS3), [**System Turnup: NTP-013**] (OC-3c), [**System Turnup: NTP-027**] (EC-1).	

Establish Initial End-to-End DS3 Service
Linear or Hub Configuration
Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 OC-12 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-12 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 **3DS3** circuit packs have already been installed during the initial shelf turnup at the DS3 terminating end(s) of the circuit and either **3DS3** or **3STS1E** 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(s) being established, determine which DS3 port(s) 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) **3DS3** circuit packs have been installed in proper group (**FN A**, **FN B**, **FN C**, or **FN D**) 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. Verify the line build out (LBO) option jumpers are installed as required and reinstall **3DS3** circuit pack(s).	**DLP-510**
5. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] 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 **3STS1E** circuit packs for EC-1 interfaces to support DS3 services being established, establish initial EC-1 low speed interfaces. [**NTP-027**]	
8. Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
9. Use the `set-t3:` command to set the characteristics of the DS3 port(s) of the circuit being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. Use the `rtrv-state:` command to determine the port state of the DS3 port(s) of the circuit being established.

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-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.

12. Use the `rtrv-state-sts1:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel must be returned to the *auto* state, using the `set-state-sts1:` command.

Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.

Add New DS3 Service/Group
Linear or Hub Configuration
System In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 OC-12 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 is in service and that a new group is being equipped with **3DS3** circuit packs for DS3 service. It also assumes that **3STS1E** 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 **3STS1E** 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**, **C**, or **D**) 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. ⚠ CAUTION 1:
To minimize "hits" on in-service ports on **3DS3** *circuit packs having a port added, it is recommended that a CIT be used to manually switch (using the* `switch-fn` *command) the* **3DS3** *circuit pack to protection if the* **3DS3** *circuit pack is removed.*

⚠ CAUTION 2:
If the protection **3DS3** *circuit pack is not available for a protection switch, removing a service* **3DS3** *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.*

If a new **3DS3** circuit pack(s) is being installed, set line build out (LBO) option jumpers and install **3DS3** circuit pack(s) into proper slots of **FUNCTION UNITS** group(s) (**A**, **B**, **C**, or **D**) being equipped. **DLP-506**

4. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the DS3 cross-connect point(s) or equivalent connection point(s) for the circuit being added.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.	
6. Perform an end-to-end DS3 transmission test for each DS3 circuit being put into service (optional).	**DLP-508**
7. Use the `set-t3:` command to set the characteristics of the DS3 port(s) of the circuit being added.	
8. Use the `rtrv-state:` command to determine the port state of the DS3 port(s) of the circuit being added.	
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. Use the `set-state-t3:` command to set the port state of the DS3 port(s) of the circuit being added.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. Use the `rtrv-state-sts1:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

11. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel must be returned to the *auto* state, using the `set-state-sts1:` command.

Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.

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 [**AT&T 363-206-202, 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 [**AT&T 363-206-202**] **DLP-513**
B. OC-12 Shelf **DLP-510**

2. Ensure that OC-3 software is compatible with the OC-12 system to be turned up [**AT&T 363-206-202, DLP-532**].

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
3. Establish an end-to-end OC-12 system.	**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 OC-3 shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches to new settings [**AT&T 363-206-202, DLP-513**] or use the `set-ne` command for the TID.	

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**. [**AT&T 363-206-202, DLP-513**].

8. ⇒ NOTE:
In OC-3 Release 6 or later software, the `set-ne:TI D: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:TID: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)**.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

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.

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.

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 OLIUs** are used, remove **OLIUs** from **MAIN 1** slots, set optical power switches to proper position [**AT&T 363-206-202, DLP-513**], then reinstall **OLIUs**.

If a different type of **OLIU** is to be used in the OC-3 **MAIN** slots, remove existing **OLIUs** from **MAIN 1** slots, and install new **OLIUs**.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
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.	**DLP-551**
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)**.	**DLP-511**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
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**.	
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(P)** slot. Verify that **FAULT** LEDs go off on all **OLIU**s.	**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-510**]. It may also include using the `set-ne:` command to indicate which system is a gateway network element (GNE).	

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. The OC-3 and OC-12 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 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

Verify that no alarms, locks, loops, or switches are present.

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 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.

At OC-12 system, install required **OLIUs** in **FUNCTION UNITS** slots being used for OC-3 extension. **DLP-503**

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 OC-3 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 for the TID. **DLP-510**

5. ⇒ NOTE 1:
For OC-3 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 (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 (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**.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

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-510**

6. NOTE:
In OC-3 Release 6 (Release 2, OC-12) or later software, the **set-ne:***TI D*:**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 (Release 2, OC-12) or later software, 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 that only ONE shelf is set as the GNE.

7. Connect OC-12 **FUNCTION UNITS OLIU** optical loops. **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 systems.

9. Determine the optical loss of the optical facility from office records or by making the required measurements.

10. ⇒ NOTE:
21D/21D-U OLIUs have no option settings and are intended to be used for short-reach intraoffice 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-510**

11. ⇒ NOTE:
Far-end communications (fecom) must be enabled using the `set-fecom` command to use the `rtrv-nmap` command to verify the optical fiber links.

Use `rtrv-fecom` command at each shelf in the network to verify that fecom is enabled and use `set-fecom:`*`address`*`:com=enabled` to enable fecom at any shelf where it is not enabled.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

12. ⇒ 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 and connect each **OLIU** to the new optical facility.	**DLP-551**

13. ⇒ NOTE 1:
If loop timing mode is specified or external timing mode is specified but the timing reference is 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** 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** packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** pack is reinserted, use the CIT and the `rtrv-sync` command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Set timing mode on **TGS** to the timing mode specified in work order or office records.	**DLP-510**
14. Perform automatic end-to-end OC-3 line test at end of the optical fiber spans [**AT&T 363-206-202, DLP-525**].	
15. Perform end-to-end DS1 transmission test for each low speed group, if required [**AT&T 363-206-202, DLP-510**].	
16. Perform end-to-end DS3 transmission test for each low speed group, if required [**AT&T 363-206-202, DLP-511**].	
17. Perform end-to-end OC-3c transmission test for **FUNCTION UNITS C** slots, if required [**AT&T 363-206-202, DLP-544**].	
18. The system is ready for service to be established.	

Convert In Service OC-12 Point-to-Point Network to Diverse Routing Point-to-Point Network

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 OC-12 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 OC-12 Multiplexer (or Regenerator) fails to respond in the indicated manner, you should refer to **Trouble Clearing: IXL-001.**

NOTE 2:
It is assumed that the DDM-2000 OC-12 system is in service and that the protection optical line is to be rerouted through one or more OC-12 Regenerators to form a diverse routed network. See Figure 1.

NOTE 3:
The **23H/23H-U OLIU** cannot be used with the **23R/23R-U REGENR.**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

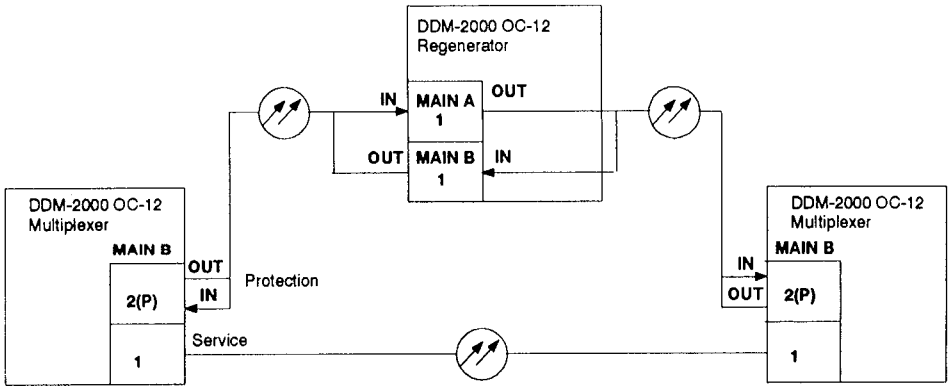


Figure 1. Example of Diverse Routing — Protection Line Through OC-12 Regenerator

At both DDM-2000 OC-12 Multiplexers, use the `switch-line:main-b:pri=lockout` command to switch service to the service line. (**ACTIVE** LED lighted only on the **23G/23G-U OLIU** in **MAIN-B 1**).

2. Install **23R/23R-U REGENR** circuit packs into the appropriate slots of the OC-12 Regenerator. **DLP-535**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⇒ NOTE:
In Release 2 or later, 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 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 2 or later, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

If Release 2 or later software is installed, use the `set-ne:TID:gne=yes` command to designate ONE shelf as the GNE.

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4. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) to use the `rtrv-nmap` command to verify the optical fiber links. Default condition for the DCC channel is enabled. If it has been disabled, use the `set-fecom:` command **at each shelf** to enable far end communications.

At each shelf, use the `set-fecom:address:com=enable` command to ensure far end communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. ⇒ NOTE: Optical span tests (using the `test-auto` command) between multiplexers and regenerators or between regenerators are not available. Therefore, each optical span must be looped back at the regenerator site during turnup to ensure that the span is good. Perform optical fiber connections and verification of the optical facility.	**DLP-511**
6. Perform end-to-end optical line test.	**DLP-520**
7. At both DDM-2000 OC-12 Multiplexers, use the `switch-line:main-b:pri=reset` command to reset the line switch.	

Discontinue OC-12 Span
Linear or Hub Configuration

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE:
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.

Determine which optical span (service or protection) is being discontinued.

2. Ensure service (signals) has been removed from the DS3/OC-3c/EC-1 groups in the span(s) being discontinued (**NTP-006**, **NTP-015**, and/or **NTP-029**).

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/TST** pushbutton.

At DDM-2000 OC-12 Multiplexers, remove optical fiber connections from all **23G/23G-U** or **23H/23H-U OLIU**s associated with optical span(s) being discontinued.

4. At the DDM-2000 OC-12 Multiplexers, remove **23G/23G-U** or **23H/23H-U OLIU**(s) associated with optical span being discontinued, if required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
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 **23G/23G-U** or **23H/23H-U OLIU** circuit pack(s) was removed, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** or use the `upd` command to update the DDM-2000 internal equipment list. If **23G/23G-U** or **23H/23H-U OLIU** circuit pack(s) was *not* removed, connect optical fiber loops to **OLIU**(s).	**DLP-534**
6. At all OC-12 Regenerators, remove optical fiber connections from all **23R/23R-U REGENR**s associated with optical span(s) being discontinued, if required.	
7. At the DDM-2000 OC-12 Regenerators, remove the **23R/23R-U REGENR**s associated with optical span being discontinued, if required.	
8. If **23R/23R-U REGENR** circuit packs were removed, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** or use the `upd` command to update the DDM-2000 internal equipment list.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE 1:
With Release 2 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.

10. ⇒ NOTE:
23R/23R-U REGENR circuit packs cannot be individually looped back since they do not generate a valid OC-12 optical signal. Therefore, the **FAULT** LEDs will be *flashing* on installed **23R/23R-U REGENR** circuit packs, and critical **CR** alarms will be present if the **23R/23R-U REGENR**s *are not removed.*

Verify that all other alarms go off.

Establish Initial End-to-End DS3 Service
Path Switched Ring
Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 OC-12 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-12 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 **3DS3** circuit packs have been installed during the initial shelf turnup at the DS3 terminating end(s) of the circuit. The other terminating end(s) may be equipped with **3DS3** or **3STS1E** 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 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) **3DS3** circuit packs have been installed in proper group (**FN A**, **FN B**, **FN C**, or **FN D**) 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. Verify the line build out (LBO) option jumpers are installed as required and reinstall **3DS3** circuit pack(s).	**DLP-510**
5. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] 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 **3STS1E** circuit packs for EC-1 interfaces to support DS3 services being established, establish initial EC-1 low speed interfaces. [**NTP-023**]	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
Release 3 supports manual STS-1 cross-connections in OC-12 ring applications. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Terminating cross-connections are made at the terminating nodes, and pass-through cross-connections are made at all other nodes.

⇒ NOTE 2:
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 terminating and pass-through node from the work order or circuit order.

9. Enter or change the necessary STS-1 cross-connections for each node in the network.

A. Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⇒ NOTE:
For a circuit in a path protected ring network, use the **sw-path-sts1:** *address* command at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 path and repeat this test on the other path.

Perform DS3 end-to-end transmission test for each circuit being put into service (optional). **DLP-508**

11. Use the **set-t3:** command to set the characteristics of the DS3 port(s) of the circuit being established.

12. Use the **rtrv-state-eqpt:** command to determine the port state of the DS3 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-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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. Use the `rtrv-state-sts1:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

15. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel will not be returned to the *auto* state, until it is changed using the `set-state-sts1:` command or until the cross-connection involving this STS-1 channel is deleted.

Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.

Add New DS3 Service/Group
Path Switched Ring
System In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 OC-12 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 is in service and that a new group is being equipped with **3DS3** circuit packs for DS3 service. It also assumes that **3STS1E** 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 **3STS1E** 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**, **C**, or **D**) 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. ⚠ CAUTION 1: *To minimize "hits" on in-service ports on* **3DS3** *circuit packs having a port added, it is recommended that a CIT be used to manually switch (using the* `switch-fn` *command) the* **3DS3** *circuit pack to protection if the* **3DS3** *circuit pack is removed.* ⚠ CAUTION 2: *If the protection* **3DS3** *circuit pack is not available for a protection switch, removing a service* **3DS3** *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.* If a new **3DS3** circuit pack(s) is being installed, set the line build out (LBO) option jumpers and install the **3DS3** circuit pack(s) into proper slot(s) of **FUNCTION UNITS** group(s) (**A**, **B**, **C**, or **D**) being equipped.	**DLP-506**
4. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the DS3 cross-connect point(s) or equivalent connection point(s) for the circuit being added.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.

6. ⇒ NOTE 1:
Release 3 supports manual STS-1 cross-connections in OC-12 ring applications. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Terminating cross-connections are made at the terminating nodes, and pass-through cross-connections are made at all other nodes.

⇒ NOTE 2:
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-connect provisioning.

Determine the necessary STS-1 cross-connections for each terminating and pass-through node from the work order or circuit order.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Enter or change the necessary STS-1 cross-connections for each node in the network.	
A. Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**
8. ⇒ NOTE: For a circuit in a path protected ring network, use the `sw-path-sts1:`*address* command at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 path and repeat this test on the other path.	
Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
9. Use the `set-t3:` command to set the characteristics of the DS3 port(s) of the circuit being added.	
10. Use the `rtrv-state-eqpt:` command to determine the port state of the DS3 port(s) of the circuit being added.	

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-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 added.

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12. Use the **rtrv-state-sts1:** command to determine the channel state of the STS-1 channel(s) of the circuit being established.

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13. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel will not be returned to the *auto* state, until it is changed using the **set-state-sts1:** command or until the cross-connection involving this STS-1 channel is deleted.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.	

Establish End-to-End DDM-2000 OC-12 System Optical Fiber Spans Path Switched Ring Network

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

NOTE 2:
It is assumed that all DDM-2000s in the system have passed the looped transmission test(s). [**System Turnup: NTP-002**]

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:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and ring applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for ring applications. **S2:5** 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 3 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-510**

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.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Verify no duplicate TBOS, site/ne, or TID settings exist. The `rtrv-ne:` command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches to new settings or use the `set-ne` command for the TID.	**DLP-510**

4. ⇒ NOTE:
In Release 3 or later, the `set-ne:`*`TI D`*`: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 3 or later, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

If Release 3 or later software is installed, use the `set-ne:`*`TI D`*`:gne=yes` command to designate ONE shelf as the GNE.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE:
A ring configuration requires that the **MAIN-B-1 OLIU** at one shelf (node) connects to the **MAIN-B-2(P) 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-B-2(P)**) associated with the optical span being established. At the other end, remove the optical loop from the associated **OLIU** (for example, **MAIN-B-1**) in the optical span being established.

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.

At each shelf, use the `set-fecom:`*`address`*`:com=enable` command to ensure far end communications (fecom) is enabled.

7. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-511**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ 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-510**

9. ⇒ NOTE 1:
If Kbyte (sync messaging) is enabled at any node in a ring, it **must** be enabled at all nodes of a ring.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
The `rtrv-oc12:` command retrieves the `OC-12 Line Provisioning Report`. This report displays the provisioned configuration of OC-12 lines. See the "Commands and Reports" section of this manual for a description of the `rtrv-oc12:` command format.

Use the `rtrv-oc12:` command to obtain the `OC-12 Line Provisioning Report` and verify if Kbyte is enabled or disabled. Use the `set-oc12:` command to enable or disable the Kbyte parameter, as required.

10. NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte must also be enabled.

NOTE 2:
If Sync Autoreconfiguration is enabled at any node in a ring, it **must** be enabled at all 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.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Use the `rtrv-sync:` command to obtain the `Synchronization Report` and verify if Sync Autoconfiguration is enabled or disabled. Use the `set-sync:` command to enable or disable the Sync Autoconfiguration parameter, as required.	
11. ⇒ NOTE: The `rtrv-pm-line` command in the following procedure displays performance-monitoring data associated with the OC-12 lines terminated on the system.	
Perform end-to-end OC-12 line test for optical span under test.	**DLP-548**
12. Repeat this procedure from Item 2 for each additional optical span being established in the DDM-2000 OC-12 ring network.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. The system is now ready for initial service to be established.
    Initial DS3 Service **[System Turnup: NTP-017]**
    Initial EC-1 Interface **[System Turnup: NTP-023]**

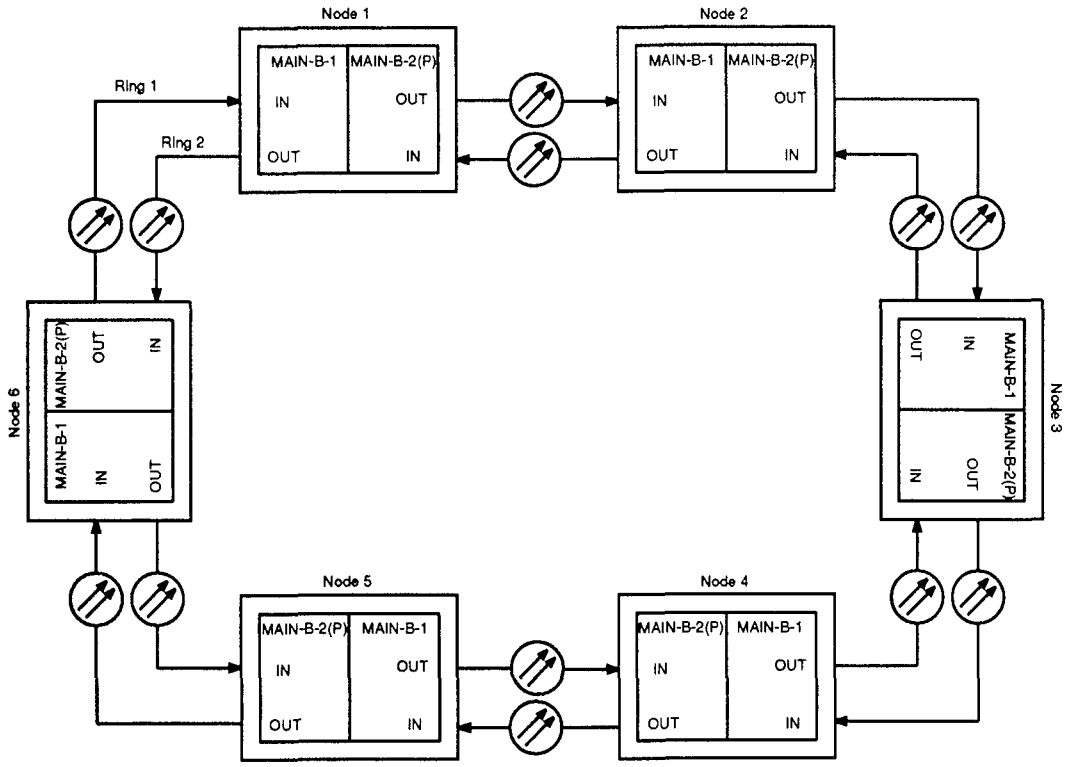


Figure 1. Example OC-12 Ring Configuration Connections

Add New DDM-2000 OC-12 Node (Shelf) To DDM-2000 OC-12 Path Switched Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure assumes that the DDM-2000 is in service and a new RT site (shelf) is being added to the path switched ring configuration. Release 3 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 3) has been loaded. [**System Turnup: NTP-002**]

   ⇒ 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

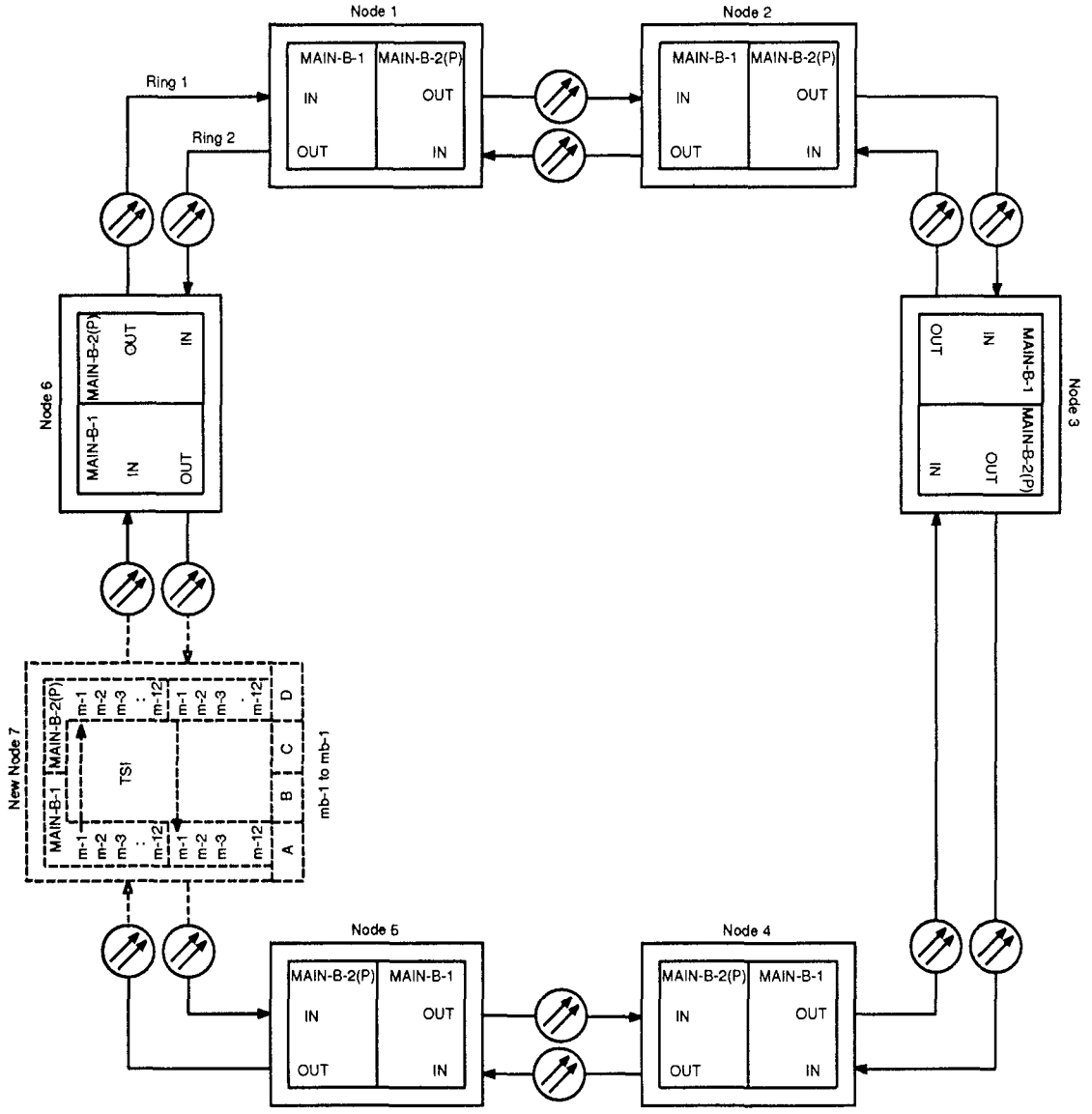


Figure 1. Adding an RT (Node) to an Existing OC-12 Ring Network

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 1:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support rings and open systems interconnection (OSI) protocol. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking. **S2:5** 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 3 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 new shelf **OHCTL.** **DLP-510**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE:
It may be helpful to make a sketch of the network to visualize the cross-connections required.

Use **rtrv-nmap:** command to determine systems (sites) in the network and how they are connected to each other.

5. ⇒ NOTE 1:
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.

⇒ NOTE 2:
In Release 3 or later, 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 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 3 or later, 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

Use the `rtrv-ne` command at each site to verify that no duplicate GNE, TBOS, site/ne, or TID settings exist. If duplicates exist, determine new settings and set the **SYSCTL** and **OHCTL** switches to new settings or use the `set-ne` command for the TID and GNE.

6. From office records or by using the `rtrv-crs-sts1:all` command at any site, determine the existing cross-connections.

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:
Up to 12 DS3s may be terminated in a ring network. Once a DS3 is terminated, that time slot must be reserved in both directions around the ring to the far end. Therefore, if a DS3 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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the `ent-crs-sts1:` command at the new shelf to make all required *pass-through* cross-connections (for example, `ent-crs-sts1:mb-1,mb-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. ⚠ 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.

9. Verify that only `inc. OC-12 LOS` and `inc. STS1 AIS` alarms are present at each end of the fiber cut.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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 new shelf **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the `rtrv-sync` command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected.

Set timing mode on new shelf **TGS** to the timing mode specified in work order or office records. **DLP-510**

11. ⇒ NOTE 1:
If Kbyte (sync messaging) is enabled at any node in a ring, it **must** be enabled at all nodes of a ring.

⇒ NOTE 2:
The `rtrv-oc12:` command retrieves the `OC-12 Line Provisioning Report`. This report displays the provisioned configuration of OC-12 lines. See the "Commands and Reports" section of this manual for a description of the `rtrv-oc12:` command format.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-oc12:** command to obtain the OC-12 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc12:** command to enable or disable the Kbyte parameter, as required.

12. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any node in a ring, it **must** be enabled at all 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 Autoconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. At new shelf, remove **OLIU** optical loops.	
14. ⇒ NOTE: The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the `rtrv-nmap` command to verify the optical fiber links and 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. At each shelf, use the `set-fecom:`*`address`*`:com=enable` command to ensure far end communications (fecom) is enabled.	
15. Determine the optical loss of the optical facility from office records or by making the required measurements.	
16. Connect one pair of optical fibers from an adjacent shelf (site) to new shelf **MAIN-B-1 OLIU**. Ensure that the correct fibers are connected to the proper **OLIU** [**MAIN-B-2(P) OLIU** in one node to **MAIN-B-1 OLIU** in an adjacent node].	**DLP-511**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
17. ⇒ 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 to verify proper fiber connections have been made to the adjacent node.	
18. Connect optical fibers from the other adjacent shelf (site) to new shelf **MAIN-B-2(P) OLIU**. Ensure that the correct fibers are connected to the proper **OLIU** [**MAIN-B-2(P)** in one node to **MAIN-B-1** in an adjacent node].	**DLP-511**
19. ⇒ 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 to verify proper fiber connections have been made to the adjacent node.	
20. Verify that all alarm and status conditions clear. If `inc. STS1 AIS` alarm is present and no `inc. OC-12 LOS` alarm, check that all pass-through cross-connections have been properly made using the `rtrv-crs-sts1:` command.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. NOTE:
The `rtrv-pm-line` command in the following procedure displays performance-monitoring data associated with the OC-12 lines terminated on the system.

Perform end-to-end OC-12 line test for optical span under test. **DLP-548**

22. NOTE:
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3/EC-1 port being tested. After one path (ring1 or ring2) has been tested, use the `switch-path-sts1:` command at both ends to test the other ring path.

Perform appropriate end-to-end transmission test for the circuits being added, if required.

DS3 transmission test **DLP-508**

23. The system is ready for service to be established.
Initial DS3 Service [**System Turnup: NTP-017**]
Initial EC-1 Service [**System Turnup: NTP-023**]

Establish Initial Low Speed EC-1 Interface
Path Switched Ring
Group Equipped But Not In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

---

1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
The end-to-end network must be established before continuing with this procedure. If all the nodes of the network have not been equipped and installed, refer to **System Turnup/Circuit Order: IXL-001** for procedures to equip the DDM-2000 shelves and to establish the end-to-end network.

⇒ NOTE 2:
This procedure assumes that **3STS1E** circuit packs 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 **3DS3** or **3STS1E** 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 node(s), determine which **3STS1E** 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) **3STS1E** circuit packs have been installed in proper group (**FN A**, **FN B**, **FN C**, or **FN D**) 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. 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. Verify the line build out (LBO) option jumpers are installed as required and reinstall **3STS1E** circuit pack(s).	**DLP-510**
5. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the EC-1 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 **3DS3** circuit packs for DS3 interfaces to support DS3 services being established, establish initial end-to-end DS3 service. [**NTP-017**]	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
Release 3 supports manual STS-1 cross-connections in OC-12 ring applications. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Terminating cross-connections are made at the terminating nodes, and pass-through cross-connections are made at all other nodes.

⇒ NOTE 2:
The following commands may be used to delete, enter, and retrieve 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-connect provisioning.

Determine the necessary cross-connections for each terminating and pass-through node from the work order or office records.

9. Enter or change the necessary STS-1 cross-connections for each node.

A. Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
10. ⇒ NOTE: For a circuit in a path protected ring network, use the **sw-path-sts1:***address* command at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 path and repeat this test on the other path. Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
11. Use the **set-ec1:** command to set the characteristics of the EC-1 port(s) at the EC-1 terminating node of the circuit being established.	
12. Use the **rtrv-state-eqpt:** 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.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. Use the `rtrv-state-sts1:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

15. NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel will not be returned to the *auto* state, until it is changed using the `set-state-sts1:` command or until the cross-connection involving this STS-1 channel is deleted.

Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.

Add New STS1E Low Speed Service/Group for EC-1 Interface
Path Switched Ring
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 **3STS1E** 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**, **C**, or **D**) is being equipped.

---

2. Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⚠ CAUTION 1:
To minimize "hits" on in-service ports on **3STS1E** *circuit packs having a port added, it is recommended that a CIT be used to manually switch (using the* `switch-fn` *command) the* **3STS1E** *to protection if the* **3STS1E** *circuit pack is removed.*

⚠ CAUTION 2:
If the protection **3STS1E** *circuit pack is not available for a protection switch, removing a service* **3STS1E** *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.*

If a new **3STS1E** circuit pack(s) is being installed, set line build out (LBO) option jumpers and install **3STS1E** circuit pack(s) into proper slot(s) of **FUNCTION UNITS** group(s) (**A**, **B**, **C**, or **D**) being equipped. **DLP-547**

4. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001**.

6. If one of the terminating nodes is equipped with **3DS3** circuit packs for DS3 interfaces to support DS3 services being added, add DS3 service. [**NTP-018**]

7. ⇒ NOTE 1:
Release 3 supports manual STS-1 cross-connections in OC-12 ring applications. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Terminating cross-connections are made at the terminating nodes, and pass-through cross-connections are made at all other nodes.

⇒ NOTE 2:
The following commands may be used to delete, enter, and retrieve 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-connect provisioning.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Determine the necessary cross-connections for each terminating and pass-through node from the work order or office records.	
8. Enter or change the necessary STS-1 cross-connections for each node.	
A. Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**
9. ⇒ NOTE: For a circuit in a path protected ring network, use the `switch-path-sts1:`*address* command at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 path and repeat this test on the other path.	
Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
10. Use the `set-ec1:` command to set the characteristics of the EC-1 port(s) of the circuit being added.	
11. Use the `rtrv-state-eqpt:` command to determine the port state of the EC-1 port(s) of the circuit being added.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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-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- port(s) of the circuit being added.

13. Use the **rtrv-state-sts1:** command to determine the channel state of the STS-1 channel(s) of the circuit being established.

14. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel will not be returned to the *auto* state, until it is changed using the **set-state-sts1:** command or until the cross-connection involving this STS-1 channel is deleted.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.	

Convert DS3 Group Service to EC-1 Group Service Path Switched Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure assumes that the DDM-2000 is in service and that a DS3 group is being changed to an EC-1 group to provide an EC-1 interface. Release 3 supports an EC-1 interface for path switched rings.

   ⇒ 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**, **C**, or **D**) 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-3, remove the DS3 signals associated with the DS3 group being converted. (**FAULT** LED flashes on **3DS3** 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:
   Release 3 supports manual STS-1 cross-connections in OC-12 ring applications. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Terminating cross-connections are made at the terminating nodes, and pass-through cross-connections are made at all other nodes.

   From work order or `rtrv-crs-sts1` 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-sts1` command to determine the proper cross-connections.

NOTE 1:
DS3 **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 delete, enter, and retrieve 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-connect provisioning.

Use the `dlt-crs-sts1:` command to delete cross-connections associated with all **3DS3** circuit packs being removed.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Remove the **3DS3** circuit packs from group being converted to EC-1 service.	
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. Set line build out (LBO) option jumpers and install **3STS1E** circuit packs into **FUNCTION UNITS** group (**A**, **B**, **C**, or **D**) being put into service.	**DLP-510**
11. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit 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.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. If one of the terminating nodes is equipped with **3DS3** circuit packs for DS3 interfaces to support DS3 services, add DS3 service. [**NTP-018**]	
14. Determine the necessary cross-connections for each terminating and pass-through node from the work order or office records.	
15. Enter or change the necessary STS-1 cross-connections for each node.	
A. Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**
16. ⇒ NOTE: For a circuit in a path protected ring network, use the `sw-path-sts1:`*address* command at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 path and repeat this test on the other path.	
Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
17. Use the `set-ec1:` command to set the characteristics of the EC-1 port(s) of the circuit being converted.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

18. Use the `rtrv-state-eqpt:` command to determine the port state of the EC-1 port(s) of the circuit being converted.

19. ⇒ 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 converted.

20. Use the `rtrv-state-stsl:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel will not be returned to the *auto* state, until it is changed using the **set-state-sts1:** command or until the cross-connection involving this STS-1 channel is deleted.

Use the **set-state-sts1:** command to set the channel state of the STS-1 channel(s) of the circuit being established.

Establish Initial Low Speed EC-1 Interface Linear or Hub Configuration Group Equipped But Not 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:
   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 **3STS1E** circuit packs 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 **3DS3** or **3STS1E** 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 node(s), determine which **3STS1E** 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) **3STS1E** circuit packs have been installed in proper group (**FN A**, **FN B**, **FN C**, or **FN D**) 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. 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. Verify the line build out (LBO) option jumpers are installed as required and reinstall **3STS1E** circuit pack(s), as required.	**DLP-510**
5. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the EC-1 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 **3DS3** circuit packs for DS3 interfaces to support DS3 services being established, establish initial end-to-end DS3 service. [**NTP-004**]	
8. Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
9. Use the `set-ec1:` command to set the characteristics of the EC-1 port(s) at the EC-1 terminating node of the circuit being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. Use the `rtrv-state:` command to determine the port state of the EC-1 port(s) of the circuit being established.

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-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.

12. Use the `rtrv-state-sts1:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel must be returned to the *auto* state, using the `set-state-sts1:` command.

Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.

Add New STS1E Low Speed Service/Group for EC-1 Interface
Linear or Hub Configuration
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 that a new group is being equipped with **3STS1E** 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**, **C**, or **D**) 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. ⚠ CAUTION 1:
To minimize "hits" on in-service ports on **3STS1E** *circuit packs having a port added, it is recommended that a CIT be used to manually switch (using the* `switch-fn` *command) the* **3STS1E** *circuit pack to protection if the* **3STS1E** *circuit pack is removed.*

⚠ CAUTION 2:
If the protection **3STS1E** *circuit pack is not available for a protection switch, removing a service* **3STS1E** *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.*

If new **3STS1E** circuit packs are being installed, set line build out (LBO) option jumpers and install **3STS1E** circuit pack(s) into proper slot(s) of **FUNCTION UNITS** group(s) (**A**, **B**, **C**, or **D**) being equipped. **DLP-547**

4. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.

5. 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
6. If one of the terminating nodes is equipped with **3DS3** circuit packs for DS3 interfaces to support DS3 services being added, add DS3 service. [**NTP-005**]	
7. Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
8. Use the `set-ecl:` command to set the characteristics of the EC-1 port(s) of the circuit being added.	
9. Use the `rtrv-state:` command to determine the port state of the EC-1 port(s) of the circuit being added.	
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 added.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. Use the `rtrv-state-sts1:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

12. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel must be returned to the *auto* state, using the `set-state-sts1:` command.

Use the `set-state-sts1:` command to set the channel state of the STS-1 channel(s) of the circuit being established.

Convert DS3 Group Service to EC-1 Group Service Linear or Hub Configuration

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   NOTE 1:
   This procedure assumes that the DDM-2000 is in service and that a DS3 group is being changed to an EC-1 group to provide an EC-1 interface.

   NOTE 2:
   If, at any point in this procedure, the DDM-2000 fails to respond in the indicated manner, you should refer to **Trouble Clearing: IXL-001.**

   Determine which **FUNCTION UNITS** group (**A**, **B**, **C**, or **D**) is being converted.

2. Use the `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
3. At the DSX-3, remove the DS3 signals associated with the DS3 group being converted. (**FAULT** LED flashes on **3DS3** 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. Remove the **3DS3** circuit packs from group being converted to EC-1 service.	
6. Momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the DDM-2000 internal equipment list.	
7. Verify that all alarms are off.	
8. Set line build out (LBO) option jumpers and install **3STS1E** circuit packs into **FUNCTION UNITS** group (**A**, **B**, **C**, or **D**) being put into service.	**DLP-510**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
9. Make the appropriate backplane cable connection(s) [**FN A** (**J33**, **J30**), (**J34**, **J31**), and/or (**J35**, **J32**)], [**FN B** (**J39**, **J36**), (**J40**, **J37**), and/or (**J41**, **J38**)], [**FN C** (**J45**, **J42**), (**J46**, **J43**), and/or (**J47**, **J44**)], or [**FN D** (**J51**, **J48**), (**J52**, **J49**), and/or (**J53**, **J50**)] to the EC-1 cross-connect point(s) or equivalent connection point(s) for the circuit being added.	
10. 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.	
11. If one of the terminating nodes is equipped with **3DS3** circuit packs for DS3 interfaces to support DS3 services, add DS3 service. [**NTP-005**]	
12. Perform DS3 end-to-end transmission test for each circuit being put into service (optional).	**DLP-508**
13. Use the `set-ec1:` command to set the characteristics of the EC-1 port(s) of the circuit being converted.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. Use the `rtrv-state:` command to determine the port state of the EC-1 port(s) of the circuit being converted.

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-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 DS3 port(s) of the circuit being converted.

16. Use the `rtrv-state-stsl:` command to determine the channel state of the STS-1 channel(s) of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

17. ⇒ NOTE:
If a STS-1 channel is in the *nmon* state, the channel is not monitored and alarm or status conditions are not reported. The STS-1 channel will not automatically go to the *in service* state and begin normal reporting of alarm and status conditions when a good signal is detected as it will in the *auto* state. In the *auto* state, the STS-1 channel is monitored and alarm and status conditions are not reported. In the *nmon* state, the STS-1 channel must be returned to the *auto* state, using the **set-state-sts1:** command.

Use the **set-state-sts1:** command to set the channel state of the STS-1 channel(s) of the circuit being established.

Upgrade DDM-2000 OC-12 Point-to-Point Network to Path Switched Ring Out of Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION 1:
If the path switched ring span lengths require that the **23G/23G-U OLIU***s will be replaced in this procedure, you must determine if the* **23H/23H-U OLIU***s will support the existing ring span length. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.* [**DLP-511**]

⚠ 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:
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 software is required for all shelves in the ring configuration.

