Lucent Technologies
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DDM-2000 OC-12 Multiplexer Release 5

User/Service Manual — Volume I

363-206-290
Issue 2
November 1996

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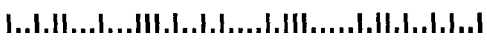


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About This Document

Purpose

This *DDM-2000 OC-12 Multiplexer User/Service Manual, Volume I,* includes Releases 5.0, 5.1 and provides the following:

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

The *DDM-2000 OC-12 Multiplexer User/Service Manual (TOP), Volume II,* includes Releases 5.0, 5.1 and provides operation and maintenance (O&M) task oriented practice (TOP) supporting acceptance, turnup, and maintenance.

(Prior to Release 5, refer to LTP 363-206-207.)

Intended Audiences

This user/service manual is used by training and by the end users responsible for O&M of the DDM-2000 OC-12 Multiplexer. It may be used by anyone desiring specific information about the DDM-2000 OC-12 Multiplexer O&M.

Reason for Reissue

This is Issue 2 of this document. It replaces *DDM-2000 OC-12 Multiplexer User/Service Manual, Volume I,* Issue 1. It has been updated with information on Release 5.1. Significant changes to this document are noted by change bars (|) in the outermost margins.

Safety Instructions

Product Safety Labels

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

These admonishments have the following definitions:

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

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

The alert symbol • appears throughout this product and in this manual to alert the user to the presence of important operating and maintenance (servicing) instructions for the DDM-2000 OC-12 Multiplexer.

Lightwave Safety Guidelines

General Laser Information

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

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

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

Lasers and Eye Damage

Light energy emitted by laser and high-radiance LEDs in the 400-1400nm range may cause eye damage if absorbed by the retina. When a beam of light enters the eye, the eye magnifies and focuses the energy, magnifying the irradiance. The irradiance of energy that reaches the retina is approximately 10^5 or100,000 times that at the cornea; and if sufficiently intense, may cause a retinal burn.

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

Classification of Lasers

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

Lightwave Safety Precautions

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

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

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

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

Safety Precautions for Enclosed Systems

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

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

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

Safety Precautions for Unenclosed Systems

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

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

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

Electrostatic Discharge (ESD) Considerations

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

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

† ANSI is a registered trademark of American Standards Institute, Inc

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

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

* Registered trademark of The Dow Chemical Company.

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

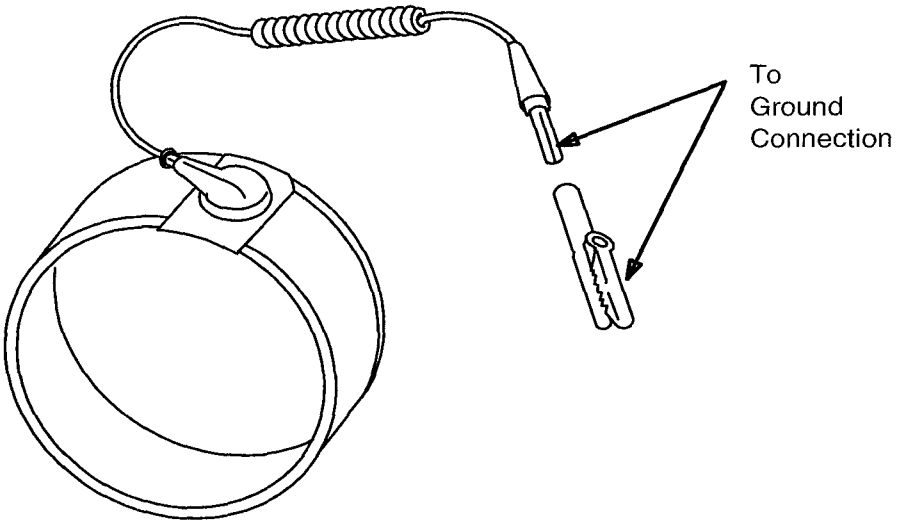


Figure A. Static Control Wrist Strap

IMPORTANT SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
4. Slots and openings in this product's back or bottom are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided. For information on proper ventilation requirements, consult the "Equipment Installation Considerations" section of LPT 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 Lucent Technologies' 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 LTP 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 Multiplexers:

- Number: LTP 190-523-101 (User Manual only) Release 3.0
  Order Comcode 107265944 for User Manual & Software for Release 3.0

  Title: *CPro-2000 User Manual*

  Audience: Maintenance personnel

  Content: Using the tool to provision and maintain ring networks

- Number: LTP 365-576-100 (User Manual only) Release 4.0
  Number: LTP 365-576-101 (User Manual & Software) Release 4.0

  Title: *CPro-2000 User Manual*

  Audience: Maintenance personnel

  Content: Using the tool to provision and maintain ring networks

- Number: LTP 365-576-110 (User Manual only) Release 5.0
  Number: LTP 365-576-111 (User Manual & Software) Release 5.0

  Title: *CPro-2000 User Manual*

  Audience: Maintenance personnel

  Content: Using the tool to provision and maintain ring networks

- Number: LTP 365-576-120 (User Manual only) Release 6.0
  Number: LTP 365-576-121 (User Manual & Software) Release 6.0

  Title: *CPro-2000 User Manual*

  Audience: Maintenance personnel

  Content: Using the tool to provision and maintain ring networks

- Number: LTP 363-206-200

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

  Audience: Network planners, equipment engineers, and sales teams

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

- Number: LTP 363-206-201

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

  Audience: Maintenance personnel

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

- Number: LTP 363-206-204

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

  Audience: Customers planning to install the equipment

  Content: Customer installation instructions

- Number: LTP 363-206-206

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

  Audience: Maintenance personnel

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

- Number: C107564270

  Title: *ITM SNC Users Guide*

  Audience: Operations personnel

  Content: Integrated Transport Management Subnetwork Controller information.

- Number: LTP 363-206-207

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

  Audience: Maintenance personnel

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

- Number: LTP 363-206-208

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

  Audience: Customers planning to install the equipment

  Content: Customer installation instructions

- Number: LTP 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: LTP 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: LTP 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: LTP 363-206-280

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

  Audience: Maintenance personnel

  Content: Detailed description, technical specifications, commands and reports (Volume I), and operations and maintenance procedures (Volume II) for DDM-2000 OC-3 Multiplexer, Releases 8.1 and 9.1

- Number: LTP 363-206-281

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

  Audience: Maintenance personnel

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

- Number: LTP 363-206-291

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

  Audience: Maintenance personnel

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

- Number: LTP 363-206-300

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

  Audience: Network planners, equipment engineers, and sales teams

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

- Number: LTP 363-206-301

  Title: *DDM-2000 FiberReach Multiplexer Wideband Shelf User/Service Manual*

  Audience: Maintenance personnel

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

- Number: LTP 363-206-310

  Title: *DDM-2000 FiberReach Multiplexer Installation Manual*

  Audience: Users planning to install the equipment

  Content: Customer installation instructions

- Number: LTP 824-102-147

  Title: *2000 Product Family Operations Interworking Guide*

  Audience: Maintenance Personnel

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

- Number: LTP 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. Will become only FT-2000 OC-48 Lightwave System when reissued (see LTP 824-102-151).

- Number: LTP 824-102-149

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

  Audience: Engineers

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

- Number: LTP 824-102-151

  Title: *DDM-2000 Multiplexers Operations Systems Engineering Guide*

  Audience: Engineers

  Content: Operations systems engineering information for the DDM-2000 Multiplexers

- DDM-2000 OC-3 Drawings:

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

- DDM-2000 OC-12 Drawings:

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

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

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

- Number. LTP 363-205-000

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

- Number: LTP 363-205-010

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

- Number: LTP 626-500-105

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

- Number: LTP 626-500-115

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

The following documents provide additional information about related equipment:

- Number: LTP 363-206-150

  Title: *DDM-Plus User/Service Manual*

- Number: LTP 363-206-151

  Title: *DDM-Plus Installation Manual*

- Number: LTP 363-206-152

  Title: *DDM-Plus Quick Reference Guide*

- Number: LTP 363-206-156

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

- Number: LTP 363-206-157

  Title: *DDM-Plus Wall DT Installation Manual*

- Number: LTP 365-303-102

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

- Number: LTP 365-301-130

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

- Number: LTP 365-331-000

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

- Number: LTP 365-340-004

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

- Number: LTP 365-575-100

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

- Number: LTP 636-299-120

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

- Title: *MegaStar** 2000 Documents

Comcode 107585648	Installation Manual
Comcode 407397512	Schematic Package
Comcode 107585655	Reference Manual
Comcode 107585671	System Application Manual

* Trademark of Harris Corporation

Related Training

The National Product Training Center at Dublin, Ohio, and Lisle, Illinois, provides management courses for planning, engineering, and ordering, as well as training for telecommunications technicians in installation, operations, and maintenance. Suitcasing of these courses is available. Consult your local Lucent Technologies' 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: LW2211 (CD-ROM)

  Title: DDM-2000 OC-3/OC-12 Multiplexer Fundamentals

  Audience: A CD-ROM-based course for anyone interested in learning the fundamentals of operation of the DDM-2000 OC-3/OC-12 Multiplexers

  Content: General information about the DDM-2000 OC-3 and OC-12 Multiplexers, including a product overview, applications, and architecture

- Number: LW2212

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

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

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

- Number: LW2312

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

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

  Prerequisite: LW2212

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

- Number: LW2603

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

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

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

- Number: LW2608

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

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

  Prerequisite: LW2603

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

- Number: LW2610

  Title: DDM-2000 FiberReach Wideband Shelf, Operations and Maintenance

  Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in DDM-2000 FiberReach network functions

  Prerequisite: LW2212, LW2312, LW2603, or LW2608

  Content: Information supporting operations, maintenance, and provisioning of DDM-2000 FiberReach Wideband Shelf. On-site shelves are used for extensive hands-on experience.

- Number: LW2611

  Title: DDM-2000 FiberReach Multiplexer Release 1.0 Self-Paced Course

  Audience: Technicians, supervisors, maintenance engineers, and operation support personnel involved in DDM-2000 FiberReach network functions

  Prerequisite: LW2212, LW2312, LW2603, or LW2608

  Content: Information supporting system engineering and planning, applications, operations, maintenance, and provisioning of DDM-2000 FiberReach networks

- Number: LW2612

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

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

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

- Number: LW2614

  Title: 2000 Product Family Surveillance and Performance Monitoring

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

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

- Number: LW2618

  Title: Advanced Ring Network Applications, Operations, and Maintenance

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

  Prerequisites: LW2608 and LW2616

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

Customer Technical Support (CTS)

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

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

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

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

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

single point of contact with the customer, the RTAC engineer will involve all necessary tiers of support to solve the customer problem.

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

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

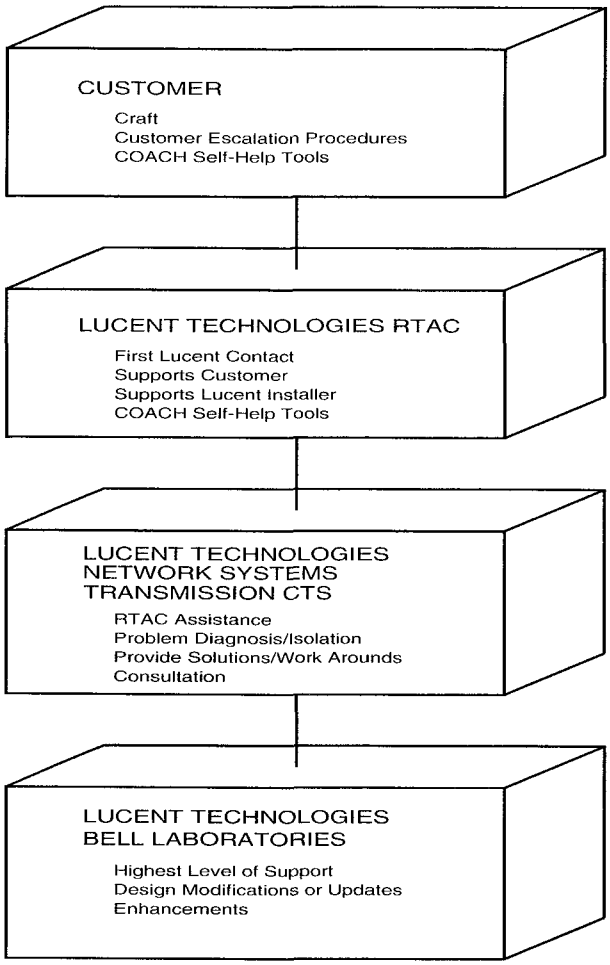


Figure B. Product Support

The following COACH tools are available to the user:

- Diagnostic Dictionary

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

- News and Bulletins

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

- Compatibility Data

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

- COACH User's Guide

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

For information on obtaining a COACH login, contact:

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

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

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

Engineering and Installation Services

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

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

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

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

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

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

Customer Technical Support Enhanced Services

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

Typical Enhanced Services include:

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

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

Documentation Support

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

How to Order Documents

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

Customer	Mail Order	Telephone Order *(Monday through Friday)*
Commercial Customers *	Lucent Technologies Customer Information Center Attention: Order Entry Section 2855 N. Franklin Road P.O. Box 19901 Indianapolis, IN 46219	Within USA: 1-888-LUCENT8 **1-888-582-3688** *7:30 a.m. to 6:30 p.m. EST* FAX: **1-800-566-9568** From Europe, The Middle East & Africa: Toll **1-317-322-6416** From Canada, the Caribbean & Latin America: Toll **1-317-322-6646** From Asia, the Pacific Region & China: Toll **1-317-322-6411** Worldwide: FAX: **1-317-322-6699**
RBOC/BOC	Process through your Company Documentation Coordinator	

* For commercial customers, a check, money order, purchase order number, or charge card number is required with all orders. Make checks payable to Lucent Technologies.

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

Standing Orders

One-time orders include a binder (if applicable) and the document contents for the current issue in effect at the time of order. Also, you may request placement on the standing order list for all later reissues of the document. The standing order list for each document provides automatic distribution for all reissues of the document. RBOC/BOC customers should process document orders or standing order requests through their Company Documentation Coordinator. For questions regarding standing orders or to be placed on a standing order list, call the applicable Lucent Customer Information Center number listed in "How To Order Documents."

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Feedback forms are located immediately after the title page of this document. Please fill out the form and return it to the address stamped on the front of the form or fax it to the number provided on the form.

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 Lucent Technologies' Account Executive, or the Lucent Customer Information Center (1-800-432-6600).
- For pricing information, contact your Lucent Network Systems Account Executive or the Lucent Customer Information Center (1-800-432-6600). The CD-ROM Product Line Order Number for the All Access and Transport Products Grouping is LTP 300-100-010.
- For technical information, call Lucent Documentation Support (1-800-334-0404).

System Introduction

1

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System Introduction

1

Overview

This section introduces the Lucent Technologies' 2000 Product Family and briefly describes the DDM-2000 OC-12 Multiplexer.

Introduction to the 2000 Product Family

Lucent Technologies 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 2000 Product Family includes the following products:

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

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.

The DDM-2000 OC-12 Multiplexer is designed for loop (access), interoffice (transport), and customer location applications. The DDM-2000 OC-12 Multiplexer starts with many of the proven features of Lucent Technologies' 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 integrated test capabilities 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 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 a craft interface terminal (CIT) gives access to sophisticated maintenance, provisioning, and reporting features. A personal computer (PC) is needed to download software and to run CPro-2000 graphical user interface tool software.

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. See LTP 363-206-207, "DDM-2000 OC-12 Multiplexer and OC-12 Regenerator User/Service Manual" for more information on the OC-12 Regenerator.

The DDM-2000 OC-12 Multiplexer has a phased release plan. This manual covers Release 5.1. The manual will be updated to cover additional releases as they become available.

DDM-2000 OC-12 Multiplexer Releases

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 TL1/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 short-reach multimode proprietary optical interface (IS-3) between the OC-3 and OC-12 shelves and the BBF2B TGS circuit pack, which provides DS1 timing outputs. Release 1.0 includes a security feature that offers security against unauthorized access to the CIT system functions. Logins, passwords, and user categories are provided. Security can be enabled or disabled.

Release 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 OC-48 Lightwave System 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 [AUTO], in-service [IS], and not monitored [NMON]) for STS-1 channels.

Release 2.3 provides OC-3 line state provisioning in addition to the features of Release 2.2. Line state provisioning allows in-service and not-monitored states of OC-3 line level alarms on Function Unit OLIUs. The alarms can be squelched and removed from the alarm report. Used in one-way OC-3c transport on OC-12 video applications.

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 (ring 0x1 low-speed interface) optical interconnections between DDM-2000 OC-3 and OC-12 ring shelves (OC-3/IS-3), enhanced DS3 PM, channel state provisioning, OC-3 ring to OC-12 ring in-service upgrades, low-speed EC-1 loopbacks, and additional TL1 commands and enhancements.

The OC-12 STS-1/VT1.5 path switched ring (ring 0x1 low-speed interface) OC-3/IS-3 interface offers a significant advantage over the 1+1 protected OC-3/IS-3 interface for VT1.5 path switched ring applications. Ring (0x1) low-speed interface means two service lines (no protection lines) are used between the OC-12 Multiplexer ring and the OC-3 Multiplexer ring.

Ring 0x1 low-speed 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 (from the fiber or high-speed interface) 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 (AUTO, IS, and NMON) 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.

Release 5.0 is a ring release using the new BBG8 system controller and BCP4 overhead controller circuit packs.

- New applications:
  - — OC-3/IS-3 DRI with STS-1/STS-3c drop and continue. DDM-2000 and DDM-2000/FT-2000 OC-48 Lightwave System rings can be interconnected over OC-3, IS-3, OC-3c, or IS-3c interfaces with single-ended operations and DCC connectivity. Upgrades from EC-1 DRI to OC-3/IS-3 DRI.
  - — OC-3/OC-3c/IS-3/IS-3c linear optical extensions. 1+1 protected OC-3/OC-3c/IS-3/IS-3c linear optical extensions from OC-12 rings.
  - — OC-3c transport for broadband services.
  - — OC-3 operations interworking with FT-2000 OC-48 Lightwave System. Single-ended operations and DCC connectivity supported over OC-3 interfaces. Requires FT-2000 OC-48 Lightwave System Release 6.0 software.
  - — Dual homing. An OC-3 ring can be dual-homed to two different OC-12 shelves via ring (0x1) low-speed interface interconnections. Full DCC connectivity to the OC-3 ring.
  - — Ring (0x1) low-speed interface to OC-3 multinode ring. OC-3 multinode ring is connected to an OC-12 ring shelf via ring (0x1) low-speed interface interconnection to a single OC-12 Function Unit. Full DCC connectivity to the OC-3 ring.
  - — STS-3c broadcast for video applications.
  - — Increased subnetwork sizes. DDM-2000/*SLC*-2000 subnetworks of 32 network elements (NE). Mixed DDM-2000/*SLC*-2000/FT-2000 OC-48 Lightwave System/OC-3 Release 7.2 subnetworks of 24 to 32 NEs.

- New features:
  - — Multiple Operations System (OS) Gateway Network Element (GNE). In DDM-2000/*SLC*-2000 subnetworks, more than one NE can be physically connected to X.25 allowing OSs to automatically select an alternate GNE in case of primary GNE failure. The feature also allows different GNEs to support different OSs simultaneously.
  - — Additional X.25 switched virtual circuits. Nine virtual circuits can be provisioned in any combination of switched and permanent virtual circuits for connections to OSs.
  - — Provisionable X.25 packet size of 128 or 256 bytes.
  - — Centralized operations over X.25 link. DDM-2000 CIT commands have equivalent TL1 commands. This allows centralized operations of DDM-2000 systems via the TL1/X.25 link as an alternative to CIT commands.
  - — New controllers. The new BBG8 and BCP4 controller circuit packs provide expanded memory and processing capacity needed to support large networks. Feature enhancements include:
    - Remote software download. Software can be downloaded from a PC connected to a DDM-2000/*SLC*-2000 NE to either the local or remote NEs.
    - Electronic provisioning. Provisionable parameters are set by software, thus reducing the need for DIP switches. CIT baud rate is provisioned automatically via autobaud detection.
    - User assigned RT miscellaneous discretes increased from 15 to 21.
    - Upgrades to the new controllers can be done in service.
  - — Enhanced PM. Enhancements to DS3 line and path PM to further support tariff verification. Enhanced DS3 PM requires the new BBG11B 3DS3 circuit pack.
  - — Path switching and channel state provisioning for STS-3c channels.
  - — Line state provisioning. A capability provided on DDM-2000 OC-12 Multiplexers that suppresses reporting of alarms and events by supporting multiple states (IS and NMON) for OC-3 low-speed interfaces.

- — Enhanced security. General- and reports-only users increased from 50 to 100. Lockout of nonprivileged users and log of all login attempts is provided.
- — Electrical facility loopbacks. DS3 and EC-1 equipment loopbacks of the incoming low-speed signal back towards the DSX.
- — STS path trace. Provided in the J1 byte of the SONET path overhead to verify STS path continuity. The path trace signal is used to verify path continuity by repetitively transmitting a fixed 64 byte length string. The value of the transmit and receive expected path trace signal is provisionable. The value of the provisionable receive expected path trace signal is compared to the actual received path trace signal to verify continuity. This allows "labeling" of STS-1s and retrieval of the path by the "label" (for example, "ABC #1"). STS path trace requires the new BBG11B 3DS3 circuit pack.
- — Provisionable AIS or unequipped conditions. Allows the user to provision, on a per-shelf basis, for either AIS or unequipped signal insertion on a non-cross-connected STS channel.
- — Provisionable line and path AIS alarm levels. Alarm levels can be provisioned on a per-line or per-path basis.
- — Brownout protection. If the voltage to the shelf drops below the safe operating voltage, the system will suspend normal operations and wait for safe operating voltage to return. Assuming a sufficient voltage level, a flashing "L" will be displayed on the system controller (SYSCTL).
- — SYSCTL optical faceplate latch. An optical switch on the BBG8 SYSCTL circuit pack latch causes a suspension of controller operations and an "F" to be displayed on the SYSCTL display when the latch is pulled. Closing the latch causes a controller reset.
- — DS3 failure generates STS path AIS. With the OC-12 shelf provisioned for DS3 DRI, a DS3 failure translates to an STS path AIS to ensure a downstream STS path switch.

Release 5.1 is an enhanced ring release which supports all features of R5.0. In addition, it supports the following:

- New Applications:
  - — Enhanced DS3 Dual Ring Interworking translation of an incoming DS3 failure condition into an STS-1 AIS condition for far-end detection and STS-1 path switching of the failed DS3.

- New Features:
  - — S1 byte Synchronization Messaging. Uses the S1 byte of the SONET overhead to pass timing status information to different nodes in a loop-timed network. Synchronization messaging mode (S1 byte or K2 byte) is provisionable on a per OC-N basis.
  - — Enhanced software download. Provides a software copy capability which allows new software generic to be downloaded to the DDM-2000 system while the current version is still running. When the appropriate command is initiated, the new generic is executed with no disruption of DCC. Execution of the new generic can be scheduled, allowing coordination of cutover of several NEs in the subnetwork.
  - — Fourth level of security. A new maintenance security level, which allows access to Reports and some maintenance activities is provided in addition to the three current levels of privileged, general, and reports-only.
  - — Large networks. Supports DDM-2000 and FiberReach networks of up to 50 nodes.
  - — CPro-2000, ITM SNC support. Release 5.1 is supported by:

    CPro-2000 Releases 5.0 and 6.0, ITM SNC Releases 2.2 and 4.0.

Applications

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Applications

2

Overview

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

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

Introduction

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

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

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

Network Configurations

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

Path Switched Rings

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

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

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

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

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

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

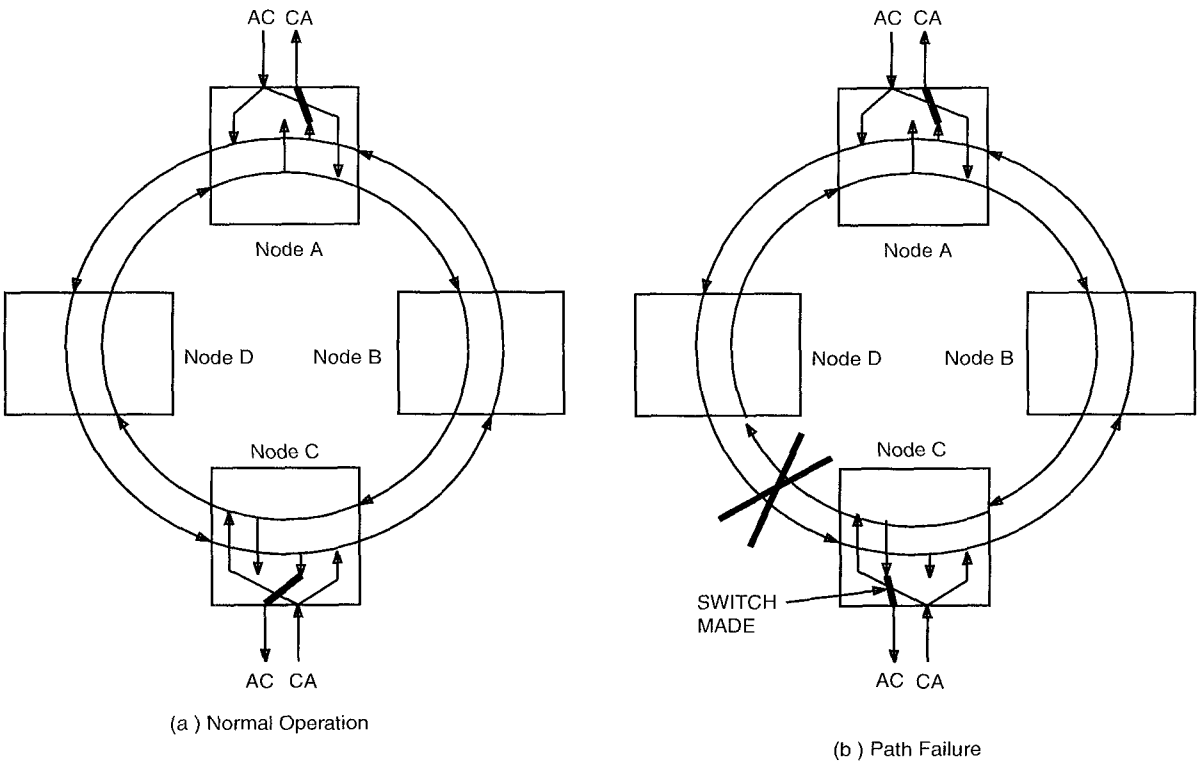


Figure 2-1. Path Switched Ring

OC-12 Path Switched Rings

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

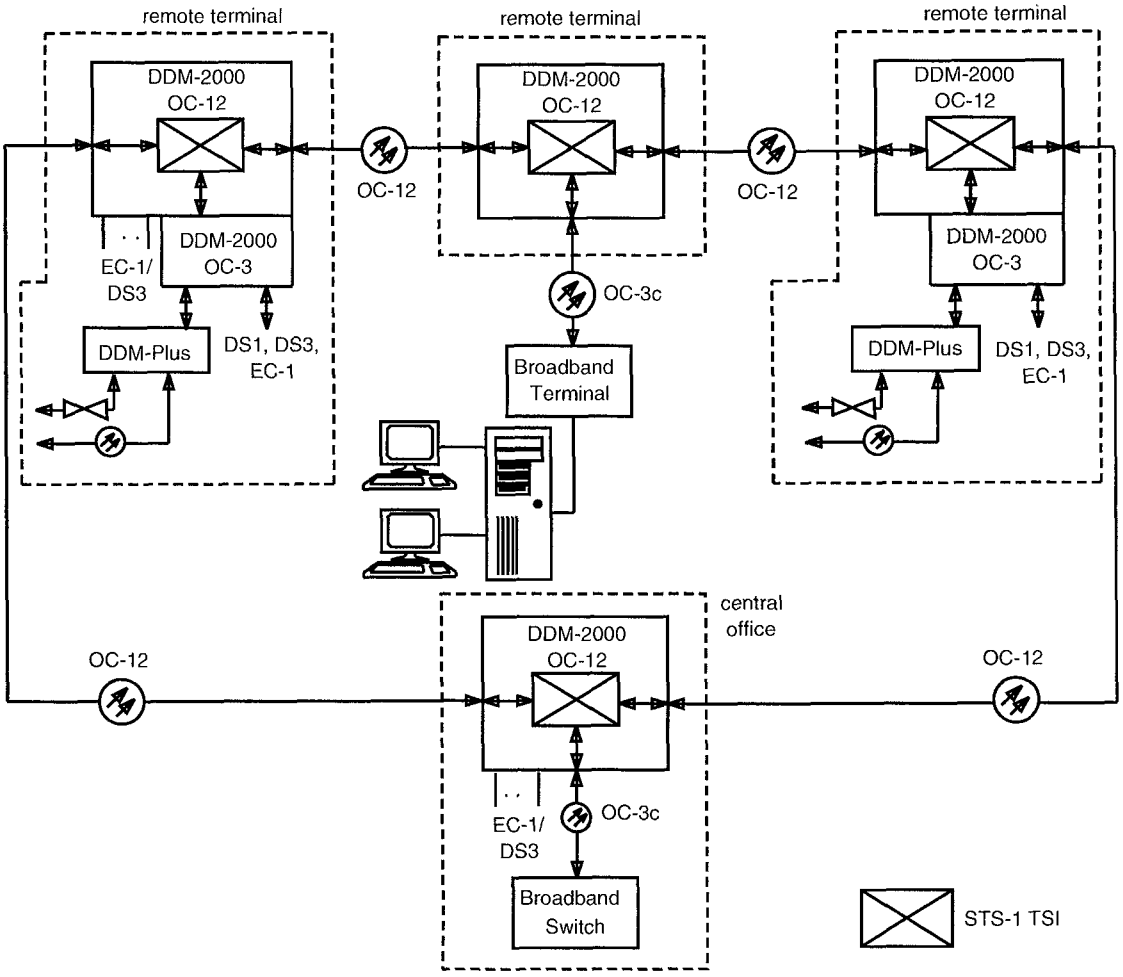


Figure 2-2. OC-12 Path Switched Ring — STS-1 Level Path Switching

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

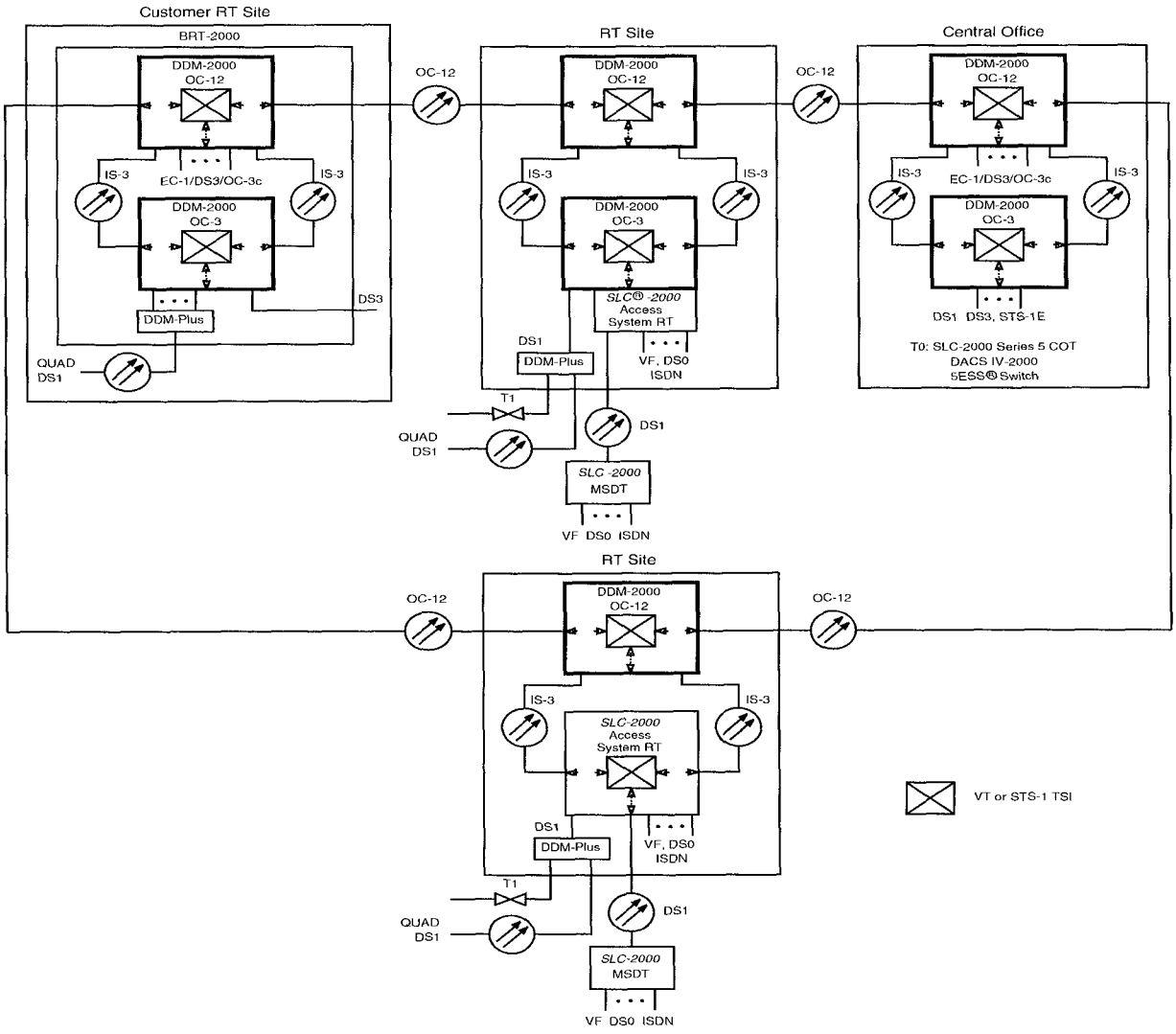


Figure 2-3. OC-12 Path Switched Ring Using OC-12 Multiplexer—Mixed STS-1 and VT1.5 Path Switching

If fiber exhaustion is a problem, the 2000 Product Family provides several alternatives for the network planners to pick from, depending on the specifics of their application. If fiber is available, multiple DDM-2000 OC-3 Multiplexer rings can be installed; or if fiber is unavailable or if the administrative ease of a single ring is desired, a single DDM-2000 OC-12 Multiplexer ring can be installed. Fiber exhaustion often occurs when customer demand for voice, DS1, and DS3 services grows to fill the OC-3 ring's capacity. If the growth has come from only one or two sites and there is spare fiber in place, these high demand sites may be cut to a new OC-3 ring without interrupting service. Alternatively, driven by fiber exhaustion or evolution to customer DS3 services, the OC-3 ring may be upgraded in service to an OC-12 ring. In this configuration (Figure 2-4), DDM-2000 OC-3 Multiplexer equipment is colocated with a DDM-2000 OC-12 Multiplexer shelf to provide a unified VT1.5 path switched ring node with an OC-12 high-speed interface.

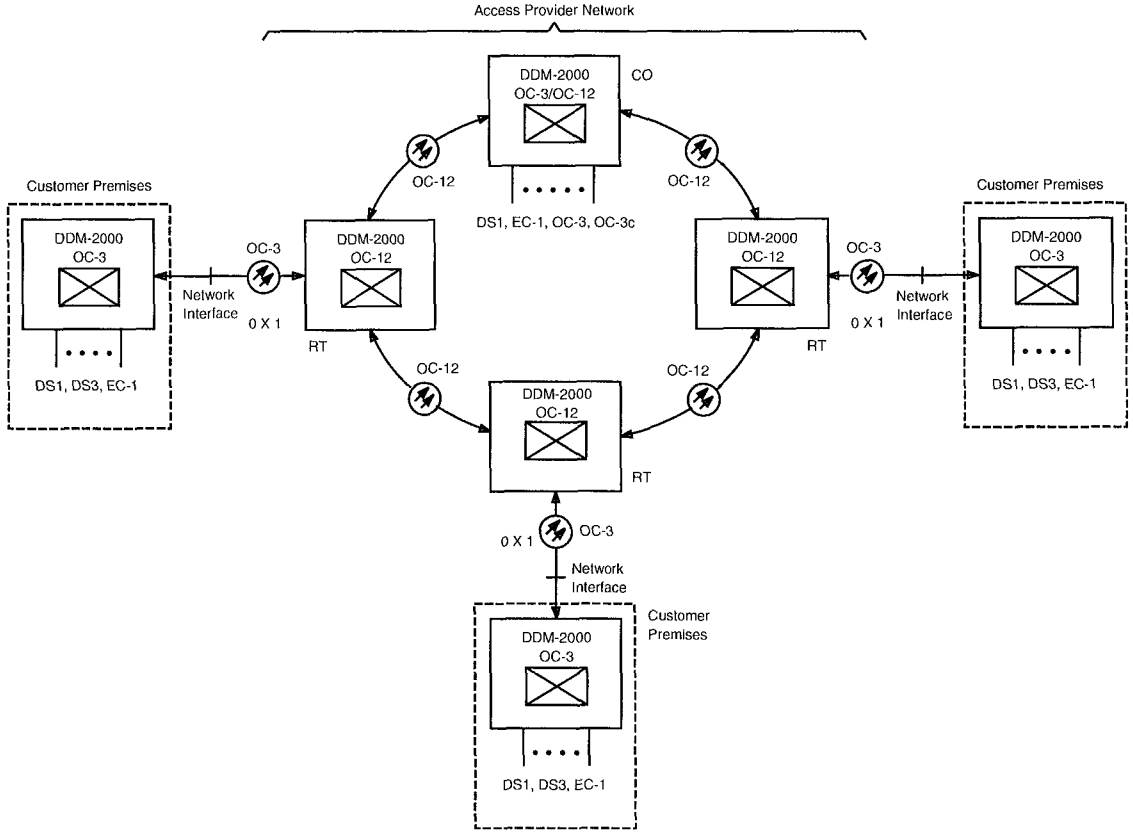


Figure 2-4. OC-3 Ring with OC-12 Ring Transport

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

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

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

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

For customers who have significant bandwidth demands or whose geographical situation requires additional OC-3 shelves from a single OC-12 location, Figure 2-5 shows how these applications can also be met. In addition, diverse routing to two separate OC-12 shelves can increase the reliability of the network even further.