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 1:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and ring applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking and ring applications. **S2:5** 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 3 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.

Replace **BCP1 OHCTL** circuit pack, if required. **DLP-500**

4. Upgrade software in each DDM-2000 OC-12 shelf with Release 3 that supports the path switched ring configuration. (Software upgrades must be made locally at each shelf.) **DLP-527**

5. ⇒ NOTE:
In Release 3, the **BCP3 TSI** circuit pack is required for manual internal STS-1 cross-connections in path switched ring applications.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Replace **BCP2 TSIs** in each shelf with **BCP3 TSIs**. (Protection **BCP3 TSIs** are required.)	**DLP-505**

6. At **each** shelf, use `ent-crs-sts1:` command to make all required STS-1 cross-connections.

7. Use `rtrv-sync:` command to check timing mode and parameters for proper provisioning. If necessary, use `set-sync:` command to change timing provisioning.

8. Use `set-fecom:dcc-m:com=disabled` command to disable far-end communications (fecom) at the near end shelf.

9. ⚠ CAUTION:
Transmission configuration information for in service systems is stored on the **TGS** *circuit pack in* **TGS** *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 may be necessary to remove the* **TGS** *circuit pack in* **TGS** *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 would 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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⚠ 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.

NOTE:
In the ring configuration, optical fibers from **MAIN-A-1** at one node connect to **MAIN-B-1** at the adjacent node.

At Node 1, remove and reconnect the optical fibers as shown in Figure 1.

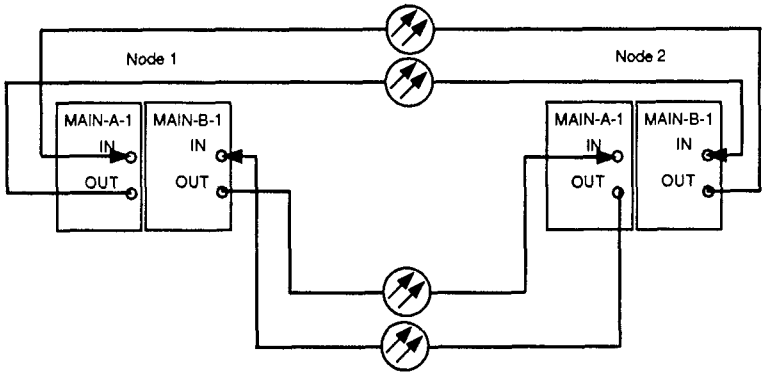


Figure 1. DDM-2000 OC-12 Point-to-Point to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⇒ NOTE:
In Release 3 or later, the `set-ne:TI D: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 3 or later, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

If Release 3 or later software is installed, use the `set-ne:TI D:gne=yes` command to designate ONE shelf as the GNE.

12. Use `set-fecom:dcc-all:com=enabled` command at both ends to enable far-end communications (fecom).

13. ⇒ NOTE 1:
If Kbyte (sync messaging) is enabled at any node in a ring, it **must** be enabled at all nodes of a ring.

⇒ NOTE 2:
The `rtrv-oc12:` command retrieves the `OC-12 Line Provisioning Report`. This report displays the provisioned configuration of OC-12 lines. See the "Commands and Reports" section of this manual for a description of the `rtrv-oc12:` command format.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-oc12:** command to obtain the OC-12 Line Provisioning Report and verify if Kbyte is enabled or disabled. Use the **set-oc12:** command to enable or disable the Kbyte parameter, as required.

14. NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte must also be enabled.

NOTE 2:
If Sync Autoreconfiguration is enabled at any node in a ring, it **must** be enabled at all 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 Autoconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoconfiguration parameter, as required.

15. The ring configuration is now complete and new nodes may be added as required [**NTP-021**].

Upgrade DDM-2000 OC-12 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:
If the path switched ring span lengths require that the **23G/23G-U OLIU***s will be replaced in this procedure, you must determine if the* **23H/23H-U OLIU***s will support the existing ring span length. Optical line power measurements and/or office records must be used to verify that the existing span length can be supported.* [**DLP-511**]

⚠ 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 is 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:
Read the entire upgrade procedure to become familiar with the sequence of steps and requirements before beginning the actual upgrade.

NOTE 2:
Ignore faceplate LEDs and State Reports at each terminal during the upgrade procedure because actual transmission paths may be different from those shown because of fiber splitter in the transmission paths.

NOTE 3:
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 software is required for the final ring configuration.

NOTE 4:
All shelves in the same network must have the same or compatible software releases. (Linear Releases 1.2 and 2.0 are approved to be upgraded to Ring Release 3.0.)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 5:
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. NOTE:
Release 3 software does not support OLIUs in **FUNCTION UNITS** slots. The shelves to be upgraded should have all optical extensions removed prior to the start of the upgrade procedure. If the OLIUs are not removed, a **CR** or **MN** LED will be lighted, and the `Active Alarm and Status Report` will show an `illegal CP type` for each **FUNCTION UNITS** slot containing an OLIU following the completion of the upgrade.

Remove service and equipment not supported by ring software.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. 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.

5. ⚠ 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 may 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 would cause service interruption.

   Ensure both **TGS** circuit packs are installed. At Node 1 and Node 2, 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**. Use the `switch-sync:s=circuitpack,pri=inhibit` command to freeze the protection switch on **TGS-2**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. At Node 1 and Node 2, use the `switch-line:main-b:pri=manual` command to switch to the protection line. Use the `rtrv-state:main-b` command to check switch state (`main-b-2 OLIU active`). (See Figure 1.)

7. At Node 1 and Node 2, use `set-fecom:dcc-m-b:com=disabled` command to disable far-end communications (fecom).

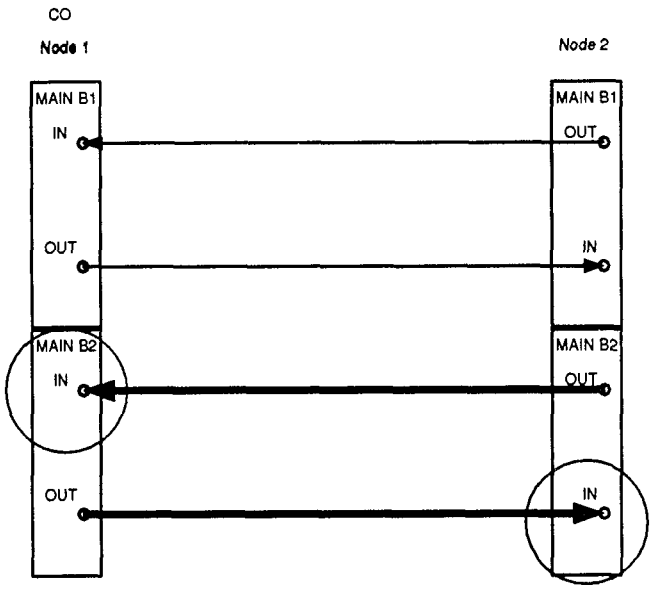


Figure 1. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. At Node 1, install optical splitter in **MAIN-B-1 OUT** optical line as shown in Figure 2.

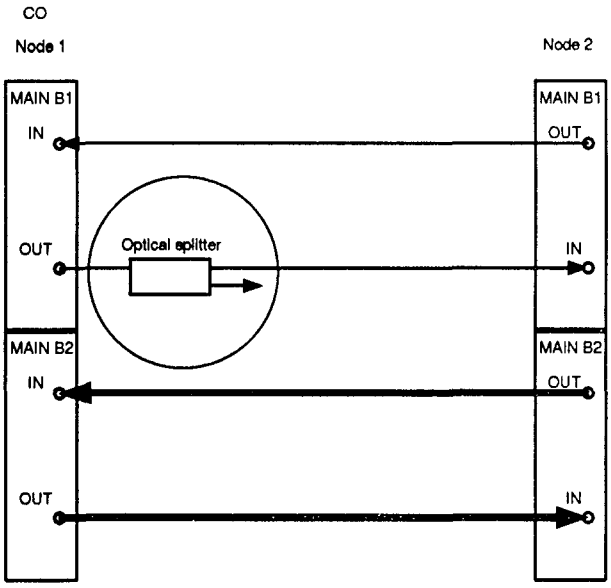


Figure 2. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN** OLIU extinguishes before attempting switch.

At Node 2 only, use the **`switch-line:main-b:pri=manual`** command to switch to the service (MAIN-B-1) line (`main-b-1 OLIU active`). (See Figure 3.)

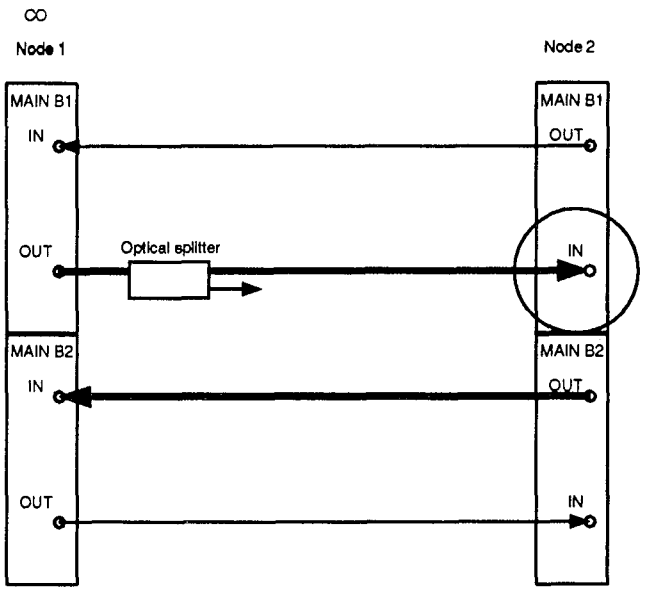


Figure 3. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. At Node 1, remove optical fiber from **OLIU MAIN-B-2 OUT** and connect it to the other output of the optical splitter. (See Figure 4.)

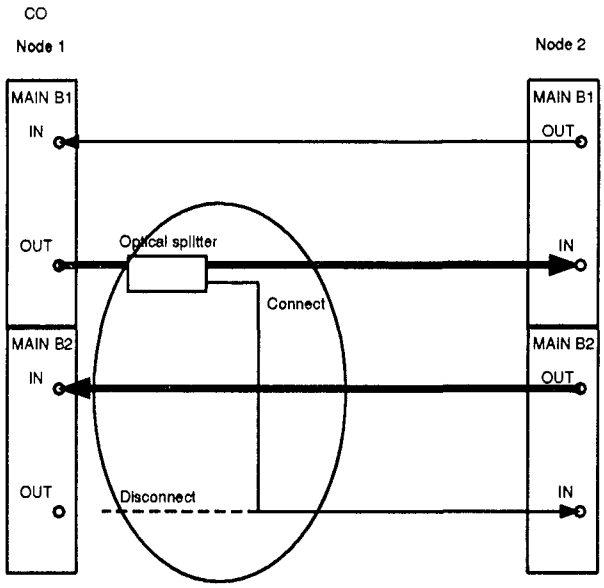


Figure 4. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN** OLIU extinguishes before attempting switch.

At Node 2 only, use the `switch-line:main-b:pri=manual` command to switch service to the protection line (`main-b-2 OLIU active` at Node 2). (See Figure 5.)

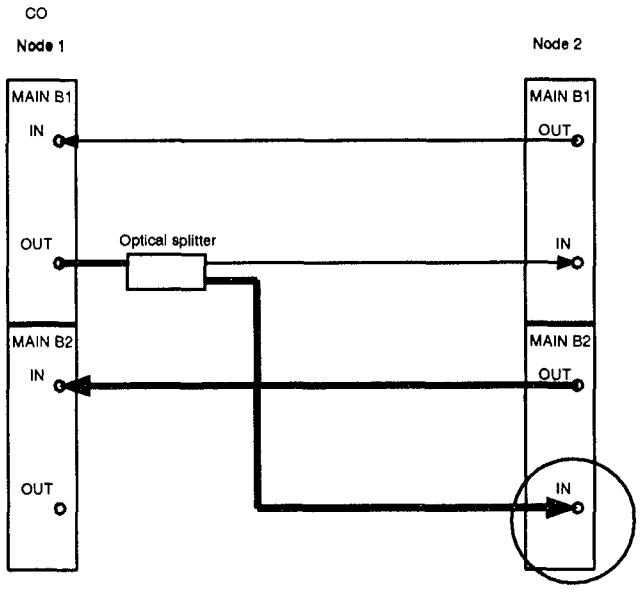


Figure 5. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. Disconnect the optical splitter output from the fiber going to Node 2 **MAIN-B-1 IN** and connect the fiber to Node 1 **MAIN-B-2 OUT**. (See Figure 6.)

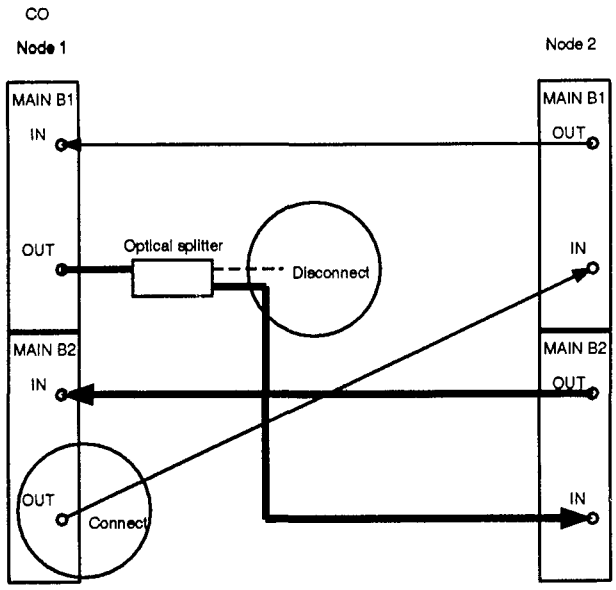


Figure 6. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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-b:pri=manual`** command to switch service to the service line (`main-b-1 OLIU active` at Node 2). (See Figure 7.)

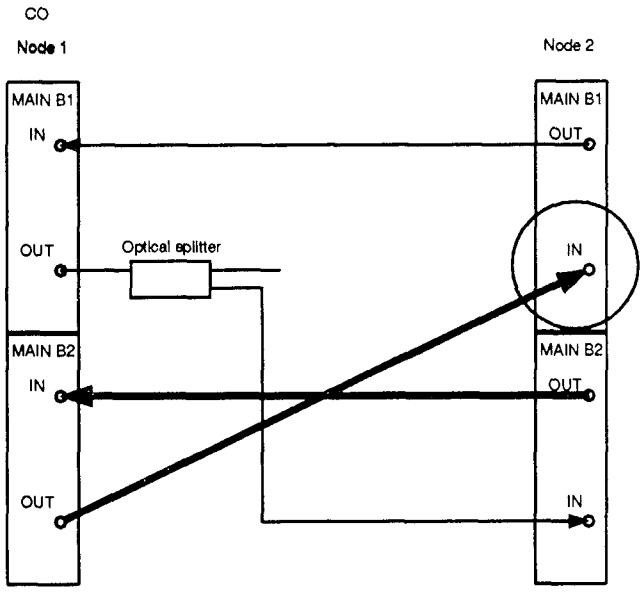


Figure 7. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. At Node 1, remove optical splitter from **MAIN-B-1 OUT**. Connect optical fiber from Node 1 **MAIN-B-1 OUT** to Node 2 **MAIN-B-2 IN**. (See Figure 8.)

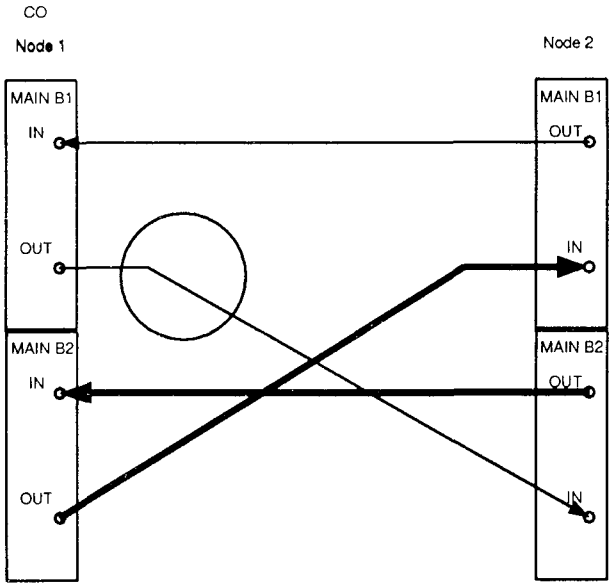


Figure 8. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

15. Disconnect optical fiber from **MAIN-B-1 IN** at Node 1 and install optical splitter in **MAIN-B-1 IN** optical line as shown in Figure 9.

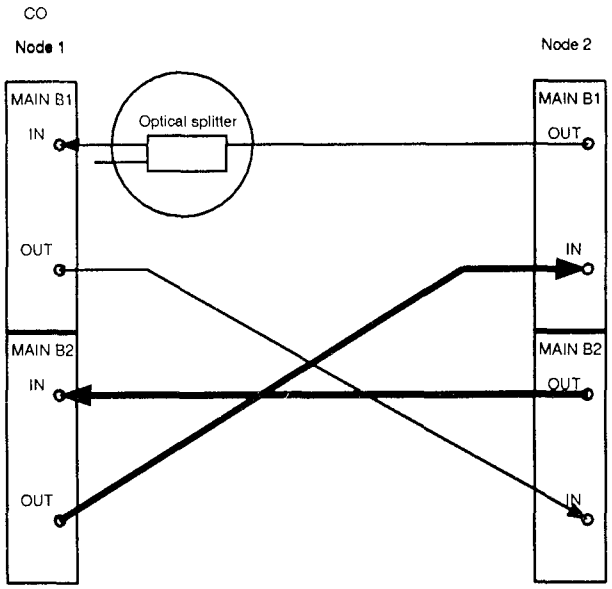


Figure 9. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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 1 only, use the `switch-line:main-b:pri=manual` command to switch service to the service line (`main-b-1 OLIU active` at Node 1). (See Figure 10.)

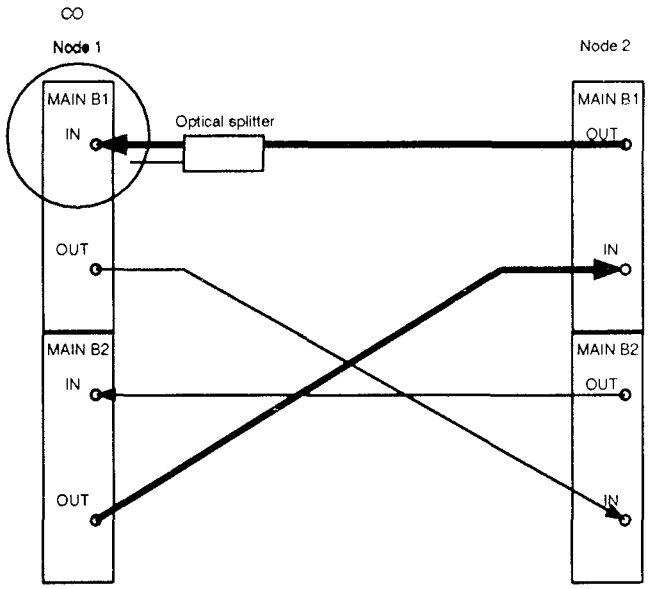


Figure 10. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

17. Disconnect optical fiber from Node 1 **MAIN-B-2 IN** and connect remaining optical splitter output to **MAIN-B-2 IN**. (See Figure 11.)

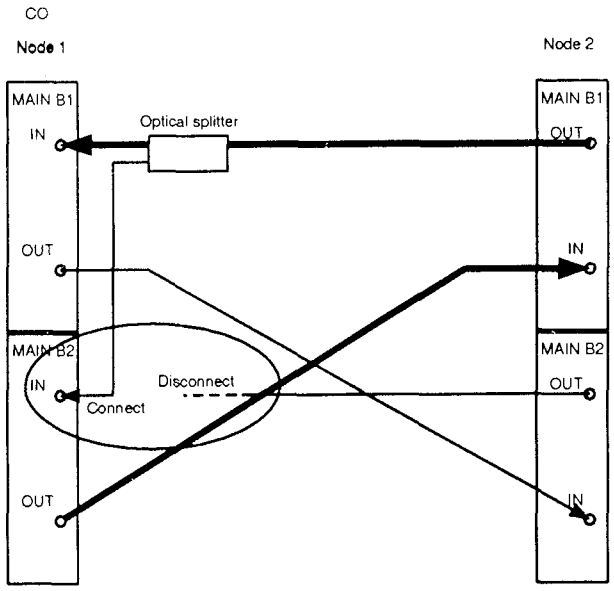


Figure 11. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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 1, use the **`switch-line:main-b:pri=manual`** command to switch service to the protection line (`main-b-2 OLIU active` at Node 1). (See Figure 12.)

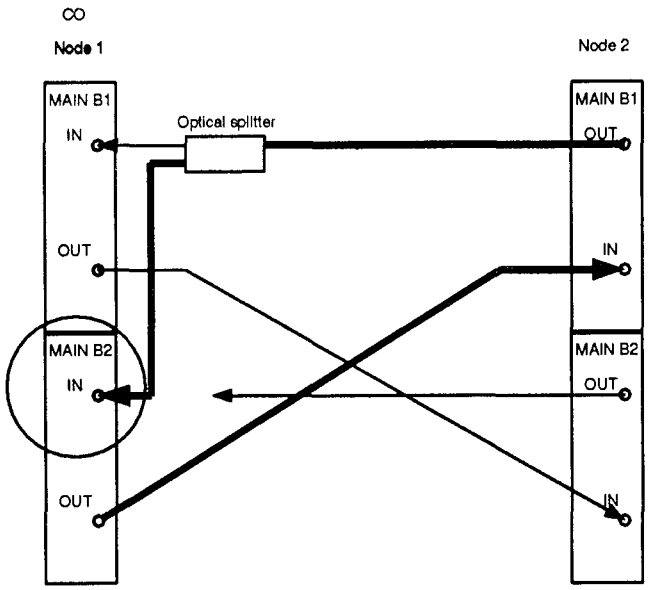


Figure 12. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

19. At Node 1, remove optical splitter output from **MAIN-B-1 IN** and connect optical fiber from Node 2 **MAIN-B-2 OUT** to Node 1 **MAIN-B-1 IN.** (See Figure 13.)

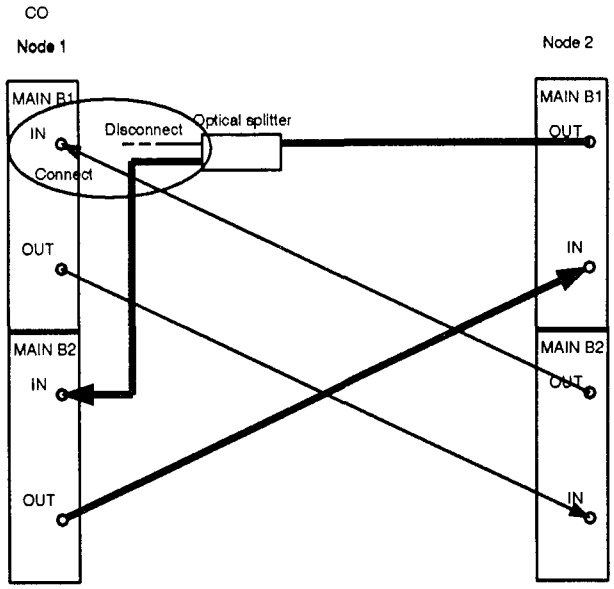


Figure 13. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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, use the **`switch-line:main-b:pri=manual`** command to switch service to the service line (`main-b-1 OLIU active`) at Node 1. (See Figure 14.)

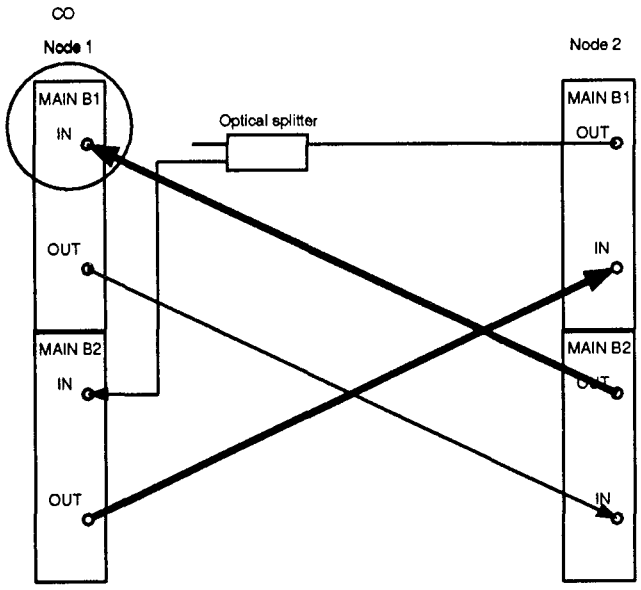


Figure 14. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. At Node 1, remove optical splitter from **MAIN-B-2 IN.** Connect optical fiber from Node 2 **MAIN-B-1 OUT** to Node 1 **MAIN-B-2 IN.** (See Figure 15.)

22. ⇒ NOTE:
Wait until **FAULT** LED on **MAIN** OLIU extinguishes before attempting switch.

At Node 2, use the **`switch-line:main-b:pri=manual`** command to switch service to the protection line (`main-b-2 OLIU active`) at Node 2. (See Figure 15.)

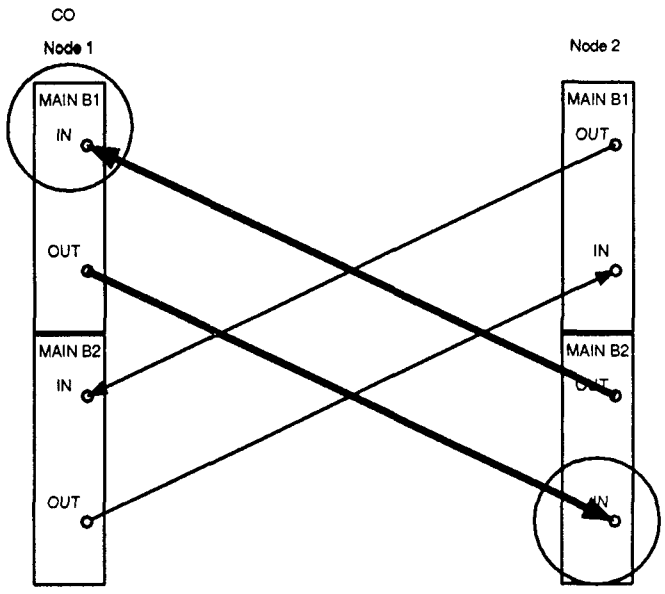


Figure 15. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

23. ⇒ NOTE:
An additional hit on the transmission will occur if a manual switch of the **TSI** circuit pack is necessary.

At Node 2, identify the **BCP2 TSI** circuit pack with the lighted **ACTIVE** LED on the faceplate. If necessary, perform a `switch-tsi:pri=`*`manual`* command to make the **BCP2 TSI** circuit pack in the **TSI-2** slot the active circuit pack.

---

24. At Node 2, unseat **MAIN-B-1 OLIU**.

---

25. At Node 2, remove **BCP2 TSI** circuit pack in the **TSI-1** slot.

---

26. At Node 2, unseat **TGS** circuit pack in the **TGS-1** slot.

---

27. ⇒ NOTE 1:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and ring applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for ring applications. **S2:5** 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 3 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
NOTE 2: The **FAULT** LED on the **OHCTL** will flash and the **MJ** LED will be lighted until the other end is upgraded.	
Unseat **BCP1 OHCTL** and verify switch settings. Replace **OHCTL** if not an **S2:4** or later.	**DLP-500**
28. Upgrade Node 2 (shelf) with Release 3 software. (Software upgrades must be made locally at each shelf.)	**DLP-527**
29. NOTE 1: **BCP2 TSI** circuit pack in **TSI-2** slot will be alarmed as an illegal circuit pack. A transmission hit will result when the new **BCP3 TSI** circuit pack is inserted into **TSI-1** slot.	
NOTE 2: Allow Node 2 (shelf) LED indications to settle down before inserting new **BCP3 TSI**.	
At Node 2, insert new **BCP3 TSI** into **TSI-1** slot.	
30. At Node 2, reseat **MAIN-B-1 OLIU**.	
31. At Node 2, reseat **TGS** circuit pack in the **TGS-1** slot.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

32. ⇒ NOTE:
Two unidirectional transmission hits will result when the **MAIN-B-2 OLIU** is removed.

At Node 2, remove **MAIN-B-2 OLIU**.

33. At Node 2, remove **BCP2 TSI** circuit pack from **TSI-2** slot.

34. At Node 2, seat new **BCP3 TSI** circuit pack into **TSI-2** slot.

35. At Node 2, reseat **MAIN-B-2 OLIU**.

36. ⇒ NOTE:
An additional hit on the transmission will occur if a manual switch of the **TSI** circuit pack is necessary.

At Node 1, identify the **BCP2 TSI** circuit pack with the lighted **ACTIVE** LED on the faceplate. If necessary, perform a `switch-tsi:pri=`*`manual`* command to make the **BCP2 TSI** circuit pack in the **TSI-2** slot the active circuit pack.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

37. At Node 1, unseat **MAIN-B-1 OLIU**.

38. At Node 1, remove **BCP2 TSI** circuit pack in the **TSI-1** slot.

39. At Node 1, unseat **TGS** circuit pack in the **TGS-1** slot.

40. NOTE 1:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and ring applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for ring applications. **S2:5** 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 3 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.

Unseat **BCP1 OHCTL** circuit pack and verify switch settings. Replace **OHCTL** if not an **S2:4** or later. **DLP-500**

41. Upgrade Node 1 (shelf) with Release 3 software. **DLP-527**
(Software upgrades must be made locally at each shelf.)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

42. ⇒ NOTE 1:
BCP2 TSI circuit pack in **TSI-2** slot will be alarmed as an illegal circuit pack. A transmission hit will result when the new **BCP3 TSI** circuit pack is inserted into **TSI-1** slot.

⇒ NOTE 2:
Allow Node 1 (shelf) LED indications to settle down before inserting new **BCP3 TSI**.

At Node 1, insert new **BCP3 TSI** circuit pack into **TSI-1** slot.

---

43. At Node 1, reseat **MAIN-B-1 OLIU**.

---

44. At Node 1, reseat **TGS** circuit pack in the **TGS-1** slot.

---

45. ⇒ NOTE:
Two unidirectional transmission hits will result when the **MAIN-B-2 OLIU** is removed.

At Node 1, remove **MAIN-B-2 OLIU**.

---

46. At Node 1, remove **BCP2 TSI** circuit pack from **TSI-2** slot.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

47. At Node 1, seat new **BCP3 TSI** circuit pack into **TSI-2** slot.

48. At Node 1, reseat **MAIN-B-2 OLIU**.

49. Use `set-fecom:dcc-m-b:com=enabled` command at Node 1 and Node 2 to enable far-end communications (fecom).

50. ⇒ NOTE:
In Release 3 or later software, the `set-ne:`*`TI D`*`: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 3 or later software, one shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

When Release 3 or later software is installed, use the `set-ne:`*`TI D`*`:gne=yes` command to designate ONE shelf as the GNE.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

51. NOTE 1:
If Kbyte (sync messaging) is enabled at any node in a ring, it **must** be enabled at all nodes of a ring.

NOTE 2:
The `rtrv-oc12:` command retrieves the `OC-12 Line Provisioning Report`. This report displays the provisioned configuration of OC-12 lines. See the "Commands and Reports" section of this manual for a description of the `rtrv-oc12:` command format.

Use the `rtrv-oc12:` command to obtain the `OC-12 Line Provisioning Report` and verify if Kbyte is enabled or disabled. Use the `set-oc12:` command to enable or disable the Kbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

52. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any node in a ring, it **must** be enabled at all 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 Autoconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoconfiguration parameter, as required.

53. The ring configuration is now complete and new nodes may be added as required [**NTP-021**].

Establish End-to-End DDM-2000 OC-3 System Optical Fiber Spans Dual 0x1 Path Switched Ring Network

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001.**

⇒ NOTE 2:
It is assumed that all DDM-2000 OC-3 shelves in the system have passed the looped transmission test(s) [**AT&T 363-206-202, System Turnup: NTP-016**] and the OC-12 ring has been established [**System Turnup: NTP-020**].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
Release 3.1, or later, software must be installed in the OC-12 shelves. Release 7.1, or later, software must be installed in the OC-3 shelves.

Determine the optical loss of each optical span from office records or by making the required measurements.

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(P) OLIU** connects to the associated **FN( ) 2(P) 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`).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE:
For a given optical span, the user/network switches (**S2**) on the OC-3/OC-12 **OHCTL**s must be set to opposite values. Since the dcc mode parameter of the `set-ne` command is set to identical (`dcc=identical`) on the OC-3 shelf, only the **S2-1** switch segment associated with the OC-3 **MAIN 1 OLIU** must be set. The OC-3 **OHCTL S2-2** switch segment for the **MAIN 2(P) OLIU** is ignored in dual 0x1 applications. Factory switch settings support this arrangement.

Verify that the user/network switches (**S2**) on all OC-3/OC-12 **OHCTL**s are set correctly.

1. OC-12 **DLP-510**
2. OC-3 (**AT&T 363-206-202**) **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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Verify no duplicate TBOS, site/ne, or TID settings exist. The `rtrv-ne:` command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches to new settings or use the `set-ne` command for the TID. Verify that only one OC-3/OC-12 shelf is set as the last node in the TBOS chain using the **SYSCTL** switch **S4-1**.

1. OC-12 **DLP-510**
2. OC-3 (**AT&T 363-206-202**) **DLP-513**

6. ⇒ NOTE:
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 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. One shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

Use the `set-ne:`*TID*`:gne=yes` command to designate ONE OC-12 shelf as the GNE.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. At the DDM-2000 OC-3 shelf being connected to the OC-12, remove the optical loops from **MAIN 1** and **MAIN 2(P)** slots associated with the optical spans being established. At the OC-12 end, remove the optical loops from the associated **OLIU**s in the **FUNCTION UNITS** slots (**FN ( ) 1** and **FN ( ) 2(P)**) associated with the optical spans being established.

8. ⇒ NOTE:
Fecom must be enabled using the `set-fecom` command to use the `rtrv-nmap` command to verify the optical fiber links.

Use `set-fecom:`*`address`*`:com=enabled` to enable fecom at each shelf of the optical spans being established.

9. Perform optical fiber connections and verification of the integrity of the optical spans being established. **DLP-551**

10. ⇒ 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-510**

11. NOTE:
The `rtrv-pm-line` command in the following procedure displays performance monitoring data associated with the OC-3 lines terminated on the system.

Perform end-to-end OC-3 line test [**AT&T 363-206-202, DLP-515**].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. Repeat this procedure from Item 2 for any additional dual 0X1 optical spans being established in the DDM-2000 OC-3/OC-12 network.

13. ⇒ NOTE:
Up to three STS-1 channels (any 3 of 12) may be chosen to be cross-connected to the OC-12 **FUNCTION UNITS** slots to be used to connect the OC-3 shelf at each OC-12 location. Any STS-1 channels that are to be terminated at an OC-3 shelf at the VT1.5 or STS-1 signal rate, must be cross-connected through a dual 0X1 function unit OLIU in the corresponding OC-12 shelf. In the case of the VT1.5 signal, the same STS-1 signal may be cross-connected to OC-3 shelves at several OC-12 nodes until the STS-1 signal reaches its capacity of 28 VT1.5 signals.

At each OC-12 shelf interfacing with a dual 0X1 OC-3 shelf, determine the STS-1 channels to be cross-connected to the **FUNCTION UNITS** slots. Use the
`ent-crs-sts1:mb-[1-12],fn-[a,b,c,d]-[1,2,all]`
command to make proper cross-connections.

14. ⚠ CAUTION:
Critical or Major alarms will be generated if pass-through cross-connections are not made on each required OC-12 shelf in the OC-12 ring network.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
At each OC-12 node in the ring, pass-through cross-connections must be made for each STS-1 channel that is carrying traffic and has not been cross-connected to a **3DS3**, **3STS1E**, or **OLIU** circuit pack in a **FUNCTION UNITS** slot at the OC-12 node. For STS-1 channels terminating at OC-3 nodes, STS-1 or VT1.5 pass-through cross-connections are done at the OC-3 nodes in the same manner as a normal OC-3 ring.

At each OC-12 shelf, determine the STS-1 channels to be pass-through cross-connected. Use the `ent-crs-sts1:mb-{1-12},mb-{1-12}` command at each required OC-12 shelf to make all required *pass-through* cross-connections for the selected STS-1 channels.

15. The system is now ready for initial service to be established.
Initial DS1 Service [**AT&T 363-206-202, System Turnup: NTP-004**]
Initial DS3 Service [**AT&T 363-206-202, System Turnup: NTP-005**]
Initial EC-1 Interface [**AT&T 363-206-202, System Turnup: NTP-034**]

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

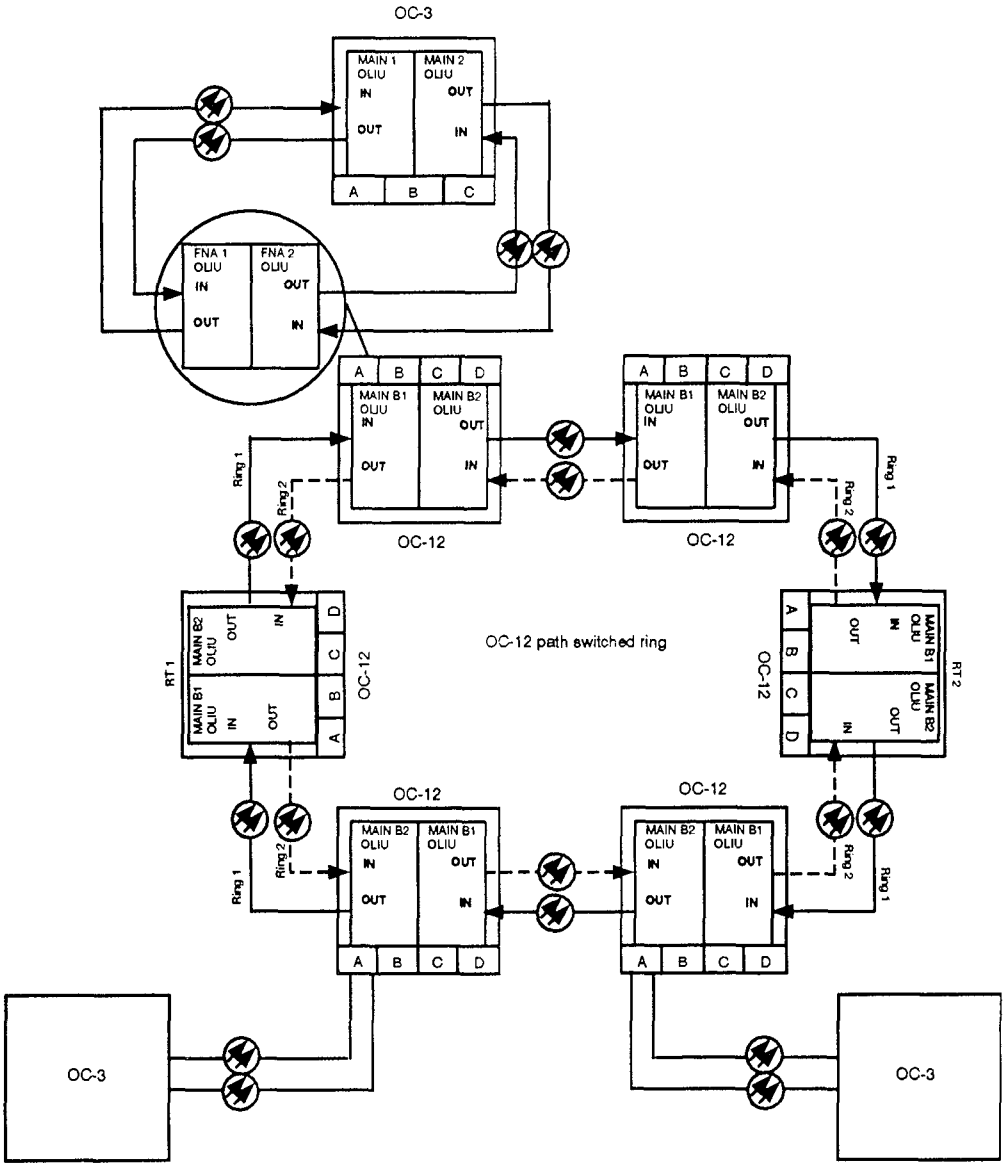


Figure 1. Example Dual 0x1 Ring Configuration Connections

Upgrade DDM-2000 OC-3 Ring Network to OC-12 Ring Network In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⇒ NOTE 1:
   This procedure is used to convert an OC-3 VT1.5 path protected ring network to an OC-12 VT1.5 path protected ring network. It is assumed that the fiber being used in the current OC-3 ring network will be used to build the new OC-12 ring.

   ⇒ NOTE 2:
   With minor changes, this procedure may also be used to move VT1.5 service onto a currently existing OC-12 ring. The fiber connecting the OC-12 nodes at each site would already be connected and the OC-12 ring would already be carrying service. The OC-12 ring must have enough excess bandwidth to carry at least three more STS-1s (84 DS1s) if all service on the OC-3 network is going to be rolled over onto the OC-12 ring.

   ⇒ NOTE 3:
   This procedure uses a 3-node OC-3 ring as an example for the OC-3 to OC-12 ring upgrade (Figure 1). Other network upgrades are possible and can be done using these procedures with minor modifications. Local procedures will have to be written, using the concepts of this procedure, to upgrade the particular configuration that you have.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

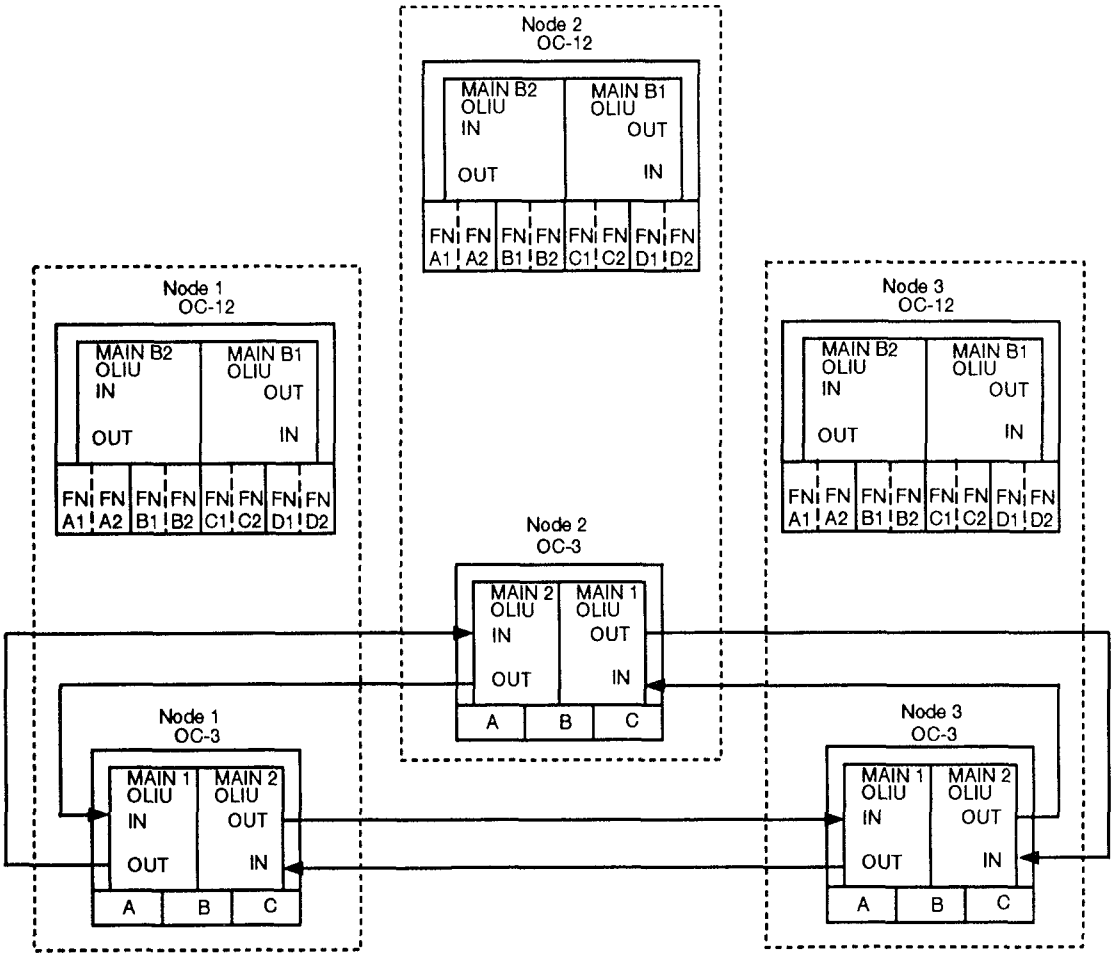


Figure 1. Example of OC-3 to OC-12 Ring Upgrade (1 of 7)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
This procedure assumes that an OC-12 shelf has been installed and equipped [**NTP-002**] at each OC-3 shelf location. The OC-12 shelf must be equipped with **MAIN OLIU**s, **BCP3 TSI**s, and **21-type OLIU**s in the **FUNCTION UNITS** (**FN**) slots being used to connect with the OC-3 shelf. Each OC-3 shelf **MAIN OLIU** will be replaced with **22D-U OLIU**s in the following procedures.

NOTE 5:
Release 3.1, or later, software must be installed in the OC-12 shelves. Release 7.1, or later, software must be installed in the OC-3 shelves.

NOTE 6:
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 at the OC-3 ring to verify that no alarms, locks, or switches are present.

2. Notify maintenance center that alarms will be generated.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⇒ NOTE:
For a given optical span, the user/network switches (**S2**) on the OC-3/OC-12 **OHCTL**s must be set to opposite values. Since the dcc mode parameter of the `set-ne` command is set to identical (`dcc=identical`) on the OC-3 shelf, only the **S2-1** switch segment associated with the OC-3 **MAIN 1 OLIU** must be set. The OC-3 **OHCTL S2-2** switch segment for the **MAIN 2(P) OLIU** is ignored in dual 0x1 applications. Factory switch settings support this arrangement.

Verify that the user/network switches (**S2**) on all OC-3/OC-12 **OHCTL**s are set correctly.

1. OC-12 **DLP-510**
2. OC-3 (**AT&T 363-206-202**) **DLP-513**

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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Verify no duplicate TBOS, site/ne, or TID settings exist. The `rtrv-ne:` command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and set **SYSCTL** and **OHCTL** switches to new settings or use the `set-ne` command for the TID. Verify that only one OC-3/OC-12 shelf is set as the last node in the TBOS chain using the **SYSCTL** switch **S4-1**.

1. OC-12 **DLP-510**
2. OC-3 (**AT&T 363-206-202**) **DLP-513**

5. ⇒ NOTE:
   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 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. One shelf must be provisioned as the GNE even if the X.25 operations support interface is unused.

   Use the `rtrv-ne` command at each OC-12 shelf to verify that only one OC-12 shelf is set as the GNE. Use the `set-ne:`*`TID`*`:gne=yes` command to designate one OC-12 shelf as the GNE.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⇒ NOTE:
Up to three STS-1 channels (any 3 of 12) may be chosen to be cross-connected to the OC-12 **FUNCTION UNITS** slots to be used to connect the OC-3 shelf at each OC-12 location. Any STS-1 channels that are to be terminated at an OC-3 shelf at the VT1.5 or STS-1 signal rate, must be cross-connected through a dual 0X1 function unit OLIU in the corresponding OC-12 shelf. In the case of the VT1.5 signal, the same STS-1 signal may be cross-connected to OC-3 shelves at several OC-12 nodes until the STS-1 signal reaches its capacity of 28 VT1.5 signals.

At each OC-12 shelf interfacing with a dual 0X1 OC-3 shelf, determine the STS-1 channels to be cross-connected to the **FUNCTION UNITS** slots. Use the
`ent-crs-sts1:mb-[1-12],fn-[a,b,c,d]-[1,2,all]`
command to make proper 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 each required OC-12 shelf in the OC-12 ring network.

NOTE:
At each OC-12 node in the ring, pass-through cross-connections must be made for each STS-1 channel that is carrying traffic and has not been cross-connected to a **3DS3**, **3STS1E**, or **OLIU** circuit pack in a **FUNCTION UNITS** slot at the OC-12 node. For STS-1 channels terminating at OC-3 nodes, STS-1 or VT1.5 pass-through cross-connections are done at the OC-3 nodes in the same manner as a normal OC-3 ring.

At each OC-12 shelf, determine the STS-1 channels to be pass-through cross-connected. Use the **ent-crs-sts1:mb-{1-12},mb-{1-12}** command at each required OC-12 shelf to make all required *pass-through* cross-connections for the selected STS-1 channels.

8. At the OC-3 shelf set as the GNE, use the **set-ne:tid=***tid***;gne=no** command to set the GNE to *no*.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE:
Sync auto-reconfiguration is disabled during this upgrade to avoid timing hits and unnecessary alarms. After the upgrade is completed, it is recommended that sync auto-reconfiguration be enabled at all nodes in the network.

At all shelves in the network, use the **`set-sync:auto=`*`disabled`*** command to disable sync auto-reconfiguration.

10. ⇒ NOTE:
An `inconsistent DCC switches` alarm will occur when the OC-12 shelf **OLIU**s are looped back and fecom is enabled. The alarm will clear as the **OLIU** loopbacks are removed and the OC-12 and OC-3 shelves are interconnected.

Use **`rtrv-fecom`** command at each shelf in the network to verify that fecom is enabled and use **`set-fecom:`***`address`***`:com=enabled`** to enable fecom at any shelf where it is not enabled.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⚠ 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:
A protection switch may cause a transmission hit when fibers are removed.

NOTE:
This procedure begins at the GNE and progresses around the OC-3 ring until all optical fiber connections are made.

Starting at the location of the OC-12 shelf designated as the GNE, disconnect the fiber pair between the associated OC-3 shelf and a neighboring OC-3 shelf. For example in Figure 2, if the GNE is at Node 1, disconnect the fiber pairs between the OC-3 at Node 1 and the OC-3 at Node 2. If required, use these fibers to connect OC-12 Node 1 and Node 2 [**DLP-511**].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

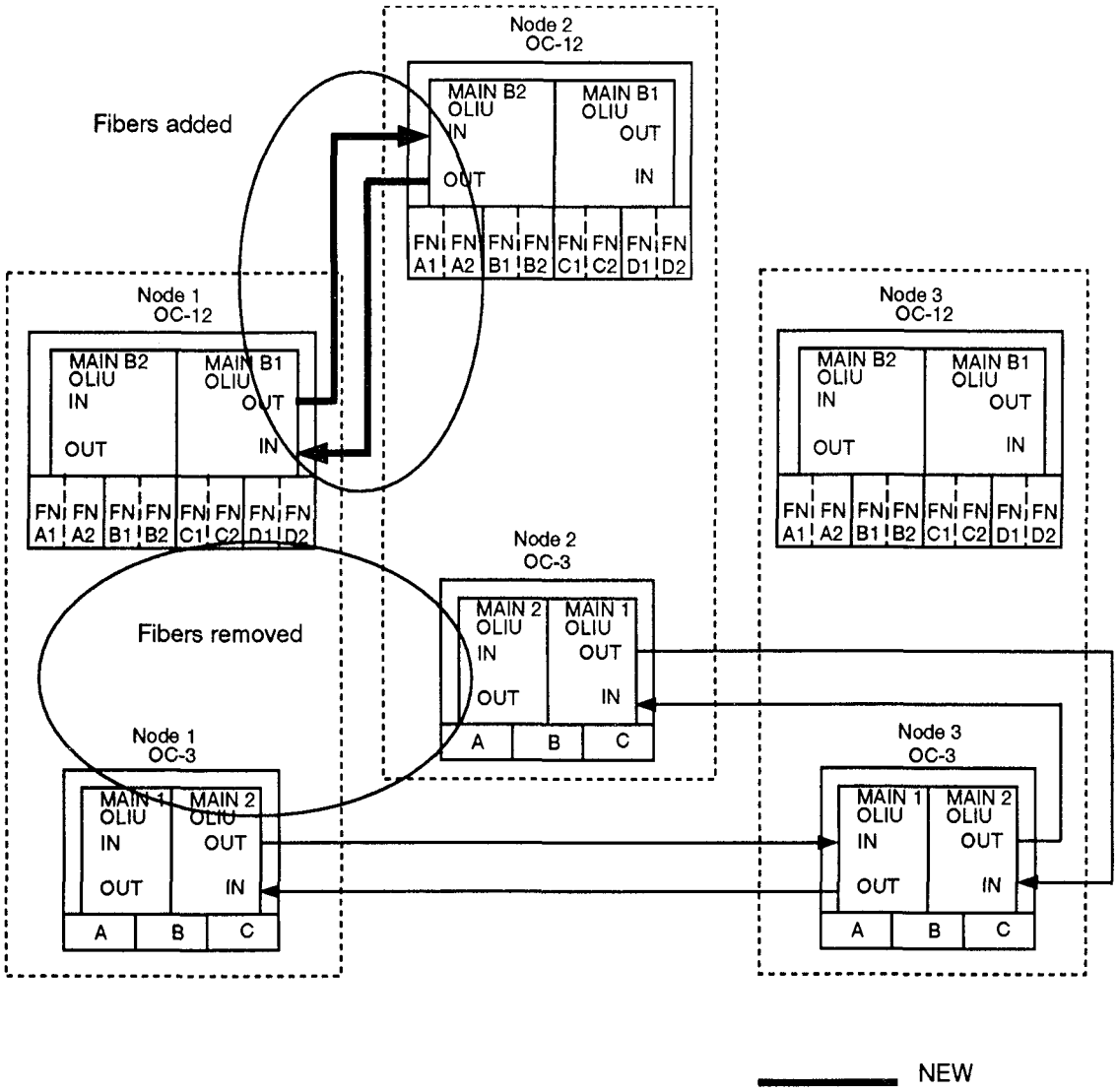


Figure 2. Example of OC-3 to OC-12 Ring Upgrade (2 of 7)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. ⇒ NOTE:
An `inconsistent DCC switches` alarm will occur at the OC-3 shelves when the DCC is set to identical. The alarm will clear when the OC-3 ring to OC-12 ring upgrade is complete.

At OC-3 Nodes 1 and 2, use the `set-ne:dcc=identical` command to configure the dcc for dual 0x1 connections.

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13. ⇒ NOTE:
The remainder of this procedure is based on the 3-node example in the figures and the assumption that the GNE is at Node 1.

At Node 1, remove **22F OLIU** from OC-3 **MAIN 1** slot. At Node 2, remove **22F OLIU** from OC-3 **MAIN 2(P)** slot. Momentarily depress **UPD/INIT** button on **SYSCTL** at both nodes.

---

14. At Node 1, insert **22D-U OLIU** into OC-3 **MAIN 1** slot. At Node 2, insert **22D-U OLIU** into OC-3 **MAIN 2(P)** slot.

---

15. ⇒ NOTE 1:
Due to multiple DCC channels during portions of this upgrade, the `rtrv-nmap` command cannot be used for verification of optical fiber connections between the OC-3 and OC-12 nodes until all fiber connections have been completed throughout the network.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

NOTE 2:
The connection between the OC-3 and OC-12 is a dual 0x1 connection. In dual 0x1 connections, **MAIN 1** of the OC-3 must be connected to the **FN-( )-1** slot of the OC-12. The **MAIN 2(P)** of the OC-3 must be connected to the **FN-( )-2(P)** slot of the OC-12.

At Node 1, perform optical fiber connections from OC-3 **MAIN 1** slot to OC-12 **FN-( )-1**. See Figure 3. **DLP-551**

16. NOTE:
Due to multiple DCC channels during portions of this upgrade, the `rtrv-nmap` command cannot be used for verification of optical fiber connections between the OC-3 and OC-12 nodes until all fiber connections have been completed throughout the network.

At Node 2, perform optical fiber connections from OC-3 **MAIN 2(P)** slot to OC-12 **FN-( )-2(P)**. See Figure 3. **DLP-551**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

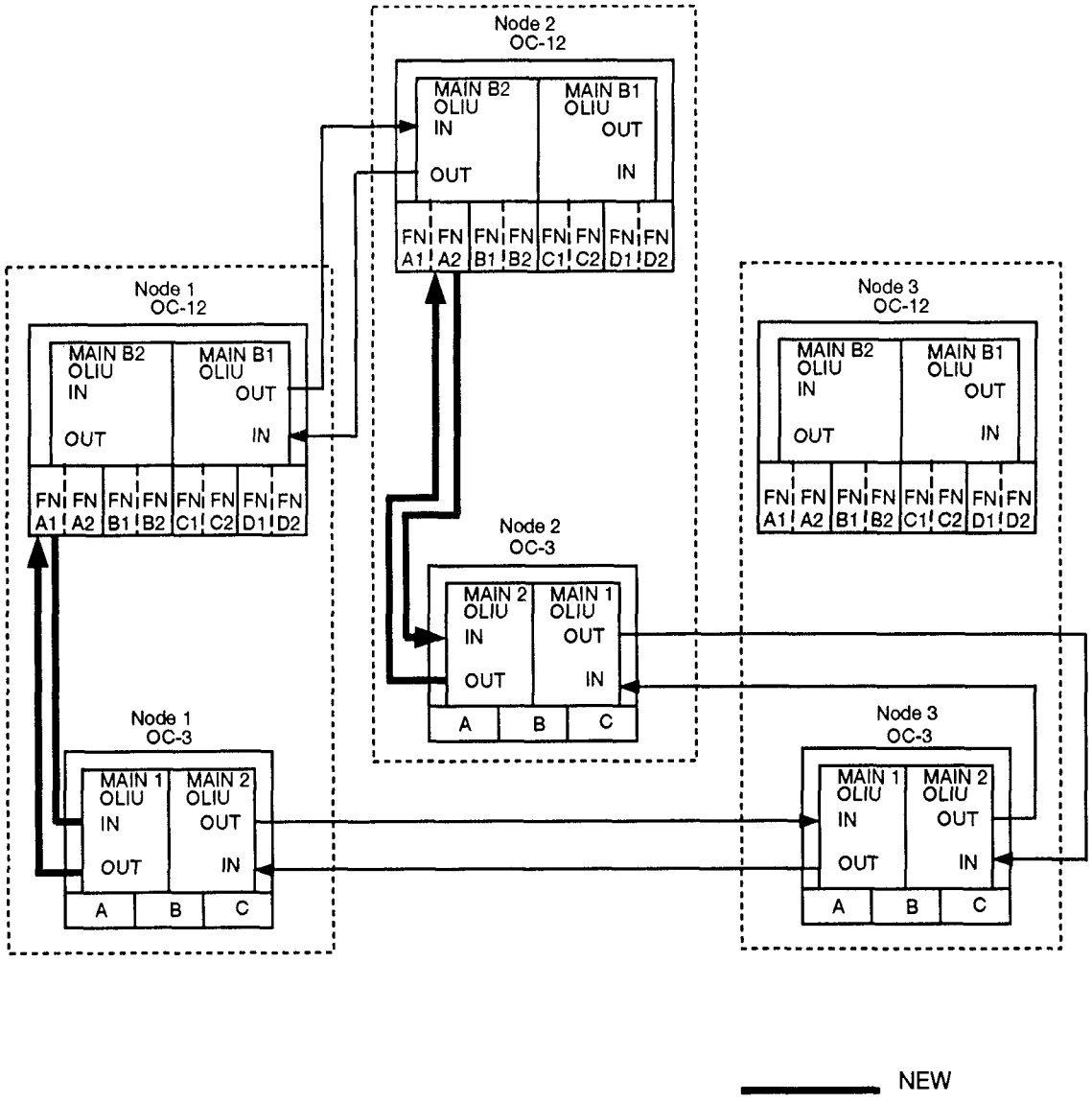


Figure 3. Example of OC-3 to OC-12 Ring Upgrade (3 of 7)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
17. ⇒ NOTE: An `inconsistent DCC switches` alarm will occur at the OC-3 shelves when the DCC is set to identical. The alarm will clear when the OC-3 ring to OC-12 ring upgrade is complete. At OC-3 Node 3, use the `set-ne:dcc=identical` command to configure the dcc for dual 0x1 connections.	
18. See Figure 4. Disconnect the fiber pair between OC-3 Node 2 and Node 3. If required, use these fibers to connect OC-12 Node 2 and Node 3.	**DLP-511**
19. At Node 2, remove **22F OLIU** from OC-3 **MAIN 1** slot. At Node 3, remove **22F OLIU** from OC-3 **MAIN 2(P)** slot. Momentarily depress **UPD/INIT** button on **SYSCTL** at both nodes.	
20. At Node 2, insert **22D-U OLIU** into OC-3 **MAIN 1** slot. At Node 3, insert **22D-U OLIU** into OC-3 **MAIN 2(P)** slot.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

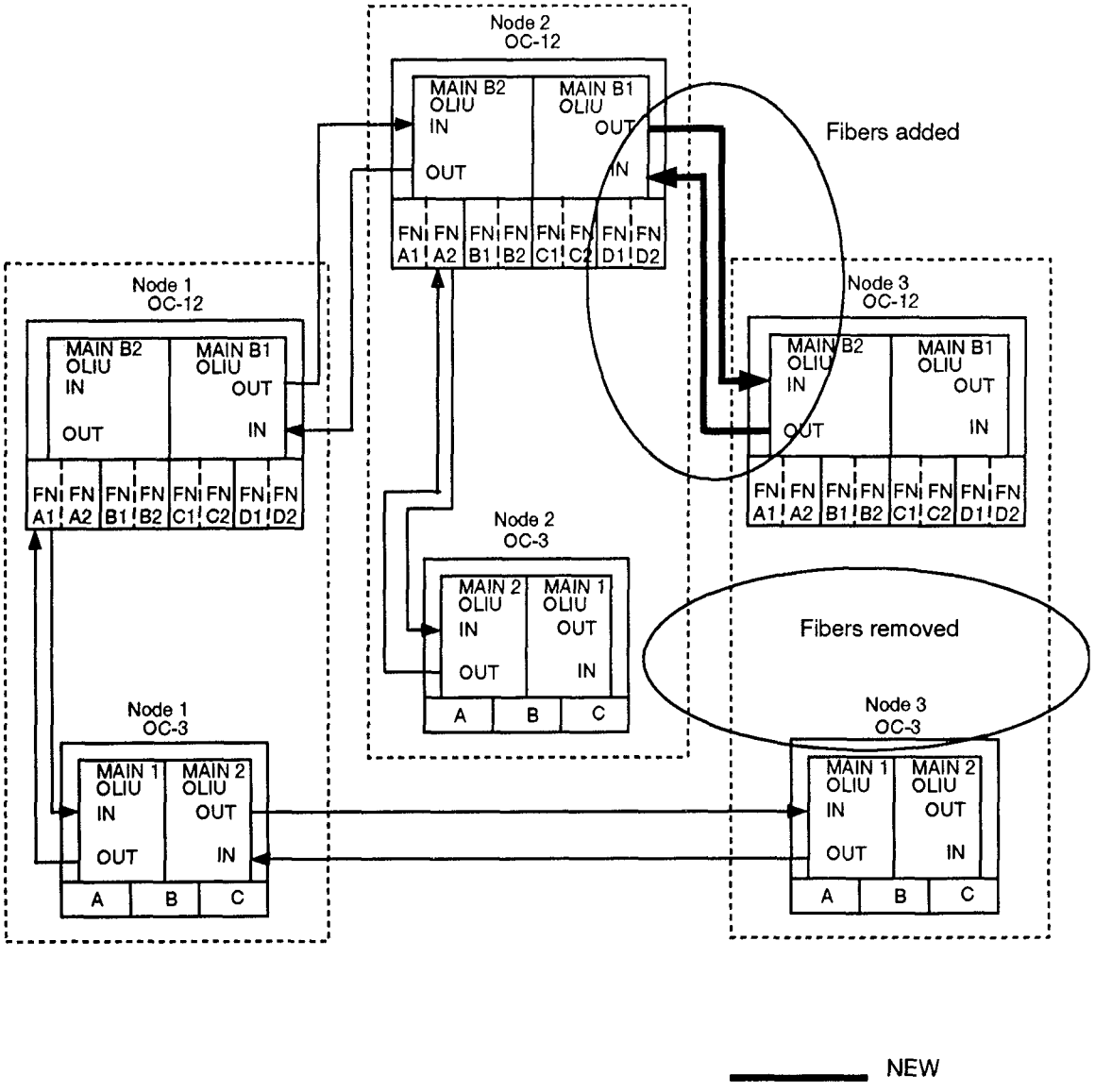


Figure 4. Example of OC-3 to OC-12 Ring Upgrade (4 of 7)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

21. ⇒ NOTE:
Due to multiple DCC channels during portions of this upgrade, the `rtrv-nmap` command cannot be used for verification of optical fiber connections between the OC-3 and OC-12 nodes until all fiber connections have been completed throughout the network.

At Node 2, perform optical fiber connections from OC-3 **MAIN 1** slot to OC-12 **FN-( )-1**. See Figure 5. **DLP-551**

22. ⇒ NOTE:
Due to multiple DCC channels during portions of this upgrade, the `rtrv-nmap` command cannot be used for verification of optical fiber connections between the OC-3 and OC-12 nodes until all fiber connections have been completed throughout the network.

At Node 3, perform optical fiber connections from OC-3 **MAIN 2(P)** slot to OC-12 **FN-( )-2(P)**. See Figure 5. **DLP-551**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

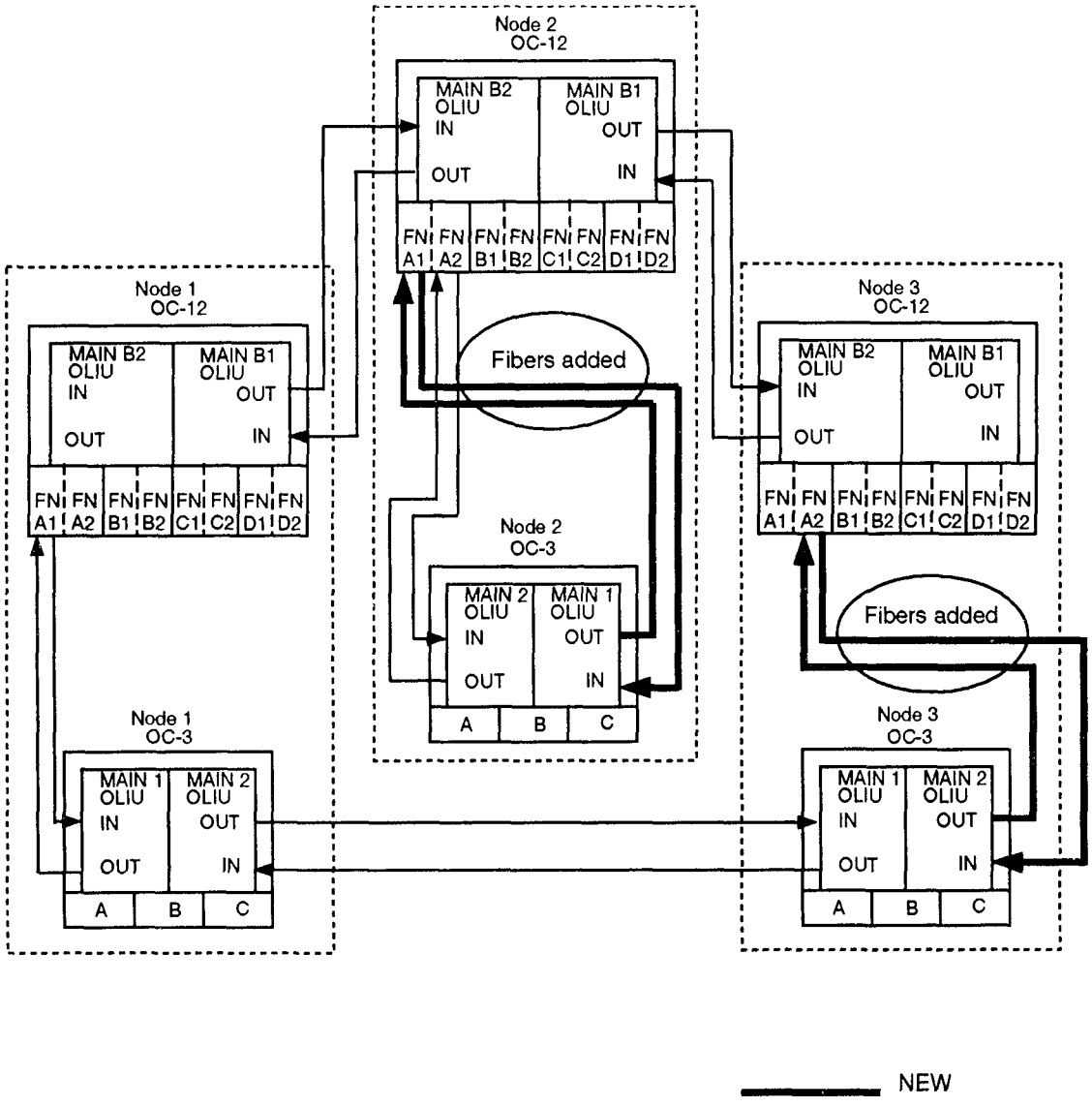


Figure 5. Example of OC-3 to OC-12 Ring Upgrade (5 of 7)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
23. See Figure 6. Disconnect the fiber pair between OC-3 Node 3 and Node 1. If required, use these fibers to connect OC-12 Node 3 and Node 1.	**DLP-511**
24. At Node 3, remove **22F OLIU** from OC-3 **MAIN 1** slot. At Node 1, remove **22F OLIU** from OC-3 **MAIN 2(P)** slot. Momentarily depress **UPD/INIT** button on **SYSCTL** at both nodes.	
25. At Node 3, insert **22D-U OLIU** into OC-3 **MAIN 1** slot. At Node 1, insert **22D-U OLIU** into OC-3 **MAIN 2(P)** slot.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

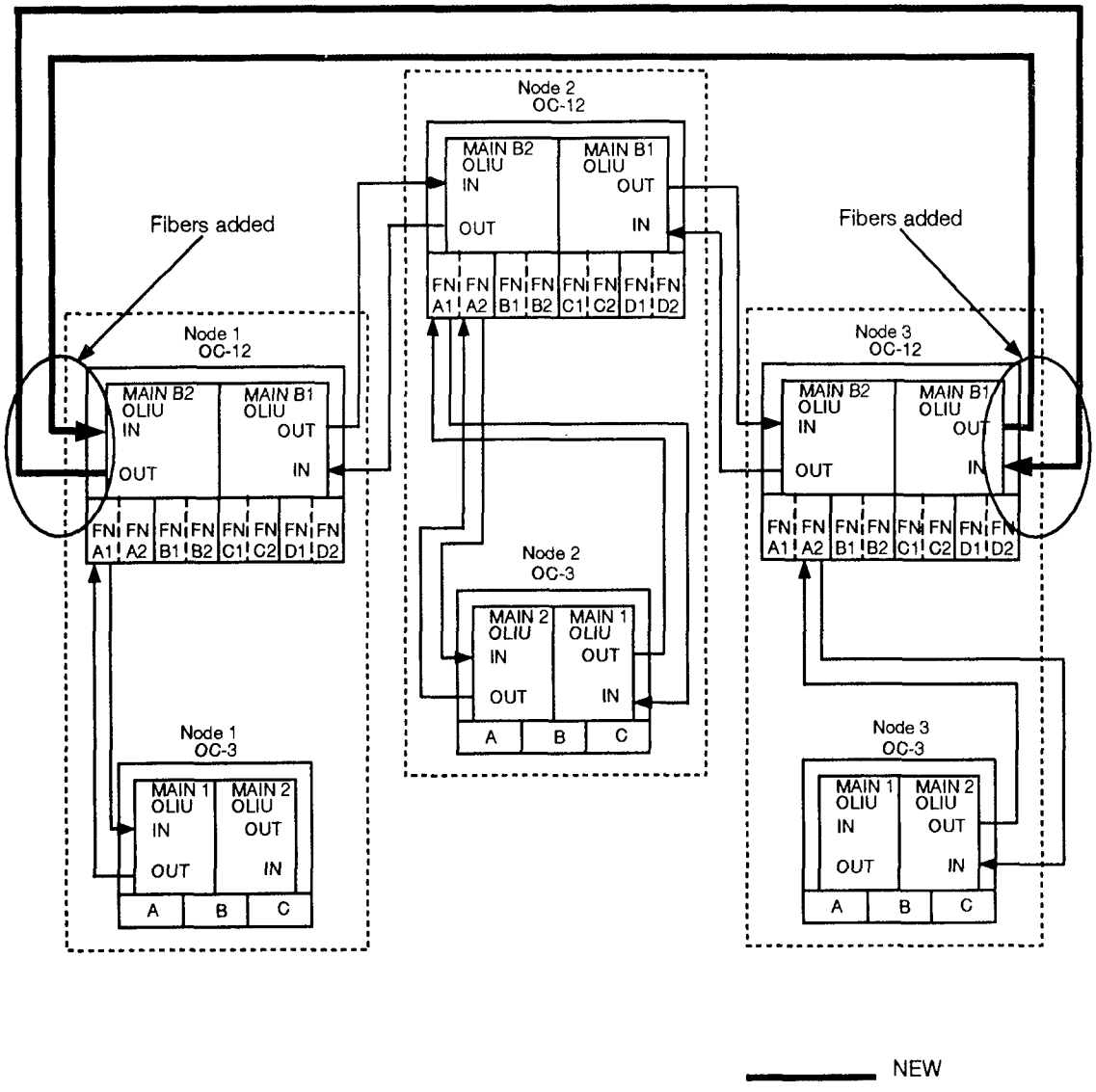


Figure 6. Example of OC-3 to OC-12 Ring Upgrade (6 of 7)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

26. ⇒ NOTE:
Due to multiple DCC channels during portions of this upgrade, the `rtrv-nmap` command cannot be used for verification of optical fiber connections between the OC-3 and OC-12 nodes until all fiber connections have been completed throughout the network.

At Node 3, perform optical fiber connections from OC-3 **MAIN 1** slot to OC-12 **FN-( )-1**. See Figure 7. **DLP-551**

27. ⇒ NOTE:
Due to multiple DCC channels during portions of this upgrade, the `rtrv-nmap` command cannot be used for verification of optical fiber connections between the OC-3 and OC-12 nodes until all fiber connections have been completed throughout the network.

At Node 1, perform optical fiber connections from OC-3 **MAIN 2(P)** slot to OC-12 **FN-( )-2(P)**. See Figure 7. **DLP-551**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

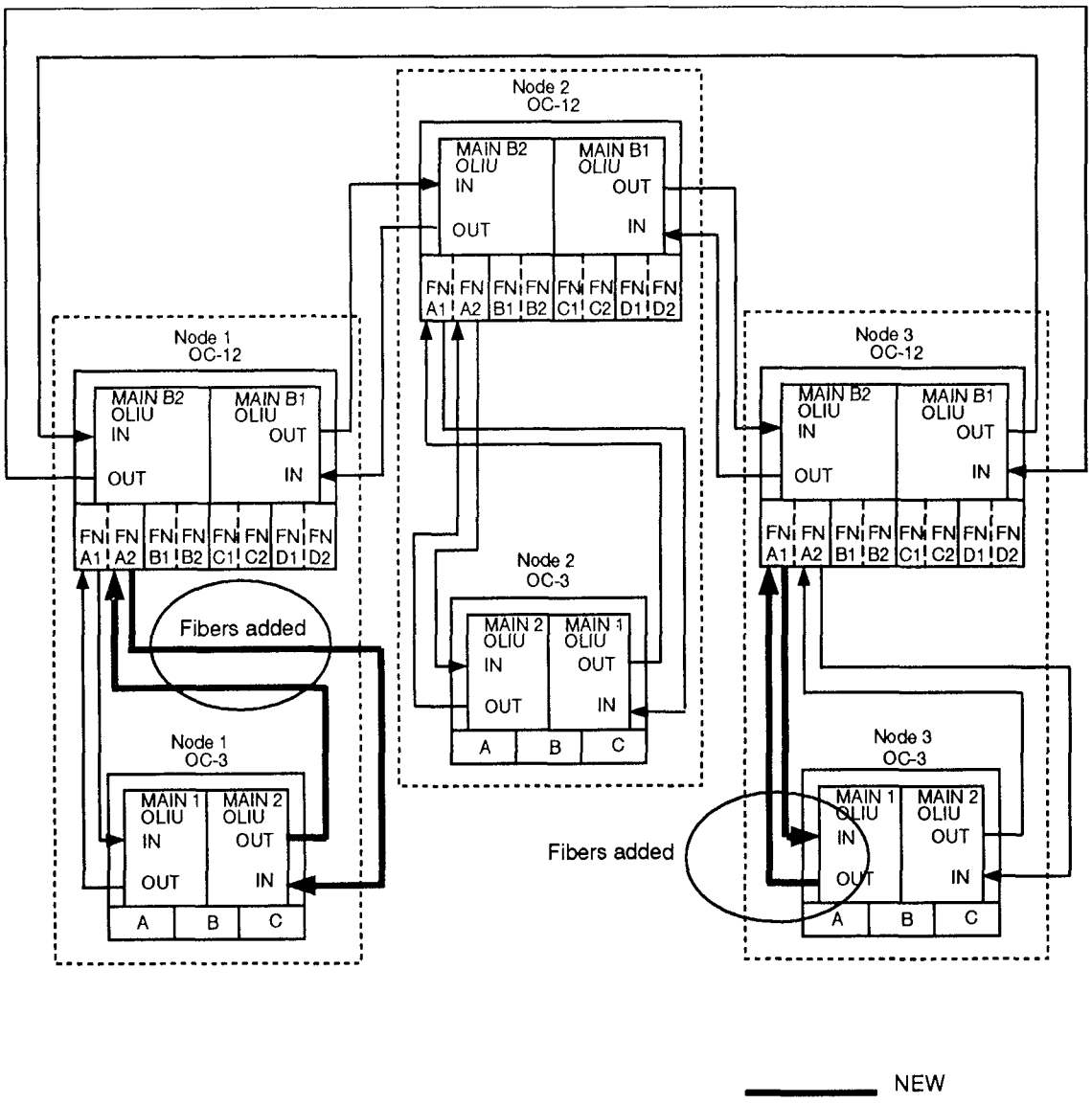


Figure 7. Example of OC-3 to OC-12 Ring Upgrade (7 of 7)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

28. Use `set-sync:auto=enabled` command to enable sync auto-reconfiguration at all Nodes.

29. ⇒ NOTE:
The simpliest timing configuration would be to set the GNE to receive external timing from the BITS clock, and all other nodes in the network to receive loop timing. Many timing configurations are possible.

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.

30. Use the `rtrv-nmap:` command to verify all the optical links of the completed network.

31. Use the `rtrv-ne:` command to verify which OC-12 shelf is the GNE. If necessary, use `set-ne:` command to change the shelf designated as the GNE if specified on the work order.