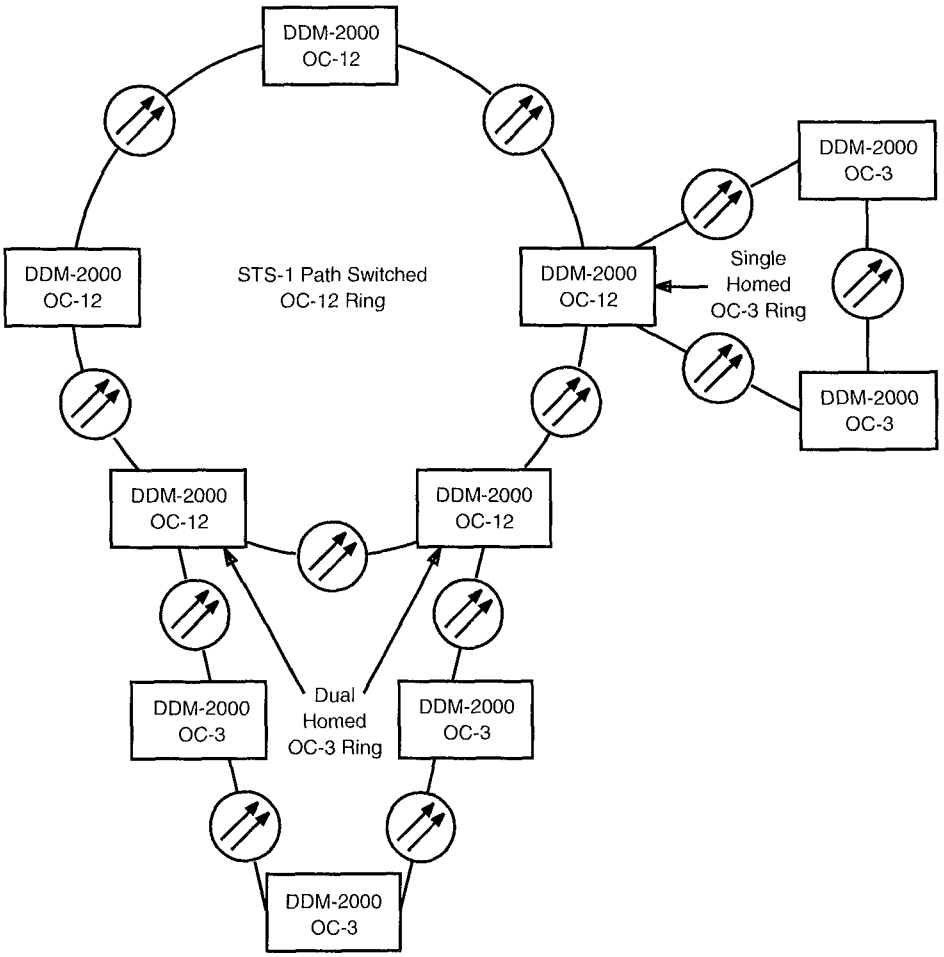


Figure 2-5. Multinode OC-3 Ring With OC-12 Ring Transport

The DDM-2000 OC-3 and OC-12 Multiplexers' path switched ring capabilities work together to provide cost-effective transport for small or medium cross-section interoffice networks such as outstate trunks. Such a ring, shown in Figure 2-6, provides DS1, DS3, EC-1, and OC-3c transport.

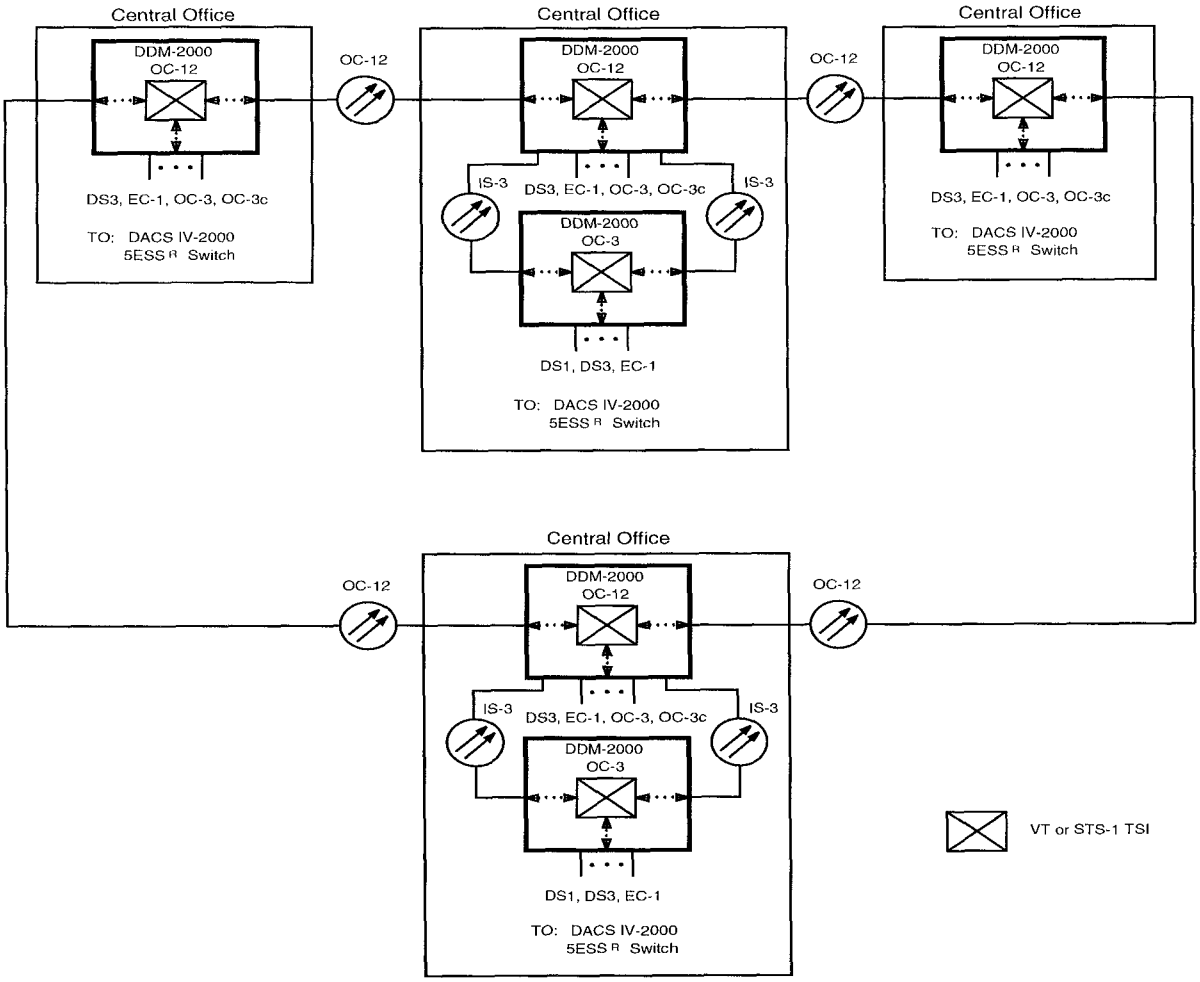


Figure 2-6. DDM-2000 OC-12 Path Switched Interoffice Ring

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

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

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

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

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

Folded Ring

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

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

When route diversity is not available or fiber cable cuts are not a driving concern, the two-fiber path switched ring feature can be applied in a "folded" (a folded ring is a single path ring) configuration (Figure 2-7). This use of DDM-2000 OC-3, OC-12, and *SLC*-2000 access resource manager (ARM) path switched rings applies in particular to hubbing and linear topologies where there is no return path from the end remote site to the central office (CO). While a complete cut through the fiber cable cannot be protected, single-node equipment failures are still protected. Furthermore, a two-fiber ring ARM uses only one optical transmitter/receiver in each direction (two per remote shelf), in contrast to a 1+1 line protection arrangement that requires four optical transmitter/receivers per remote shelf. Thus the ring configuration reduces equipment costs, a benefit independent of its survivability advantage. The ring topology also makes node addition/deletion straightforward.

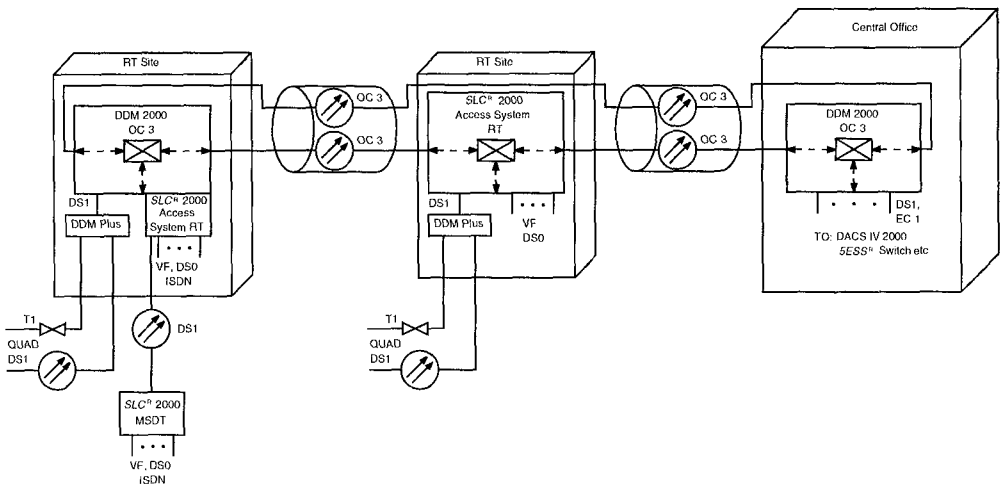


Figure 2-7. Folded Ring Configuration

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

Rings that cover a large geographical area or interconnected path switched rings are a cost effective and popular way for a service provider to offer these high priority services. Figure 2-8 shows a ring configuration using DDM-2000 OC-3 ring nodes with DDM-2000 OC-12 point-to-point nodes to provide a high-service availability architecture. This configuration will survive fiber, equipment, and catastrophic office failure, since it provides an alternative service path through a secondary CO and uses the path switching ability of the DDM-2000 OC-3 to select between these two paths.

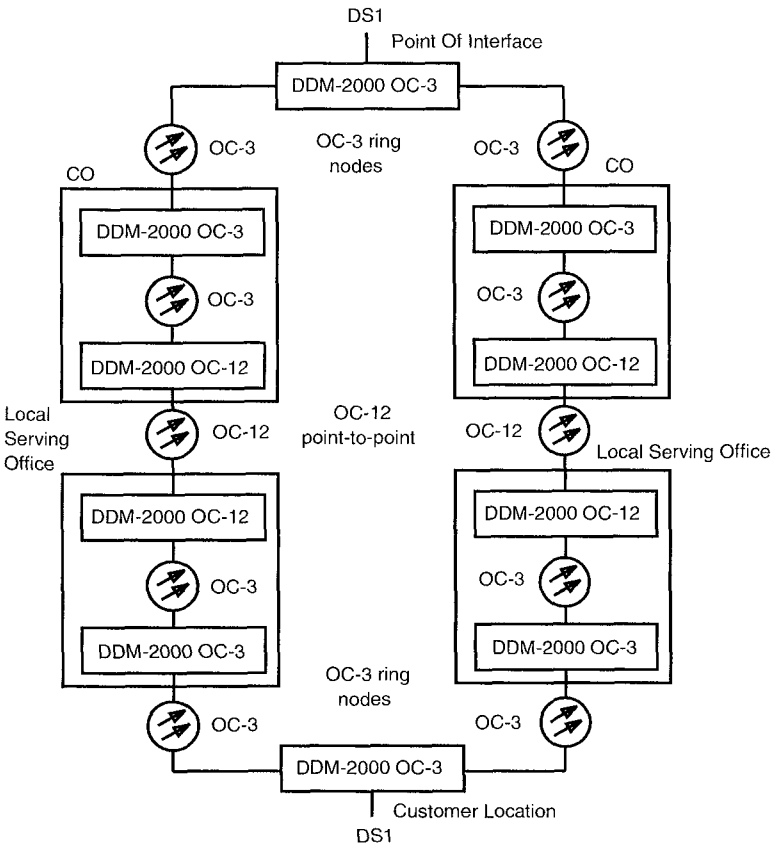


Figure 2-8. OC-3 Ring Transport on OC-12 Point-to-Point

Dual Homing

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

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

Dual Ring Interworking (DRI)

In an interconnected ring or DRI topology, two rings are connected together at two geographically separate nodes. In addition to the facility and node failure protection that a single ring provides, the dual node interconnection between the rings provides an automatic alternate route in the event of a catastrophic failure at one of the interconnecting nodes. Typically, such a topology is used to interconnect a loop feeder access ring to a higher bandwidth interoffice ring as shown in Figure 2-9. This architecture can withstand any single equipment or fiber failure in each of the rings or a failure (which could range from a CO shutdown in the case of fire, for example, or equipment failure, or failure of the facility connecting the two rings) of either of the two interconnecting nodes without losing service on either the access ring or the interoffice ring. Such a catastrophic failure would cause a service outage for a simple ring architecture.

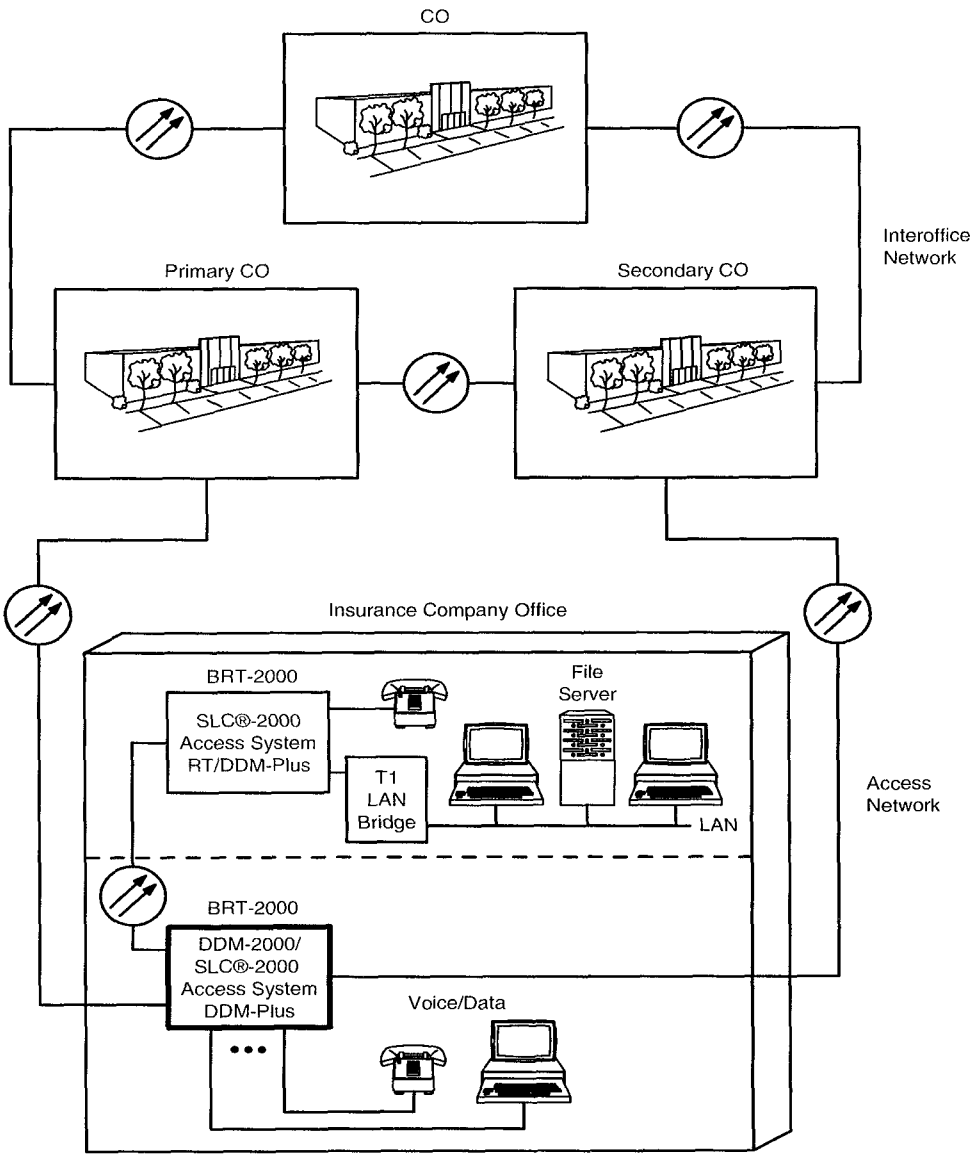


Figure 2-9. Dual Access Configuration

As Figure 2-10 shows, DRI allows a circuit (for instance, between nodes A and Z) with one termination in the upper ring and the other termination in the lower ring to survive a failure of the shared node that is currently carrying service for the circuit. The failure is depicted by an "X" in the figure. The two shared nodes are in CO B and CO C. Both nodes have the signal available to them at all times. When a failure occurs, the two terminating nodes and the two shared nodes switch so that traffic is carried through CO C and around the node failure.

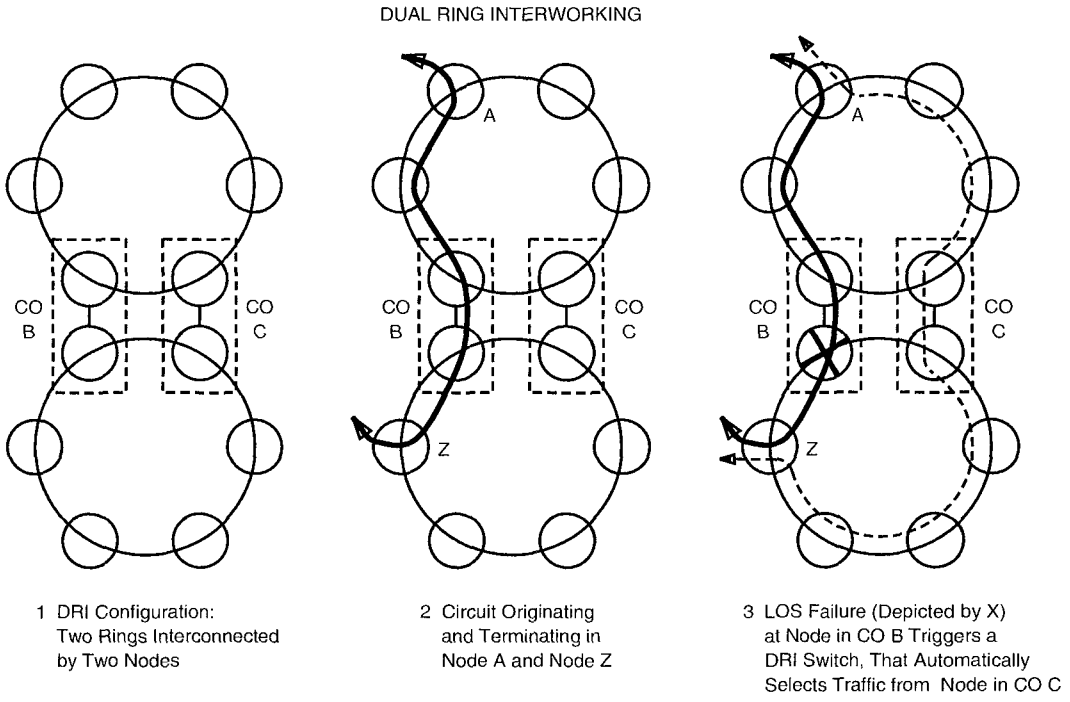


Figure 2-10. Dual Ring Interworking Concepts

DDM-2000 OC-3, OC-12, and FT-2000 OC-48 Lightwave Systems can be configured to offer this topology. Often the DDM-2000 equipment is used for the loop feeder access ring, and the FT-2000 OC-48 Lightwave System equipment is used for the interoffice ring. Figure 2-11 shows a DDM-2000 OC-3 (or OC-12) path switched ring interworking with an FT-2000 OC-48 Lightwave System bidirectional line-switched ring.

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

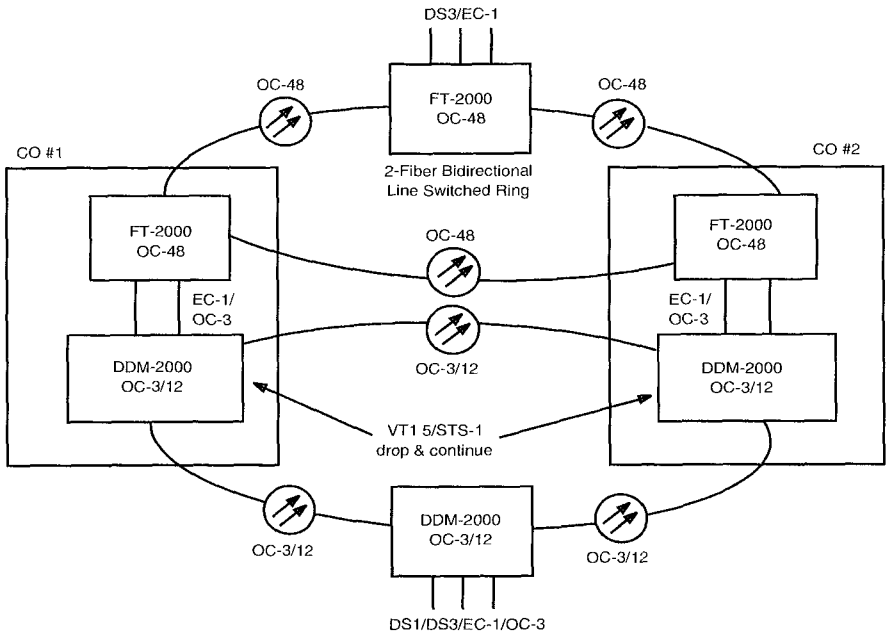


Figure 2-11. OC-3/12 to FT-2000 OC-48 Lightwave System Dual Ring Interworking

The DDM-2000 drop-and-continue feature also finds an excellent application in interconnecting two rings via an intermediate transport network. In the example shown in Figure 2-12, DDM-2000 OC-3 Multiplexer access rings act as a DRI pair via an FT-2000 OC-48 Lightwave System and DACS IV-2000 interoffice network. The advantage of this network is the grooming for DRI traffic provided by the DACS IV-2000. Both DDM-2000 OC-3 rings provide drop and continue at each of their two duplicate COs. Both copies of the signal are transported as separate tributaries through the interoffice network, and path switching is implemented at the edges of the network. Signal redundancy is preserved on an end-to-end basis.

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

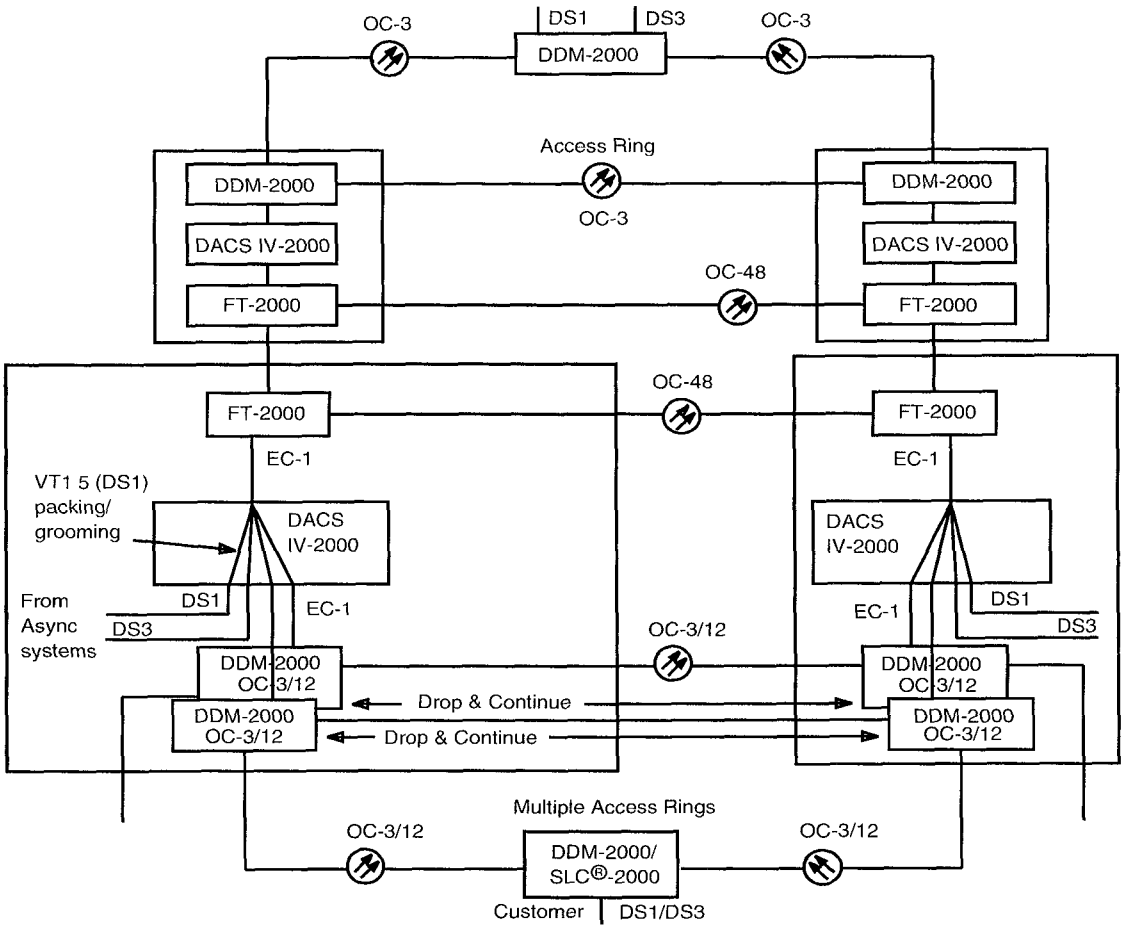


Figure 2-12. DDM-2000 Ring Interworking with FT-2000 OC-48 Lightwave System Transport and DACS IV-2000 Grooming

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

An additional topological flexibility offered by the DDM-2000 OC-3 and OC-12 Multiplexers is 1+1 protected linear OC-3 and IS-3 optical extensions from OC-3 and OC-12 rings. Using this capability, the DDM-2000 OC-3 and OC-12 Multiplexers can support many of the new network configurations desired in the evolving loop feeder environment. As Figure 2-13 shows, an access provider can use linear optical extensions from an OC-12 ring to provide OC-3/OC-3c signals directly to end users. This gives the end users the bandwidth they need for large bandwidth applications, such as video, and provides it to them via the path switched ring architecture they require for high service availability. If enabled, full single-ended operations are available on all network elements (NEs). This gives the end user full control of performance monitoring (PM) data, network reconfigurations, and provisioning of the network.

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

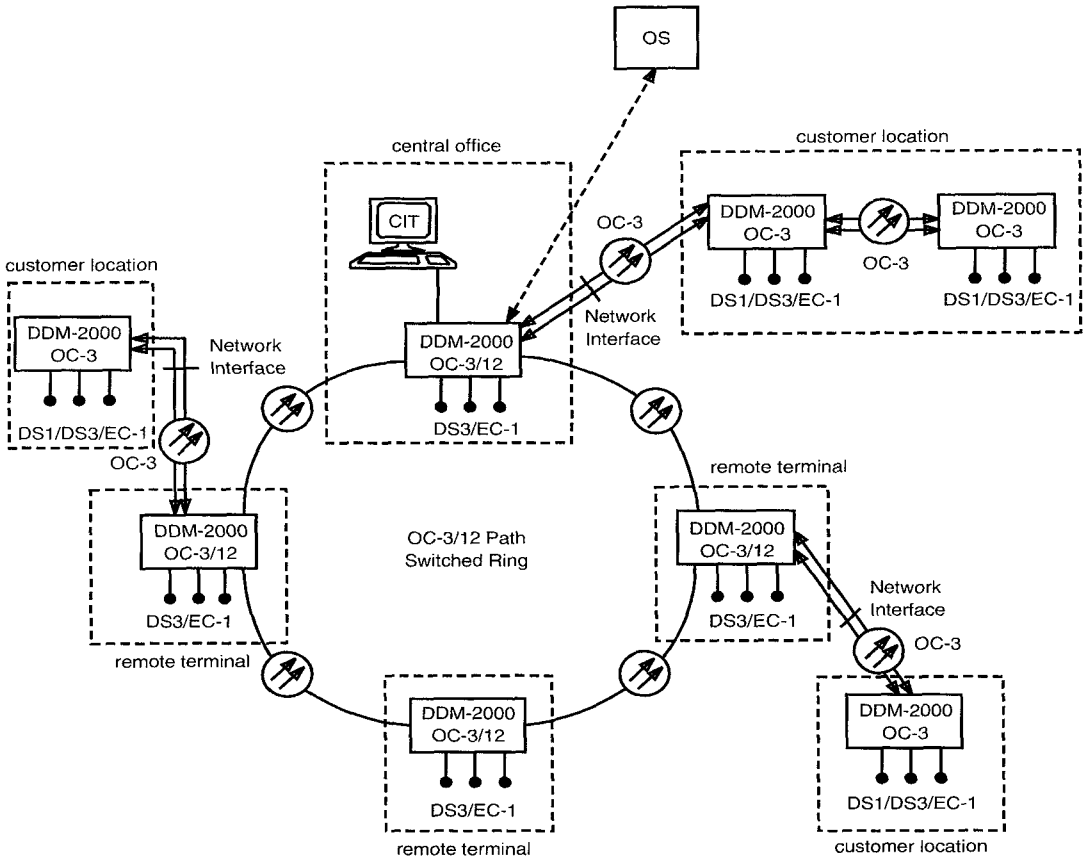


Figure 2-13. OC-3 Services Using Linear Optical Extensions

OC-12 Point-to-Point

Simple, efficient capacity upgrades provide an additional point of flexibility for the DDM-2000 OC-3 and OC-12 Multiplexers. Initial deployments can be sized according to current needs and near-term forecasts, which minimize the network's cost. As large-scale growth occurs (for example, DS1 and DS3 service expansion), the DDM-2000 OC-3 and OC-12 Multiplexers can be rearranged to match each application.

The upgrade from a DDM-2000 OC-3 point-to-point system to a DDM-2000 OC-12 system can be done without interrupting service. The procedure converts the DDM-2000 OC-3 Multiplexer shelves so that they interconnect with the DDM-2000 OC-12 Multiplexer shelf. The resulting high-capacity, point-to-point configuration is shown in Figure 2-14. The larger bandwidth accommodates additional DDM-2000 OC-3 Multiplexers for DS1 access.

In addition to upgrading an existing OC-3 network, the DDM-2000 OC-12 Multiplexer also provides DS3, EC-1, OC-3 or OC-3c service transport between a remote site and a CO. It can do this in either a stand-alone (terminal) configuration or, if desired, it could be connected directly to a DACS IV-2000 Cross-Connect System using DS3 or EC-1 interfaces.

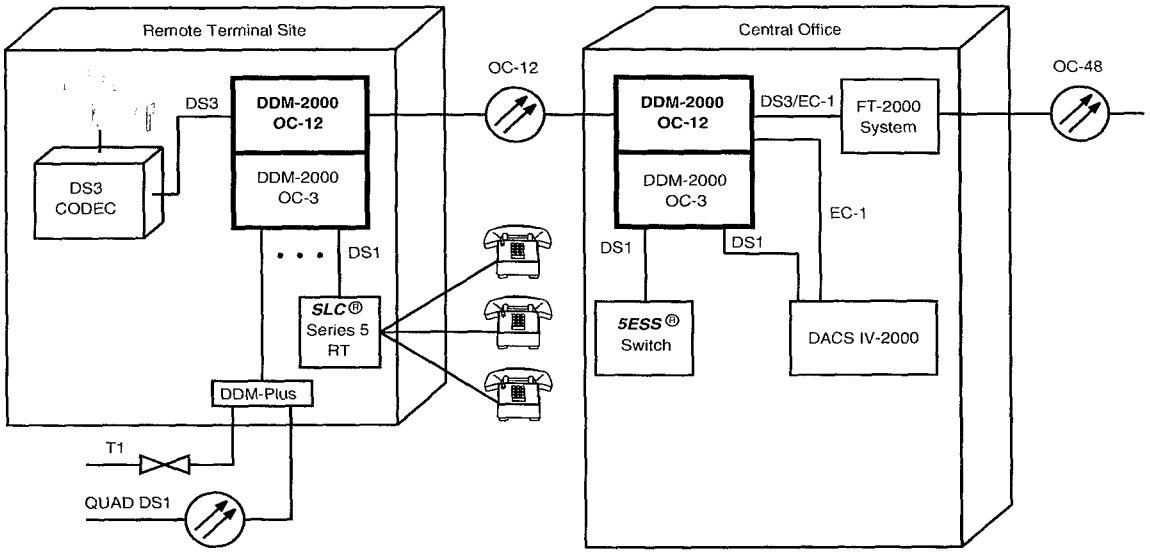


Figure 2-14. OC-12 Point-to-Point Loop Configuration

Like the loop feeder point-to-point applications, the interoffice DDM-2000 OC-3 point-to-point Multiplexer application supports smooth in-service capacity upgrades using the DDM-2000 OC-12 Multiplexer (Figure 2-15). The initial DDM-2000 OC-3 Multiplexer shelf is connected in service to the DDM-2000 OC-12 Multiplexer, allowing high-speed interconnection between offices. The DDM-2000 OC-12 Multiplexer is also well suited for stand-alone interoffice transport of high-capacity DS3, EC-1, and OC-3c signals. The DDM-2000 OC-12 Multiplexer offers two high-speed optical interfaces: at a wavelength of 1310 nm, it supports a 51 kilometer (32 miles) span length; and at a wavelength of 1550 nm, it supports a 100 kilometer (61 miles) span length.

Like the DDM-2000 OC-3 Multiplexers, the DDM-2000 OC-12 Multiplexers allow independent synchronization of each site from its own office clock and disabling single-ended operations when the application crosses a maintenance boundary. Timing can be passed from one office clock to another with a DS1 timing output derived from an incoming OC-12 signal.

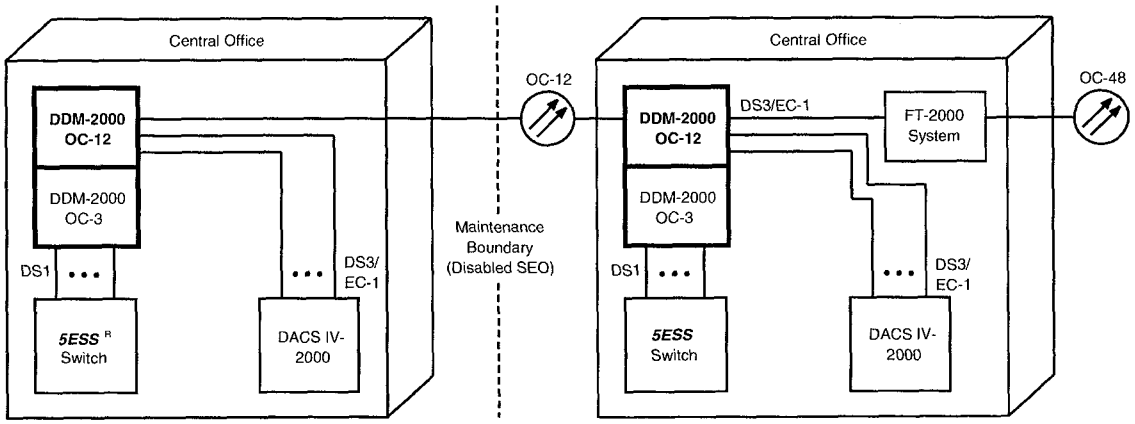


Figure 2-15. OC-12 Point-to-Point Interoffice Configuration

OC-12 Regenerator

The DDM-2000 OC-12 Regenerator is designed for applications that exceed the allowed loss budget of the DDM-2000 OC-12 Multiplexer. Such situations often occur in the loop feeder environment when diverse routing of service and protection lines causes one of the two routes, because of a combination of distance and connector/splice loss, to exceed the optical loss budget of the Multiplexer. A DDM-2000 OC-12 Regenerator can be used as a cost effective solution to this dilemma (Figure 2-16). The DDM-2000 OC-12 Regenerator may also be used symmetrically for applications requiring optical signal regeneration on both lines. Since the OC-12 Regenerator does not access the SONET data communications channel (DCC), OC-12 Regenerator software is compatible with all DDM-2000 OC-12 releases and can be used in all DDM-2000 OC-12 configurations.

To best serve loop feeder applications, the OC-12 Regenerator can be located at a remote site as well as in a CO. The DDM-2000 OC-12 Regenerator is through-timed (timing is recovered from the signal incoming to each regenerator and used to retime the outgoing signal) and therefore requires no external timing references at the regenerator site.

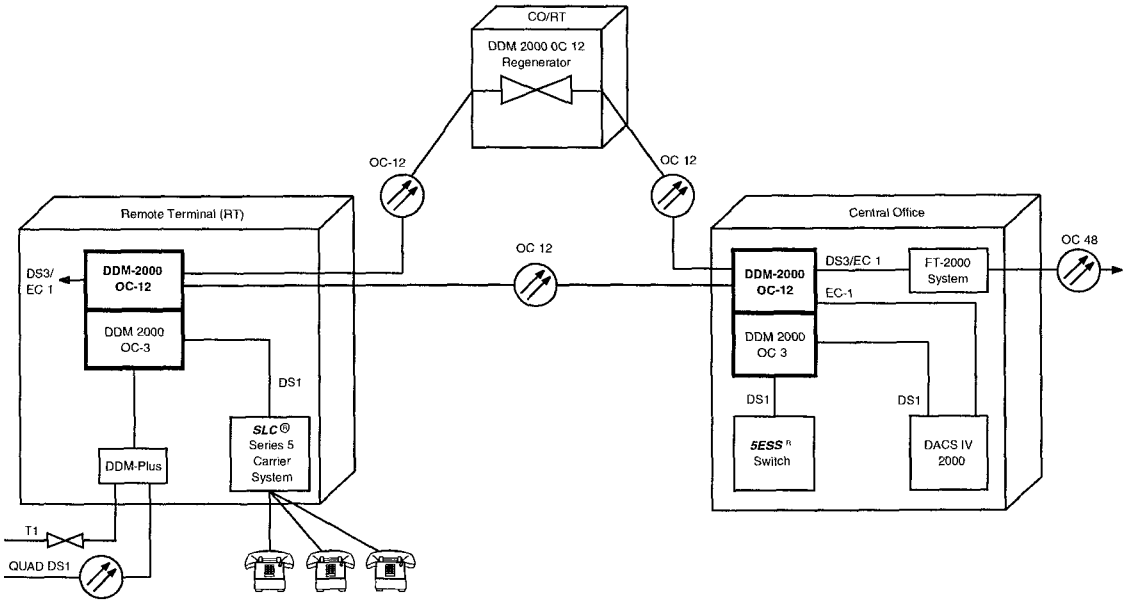


Figure 2-16. OC-12 Regenerator Loop Feeder Configuration — Diverse Routing

Like the loop feeder application, the OC-12 Regenerator (Figure 2-17) 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.

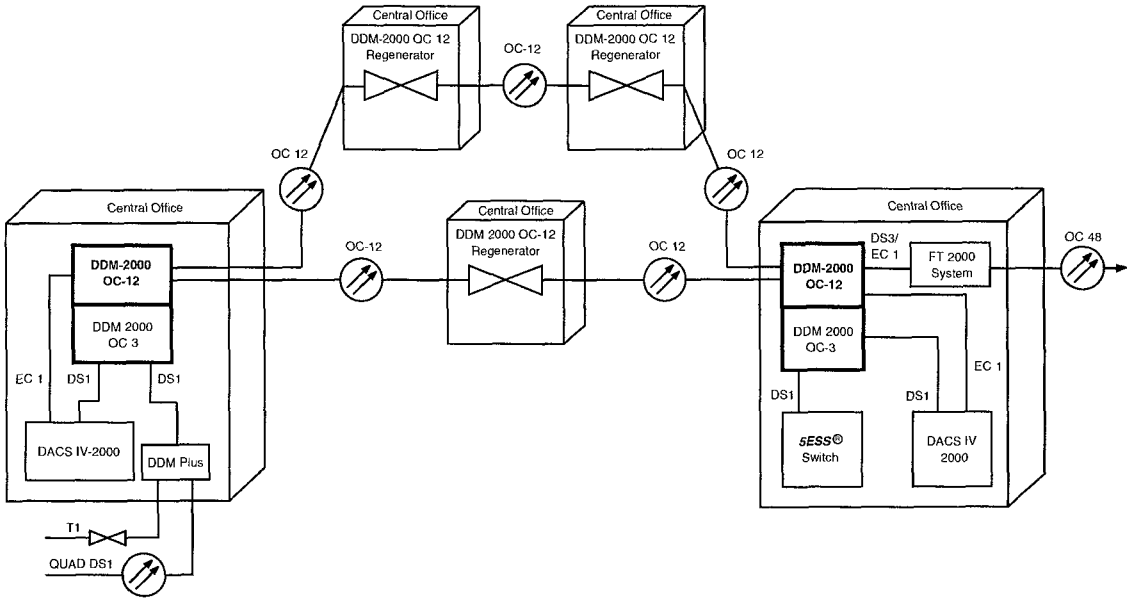


Figure 2-17. OC-12 Regenerator Interoffice Configuration — Diverse Routing

OC-12 Hubbing

The DDM-2000 OC-12 Multiplexer supports the hubbing topologies that are often found in rural/suburban loop feeder environments. It can be used to provide OC-12 hubbing for an initial network installation or as an upgrade to a DDM-2000 OC-3 hubbing topology. The OC-3 hubbing application can grow to an OC-12 hubbing application (Figure 2-18) with a total network capacity of 12 STS-1s. This upgrade allows users to take advantage of the low-cost OC-3 hub initially and to use the high-capacity OC-12 hub when growth occurs at the RT sites.

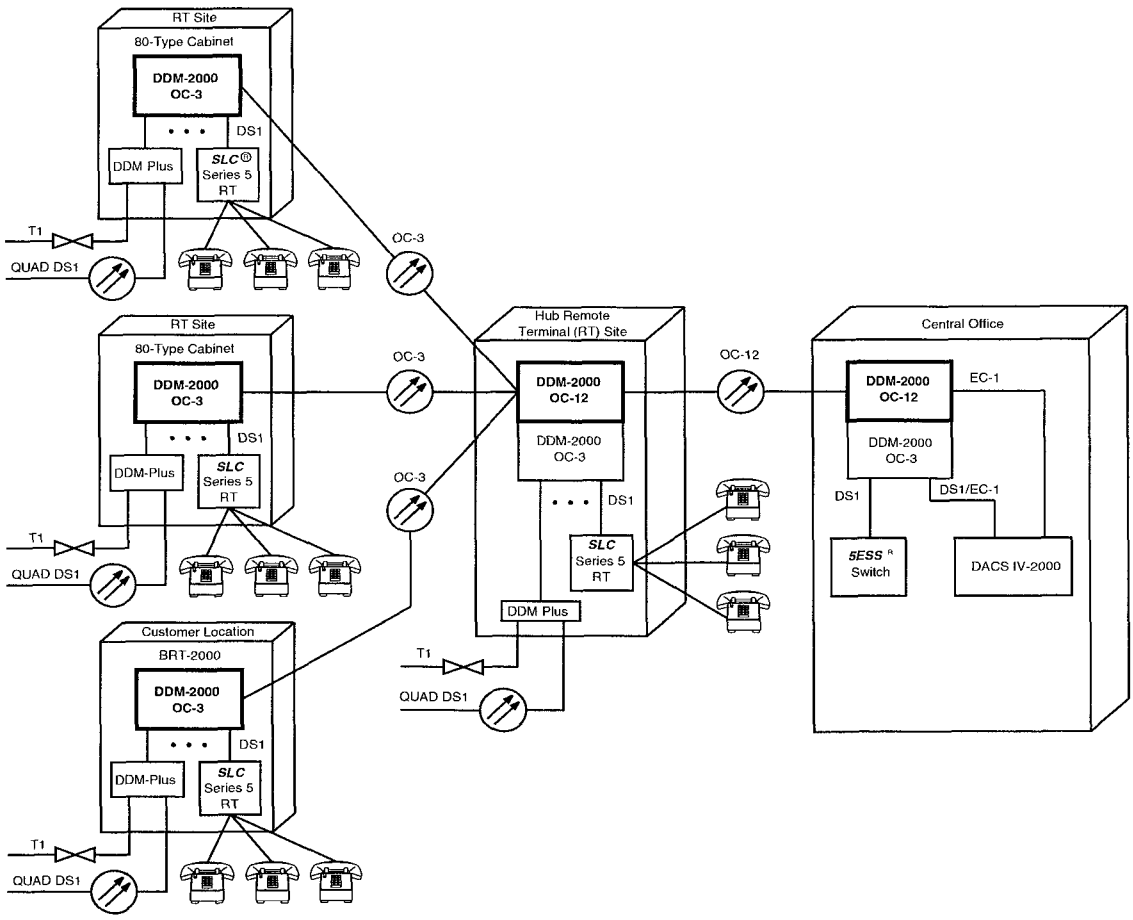


Figure 2-18. OC-12 Hubbing Configuration

The OC-12 hubbing application uses an OC-12 span between the CO and hub RT site. It retains the original OC-3 spans between the hub RT site and the end RT sites, allowing more total capacity to be allocated across the OC-3 optical extensions. For example, once the DDM-2000 OC-12 system is installed, the OC-3 optical extensions to the RT sites can grow to their full capacity of three STS-1 signals. The original DDM-2000 OC-3 Multiplexer at the hub RT site continues to serve local DS1 interface needs following the upgrade, while the OC-3 optical extensions are rolled to OC-3 low-speed interfaces on the DDM-2000 OC-12 Multiplexer. A maximum of four OC-3 spans may be extended from the OC-12 hubbing shelf. As in OC-12 point-to-point applications, growth beyond 84 DS1 signals may be met in the CO with additional DDM-2000 OC-3 Multiplexers or with DS3, EC-1, or OC-3 interfaces to a DACS IV-2000 Cross-Connect System or an FT-2000 OC-48 Lightwave System.

A large industrial complex with large bandwidth requirements equivalent to several STS-1 signals at each building requires an OC-12 hubbing topology. Such situations often arise at locations with high-density DS1 traffic and new DS3 services. The OC-12 hubbing application provides a flexible network solution to this application (Figure 2-19). The RT hub site can be located in a main building or centrally located in an outdoor enclosure.

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

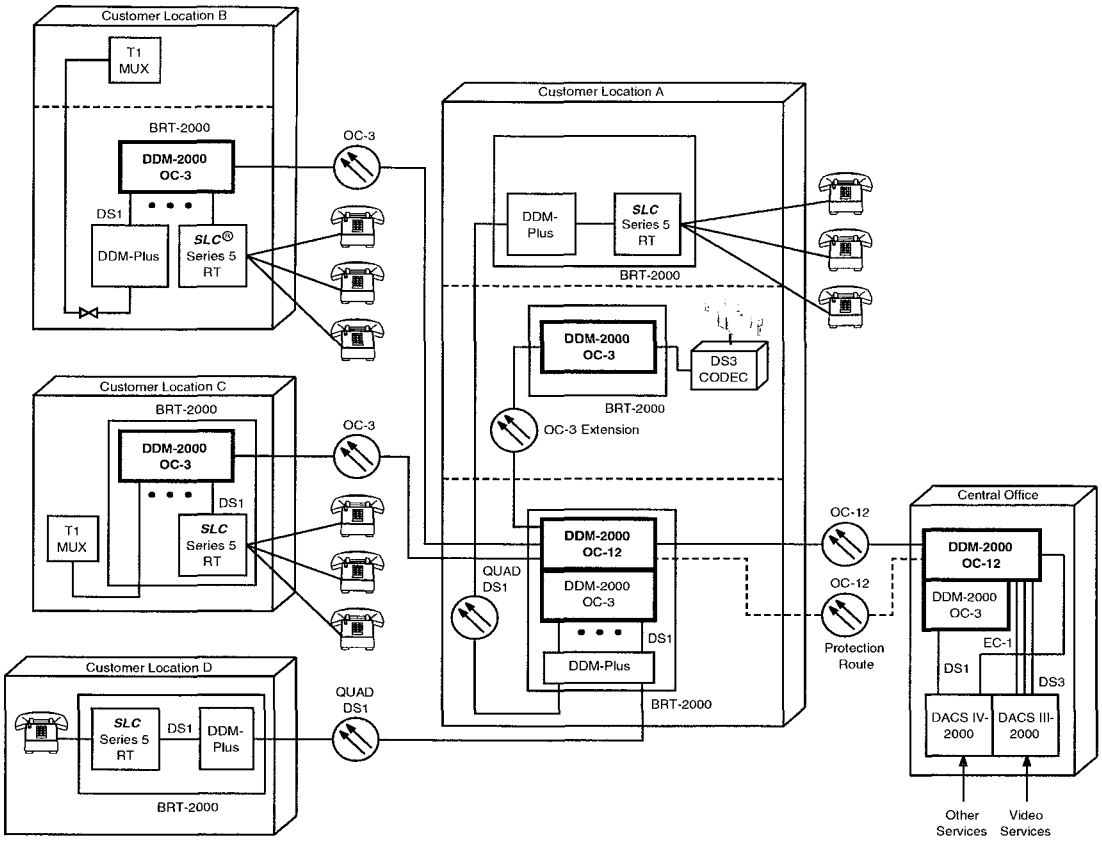


Figure 2-19. Large Industrial Park Configuration

OC-3c Transport on OC-12

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

Many DDM-2000 features, such as high reliability, flexible networking configurations, and DS1/DS3/EC-1/OC-3c services, satisfy private network needs. Figure 2-20 shows how DDM-2000 OC-3 and OC-12 Multiplexers provide flexible interconnection of several data/video networks. The two multibuilding campuses have local data needs served by ATM networks.

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

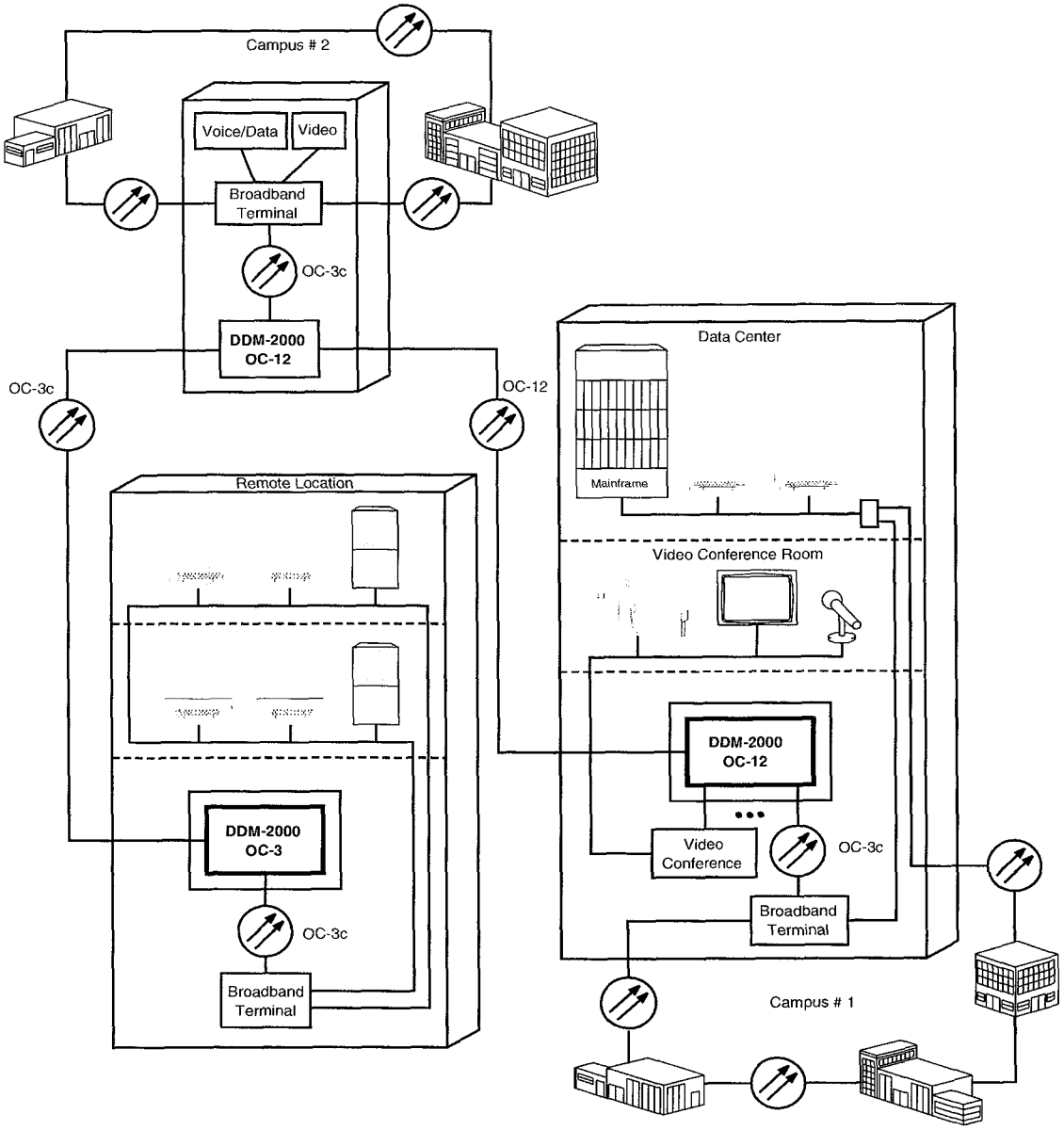


Figure 2-20. OC-3c Transport — Private Data/Video/ATM Network Application

2000 Product Family Interworking

SLC-2000 Access System

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

Figure 2-21 shows a business narrowband application using the DDM-2000 FiberReach Multiplexer on an OC-1 path switched ring. This application provides protected POTS, ISDN, and special services, as well as DS1 services. The ring host is a DDM-2000 OC-3/OC-12 remote node on an OC-3/OC-12 path switched ring via a *SLC*-2000 ARM or a DDM-2000 OC-3 Multiplexer. OC-1 extensions from OC-12 rings are planned in a future release.

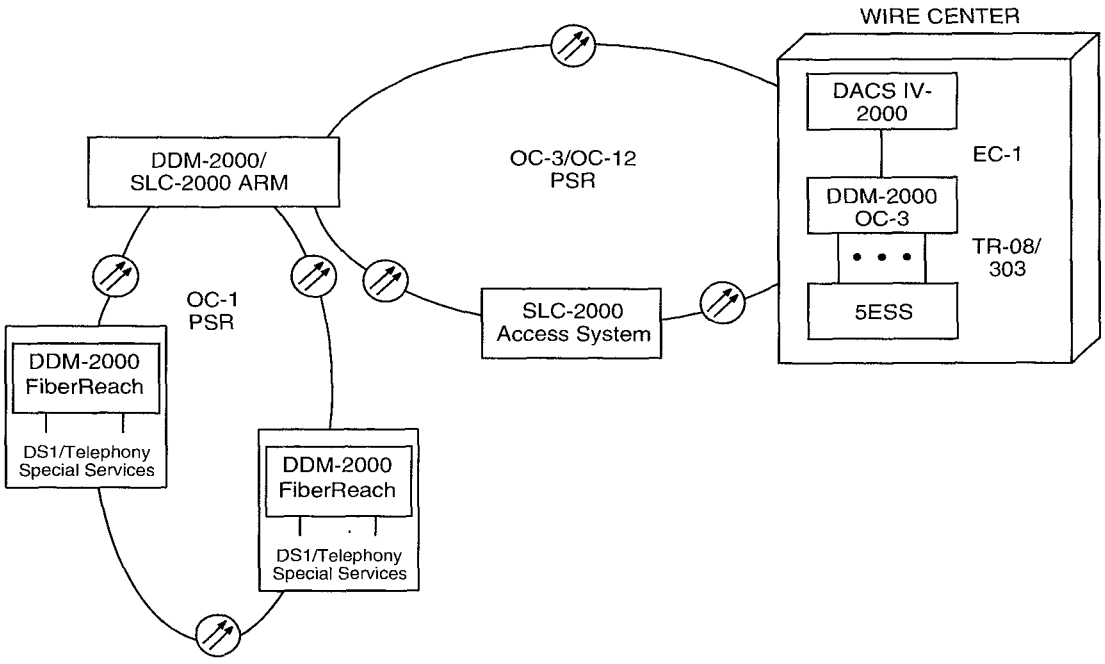


Figure 2-21. OC-3 Loop Carrier Interface Configuration

At hubbing and linear add/drop sites, a DDM-2000 Multiplexer and *SLC*-2000 Access System RT combine to create an integrated SONET DLC node. The DDM-2000 Multiplexer provides the OC-3 and OC-12 facility interfaces and add and drop traffic to the adjacent *SLC*-2000 Access System RT via EC-1 or IS-3 interfaces. Figure 2-22 shows *SLC*-2000 Access System in an OC-12 hubbing application. A DDM-2000 OC-3 Multiplexer is used at one of the RT sites due to demand for more than 28 DS1 services.

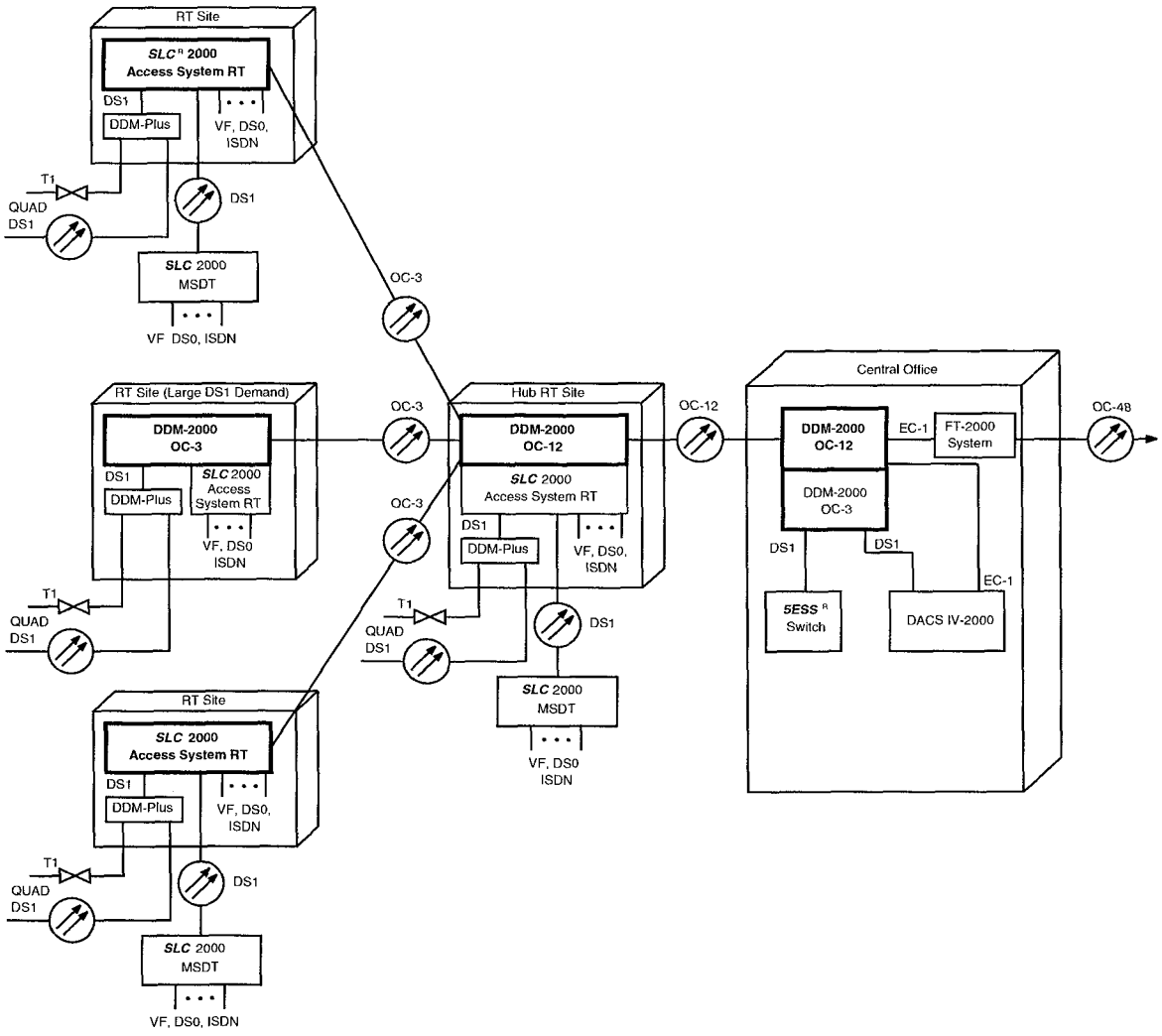


Figure 2-22. *SLC*-2000 Access System in an OC-12 Hubbing Configuration

FT-2000 OC-48 Lightwave System

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

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

- FT-2000 OC-48 Lightwave System (Release 6.0 and later)
- DDM-2000 OC-3 Multiplexer (Release 7.2 and later)
- DDM-2000 OC-12 Multiplexer (Release 5.0 and later).

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

- Remote login
- Gateway network element (GNE) operation
- Remote NE status
- Remote software download and copy.
- **Remote login**: A user logged in locally to an DDM-2000 OC-12 Multiplexer can remotely log in to another DDM-2000 OC-12 Multiplexer through an FT-2000 OC-48 Lightwave System.
- **OSGNE operation**: One or more FT-2000 OC-48 Lightwave Systems can serve as a single interface to the local X.25 message-based operations system for the DDM-2000 OC-12 Multiplexers through the OC-12 DCC. A DDM-2000 OC-12 NE with an active X.25 link to its associated OC is called an OSGNE. Multiple OSGNEs are supported in DDM-2000 OC-12 subnetworks.
- **Remote NE status**: The FT-2000 OC-48 Lightwave System can receive and transport alarm and status information from other FT-2000 OC-48 Lightwave Systems and DDM-2000 OC-12 Multiplexers that are in the same subnetwork. Within a subnetwork, NEs in the same alarm group (provisionable) exchange alarm and status information through at least one alarm gateway network element (AGNE). When an AGNE receives alarm and status information, it rebroadcasts the information to all the other NEs in the alarm group. An alarm group can support the maximum number of NEs supported in the subnetwork.
- **Remote software download and copy:** A DDM-2000 OC-12 Multiplexer can download (copy) to another DDM-2000 OC-12 through an FT-2000 OC-48 Lightwave System network.

Figure 2-23 shows an example of an interface between FT-2000 OC-48 Lightwave System and OC-3 linear and OC-12 ring systems.

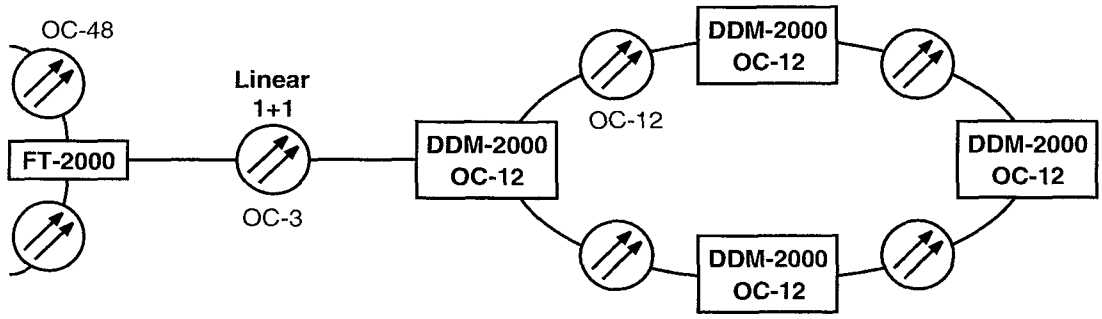


Figure 2-23. OC-12 Ring Interfaces with FT-2000 OC-48 Lightwave System

Service Applications

Loop Feeder

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

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

Interoffice Transport

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

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

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

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

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

Broadband Business Access

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

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

The large multisite medical facility shown in Figure 2-24 uses broadband services for intersite imaging and video needs as well as lower bandwidth voice and data services into the public network based in ISDN primary rate interface (PRI) and basic rate interface (BRI) interfaces. These services can be delivered efficiently with the DDM-2000 OC-3, OC-12, and *SLC*-2000 Access System's flexible TSI and add/drop capabilities. The ring architecture prevents service outage due to a cable cut or node failure.

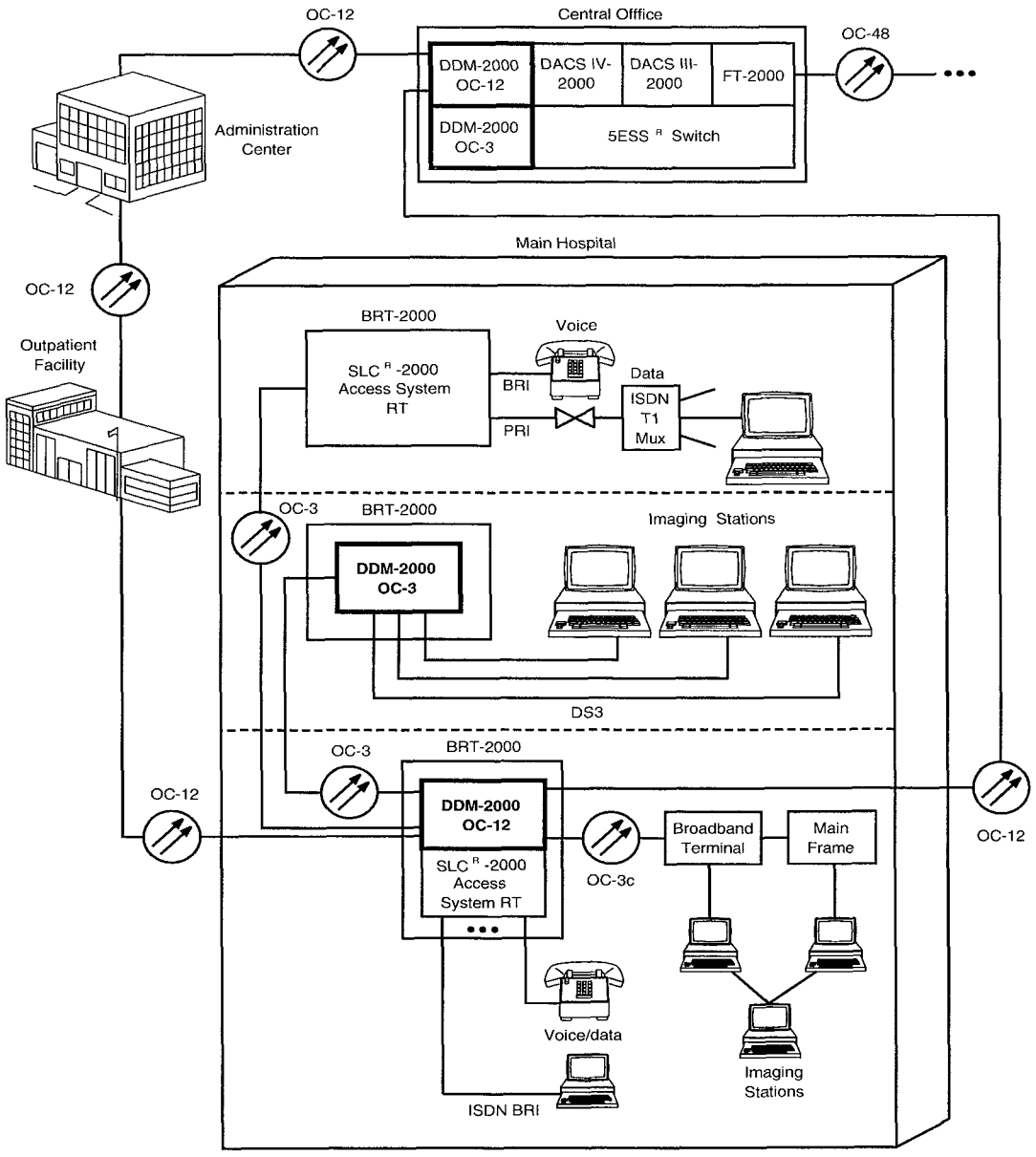


Figure 2-24. Self-Healing Medical Campus Network Application

Gateway Between SONET and Asynchronous Interfaces

Figure 2-25 shows an OC-12 STS-1 drop and continue to DS3 interface application for DDM-2000 OC-12 ring releases. The application is a DRI network with the following components and releases:

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

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

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

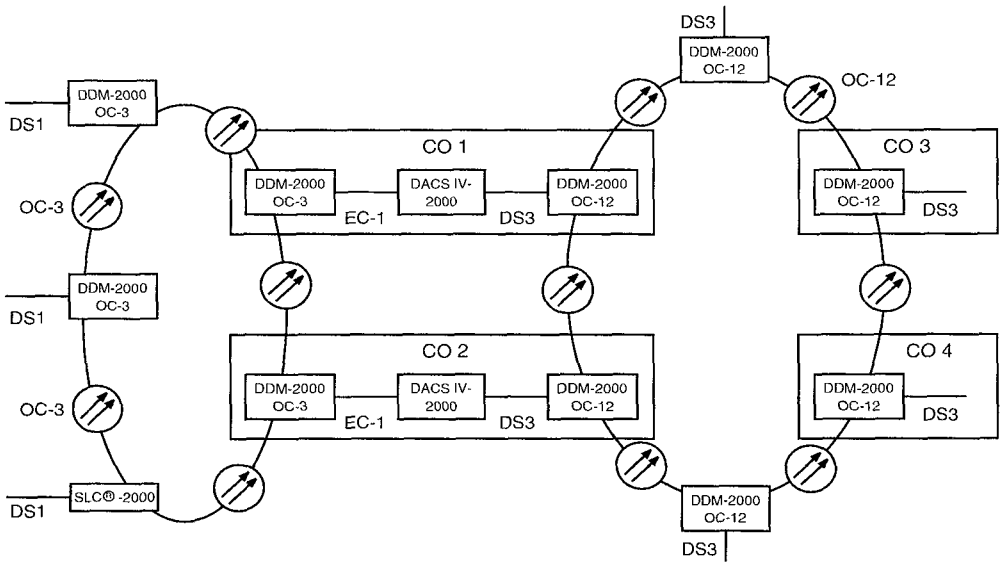


Figure 2-25. OC-12 STS-1 Drop-and-Continue to DS3 Interfaces

STS-3c Video Broadcast

Video applications are becoming increasingly more important in the competitive home entertainment industry. The DDM-2000 OC-12 Multiplexer can be the backbone for video distribution needs. Figure 2-26 shows the video broadcast application for the DDM-2000 OC-12 Multiplexer. In this application, incoming STS-3c signals at a "head-end" OC-12 shelf are simultaneously dropped at any number of remote OC-12 terminals. This provides the capability of simultaneously transmitting up to eight STS-3c video feeds to remote sites.

The significant features of this application are:

- Both inner and outer rings distribute up to four STS-3c unprotected one-way signals. These signals are then connected to OC-3 or IS-3 circuit packs.
- The STS-3c signals can be provisioned in pairs (two, four, six, or eight) and unused time slots can be used for other ring applications.

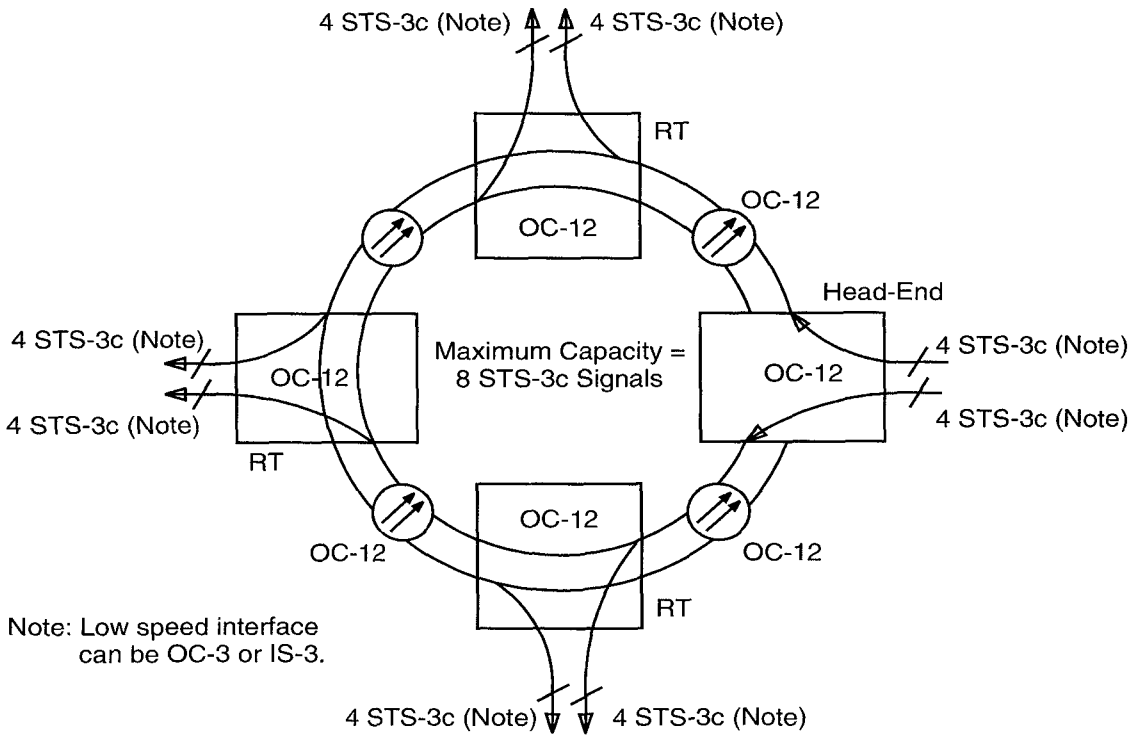


Figure 2-26. STS-3c Video Broadcast Application

Locked STS-3c - Broadband Services

As the demand for broadband services increases, the efficient and flexible use of bandwidth will grow in importance. Beginning with DDM-2000 OC-12 Release 5.0, the option of a "locked" STS-3c is available. Figure 2-27 shows an example of a broadband services application using a locked STS-3c to provide dedicated connections in an ATM network.

The significant features of this application are:

- Efficient bandwidth utilization

  Single STS-3c rail within the OC-12 bandwidth

  Data and telephony over a common network
- Point-to-point connections using locked cross-connects
- Added PM capabilities of SONET system.

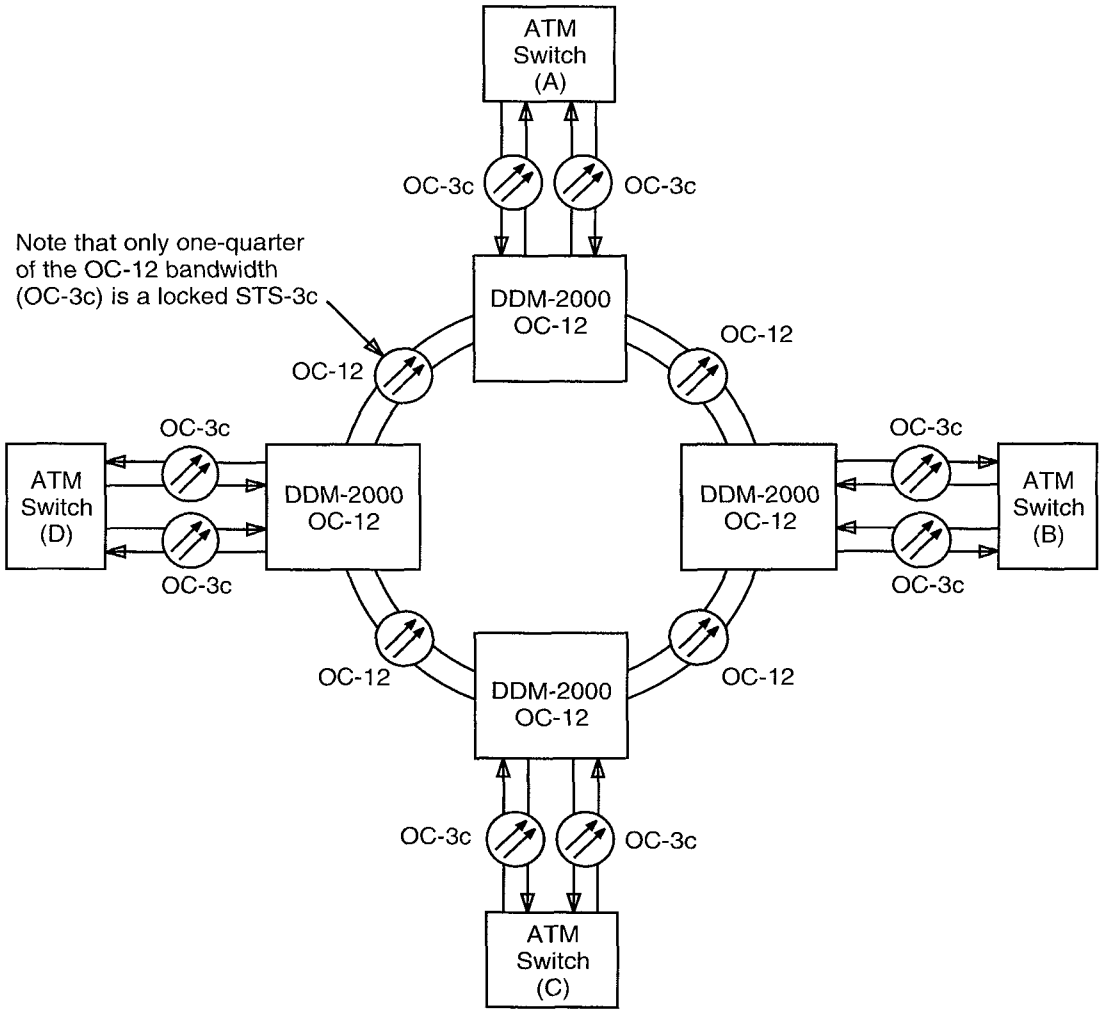


Figure 2-27. Locked STS-3c - Broadband Services

Teleprotection and Supervisory Control and Data Acquisition (SCADA) Applications

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

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

The locked cross-connection feature allows a DS1 to be removed from the TR-496 compliant VT path protection switching algorithm and provisioned as an unprotected path between any two nodes on the ring. As shown in Figure 2-28, locked cross-connection can be used to interconnect adjacent nodes all the way around SONET rings, thereby permitting access to the DS1 at each SONET node. Figure 2-28 shows a single DS1 locked between ring nodes, but this can be extended to an arbitrary number of DS1s within the available SONET bandwidth. This locked cross-connection feature fixes the ring rotation (and delay) of the DS1 paths on the ring and also permits DS0 grooming of the DS1s at each DDM-2000 or DDM-2000 FiberReach node using an external drop/insert multiplexer, such as the RFL 9001 Intelligent Multiplexer. Figure 2-28 shows the DDM-2000 interconnecting at the DS1 level with an adjacent RFL 9001 Intelligent Multiplexer that, in turn, connects on the low-speed side to protective relay and SCADA equipment. Specially designed channel units in the RFL 9001 Intelligent Multiplexer detect when a fault occurs on the power line or substation and communicate at the DS0 level with other substation nodes to isolate the power grid fault. See Section 5, "Operations, Administration, Maintenance, and Provisioning," for more information on the locked cross-connection feature.

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

Figure 2-28 also shows an optical drop/insert DS1 extension from the SONET rings implemented with RFL 9001 Intelligent Multiplexers. This extension is useful for serving low bandwidth sites remote from the SONET backbone. The figure shows a single host DDM-2000 interconnecting the rings, but the application could be a DRI to provide node survivability.