Clear Critical (CR) Alarm

1. ⇒ NOTE:
   Critical alarms are failures that cause loss of service to at least 1 DS3. 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-525**].

   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-525**).

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 to the near-end system.

Reference: **DLP-516**

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. 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, channel, port or operations interface where the event occurred. Use the **rtrv-alm** command to get another report.

⇒ NOTE 3:
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.OC12 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-b-2   MM-DD HH:MM:SS    SA    inc. OC12 LOS
-------------------------------------------------------------
 MAJOR        fn-b-1     MM-DD HH:MM:SS          inc. EC1 LOS
                                .

                                .
 MAJOR        dcc-m-b-2  MM-DD HH:MM:SS          section DCC chan fail
 MAJOR        dcc-m-b-1  MM-DD HH:MM:SS          section DCC chan fail
-------------------------------------------------------------
 MINOR        main-b-1   MM-DD HH:MM:SS          inc. OC12 LOS
-------------------------------------------------------------
 ne-acty      -                                  holdover mode active
*/
```

Figure 1. Example of Active Alarms and Status Report

12. Does the `Source Address` of any top entry in the alarm report indicate 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 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.) OC12 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 loss of pointer (LOP) STS1 #4 loss of pointer (LOP) STS1 #5 loss of pointer (LOP) STS1 #6 loss of pointer (LOP) STS1 #7 loss of pointer (LOP) STS1 #8 loss of pointer (LOP) STS1 #9 loss of pointer (LOP) STS1 #10 loss of pointer (LOP) STS1 #11 loss of pointer (LOP) STS1 #12 sig. degrade (BER)	Failure of **OLIU** at near or far end, or failure of receive fiber	TAP-111 (R1, R2) or TAP-125 (R3)
	inc. STS1 LOP OC12 *slotaid*	If failure on both OC-12 lines: unprotected removal or failure of **3DS3** CP at far end	Step 31
		If failure on only one OC-12 line: Failure of **OLIU** at near or far end	TAP-111 (R1, R2) or TAP-125 (R3)
CRITICAL. **CR** LED lighted.	inc OC12 line AIS	Failure of **OLIU** at the far end.	Step 37
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.	AT&T 363-206-202
	inc STS1 LOP OC3 *slotaid*	If failure on both OC-3 lines: unprotected removal or failure of **MXRVO** or **DS3** CP at far end	AT&T 363-206-202
		If failure on only one OC-3 line· Failure of **OLIU** at near or far end.	
CRITICAL. **CR** LED lighted.	inc. OC3 line AIS	Failure of **OLIU** at the far end.	AT&T 363-206-202

See notes/footnotes at end of table.

Table A. Critical (CR) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
CRITICAL. **CR** LED lighted. **FAULT** LED flashing on **3DS3**.	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 **3STS1E**.	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 **3STS1E** 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 **3STS1E** 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 **3STS1E** circuit pack.	Step 35
CRITICAL. **CR** LED lighted.	inc STS1 AIS	Incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or obscure failure of a **3DS3**, **3STS1E**, or **OLIU** CP at the far end.	TAP-124
	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 (R1, R2) or TAP-125 (R3)
	inc STS1 unequipped	STS-1 cross-connects have been deleted in upstream equipment interfacing with the DDM-2000 OC-12 ring.	Find the deleted cross-connects in the upstream equipment.
	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 TSI circuit packs fail Both OLIU circuit packs fail Both 3DS3 circuit packs fail Both 3STS1E circuit packs fail	Internal circuit pack failure. Replace circuit pack.	DLP-518

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 TSI circuit packs removed Both OLIU circuit packs removed Both 3DS3 circuit packs removed Both 3STS1E 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-510**] or change sync. parameters (**set-sync**).
	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.
	Frequency error	The DS1 external timing reference to the local shelf terminating DS3 signals or an upstream shelf from which DS3 signals are being received has a frequency offset greater than about 20 hertz.	Check frequency of DS1 external timing reference signal at local shelf or check upsteam shelf for frequency offset.
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.

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 **3DS3/ 3STS1E** 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 **3DS3/3STS1E** circuit pack at near end.

Reference: **DLP-518**

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 3.
Do **TAP-125** if Release 3 (ring configuration).
If **NO**, then continue with **Step 20.**

20. ⇒ NOTE:
Failure of both the service and protection **TGS**, **3STS1E**, or **3DS3** 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-510**) 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-510**

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**, **3STS1E**, or **3DS3**) 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 **3DS3**(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 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 **3DS3** circuit packs have not been removed, replace the **3DS3** circuit pack associated with the identified **OLIU** slot in the alarm message.

    Reference: **DLP-518**

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 **3STS1E** circuit pack. Replace **3STS1E** circuit pack [**DLP-518**]. 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 **3STS1E** circuit pack associated with the identified STS-1 signal. Determine location of the **3STS1E** circuit pack from office records or use the `rtrv-crs-( )` commands to trace back through the STS-1 cross-connections associated with the identified STS-1 signal. Replace far-end **3STS1E** circuit pack.

    Reference: **DLP-518**

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-518**

38. **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 DDM-2000 (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 and log in to the near-end system, if not already performed.

   Reference: **DLP-516**

2. NOTE 1:
   The `Active Alarm and Status Report` is output automatically following CIT log in. 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, channel, port or operations interface where the event occurred. Use the **`rtrv-alm`** command to get another report.

   NOTE 2:
   The report shown below 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 dashed line in the `Active Alarm and Status Report` (for example, `MINOR farend ... SiteXNE1` in Figure 1).

```
/* 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     fn-b-1     MM-DD HH:MM:SS          inc  STS1 AIS
*/
```

Figure 1. Example of Active Alarms and Status Report

3. Does the `Source Address` of any top entry 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` 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.

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-517**

8. Use the **rtrv-alm** command at the far-end system to get a report of status and alarms. See Table A for a detailed description of the messages in the alarm and status report.

9. Repeat this procedure from Step 3. Remember that when the procedures refer to local it is now the shelf from which you are getting the Alarm and Status Report.

Table A. RTRV-ALM Message Descriptions

Description	Alarm Level	Meaning
`23R CP failed`		Internal equipment failure of the 23R Regenerator circuit pack
`-48V power/fuse failed`	MN	–48 volt power feeder or fuse on user panel has failed.
`3DS3 CP failed`	CR or MN	Internal equipment failure of specified **3DS3** CP.
`OHCTL CP failed`	MJ	Internal equipment failure of **OHCTL** CP.
`OLIU CP failed`	CR or MN	Internal equipment failure of specified **OLIU** CP.
`SYSCTL CP failed`	MJ	Internal equipment failure of **SYSCTL** CP. System has determined that some part of **SYSCTL** CP has failed. Note: Some types of failures cannot be reported since **SYSCTL** CP cannot function under these conditions.
`TGS CP failed`	CR or MN	Internal equipment failure of the specified **TGS** CP, or the systems at both ends of the span are loop-timed from each other.
`TSI CP failed`	CR or MN	Internal equipment failure of specified **TSI** CP.
`AC power failed`	PMN	AC power supply to remote terminal cabinet has failed.
`ACO active`	Status	Parallel telemetry outputs and audible office alarms normally active due to alarm conditions in system are being suppressed (See `opr-aco` command.)
`APS channel failed`	MN	SONET automatic protection switching (APS) channel on protection OC-12 line has failed. **Likely causes**: Failure of **OLIU** CP on protection line (**MAIN-B-2(P)**) at far end; failure of **OLIU** CP on protection line (**MAIN-B-2(P)**) at near end.
`auto turnup test IP`	ABN	An automatic turnup test is in progress
`communication failure`	Status	System is not communicating with another shelf in subnetwork. This system is normally communicating with that shelf through SONET section DCC specified in address column The `rtrv-nmap` command will report name of system(s) with which this system is not communicating. **Likely causes**: An unprotected OC-12 line failure in the subnetwork, a **SYSCTL** or **OHCTL** failure; reset, or initialization on another shelf; section DCC channel failure on this or another shelf.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
controln	Status	Specified environmental control point (miscellaneous discrete output) is active. Note: Actual message that appears in alarm and status report for this condition can be provisioned; this is the default message. See **rtrv-attr-cont** and **set-attr-cont** commands. **Likely cause**: Environmental control by either a TBOS control point or by closing of corresponding environmental control input at 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 - (timing)	CR or MN	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.
CP removed	CR or MN	*CP previously installed in this system is removed. CP should* be reinstalled, or an update should be done to remove if from system equipment list.
DS3 loopback	ABN	A loopback (toward optical fiber) is active on specified T3 port. (See **opr-lpbk-t3** and **rls-lpbk-t3** commands.)
DS3 trmsn test IP	ABN	Transmission test using internal test signal generator and monitor is in progress on specified T3 port. (See **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 GNE	MJ	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. See **set-ne** and **rtrv-ne** commands for GNE provisioning information.
duplicate site/ne address	MJ	Two or more shelves in network have same site address (determined by switches on **SYSCTL** CP) and same network element address (determined by switches on **OHCTL** CP).
duplicate TBOS display	MJ	Two or more shelves in network have same TBOS display number (determined by switches on **SYSCTL** CP).
duplicate TID	MJ	Two or more shelves in network have same system name or TID set by **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 A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`environmentn`	CR, MJ, MN or none	Specified environmental alarm point (miscellaneous discrete input) is active. Note: Actual message that appears in alarm and status report for this condition can be provisioned; this is default message. See **`rtrv-attr-env`** and **`set-attr-env`** commands.
`excessive holdover`	MJ	System has been in holdover mode for more than 4 hours. This may cause degraded performance (high error rates) on transmitted and/or received signals Whenever this condition exists, `holdover mode active` condition also exists. **Likely cause**: See `holdover mode active`.
`externalMinor`	CR, MJ, MN or none	*External minor alarm input (environmental alarm input 15)* is active. Typically, this input will be connected to power shelf, and will indicate that DC power or cooling fan in a remote terminal cabinet has failed. Note: Actual message that appears in alarm and status report for this condition can be provisioned; this is the default message. See **`rtrv-attr-env`** and **`set-attr-env`** commands.
`fan control relay failed`	MN	Thermostat on **SYSCTL** indicates that cooling fan should be turned on, and fan control relay on **SYSCTL** CP failed to operate, or the fan control relay output (backplane connector **P62**) does not connect to a fan. System will continue to operate, but if the **SYSCTL** controls a fan, it might overheat, leading to degraded or interrupted transmission and/or circuit pack failures. **Likely cause: SYSCTL** CP failure; telemetry output common pin on **P62** is not grounded.
`fan shelf failed`	MN	System has detected a failure of the DDM-2000 fan shelf System will continue to operate but it may overheat. Fan must be replaced within **4 hours** of the failure; otherwise service might be interrupted and/or circuit packs might fail. **Likely cause:** Filter needs replacing, a fan pack failed, fan shelf has lost one or both power feeders, or the fan shelf control board has failed.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
forced switch	ABN	When associated with OC-3/OC-12 line, this message means that identified line is not selected as 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 protection switch is reset, or a lockout or inhibit switch request is received. Note. OC-3/OC-12 line switching is unidirectional. Because of this, specified OC-3/OC-12 line might still be active (if far end is selecting specified line to receive traffic), and far end might still be free to switch the line it is selecting to receive traffic See **switch-line** command. When associated with function unit slot or **TSI** slot, this message means that 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 protection switch is reset or a lockout or inhibit switch request is received See **switch-fn** and **switch-tsi** commands.
Frequency error	CR	This alarm condition indicates that the timing of a terminated DS3 signal has an unaccepatble frequency offset. **Likely cause:** The DS1 external timing reference to the local shelf or an upstream shelf has a frequency offset greater than about 20 hertz.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`holdover mode active`	NE ACTY	System is in holdover synchronization mode. **Likely causes**: a. System was manually switched to holdover mode (with `switch-sync` command or in a central office system, with TBOS control point 54) and switch has not been reset; or b. the system automatically switched to holdover mode due to failure of timing references, and either 1. the reference failures have not cleared, or 2. the system is provisioned for nonrevertive synchronization mode switching, or 3. the system is provisioned for `External` timing and no external timing references are available, or 4. the system is provisioned for loop-timed operation and the optical line or OLIU circuit pack has failed, or a message indicating an upstream clock problem has been received on the sync message bits of the optical line. See `rtrv-sync` command. Condition can be cleared by repairing at least one of timing references (if both are failed) and resetting synchronization mode protection switch with command `switch-sync:s=mode,pri=reset`. In a central office system, the synchronization mode can also be reset with a TBOS control point.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`illegal CP type`	CR or MN	An illegal or unknown circuit pack type has been inserted into the shelf. The circuit pack should be removed from the shelf
`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 causes:** Failure of the incoming DS1 synchronization reference signal.
`inc. DS1 sync. ref. LOF`	MJ or MN	System is unable to frame on the DS1 synchronization reference signal. **Likely causes:** Upstream failure in the clock providing the reference signal; high bit error ratio on the received signal, caused by failure of the office timing supply that provides the DS1 timing reference; the system is provisioned for SF format on the specified DS1 synchronization reference signal and the received DS1 signal is in ESF format.
`inc. DS1 sync. ref. LOS`	MJ or MN	At least 128 consecutive zeros were received in the DS1 synchronization reference signal, or the energy at the DS1 input is below a preset threshold. **Likely causes:** Failure of the office timing supply that provides the DS1 timing reference or failure of the connection to the timing supply.
`inc. DS1 sync ref OOL`	MJ or MN	The incoming DS1 synchronization reference signal is out of lock (OOL). The frequency of the clock providing the DS1 reference signal is out of specification. **Likely causes:** Failure of the office timing supply that provides the DS1 timing reference.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`inc. (from OC-12) DS3 AIS`	NE ACTY	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal **Likely causes:** The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end.
`inc (from OC-12) 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 **3DS3** CP at the far end or near end; the DS3 signal is looped at both ends
`inc. DS3 LOS`	CR, MJ, MN or None	At least 128 consecutive zeros were detected in DS3 signal received from DSX-3. **Likely causes:** Equipment failed or removed at DSX-3, DS3 input disconnected at DSX-3 or at backplane
`inc. (from DSX) DS3 sig. failed`	CR	Bit error ratio (BER) in incoming DS3 signal exceeds provisioned failure threshold, 10^{-3} or 10^{-6}. **Likely causes:** Failure of upstream equipment or facility (towards the DSX-3); cross-talk in office wiring; unprotected failure of **3DS3** CP.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
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 **3STS1E** CP at the near end, the **3STS1E** 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 **3STS1E** or equivalent CP at the far end. Failure of the **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	CR, MJ MN or none	The system has detected loss of signal (LOS) condition on the EC-1 line. **Likely cause:** Failure of the **3STS1E** or equivalent CP at far end Failure of the incoming cable. Failure of the **3STS1E** 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 **3STS1E** 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 **3STS1E** CP at the near end. Failure of the incoming cable. Cross-talk in office wiring. Failure of the **3STS1E** 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 **3STS1E** CP at the near end. Failure of the incoming cable. Cross-talk in office wiring. Failure of the **3STS1E** CP at the far end.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
inc OC3 line AIS	CR or NE ACTY	System has detected OC-3 line alarm indication signal (AIS) on incoming OC-3 line **Likely cause:** Failure of **OLIU** CP at far end.
inc. OC3 BER	CR or MN	Bit error ratio (BER) in received OC-3 signal exceeds 10^{-3}. **Likely causes:** Failure of **OLIU** CP at near end, failure of receive fiber, or failure of **OLIU** CP at far end.
inc. OC3 FERF	NE ACTY	System has detected the OC-3 far end receive failure (FERF) signal in the incoming OC-3 signal. **Likely causes:** Failure of the **OLIU** CP at near end, or failure of **OLIU** CP at far end, or the transmit fiber on the specified line.
inc. OC3 LOF	CR or MN	System has detected loss-of-frame (LOF) condition in 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 **OLIU** CP at near end, failure of **OLIU** CP at far end, or failure of receive fiber.
inc OC3 LOS	CR or MN	System has detected loss-of-signal (LOS) condition on the OC-3 line. **Likely causes:** Failure of **OLIU** CP at near end, failure of **OLIU** CP at far end, or failure of the receive fiber
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 **OLIU** CP at near end, failure of **OLIU** CP at 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 received OC-3 signal exceeds 10^{-3}. **Likely causes:** Failure of **OLIU** CP at near end, failure of **OLIU** CP at far end, or failure of the receive fiber.
inc OC12 FERF	NE ACTY	System has detected OC-12 far end receive failure (FERF) signal in incoming OC-12 signal. **Likely causes:** Far end has detected an incoming signal failure on specified OC-12 line This may be caused by failure of **OLIU** CP at near end, **OLIU** CP at the far end, or transmit fiber on specified line.
inc OC12 line AIS	CR or NE ACTY	System has detected OC-12 line alarm indication signal (AIS) on an incoming OC-12 line. **Likely causes:** Failure of **OLIU** CP at far end.
inc. OC12 LOF	CR or MN	System has detected loss-of-frame (LOF) condition on an incoming OC-12 signal. LOF is defined as an out-of-frame (OOF) condition (four consecutive errored STS-1 framing patterns) that lasts for at least 3 milliseconds **Likely causes:** Failure of **OLIU** CP at near end, failure of **OLIU** CP at far end, or failure of receive fiber

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
inc. STS1 LOP OC12 #x	CR or MN	System has detected loss-of-pointer (LOP) condition. A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal. **Likely causes:** If this condition occurs on the STS-1 on both OC-12 lines, the likely cause is an unprotected failure of a **3DS3** CP at the far end. If this condition occurs on only one OC-12 line, the likely cause is failure of the **OLIU** CP at the near end or far end.
inc OC12 LOS	CR or MN	System has detected loss-of-signal (LOS) condition on OC-12 line. **Likely causes:** Failure of **OLIU** CP at near end, failure of **OLIU** CP at far end, or failure of receive fiber.
inc. OC12 sig. degrade (BER)	CR or MN	Bit error ratio (BER) in specified OC-12 line exceeds provisioned soft error threshold (10^{-9} to 10^{-5}) but below hard error threshold of 10^{-3}. **Likely causes:** Failure of **OLIU** CP at near end, failure of **OLIU** CP at far end, failure of receive fiber, or optical attenuator is being used when it should not be, or is not being used when it should be.
inc. OC12 sig failed (BER)	CR or MN	Bit error ratio (BER) in the received OC-12 signal exceeds 10^{-3}. **Likely causes:** Failure of **OLIU** CP at near end, failure of **OLIU** CP at far end, or failure of receive fiber.
inc. STS1 AIS	CR or NE ACTY	System has detected incoming STS-1 alarm indication signal (AIS) in active OC-3/OC-12 line. System responds by transmitting DS3 AIS toward the DSX and transmitting STS-1 yellow toward fiber from which the AIS is being received. **Likely causes:** Unprotected removal or failure of **3DS3** or **OLIU** CP at 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 3STS1E circuit pack or failure of the 3STS1E circuit pack at the near end.
inc STS1 LOP OC3 #x	CR or MN	System has detected loss-of-pointer (LOP) condition. Valid STS-1 pointer could not be found for eight consecutive frames in identified STS-1 signal. **Likely causes:** If this condition occurs on STS-1 on both OC-3 lines, the likely cause is an unprotected failure of an **MXRVO** or a **DS3** CP at far end. If this condition occurs on only one OC-3 line, the likely cause is failure of **OLIU** CP at near end or far end.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`inc. STS1 sig degrade (BER)`	CR or MN	For STS-1 path ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold.
`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}) **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-12 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	System has detected incoming STS-1 yellow signal inserted by the far end path terminating equipment. **Likely causes:** Unprotected failure of a **3DS3** CP at far end, unprotected failure of a **3DS3** CP at near end.
`inconsistent DCC switches`	MJ	The User/Network switch on the OHCTL circuit pack is set the same at both ends of the DCC.
`illegal CP type`	MN	A circuit pack is installed in the **MAIN-A** slots. The circuit pack should be removed from the shelf
`inhibit switch`	ABN	When associated with OC-3/OC-12 line, this message means that identified line is not selected as active receiving line, and a protection switch to make identified line the active receiving line will not be done No further protection switching of specified line will be done until protection switch is reset Note: OC-3/OC-12 line switching is unidirectional. Because of this, specified OC-3/OC-12 line might still be active (if far end is selecting specified line to receive traffic), and far end might still be free to switch line it is selecting to receive traffic. See **`switch-line`** command. When associated with function unit slot, **TSI** slot, timing slot, or timing reference, this message means that identified equipment or reference is not active, and protection switches to identified equipment or reference will not be done until protection switch is reset. See **`switch-fn`**, **`switch-tsi`**, and **`switch-sync`** commands.
`inhibit auto. os messages`	ABN	This message occurs when TL1 autonomous alarm reporting is inhibited by the TL1 **`inh-msg`** command.
`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.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
lockout of protection	ABN	When associated with OC-3/OC-12 line, this message means that identified line is not selected as active receiving line, and a protection switch to make identified line active receiving line will not be allowed. Note: OC-3/OC-12 line switching is unidirectional. Because of this, specified OC-3/OC-12 line might still be active (if far end is selecting specified line to receive traffic), and far end might still be free to switch line it is selecting to receive traffic. Lockout will remain in effect until protection switch is reset or until a protection switch inhibit request is entered. See **switch-line** command
manual sync. mode switch	ABN	Synchronization mode has been manually switched to holdover or free-running and will remain in that mode until switch request is reset (See **switch-sync** command.)
program installation IP	Status	This system is being used to install software into another system. If this procedure is interrupted prior to completion, the remote systems' control circuit packs will likely become inoperable until another install program attempt is successful.
section DCC channel failed	MJ	System cannot communicate with far-end system through SONET section data communications channel (DCC). **Likely causes: SYSCTL** or **OHCTL** CP failure, reset, or initialization at far end; failed program installation at far end; program installation in progress at far end, **SYSCTL** or **OHCTL** CP failure at near end.
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.
unexpected CP present	MN	CP is installed in one of **MAIN-A-1** or **MAIN-A-2(P)** slots. The CP should be removed from the shelf.

Table A. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`unexpected CP switches`	MJ	When associated with **SYSCTL** slot, this message means that an invalid switch setting has been selected on the CP, or that some of the unused switches are not in the prescribed position. For **OLIU** slots, it indicates that the optical power switch on the **OLIU** CP was different from what it was before the **OLIU** CP was replaced. For DS3 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. When associated with a function unit (**FN**) slot, this message means that the optical power switch on the **21G OLIU** CP is different from what it was before the **21G OLIU** CP was replaced.
`unexpected CP type`	CR 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 an OC-12 system, this message measn that an **OLIU** CP is inserted in a slot provisioned for a **3DS3** CP, or a **3DS3** CP is inserted in a slot provisioned for an **OLIU** CP.
`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 the `set-ne` command for provisioning.)

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-525**].

   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-525**).

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 to the near-end system.

Reference: **DLP-516**

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. 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, channel, port or operations interface where the event occurred. Use the **`rtrv-alm`** command to get another report.

⇒ NOTE 3:
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, "MINOR ... section dcc channel failed" 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
=============================================================
 MINOR       farend     MM-DD HH:MM:SS   nsa   SiteXNE1
 MINOR       dcc-m-b-1  MM-DD HH:MM:SS   nsa   section dcc channel failed
-------------------------------------------------------------
 ne-acty     farend     MM-DD HH:MM:SS    -    SiteYNE1
 ne-acty     fn-a-1     MM-DD HH:MM:SS    -    inc  STS1 yellow
 ne-acty     fn-c-1     MM-DD HH:MM:SS    -    inc. STS1 yellow
 ne-acty     main-b-1   MM-DD HH:MM:SS    -    inc  OC12 FERF
*/
```

Figure 1. Example of Active Alarms and Status Report

12. 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. Note the trouble description in Table A for the highest alarm level.

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.
MN LED lighted.	`automatic protection switch (APS) channel failed`	Failure of near-end or far-end prot. **OLIU** (MAIN-B-2(P)) CP or failure of receive fiber on the prot line at near end.	TAP-111
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 - (timing)`	When associated with **TGS** slot, current CP switch settings do not support the sync. timing provisioned.	Change **TGS** switches [DLP-510] or change sync. parameters (**set-sync**).

MN LED lighted. **FAULT** LED lighted on circuit pack	`3DS3 circuit pack fail`
	`3STS1E circuit pack fail`
	`TGS circuit pack fail`
	`TSI circuit pack fail`
	`OLIU circuit pack fail`
		Internal failure of circuit pack with lighted LED	Step 16

MN LED lighted.	`3DS3 circuit pack removed`
	`3STS1E circuit pack removed`
	`TGS circuit pack removed`
	`TSI circuit pack removed`
	`OLIU circuit pack removed`
		Circuit packs removed without doing **upd** command to remove circuit packs from equipment list	Step 27

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.

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.	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.
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 25

See Notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted. **FAULT** LED flashing on **3DS3**	`inc. (from DSX) DS3 LOS*` `inc (from DSX) DS3 sig. fail`†	Equipment failed or removed at DSX-3	Step 23

MN LED lighted. **FAULT** LED flashing on **OLIU**	`incoming (inc.) OC12`
	`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 pointer (LOP)`
	`STS1 #4`
	`loss of pointer (LOP)`
	`STS1 #5`
	`loss of pointer (LOP)`
	`STS1 #6`
	`loss of pointer (LOP)`
	`STS1 #7`
	`loss of pointer (LOP)`
	`STS1 #8`
	`loss of pointer (LOP)`
	`STS1 #9`
	`loss of pointer (LOP)`
	`STS1 #10`
	`loss of pointer (LOP)`
	`STS1 #11`
	`loss of pointer (LOP)`
	`STS1 #12`
	`loss of signal (LOS)`
	`sig. degrade (BER)`
		Failure of **OLIU** at near or far end, or failure of receive fiber.	TAP-111 (R1,R2) TAP-125 (R3)

	`inc. STS1 LOP OC12` *slotaid*	If failure on both OC-12 lines: unprotected removal or failure of **3DS3** CP at far end.	Step 46
		If failure on only one OC-12 line: Failure of **OLIU** at near or far end.	TAP-111 (R1,R2) TAP-125 (R3)

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 **3STS1E**	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 **3STS1E** at near or far end, or failure of receive fiber	Step 23
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.	AT&T 363-206-202
	inc STS1 LOP OC3 *slotaid*	If failure on both OC-3 lines: unprotected removal or failure of **MXRVO** or **DS3** CP at far end.	AT&T 363-206-202
		If failure on only one OC-3 line: Failure of **OLIU** at near or far end.	AT&T 363-206-202

See Notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted.	`inc. STS1 sig failed (BER)` `inc STS1 sig degrade (BER)`	Failure of **OLIU** at near end or far end or failure of receive fiber.	TAP-111 (R1, R2) TAP-125 (R3)
	`inc STS1 unequipped`	An STS-1 cross-connect has been deleted in upstream equipment interfacing with the DDM-2000 OC-12 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 42

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 39

MN LED lighted.	`unexpected CP present`	Circuit pack inserted into **MAIN-A** slot.	Circuit pack should be removed from the 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.
† 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-125** if linear configuration.
    Do **TAP-125** 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-518** 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 27.**

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
3DS3/3STS1E	Step 23
TGS	Step 25

23. Switch service to protection. If LED is flashing on protection **3DS3/3STS1E**, issue trouble report of bad incoming DS3/EC-1 signal from DSX-3/STSX cross-connect point. If LED is not flashing on protection **3DS3/3STS1E**, replace service **3DS3/3STS1E** circuit pack [**DLP-518**].

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. 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-518**

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

27. Have two of the same type (service and protection **TGS**, **3STS1E**, **3DS3**, or **OLIU**) circuit packs been removed from the system?

    If **YES**, then continue with **Step 28.**
    If **NO**, then proceed to **Step 30.**

28. 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.

29. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

30. Is ED-8C733-30, G8 Fan Shelf installed?

    If **YES**, then continue with **Step 31.**
    If **NO**, then proceed to **Step 33.**

31. Is **POWER ON** LED lighted on fan shelf?

    If **YES**, then continue with **Step 32.**
    If **NO**, then go to **TAP-118.**

32. Is **FILTER REPLACE** or any **FAULT** LED lighted on fan shelf?

    If **NO**, then continue with **Step 33.**
    If **YES**, then go to **TAP-118.**

33. ⚠ 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 34**.
If **NO**, then do **TAP-113**.

34. NOTE:
The fuses on the ED-8C727-31, G1 User Panel are 10 amp fuses, COMCODE 406203190.

Replace blown –48V fuse on User Panel?

35. Did fuse blow again?

If **YES**, then proceed to **Step 37**.
If **NO**, then continue with **Step 36**.

36. Is MINOR alarm cleared?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then proceed to **Step 38**.

37. ⚠ 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**, **3DS3**, **3STS1E**, 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-518**). 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. If fuse blows after all circuit packs have been removed, trouble is in the backplane.

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

39. 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 42**.
If **NO**, then continue with **Step 40**.

40. Remove circuit packs from wrong slots, check option switches (**DLP-510**) and reinstall circuit packs into the correct slots.

41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

42. 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-510**

43. Are switch settings correct?

If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 44**.

44. 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.

45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

46. Indications are that there is an unprotected failure or removal of a **3DS3** 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 cross-connections associated with the identified **OLIU** slot.

47. 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.

48. If the **3DS3** circuit packs have not been removed, replace the **3DS3** circuit pack associated with the identified **OLIU** slot in the alarm message.