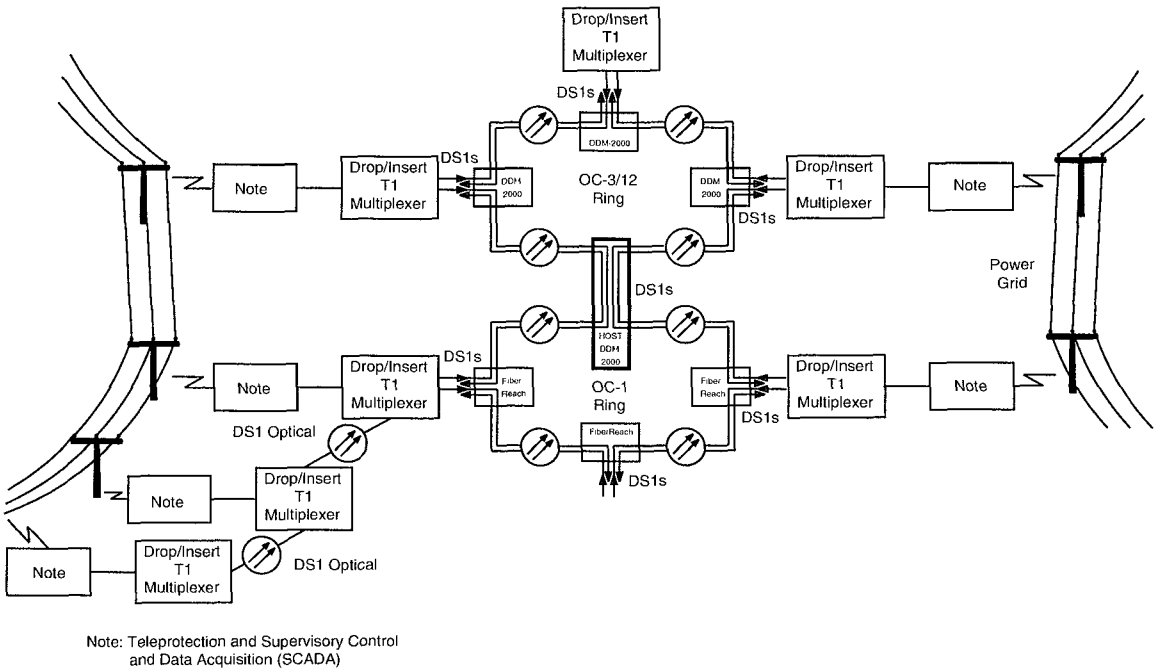


Figure 2-28. Teleprotection and SCADA Application

Intelligent Vehicle Highway System (IVHS) Applications

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

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

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

Figure 2-29 shows a typical IVHS application. An IVHS network calls for carrying data between roadside equipment, such as traffic counters, speed sensors, variable messaging signs, video cameras, toll-taking equipment, pay phones and call boxes, and a traffic operations center where incoming data is processed and responses are generated. The DDM-2000 OC-3 and OC-12 Multiplexers provide a perfect backbone for carrying this information. The DDM-2000 OC-3 Multiplexer SONET ring capability, when coupled with diverse fiber routing on opposite sides of the roadway, makes the backbone completely self-healing in the face of failures. Such reliability is absolutely essential, especially as travelers come to depend more and more on IVHS networks. The VT1.5 and STS-1 bandwidth management capabilities of the DDM-2000 OC-3 and OC-12 Multiplexers allow flexible allocation of bandwidth to match the dynamics of a roadway system, which is undergoing unpredictable changes in traffic patterns, breakdowns, accidents, and repairs. Such bandwidth management provides a system which meets the IVHS network needs in a cost-effective manner. DDM-2000 OC-3 and OC-12 Multiplexers completely meet the transmission needs of an IVHS network.

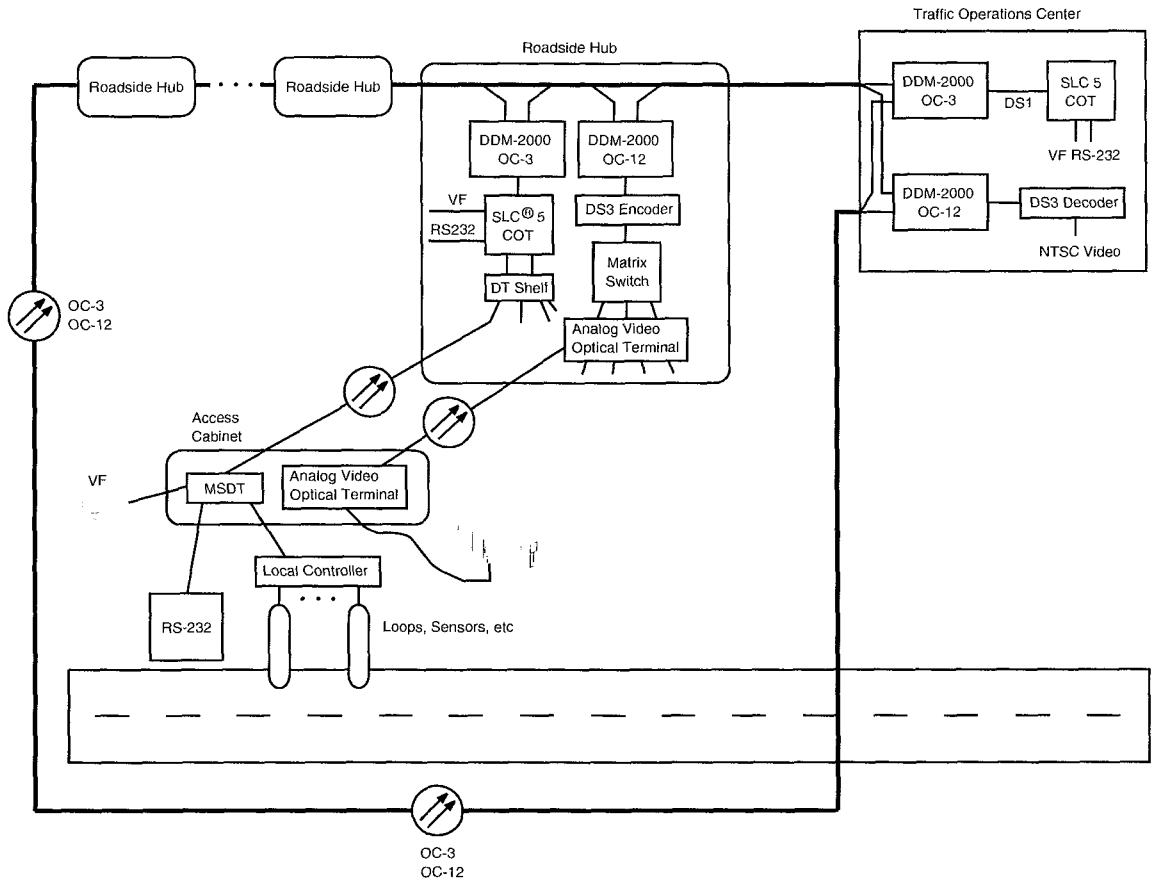


Figure 2-29. Intelligent Vehicle Highway System (IVHS) Application

Shelf Descriptions and Configurations

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Shelf Descriptions and Configurations

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Overview

This section provides the physical description of the DDM-2000 OC-12 Multiplexer shelf and illustrates typical shelf equipage for different configurations. In addition, this section provides a physical description of the DDM-2000 Fan Shelf.

DDM-2000 OC-12 Multiplexer Shelf

The DDM-2000 OC-12 Multiplexer is shown in Figure 3-1 and Figure 3-2. Figure 3-1 is the new Group 4 shelf. The Group 4 shelf measures 14 inches high by 21.25 inches wide by 13.25 inches deep and fits in a standard 23-inch wide bay. The Group 4 shelf will be available in the first half of 1997, replacing the Group 1 shelf for new applications (or existing applications). When using the G4 shelf with the alternative isolated grounding scheme, the BBG8B SYSCTL is required. The G4 shelf may be used with a traditional grounding scheme with any system controller circuit pack.

The Group 1 shelf measures 14 inches high by 21.25 inches wide by 12 inches deep and fits in a standard 23-inch wide bay. User panels are not interchangeable between shelves (old in the new or new in the old). If desired, a G1 shelf can be upgraded to provide the deeper front cover offered with the G4 shelf by ordering the Front Cover Upgrade Kit, comcode #847554185.

Each shelf is a stand-alone entity with its own fiber cabling and interfaces to DSX-3, STSX-1, office power, and operations interfaces. Cabling for office alarms, parallel telemetry monitoring, CIT interfaces, DS1 timing inputs and outputs, and TBOS can be shared among other shelves in the bay. The default configuration provides rear access cabling. Front access through dangler cables is available as an option. Front-access optical connectors interconnect to fiber optic facilities and facilitate shelf loopback and fiber tests. The optical connectors are mounted on the OLIU circuit pack faceplate.

The DDM-2000 OC-12 Multiplexers provide Lucent's universal optical connector on all OLIUs. These OLIUs are designated by a -U. The universal optical connectors are receptacles on the faceplate of the OLIUs that allow a single OLIU to support either *ST*®, FC-PC, or SC connectors as needed.

A DDM-2000 OC-12 Multiplexer shelf consists of the following:

- 18 circuit pack slots
  - — 2 four-inch slots
  - — 9 eight-inch slots
  - — 7 twelve-inch slots
- User panel
- Fully connectorized backplane
- Front and back covers.

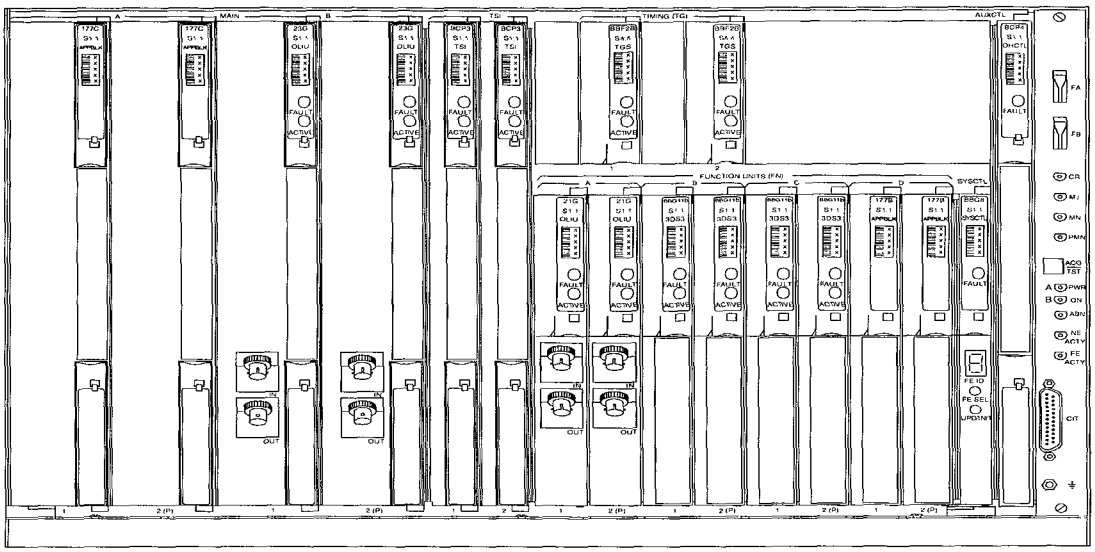


Figure 3-1. DDM-2000 OC-12 Shelf — Front View

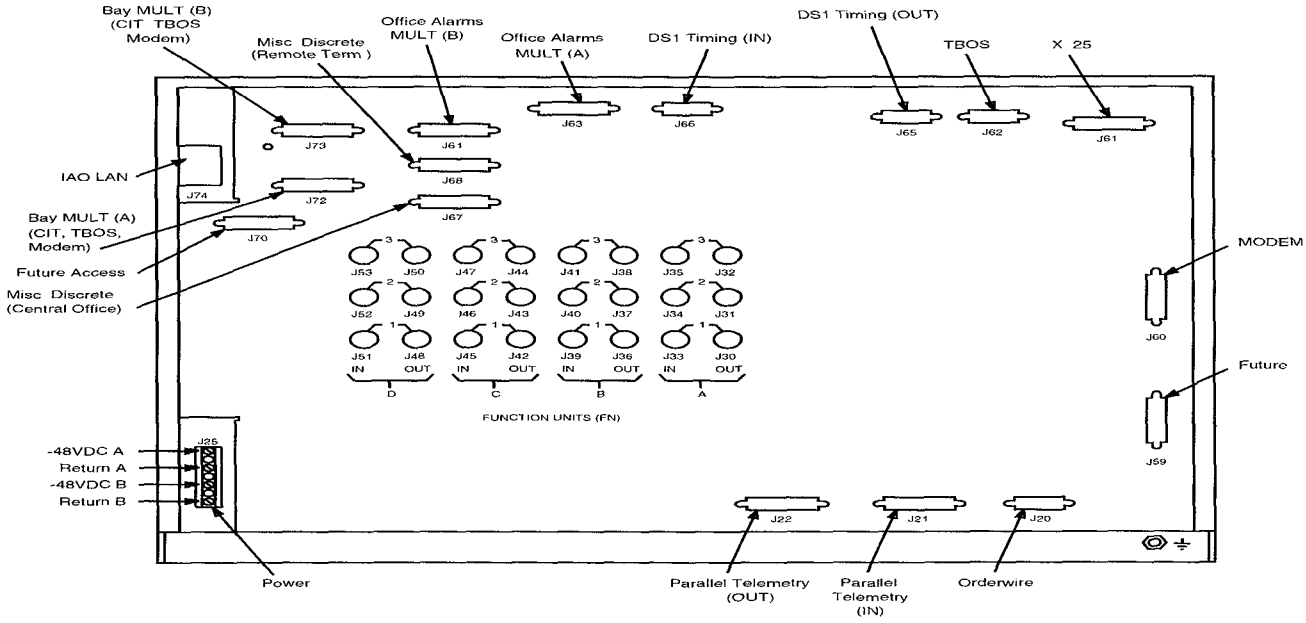


Figure 3-2. DDM-2000 OC-12 Shelf — Rear View

Table 3-1 lists the DDM-2000 OC-12 Multiplexer plug-ins.

Table 3-1. DDM-2000 OC-12 Plug-Ins

Product Code	Functional Name	Functional Designation
BBF2B	Synchronous Timing Generator	TGS
BBG11/11B *	Triple DS3	3DS3
BBG12	Triple EC-1 Interface	3STS1E
BBG5	System Controller	SYSCTL
BBG8	System Controller	SYSCTL
BCP1	Overhead Controller	OHCTL
BCP2	Time Slot Interchange	TSI FLEX
BCP3	Time Slot Interchange Flex	TSI FLEX
BCP4	Overhead Controller	OHCTL
21D-U	IS-3 OLIU	OLIU
21G-U	OC-3 OLIU	OLIU
23G/23G-U	OC-12 OLIU	OLIU
23H/23H-U	OC-12 1550 nm OLIU	OLIU
177B	Apparatus Blank (8")	APPBLK
177C	Apparatus Blank (12")	APPBLK

* BBG11B DS3 circuit pack is required for enhanced DS3 performance monitoring.

As shown in Figure 3-1, the front view of the shelf is divided into seven functional groupings:

- Starting from left to right:
  - MAIN
  - TSI (Time Slot Interchange)
  - TIMING (TG)
  - AUXCTL
  - USER PANEL
- Continuing below the TIMING area:
  - FUNCTION UNITS (FN)
  - SYSCTL.

Four 12-inch slots, designated MAIN, are for the Main OC-12 OLIU circuit packs. These circuit packs are arranged in two service and protection pairs designated Main A and Main B. Main A slots 1 and 2(P) must be equipped with 177C apparatus blanks (APPBLK) except when the shelf is used as an OC-12 Regenerator shelf.

Two 12-inch slots, designated TSI, are for two time slot interchange (TSI) circuit packs.

Two 4-inch slots, designated TG, are for two timing generator packs (TGS), service and protection.

One 12-inch slot, designated AUXCTL, is for the overhead controller (OHCTL) circuit pack.

Eight 8-inch slots, designated FN, are for Function Unit circuit packs. These slots are divided into four groups designated A, B, C, and D. The FN slots can be equipped interchangeably by group, with service and protection.

One 8-inch slot, designated SYSCTL, is for the main controller circuit pack (SYSCTL).

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

- Two –48 volt fuses (10A)
- Four alarm LEDs
- ACO/TEST pushbutton control
- Five status LEDs
- CIT port
- ESD jack.

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

As shown in Figure 3-3, the front of the shelf is covered with an electromagnetic compatibility (EMC) cover. If the shelf needs to be accessed for maintenance activities, the cover is hinged to drop down 180 degrees or it can be easily removed by pulling out when at 45 degrees. The rear of the shelf is covered over the DS3 interface connectors and shelf cables. All covers are necessary to meet the EMC guidelines set by the Federal Communications Commission (FCC).

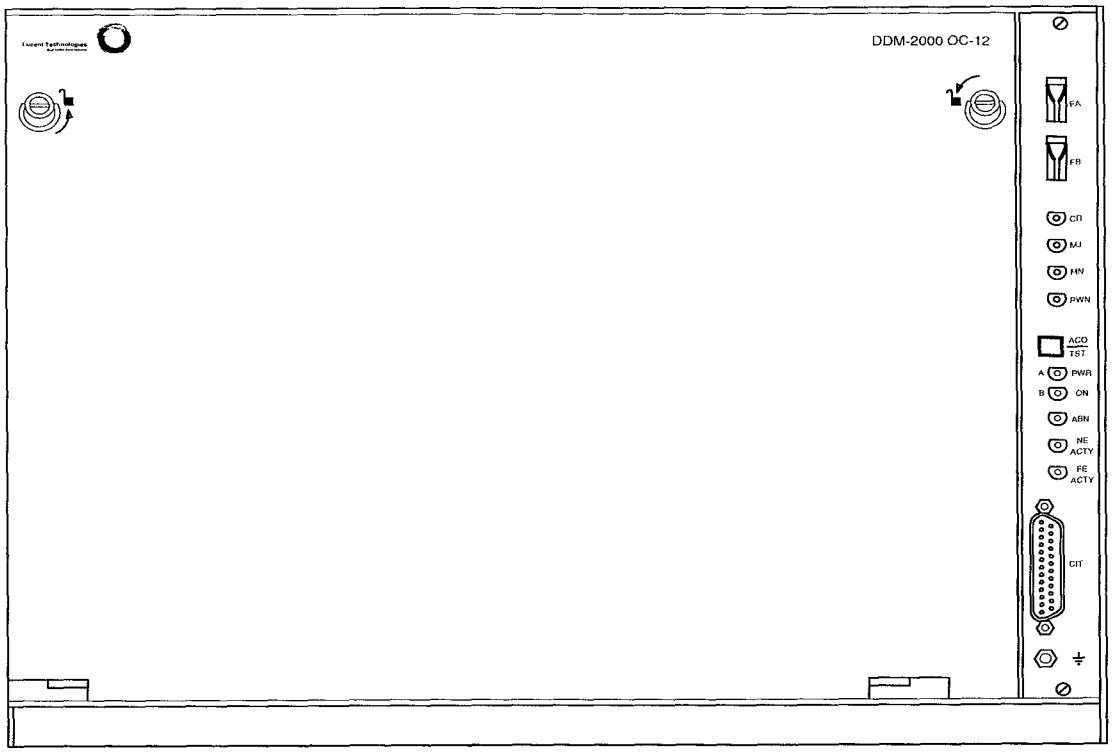


Figure 3-3. DDM-2000 OC-12 Front Panel

DDM-2000 OC-12 Multiplexer Shelf Configurations

A DDM-2000 OC-12 Multiplexer path switched ring shelf supports all OC-12 ring applications.

- The following circuit packs are required in all DDM-2000 OC-12 Multiplexer path switched ring applications:
  - 177C 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.
  - BCP3 TSI circuit packs in the TSI slots connect STS-1s from the Main B slots to the FN slots. The BCP3 TSI also distributes the timing it receives from the BBF2B TGS circuit packs to circuit packs in the Main and FN slots.
  - BBF2B TGS circuit packs in the TIMING slots provide timing to the BCP3 TSI circuit packs.
  - BBG8 SYSCTL and BCP4 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 FN slots must be equipped with 177B APPBLK to ensure adequate cooling of the shelf.
- All applications should be equipped with a baffle as shown in ED-8C727-10.

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.

Use the table in the following way: Pick one circuit pack from each column to build an application. Any combination of BBG11/11B, BBG12, 21D-U, or 21G-U/ 21G2-U OLIUs are allowed in the FN slot. Provisioning rules require that both slots of a 1X1 pair have the same circuit pack type. For multiple OLIU circuit pack types, these units can be mixed if they follow the provisioning rules.

Table 3-2. DDM-2000 OC-12 Multiplexer Circuit Pack and Software Compatibility Matrix

Release Number	Slot Name						
	Main-A	Main-B	TSI	TG	FN	SYSCTL	AUXCTL
5.0, 5.1 (Ring)	177C	23G/23G-U 23H/23H-U	BCP3	BBF2B	21G/21G-U/ 21G2-U 21D/21D-U BBG11/11B* BBG12 177B	BBG8	BCP4

* BBG11B DS3 circuit pack required for enhanced DS3 performance monitoring.

OC-12 STS-1 Path Switched Ring Shelf

Figure 3-4 shows a 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 TSI slots must be equipped with TSI FLEX circuit packs. The Function Units can be equipped with triple STS1E, triple DS3, or OC-3 circuit packs. Figure 3-4 shows a configuration that supports up to three STS-1 and three DS3 interfaces and two OC-3 optical extensions. The optical extension OLIUs can provide transport for either three independent STS-1s or one STS-3c. Dual ring interworking (DRI) capabilities are available on STS-1 paths dropped by the 3STS1E interfaces.

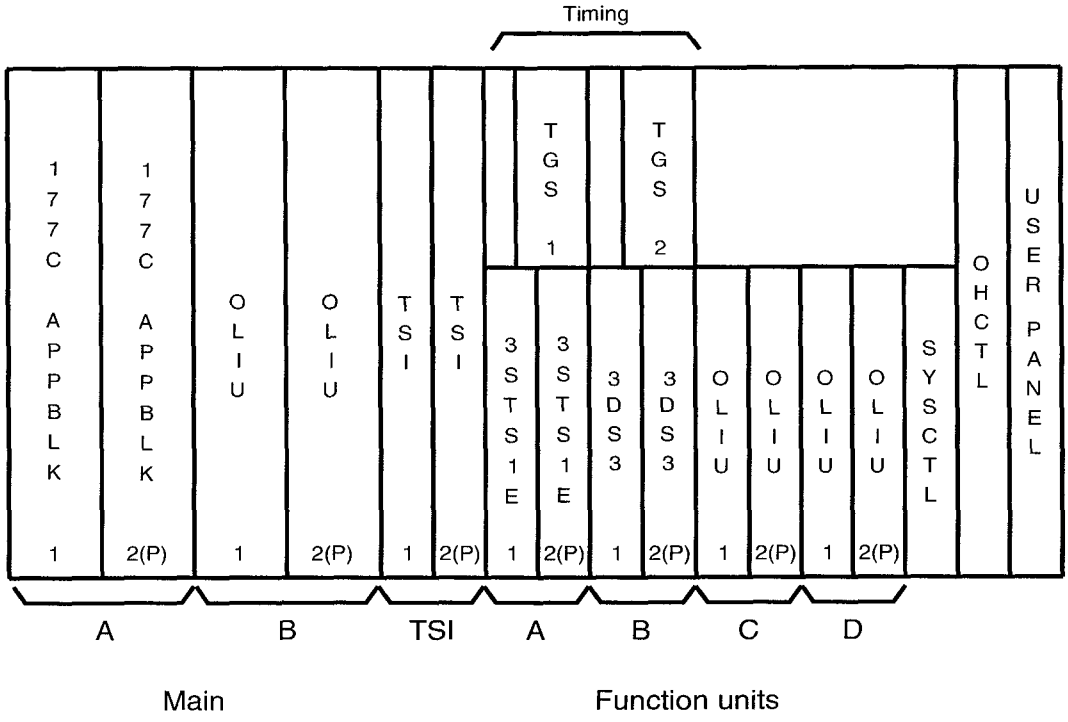


Figure 3-4. OC-12 STS-1 Path Switched Ring Shelf

OC-12 STS-1/VT1.5 Path Switched Ring Configuration

Figure 3-5 shows a DDM-2000 OC-12 Multiplexer STS-1/VT1.5 path switched ring configuration. As in the DDM-2000 OC-12 Multiplexer STS-1 ring shelf, there is one set of OC-12 interfaces and a pair of TSI FLEX circuit packs. In this configuration, however, there is also an IS-3 interface to a DDM-2000 OC-3 Multiplexer shelf where VT1.5 level path protection switching is completed. This interface between DDM-2000 OC-3 and OC-12 Multiplexers is referred to as a "0x1" interface. In this case, the DDM-2000 OC-12 Multiplexer feeds the STS-1 paths directly from the two rotations of the OC-12 ring to the OC-3 shelf. Protection switching is done on the OC-3 Multiplexer shelf. The remaining Function Units can be equipped with 3DS3, 3STS1E, or OLIU circuit packs as desired. OLIUs can be used for optical extensions as in the OC-12 Multiplexer STS-1 level path switched ring for interconnection to additional DDM-2000 OC-3 Multiplexer shelves performing VT1.5 level path switching.

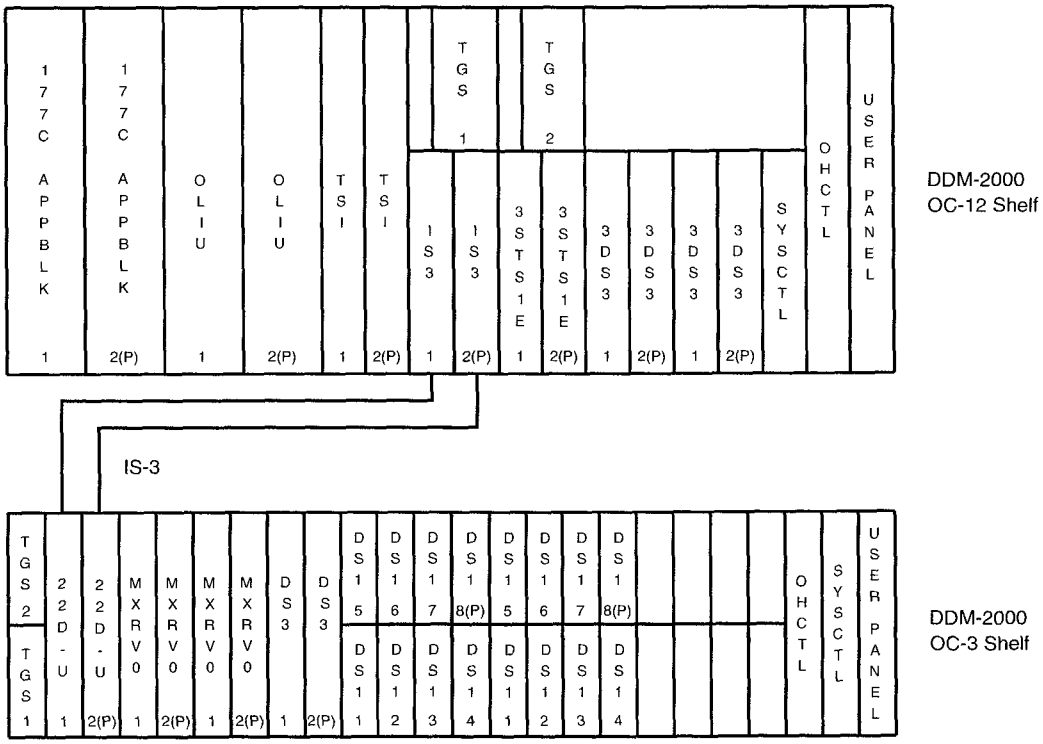


Figure 3-5. OC-12 STS-1/VT1.5 Path Switched Ring Configuration

OC-3/IS-3 Dual Ring Interworking (DRI) Configuration

Figure 3-6 shows a DDM-2000 OC-12 Multiplexer OC-3/IS-3 DRI configuration. The IS-3 interface provides a more economical way than three EC-1 interfaces to provide optical connectivity over a limited distance between an OC-3 ring and an OC-12 ring. A single IS-3 interface can connect two OC-3 nodes to two OC-12 nodes.

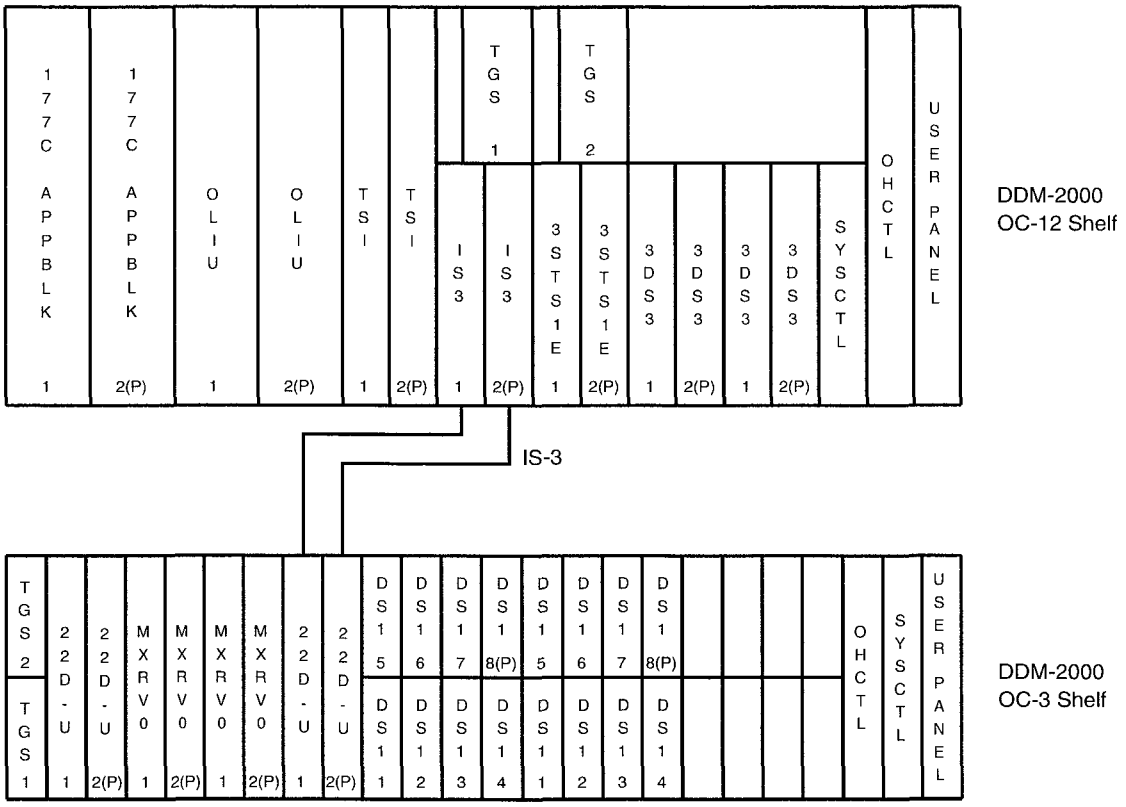


Figure 3-6. OC-3/IS-3 Dual Ring Interworking Configuration

OC-12 Ring Configuration (DS1/EC-1 Low-Speed Interfaces)

Figure 3-7 shows an OC-12 configuration using DS1/EC-1 low-speed interfaces. Interface to the low-speed shelf is made through the IS-3 (or OC-3) circuit packs, one service and one protection pack per interface. The IS-3 circuit packs replace the OLIU circuit packs in the Main slots on the DDM-2000 OC-3 shelf. This configuration supports a high-speed OC-12 interface with 84 DS1 terminations per DDM-2000 OC-3 shelf, up to a maximum of 336 DS1 terminations.

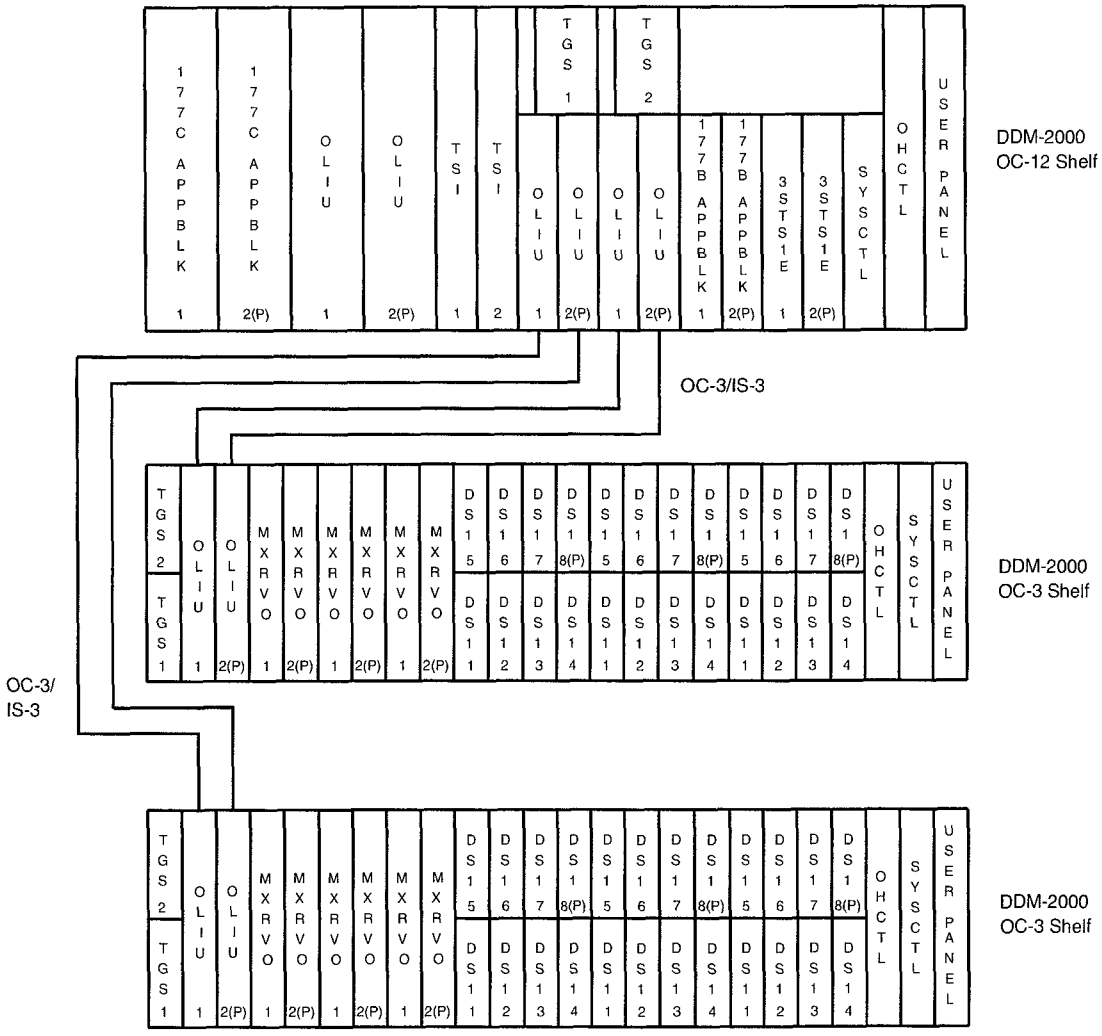


Figure 3-7. OC-12 Ring Configuration (DS1/EC-1 Low-Speed Interfaces)

OC-12 Optical Extension Shelf

Figure 3-8 shows an OC-12 optical extension shelf. The eight low-speed interfaces are equipped with four service and four protection OC-3 circuit packs. This configuration supports four OC-3 optical extensions; however, local drop configurations can be established by replacing OC-3 circuit packs with triple DS3, triple STS1E, or IS-3 circuit packs. This configuration can also support up to four OC-3 optical extensions through proper provisioning.

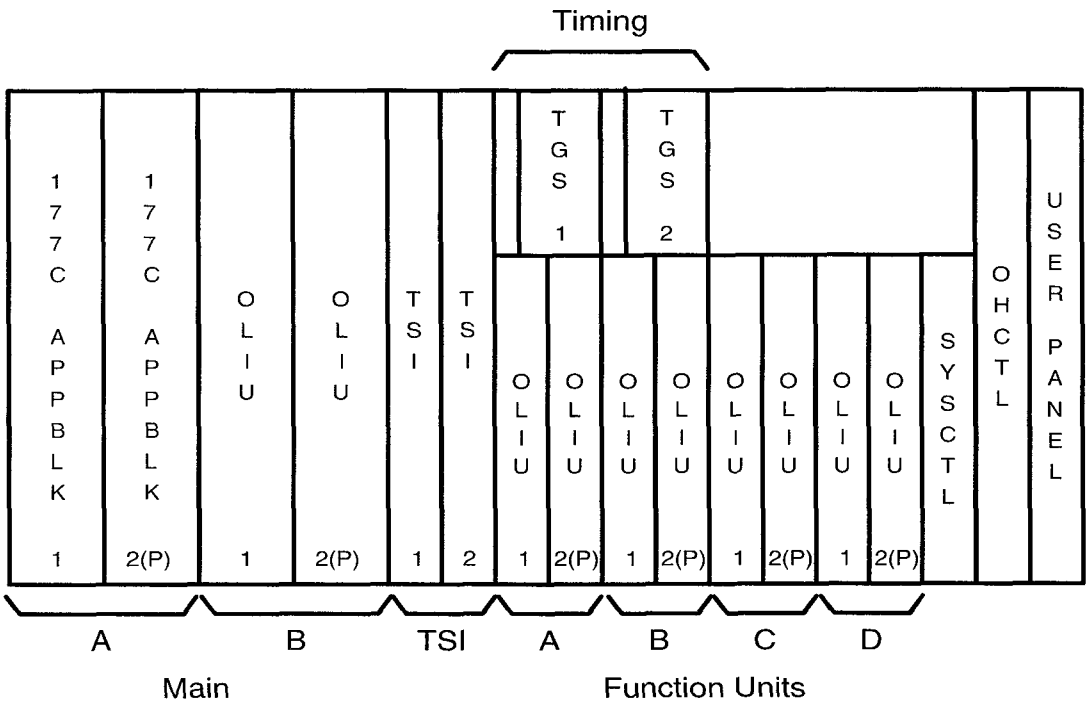


Figure 3-8. OC-12 Optical Extension Shelf

Linear (1+1) Extension From OC-12 Ring Configuration

Figure 3-9 shows a DDM-2000 OC-12 Multiplexer shelf provisioned for interfacing to an OC-3 Release 8.0 linear network extension. Two levels of switching are used. STS-1 level switching on the OC-12 ring to establish the STS-1 path and linear (1+1) switching of the service and protection lines on the OC-3 linear extension.

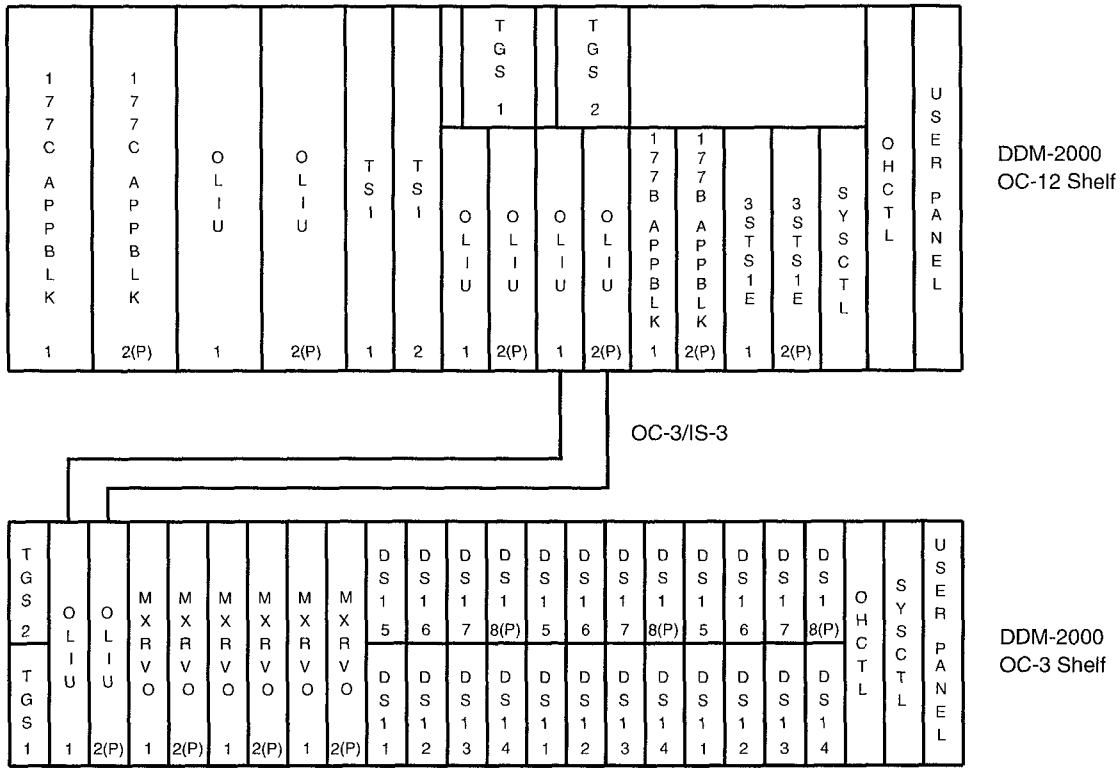


Figure 3-9. Linear (1+1) Extension From OC-12 Ring Configuration

OC-12 Dual Homing Shelf

Figure 3-10 shows a DDM-2000 OC-12 shelf equipped for a dual homing configuration, allowing two hosts to be active on the same OC-12 ring. This allows a 0x1 application where traffic is routed to both hosts to provide host protection. In this application, two DDM-2000 OC-12 shelves are hosting one OC-3 ring. Note that for single homed 0x1 applications, both Function Unit slots must be equipped while, for dual homed 0x1 applications, one Function Unit slot must be empty.

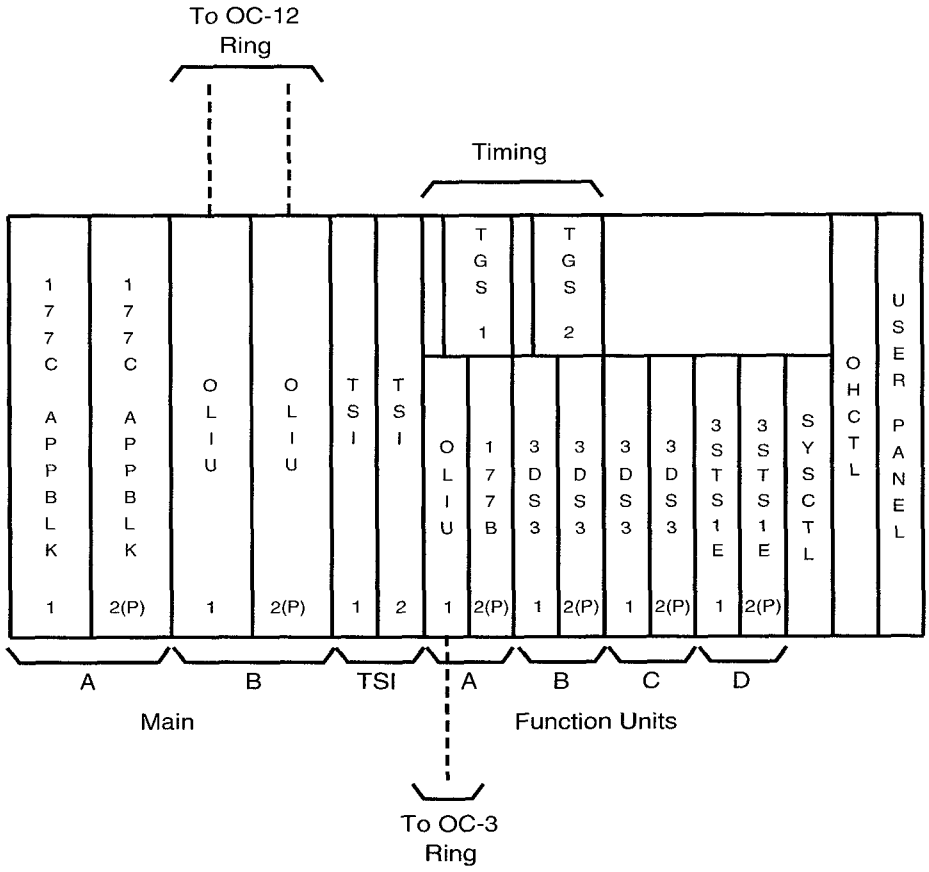


Figure 3-10. DDM-2000 OC-12 Dual Homing Shelf

OC-12 STS-3c Broadcast Shelf

Figure 3-11 shows a DDM-2000 OC-12 CO shelf equipped for an STS-3c broadcast application. This configuration uses a pair of OC-3cs provisioned for video. Each OC-3c is split and fed onto different rotations of the ring. There is no protection switching between the Function Unit circuit packs (unprotected). Each drop (RT) location can be provisioned to drop any or all of the STS-3cs to OC-3 or IS-3 circuit packs. Bandwidth on the ring, not provisioned for this application, can be used for other path-switched ring applications as shown in the figure with 6 DS3s and 3 EC-1s. This configuration also supports Locked STS-3c Broadband Services.

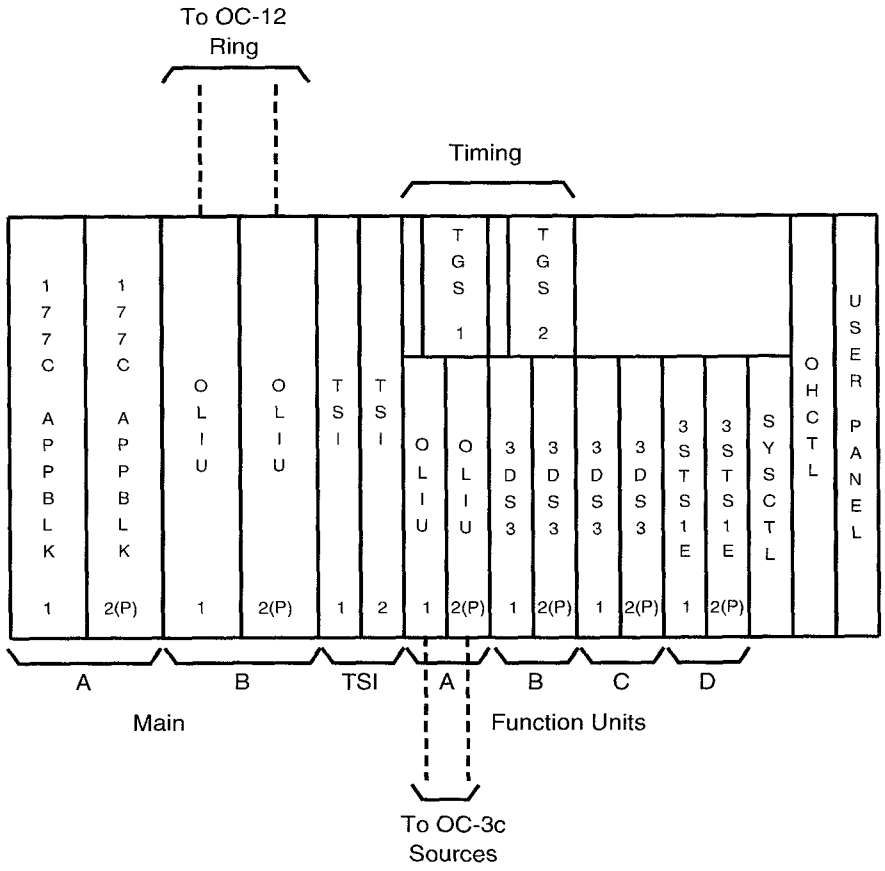


Figure 3-11. DDM-2000 OC-12 STS-3c Broadcast Shelf

OC-12 OC-3c Transport Shelf

Figure 3-12 shows a DDM-2000 OC-12 shelf equipped for an OC-3c transport application. The main application of a shelf, configured in this way, is transport of video or asynchronous transfer mode (ATM) signals. Bandwidth is mapped into STS-3c "bundles," and the bundles follow the same path to preserve the isochronous (known, periodic time interval) nature of the transported information.

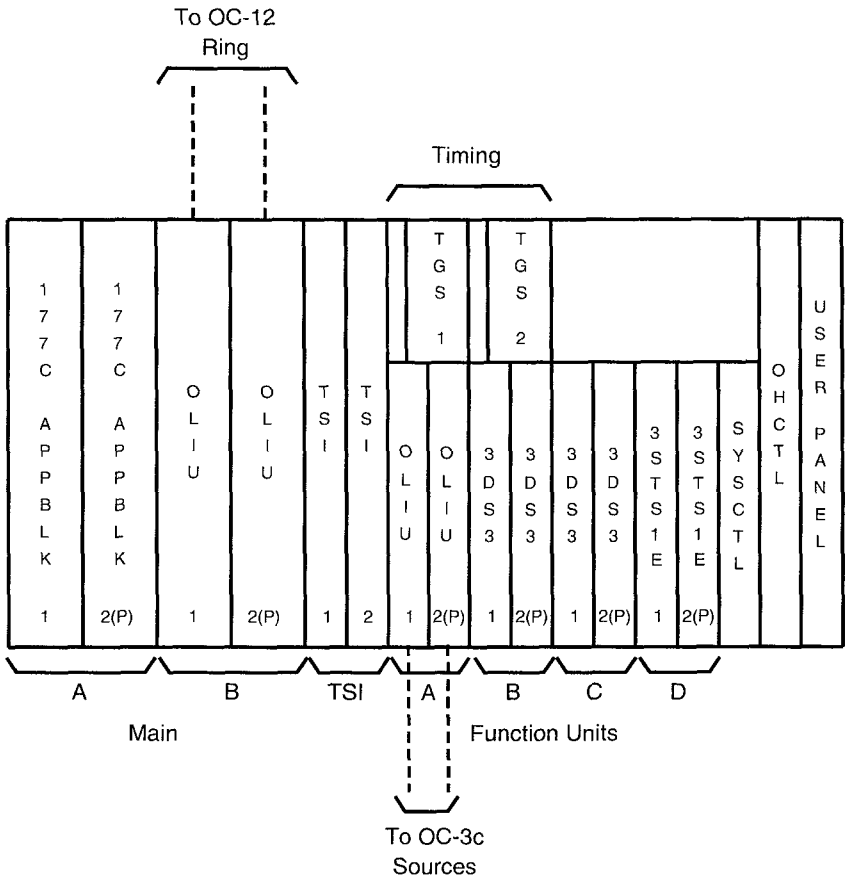


Figure 3-12. DDM-2000 OC-12 OC-3c Transport Shelf

Upgrades

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.

See Section 9, "Maintenance Description," for more information on software compatibility and upgrades.

DDM-2000 Fan Shelf

The DDM-2000 Fan Shelf (Figure 3-13) provides forced convection cooling to DDM-2000 OC-12 shelves in controlled environments (central office and controlled environment vault).

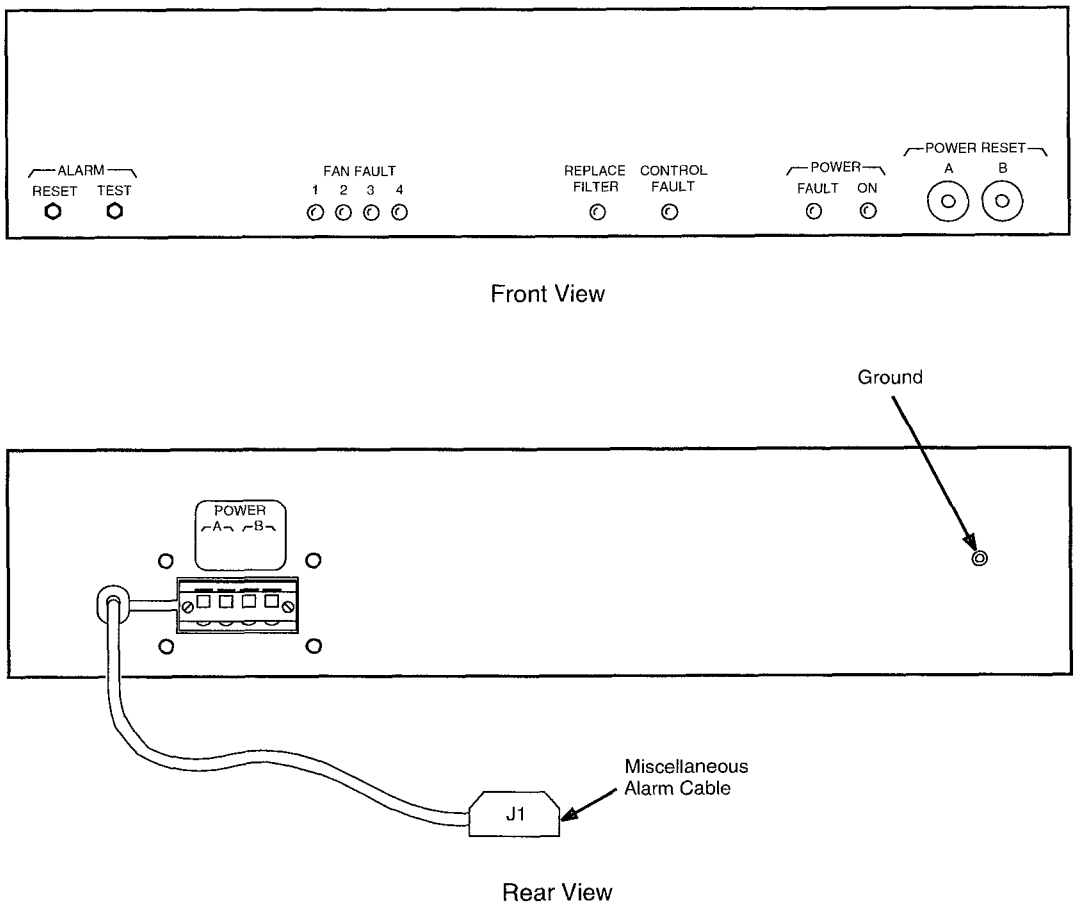


Figure 3-13. DDM-2000 Fan Shelf

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. 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.

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 3-14). The switches should be set as shown in Table 3-3.

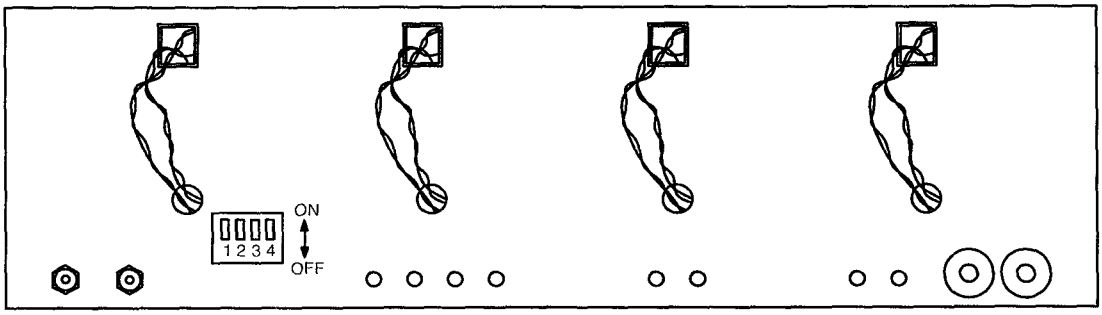


Figure 3-14. DDM-2000 Fan Shelf — Fan Switches — Front Cover Removed

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

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

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.

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

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

Power

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Power

4

Overview

This section describes the power distribution of the DDM-2000 OC-12 Multiplexer.

Introduction

The DDM-2000 OC-12 Multiplexer is powered by –48 volts direct current. The voltages required to power the circuits within the DDM-2000 OC-12 Multiplexer are generated by DC-to-DC converters mounted on circuit packs within the shelf.

The information in this section is for typical applications only. Refer to Section 10, "Technical Specifications," and LTP 801-525-168, *DDM-2000 Floor Plan Data Sheets,* and T-82046-30, Power Systems DC Distribution Circuit for Digital Transmission System, for proper engineering of battery plant and feeders for OC-12 Systems.

Power Description

Two independent –48 volt office power feeders (A and B) enter the shelf through backplane connectors and are fused and filtered at the user panel, then distributed to the circuit packs. Power conversion is performed through modular power converters located on the circuit packs. In each circuit pack, the two feeders are diode ORed, fused, filtered, and regulated by the board-mounted power modules. This provides the required redundancy in case of the loss of one feeder or one fuse. Figure 4-1 shows which circuit packs have converters mounted on the printed wiring boards. Power modules are located on the OLIU, 3DS3, 3STS1E, TSI, TGS, SYSCTL, and OHCTL circuit packs.

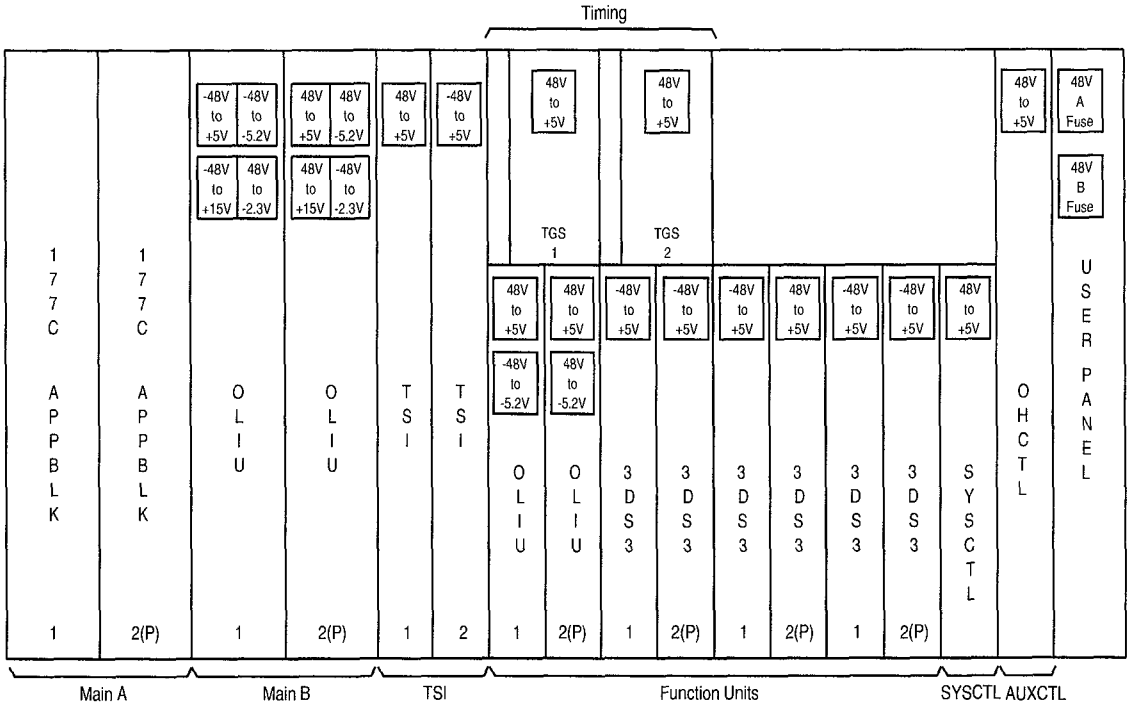


Figure 4-1. DDM-2000 OC-12 Multiplexer Power Architecture

Circuit Packs

OLIU Circuit Packs

The 21D/21D-U OLIU circuit pack is powered by a –48 volt to +5 volt DC-to-DC converter mounted on the circuit pack. The backplane power feeders supply A and B –48 volts to this converter via diode ORed circuits and fuses mounted on the circuit pack.

The 21G/21G-U OLIU circuit pack is powered by two DC-to-DC converters located on the circuit pack. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and fuses mounted on the circuit pack. One converter supplies +5 volts and one supplies –5.2 volts for the circuit pack.

The 23G/23G-U and 23H/23H-U OLIU circuit packs are powered by four DC-to-DC converters located on the circuit packs. The backplane power feeders supply A and B –48 volts to these converters via diode ORed circuits and fuses mounted on the circuit packs. One converter supplies +5 volts, one supplies –5.2 volts, one supplies –2.3 volts, and one supplies +15 volts for the circuit packs.

TSI, TGS, 3DS3, and 3STS1E Circuit Packs

The BCP3 TSI, BBF2B TGS, 3DS3, and 3STS1E circuit packs are powered by a –48 volt to +5 volt DC-to-DC converter mounted on each circuit pack. The backplane power feeders supply A and B –48 volts to this converter via diode ORed circuits and fuses mounted on the circuit pack. The converter provides +5 volts DC power for TSI, TGS, 3DS3 and 3STS1E circuit packs.

Control Circuit Packs

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

LEDs

Two green power on (PWR ON A and PWR ON B) LEDs on the Group 4 shelf user panel indicates that the shelf is receiving fused –48 volt power. The LEDs will remain illuminated as long as either –48 volt feeder is supplying power to the shelf.

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

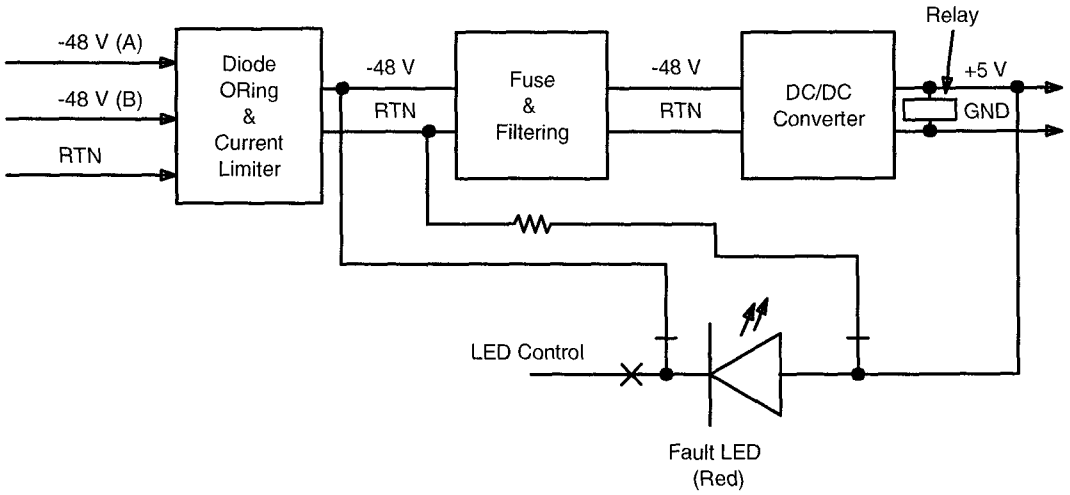


Figure 4-2. Circuit Pack Power and LED Control

Power Minor Alarm

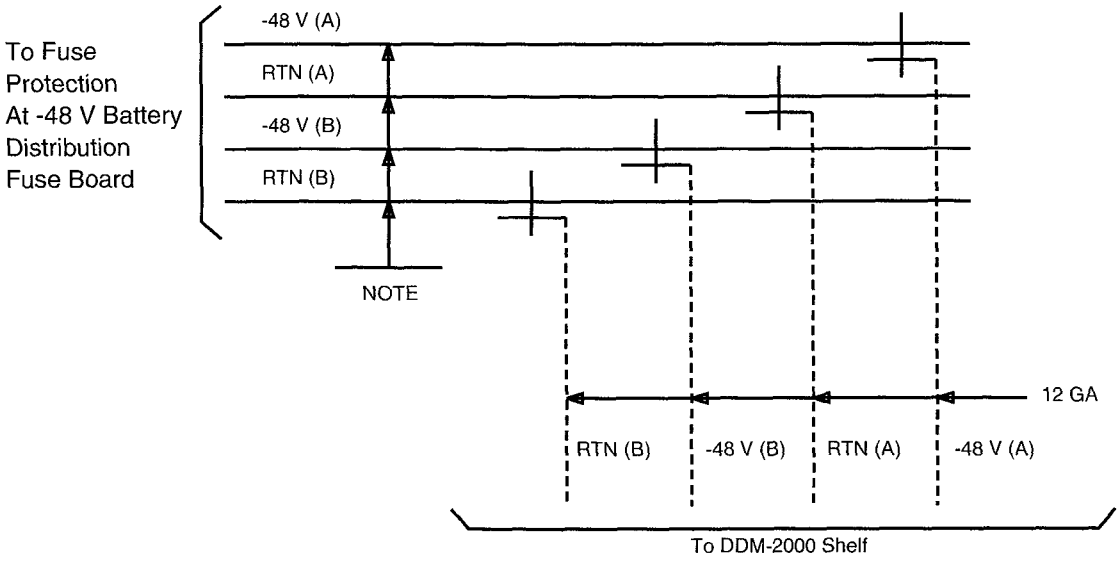
A yellow power minor (PMN) alarm LED is provided on the user panel to indicate an AC power failure at the remote terminal. The PMN alarm can be provisioned by a switch on the SYSCTL circuit pack at the central office (CO) to be either an office minor (MN) or office major (MJ) alarm. PMN alarms are also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

Power Distribution

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

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

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



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

Figure 4-3. Typical –48 Volt Power Supply for DDM-2000 OC-12 Single Shelf

Transmission and Synchronization Interfaces

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Transmission and Synchronization Interfaces

5

Overview

This section describes the DDM-2000 OC-12 Multiplexer 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 (FN). Each can be equipped with:

- BBG11/BBG11B 3DS3 circuit packs (1x1 protected)
- BBG12 3STS1E circuit packs (1x1 protected)
- 21D/21D-U OLIU circuit packs (1+1 or 0x1 protected or STS-3c broadcast video)
- 21G/21G-U/21G2-U OLIU circuit packs (1+1 or 0x1 protected or STS-3c broadcast video).

The 3DS3, 3STS1E, 21D/21D-U OLIU, and 21G/21G-U/21G2-U OLIU circuit packs can be mixed in any combination across the four Function Units to provide for termination/transport of 12 STS-1 signals or 4 concatenated STS-3c (OC-3c) signals. The DS3 interfaces accept any DSX-3 compatible clear channel signal.

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

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

Application	Ring (R5.0)	Ring (R5.1)
DS1 Low-speed *	X	X
DS3 Low-speed	X	X
EC-1 Low-speed	X	X
OC-12 High-speed	X	X
OC-3 Low-speed	X	X
OC-3c Low-speed	X	X
IS-3 Low-speed	X	X
IS-3c Low-speed	X	X

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

OC-12 STS-1 Path Switched Ring

Figure 5-1 is an overall block diagram of a DDM-2000 OC-12 Multiplexer STS-1/VT1.5 path switched ring node. The DDM-2000 OC-12 Multiplexer ring supports DS3 and EC-1 low-speed interfaces in an STS-1 path switched ring configuration, 0x1 OC-3/IS-3 interfaces in an STS-1/VT1.5 path switched ring configuration, and optical extensions with OC-3/IS-3 or OC-3c/IS-3c interfaces. The time slot interchange (TSI) feature provides full flexibility in assigning signals between low-speed DS3, OC-3/OC-3c/IS-3/IS-3c, and EC-1 ports and the high-speed interface. Each Function Unit can handle a maximum of 3 STS-1s for a total of 12 STS-1s or one STS-3c for a total of 4 STS-3cs.

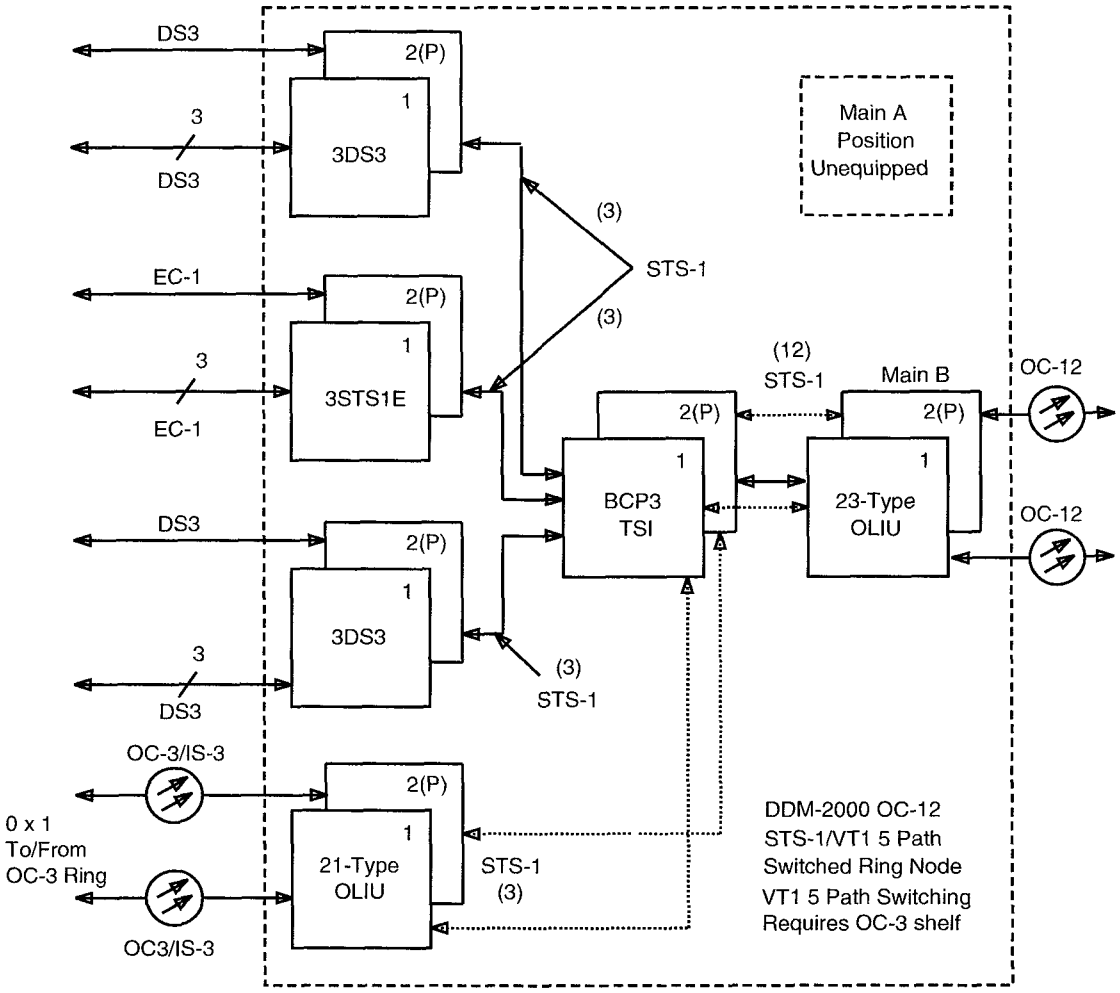


Figure 5-1. OC-12 Multiplexer Block Diagram — STS-1/VT1.5 Path Switched Ring Node

Dual Ring Interworking (DRI)

The DDM-2000 OC-12 Multiplexer STS-1/STS-3c DRI application uses the same shelf configuration as the DDM-2000 OC-12 Multiplexer path switched ring (Figure 5-1). In this configuration, the DDM-2000 OC-12 Multiplexer can provide STS-1 DRI with another DDM-2000 OC-12 ring, a DDM-2000 OC-3 ring, or an FT-2000 OC-48 Lightwave System ring with redundant signal appearances at the two central offices via EC-1/OC-3/OC-3c/IS-3/IS-3c and DS3 interfaces (see Figure 9-8 in Section 9 "Maintenance Description"). 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 (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-3/OC-12 Ring (0x1) Low-Speed Interfaces

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

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

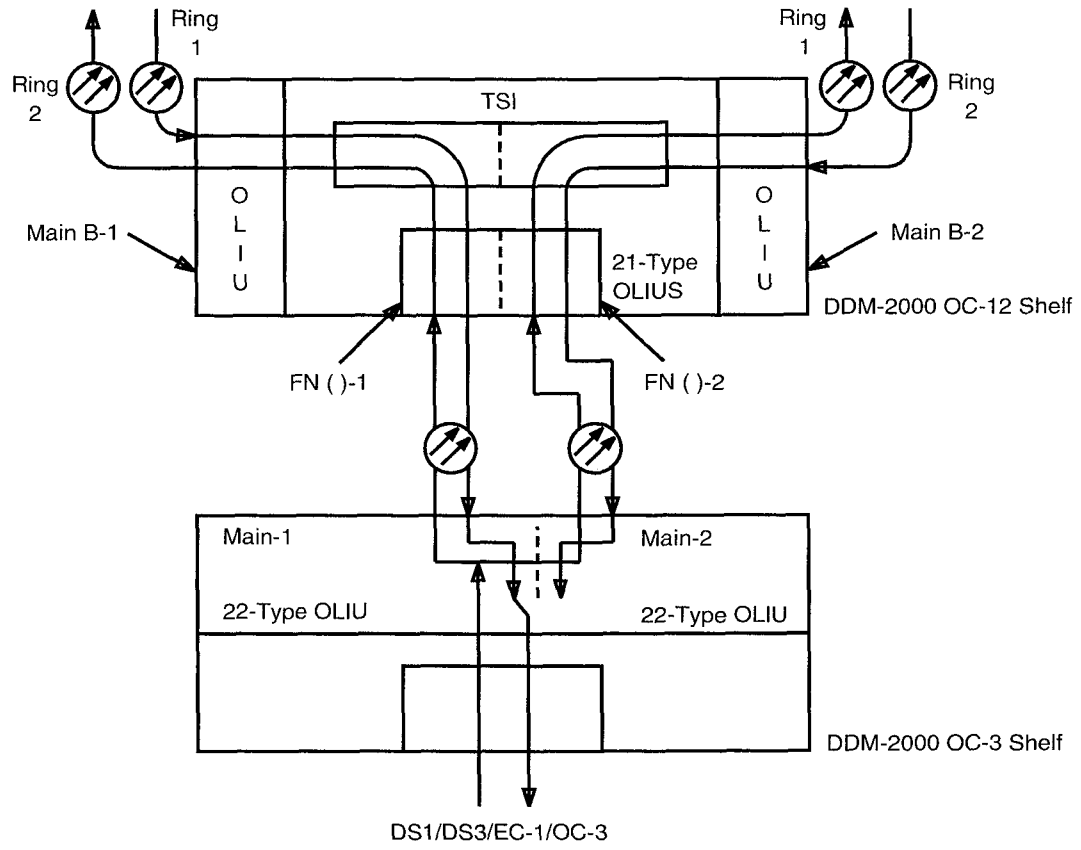


Figure 5-2. OC-3/OC-12 Ring (0x1) Low-Speed Interfaces — Single Homing

See Figure 5-3. For dual homed 0x1 ring applications, one Function Unit slot on the OC-12 shelf must be empty. When the OC-12 shelf is provisioned for 0x1 (default) 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.

When STS-1s are dropped to a 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.

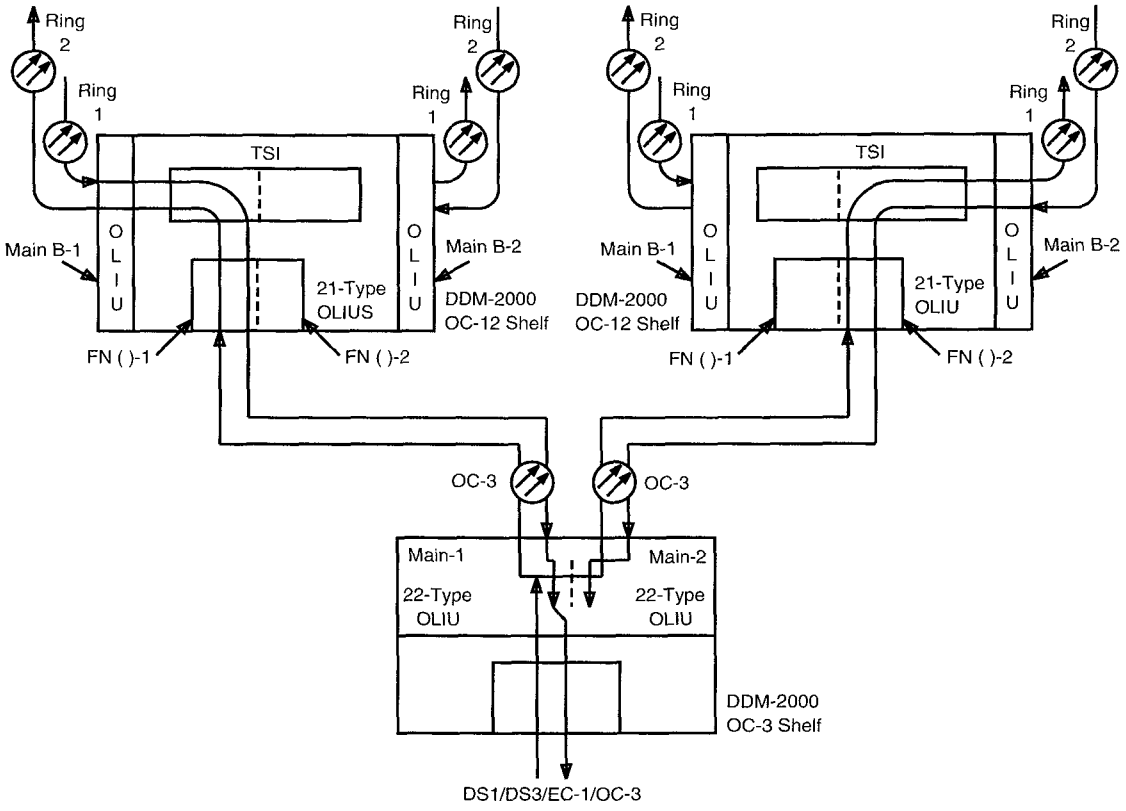


Figure 5-3. OC-3/OC-12 Ring Low-Speed Interfaces (0x1) — Dual Homing

Linear (1+1) Optical Extension Between OC-12 and OC-3

See Figure 5-4 and Figure 5-5. The Function Units in the DDM-2000 OC-12 shelf can contain linear (1+1) protected OC-3/IS-3 circuit packs. This allows a DDM-2000 OC-12 shelf to connect to the Main slots of a linear DDM-2000 OC-3 shelf. The signals between the DDM-2000 OC-12 and OC-3 shelves can be either OC-3 or OC-3c signals. This allows more options in designing a DDM-2000 network, such as adding a linear add/drop DDM-2000 OC-3 shelf off of a DDM-2000 OC-12 ring. In the transmit direction, a circuit pack failure will cause a switch. In the receive direction, an incoming STS signal failure or circuit pack failure will cause a switch.