    Reference: **DLP-518**

49. **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-516**

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 only 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 fn-d-1 MM-DD HH:MM:SS nsa inc. STS1 AIS").

```
/* Active Alarms and Status Report
================================================================
 Alarm        Source     Date   Time       Srv   Description
 Level        Address      Detected
================================================================
 ne-acty      fn-d-l     MM-DD HH:MM:SS    nsa   inc  STS1 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-525**].

   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-525**].

    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:** 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, or 2. the system is provisioned for nonrevertive synchronization mode switching, or 3. the system is provisioned for *External* timing and no external timing references are available. 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. 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.
`inc. (from OC-12) DS3 AIS`	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. **Likely causes:** The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end.
`inc. (from OC-12) 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 **3DS3** CP at the far end or near end; the DS3 signal is looped at both ends.

Table A. Alarm and Status - NE ACTY (Contd)

Activity	Meaning
inc EC1 FERF	The system has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal. **Likely causes:** The far end has detected an incoming signal failure on the specified EC-1 line. This may be caused by failure of the **3STS1E** CP at the near end, the **3STS1E** CP at the far end, or the transmit fiber on the specified line.
inc. OC12 FERF	The system has detected the OC-12 far end receive failure (FERF) signal in the incoming OC-12 signal. **Likely causes:** The far end has detected an incoming signal failure on the specified OC-12 line. This may be caused by failure of the **OLIU** CP at the near end, the **OLIU** CP at the far end, or the transmit fiber on the specified line.
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. OC12 line AIS	The system has detected OC-12 line alarm indication signal (AIS) on an incoming OC-12 line. **Likely cause:** Failure of an **OLIU** CP at the far end.
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. STS1 AIS	The system has detected an incoming STS-1 alarm indication signal (AIS) in the active OC-3 or OC-12 line. The system responds by transmitting DS3 AIS toward the DSX and transmitting STS-1 yellow back toward the fiber from which the AIS is being received. **Likely causes:** Unprotected removal or failure of a **3DS3** or **OLIU** CP at the far end.
inc. STS1 yellow	The system has detected an incoming STS-1 yellow signal inserted by the far end path terminating equipment. **Likely causes:** Unprotected failure of a **3DS3** CP at the far end, unprotected failure of a **3DS3** CP at the near end.

Install BCP1 OHCTL Circuit Pack

1. NOTE 1:
   For Release 2, the **OHCTL** must be a series **S2:3** or later to support open systems interconnection (OSI) protocol and *linear* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *linear* applications. **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 2 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

   NOTE 2:
   For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and *ring* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *ring* applications. **S2:5** 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 3 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

NOTE 3:
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 4:
A **BCP1 OHCTL** must have software installed and it must be compatible with software in **BBG5 SYSCTL**. If no software is installed or if software is not compatible, the letter **C**, **P**, or **d** will be displayed in **FE ID** display on **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** circuit packs before new software can be installed [**DLP-527**].

NOTE 5:
Switches **S1-1, S1-2**, and **S1-3** on **OHCTL** set Network Element number of shelf. The Network Element number and Site ID (set on the **SYSCTL**) form 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 Network Element number from work order or office records. Refer to Table A and Figure 1 and set 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 4-8 (**S1-4, S1-5, S1-6, S1-7**, and **S1-8**) must be set to **ON** position. If set to **OFF** position, **FAULT** LED will light on **OHCTL** and alarm will be generated.

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected switches` alarm is generated.

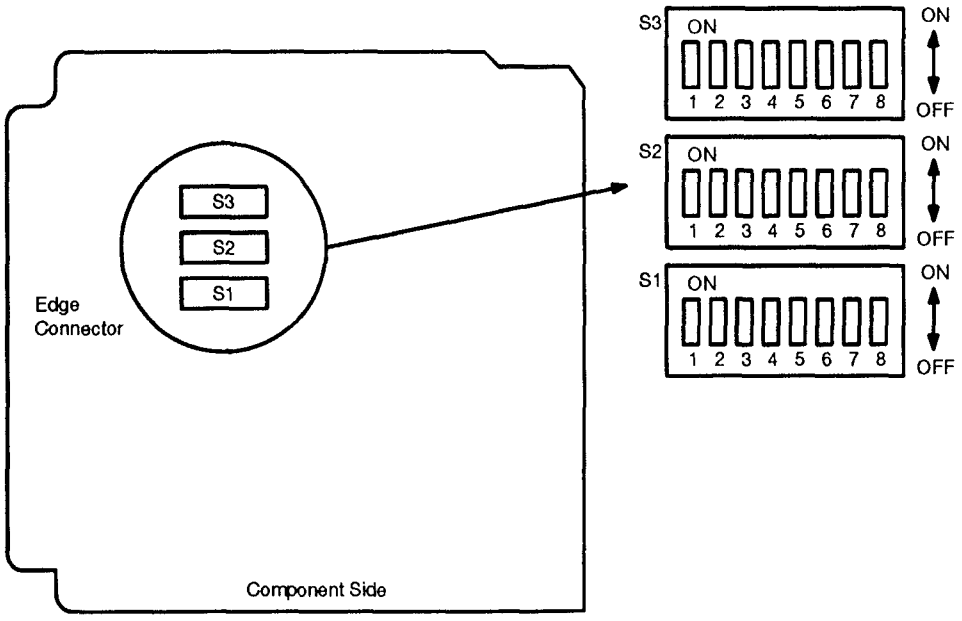


Figure 1. BCP1 OHCTL Option Switch

2. If **Release 1**, then continue with **Step 3**.
   If **Release 2**, then proceed to **Step 7**.
   If **Release 3**, then proceed to **Step 11**.

3. ⇒ NOTE:
   Switches **S2-1**, **S2-2**, **S2-3**, **S2-4**, **S2-5**, **S2-6** are unused in Release 1.

   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	S2-5	S2-6
OFF	ON	OFF	OFF	OFF	OFF

Note: These switches are reserved for Release 2 or 3 open systems interconnection protocol (OSI) application. The suggested settings will make upgrade to Release 2 or 3 easier.

4. Refer to Table C and Figure 1 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table C. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

5. ⇒ 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.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. ⇒ NOTE 1:
Switches **S2-1** through **S2-6** 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 **OLIU**s in the **MAIN** and **FUNCTION UNITS** slots at each end of the interconnected optical spans.

⇒ NOTE 2:
Refer to Figure 2 and note that factory settings for switch **S2** are **S2-1 OFF**, **S2-2 ON**, **S2-3 OFF**, **S2-4 OFF**, **S2-5 OFF**, **S2-6 OFF**, **S2-7 ON**, and **S2-8 ON**. This will permit the establishment of a linear/hub system without changing any **S2** switch settings except on the **OHCTL** at Central Office 2. In this case, **S2-2** on the **OHCTL** at Central Office 2 would be set to **OFF**.

Refer to Figure 2 for an example system configuration. Set **S2** switches for OSI interworking using examples and/or work order or office records. (The nesessary switch settings in Figure 2 are highlighted in bold type. For example, the optical span between Remote Node 1 and Central Office 1 requires that switch **S2-1** at Remote Node 1 be set to **ON** and switch **S2-3** at Central Office 1 be set to **OFF**.)

8. Refer to Table D and Figure 1 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table D. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

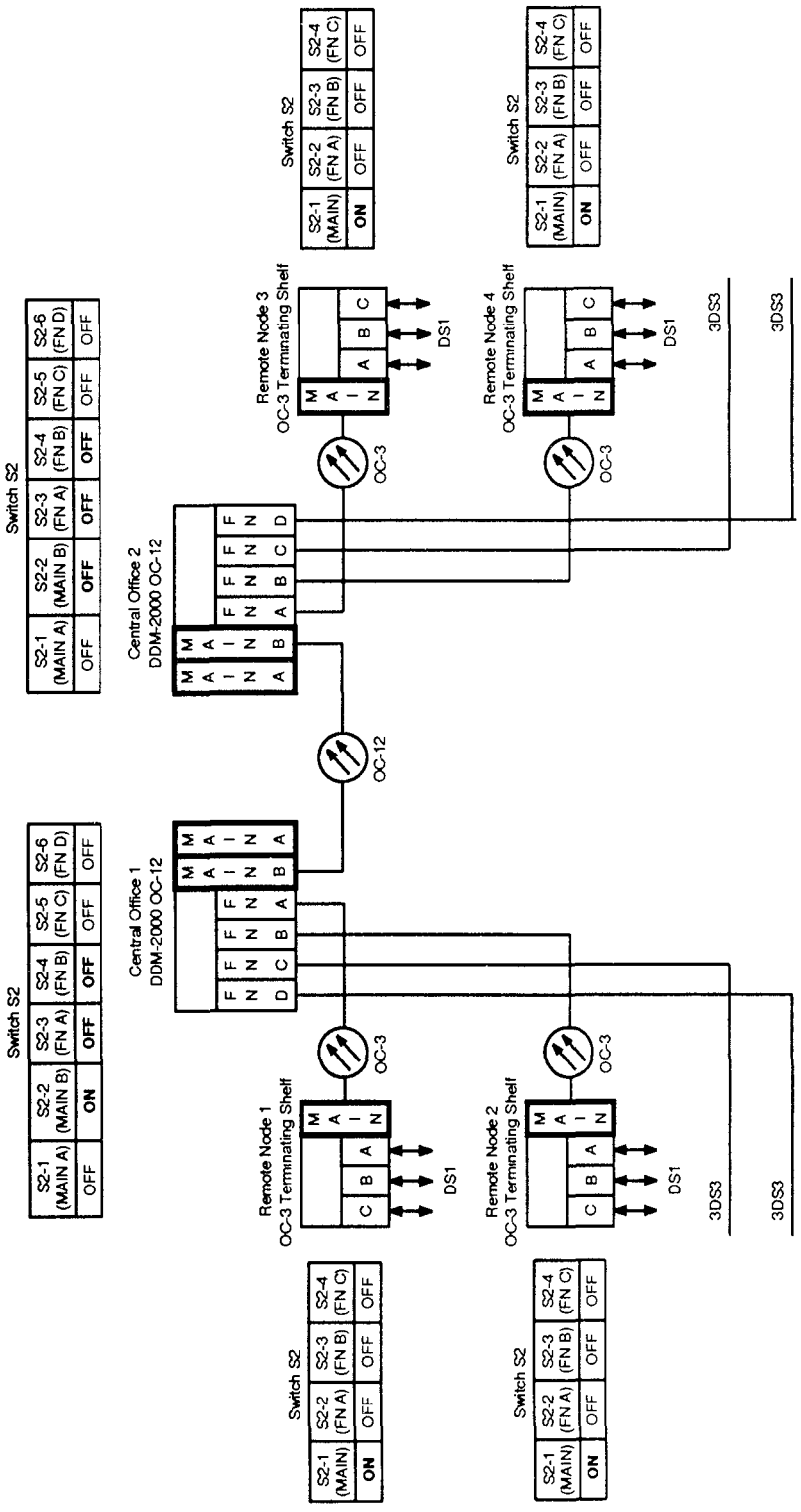


Figure 2. OC-12 Point-To-Point Using OSI Protocol

9. ⇒ 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.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. ⇒ NOTE 1:
Switches **S2-1** through **S2-6** 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 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 ring optical spans.

⇒ NOTE 2:
Refer to Figure 3 and note that factory settings for switch **S2** are **S2-1 OFF, S2-2 ON, S2-3 OFF, S2-4 OFF, S2-5 OFF, S2-6 OFF, S2-7 ON,** and **S2-8 ON**. This will permit the establishment of a ring system without changing any **S2** switch settings.

Refer to Figure 3 for an example ring system configuration. Set **S2** switches for OSI interworking using examples and/or work order or office records. (The nesessary switch settings in Figure 3 are highlighted in bold type.)

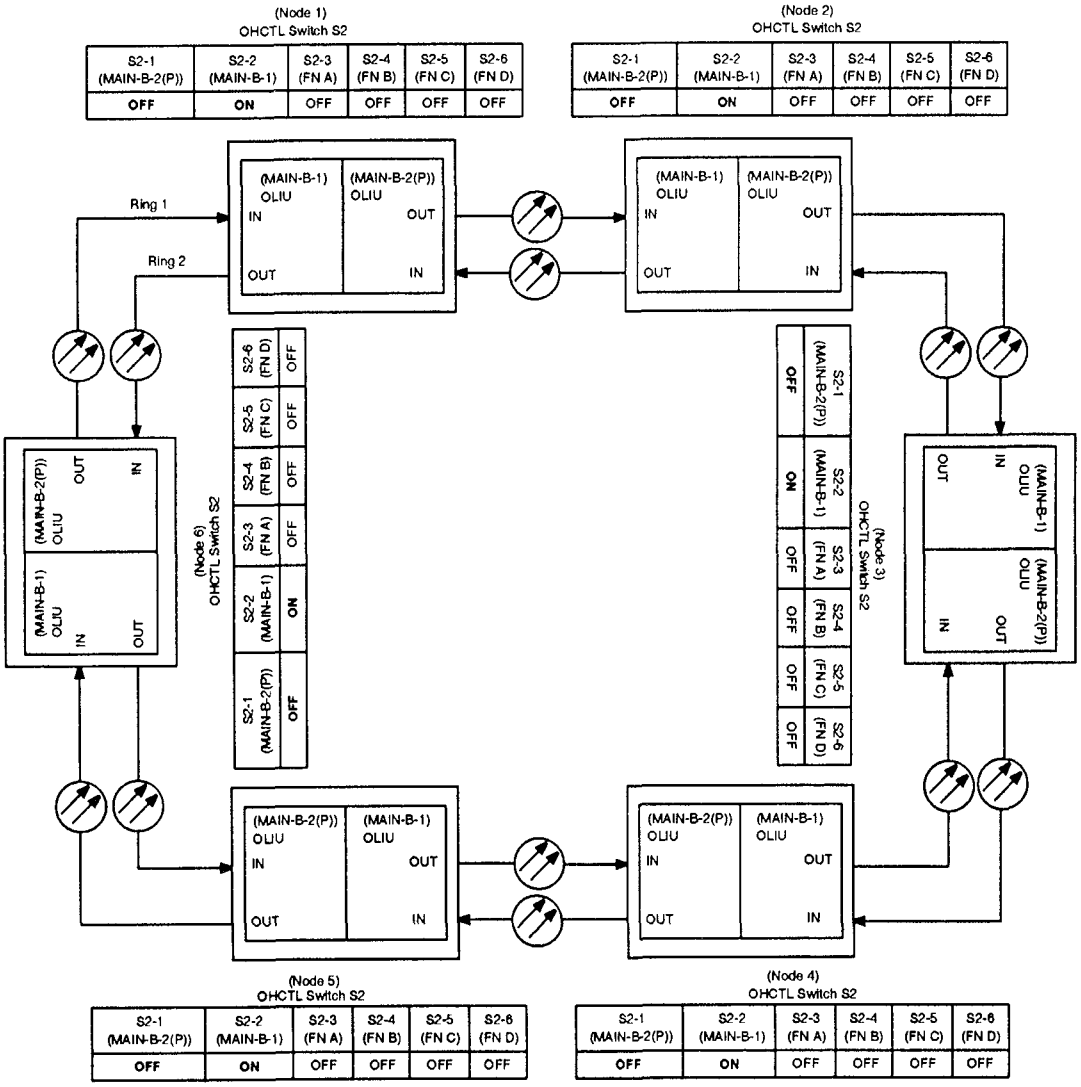


Figure 3. OC-12 Ring Using OSI Protocol

12. Refer to Table E and Figure 1 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table E. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

13. 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.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

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-510** provide more information on switch settings).

   Proceed to Step 5.

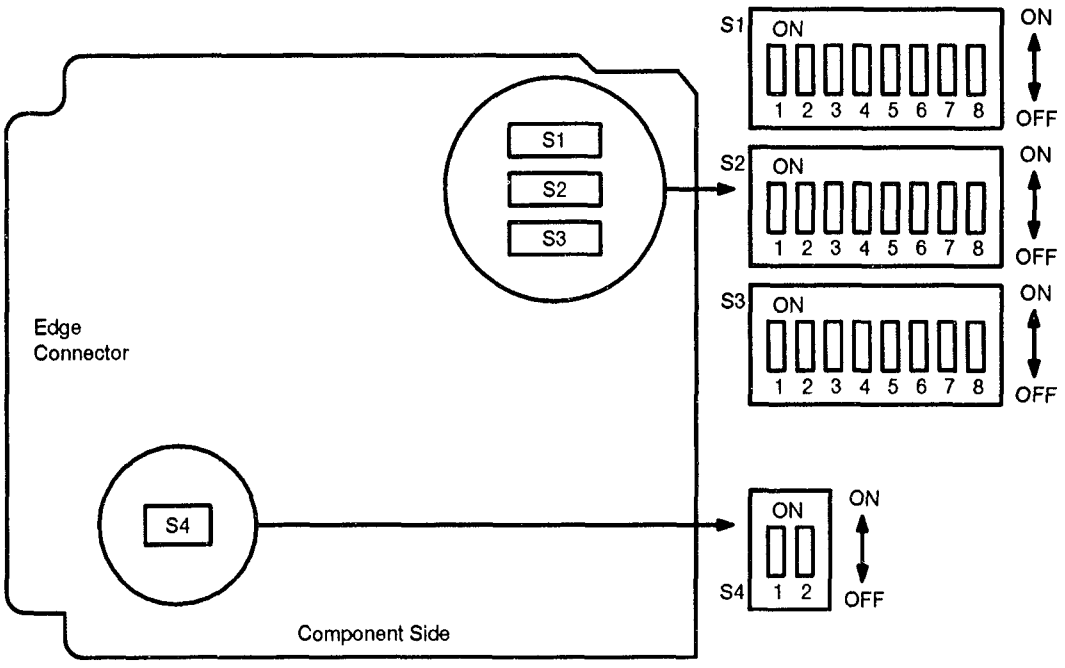


Figure 1. SYSCTL Option Settings

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 2 linear into a system with Release 3 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 (Note)

Site ID Setting*						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: *The following table lists the maximum number of nodes in a maintenance subnetwork:*

	Linear					Ring	
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	10	10	10	10	10	10	16

* Although 10 sites are possible, only site addresses 1-8 are supported prior to OC-12 Release 2.1 (linear) and Release 3.0 (ring). For releases prior to OC-12 Release 2.1 (linear) or Release 3.0 (ring), if more than 8 sites (10 maximum) are desired, you must use unique combinations of the Site and NE(OHCTL) settings to prevent duplicate site settings in the same subnetwork. Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are not used prior to OC-12 Release 2.1 (R3.0) and must be set to the **ON** position. Although site addresses 1-32 are supported for OC-12 Release 2.1 (linear) and Release 3.0 (ring), or later, only 10 site addresses may be chosen out of the 32 possibilities. 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 settings in the same subnetwork.

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-12 In-Service Upgrade Compatibility (Note)

Current Release in Shelf	Current SYSCTL Software Release							
	Linear						Ring	
	1.0.n	1.1.n	1.2.n	2.0.n	2.1.n	2.2.n	3.0.n	3.1.n
1.0.n	OK	OK	OK	C†	C†	C†	C†	C†
1.1.n	C*	OK	OK	C†	C†	C†	C†	C†
1.2.n	C*	C*	OK	C†	C†	C†	C†	C†
2.0.n	C*	C*	C*	OK	OK	OK	C†	C†
2.1.n	C*	C*	C*	C*	OK	OK	C†	C†
2.2.n	C*	C*	C*	C*	C*	OK	C†	C†
3.0.n	C*	C*	C*	C*	C*	C*	OK	OK
3.1.n	C*	C*	C*	C*	C*	C*	OK	OK

Note: All DDM-2000 OC-12 shelves in a subnetwork should be using the same 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.

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 (1.0.n, 1.1.n, 1.2.n, 2.0.n, 2.1.n) into a system currently containing a ring release (3.0.n), 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, reset the OLIU circuit pack(s). If additional assistance is required contact the AT&T Regional Technical Asistance Center (RTAC).

† Remote upgrades to Releases 2 and 3 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) using the `set-ne` command. Software should be downloaded to the DSNE (GNE) first.

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 **BCP1 OHCTL** must be installed for the controllers to function.

Ensure the **BCP1 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 2 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 **BCP1 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 2 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 1, 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 **S2:5** (ring) **OHCTL** or later must be installed for Release 2 (R3) 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 2 or later software is installed. Replace the **OHCTL** with a series **S2:3** (linear) or **S2:5** (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-527**.

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-527**.

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-509** and set any required options.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3 Transmission Test

1. ⇒ NOTE 1:
This procedure may be used to perform DS3 transmission tests on a fiber span between two DDM-2000 shelves 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.

This procedure may also be used to perform DS3 transmission tests on one or more out-of-service circuits for 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.

⇒ NOTE 2:
A CIT is required for this test to make/verify manual 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:
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:
In dual ring interworking (DRI) configurations, proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3 circuit being tested. Releases 3 supports manual STS-1 cross-connections. See the description of the following commands in the Commands and Reports section of this manual: `dlt-crs-sts1`, `ent-crs-sts1`, `rtrv-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.

Is a CIT available?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 4**.

2. ⇒ NOTE 1:
If one terminating end is equipped with **3STS1E** circuit packs to provide EC-1 service and the other terminating end is equipped with **3DS3** 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 **3STS1E** circuit packs, DS3 transmission tests may be performed. For DS3 tests, one end may be temporarily equipped with **3DS3** circuits packs to perform the transmission tests. To perform transmission tests for this configuration, remove the **3STS1E** at the near end, perform an update (`upd`), and install the **3DS3** 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 **3STS1E** circuit packs.

At the near-end **DDM-2000**, connect the CIT to the **CIT** jack on the User Panel, if required.

Reference: **DLP-516**

3. Is span between DDM-2000 shelves or dual ring interworking (DRI) configuration being tested?

   If **Span**, then continue with **Step 4**.
   If **DRI**, then proceed to **Step 38**.

4. 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 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) ⇒ NOTE:
   The `opr-lpbk-ec1` and `rls-lpbk-ec1` commands are available in linear Release 2.1 and ring Release 3.1 or later.

   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.

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.

8. Was the test successful (error free)?

   If **YES**, then proceed to **Step 24**.
   If **NO**, then proceed to **Step 33**.

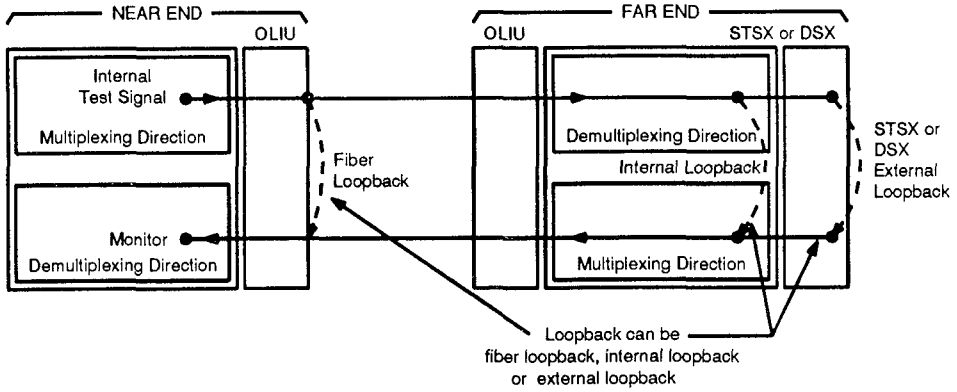


Figure 1. Transmission Test of DS3 Signal in MUX Direction

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 33.**

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.**

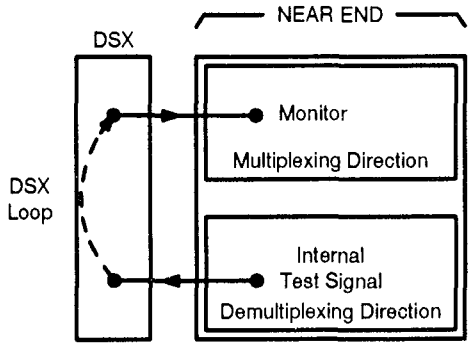


Figure 2. Transmission Test of DS3 Signal in DEMUX Direction

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 33**.

16. If all tests have been run, remove the looping patch cords from the cross-connect point. Use the `rls-lpbk-t3` or `rls-lpbk-ecl` command to release loopback(s) at the far end, if required.

17. 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**.

18. 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.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

20. 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.

21. 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.

22. Use the DS3 test set to test for error-free transmission.

23. Was the test successful (error free)?

    If **YES**, then continue with **Step 24**.
    If **NO**, then proceed to **Step 33**.

24. Is this the first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 25**.
    If **NO**, then proceed to **Step 29**.

25. Unseat the service **3DS3** circuit pack associated with the circuit under test.

26. Repeat the DS3 transmission test with the DS3 test set.

27. Was the test successful (error free)?

    If **YES**, then continue with **Step 28**.
    If **NO**, then proceed to **Step 33**.

28. Reseat the **3DS3** circuit pack associated with the circuit under test.

29. If all tests have been run, remove the looping patch cords from the cross-connections.

30. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.

31. Repeat this procedure from Step 20 for any additional DS3 circuits to be tested.

32. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

33. Has the **3DS3** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 36.**
    If **NO**, then continue with **Step 34.**

34. Replace the **3DS3** circuit pack that failed the test.

    Reference: **DLP-518**

35. Repeat this procedure for the **3DS3** circuit pack that failed.

36. Trouble may be in the DSX cross-connect wiring or the shelf backplane. 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.

37. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

38. ⇒ 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.

39. 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) ⇒ NOTE:
The `opr-lpbk-ec1` and `rls-lpbk-ec1` commands are available in linear Release 2.1 and ring Release 3.1 or later.

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.

40. ⚠ 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 5-16.

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 5, 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 5-8)]:

Test	Terminating Nodes	DRI Nodes
Test 1	Ring 1 active	Ring 1 active
Test 2	Ring 2 active	Ring 1 active
Test 3	Ring 2 active	Ring 2 active
Test 4	Ring 1 active	Ring 2 active

41. Are you using CIT and `test-trmsn-t3` command to perform this test?

    If **YES**, then continue with **Step 42.**
    If **NO**, then proceed to **Step 59.**

42. Are you doing this test in the mux or demux direction?

    If **MUX** direction, then continue with **Step 43.**
    If **DEMUX** direction, then proceed to **Step 45.**

43. 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.

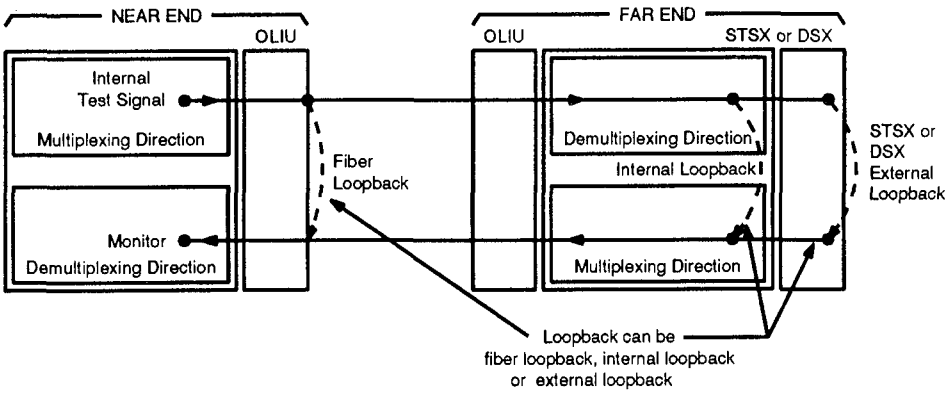


Figure 3. Transmission Test of DS3 Signal in MUX Direction

44. Was the test successful (error free)?

    If **YES**, then continue with **Step 45.**
    If **NO**, then proceed to **Step 73.**

45. See Figure 4. 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.

46. 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.

47. Was the test successful (error free)?

If **YES**, then continue with **Step 48**.
If **NO**, then proceed to **Step 73**.

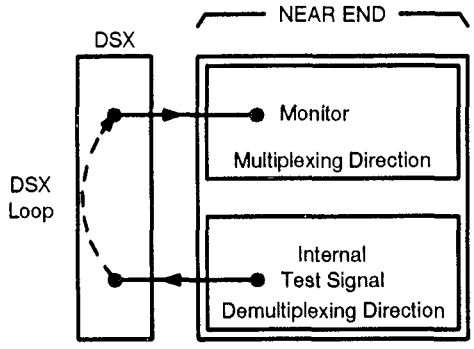


Figure 4. Transmission Test of DS3 Signal in DEMUX Direction

48. Is this the first service being placed on the group and is a protection circuit pack installed?

If **YES**, then continue with **Step 49**.
If **NO**, then proceed to **Step 53**.

49. 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.

50. Repeat the transmission test in the mux (or demux) direction using the following command:
`test-trmsn-t3:`*address*`:dirn=mux (or demux):dur=( );`.

51. Was the test successful (error free)?

    If **YES**, then continue with **Step 52**.
    If **NO**, then proceed to **Step 73**.

52. Use the following command to clear active switch requests on the protection circuit pack:
`switch-fn:`*address*`:pri=reset;`.

53. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 54**.
    If **YES**, then proceed to **Step 55**.

54. Repeat this procedure from Step 4 for the next path to be tested.

55. Remove the looping patch cords from the cross-connect point. Use the `rls-lpbk-t3` or `rls-lpbk-ec1` command to release loopback(s) at the far end, if required.

56. 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**.

57. If violation monitor removal mode was set differently than the original mode in Step 39, reprovision the mode to the original or required setting using the `set-t3` command. Repeat this procedure from Step 38 for any additional DS3 circuits to be tested.

58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

59. 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.

60. Use the DS3 test set to test for error-free transmission.

61. Was the test successful (error free)?

    If **YES**, then continue with **Step 62.**
    If **NO**, then proceed to **Step 73.**

62. Is this the first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 63.**
    If **NO**, then proceed to **Step 67.**

63. Unseat the service **3DS3** circuit pack associated with the circuit under test.

64. Repeat the DS3 transmission test with the DS3 test set.

65. Was the test successful (error free)?

    If **YES**, then continue with **Step 66.**
    If **NO**, then proceed to **Step 73.**

66. Reseat the **3DS3** circuit pack associated with the circuit under test.

67. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 68.**
    If **YES**, then proceed to **Step 69.**

68. Repeat this procedure from Step 40 for the next path to be tested.

69. Remove the looping patch cords from the cross-connections.

70. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL.**

71. Repeat this procedure from Step 38 for any additional DS3 circuits to be tested.

72. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

73. Has the **3DS3** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 76.**
    If **NO**, then continue with **Step 74.**

74. Replace the **3DS3** circuit pack that failed the test.

    Reference: **DLP-518**

75. Repeat this procedure for the **3DS3** circuit pack that failed.

76. 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.

77. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

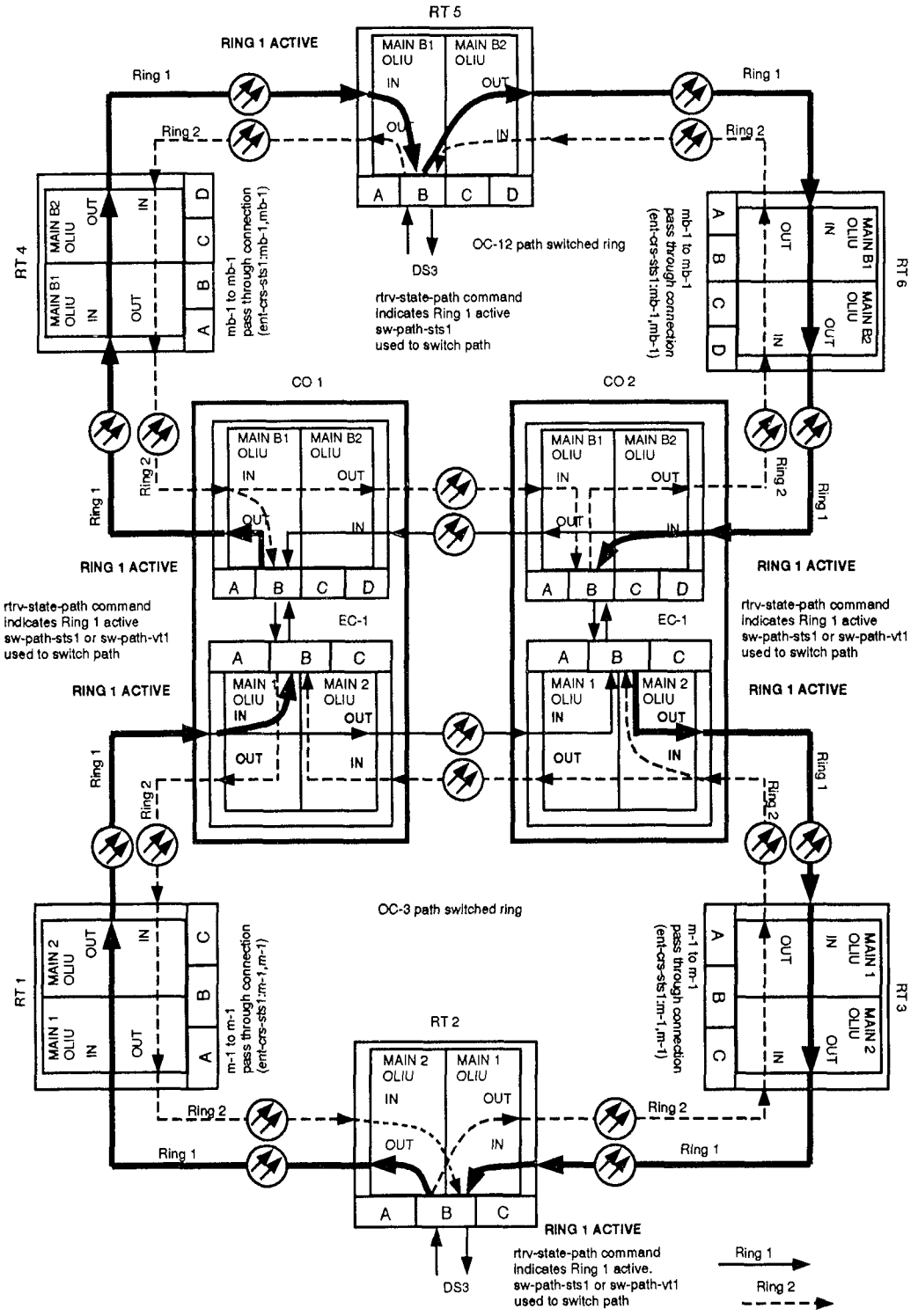


Figure 5. Example of DS3 Transmission Test in Dual Ring Interworking Network

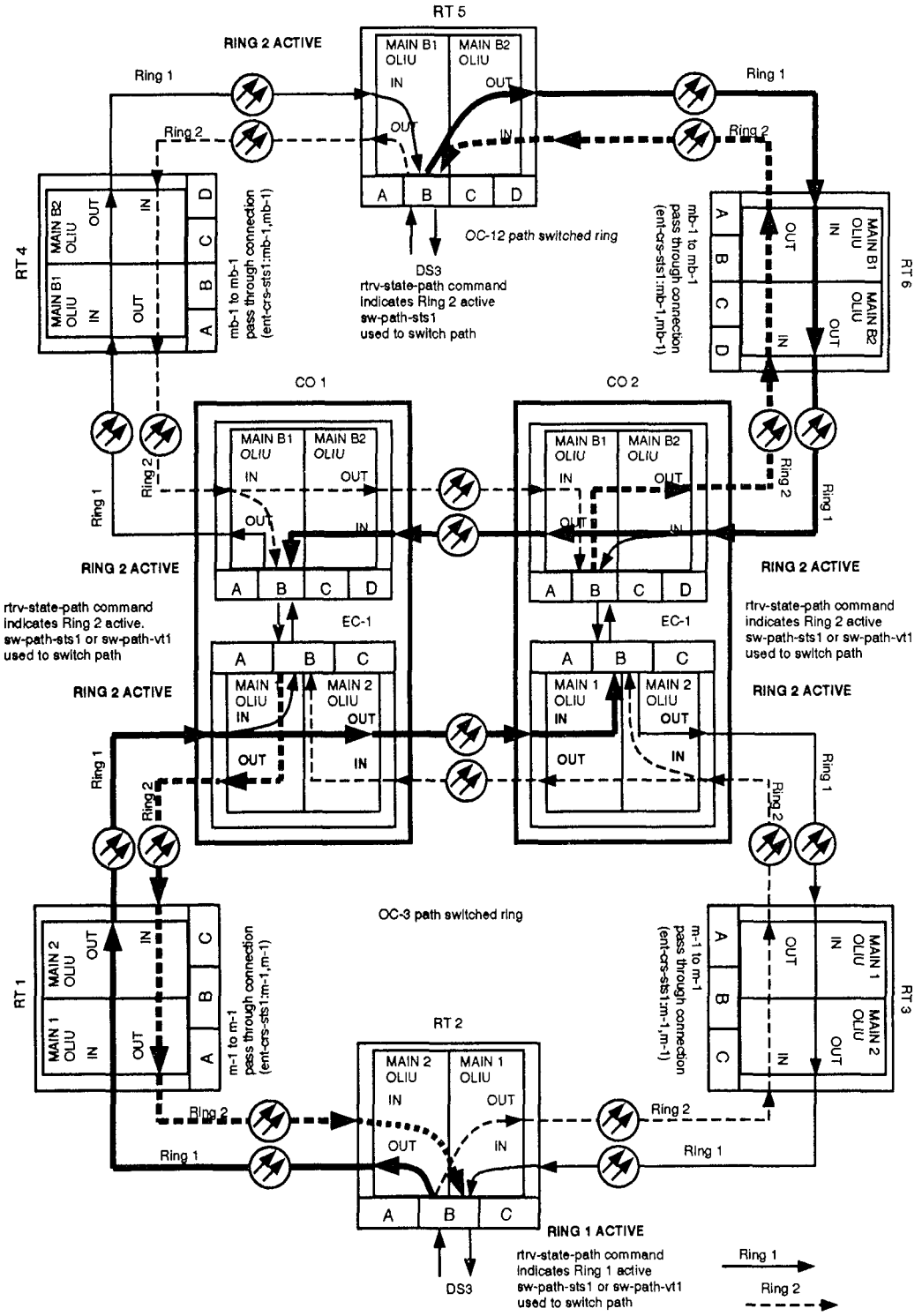


Figure 6. Example of DS3 Transmission Test in Dual Ring Interworking Network

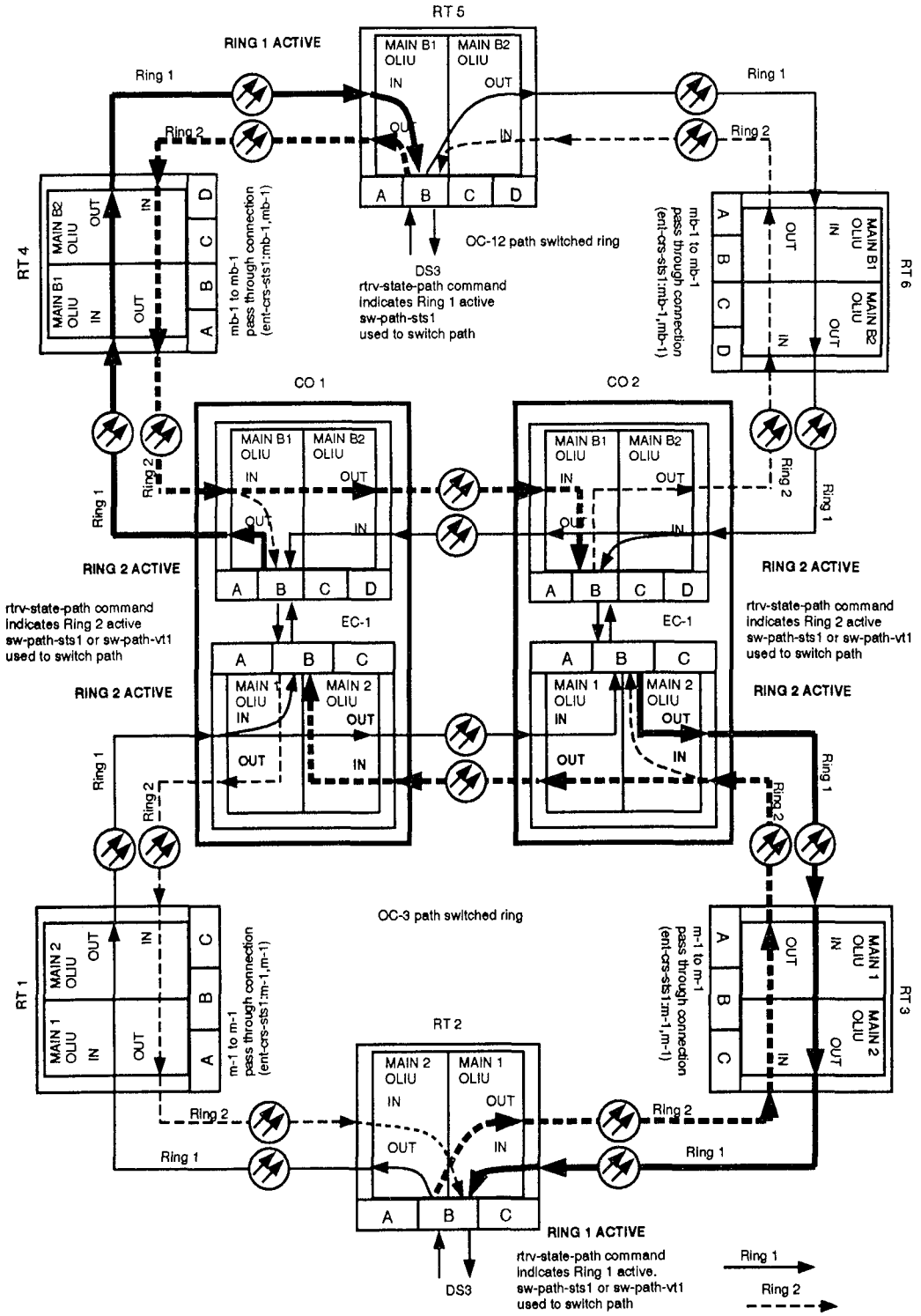


Figure 7. Example of DS3 Transmission Test in Dual Ring Interworking Network

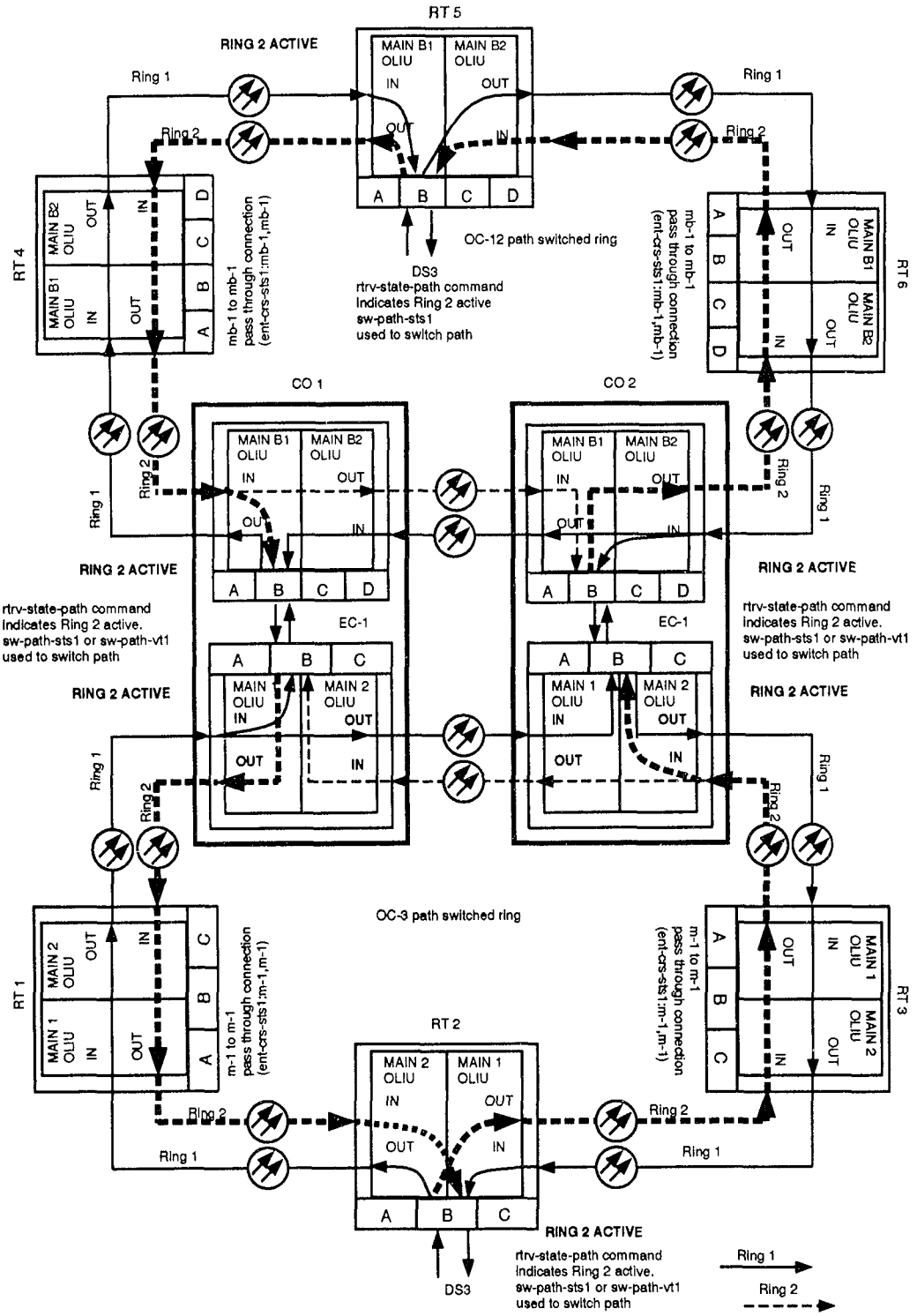


Figure 8. Example of DS3 Transmission Test in Dual Ring Interworking Network

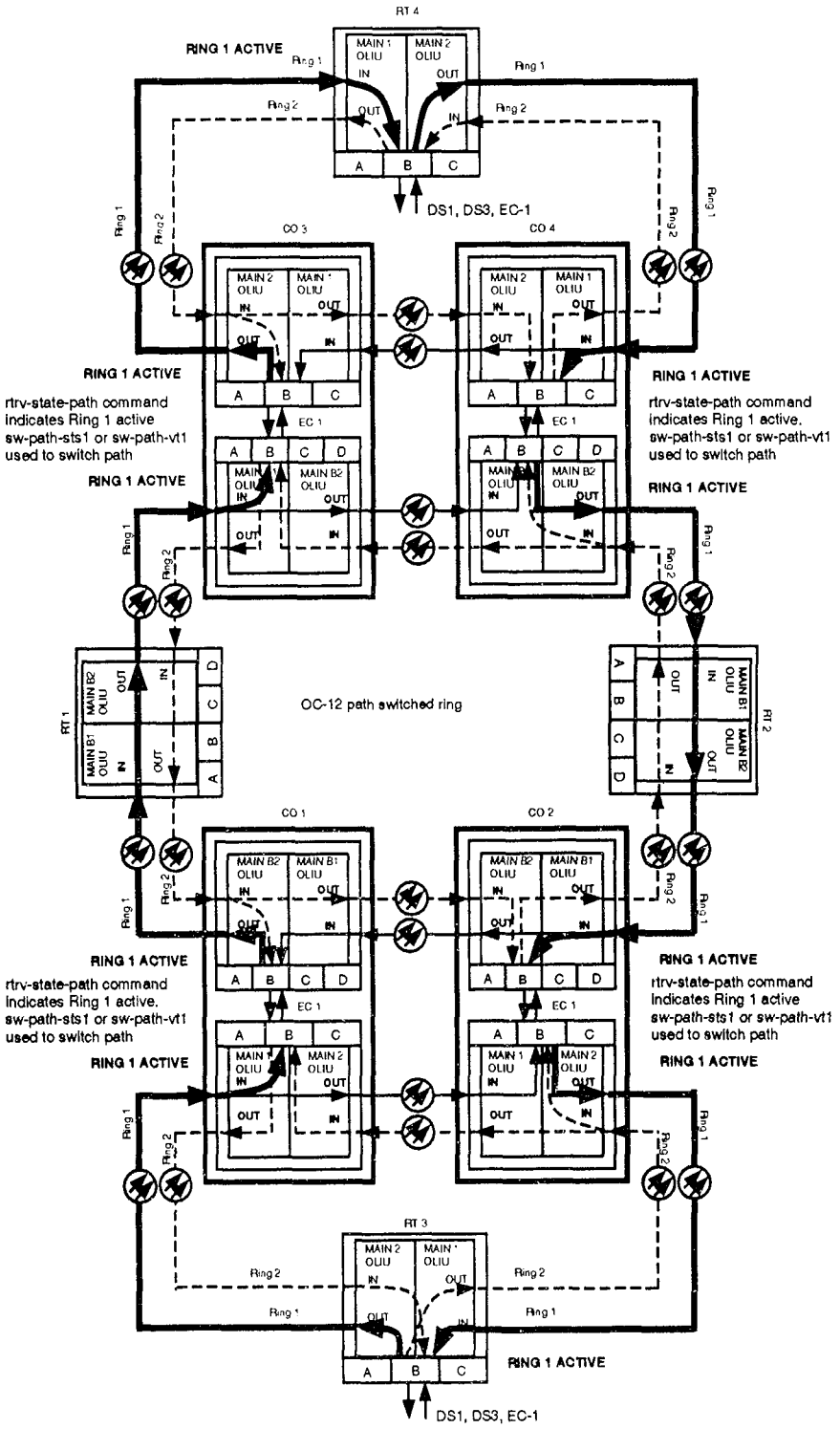


Figure 9. Example of DS3 Transmission Test in Dual Ring Interworking Network

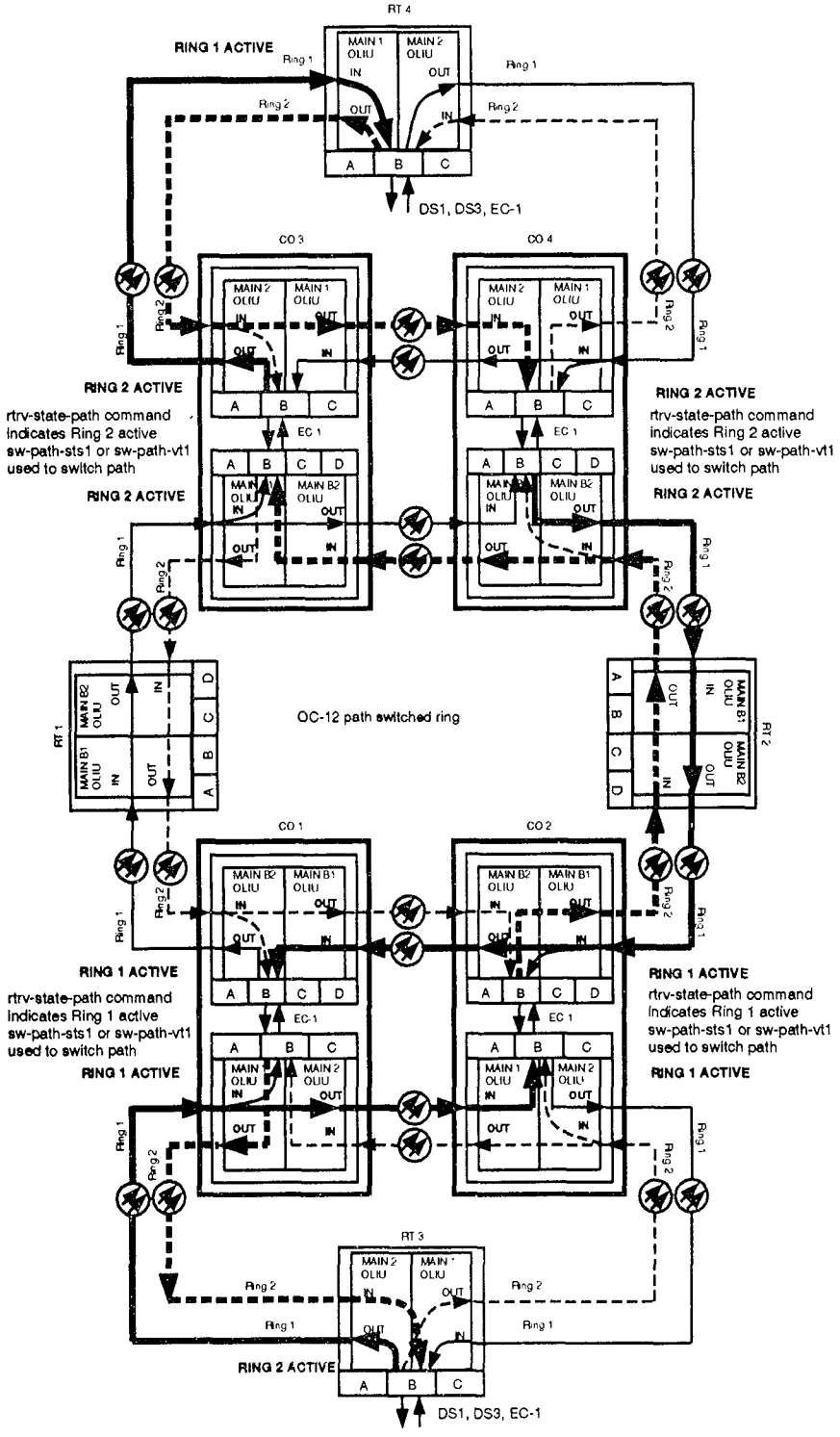


Figure 10. Example of DS3 Transmission Test in Dual Ring Interworking Network

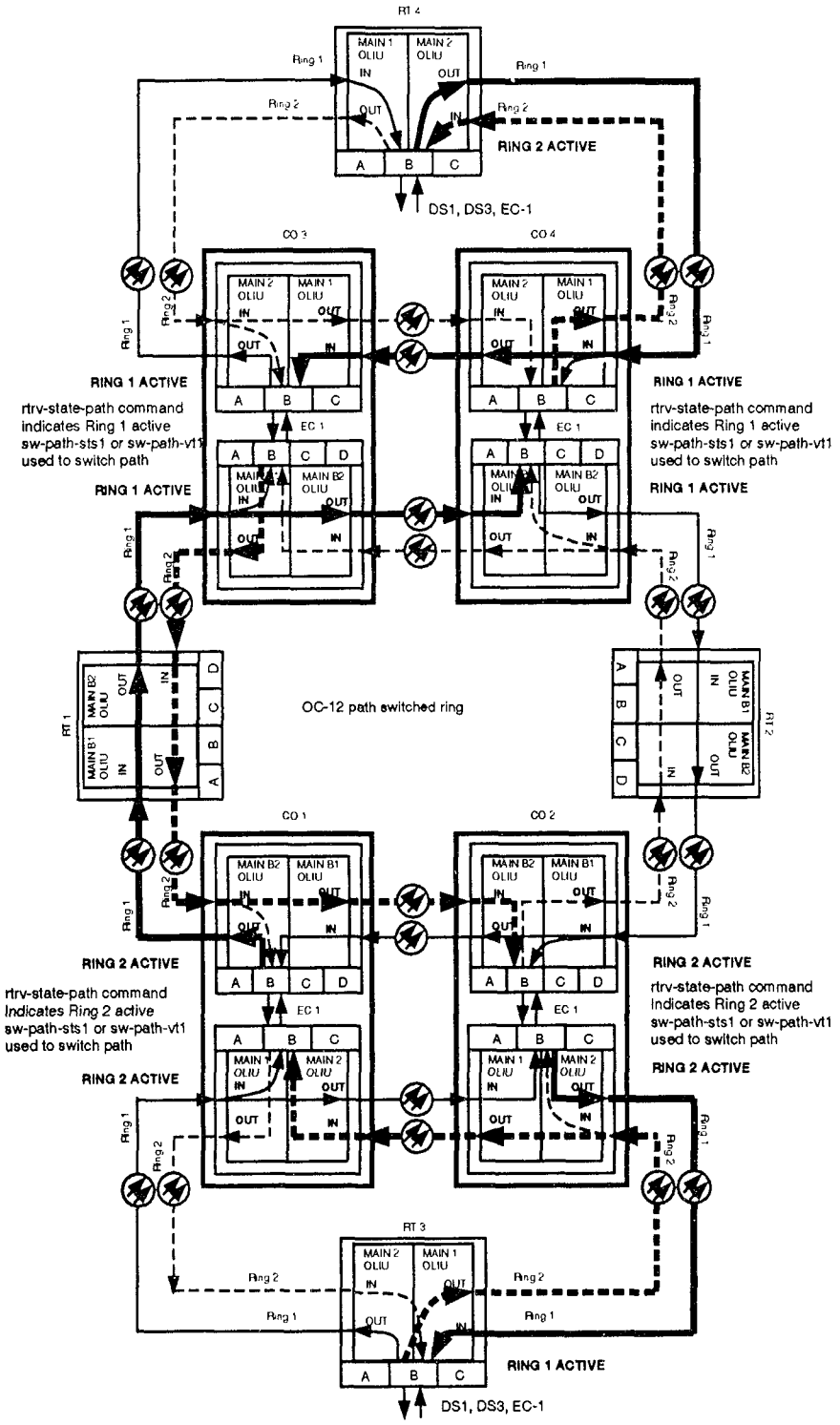


Figure 11. Example of DS3 Transmission Test in Dual Ring Interworking Network

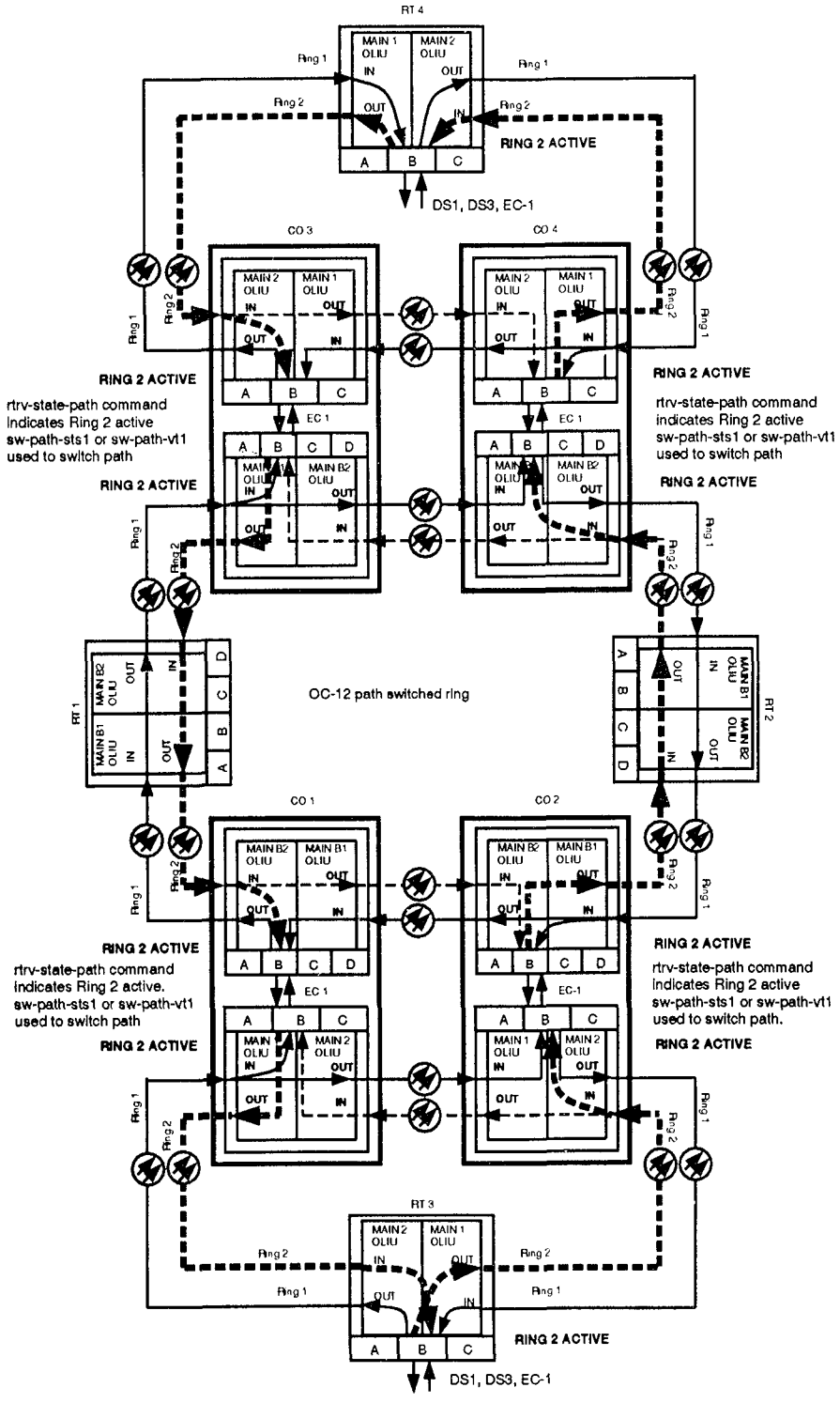


Figure 12. Example of DS3 Transmission Test in Dual Ring Interworking Network

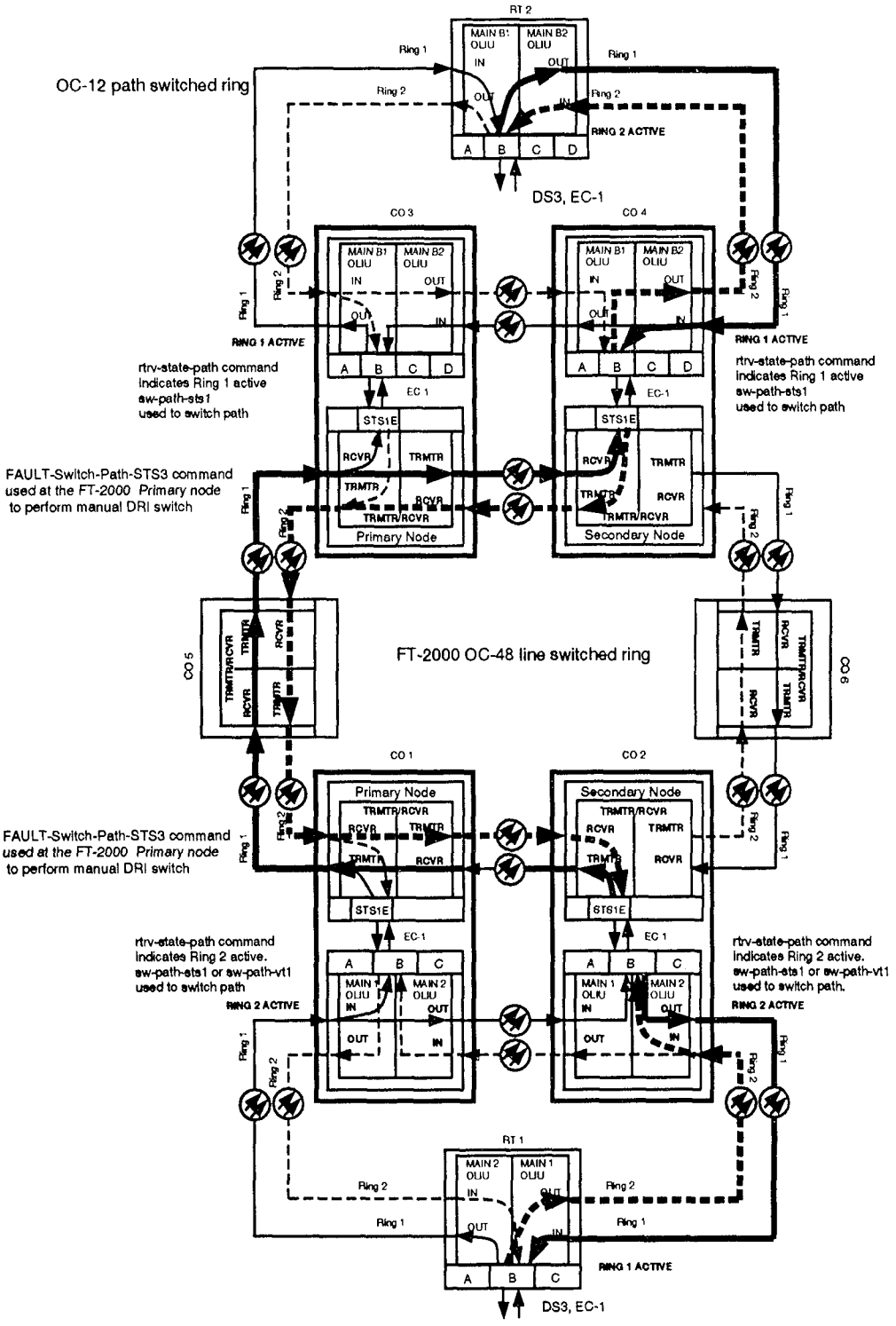


Figure 13. Example of DS3 Transmission Test in Dual Ring Interworking Network

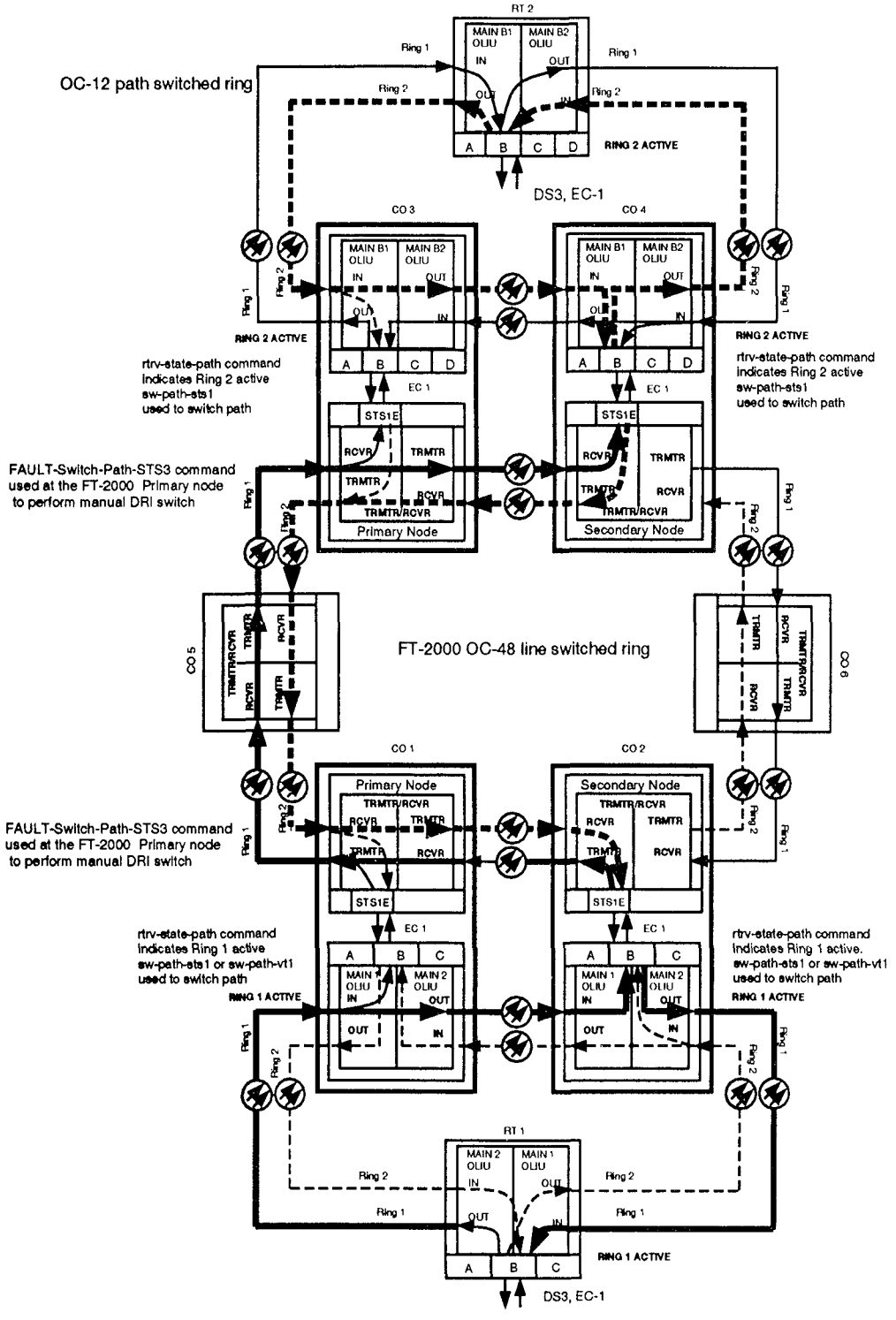


Figure 14. Example of DS3 Transmission Test in Dual Ring Interworking Network

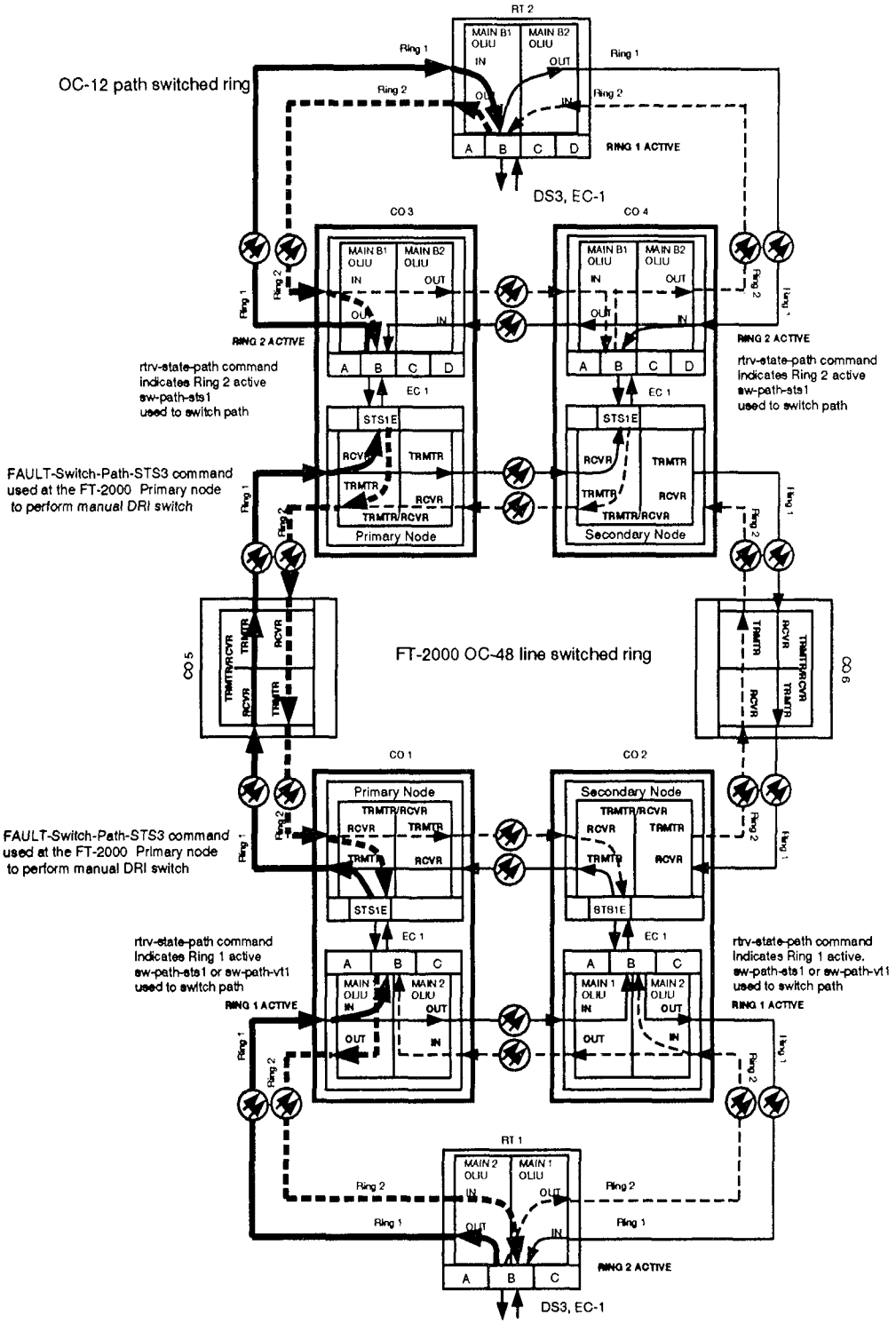


Figure 15. Example of DS3 Transmission Test in Dual Ring Interworking Network

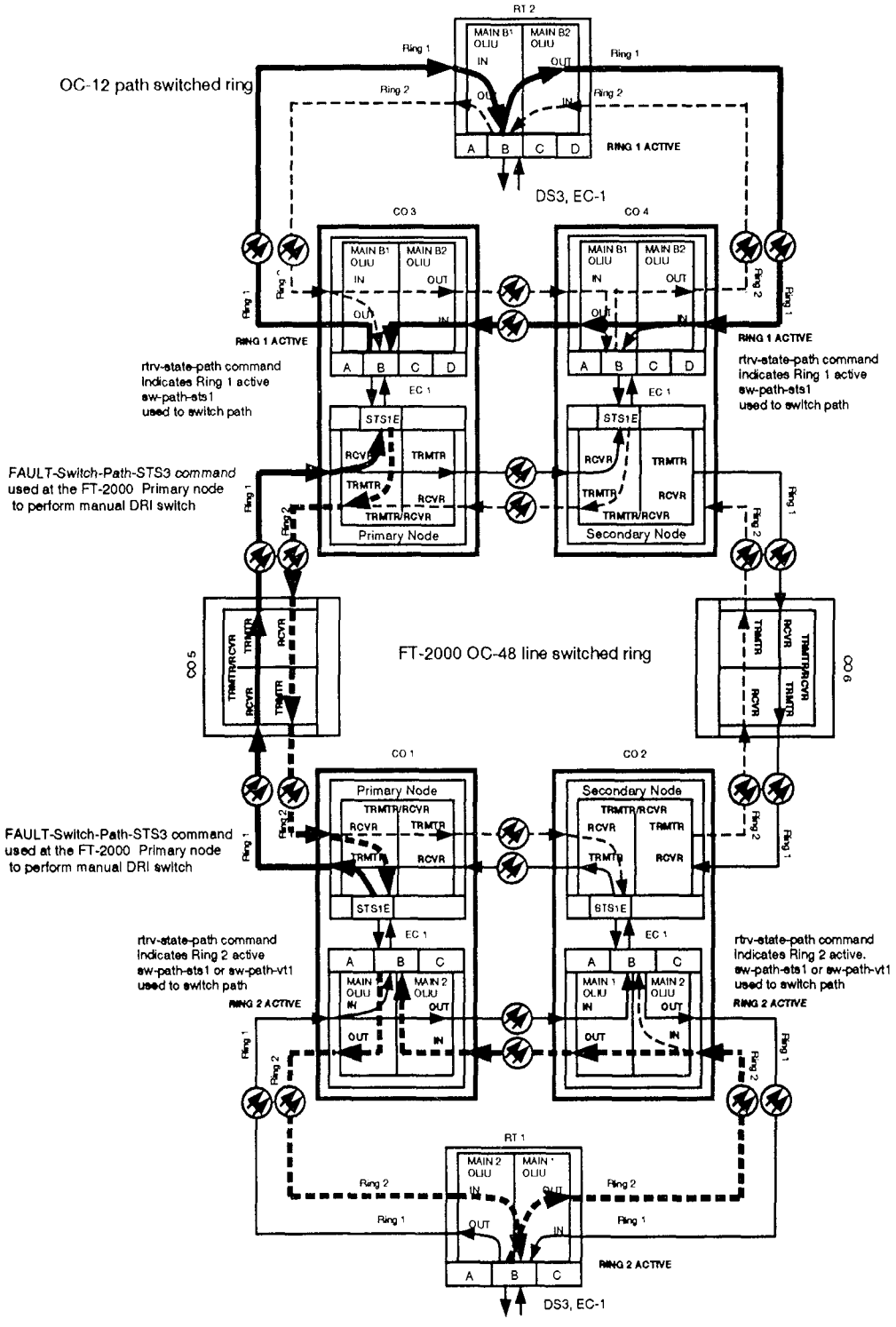


Figure 16. Example of DS3 Transmission Test in Dual Ring Interworking Network

Set Circuit Pack Options

1. ⇒ NOTE:
When a replacement circuit pack (except **SYSCTL**) is configured same as 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 original, the **SYSCTL UPD/INIT** button must be momentarily depressed (or use the update command) to update the inventory.

Find circuit pack in Table A and go to indicated step. If you were sent here from another procedure, return to that procedure after setting options.

Table A. Circuit Packs

Circuit Pack	Step
BBG5 SYSCTL	Step 2
BCP1 OHCTL	Step 13
BBF2 TGS	Step 27
BBF2B TGS	Step 31
BCP2/BCP3 TSI*	—
21G/21G-U OLIU	Step 36
BBG11 3DS3	Step 38
BBG12 3STS1E	Step 41
21D/21D-U OLIU*	—
23G/23G-U OLIU*	—
23H/23H-U OLIU*	—
23R/23R-U REGENR*	—

* There are no option switches on these circuit packs.

SYSCTL

2. ⚠ CAUTION:
Removing **SYSCTL** *without performing 10-second countdown sequence on* **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 **SYSCTL**, you must momentarily depress **ACO/TST** pushbutton on user panel and **FE SEL** pushbutton on **SYSCTL** at the same time to start 10-second countdown (9, 8, 7, etc.) on **FE ID** display. During this countdown, **SYSCTL** may be safely removed. If **SYSCTL** is failed, countdown may not occur.

Determine desired **SYSCTL** option switch settings from office records and see Figure 1.

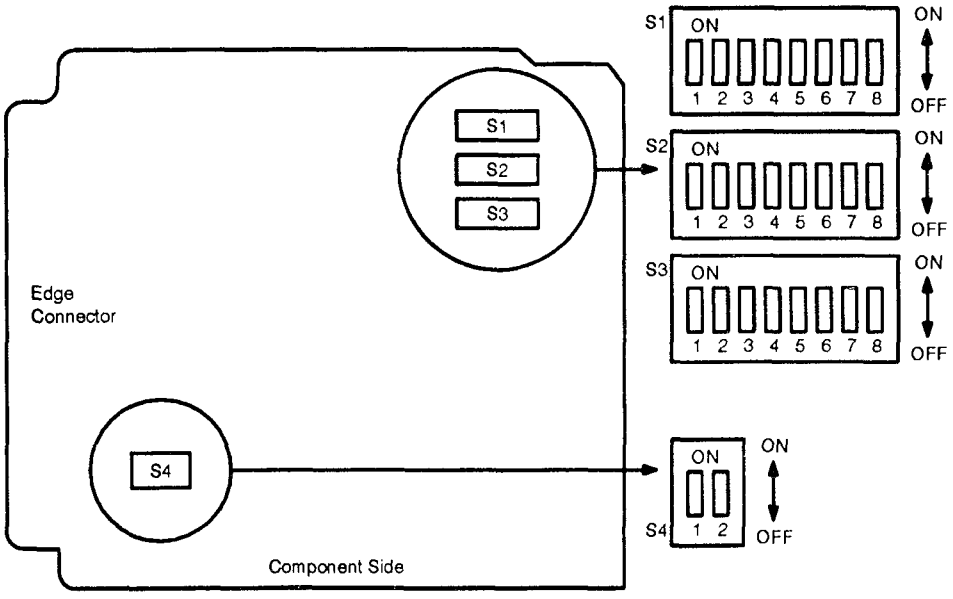


Figure 1. BBG5 SYSCTL Option Settings

3. NOTE 1:
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. Option switch tables list 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 TBOS display associated with shelf and determines TBOS poll to which CO DDM-2000 OC-12 Multiplexer will respond. Actual TBOS poll responded to is in a range from 0 to 7. For example, if CO TBOS display number is set to 1 and associated remote TBOS addresses are set to 2 and 3, then CO DDM-2000 OC-12 Multiplexer 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 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 primary backup for a group of shelves that share same TBOS link. The secondary setting assigns a shelf as a backup to primary shelf. If a shelf does not respond to TBOS poll, primary backup responds to next poll of the shelf display that failed. If primary shelf does not respond to 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 same TBOS link, remaining (up to two) shelves should be set to *Normal*. If there is no TBOS link (for example, at RT site), TBOS backup switch setting should be set for *No TBOS*.

NOTE 4:
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 option switches as indicated for the TBOS display and backup number. If TBOS is not used, set TBOS backup number to No TBOS.

Table B. SYSCTL Switch One (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 shelf as either CO shelf or RT shelf to control TBOS display formats and also operation of miscellaneous discrete points and fan control relays.

NOTE 2:
Some applications may require that TBOS information from a remote shelf be disabled (for example, in remote shelves interfacing with DDM-2000 OC-3 Multiplexer).

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 One (S1) Settings

CO/RT Select		Remote TBOS		Unused
	Switch		Switch	Switch
Value	S1-6	Value	S1-7	S1-8 (Note)
RT	OFF	Enabled	OFF	OFF
CO	ON	Disabled	ON	OFF

Note: Switch 1, section 8 (**S1-8**) is not used at present time and must be set to **OFF** position. If set to **ON** position, **FAULT** LED on the **SYSCTL** will light and an alarm will be generated.
Switch 1, section 6 (**S1-6**) must be set to the **ON** position for DDM-2000 OC-12 Regenerator applications.
Switch 1, section 7 (**S1-7**) must be set to the **OFF** position for DDM-2000 OC-12 Regenerator applications.

5. NOTE 1:
SITE ID address switch settings are 1 to 8. If an invalid address is set, setting will revert to 1, generate Major alarm, light **SYSCTL FAULT** LED, and set TBOS point 14.

NOTE 2:
To provide for a direct relationship between RT site addresses and parallel telemetry closure numbers, it is recommended to set central office SITE ID to seven. 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

Central Office SITE Address	Parallel Telemetry Closure Remote Terminal 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 option switches as indicated for SITE ID of this network element.

Table E. SYSCTL Switch 2 (S2) SITE ID Settings (Note)

	Switch				
Site ID*	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: The following table lists the maximum number of nodes in a maintenance subnetwork:

	Linear					Ring	
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	10	10	10	10	10	10	16

* Although 10 sites are possible, only site addresses 1-8 are supported prior to OC-12 Release 2.1 (linear) and Release 3.0 (ring). For releases prior to OC-12 Release 2.1 (linear) or Release 3.0 (ring), if more than 8 sites (10 maximum) are desired, you must use unique combinations of the Site and NE(OHCTL) settings to prevent duplicate site settings in the same subnetwork. Switch 2, sections 7 and 8 (**S2-7** and **S2-8**) are not used prior to OC-12 Release 2.1 (R3.0) and must be set to the **ON** position. Although site addresses 1-32 are supported for OC-12 Release 2.1 (linear) and Release 3.0 (ring), or later, only 10 site addresses may be chosen out of the 32 possibilities. 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 settings in the same subnetwork.

6. ⇒ NOTE:
SHELF ID is recommended to match shelf position in bay.

Refer to Table F and set option switches as indicated for 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 bay and CIT ports are bussed together, data rate of all front CIT ports should be set the same and data rate of all rear CIT ports should be set the same.

From office records or work order, determine data rate to be used for front and rear CIT access ports.

8. Refer to Table G and set data rate for both 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

* If an invalid data rate is selected, system defaults to 1200 baud and no alarm is generated.

9. From office records or work order, determine if Power Minor (PMN) is to be a Major or Minor alarm.

10. Refer to Table H and set PMN option switch to Major or Minor as indicated.

Table H. SYSCTL Switch 3 (S3) PMN Switch Setting

	Switch	Unused (Note)
Alarm Value	S3-7	S3-8
Office Major	ON	OFF
Office Minor	OFF	OFF

Note: Switch 3, section 8 (**S3-8**) is not used at present time and must be set to **OFF** position. If set to **ON** position, **FAULT** LED will light on **SYSCTL** and alarm will be generated.

11. ⇒ NOTE:
Up to four shelves in a bay can be connected to single TBOS link using intershelf cables (TBOS, CIT, modem). If this shelf is last (top) or only shelf on a TBOS link both sections of Switch 4 (**S4**) should be set to **ON**. If this shelf is not last shelf on a TBOS link, both sections of Switch 4 (**S4**) should be set to **OFF**. If there is no TBOS link (for example, at RT site), switches **S4-1** and **S4-2** are ignored.

Refer to Table I and set TBOS terminator switch as indicated, if required.

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 1:
For Release 2, the **OHCTL** must be a series **S2:3** or later to support open systems interconnection (OSI) protocol and *linear* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *linear* applications. **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 2 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

NOTE 2:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and *ring* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *ring* applications. **S2:5** 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 3 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

NOTE 3:
An **OHCTL** is required at both ends of system. Switches **S1-1**, **S1-2**, and **S1-3** set Network Element number of the shelf. Network Element number and Site ID form a unique address for shelf at site.

Determine Network Element number from work order or office records. Refer to Table J and Figure 2 and set Network Element number for this shelf.

Table J. 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 4-8 (**S1-4, S1-5, S1-6, S1-7**, and **S1-8**) must be set to **ON** position. If set to **OFF** position, **FAULT** LED will light on **OHCTL** and alarm will be generated.

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected switches` alarm is generated.

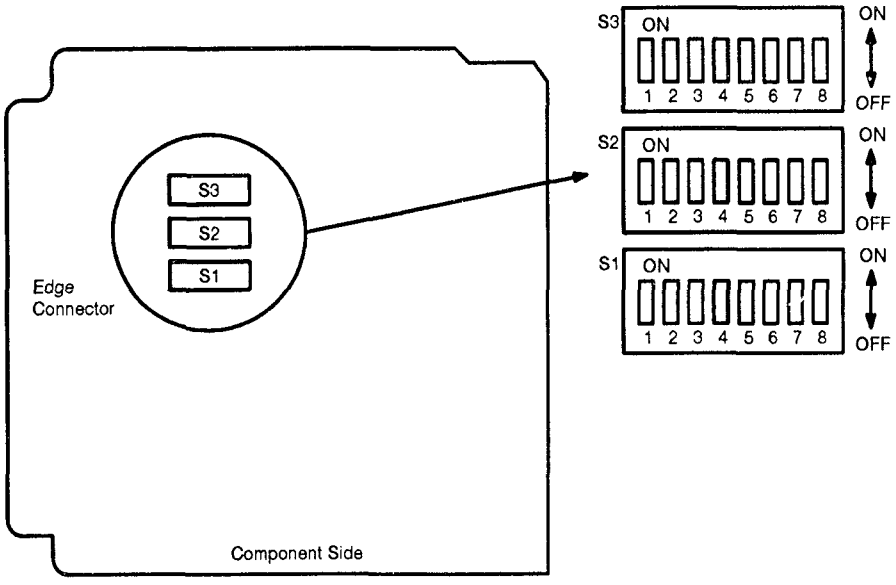


Figure 2. BCP1 OHCTL Circuit Pack

14. If **Release 1**, then continue with **Step 15**.
    If **Release 2**, then proceed to **Step 19**.
    If **Release 3**, then proceed to **Step 23**.

15. ⇒ NOTE:
    Switches **S2-1**, **S2-2**, **S2-3**, **S2-4**, **S2-5**, **S2-6** are unused in Release 1.

    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	S2-5	S2-6
OFF	ON	OFF	OFF	OFF	OFF

Note: These switches are reserved for Release 2 or 3 open systems interconnection (OSI) protocol (OSI) application. The suggested settings will make upgrade to Release 2 or 3 easier.

16. Refer to Table L and Figure 2 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table L. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

17. Install **OHCTL** into **AUXCTL** slot.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. NOTE 1:
Switches **S2-1** through **S2-6** 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 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.

NOTE 2:
Refer to Figure 3 and note that factory settings for switch **S2** are **S2-1 OFF**, **S2-2 ON**, **S2-3 OFF**, **S2-4 OFF**, **S2-5 OFF**, **S2-6 OFF**, **S2-7 ON**, and **S2-8 ON**. This will permit the establishment of a linear/hub system without changing any **S2** switch settings except on the **OHCTL** at Central Office 2. In this case, **S2-2** on the **OHCTL** at Central Office 2 would be set to **OFF**.

Refer to Figure 3 for an example system configuration. Set **S2** switches for OSI interworking using examples and/or work order or office records. (The necessary switch settings in Figure 3 are highlighted in bold type. For example, the optical span between Remote Node 1 and Central Office 1 requires that switch **S2-1** at Remote Node 1 be set to **ON** and switch **S2-3** at Central Office 1 be set to **OFF**.)