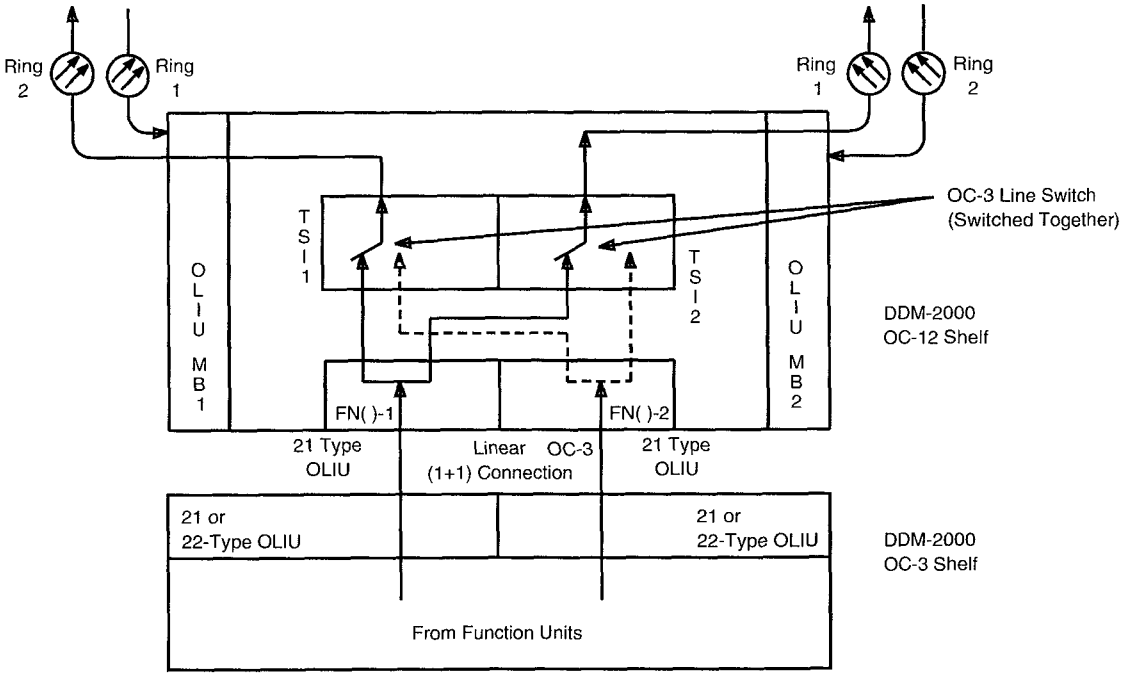


Figure 5-4. OC-12 Ring Shelf with Linear (1+1) OC-3 Low-Speed Interfaces (Transmit)

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

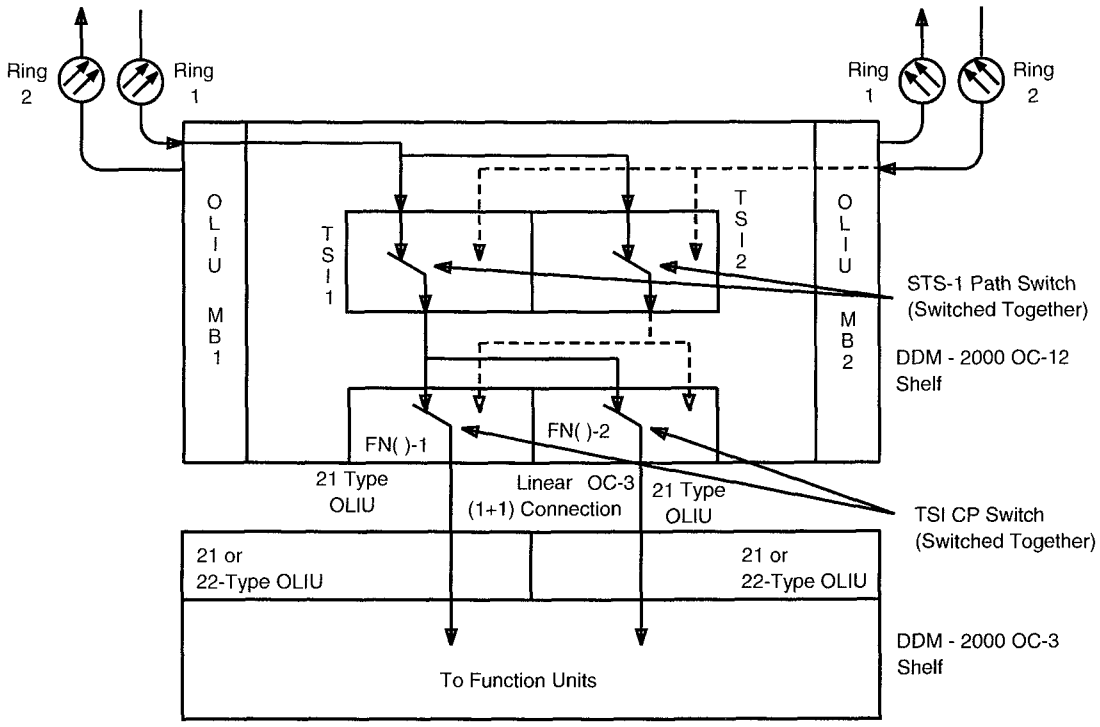


Figure 5-5. OC-12 Ring Shelf with Linear (1+1) OC-3 Low-Speed Interfaces (Receive)

Synchronization Interfaces

Each DDM-2000 OC-12 Multiplexer can be provisioned to one of three timing modes:

- Free-running from an internal oscillator
- Line timing from an incoming optical interface. This timing reference is used to generate all outgoing signals. Line timing is an intermediate node that derives timing from the incoming fiber. Loop timing is a special case of line-timing and is the terminating node that derives timing from the incoming fiber.
- External timing from the digital synchronization network via DS1 references (DS1 External).

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

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).

Line Timing

The reference signal feeding the phase-locked loop (PLL) is selected from the internal oscillator or a line-timing clock derived from the incoming optical line. In line-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 ± 4.6 ppm for 24 hours in the event of an unprotected timing DS1 reference failure.

DS1 Output Modes: MULT and SYNC OUT

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

DS1 Output Mode, MULT

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

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

If a TGS in the MULT chain is removed, shorting contacts in the backplane will redirect input and output signals so the subsequent shelves continue to receive valid DS1 signals. However, if a BBF2B provisioned for SYNC OUT is inserted in the MULT chain, the traceability of the DS1 output will be affected. This could result in untraceable timing or the creation of timing loops. To ensure that replacement circuit packs are provisioned correctly, the DDM-2000 software will monitor newly inserted packs for the correct "shelf provisioning." If a newly inserted pack does not match the shelf provisioning, the fault LED is lit on that pack and indicates that a provisioning error has occurred. It is always best to verify TGS provisioning **before** insertion.

DS1 Output Mode, SYNC OUT

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

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

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

The free-running, line-timing, and DS1 external timing modes can be combined into various subnetwork configurations, some of which are shown in Figure 5-6. 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.

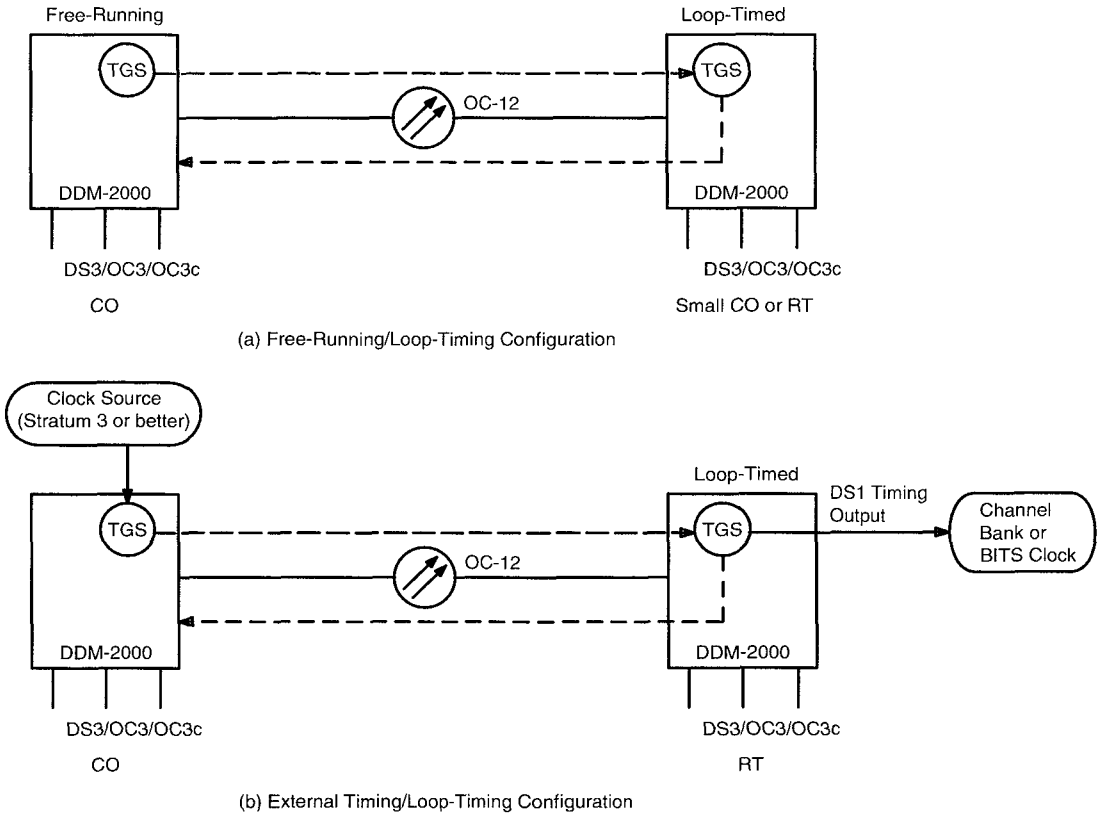


Figure 5-6. Synchronization Timing Configurations (Sheet 1 of 2)

Figure 5-6a shows the 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 5-6b and Figure 5-6c show the CO timed from an external stratum 3 or better source. The RT derives its timing from the incoming optical line and can send a DS1 output to a BITS clock.

The external timing configuration (Figure 5-6d) 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).

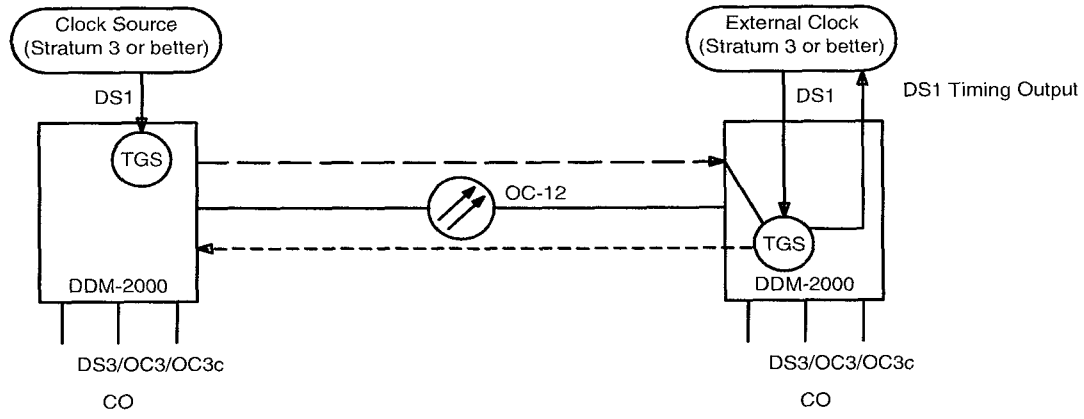
The PRS is equipment that provides a timing signal whose long-term accuracy is maintained at 10^{-11} or better with verification to universal coordinated time (time and frequency standard maintained by the U. S. National Institute of Standards and Technology), and whose timing signal is used as the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

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

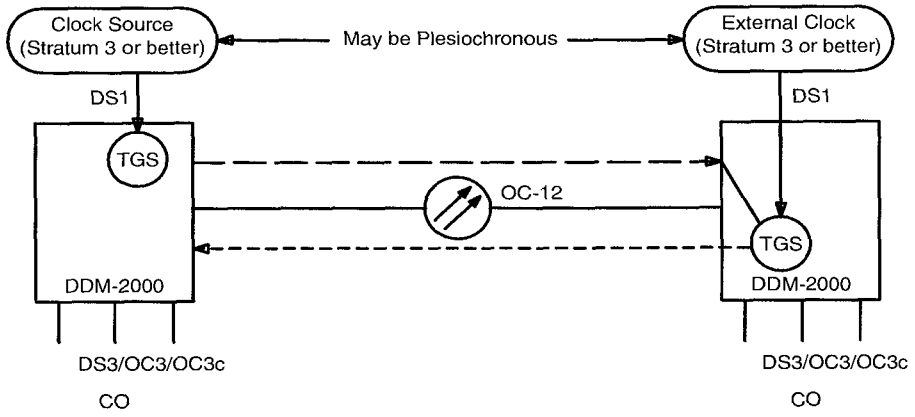
Table 5-2 summarizes the DDM-2000 OC-12 synchronization modes for the current software release.

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

Application	Ring (R5.0)	Ring (R5.1)
Free-Running	X	X
Line-Timing	X	X
External Timing	X	X
DS1 Sync Output	X	X
Synchronization Messaging	X	X
Automatic Synchronization Reconfiguration	X	X



(c) External Timing Configuration



(d) External Timing Plesiochronous

Figure 5-6. Synchronization Timing Configurations (Sheet 2 of 2)

Synchronization Messaging

SONET synchronization messaging is used to communicate the quality of subnetwork timing, internal timing status, and timing states throughout a subnetwork. Transitions to and from holdover or between OC-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 ring networks with synchronization messaging, either TGS circuit pack allows line-timing and automatic switching from either of the two ring optical interfaces.

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 line-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 line-timed site would cause a DDM-2000 Multiplexer to enter holdover.

As shown in Figure 5-7a (Figure 5-7 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.

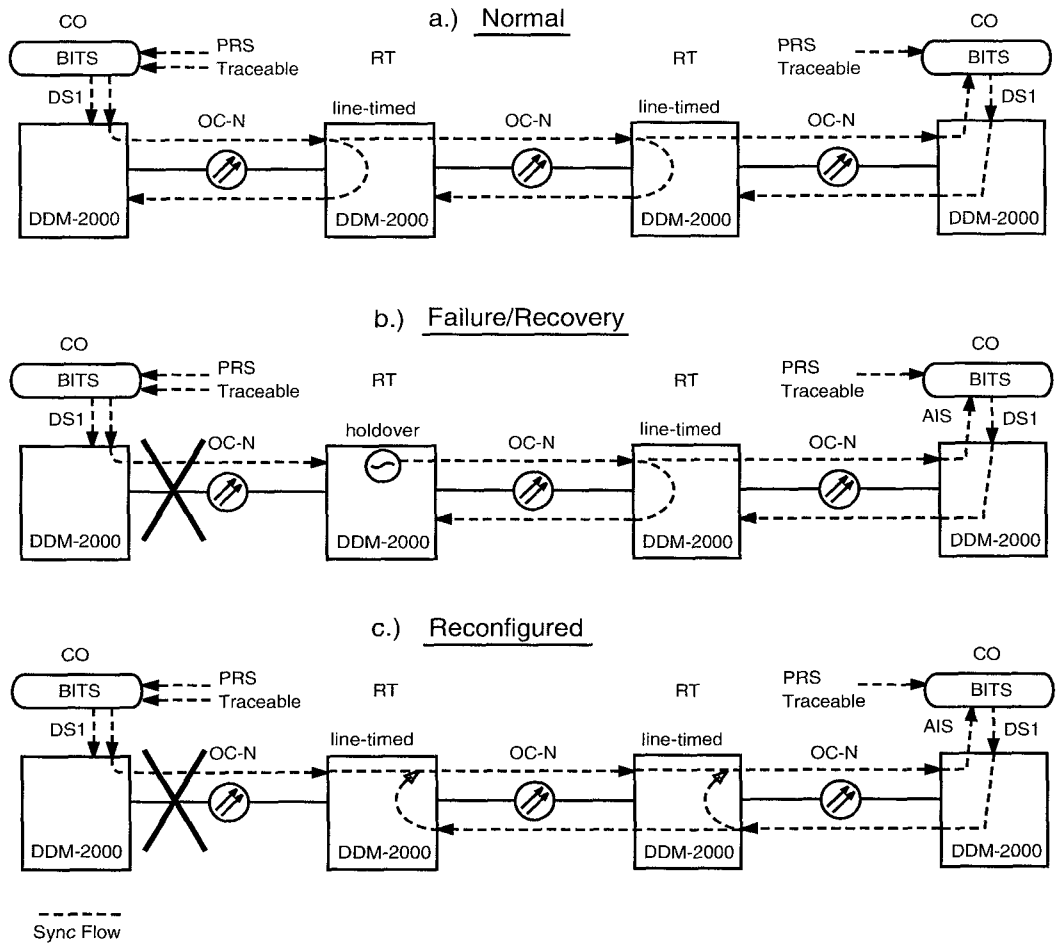


Figure 5-7. DS1 Timing Output — Dual Homing Linear

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 OC-12 Multiplexer shelf can always determine the best timing reference available to it and switch to it. Through this mechanism, the synchronous operation of the subnetwork can be maintained. The switching of timing references is hitless, and the synchronization messages also allow it to be done without creating timing loops in the process. Note that automatic synchronization reconfiguration applies only to switching between available and line-timing references and not between timing modes. For example, switching between line-timed to external timed or external timed to line-timed would not be supported.

In the linear dual-homing network in Figure 5-7, normal operation includes an external timing reference at each of the COs. The RT sites are each loop timed from the CO 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 5-8. Under normal operation, the ring has one DDM-2000 Multiplexer externally timed and the others line-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 line-timed directions to clockwise. The result is that the ring is again operating synchronously. The ring already provides self-healing restoration of the traffic, so it is especially important to maintain synchronous operation during this type of failure to prevent service degradation due to increased jitter and wander.

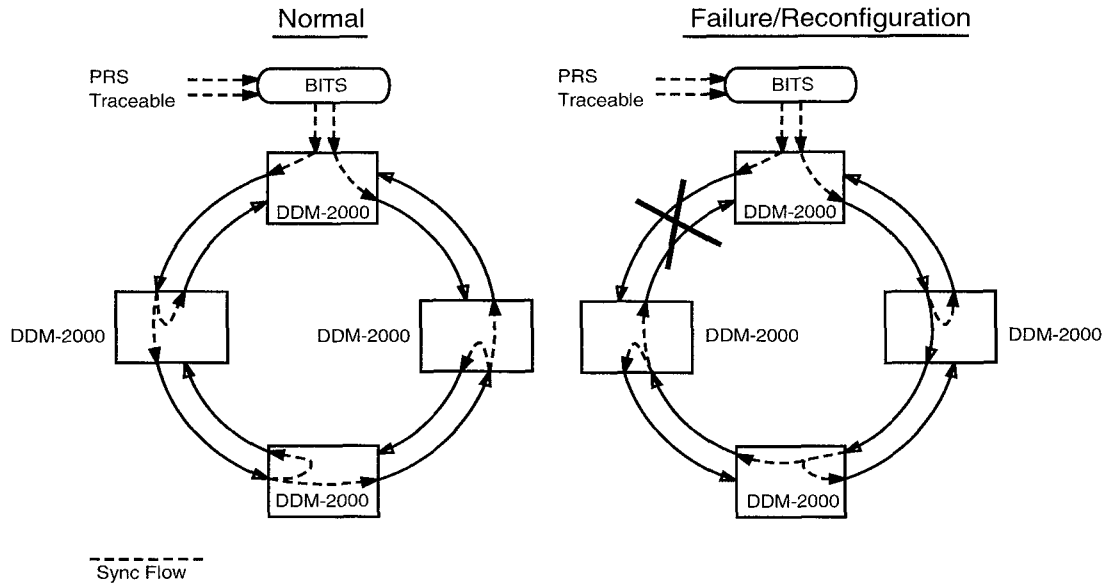


Figure 5-8. Synchronization Reconfiguration — Access Ring

Synchronization Provisioning Integrity

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

Feature Details and Options

As mentioned previously, SONET synchronization messaging is used to communicate the quality of the subnetwork timing throughout the subnetwork. This is done using bits 1-3 of the K2 byte found in the SONET overhead. In OC-12 Release 5.1 and later releases, synchronization messaging can also be done using bits 5-8 of the S1 byte in the SONET overhead. If a DDM-2000 OC-12 system is deriving timing from a given OC-N interface, and synchronization messaging is enabled on that interface (Kbyte messages and Sbyte messages in OC-12 Release 5.1 and later are provisioned using the **set-ocn** command), the system interprets the received message to determine its internal timing status. The system also determines the state of the DS1 output, if the DS1 output is enabled. The DDM-2000 OC-12 system also transmits over the particular OC-N interface and all other OC-N interfaces that are enabled for synchronization messaging, the appropriate message indicating the quality of its timing and its active timing mode. Table 5-3 and Table 5-4 list the associated internal timing status and DS1 Output states that are associated with synchronization messages received from the OC-N interface when synchronization messaging is enabled. The tables lists the messages from low to high quality.

Table 5-3. Synchronization Messages using K2 Byte

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

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

† Presently, DDM-2000 OC-12 Multiplexers cannot generate these messages, but they could be retransmitted and supported for autoreconfiguration if any of these are received by DDM-2000 OC-12 Multiplexer.

Table 5-4. Synchronization Messages using S1 Byte *

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

* This table is applicable to OC-12 R5.1 and later releases.

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

‡ Presently, DDM-2000 OC-12 Multiplexers cannot generate these messages, but they could be retransmitted and supported for autoreconfiguration if any of these are received by DDM-2000 OC-12 Multiplexer.

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

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

When the DDM-2000 OC-12 system is configured for external timing and its DS1 output port is provisioned for MULT mode, the message Sync Quality Unknown (SQU) for K byte, or Sync Trace Unknown (STU) for S byte, is sent on all the OC-N interfaces where synchronization messaging is provisioned. When the capability of communicating with a BITS clock over the DS1 overhead exists, the quality of the reference signal will be transmitted instead; for example, Stratum 1.

When the DDM-2000 OC-12 system is configured for external timing and its DS1 output port is provisioned for SYNC OUT mode, the Timing Looped Back (TLB) message for K byte, or "Don't Use" message for S byte, will be sent on the OC-N interfaces towards the network element (NE) from which the DS1 timing output is being derived. The SQU message for K byte, or STU for S byte, will be sent on all other OC-N interfaces where synchronization messaging is provisioned. If the DS1 output is generating AIS while the system is configured in this way, the message SQU for K byte, or STU for S byte, will be transmitted on all OC-N interfaces.

When the DDM-2000 OC-12 system is configured for free run or is in holdover mode, the Internal Clock message for K byte, or Traceable SONET Clk for S byte, will be sent on all OC-N interfaces where synchronization messaging is provisioned.

When the DDM-2000 OC-12 system is configured for line timing, the TLB message for K byte, and "Don't Use" for S byte, will be sent on the OC-N interfaces towards the NE from which the timing is being derived. The message received on the OC-N interface will be sent on all other OC-N interfaces where synchronization messaging is provisioned.

With automatic synchronization reconfiguration, the DDM-2000 Multiplexer systems use and compare the incoming synchronization messages on the OC-N interfaces available for line-timing to select the highest quality synchronization reference available. If the received quality levels are the same on the references available for timing, the existing line timing reference takes precedence. This feature guarantees the nonrevertive operation of reconfiguration. The line-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, loss of frame (LOF), loss of signal (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 5-5 lists the synchronization references available on DDM-2000 OC-3 and OC-12 system topologies.

Table 5-5. Available Synchronization References

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

For DDM-2000 OC-3, Function Unit C, when equipped with an OC-3/IS-3 OLIU, can be selected as an option for automatic synchronization reconfiguration. This

is useful in DRI networks where an OC-3 ring is connected through an OC-3/IS-3 optical interface to an OC-12 or FT-2000 OC-48 Lightwave System ring.

In OC-12 Release 5.1 and later ring releases, the sending of DS1 AIS on the output of the BBF2B TGS circuit pack can be provisioned by using the **set-sync** command. Depending on the quality level of the incoming sync messages, this new parameter can be provisioned to send DS1 AIS upon receiving level 5 (default), level 4, level 3, or level 2. Refer to Table 5-3 and Table 5-4 for definitions of quality levels. AIS will be sent as long as the received message is at the provisioned or greater in quality level number.

Examples

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

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

In all of the following examples, if the sync message parameter within the **set-oc3** or **set-oc12** commands has been provisioned to "S byte" for an optical interface, then the equivalent S byte message will be transmitted from that optical interface. The following are equivalent messages:

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

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

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

Synchronization Reconfiguration Using an Externally Timed Access Ring

Figure 5-9a shows an externally timed access ring operating in its normal configuration. The DDM-2000 OC-3/OC-12 Multiplexer at the CO (Site A) is externally timed from a BITS clock referenced to a PRS traceable source (host node). The remaining DDM-2000 OC-3/OC-12 Multiplexers are externally timed from a BITS clock referenced to a derived DS1.

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

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

a) Synchronization Reconfiguration Example (Before Failure)

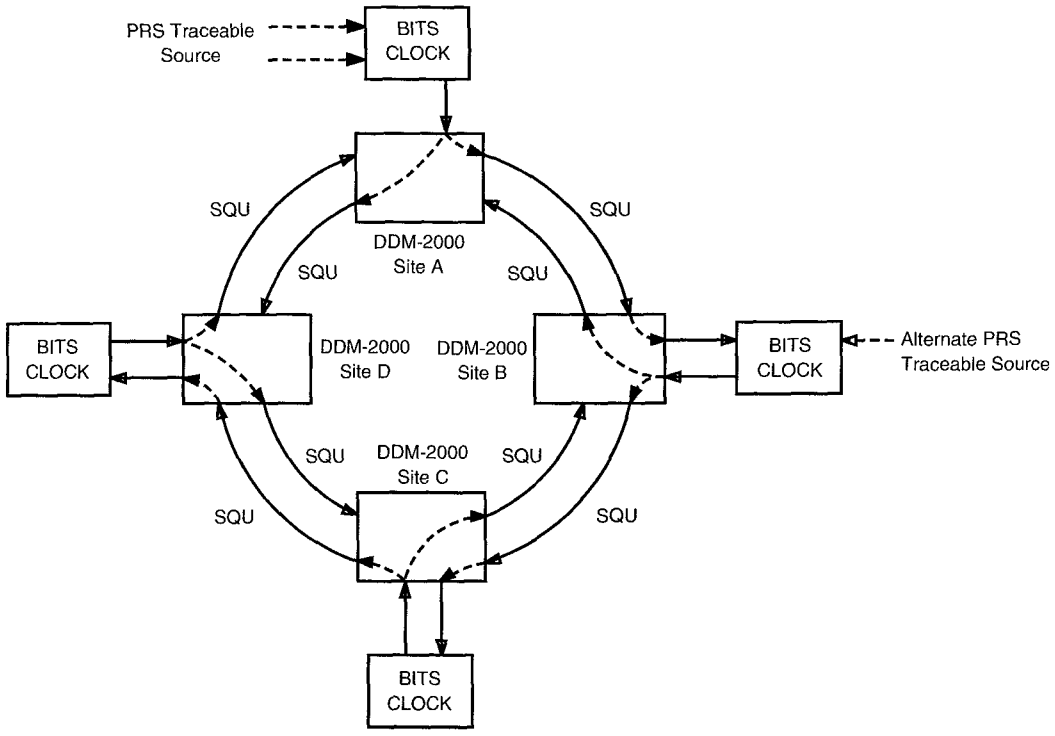


Figure 5-9. Synchronization Reconfiguration — Externally Timed Access Ring (Sheet 1 of 2)

In Figure 5-9b, a fiber has been cut between sites A and B. Immediately the DDM-2000 OC-3/OC-12 Multiplexer at site B changes the format of its derived DS1 to AIS. This forces the BITS clock at site B to enter holdover or switch input source (if a valid one is available). Because automatic synchronization reconfiguration is not available, the synchronization status messages are not used. All other non-host nodes will track the holdover clock at site B. Although no timing loops have been formed, the timing of all non-host nodes will differ from the host node by the accuracy of the holdover clock at site B.

b) Synchronization Reconfiguration (After Failure)

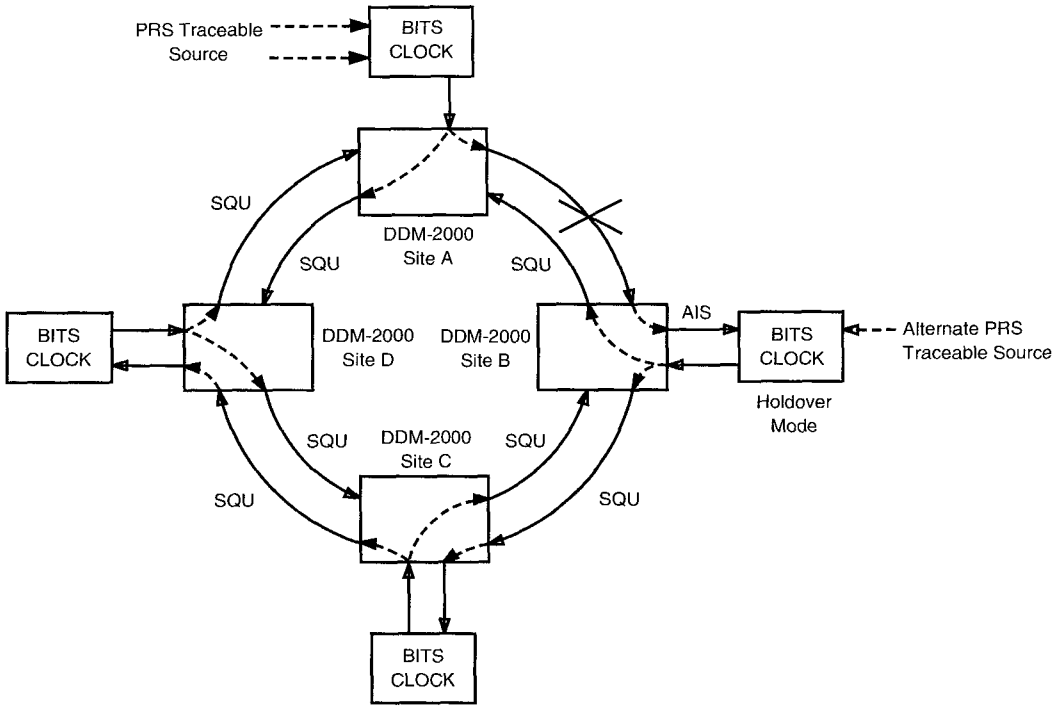


Figure 5-9. Synchronization Reconfiguration — Externally Timed Access Ring (Sheet 2 of 2)

Synchronization Reconfiguration in an Access Ring

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

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

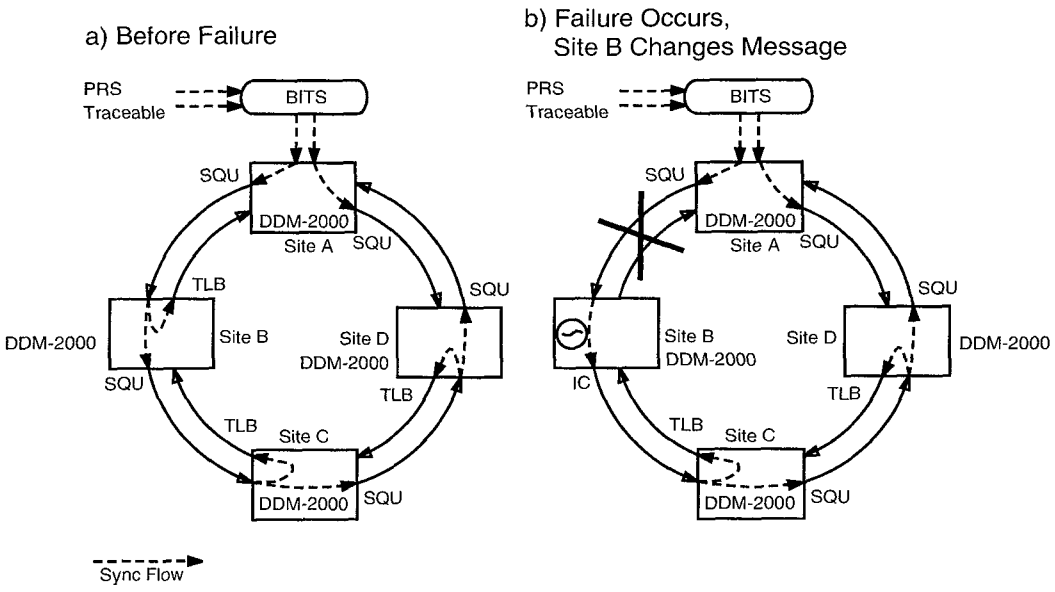


Figure 5-10. Synchronization Reconfiguration — Access Ring (Sheet 1 of 3)

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

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

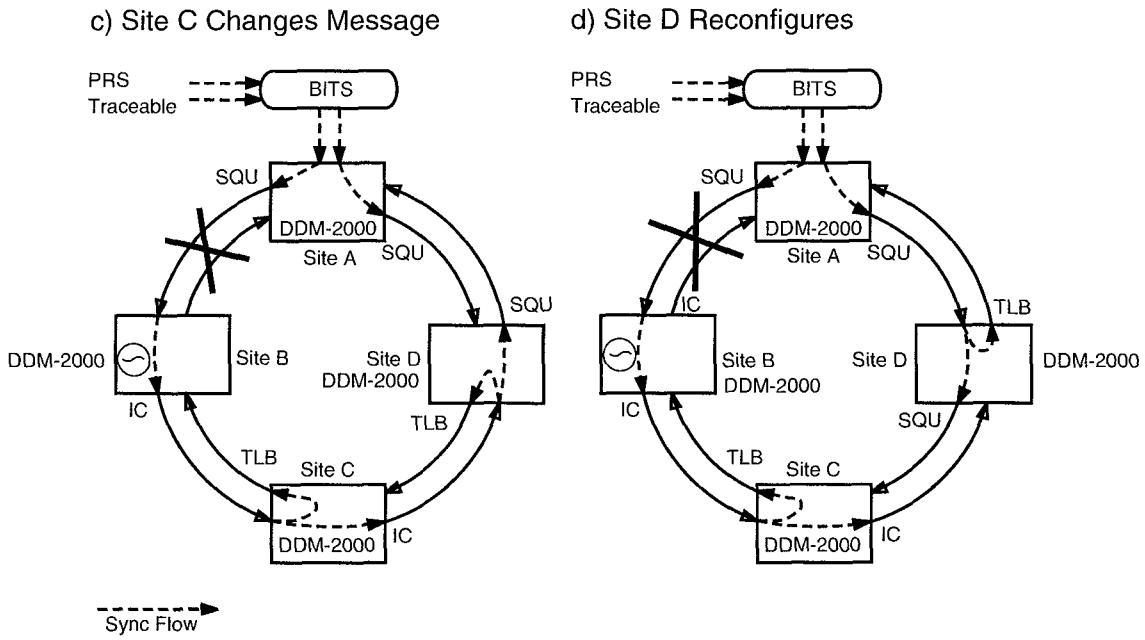


Figure 5-10. Synchronization Reconfiguration — Access Ring (Sheet 2 of 3)

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

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

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

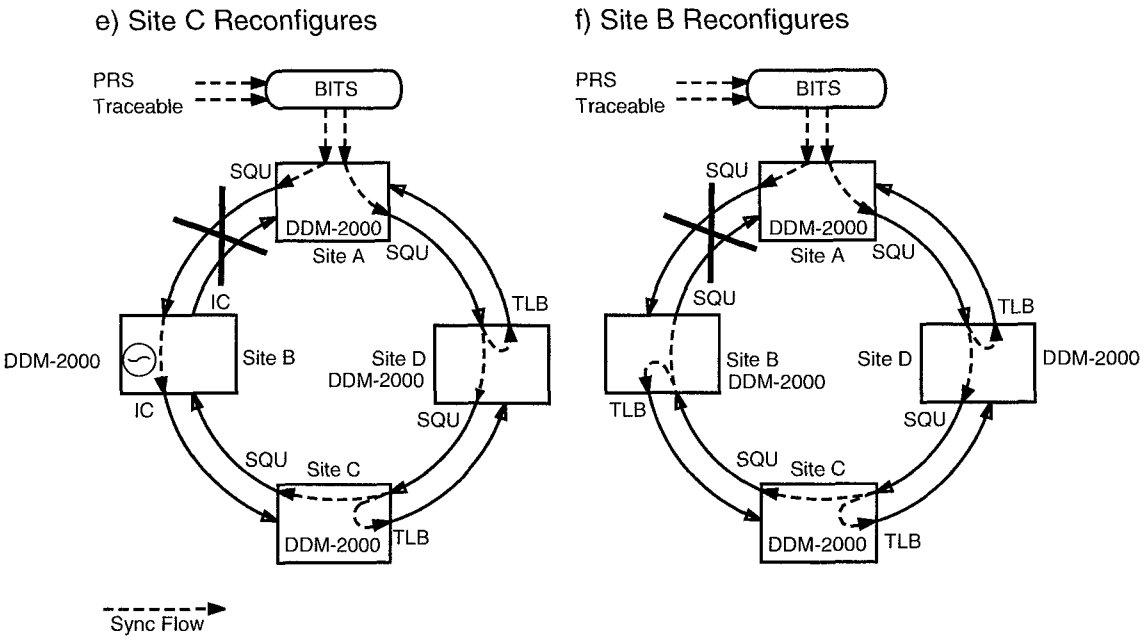


Figure 5-10. Synchronization Reconfiguration — Access Ring (Sheet 3 of 3)

Dual Homing DRI Configurations

OC-12 and FT-2000 OC-48 Lightwave System

Figure 5-11 shows how OC-N timing can be distributed from an FT-2000 OC-48 Lightwave System line switched ring to a DDM-2000 OC-12 path switched ring using a dual homing DRI configuration. The major characteristics of this configuration are:

- The FT-2000 OC-48 Lightwave System nodes are through timed and derive timing from different rotations of the OC-48 ring.
- The two DDM-2000 OC-12 DRI nodes must be provisioned for external timing. Synchronization messaging should be enabled on all OC-12 interfaces on the DRI nodes.
- All other OC-12 nodes must be provisioned for line-timing with synchronization messaging and automatic synchronization reconfiguration enabled.

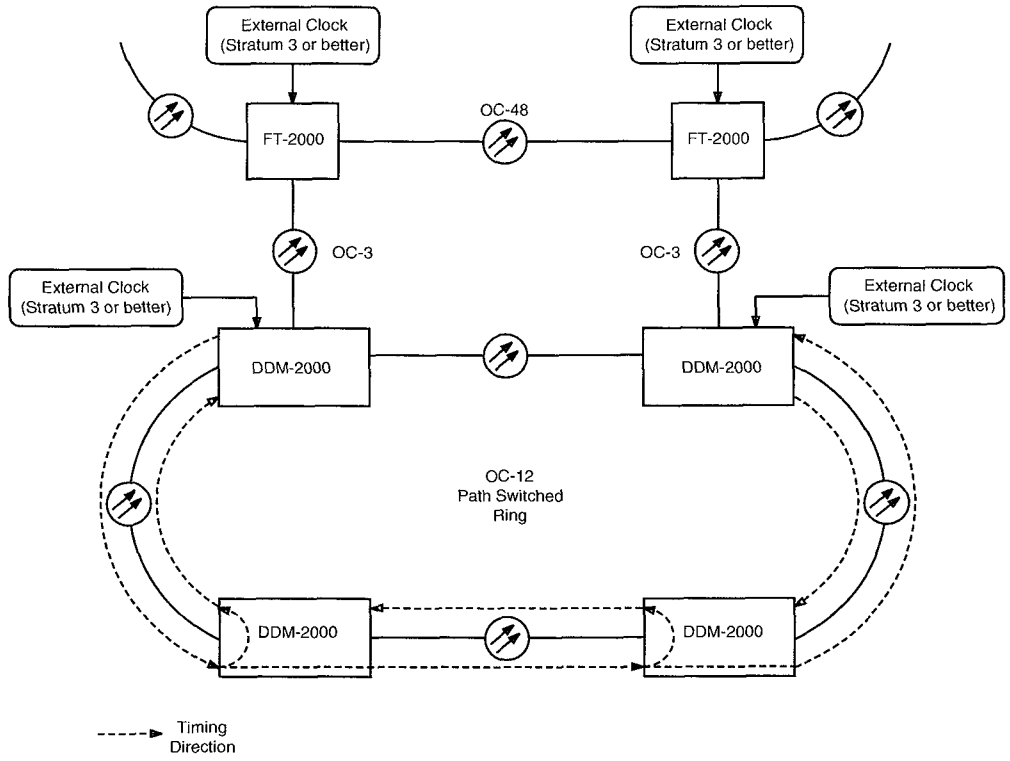


Figure 5-11. OC-12 and FT-2000 OC-48 Lightwave System Dual Homing DRI Configuration

OC-3 and OC-12

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

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

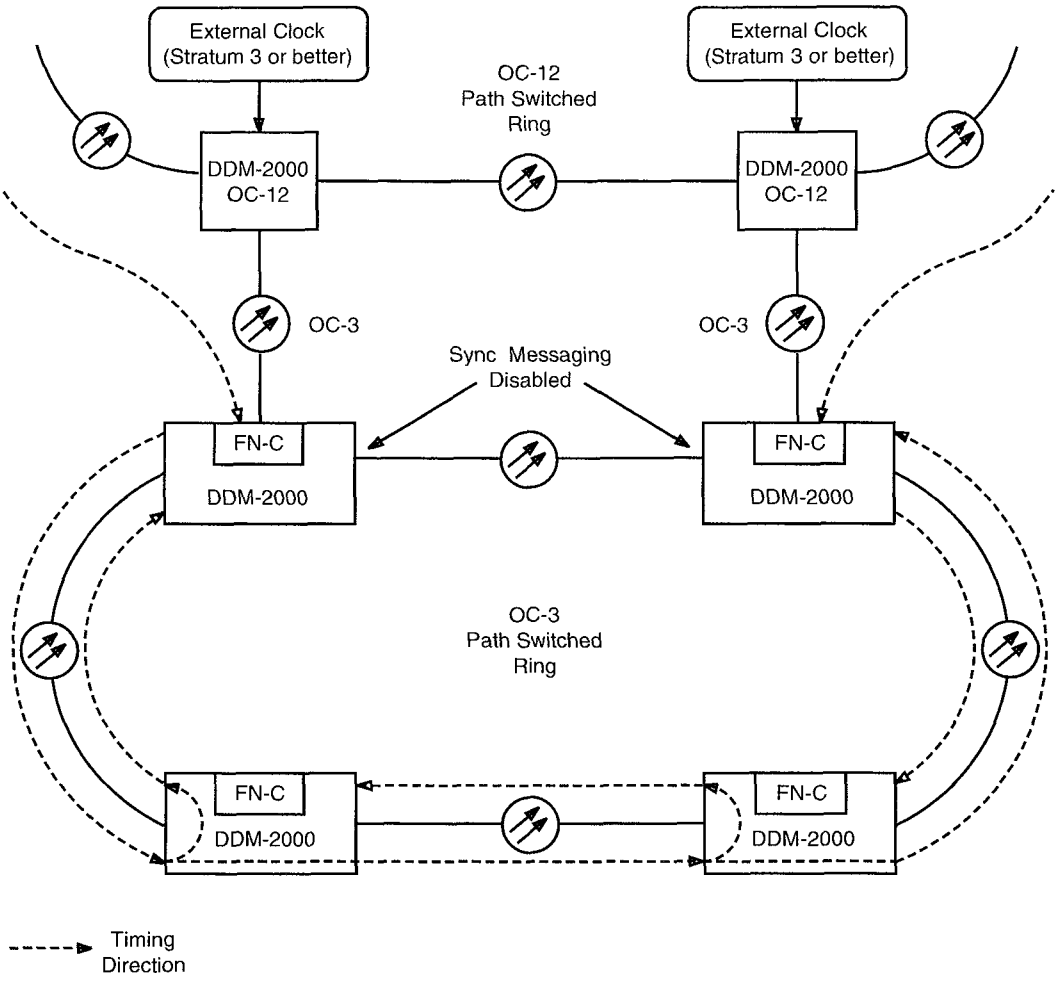


Figure 5-12. OC-3 and OC-12 Dual Homing DRI Configuration

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 CO BITS clock still times the OC-N transmitted to the remote site; at the remote site, a DS1 output reference is created directly from the received OC-N signal (Figure 5-13).