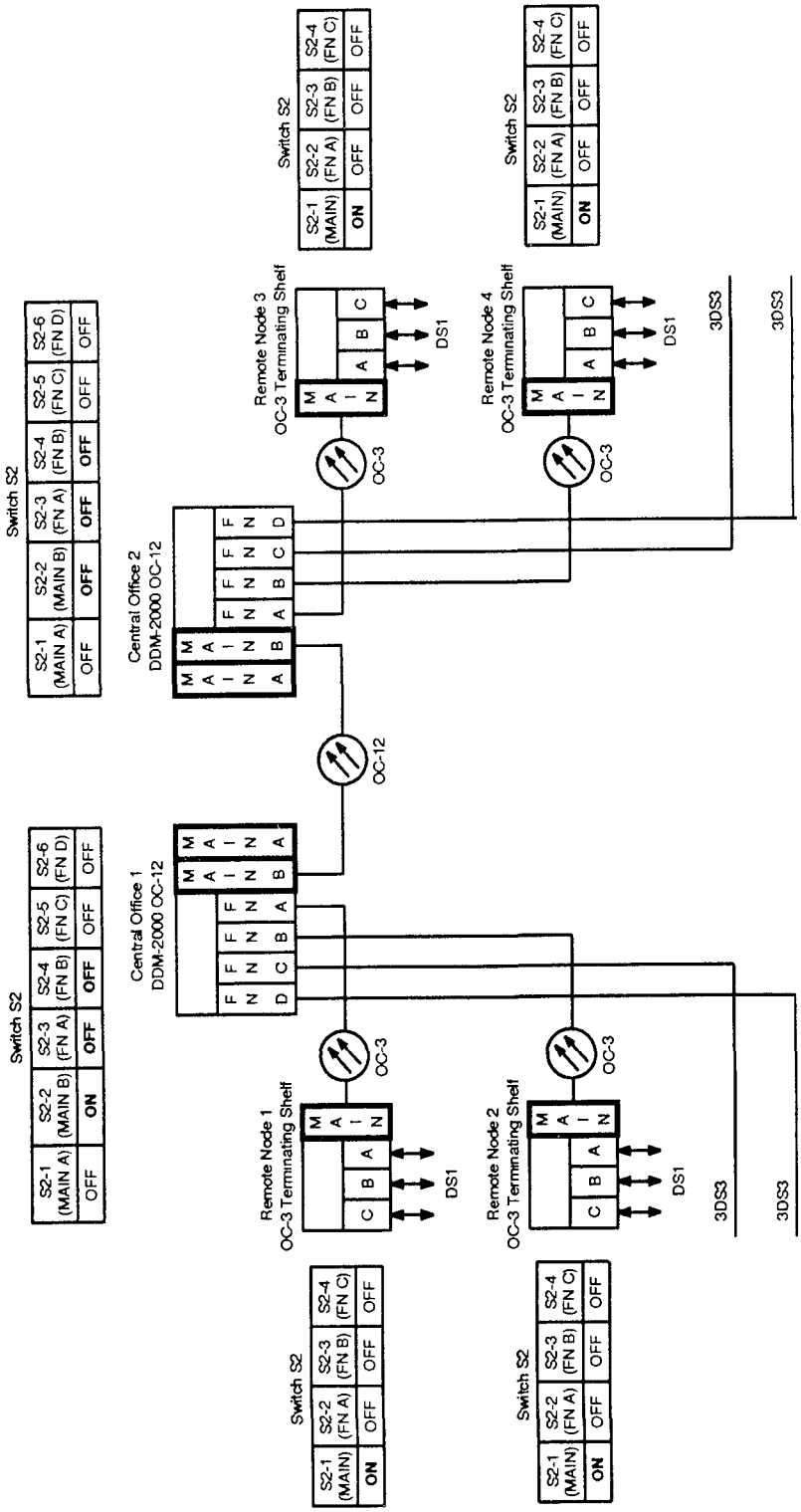


Figure 3. OC-12 Point-To-Point Using OSI Protocol

20. Refer to Table M and Figure 2 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table M. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

21. Install **OHCTL** into **AUXCTL** slot.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. ⇒ NOTE 1:
Switches **S2-1** through **S2-6** 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 4 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.

⇒ NOTE 2:
Refer to Figure 4 and note that factory settings for switch **S2** are **S2-1 OFF, S2-2 ON, S2-3 OFF, S2-4 OFF, S2-5 OFF, S2-6 OFF, S2-7 ON,** and **S2-8 ON**. This will permit the establishment of a ring system without changing any **S2** switch settings.

Refer to Figure 4 for an example ring system configuration. Set **S2** switches for OSI interworking using examples and/or work order or office records. (The nesessary switch settings in Figure 4 are highlighted in bold type.)

24. Refer to Table N and Figure 2 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table N. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

25. Install **OHCTL** into **AUXCTL** slot.

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

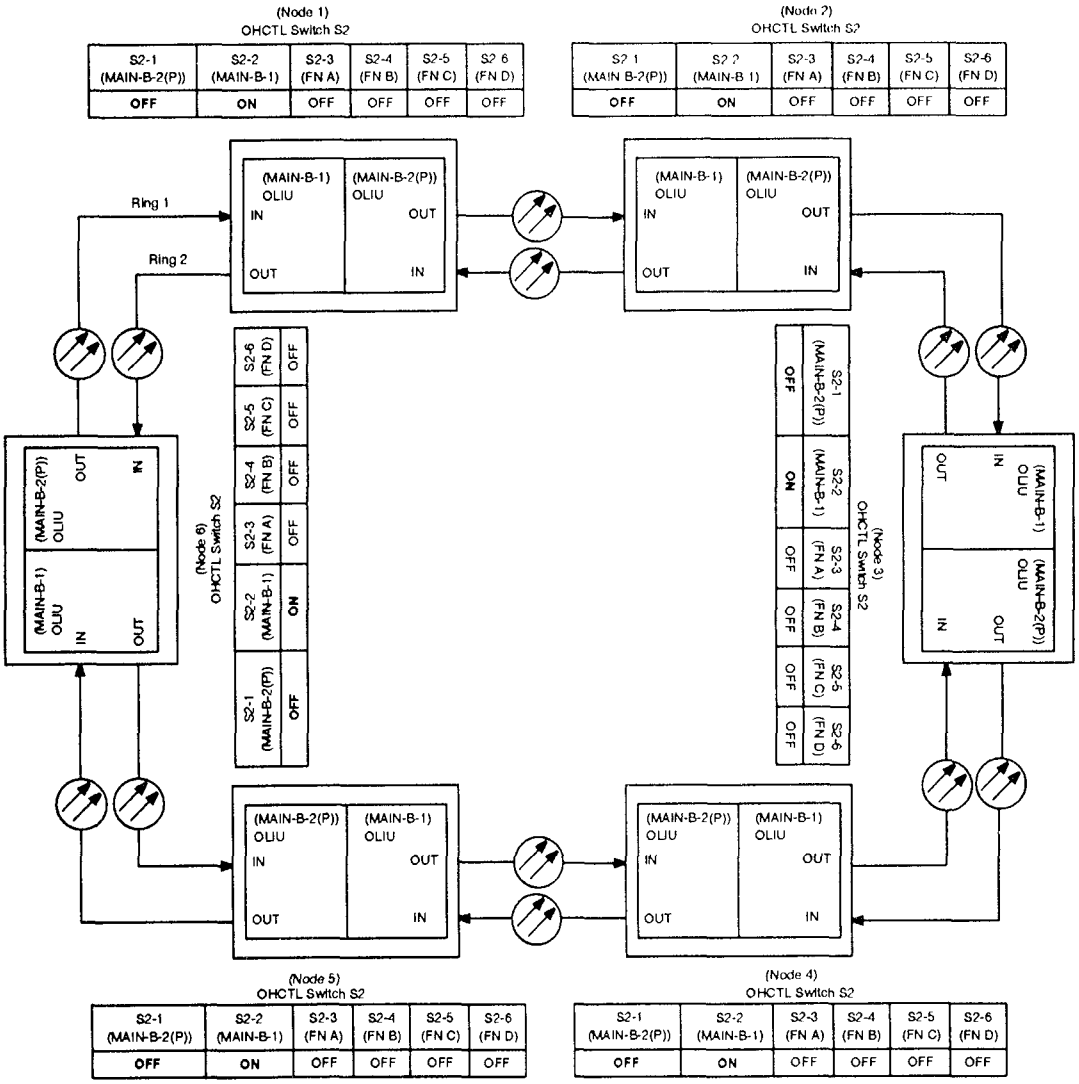


Figure 4. OC-12 Ring Using OSI Protocol

BBF2 TGS

27. 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, **BBF2 TGS** gets timing from an oscillator on **BBF2 TGS**. In external timing mode, **BBF2 TGS** gets timing from an external DS1 reference input. In loop-timed mode, **BBF2 TGS** gets timing from a reference clock recovered from received OC-12 line rate signal. Loop timing from the **MAIN B OLIU** OC-12 line is the factory default.

NOTE 3:
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.

Table O. 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 O. 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 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 5 and set timing mode as required for **BBF2 TGS** circuit pack(s).

Table P. 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	OFF	OFF
Invalid*	ON	OFF

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP type/switches` alarm is generated.

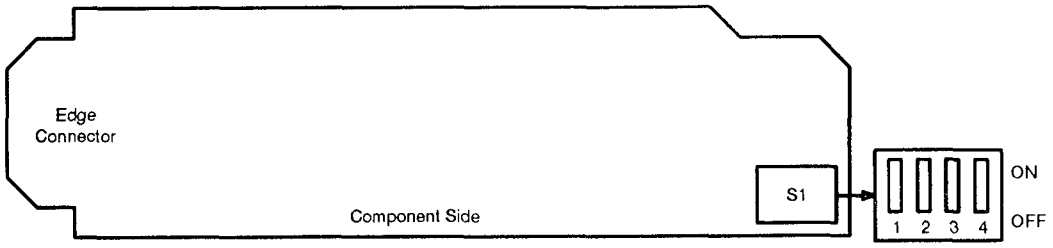


Figure 5. BBF2 TGS Option Switch

28. ⇒ 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.* Subsequence removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** must be set the same as the original settings or an update (upd) must be performed.

Is timing mode set to *DS1 External*?

If **YES**, continue with **Step 29.**
If **NO, STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. Refer to Table Q and Figure 5 and set DS1 line coding and frame format as required for **BBF2 TGS** circuit pack.

Table Q. BBF2 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

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

31. 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, **BBF2B TGS** gets timing from oscillator on **BBF2B TGS**. In external timing mode, **BBF2B TGS** gets timing from external DS1 reference input. In loop-timed mode, **BBF2B TGS** gets timing from a reference clock recovered from received OC-12 line rate signal. Loop timing from the **MAIN B OLIU** OC-12 line is the factory default.

NOTE 3:
Table R 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 R. 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 R. 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 R. 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 R. 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 S and Figure 6 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table S. 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 Output Mode	OFF	ON	OFF
Loop Timing	OFF	OFF	OFF
Loop Timing, SYNC OUT Mode	OFF	OFF	ON
DS1 External, SYNC OUT Mode	OFF	ON	ON
Invalid*	ON	OFF	ON
Invalid*	ON	OFF	OFF
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP type/switches` alarm is generated.

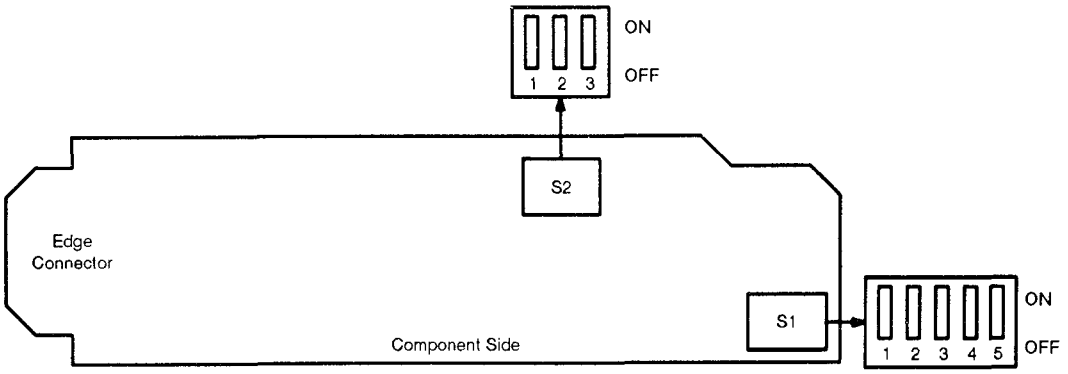


Figure 6. BBF2B TGS Option Switch

32. If the **BBF2B TGS** is provisioned for *Sync Out mode*, refer to Table T and Figure 6 and set equalizer switches for the proper cable length.

Table T. 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 `unexpected CP type/switches` alarm is generated

33. ⇒ 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. Subsequence 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**, continue with **Step 34.**
If **NO, STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. Refer to Table U and Figure 6 and set DS1 line coding and frame format as required for **BBF2B TGS** circuit pack.

Table U. 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

35. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21G/21G-U OLIU

36. ⚠ DANGER:
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam.

⚠ CAUTION:
*Before installing OLIUs, ensure all optical connectors and couplings have been properly cleaned [**DLP-522**]. Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

NOTE 1:
HIGH/LOW POWER option switch on **21G/21G-U OLIU** must be set to **LOW POWER** position when **21G/21G-U OLIU** is looped on itself.

NOTE 2:
It is assumed that the loss of optical facility is known from office records or that a measurement has been made.

Refer to Table V and Figure 7 and set **HIGH/LOW POWER** option switch to proper setting.

Table V. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LO Power
Greater than 6 dB	HI Power

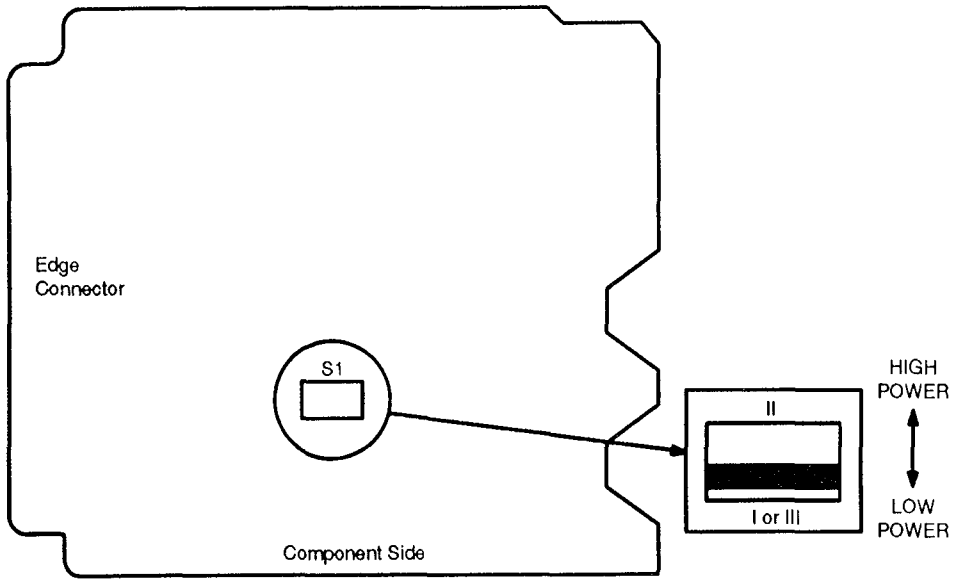


Figure 7. 21G/21G-U OLIU Option Switch

37. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

3DS3

38. Determine from office records the length of DS3 cabling between DDM-2000 OC-12 Multiplexer and DSX-3 cross-connect point.

39. Install **3DS3** option jumpers per Table W and Figure 8.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table W. 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

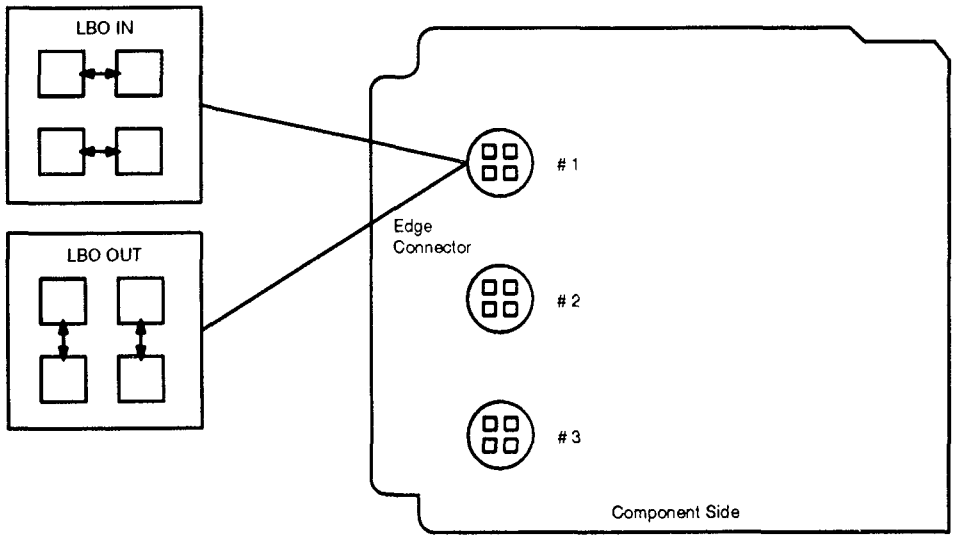


Figure 8. 3DS3 Option Settings

3STS1E

41. Determine from office records the length of EC-1 cabling between DDM-2000 OC-12 Multiplexer and STSX cross-connect point.

42. Install **3STS1E** option jumpers per Table X and Figure 9.

43. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table X. EC-1 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

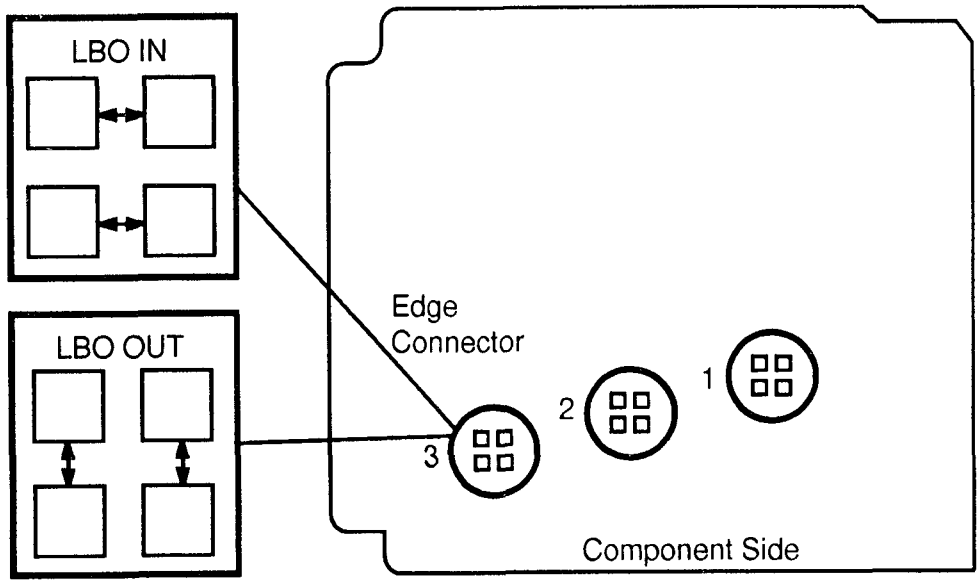


Figure 9. 3STS1E Option Settings

Perform Optical Fiber Connections and Verification of Optical Facility for MAIN OLIUs and/or REGENRs

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-12 network consisting of OC-12 Multiplexers or OC-12 Multiplexers and Regenerators. See Figures 1 and 2. When connecting optical spans using OC-12 Regenerators, you should start at the span between the OC-12 Multiplexer supplying timing (near end) and the first Regenerator (far end), then proceed to the next span [Regenerator (near end) to Regenerator (far end), or Regenerator (near end) to far-end OC-12 Multiplexer]. For each span, determine the loss of each optical fiber and install the proper LBO on the **OUT** connector of each **OLIU** or **REGENR**. Then connect the fibers to the associated **IN** and **OUT** connectors of each **OLIU** or **REGENR** at the end of the span. If the far end of the span is an OC-12 Regenerator, the output of the transmit **REGENR** must be looped back to the input of the receive line **REGENR** to verify that no **FAULT** LEDs are lighted on the near-end receive line **REGENR** or the far-end **OLIU** or **REGENR**.

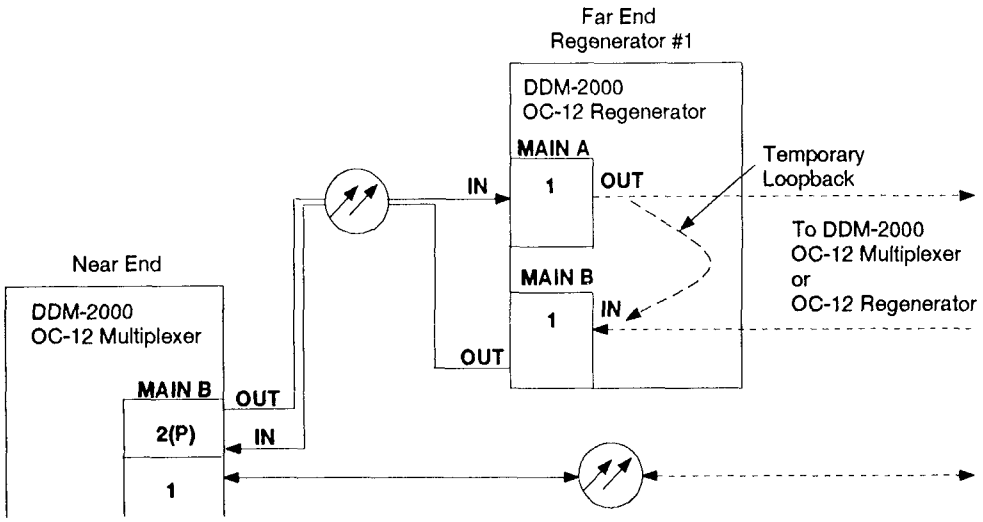


Figure 1. OC-12 Regenerator in Protection Line — OC-12 Multiplexer to Regenerator Span

NOTE 2:
It is assumed that the optical jumpers used to connect the DDM-2000 OC-12 Multiplexer or Regenerator 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.

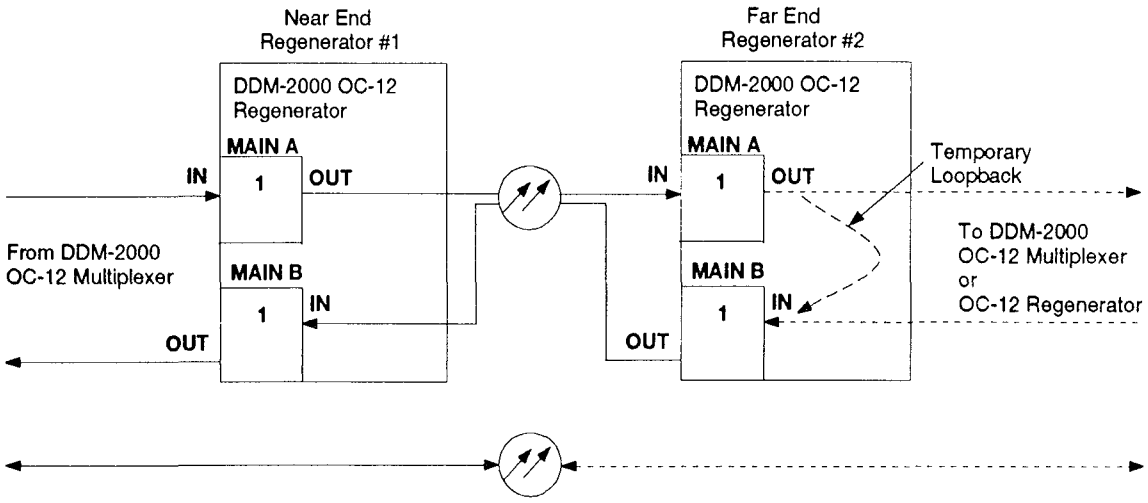


Figure 2. OC-12 Regenerator in Protection Line — OC-12 Regenerator to Regenerator Span

2. ⇒ NOTE:
23R and **23R-U REGENR**s cannot be mixed in the same DDM-2000 Regenerator Shelf.

Determine the compatibility of **OLIU**s and **REGENR**s. See Table A.

Table A. OLIU to OLIU and OLIU to REGENR Compatibility

Transmitter	Receiver
23G OLIU 23G-U OLIU	23G OLIU 23G-U OLIU 23R REGENR 23R-U REGENR
23H OLIU 23H-U OLIU	23H OLIU 23H-U OLIU
23R REGENR 23R-U REGENR	23R REGENR 23R-U REGENR 23G OLIU 23G-U OLIU

3. 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 (**REGENR**s). See Table B.

Table B. 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

4. Establish communication with technician at other end of the optical span.

5. ⇒ NOTE 1:
The optical connector labeled **OUT** is the output from the **OLIU** (**REGENR**s). The optical connector labeled **IN** is the input to the **OLIU** (**REGENR**s).

⇒ NOTE 2:
Output connections MUST be made using single-mode optical jumpers.

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-522**

6. Have you determined the value of the lightguide buildouts (LBOs) for this span?

If **YES**, then proceed to **Step 10**.
If **NO**, then continue with **Step 7**.

Optical Power Measurement

Steps 7 through 10 are used to measure optical power. Replace LBOs in the **OLIU** or **REGENR OUT** connectors with a 0 dB LBO. Connect the optical fiber transmit cable to the **OLIU** or **REGENR OUT** connection. Measure the optical power of the optical fiber receive cable at the other end using an optical power meter. Replace the 0 dB LBO with the correct LBO to attenuate the optical power to less than or equal to –8 dBm (**23G** or **23G-U OLIU/23R** or **23R-U REGENR**) or –17 dBm (**23H** or **23H-U OLIU**).

7. At both ends of the optical span, replace the *ST*, FC/PC, or SC LBO on the **OUT** (transmit) connectors of the **OLIU** (**REGENR**) with a 0 dB LBO.

8. ⇒ NOTE:
   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.

   At each end of the span, connect the optical fiber transmit cable to the **OLIU** (**REGENR**) **OUT** connection.

9. At each end of the span, measure the optical power of the optical fiber receive cable using an optical power meter.

10. See Tables C, D, E, F, G, H, I, or J. Replace the lightguide buildout assembly on the **OUT** connector of each **OLIU** (**REGENR**) with the correct buildout assembly [**DLP-538**].

    Reconnect the optical fiber transmit cables at both ends.

Table C. 23G OLIU/23R REGENR *ST* Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–15.0 to –23.0	0 dB	A3010	106312481	*ST*	SM-SM	None
–10.0 to –14.9	5 dB	A3010B	106312556	*ST*	SM-SM	Blue
–5.0 to –9.9	10 dB	A3010D	106312572	*ST*	SM-SM	Black
0.0 to –4.9	15 dB	A3010F	106312598	*ST*	SM-SM	Green
> 0.0	20 dB	A3010H	106312630	*ST*	SM-SM	Red

Table D. 23H OLIU *ST* Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–20.0 to –27.2	0 dB	A3010	106312481	*ST*	SM-SM	None
–15.0 to –19.9	5 dB	A3010B	106312556	*ST*	SM-SM	Blue
–10.0 to –14.9	10 dB	A3010D	106312572	*ST*	SM-SM	Black
–5.0 to –9.9	15 dB	A3010F	106312598	*ST*	SM-SM	Green
> –5.0	20 dB	A3010H	106312630	*ST*	SM-SM	Red

Table E. 23G-U OLIU/23R-U REGENR Universal *ST* Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–15.0 to –23.0	0 dB	A3070	106795354	*ST*	SM-SM	None
–10.0 to –14.9	5 dB	A3070B	106795362	*ST*	SM-SM	Blue
–5.0 to –9.9	10 dB	A3070D	106795370	*ST*	SM-SM	Black
0.0 to –4.9	15 dB	A3070F	106795388	*ST*	SM-SM	Green
> 0.0	20 dB	A3070H	106795396	*ST*	SM-SM	Red

Table F. 23H-U OLIU Universal *ST* Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–20.0 to –27.2	0 dB	A3070	106795354	*ST*	SM-SM	None
–15.0 to –19.9	5 dB	A3070B	106795362	*ST*	SM-SM	Blue
–10.0 to –14.9	10 dB	A3070D	106795370	*ST*	SM-SM	Black
–5.0 to –9.9	15 dB	A3070F	106795388	*ST*	SM-SM	Green
> –5.0	20 dB	A3070H	106795396	*ST*	SM-SM	Red

Table G. 23G-U OLIU/23R-U REGENR Universal FC/PC Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–15.0 to –23.0	0 dB	A3080	106795404	FC/PC	SM-SM	None
–10.0 to –14.9	5 dB	A3080B	106795412	FC/PC	SM-SM	Blue
–5.0 to –9.9	10 dB	A3080D	106795420	FC/PC	SM-SM	Black
0.0 to –4.9	15 dB	A3080F	106795438	FC/PC	SM-SM	Green
> 0.0	20 dB	A3080H	106795446	FC/PC	SM-SM	Red

Table H. 23H-U OLIU Universal FC/PC Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–20.0 to –27.2	0 dB	A3080	106795404	FC/PC	SM-SM	None
–15.0 to –19.9	5 dB	A3080B	106795412	FC/PC	SM-SM	Blue
–10.0 to –14.9	10 dB	A3080D	106795420	FC/PC	SM-SM	Black
–5.0 to –9.9	15 dB	A3080F	106795438	FC/PC	SM-SM	Green
> –5.0	20 dB	A3080H	106795446	FC/PC	SM-SM	Red

Table I. 23G-U OLIU/23R-U REGENR Universal SC Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–15.0 to –23.0	0 dB	A3060	106708951	SC	SM-SM	None
–10.0 to –14.9	5 dB	A3060B	106708969	SC	SM-SM	Blue
–5.0 to –9.9	10 dB	A3060D	106708977	SC	SM-SM	Black
0.0 to –4.9	15 dB	A3060F	106708985	SC	SM-SM	Green
> 0.0	20 dB	A3060H	106708993	SC	SM-SM	Red

Table J. 23H-U OLIU Universal SC Single-Mode Lightguide Buildouts

Received Power (dBm)	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
–20.0 to –27.2	0 dB	A3060	106708951	SC	SM-SM	None
–15.0 to –19.9	5 dB	A3060B	106708969	SC	SM-SM	Blue
–10.0 to –14.9	10 dB	A3060D	106708977	SC	SM-SM	Black
–5.0 to –9.9	15 dB	A3060F	106708985	SC	SM-SM	Green
> –5.0	20 dB	A3060H	106708993	SC	SM-SM	Red

Fiber Connection

11. ⇒ NOTE 1:
In Release 2 and later, ONE system 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 2 or later, it is suggested that optical fiber connections begin at the node designated as the GNE when establishing a new OC-12 ring configuration.

⇒ NOTE 2:
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.

At far end, connect the input optical fiber(s) to the proper **OLIU** (**REGENR**) **IN** (receive) connector at far end.

12. Did **FAULT** LED go off on the **OLIU** (**REGENR**)?

    If **NO**, then continue with **Step 13**.
    If **YES**, then proceed to **Step 14**.

13. Check optical fiber connections. Verify integrity of fiber connections. Ensure correct output at one end is connected to correct input at the other end. Replace **OLIU** (**REGENR**) with flashing LED. Continue with this procedure when trouble is cleared.

14. Is equipment at far end of optical span an OC-12 Regenerator?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed to **Step 18**.

15. See Figure 1. At far-end Regenerator, install a 15 dB LBO on the **OUT** connector of the transmit line **REGENR**. See Tables B, C, D, E, F, G, H, or I. Use a **FS1E-E-2**, **LS1SC-SC-2**, or **LS1FP-FP-10** lightguide jumper to temporarily loop the **OUT** connector of the transmit line **REGENR** to the **IN** connector of the receive line **REGENR**. See Table B.

16. Did **FAULT** LED go off on the receive line **REGENR**?

    If **NO**, then continue with **Step 17**.
    If **YES**, then proceed to **Step 18**.

17. Replace **REGENR** with flashing LED. If **FAULT** LED continues to flash, check optical jumper connections. Verify integrity of fiber connections. Ensure correct **REGENR** output is connected to correct **REGENR** input. Continue with this procedure when trouble is cleared.

18. At near end, connect the input optical fiber(s) to the corresponding **OLIU IN** (receive) connector.

19. Did **FAULT** LED go off on the **OLIU**?

    If **NO**, then continue with **Step 20**.
    If **YES**, then proceed to **Step 21**.

20. Check optical fiber connections at both ends of the fiber. Verify the integrity of the fiber connections (Step 23). Ensure **OLIU** output at one end is connected to the correct **OLIU** or **REGENR** input at the other end. Verify proper systems have been connected by using the `rtrv-nmap:` command to retrieve a map of the network (Figure 3).

Fiber Verification

21. Disconnect the fiber cable from the **OUT** connector on the **OLIU** (**REGENR**) 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.

    ⇒ NOTE:
    If the far end is a Regenerator with the fiber looping cable still installed, the **FAULT** LED will also flash on the receive line **REGENR**s (**OLIU**) at both ends.

22. Remove temporary fiber looping cable from the **REGENR**s circuit packs if the far end is a Regenerator.

23. Verify proper systems have been connected by using the `rtrv-nmap:` command to retrieve a map of the network (Figure 3).

```
/* Network Map for <System_name>
   ==========================================================================
    System Name (TID)      Connected     Neighbor     Communication     GNE
                             Through                      Status
   ==========================================================================
   local_system                                                          yes
   Site7NE1                  main-b        yes
   Site3NE1                  fn-a          yes
   Site4NE1                  main-b        no           FAILED

*/
```

Figure 3. Sample Report From `rtrv-nmap` Command

24. After all connections and tests have been made, verify optical fiber cables are placed correctly in fiber tray and properly routed in bay framework. Reinstall front cover and tighten three screws.

25. Repeat this procedure for each fiber span to be connected until the end-to-end system is established.

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Circuit Pack

1. ⚠ CAUTION 1:
Circuit packs must not be installed or replaced if **SYSCTL** *is not installed and operating normally. If* **SYSCTL** *is not installed and operating normally, unpredictable provisioning of 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 CIT and protection `switch-line` *command to do protection switch.*

⚠ CAUTION 3:
When removing circuit packs, always remove the one without the lighted **ACTIVE** *LED first.*

NOTE:
When replacement circuit pack (except **SYSCTL**) is configured same as original circuit pack, it may be inserted with no further action. When replacement circuit pack is different (different code or different switch options) from original, **SYSCTL UPD/INIT** button must be momentarily depressed to update the inventory.

Find circuit pack in Table A and go to indicated step.

Table A. Circuit Pack Replacement

Circuit Pack	Step
BBG5 SYSCTL	Step 2
BCP2/BCP3 TSI	Step 4
BCP1 OHCTL	Step 6
BBF2 TGS	Step 20
BBF2B TGS	Step 25
21G/21G-U OLIU	Step 31
21D/21D-U OLIU	Step 35
BBG11 3DS3	Step 39
BBG12 3STS1E	Step 43
23G/23G-U OLIU	Step 47
23H/23H-U OLIU	Step 47
23R/23R-U REGENR	Step 53

SYSCTL

2. Refer to **DLP-501** to replace **SYSCTL**.
3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

TSI

4. ⇒ NOTE 1:
   In Releases 1 and 2, the **BCP2 TSI** circuit pack is required for fixed internal STS-1 cross-connections in linear applications.

   ⇒ NOTE 2:
   In Release 3, the **BCP3 TSI** circuit pack is required for manual internal STS-1 cross-connections in path switched ring applications.

   There are no options to be set on **TSI** circuit pack. Remove old **TSI** and install replacement **TSI**.

   Response: **FAULT** LED on **TSI** lights for about 13 seconds and then goes off.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

OHCTL

6. NOTE 1:
For Release 2, the **OHCTL** must be a series **S2:3** or later to support open systems interconnection (OSI) protocol and *linear* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *linear* applications. **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 2 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

NOTE 2:
For Release 3, the **OHCTL** must be a series **S2:5** or later to support open systems interconnection (OSI) protocol and *ring* applications. Switches **S2-1** through **S2-6** must be set to control the identification of the DCC for OSI interworking for *ring* applications. **S2:5** 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 3 software is installed, the software will be inoperable, and an **E** will be displayed in the **FE ID** display on the **SYSCTL**.

NOTE 3:
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 4:
A replacement **OHCTL** must have the same release software as **SYSCTL**. If software is not compatible or if **OHCTL** does not contain software, the letter **C**, **P** or **d** will be displayed in **FE ID** display on **SYSCTL**. If this occurs, you must find circuit packs with compatible software or install new software [**DLP-527**].

NOTE 5:
Switches **S1-1, S1-2**, and **S1-3** on **OHCTL** set Network Element (shelf) number of shelf. Network Element number and Site ID form a unique address for a shelf at a site.

Determine Network Element number from old **OHCTL**, work order, or office records. Refer to Table B and Figure 1 and set 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 4-8 (**S1-4, S1-5, S1-6, S1-7**, and **S1-8**) must be set to **ON** position. If set to **OFF** position, **FAULT** LED will light on **OHCTL** and alarm will be generated.

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected switches` alarm is generated.

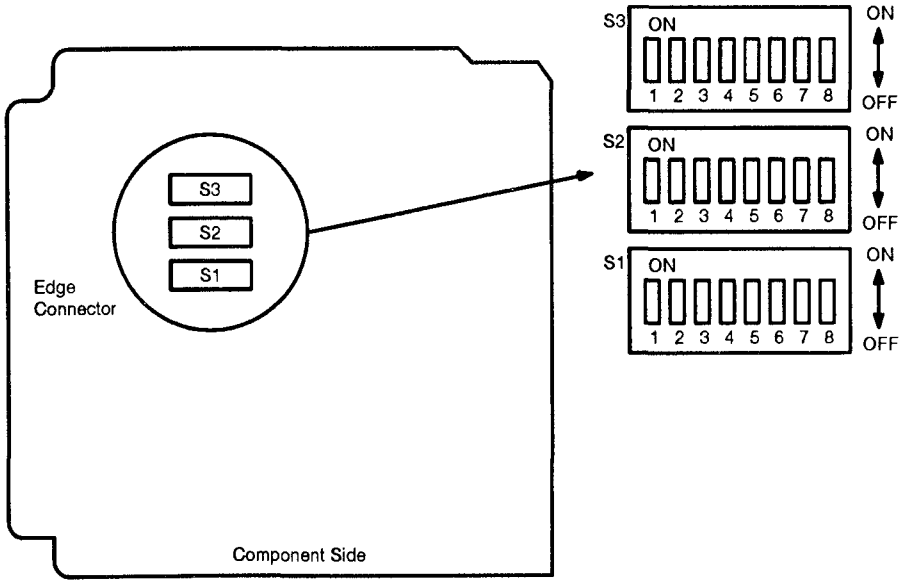


Figure 1. BCP1 OHCTL Circuit Pack

7. If **Release 1**, then continue with **Step 8**.
   If **Release 2**, then proceed to **Step 12**.
   If **Release 3**, then proceed to **Step 16**.

8. ⇒ NOTE:
   Switches **S2-1**, **S2-2**, **S2-3**, **S2-4**, **S2-5**, **S2-6** are unused in Release 1.

   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	S2-5	S2-6
OFF	ON	OFF	OFF	OFF	OFF

   Note: These switches are reserved for Release 2 or 3 open systems interconnection (OSI) protocol application. The suggested settings will make upgrade to Release 2 or 3 easier.

9. Refer to Table D and Figure 1 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

   Table D. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

10. Remove **OHCTL** and install replacement **OHCTL**.

    Response: **FAULT** LED on **SYSCTL** and **OHCTL** and **ABN** LED on user panel light for about 2 seconds and go off. **CR** alarm on user panel flashes for 10 seconds.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. ⇒ NOTE 1:
Switches **S2-1** through **S2-6** 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.

⇒ NOTE 2:
Refer to Figure 2 and note that factory settings for switch **S2** are **S2-1 OFF**, **S2-2 ON**, **S2-3 OFF**, **S2-4 OFF**, **S2-5 OFF**, **S2-6 OFF**, **S2-7 ON**, and **S2-8 ON**. This will permit the establishment of a linear/hub system without changing any **S2** switch settings except on the **OHCTL** at Central Office 2. In this case, **S2-2** on the **OHCTL** at Central Office 2 would be set to **OFF**.

Refer to Figure 2 for an example linear/hub system configuration. Set **S2** switches for OSI interworking using examples and/or work order or office records. (The necessary switch settings in Figure 2 are highlighted in bold type. For example, the optical span between Remote Node 1 and Central Office 1 requires that switch **S2-1** at Remote Node 1 be set to **ON** and switch **S2-3** at Central Office 1 be set to **OFF**.)

13. Refer to Table E and Figure 1 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table E. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

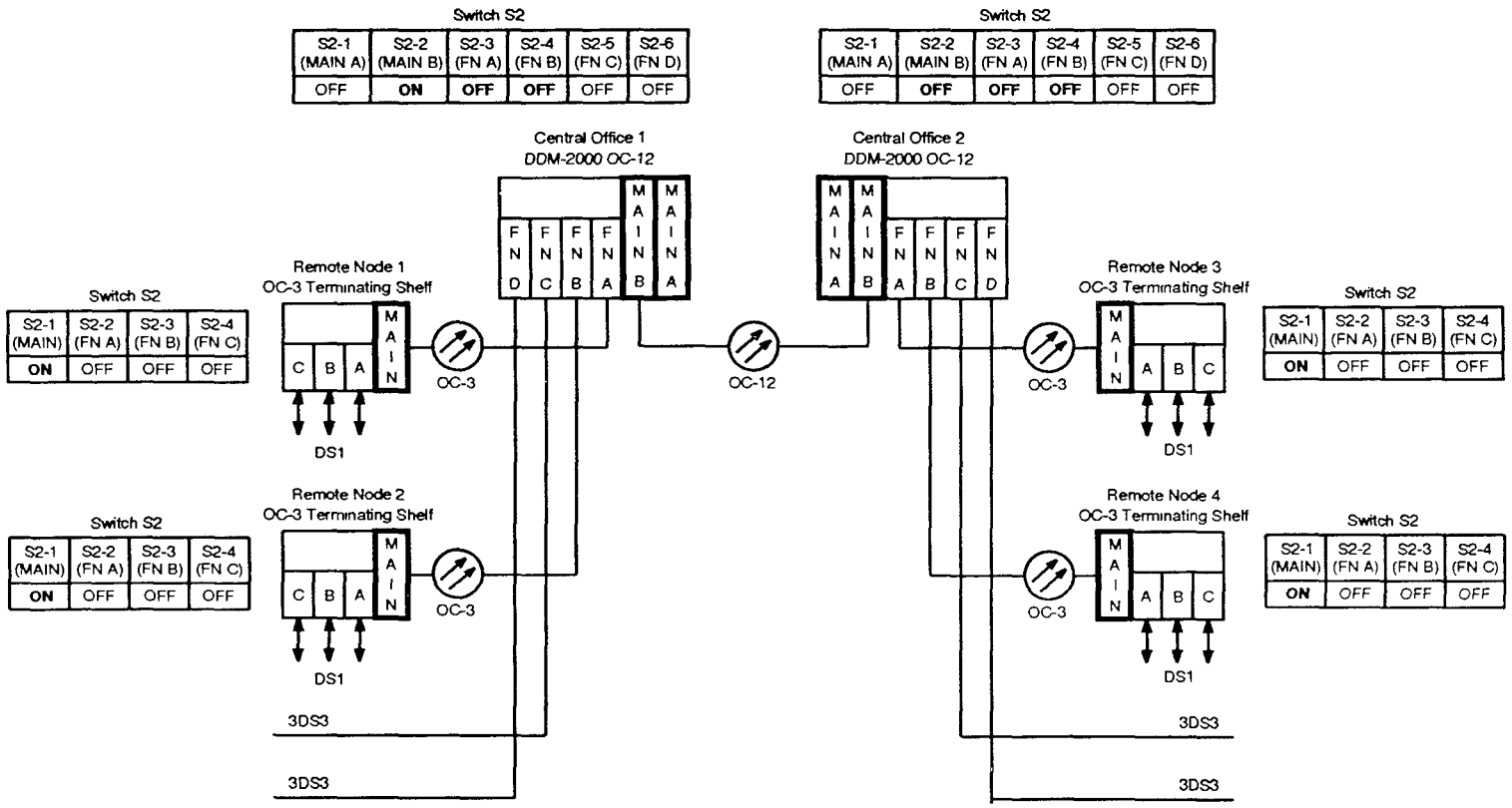


Figure 2. OC-12 Point-To-Point Using OSI Protocol

14. Remove **OHCTL** and install replacement **OHCTL**.

    Response: **FAULT** LED on **SYSCTL** and **OHCTL** and **ABN** LED on user panel light for about 2 seconds and go off. **CR** alarm on user panel flashes for 10 seconds.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. ⇒ NOTE 1:
    Switches **S2-1** through **S2-6** 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 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.

    ⇒ NOTE 2:
    Refer to Figure 3 and note that factory settings for switch **S2** are **S2-1 OFF, S2-2 ON, S2-3 OFF, S2-4 OFF, S2-5 OFF, S2-6 OFF, S2-7 ON,** and **S2-8 ON**. This will permit the establishment of a ring system *without changing any* **S2** *switch settings.*

    Refer to Figure 3 for an example ring system configuration. Set **S2** switches for OSI interworking using examples and/or work order or office records. (The nesessary switch settings in Figure 3 are highlighted in bold type.)

17. Refer to Table F and Figure 1 and set remaining switches on Switch 2 (**S2**) and Switch (**S3**) on **OHCTL** circuit pack.

Table F. Switch 2 and 3 (S2 & S3) Settings

Switch S2		Switch S3							
S2-7	S2-8	S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	S3-7	S3-8
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

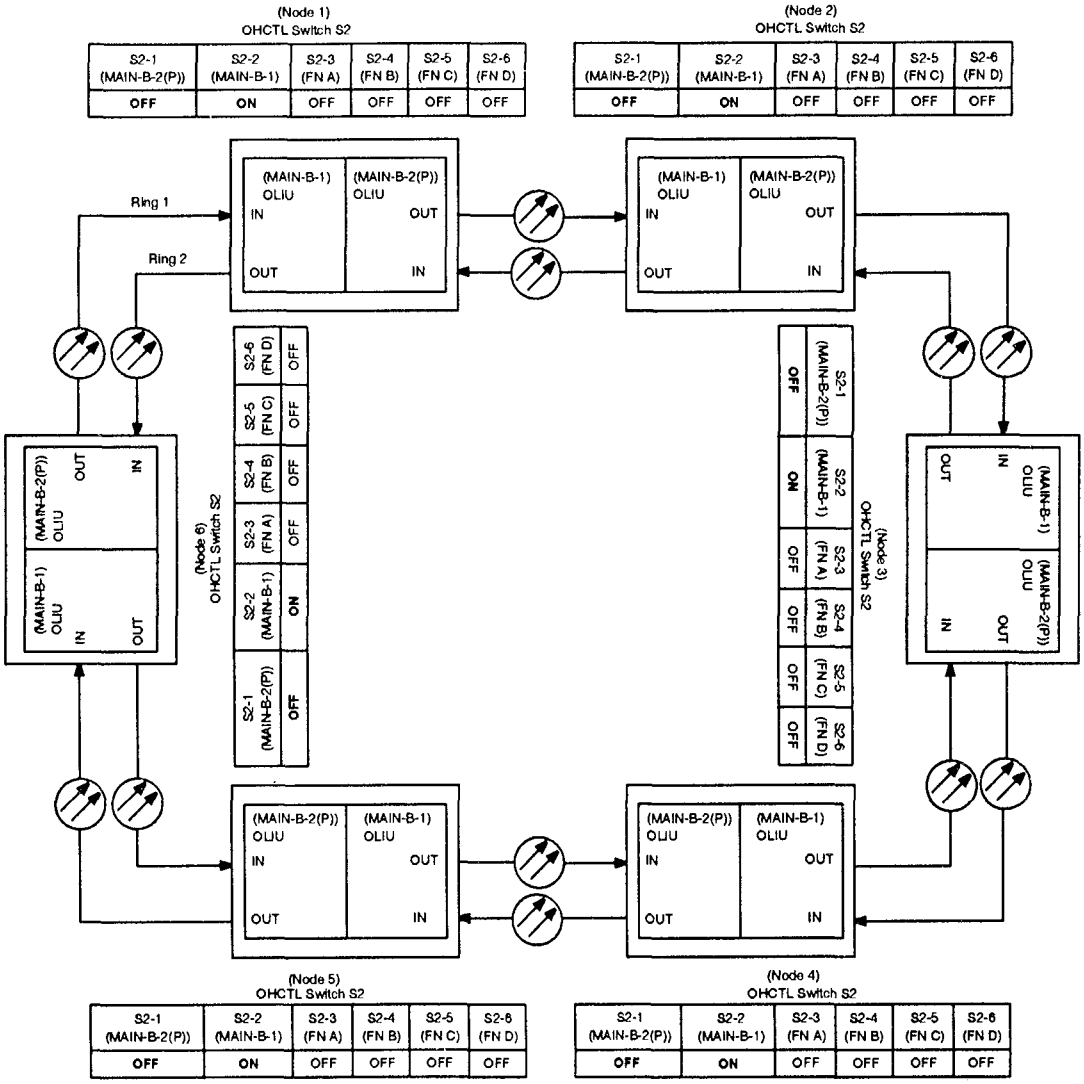


Figure 3. OC-12 Ring Using OSI Protocol

18. Remove **OHCTL** and install replacement **OHCTL**.

    Response: **FAULT** LED on **SYSCTL** and **OHCTL** and **ABN** LED on user panel light for about 2 seconds and go off. **CR** alarm on user panel flashes for 10 seconds.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

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, **BBF2 TGS** gets timing from oscillator on **BBF2 TGS**. In external timing mode, **BBF2 TGS** gets timing from external DS1 reference input. In loop-timing mode, **BBF2 TGS** gets timing from main **OLIU** from a reference clock recovered from received OC-12 line rate signal. Loop timing from the **MAIN B OLIU** OC-12 line is the factory default.

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.

Table G. 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 G. 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.

Determine timing mode from work order or office records. Refer to Table H and Figure 4 and set the timing mode as required for new **BBF2 TGS** circuit pack(s).

Table H. BBF2 TGS Timing Mode Switch Setting

	Switch S1 Settings	
Timing Mode	S1-3	S1-4
Free Running	ON	ON
DS1 External (Phase Locked)	OFF	ON
Loop Timed	OFF	OFF
Invalid*	ON	OFF

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP/type switches` alarm is generated.

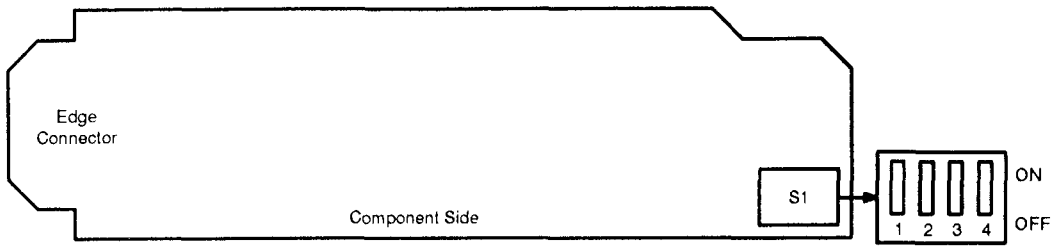


Figure 4. BBF2 TGS Option Switch

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*. Subsequence removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** must be set the same as the original settings or an update (upd) must be performed.

Is timing mode set to *DS1 External*?

If **YES**, continue with **Step 22.**
If **NO**, proceed to **Step 23.**

22. Refer to Table I and Figure 4 and set DS1 line coding and frame format as required for **BBF2 TGS** circuit pack.

Table I. 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. ⇒ NOTE 1:
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS** circuit pack. If the information is incompatible with the controller software information, an alarm is generated.

⇒ NOTE 2:
If a signal has previously been applied to original **BBF2 TGS** circuit pack, **FAULT** lamp will flash when new **BBF2 TGS** is installed until signal tests good.

Remove old **BBF2 TGS** and install replacement **BBF2 TGS**.

Response: **FAULT** LED on **BBF2 TGS** lights (flashes) for about 15 seconds and then goes off.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

25. ⇒ 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, **BBF2B TGS** gets timing from oscillator on **BBF2B TGS**. In external timing mode, **BBF2B TGS** gets timing from external DS1 reference input. In loop-timed mode, **BBF2B TGS** gets timing from main **OLIU** from a reference clock recovered from received OC-12 line rate signal. Loop timing from the **MAIN B OLIU** OC-12 line is the factory default.

⇒ NOTE 3:
Table J 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 J. 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 J. 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 J. 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 J. 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 K and Figure 5 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table K. 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 Output Mode	OFF	ON	OFF
Loop Timing	OFF	OFF	OFF
Loop Timing, SYNC OUT Mode	OFF	OFF	ON
DS1 External, SYNC OUT Mode	OFF	ON	ON
Invalid*	ON	OFF	ON
Invalid*	ON	OFF	OFF
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP type/switches` alarm is generated.

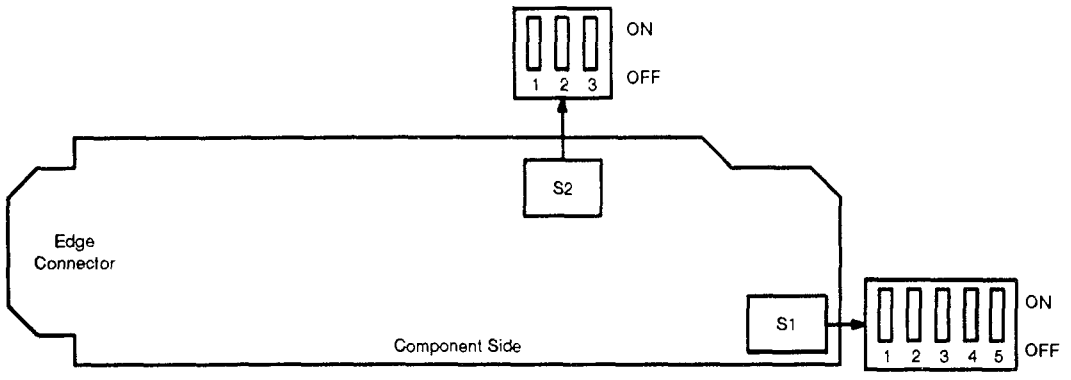


Figure 5. BBF2B TGS Option Switch

26. If the **BBF2B TGS** is provisioned for *sync out mode*, refer to Table L and Figure 5 and set equalizer switches for the proper cable length.

Table L. 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 `unexpected CP type/switches` alarm is generated.

27. ⇒ NOTE:
Switches **S1-1** and **S1-2** are ignored the first time the **TGS** was installed unless the timing mode was set to *DS1 External* or *Loop Timed sync out mode.* Subsequence removal or replacement of the **BBF2B TGS** requires that switches **S1-1** and **S1-2** be set the same as on original **BBF2B TGS** or an update (`upd`) must be done if external timing is used.

Is timing mode set to *DS1 External* or *Loop Timed sync out*?

If **YES**, continue with **Step 28.**
If **NO**, continue with **Step 29.**

28. Refer to Table M and Figure 5 and set DS1 line coding and frame format as required for **BBF2B TGS** circuit pack.

Table M. 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

29. NOTE 1:
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot 1. During software download procedures the software checks the information stored in the **TGS** circuit pack. 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.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21G/21G-U OLIU

31. ⚠ 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:
Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use CIT and `switch-line` *command to do protection switch. Line protection switching request is unidirectional. It may be necessary to perform* `switch-line` *command at near end and far end to switch both transmit and receive to same line.*

⚠ CAUTION 2:
When removing circuit packs, always remove the one without lighted **ACTIVE** *LED first.*

⚠ CAUTION 3:
Before installing **21G/21G-U OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned [***DLP-522***]. Signal performance may be degraded if connectors and couplings are not cleaned properly.*

NOTE:
It is assumed that loss of optical facility is known from office records or that a measurement has been made.

Ensure service has been switched to the other line, then remove optical cables from **21G/21G-U OLIU** to be replaced.

Refer to Table N and Figure 6 and set **HIGH/LOW POWER** option switch on replacement **21G/21G-U OLIU** to proper setting.

Table N. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LO Power
Greater than 6 dB	HI Power

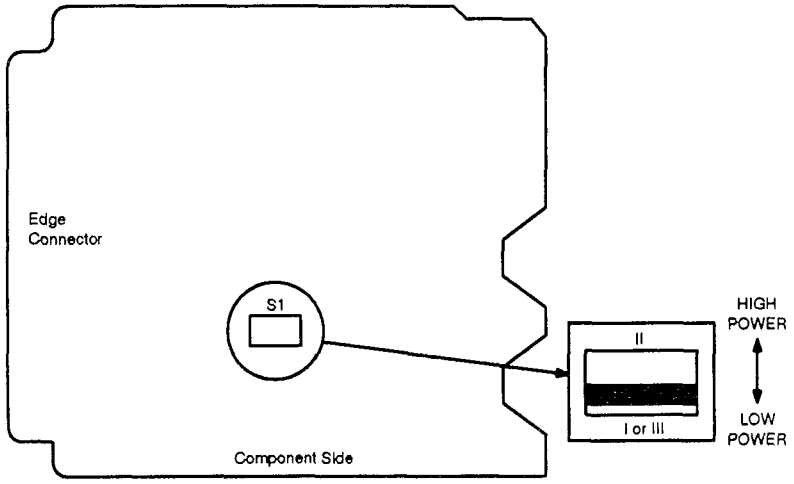


Figure 6. 21G/21G-U OLIU Option Switch

32. Remove old **21G/21G-U OLIU** and install replacement **21G/21G-U OLIU**.

    Response: **FAULT** LED on **21G/21G-U OLIU** flashes.

33. ⇒ NOTE:
    FAULT LED on **21G/21G-U OLIU** may flash from 15 seconds to 3 minutes and 25 seconds depending on provisioned signal degrade threshold.

    Connect optical cables to replacement **21G/21G-U OLIU**.

    Response: **FAULT** LED on **21G/21G-U OLIU** goes off.

34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21D/21D-U OLIU

35. ⚠ 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:
Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use CIT and `switch-line` *command to do protection switch. Line protection switching request is unidirectional. It may be necessary to perform* `switch-line` *at near end and far end to switch both transmit and receive to same line.*

⚠ CAUTION 2:
When removing circuit packs, always remove the one without lighted **ACTIVE** *LED first.*

⚠ CAUTION 3:
Before installing **21D/21D-U OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned [***DLP-522***]. Signal performance may be degraded if connectors and couplings are not cleaned properly.*

Ensure service has been switched to other line, then remove optical cables from **21D/21D-U OLIU** to be replaced.

36. Remove old **21D/21D-U OLIU** and install replacement **21D/21D-U OLIU**.

    Response: **FAULT** LED on **21D/21D-U OLIU** flashes.

37. ⇒ NOTE:
    FAULT LED on **21D/21D-U OLIU** may flash from 15 seconds to 3 minutes and 25 seconds depending on provisioned signal degrade threshold.

    Connect optical cables to replacement **21D/21D-U OLIU**.

    Response: **FAULT** LED on **21D/21D-U OLIU** goes off.

38. **STOP: YOU HAVE COMPLETED THIS PROCEDURE.**

3DS3

39. Determine from office records length of DS3 cabling between DDM-2000 OC-12 Multiplexer and DSX-3 cross-connect point.

40. Refer to Table O and Figure 7. Install DS3 option jumpers per Table O.

Table O. 3DS3 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

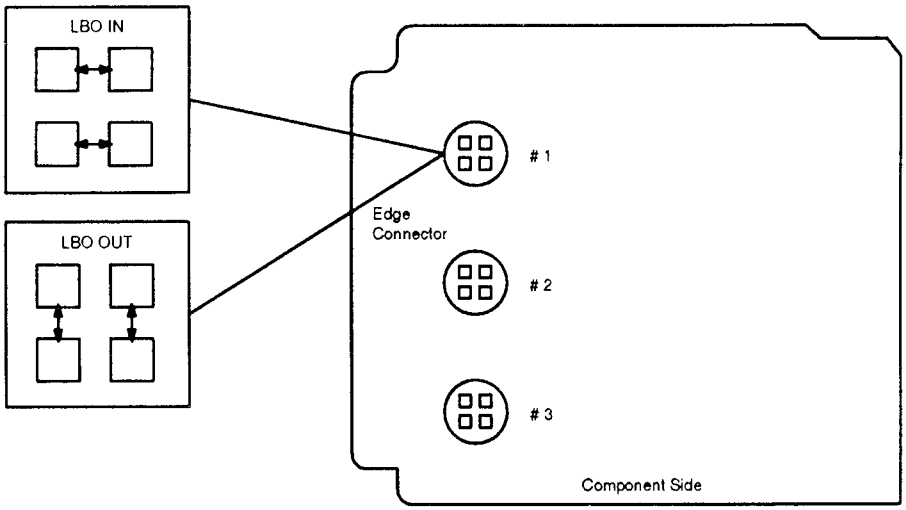


Figure 7. 3DS3 Option Settings

41. ⇒ NOTE:
If a signal has previously been applied to original **3DS3** circuit pack, **FAULT** lamp will flash when new **3DS3** is installed until signal tests good.

Remove old **3DS3** and install replacement **3DS3**.

Response: **FAULT** LED on **3DS3** flashes for about 15 seconds and then goes off.

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

3STS1E

43. Determine from office records length of EC-1 cabling between DDM-2000 OC-12 Multiplexer and STSX cross-connect point.

44. Refer to Table P and Figure 8. Install STS-1 option jumpers per Table P.

Table P. 3STS1E 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

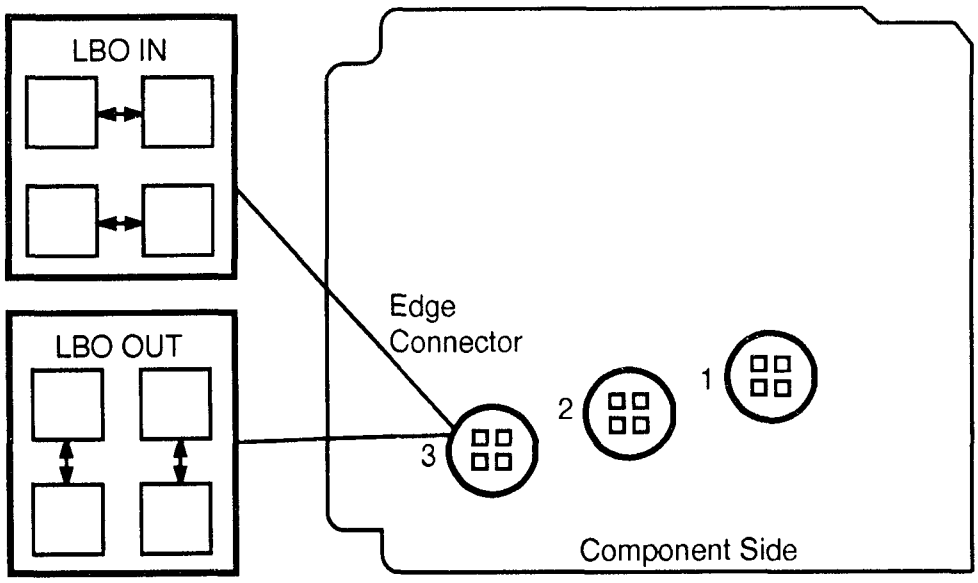


Figure 8. 3STS1E Option Settings

45. ⇒ NOTE:
If a signal has previously been applied to original **3STS1E** circuit pack, **FAULT** lamp will flash when new **3STS1E** is installed until signal tests good.

Remove old **3STS1E** and install replacement **3STS1E**.

Response: **FAULT** LED on **3STS1E** flashes for about 15 seconds and then goes off.

46. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23G/23G-U or **23H/23H-U OLIU**

47. ⚠ 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:
Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use CIT and `switch-line` *command to do protection switch. Line protection switching request is unidirectional. It may be necessary to perform* `switch-line` *at near end and far end to switch both transmit and receive to same line.*

⚠ CAUTION 2:
When removing circuit packs, always remove the one without lighted **ACTIVE** *LED first.*

⚠ CAUTION 3:
Before installing **23G/23G-U** *or* **23H/23H-U OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned [***DLP-522***]. Signal performance may be degraded if connectors and couplings are not cleaned properly.*

Ensure service has been switched to other line.

48. Determine from old **23G/23G-U** or **23H/23H-U OLIU** if lightguide buildout (LBO) is required.

49. Remove LBO (if installed) [**DLP-538**] and optical cables from **23G/23G-U** or **23H/23H-U OLIU** to be replaced.

50. Remove old **23G/23G-U** or **23H/23H-U OLIU** and install replacement **23G/23G-U** or **23H/23H-U OLIU**.

51. ⇒ NOTE:
    If a signal has previously been applied to original **23G/23G-U** or **23H/23H-U OLIU** circuit pack, **FAULT** lamp will flash when new **23G/23G-U** or **23H/23H-U OLIU** is installed until signal tests good.

    Install LBO (if required) [**DLP-538**] and optical cables on replacement **23G/23G-U** or **23H/23H-U OLIU**.

    Response: **FAULT** LED on **23G/23G-U** or **23H/23H-U OLIU** flashes for about 15 seconds or longer and then goes off.

52. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23R/23R-U REGENR

53. ⚠ 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:
Before installing **23R/23R-U REGENR***s, ensure all optical fiber connectors and couplings have been properly cleaned* **[DLP-522]**. *Signal performance may be degraded if connectors and couplings are not cleaned properly.*

⚠ CAUTION 2:
Removal of the wrong **23R/23R-U REGENR** *will cause service interruption.*

Determine the **23R/23R-U REGENR** to be replaced.

54. Determine from old **23R/23R-U REGENR** if lightguide buildout (LBO) is required.

55. Remove LBO (if installed) [**DLP-538**] and optical cables from **23R/23R-U REGENR** to be replaced.

56. Remove old **23R/23R-U REGENR** and install replacement **23R/23R-U REGENR**.

57. ⇒ NOTE:
FAULT lamp will flash when new **23R/23R-U REGENR** is installed until a good OC-12 signal is applied.

Install LBO (if required) [**DLP-538**] and optical cables on replacement **23R/23R-U REGENR**.

Response: **FAULT** LED on **23R/23R-U REGENR** flashes for about 15 seconds or longer and then goes off.

58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make STS1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration Release 3

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 the 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`, `rtrv-crs-sts1`, and `dlt-crs-sts1`.

NOTE 3:
You will 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 <System_name>
   ==========================================================================
    System Name (TID)      Connected     Neighbor     Communication     GNE
                             Through                      Status
   ==========================================================================
   CO2                       main-b        yes                          yes
   CO3                       main-b        yes
   CO4                       main-b        no
   CO5                       main-b        no
   CO1                       main-b        no           FAILED

*/
```

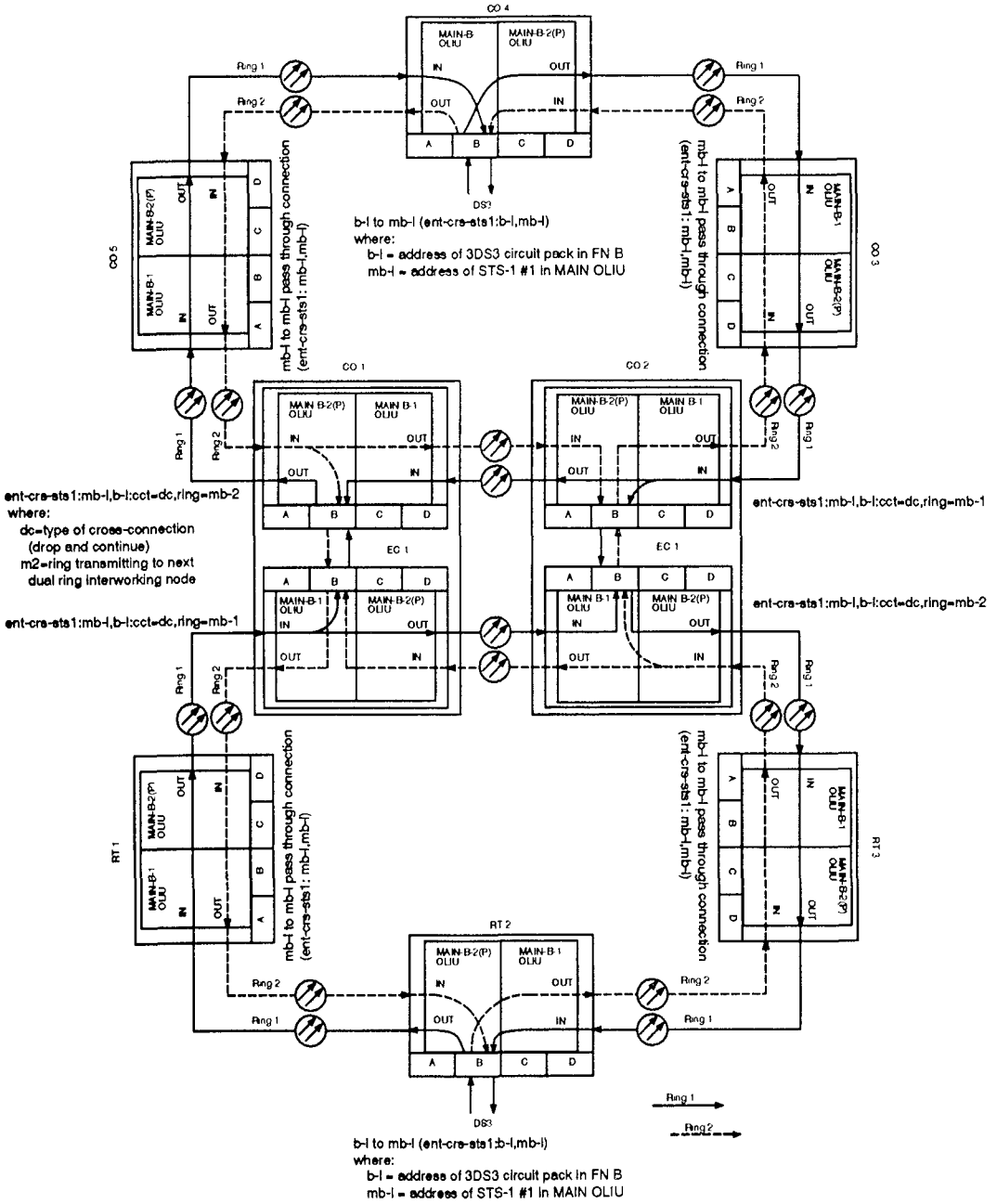


Figure 1. Example of Dual Ring Interworking Cross Connections

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 dual ring configurations, cross-connections consist of drop and continue connections in addition to pass-through and terminating cross-connections. For example in Figure 1, drop and continue connections are made at the four nodes in CO1 and CO2 located between the two rings.

   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 **3DS3** and/or **3STS1E** circuit packs if DS3 service is being established?

6. ⇒ NOTE 1:
   Cross-connections supporting DS3 services are STS1 cross-connections.

   ⇒ NOTE 2:
   The following commands may be used to delete, enter, and retrieve 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.

   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 DS3 circuit being established, use the `rtrv-crs-sts1:` 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 DS3 #3 low speed port in the **3DS3** circuit pack in **FUNCTION UNITS** group A (a-3) is to be connected to timeslot mb-1 and the `rtrv-crs-sts1` 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-sts1` commands.

8. ⇒ NOTE:
   In Release 3 or later, channel state provisioning provides IS, AUTO, and NMON states for STS channels similar to the channel states for 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-sts1:`** command to provision pass-through connections. [For example, to make pass-through cross-connections for STS-1 #1, use the **`ent-crs-sts1:mb-1,mb-1`** command.]

9. At the terminating (drop) nodes of the circuit being established, use the `ent-crs-sts1:` command to make the terminating cross-connections (for example, `ent-crs-sts1:mb-1,b-2`)

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, verify proper backplane EC-1 cable connections [**J30-J33**, **J31-J34**, **J32-J35** (**FN A**)], [**J36-J39**, **J37-J40**, **J38-J41** (**FN B**), [**J42-J45**, **J43-J46**, **J44-J47** (**FN C**), [**J48-J51**, **J49-J52**, **J50-J53** (**FN D**), between function groups used for service being provided. See CO 1 and CO 2 in Figure 1.

13. ⇒ NOTE:
    Ring 1 is the ring being received on the **MAIN-B-1 OLIU**. Ring 2 is the ring being received on the **MAIN-B-2(P) OLIU**. The ***ring*** parameter of the `ent-crs` commands is used to identify which ring rotation will be continued as well as dropped at a node. If Ring 2 continues to the next node, then ***ring=mb2***.

    At the dual ring interworking node sites, determine the ring (Ring 1 and Ring 2) rotation for each node. For example, in Figure 1, note that at CO 1 in the top ring configuration, Ring 2 is the transmitting ring from CO 1 to CO 2. In the bottom ring configuration, Ring 1 is the transmitting ring from CO 1 to CO 2, then ***ring=mb1***.

14. 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-B-1 OLIU** (mb-1) is to be cross-connected to function group B (b) then the command `ent-crs-sts1:mb-1,b-1:cct=dc,ring=mb2` 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-sts1:` command to verify that the proper connection has been made. If an improper cross-connection is made, use the `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 `inc. STS1 AIS` alarms are present, look for missing or improperly made cross-connections. Use **TAP-124** to locate missing cross-connections, if required.

Perform Optical Fiber Connections and Verification of Optical Facility for FUNCTION UNITS OLIUs

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 function unit optical fiber spans for an OC-12 network consisting of OC-3 and OC-12 Multiplexers. For each span, determine the loss of each optical fiber and install the proper LBO on the **OUT** connector of each **OLIU**. 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 and OC-12 Multiplexers 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 OLIU**s, the recommended optical fiber is single-mode. **21D/21D-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-522**

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 in the **OLIU OUT** connectors with a 0 dB LBO. Connect the optical fiber transmit cable to the **OLIU OUT** connection. Measure the optical power of the optical fiber receive cable at the other end using an optical power meter.

6. At both ends of the optical span, replace the *ST*, FC/PC, or SC LBO on the **OUT** (transmit) connectors of the **OLIU** with a 0 dB LBO [**DLP-538**].

7. At each end of the span, connect the optical fiber transmit cable to the **OLIU OUT** connection.

8. At each end of the span, measure the optical power of the optical fiber receive cable using an optical power meter.

9. Replace the lightguide buildout assembly on the **OLIU** with the correct buildout assembly per Figure 1 and Tables C, D, E, F, G, H, and/or I. [**DLP-538**].

Reconnect the optical fiber transmit cables at both ends.

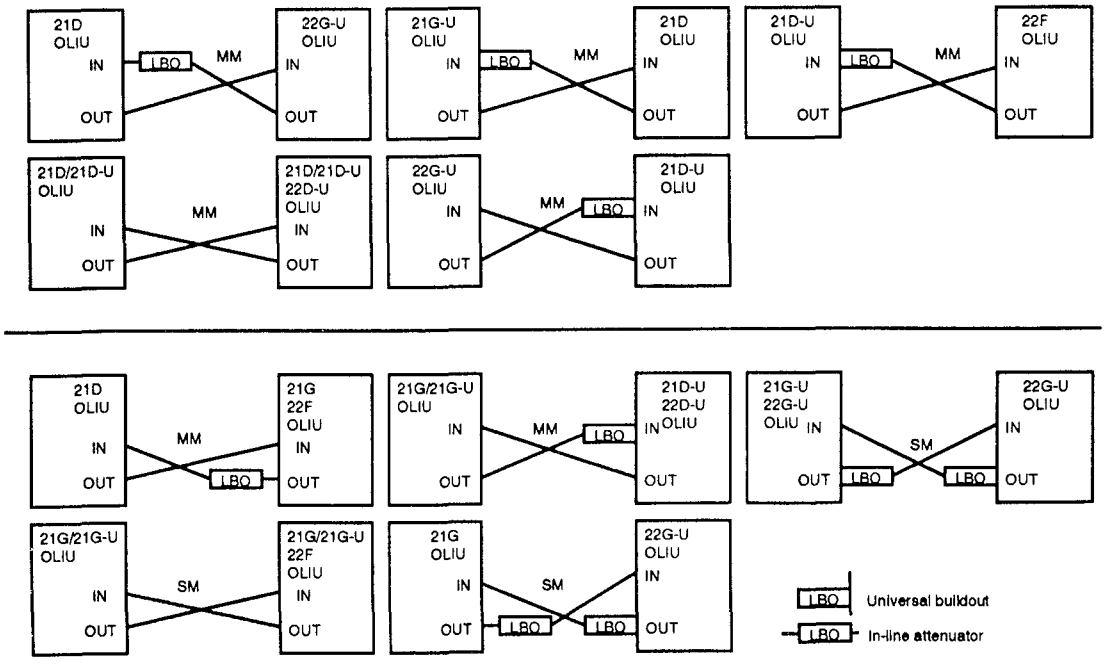


Figure 1. Fiber Optic Connections and Line Buildouts

Table C. Measured Optical Power and Required LBO

	Receiver									
	21G/21G-U OLIU (High/Low Power)		22F OLIU		22G-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)
21G/21G-U OLIU		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	-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	-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	-15.0 to -33.8	0	-15.0 to -31.8	0
21G/21G-U OLIU		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	-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	-15.0 to -33.8	0	-15.0 to -31.8	0
22F OLIU		10		10		10	-8.0 to -10.0	10	-8.0 to -10.0	10
		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	-15.0 to -33.8	0	-15.0 to -31.8	0
22G-U OLIU		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	-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	-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	-15.0 to -33.8	0	-15.0 to -31.8	0
21D/21D-U/22D-U OLIU (Controlled & (Uncontrolled Env.)		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	-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.

Table D. In-Line Multimode and Single-Mode 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 E. Universal *ST* Multimode and Single-Mode 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	A3070B	106795362	*ST*	SM-SM	Blue
10 dB	A3070D	106795370	*ST*	SM-SM	Black
15 dB	A3070F	106795388	*ST*	SM-SM	Green
20 dB	A3070H	106795396	*ST*	SM-SM	Red

Table F. Universal FC/PC Multimode and Single-Mode 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	A3080B	106795412	FC/PC	SM-SM	Blue
10 dB	A3080D	106795420	FC/PC	SM-SM	Black
15 dB	A3080F	106795438	FC/PC	SM-SM	Green
20 dB	A3080H	106795446	FC/PC	SM-SM	Red

Table G. Universal SC Multimode and Single-Mode 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	A3060B	106708969	SC	SM-SM	Blue
10 dB	A3060D	106708977	SC	SM-SM	Black
15 dB	A3060F	106708985	SC	SM-SM	Green
20 dB	A3060H	106708993	SC	SM-SM	Red

Table H. Universal ST Multimode 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 I. Universal SC Multimode 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:
In Release 2 and later, ONE system 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.

At far end, connect the input optical fiber(s) to the proper **OLIU IN** (receive) connector at far end.

11. Did **FAULT** LED go off on the **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 (Step 17). Ensure 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 **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 (Step 17). Ensure **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:` command to retrieve a map of the network (Figure 2).

Fiber Verification

16. Disconnect the optical 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:` command to retrieve a map of the network (Figure 2).

```
/* Network Map for <System_name>
   ==========================================================================
    System Name (TID)      Connected      Neighbor     Communication     GNE
                             Through                      Status
   ==========================================================================
   Site7                     fn-a          yes                           yes
   Site3                     fn-b          yes
   Site4                     fn-c          no            FAILED

*/
```

Figure 2. Sample Report From `rtrv-nmap` Command

18. After all connections and tests have been made, verify optical fiber cables are placed correctly in fiber tray 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.**

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 STS-1/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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