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

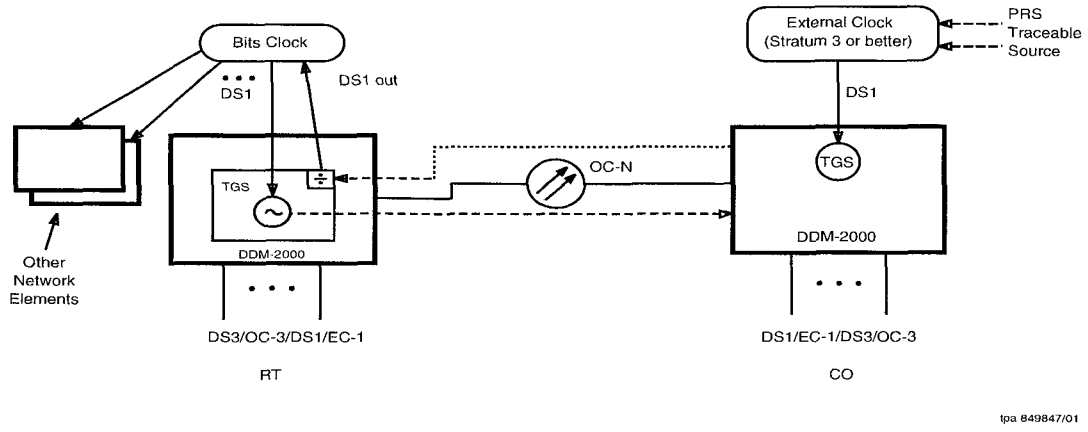


Figure 5-13. OC-N Derived DS1 Timing Reference

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

A previous drawback to using OC-N timing distribution was that network timing failures could not be communicated to downstream clocks via DS1 AIS, since the DS1 signal does not pass over the OC-N interface. With synchronization messaging, clock stratum levels can be passed from NE to NE, allowing downstream clocks to switch timing references without creating timing loops, if a network synchronization failure occurs. If a quality timing reference is no longer available, the DDM-2000 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 COs. In this configuration, a DS1 reference from the CO BITS clock still times the OC-N transmitted to the remote site. The line-timing capability of the DDM-2000 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 CO be traceable to the same clock used to source the DS1s being carried to the customer site or small CO. If it is not, slips may occur.

Although an ideal source of timing, OC-N timing distribution, that is, via a DS1 timing output, cannot be used to provide timing in all applications. In cases where the local equipment is not provided with an external timing reference input, or in some private networks where the timing is to be distributed from another private network location, timing 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 line-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*.

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 5-14) and synchronizing an end-office remote switch to a larger office's host switch.

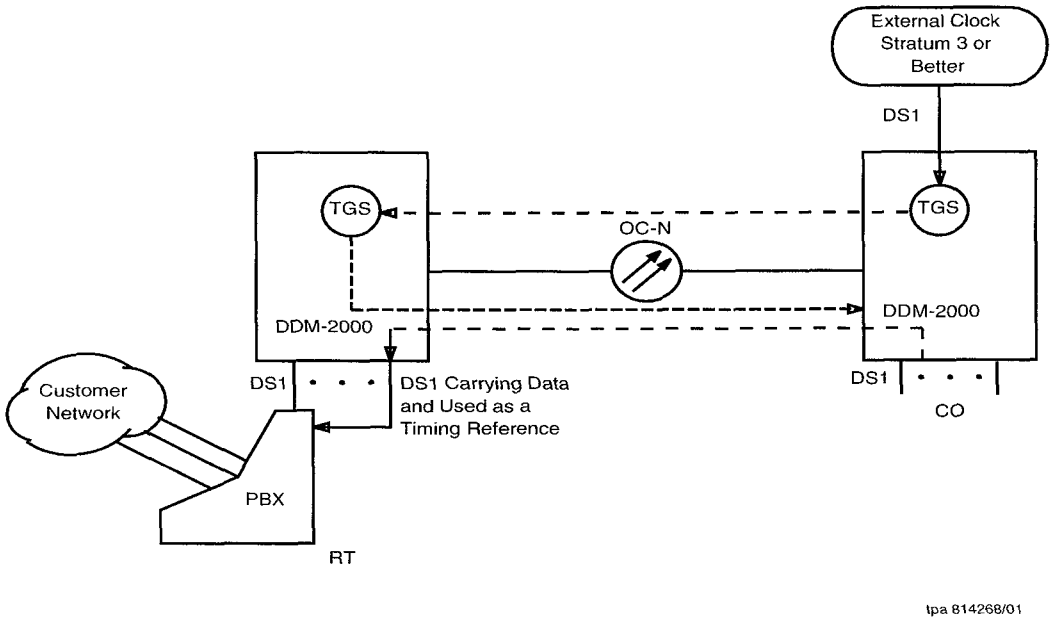


Figure 5-14. Timing from Multiplexed DS1

* Synchronous operation via line-timing eliminates the generation of VT pointer adjustments, thus maintaining the phase stability needed for a high-quality DS1 timing reference. Cross-connecting at the STS-1 level also eliminates the VT pointer adjustments. While the design of the DDM-2000 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.

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 allow alarms and status information generated by the system to be reported.

Operations interfaces include:

- Two EIA-232-D craft interface terminal (CIT) interfaces
- User panel controls and indicators
- Equipment status indicators
- Office alarms
- TL1/X.25 interface to an alarm surveillance operations system, such as Bellcore's Network Monitoring and Analysis (NMA) and Operations Systems/Intelligent Network Elements (OPS/INE) operations systems (OS), and Lucent Technologies OSs.
- Serial telemetry (telemetry byte-oriented serial [TBOS])
- Parallel telemetry
- User definable miscellaneous discrete environmental alarms and controls.

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

Craft Interface Terminals (CIT)

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

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

* Registered trademark of Microsoft Corporation.

Table 6-1. Craft Interface Terminals

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

* Safari is a registered trademark of AT&T.

† Was Teletype 5425 or ATTIS 4425.

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

§ Trademark of Digital Equipment Corporation.

¶ Registered trademark of Hewlett-Packard Company.

** With terminal emulation software.

†† Registered trademark of International Business Machines Corporation.

‡‡ Registered trademark of Kabushiki Kaisha Toshiba.

§§ 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.

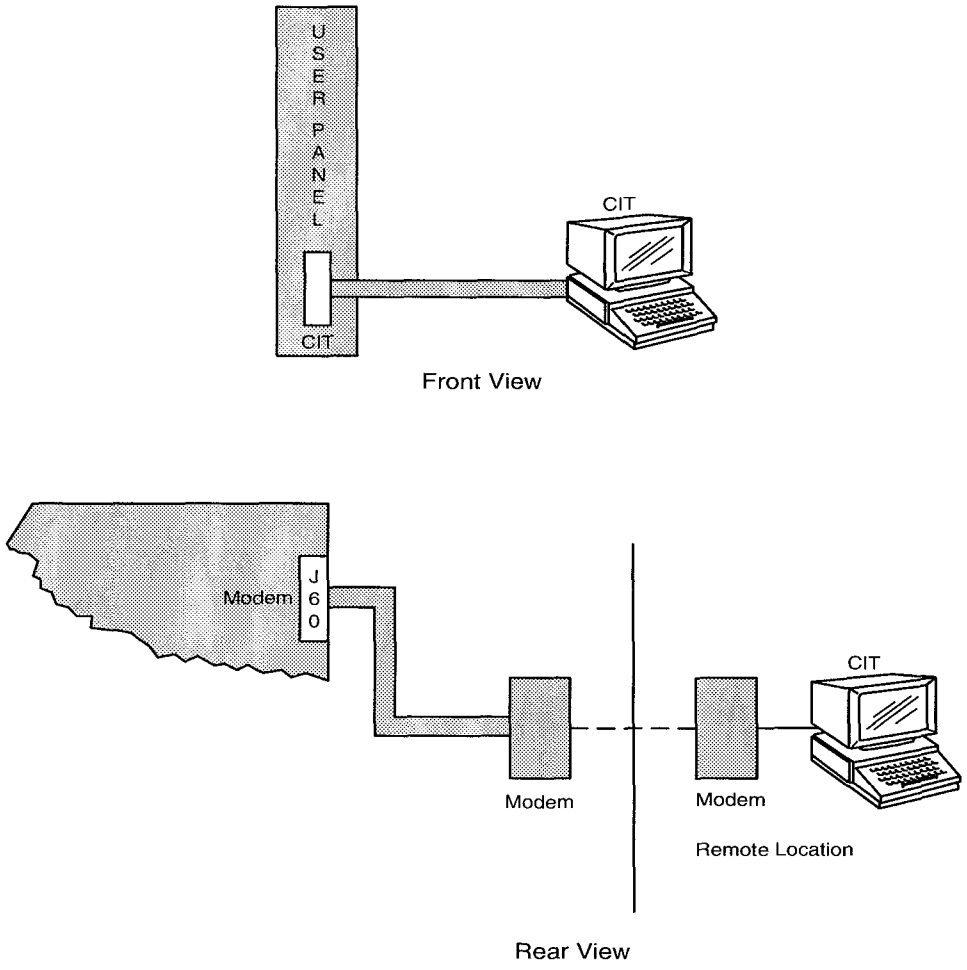


Figure 6-1. Craft Interface Terminal (CIT) Connectors

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).

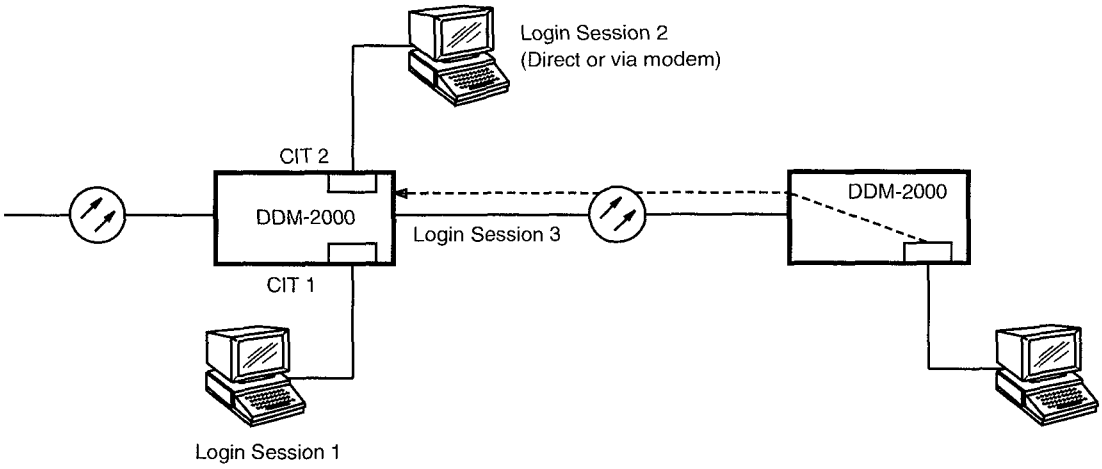


Figure 6-2. Craft Interface Terminal (CIT) Login Sessions

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 (PM)
- Provisioning
- Fault management
- Software downloading
- Security management.

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

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

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.

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. Automatic selection (autobaud detection) data rates of 300, 1200, 2400, 4800, 9600, and 19,200 baud are provided for both CIT interfaces.

* MS-DOS and Windows are registered trademarks of Microsoft Corporation

NOTE:
The DDM-2000 OC-12 Multiplexer CIT interface supports data rates up to 19200 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 the terminal for a lower data rate. The data rate for the DDM-2000 OC-12 Multiplexer is set automatically to match the data rate of the terminal (autobaud).

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:

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

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* Trademark of NCR Corporation.
† Registered trademark of AT&T
‡ Trademark of Paradyne Corporation
§ Registered 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 DCC over the OC-N interface. 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 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.

CPro-2000 Graphical User Interface and Provisioning Tool

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

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

* Registered trademark of Microsoft Corporation

User Panel

The user panel for the Group 4 shelf, 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.

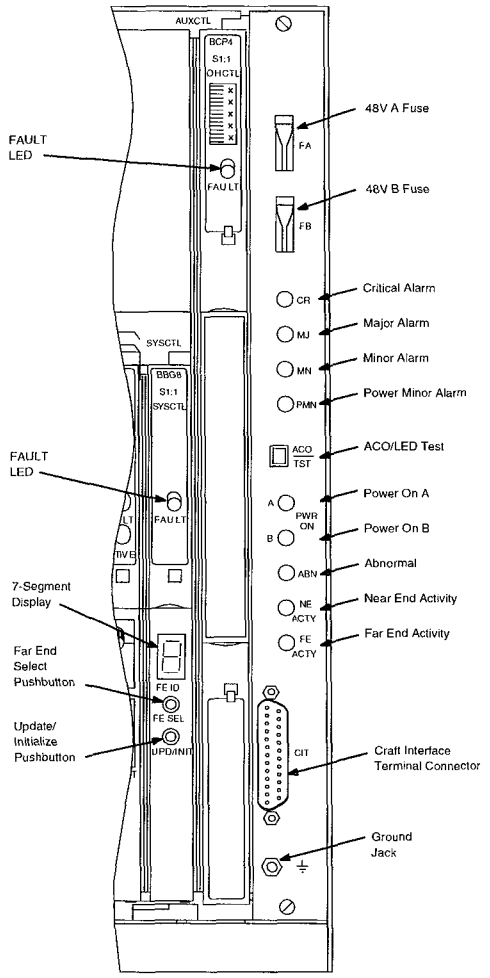


Figure 6-3. User Panel for Group 4 Shelf

User Panel LEDs

The user panel LEDs are used to display a summary of the DDM-2000 OC-3/ OC-12 shelves in an alarm group. The terms near-end and far-end and local and remote are used to differentiate between the shelf the user is at or working at (near-end, local) and another shelf in the same alarm group connected through the SONET DCC (far-end, remote).

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

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

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

FE SEL Pushbutton

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

If the FE SEL pushbutton is pushed again within 15 seconds, the FE ID display shows the local shelf SITE address (with the decimal point), and the user panel LEDs show a composite of the alarm and status condition of all shelves at this site. In OC-3/OC-12 applications, there may be up to five shelves at one site within the same alarm group. The first button push allows display of alarm and status conditions of a single shelf at the local site, and subsequent button pushes allow display of alarm and status conditions at the local site or one of the remote sites.

Each time the FE SEL button is pushed again within 15 seconds, the FE ID display and user panel increment to display the next highest SITE address in the same alarm group and the alarm or status condition of the shelves in the same alarm group 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.

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

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

ACO/TST Pushbutton

The ACO/TST pushbutton tests all the LEDs on the shelf. All LEDs on the shelf will be lit while the pushbutton is pressed. If the ACO pushbutton is pressed and held for more than 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 lit.

UPD/INIT Pushbutton

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

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 (Volume II).

Table 6-2. DDM-2000 OC-12 Multiplexer 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 (Volume II) for detailed procedures.

Equipment Indicators

FAULT Indicators

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

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

High- and low-speed transmission interface and timing circuit packs cause the FAULT indicator to blink when a failure (for example, loss of signal (LOS), loss of frame (LOF), loss of pointer (LOP), or crossing of the signal fail or signal degrade threshold) of the signal incoming to that circuit pack is detected. The 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, 0x1, 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 in the same alarm group. For loop applications, alarm conditions detected at the remote site in the same alarm group cause the appropriate central office audible and visual alarms to be activated.

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

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

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

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

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

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

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 19200 baud to control and report alarm and status conditions and PM data to an alarm surveillance OS such as Bellcore's Network Monitoring and Analysis (NMA) OS. 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 supports remote and automated provisioning from a provisioning OS such as Bellcore's Operations System/Intelligent Network Element (OPS/INE). The DDM-2000 OC-12 Multiplexer also supports a provisioning interface to *RIDES** OS 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.

Autonomous messages are supported. 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 LTP 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide.*

* Registered trademark of Ericsson Raynet

Serial Telemetry (TBOS)

Telemetry byte-oriented serial (TBOS) is a protocol that defines one physical interface for direct connection between the telemetry remote and the monitored equipment. The system provides a TBOS link to remote detailed alarm, status, and control information to/from an OS. The TBOS link is provided through a rear access RS-422 interface port. Data transmission is at 2400 baud. A TBOS display contains 63 alarm/status points to carry information from the DDM-2000 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 shelf uses one TBOS display. The number of the display assigned to each shelf is determined by user provisioning from the CIT. One TBOS link can be shared among multiple shelves in a single bay. A TBOS link can support up to eight displays in an OC-3 or OC-12 alarm group or up to four OC-3 or OC-12 point-to-point networks or any combination less than or equal to eight. Large subnetworks can have more than one TBOS link if they are provisioned for multiple alarm groups. However, each alarm group can only have one TBOS link.

A backup function is provided so that failure of a single DDM-2000 OC-12 system in the CO will not interrupt reporting for the other systems that share the same TBOS link. The backup function provided by each shelf is determined by user provisioning from the CIT.

Two types of TBOS displays are provided: one for CO systems and one for remote terminal (RT) systems. The type of display used for each shelf is determined by the CO/RT user provisioning from the CIT.

The sending and receiving of TBOS information via the DCC can be enabled or disabled via user provisioning from the CIT. See the **set-ne** command in Section 11, "Commands and Reports."

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

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

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

NOTE:
Some telemetry remotes, such as Northern Telecom's 7025 system, are not compatible with the TBOS backup feature of the DDM-2000. See LTP 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide,* for more information.

TBOS Display Tables

Table 6-3 and Table 6-4 define the meaning of each point in the alarm and status displays and in the control displays for the DDM-2000 OC-12 Multiplexer. For more information on the TBOS interface and provisioning, see LTP 824-102-151, *DDM-2000 Multiplexers 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 3	NSA SA	Incoming OC-3 Signal Failure (LOS+LOF+SF +STS1/STS3c LOP) Incoming OC-3 Signal Failure (LOS+LOF+SF+AIS)		
4 5	NSA SA	Incoming OC-12 Signal Failure (LOS+LOF+SF +STS1/STS3c LOP) 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 10	NSA SA	Synchronization Equipment Failure/Frequency Error		
11 12	NSA SA	TSI Equipment Failure		
13	NSA	Fuse/Power Circuit Failure		
14	NSA	Controller Failure/Provisioning Error		
15 16	NSA SA	Optical Terminating Equipment Failure or Illegal CP type		
17 18	NSA SA	DS3/EC1 Terminating Equipment Failure		
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		

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

Point	Type (Note)	Central Office Condition	Type (Note)	Remote Terminal Condition
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
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		

Notes:

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 = alarm

Points 49 - 63 = status

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

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

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)

See note and footnotes at end of table.

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)
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**)
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**)

See note and footnotes at end of table

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)
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

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)
61	CO28 or RT58*	Reserved for Future Control Use	Release Misc. Discrete Env Control 4
62	58	Alarm Cut Off (**opr-aco**)	
63	58	Processor Reset (**reset**)	
64	28	Reserved For Future Control Use	

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

† EC-1 interfaces only.

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

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. To be reported, far-end NEs must be in the same alarm group as the near-end NEs and must have site identification numbers of 1 to 7.
  - — Carrier Line Failure (CLF) Status — This closure indicates detection of failures in a SONET optical or electrical line. This applies to SONET optical or electrical line failures detected incoming to the system.

- — Incoming (INC) Status — This closure indicates detection of asynchronous electrical signal failures (that is, LOS or crossing of the signal fail threshold). Asynchronous electrical signal failures include low-speed 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.

For more information on parallel telemetry provisioning and interface, see LTP 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

User-Definable Miscellaneous Discretes — Environmental Alarms and Controls

To allow monitoring and control of equipment colocated with a DDM-2000 OC-12 Multiplexer in a remote site, a set of user-definable miscellaneous discrete environmental alarms and controls is provided.

Twenty-one miscellaneous discrete alarm/status points are provided to monitor environmental conditions at remote terminal sites (open door, high temperature, etc.). The first 14 points and points 16 through 21 are activated by contact closures. The fifteenth point (External Minor) is for monitoring of remote structure power and fan apparatus (for example, DC power shelf failure); this point is activated by a –48 volt input.

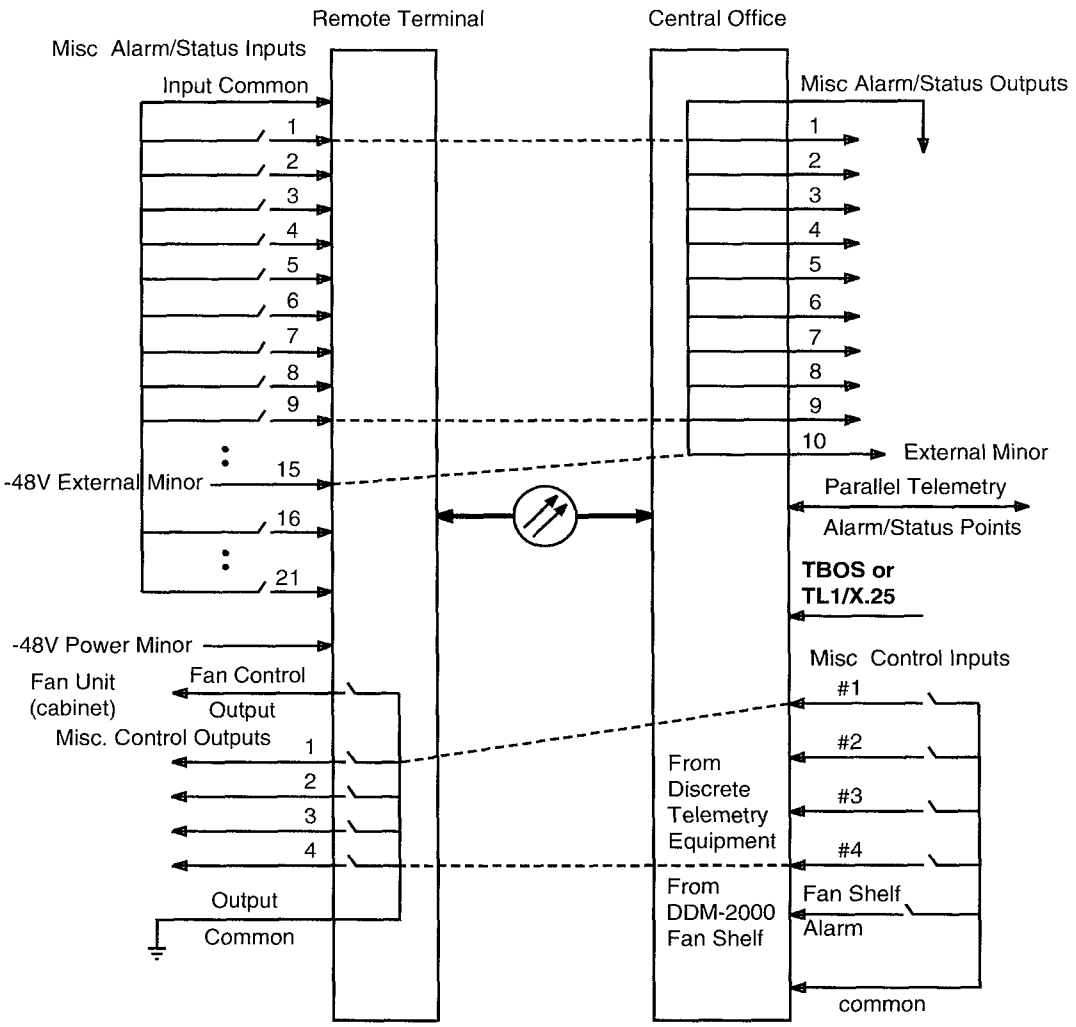
Four control points are provided to control equipment (pumps, generators, etc.) at remote terminal sites. When activated, the control points provide a contact closure between the control point output and ground.

Miscellaneous discrete alarms/statuses and controls are transmitted between the remote DDM-2000 OC-12 Multiplexers and the CO DDM-2000 OC-12 via the SONET section DCC. OS access to all miscellaneous discretes alarm/status points (1 through 21) is provided via TL1/X.25 and access to input point 1 through 15 is available through TBOS. OS access to inputs 1 through 9 and point 15 is provided through a parallel telemetry output interface at the CO. Input point 15 is sent to parallel output point 10 to provide External Minor. Figure 6-4 shows OS access to miscellaneous discretes through the DDM-2000 Multiplexer at the CO. Access to all miscellaneous discrete alarm/status points is also provided through the CIT. The state of the control points can be reported, but not controlled, through the CIT. Control points are operated through parallel telemetry, TBOS, or TL1/X.25 interfaces.

The names and alarm levels of the 21 alarm/status points and the names of the 4 control points can be provisioned through the CIT in remote terminal systems. (Refer to the **`set-attr-env, set-attr-cont, rtrv-attr-env,`** and **`rtrv-attr-cont`** commands in Section 11, "Commands and Reports."

The following additional information is provided for user-definable miscellaneous discretes alarm and control.

- User-Definable Miscellaneous Discretes — Parallel Telemetry Access:
  - — In addition to the parallel telemetry alarm, status, and ACO control points described previously, the DDM-2000 OC-12 Multiplexer provides user-definable miscellaneous discrete environmental alarms and controls. A set of 21 alarm/status inputs, from the DDM-2000 OC-12 Multiplexer to an OS, and 10 CO alarm/status outputs are provided.
  - — In multispan applications (for example, STS-1 drop and hubbing), the control points operated through the parallel telemetry interface at the DDM-2000 OC-12 in the CO are "broadcast" to all RTs in the same alarm group connected to that DDM-2000 OC-12 Multiplexer in the CO. These can be transmitted between an OS and remote DDM-2000 Multiplexer through a parallel telemetry interface on the DDM-2000 Multiplexer.
  - — In multispan applications, the miscellaneous discrete environmental alarm and status points from all RTs connected to one DDM-2000 OC-12 in the CO are "ORed" by the DDM-2000 OC-12 in the CO for transmission to the OS through the parallel telemetry interface. The FE status points described previously can be used to determine the location of a miscellaneous discrete environmental alarm.
  - — Unlike the other parallel telemetry alarm, status, and control points described previously, the miscellaneous discretes are not ORed among shelves in a bay. Each shelf in a bay has its own set of miscellaneous discrete environmental alarms and controls.



Miscellaneous alarm input #14 is typically wired to fan shelf alarm in controlled environment remote terminal applications where the fan shelf is required
If the BBG8 SYSCTL circuit pack is used at the CO, the fan alarm can be wired to misc discrete 1-9 at the remote site if a parallel telemetry output at the CO is required

Figure 6-4. Miscellaneous Discretes

Circuit Pack Descriptions

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Circuit Pack Descriptions

7

Overview

This section provides a detailed functional description of the DDM-2000 OC-12 Multiplexer circuit packs.

Introduction

The circuit packs in the DDM-2000 OC-12 Multiplexer are divided into three main categories:

- Control circuit packs
  - — BBG8 system controller (SYSCTL)
  - — BCP4 overhead controller (OHCTL)
- Synchronization circuit pack
  - — BBF2B timing generator (TGS)
- Transmission circuit packs
  - — BBG11/BBG11B 3DS3 low-speed interface (3DS3)
  - — BBG12 3STS1E low-speed interface (3STS1E)
  - — BCP3 STS-1 time slot interchange — flexible (TSI FLEX)
  - — 21D/21D-U IS-3 optical line interface unit (OLIU)
  - — 21G/21G-U/21G2-U OC-3 OLIU (long reach 1310 nm)
  - — 23G/23G-U OC-12 OLIU (long reach 1310 nm)
  - — 23H/23H-U OC-12 OLIU (long reach 1550 nm).

Compatibility

The BBG8 SYSCTL, BBF2B TGS, 21D/21D-U OLIU, and 21G/21G-U/21G2-U OLIU circuit packs are common to both the DDM-2000 OC-3 and OC-12 Multiplexers.

Universal Optical Connector

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

The following circuit packs are available with the connector:

- 21D-U OLIU
- 21G-U/21G2-U OLIU
- 23G-U OLIU
- 23H-U OLIU.

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

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

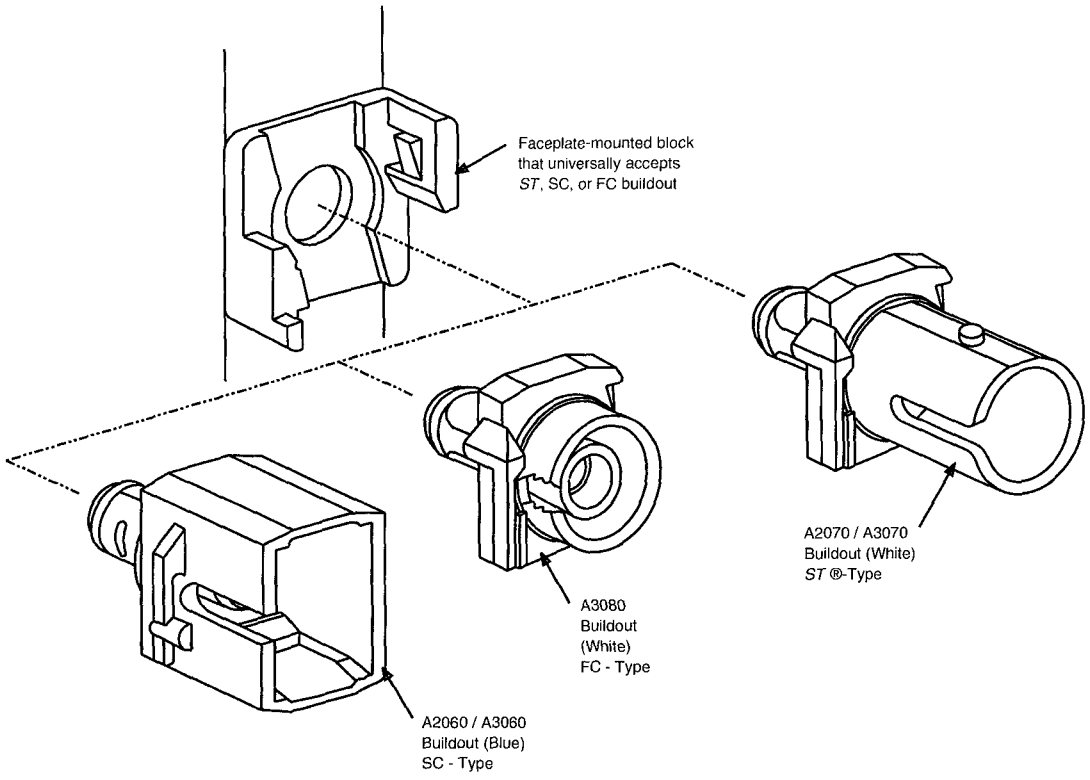


Figure 7-1. Universal Optical Connector

Control

The control system controls and reports the status of the transmission signal through the DDM-2000 OC-12 Multiplexer. All system features are implemented or supported through the control system. However, transmission is unaffected by control system failure. If a controller does fail, protection switches are not done. Therefore, if there is another circuit pack failure requiring a protection switch along with the controller failure, service may be affected depending on the function of the failed pack. The control system continuously monitors the equipment to determine if a protection switch is necessary and to provide equipment performance information.

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

Control Circuit Packs

There are two control circuit packs, the BBG8 SYSCTL and the BCP4 OHCTL. Both the SYSCTL and OHCTL are required for all applications.

BBG8 SYSCTL Circuit Pack Description

Purpose of Circuit

The BBG8 SYSCTL circuit pack is the main system controller in the system. Together with its companion OHCTL, it has control over all shelf functions and provides all user interfaces into the system. The BBG8 SYSCTL must be used with the BCP4 OHCTL.

BBG8 SYSCTL Faceplate Controls and Indicators

The BBG8 SYSCTL circuit pack faceplate controls and indicators are shown in Figure 7-2. The SYSCTL has a red FAULT LED and a 7-segment numeric LED display, as well as the FE SEL and UPD/INIT pushbuttons on its faceplate. The red FAULT LED lights on detection of a circuit pack failure.

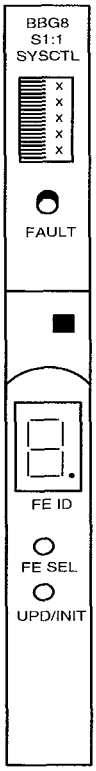


Figure 7-2. BBG8 SYSCTL Circuit Pack

An optical switch on the BBG8 SYSCTL circuit pack latch causes a suspension of controller operations and an "F" to be displayed on the controller panel display when the latch is pulled. Closing the latch causes a controller reset. These controls and indicators are discussed in more detail under "User Panel" in Section 6, "Operations Interfaces."

General Description of Operation

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

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

Detailed Description of Operation

Control Circuitry

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

Memory

Program Flash-EPROM . The main program is stored in the flash-EPROM, which combines the nonvolatility of EPROM with the in-circuit reprogramming ability of electrically erasable programmable read-only memory (EEPROM). Electrically Erasable Programmable Read-Only Memory FEPROM allows in-service software upgrades to be performed locally or remotely without replacing the SYSCTL circuit pack. Program upgrades of remote DDM-2000 OC-12 shelves can also be done via the overhead channel from the central office (CO). Of course, software upgrades may also be accomplished by replacing circuit packs with packs that have already had software upgrades.

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

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

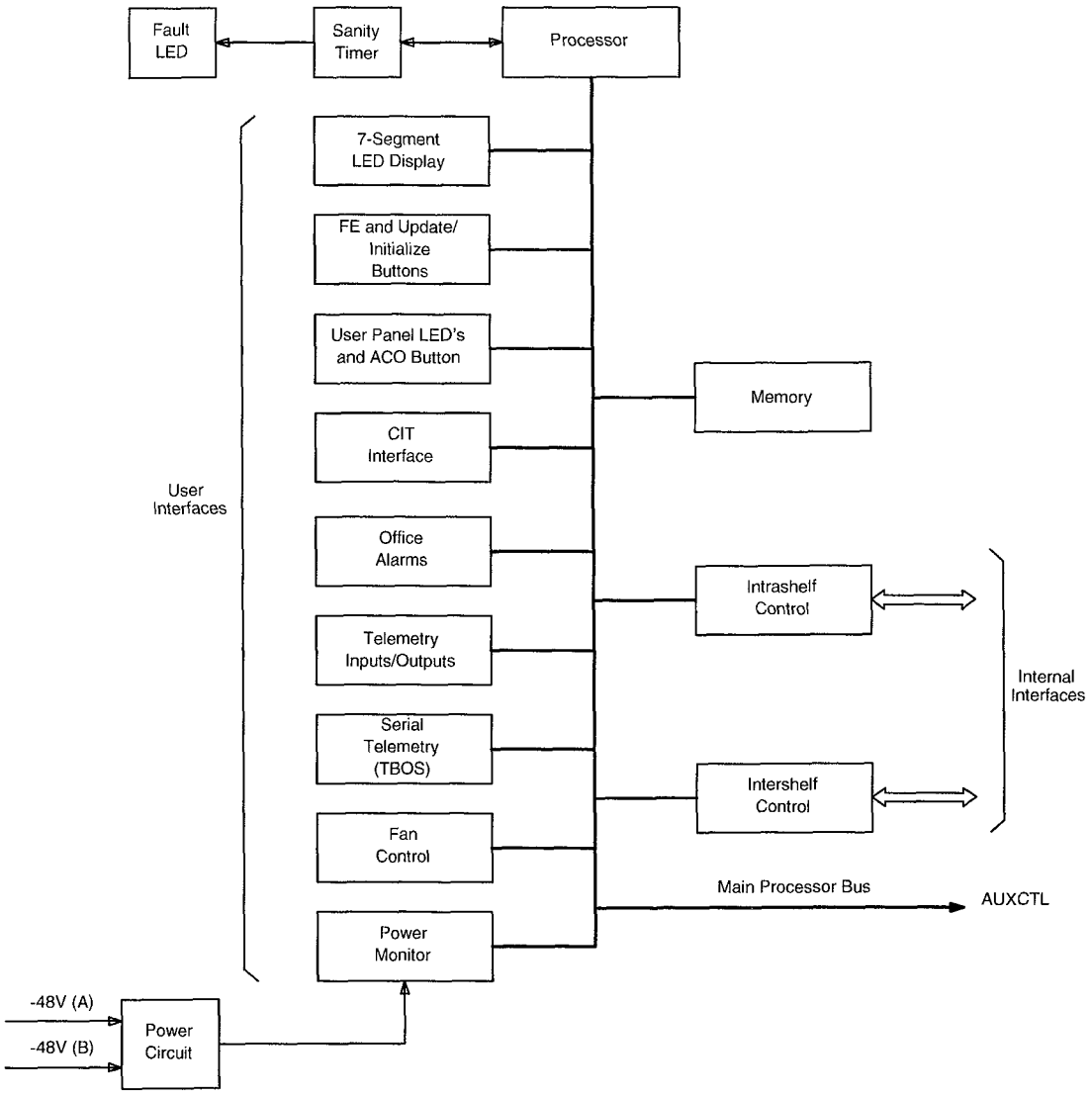


Figure 7-3. BBG8 SYSCTL Circuit Pack Block Diagram

Transmission/Timing Circuit Pack Interfaces

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

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

Operation Interfaces

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

OC-12 Transport Overhead Channel

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

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* Common Language is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc

Power Monitoring and Fan Control

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

If the voltage to the shelf drops below the safe operating voltage, the system will suspend normal operations and wait for safe operating voltage to return. This is called "brownout protection." Assuming a sufficient voltage level, a flashing "L" will be displayed on the SYSCTL.

Interface to Other DDM-2000 OC-12 Shelves

The SYSCTL interfaces with SYSCTLs of other DDM-2000 OC-12 shelves through the intershelf control bus. This interface allows the user to access each DDM-2000 OC-12 shelf in a bay via a modem or craft interface terminal (CIT) connected to any shelf in that bay. The intershelf control bus also allows the user to share a single byte-oriented serial (TBOS) link among a maximum of four shelves (plus four associated remote terminal [RT] shelves), by connecting a single telemetry TBOS interface to one shelf in the bay.

Power Circuitry

The SYSCTL receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion to a +5 volt source to power the rest of the circuit pack.

BBG8 SYSCTL Hardware Setting

The BBG8 has two hardware switches, Switch 1 (S1) for Product Identification and Switch 2 (S2) for TBOS Termination. S2-1 sets the DDM-2000 OC-3 shelf as the terminating (last) or nonterminating (not last) shelf in a cascaded TBOS link. S2-2 through S2-8 should be OFF (see Figure 7-4).

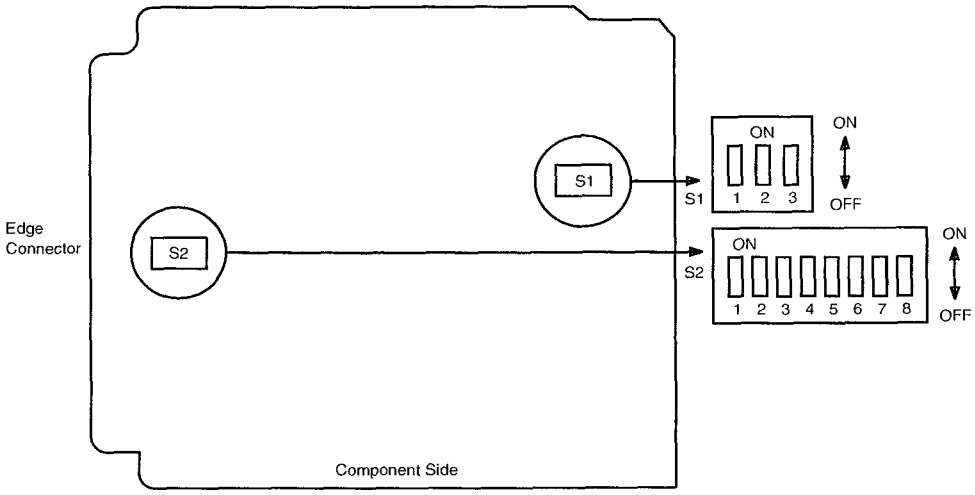
Switch 1 (S1) Settings

VALUE	S1-1	S1-2	S1-3
DDM-2000/*SLC*-2000/ DDM-2000 FiberReach	OFF	OFF	OFF

Switch 2 (S2) Settings

VALUE	S2-1	S2-2 *	S2-3	S2-4	S2-5	S2-6	S2-7	S2-8
TBOS Last	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
TBOS Not Last	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

* S2-2 through S2-8 should be OFF.



Notes:

1. The switch is set by moving the slide toward the desired position.
2. The FAULT LED will also light if the companion OHCTL is not inserted.

Figure 7-4. BBG8 SYSCTL Option Switches

BBG8 SYSCTL Quick Reference Summary

Interface Functions

Intrashelf interface functions performed by the SYSCTL are as follows:

- Direct control of other circuit packs via a serial control link and intrashelf control bus
- Control of circuit pack and user panel LEDs
- Detecting the presence of, and identifying, circuit packs installed in the system.

Craft Interface:

- Local and remote craft interface automatically provisioned to 300, 1200, 2400, 4800, 9600, or 19,200 baud
- Provides interface for all advanced provisioning, PM, administration, and maintenance activities.

User Panel

- Alarm and status indicators
- Controls.

Telemetry Functions

Telemetry functions provided by the SYSCTL are as follows:

- TBOS alarm, surveillance, and control (AS&C) interface operating at 2400 baud
- Miscellaneous discrete environmental alarms and control.

Maintenance Functions

Maintenance functions provided by the SYSCTL are as follows:

- Automatic reset on powerup
- Fault detection, isolation, and reporting
- Protection switching control of other circuit packs
- Inventory information (*CLEI* code, date of manufacture, etc.).

BCP4 OHCTL Circuit Pack Description

Purpose of Circuit

The OHCTL circuit pack is used in conjunction with the BBG8 SYSCTL. It provides overhead channel interfaces for the system.

Faceplate Indicator

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

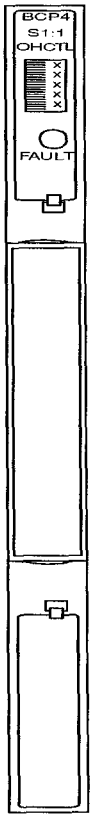


Figure 7-5. BCP4 OHCTL Circuit Pack

General Description of Operation

The OHCTL circuit pack provides the following five basic functions:

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

Detailed Description of Operation

OC-12 Transport Overhead Channel

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

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

Parallel Telemetry

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

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

User Definable Miscellaneous Discrete Environmental Alarms and Controls

The system provides four miscellaneous discrete control outputs and 21 miscellaneous discrete alarm/status inputs when the DDM-2000 OC-12 is configured as an RT. For this application, the SYSCTL supplies all of the necessary miscellaneous discrete I/O. When the DDM-2000 OC-12 resides in a central office, four control inputs and ten alarm/status outputs are provided. If more than ten miscellaneous discrete alarm/status inputs are used at the remote, the TBOS or TL1 interface at the central office will be used to recognize all of the alarm/status. In this configuration, the SYSCTL provides four inputs and four outputs, while the OHCTL provides the remaining six miscellaneous discrete outputs.

X.25 Message-Based Operation Interface

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

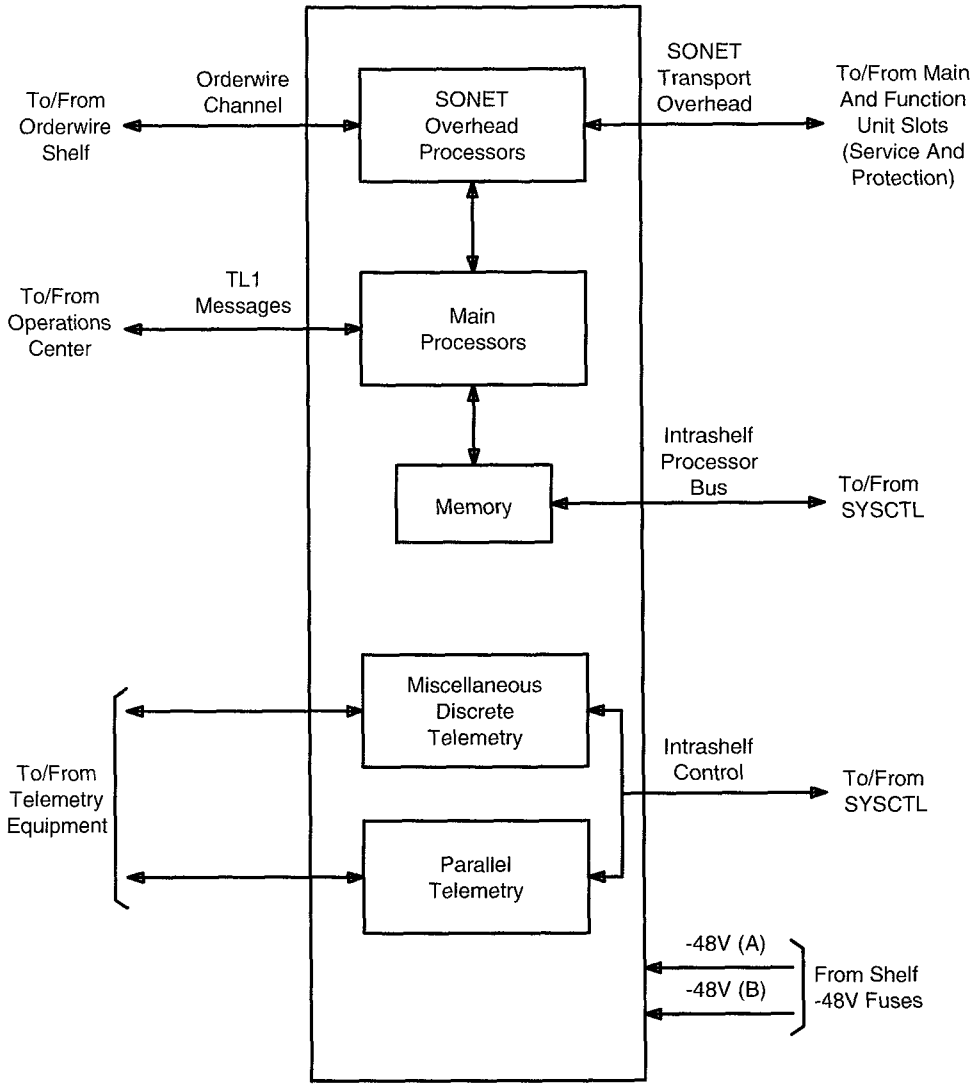


Figure 7-6. BCP4 OHCTL Circuit Pack Block Diagram

Orderwire Interface

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

Interface Circuitry

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

Maintenance Features and Modes

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

Power Circuitry

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

OHCTL Quick Reference Summary

Functions

Major functions of the OHCTL circuit pack are as follows:

- SONET overhead channel interface to OLIU circuit packs
- Parallel telemetry to remotely provide alarm and status information to an operations center
- User-definable miscellaneous discrete environmental alarm and status outputs for monitoring auxiliary remote site equipment used with a DDM-2000 OC-12 shelf
- An X.25 message-based operations interface
- External orderwire interface
- Inventory information (*CLEI* code, date of manufacture, etc.)
- Intra-office LAN interface.

Synchronization

Synchronization Functions

The DDM-2000 OC-12 Multiplexer supports three synchronization modes:

a. DS1 timing input from stratum 3 or better office clock for CO applications

b. Free-running in CO applications when external timing inputs are not available

c. Line (formerly loop) timing for remote timing functions.

In addition, the BBF2B TGS circuit pack provides a DS1 timing output that is used for network synchronization and allows line (formerly loop) timing and DS1 Output timing to be derived from either the Main or Function Unit OLIU.

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

BBF2B TGS Circuit Pack Description

Purpose of Circuit

The synchronous timing generator (TGS) circuit pack provides timing for the shelf. Other functions include a derived DS1 output for use as a reference signal by a building integrated timing supply (BITS) or a DS1 MULT capability synchronizing other shelves in the bay. The derived DS1 is traceable to timing from either the Main or Function Unit C OLIUs.

TGS Faceplate Indicators

The TGS circuit pack faceplate indicators are shown in Figure 7-7.

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

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

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

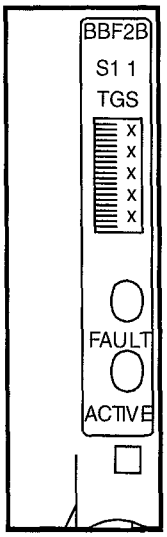


Figure 7-7. BBF2B TGS Circuit Pack

General Description of Operation

The TGS circuit pack provides timing signals to the DDM-2000 OC-12 circuit packs. The TGS circuit pack is microprocessor controlled and has the capability to synchronize to external DS1 references or to loop references from an incoming optical signal. The on-board oscillator has sufficient accuracy to provide timing signals without synchronization references for point-to-point systems (free-running) and a DS1 timing output for network timing distribution.

The TGS circuit pack supports three timing modes to serve a wide range of DDM-2000 OC-12 synchronization needs: external timing, line (formerly loop) timing, and free-running and external timing or line (formerly loop) timing with DS1 output provisioned for network synchronization.

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

In line (formerly loop)-timing mode, the TGS circuit pack derives local shelf timing from the received OC-12 signal.

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

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

DS1 Timing Output

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

- MULT
  - — This mode is normally used to distribute a DS1 timing reference to other shelves in the bay. In this mode, the distributed DS1 Output is derived from the external DS1 reference that is input to the shelf.
- SYNC OUT
  - — This mode is used to distribute a DS1 timing reference to a BITS. In this mode, the distributed DS1 Output is based on the timing signal the TGS circuit pack has derived from the received OC-12 signal from the Main OLIUs.
  - — If the DS1 output is provisioned for SYNC OUT mode, DS1 AIS will be inserted on detection of unprotected OC-12 line failure.

Detailed Description of Operation

Control Circuitry

Figure 7-8 is an overall block diagram of the BBF2B TGS circuit pack. The TGS circuit pack interfaces with the SYSCTL via the intrashelf control bus. Through this interface, the SYSCTL monitors the health of the TGS circuit pack to provide alarm reporting. The SYSCTL also controls TGS circuit pack switching and mode functions, as well as controlling the faceplate LEDs.

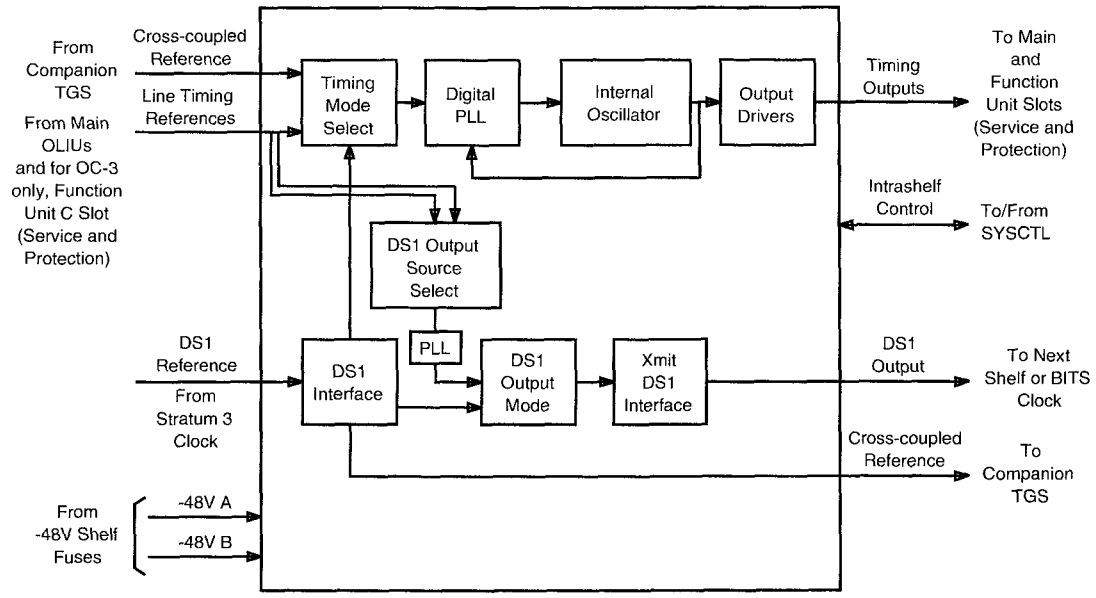


Figure 7-8. BBF2B TGS Circuit Pack Block Diagram

Timing Circuitry

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

Line Timing. The reference signal feeding the phase-locked loop is selected from the internal oscillator or a line-timing clock derived from the incoming optical line. In line (formerly loop)-timing mode, the OC-12 line being selected for transmission is also selected as the timing reference. The OC-12 line in Main-b-1 or Main-b-2 selected for transmission can optionally be selected for the timing reference. This selection is under the control of the on-board microcontroller and the SYSCTL and is dependent on the timing mode selected by the user via on-board selection switches and the status of the references. Loss of both line (formerly loop)-timing references will cause the TGS circuit pack to go into holdover mode to maintain system timing.

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

DS1 Output. The DS1 output port of the BBF2B TGS circuit pack can be provisioned for either MULT or SYNC OUT mode via a hardware switch. In the SYNC OUT mode, the DS1 output signal derives its timing from the incoming OC-12 lines through timing synchronization signals from the DDM-2000 OC-12 Main OLIUs (main-b-1 or main-b-2). The default is main-b-1.

Selection of these timing synchronization signals for the DS1 output in SYNC mode is controlled by the SYSCTL circuit pack. This selection can be provisioned via software command to "track" the active received side of the OC-12 line used for transmission, to always select its timing from the specified OC-12 line (main-b-1 or main-b-2) regardless of its maintenance condition. Loss of timing reference for the DS1 output will result in the insertion of DS1 AIS on this output port.

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

Clock Output Functions

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

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

- SYNC OUT Mode
  - — The DS1 output port of the BBF2B TGS circuit pack can be provisioned to be a derived DS1 signal traceable to a received optical line used for network timing distribution. The SYNC OUT capability is available for a DDM-2000 set for external-timing or line-timing.
- MULT Mode
  - — The DS1 output port of the TGS circuit pack can be provisioned to output a buffered copy (at a DSX level) of the DS1 signal at the input port. A DS1 traceable source is applied to the first DDM-2000 shelf. The output of the first shelf is then cabled to the second shelf, and all subsequent shelves fed from the previous ones. In this way, a MULT chain is formed from a single DS1 reference. The MULT capability is only available for a DDM-2000 provisioned for external-timing.

Protection Circuitry

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

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

Fault Detection Circuitry

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

The incoming DS1 references are monitored for:

- Loss of signal (LOS) (128 consecutive zeros)
- DS1 AIS
- Loss of frame (LOF)
- Excessive out-of-frame (OOF) count
- Greater than 10^{-3} bit error rate (BER)

Power Circuitry

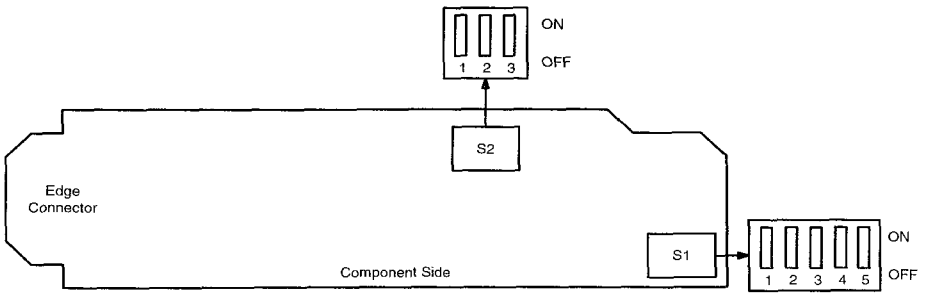
The TGS circuit pack receives two sources of –48 volts which are diode ORed, fused, and filtered prior to conversion to a +5 volt source to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

TGS Hardware Settings

The TGS circuit pack option switches provide the following functions:

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

Figure 7-9 shows the location of the option switches for the BBF2B TGS circuit pack.



Notes:

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

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

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

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

* Factory default.

TGS Timing Mode Switch Settings

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

* Factory default
† Main-b-1 OLIU is default; Main-b-2 by `set-sync` command

Figure 7-9. BBF2B TGS Option Switches for DDM-2000 OC-12 (Sheet 1 of 2)

Equalizer Switch Settings

Equalization (Note)	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
131' to 262'	ON	OFF	ON
262' to 393'	ON	OFF	OFF
393' to 524'	OFF	ON	ON
524' to 655'	OFF	ON	OFF
Invalid	OFF	OFF	OFF
Invalid	OFF	OFF	ON
Invalid	ON	ON	ON

Note: Distance in feet for 22 gauge PIC (ABAM) cable.

Figure 7-9. BBF2B TGS Option Switches for DDM-2000 OC-12 (Sheet 2 of 2)

TGS Quick Reference Summary

Provisioned Modes

The TGS circuit pack can be provisioned through on-board option switches to any one of three timing modes: (a) External timing mode, (b) Line (formerly loop) timing mode, or (c) Free-running mode.

In addition, the BBF2B TGS circuit pack can be provisioned through on-board option switches to provide a DS1 output for network timing distribution or for shelf timing distribution. Line (formerly loop) timing from the Main OC-12 line is the factory default.

Holdover Mode

The holdover mode maintains the last good reference frequency during unprotected failure of external or line (formerly loop)-timing references.

Maintenance and Control

The following maintenance functions are provided on the TGS circuit pack: (a) DS1 reference monitoring, (b) TGS and OLIU circuit pack protection switching, and (c) inventory information (*CLEI* code, date of manufacture, etc.).

DS1 Output

- DS1 Output (MULT) — a buffered copy of the external DS1 input reference used for intershelf timing
- DS1 Output (SYNC OUT) — derived from received OC-12 line for network timing distribution.

Transmission

The transmission circuit packs are the BBG11 3DS3, BBG11B 3DS3, BBG12 3STS1E, BCP3 TSI FLEX, 21D/21D-U OLIU, 21G/21G-U/21G2-U OLIU, 23G/23G-U OLIU, and the 23H/23H-U OLIU.

BBG11 3DS3 Circuit Pack Description

Purpose of Circuit

The BBG11 3DS3 circuit pack provides a low-speed interface between asynchronous DS3 rate signals and SONET standard STS-1 signals.

BBG11 3DS3 Faceplate Indicators

The BBG11 3DS3 circuit pack faceplate indicators are shown in Figure 7-10. The red FAULT LED is lit by the SYSCTL on detection of the BBG11 3DS3 circuit pack failure or by the loss of the circuit pack +5 V DC. In the event of an incoming signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

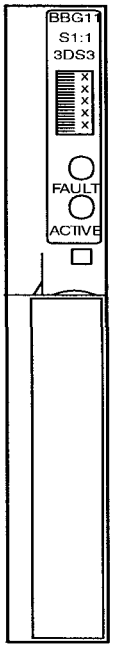


Figure 7-10. BBG11 3DS3 Circuit Pack

General Description of Operation

The BBG11 3DS3 circuit pack provides bidirectional transport of three DS3 signals through the DDM-2000 OC-12 Multiplexer in either clear channel (CC) mode, violation monitor and removal (VMR) mode, or violation monitor (VM) mode by mapping the DS3 into an STS-1 signal. The 3DS3 circuit pack performs maintenance and provisioning functions associated with the STS-1 and DS3 signals and provides access to the STS-1 path overhead. The 3DS3 circuit pack interfaces to the TSI circuit pack at the STS-1 rate, to the DSX-3, and to the SYSCTL, and it receives timing signals from the TSI circuit pack. When provisioned for the clear channel (CC) mode, the 3DS3 can transport any DS3 rate signal that meets specified electrical interface requirements. When provisioned for the VMR or VM mode, the DS3 signal must meet both electrical and DS3 frame format requirements.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-11 provides an overall block diagram of the BBG11 3DS3 circuit pack. The transmit direction is the direction towards the STS-1 signal, and the receive direction refers to the direction towards the DSX-3. In the transmit direction, the BBG11 3DS3 receives three incoming bipolar 3-zero substitution (B3ZS) encoded DS3 signals from the DSX-3. A closed protection relay contact routes the DS3 signal to a circuit that splits the signal and sends one output to the companion (standby) circuit pack and the other to its own receiver. The BBG11 3DS3 receiver performs equalization and clock recovery, performs B3ZS decoding and optional automatic AIS insertion which it synchronizes to the STS-1 rate; inserts STS-1 path overhead; and transmits the STS-1 rate signal to the TSI circuit packs.

Receive Direction. The BBG11 3DS3 receives STS-1 data from both the active and standby TSI circuit packs, selects one set of STS-1s, performs pointer interpretation, processes and removes the path overhead, desynchronizes the embedded DS3, provides a provisionable VMR function, and then B3ZS-encodes the signal for transmission to the DSX-3. A jumper allows the user to insert or remove a line build-out (LBO) network (225 ft. of 734A type cable equivalent) to provide the required signal level and shape at the DSX-3.

Before the DS3 signal is B3ZS-encoded, a VMR function can be provisioned via the control circuitry for one of three possible modes:

- VMR with DS3 AIS insertion (default)
- VM and AIS insertion without removal of violations
- CC
  - — With DS3 AIS insertion
  - — Without DS3 AIS insertion.

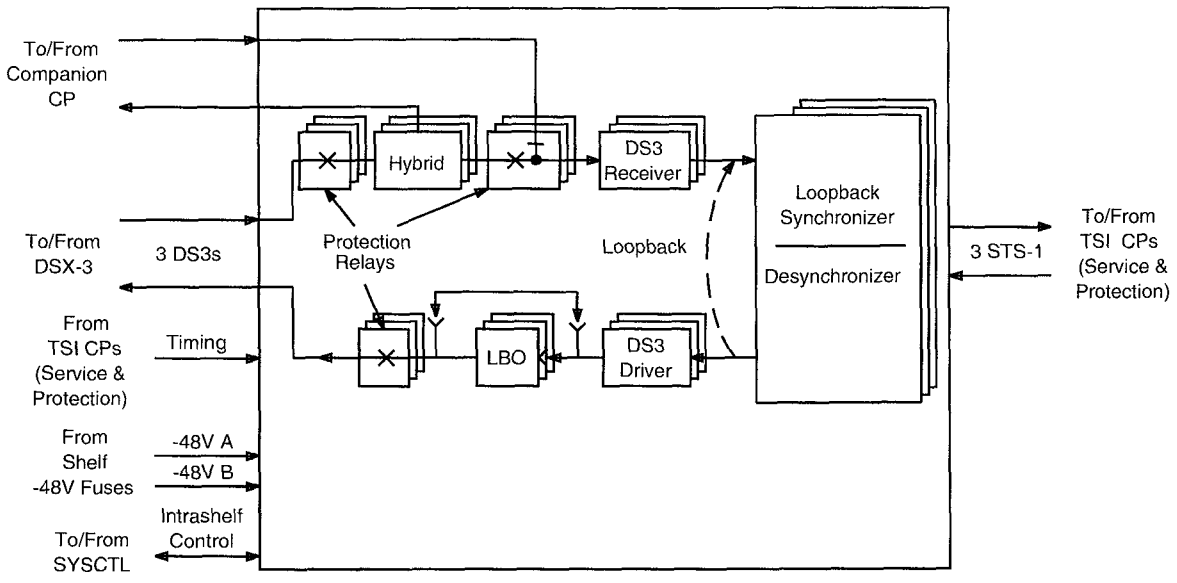


Figure 7-11. BBG11 3DS3 Circuit Pack Block Diagram

Control Circuitry

The BBG11 3DS3 circuit pack interfaces with the SYSCTL via the intrashelf control bus. Redundancy in the intrashelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The BBG11 3DS3 provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and DS3 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the BBG11 3DS3 responds to control signals from the SYSCTL (such as active and fault LED controls).

Timing Circuitry

The BBG11 3DS3 circuit pack derives its timing information from the recovered DS3 clock of the DSX-3 incoming signal. In the transmit direction, a 44.736 MHz clock is recovered from the incoming DS3 signal and is used to recover DS3 data. In the receive direction, a smoothed 44.736 MHz clock is generated by a phase-locked loop to accompany the DS3 signal extracted from the STS-1 payload.

In addition to the recovered DS3 clock, the BBG11 3DS3 circuit pack requires STS-1 timing supplied by the TSI circuit pack, via the circuit pack edge connector, from the backplane.

Protection Circuitry

Optional 1x1 nonrevertive BBG11 3DS3 circuit pack protection is provided. Switch points for the STS-1 side of the BBG11 3DS3 are located on the TSI circuit packs. Switch points for the DS3 side are implemented with relays on the 3DS3 circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL via the control interfaces. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the BBG11 3DS3 side, the DS3 inputs from a DSX-3 are sent to both the active and standby BBG11 3DS3 circuit packs. Only the active unit selects the DS3 input. The SYSCTL circuit pack supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the DS3 input signals and sends them to the standby unit and to its own receiver. To implement a protection switch on the DS3 side, the SYSCTL switches the relays on each unit to their opposite state.

When a BBG11 3DS3 is removed, shorting contacts on the backplane connector operate so that the DS3 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

Monitoring and Testing. The BBG11 3DS3 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the BBG11 3DS3 circuit pack is inserted or recovers from a transient failure.

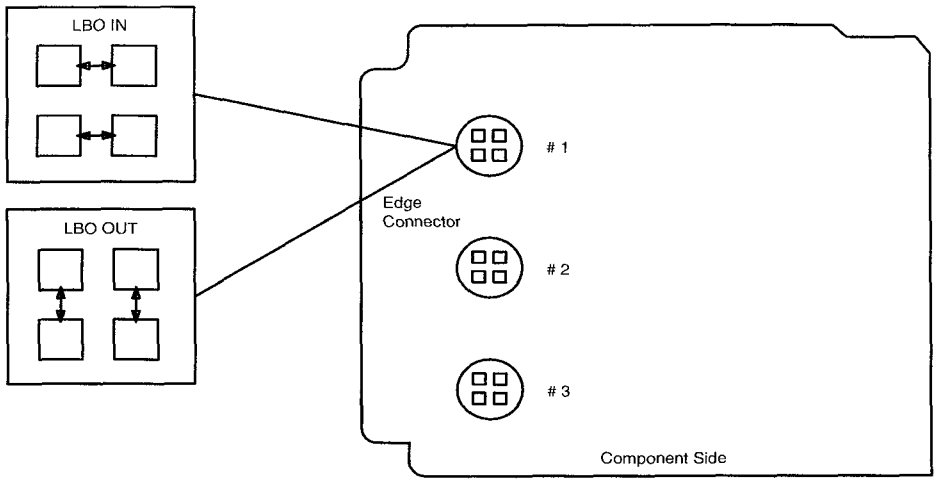
Loopbacks. Two loopbacks are provided for each DS3 interface on the BBG11 3DS3 circuit pack. The terminal loopback bridges the DS3 desynchronizer output signal (transmitted towards the DSX-3) back into the DS3 synchronizer input. Operation of this loopback does not affect the signal transmitted to the DSX-3. The facility loopback bridges the STS-1 output signal to the TSI back towards the DSX-3. Operation of this loopback does not affect the signal transmitted to the fiber. Both loopbacks are controlled by the SYSCTL through the intrashelf control bus.

Power Circuitry

The BBG11 3DS3 circuit pack receives two sources of –48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG11 3DS3 Hardware Settings

The location of the BBG11 3DS3 circuit pack line build-out (LBO) jumpers is shown in Figure 7-12. The 3DS3 LBO settings are shown in the table.



3DS3 LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	
0 to 225 >225 to 450	0 to 75 >75 to 150	0 to 125 >125 to 250	LBO IN LBO OUT

Figure 7-12. 3DS3 Line Build-Out (LBO) Jumpers

BBG11 3DS3 Quick Reference Summary

Transmit Functions

The 3DS3 circuit pack transmit functions are as follows:

- Receives three B3ZS encoded DS3 signals from a DSX-3
- Recovers three DS3 clocks and nonreturn to zero (NRZ) data
- Synchronizes the data signals to STS-1 signal rate
- Inserts STS-1 path overhead
- Provides three STS-1 signals to the TSI circuit packs.

Receive Functions

The following receive functions are performed by the BBG11 3DS3 circuit pack:

- Desynchronizes the incoming STS-1 signals
- Terminates the STS-1 paths
- Optionally checks and/or corrects P-bit parity errors
- B3ZS encodes the outgoing DS3 signals
- Pre-equalizes the DS3 signals (with line build-out) and transmits them to the DSX-3.

Control Functions

The major control functions are as follows:

- Protection switching for TSI and 3DS3 circuit packs
- STS-1 path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Detects STS-1 path AIS coming from the fiber
- Detects STS-1 path unequipped signal coming from the fiber
- Inserts DS3 AIS toward the fiber and DSX-3
- Detects DS3 AIS coming from the fiber
- Inserts and detects STS-1 path yellow signal to/from the fiber
- Detects DS3 line failure (LOS and BER).

BBG11B 3DS3 Circuit Pack Description

Purpose of Circuit

The BBG11B 3DS3 circuit pack provides a low-speed interface between asynchronous DS3 rate signals and SONET standard STS-1 signals. The BBG11B provides the same functions as the BBG11 and can be used in place of the BBG11 in all applications. In addition, the BBG11B provides enhanced DS3 PM.

BBG11B 3DS3 Faceplate Indicators

The BBG11B 3DS3 circuit pack faceplate indicators are shown in Figure 7-13. The red FAULT LED is lit by the SYSCTL on detection of the BBG11B 3DS3 circuit pack failure or by the loss of the circuit pack +5 V DC. In the event of an incoming signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

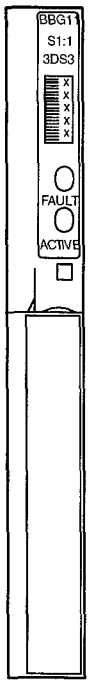


Figure 7-13. BBG11B 3DS3 Circuit Pack

General Description of Operation

The BBG11B 3DS3 circuit pack provides bidirectional transport of three DS3 signals through the DDM-2000 OC-12 Multiplexer in either clear channel (CC) mode, violation monitor and removal (VMR) mode, or violation monitor (VM) mode, by mapping the DS3 into an STS-1 signal. The BBG11B 3DS3 circuit pack performs maintenance and provisioning functions associated with the STS-1 and DS3 signals and provides access to the STS-1 path overhead. The BBG11B 3DS3 circuit pack interfaces to the TSI circuit pack at the STS-1 rate, to the DSX-3, and to the SYSCTL, and it receives timing signals from the TSI circuit pack. When provisioned for the clear channel mode, the 3DS3 can transport any DS3 rate signal that meets specified electrical interface requirements. When provisioned for the VMR or VM mode, the DS3 signal must meet both electrical and DS3 frame format requirements.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-14 provides an overall block diagram of the BBG11B 3DS3 circuit pack. The transmit direction is the direction towards the STS-1 signal, and the receive direction refers to the direction towards the DSX-3. In the transmit direction, the BBG11B 3DS3 receives three incoming B3ZS encoded DS3 signals from the DSX-3. A closed protection relay contact routes the DS3 signal to a circuit that splits the signal and sends one output to the companion (standby) circuit pack and the other to its own receiver. The BBG11B 3DS3 receiver performs equalization and clock recovery, B3ZS decoding, optional automatic DS3 AIS insertion, and a provisionable VMR function. The BBG11B DS3 then synchronizes and maps the DS3 to the STS-1 rate, inserts STS-1 path overhead and transmits the STS-1 rate signal to the TSI circuit packs.

Receive Direction. The BBG11B 3DS3 receives STS-1 data from both the active and standby TSI circuit packs, selects one set of STS-1s, performs pointer interpretation, processes and removes the path overhead, desynchronizes the embedded DS3, provides a provisionable VMR function, and then B3ZS-encodes the signal for transmission to the DSX-3. A jumper allows the user to insert or remove a line LBO network (225 ft. of 734A-type cable equivalent) to provide the required signal level and shape at the DSX-3.

Before the DS3 signal is B3ZS-encoded (receive direction) or decoded (transmit direction), a VMR function can be provisioned via the control circuitry for one of three possible modes:

- VMR with DS3 AIS insertion (default)
- VM and AIS insertion without removal of violations
- CC
  - — With DS3 AIS insertion
  - — Without DS3 AIS insertion.

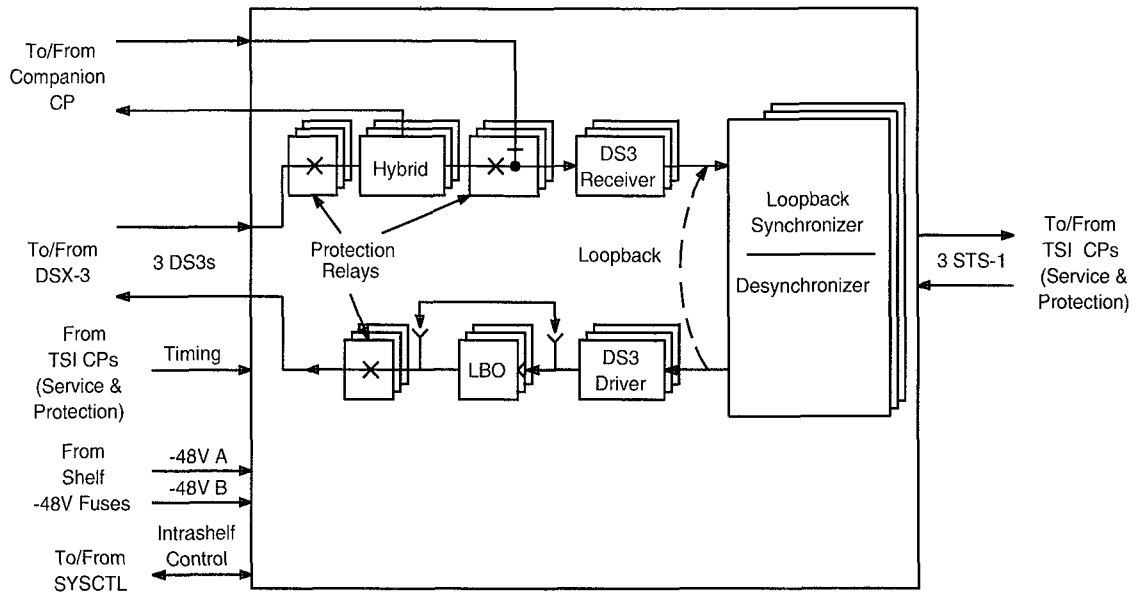


Figure 7-14. BBG11B 3DS3 Circuit Pack Block Diagram

Control Circuitry

The BBG11B 3DS3 circuit pack interfaces with the SYSCTL via the intrashelf control bus. Redundancy in the intrashelf control bus assures the level of control required to perform protection switching and alarming of a faulty circuit pack. The BBG11B 3DS3 provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and DS3 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the BBG11B 3DS3 responds to control signals from the SYSCTL (such as active and fault LED controls).

Timing Circuitry

The BBG11B 3DS3 circuit pack derives its timing information from the recovered DS3 clock of the DSX-3 incoming signal. In the transmit direction, a 44.736 MHz clock is recovered from the incoming DS3 signal and is used to recover DS3 data. In the receive direction, a smoothed 44.736 MHz clock is generated by a phase-locked loop to accompany the DS3 signal extracted from the STS-1 payload.

In addition to the recovered DS3 clock, the BBG11B 3DS3 circuit pack requires STS-1 timing supplied by the TSI circuit pack, via the circuit pack edge connector, from the backplane.

Protection Circuitry

Optional 1x1 nonrevertive BBG11B 3DS3 circuit pack protection is provided. Switch points for the STS-1 side of the BBG11B 3DS3 are located on the TSI circuit packs. Switch points for the DS3 side are implemented with relays on the 3DS3 circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL via the control interfaces. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the BBG11B 3DS3 side, the DS3 inputs from a DSX-3 are sent to both the active and standby BBG11B 3DS3 circuit packs. Only the active unit selects the DS3 input. The SYSCTL circuit pack supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the DS3 input signals and sends them to the standby unit and to its own receiver. To implement a protection switch on the DS3 side, the SYSCTL switches the relays on each unit to their opposite state.

When a BBG11B 3DS3 is removed, shorting contacts on the backplane connector operate so that the DS3 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

Monitoring and Testing. The BBG11B 3DS3 circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the BBG11B 3DS3 circuit pack is inserted or recovers from a transient failure.

Loopbacks

Two loopbacks are provided for each DS3 interface on the BBG11B 3DS3 circuit pack. The terminal loopback bridges the DS3 desynchronizer output signal (transmitted towards the DSX-3) back into the DS3 synchronizer input. Operation of this loopback does not affect the signal transmitted to the DSX-3. The facility loopback bridges the STS-1 output signal to the TSI back towards the DSX-3. Operation of this loopback does not affect the signal transmitted to the fiber. Both loopbacks are controlled by the SYSCTL through the intrashelf control bus.

Performance Monitoring

The BBG11B DS3 circuit pack provides PM circuitry for the following performance parameters:

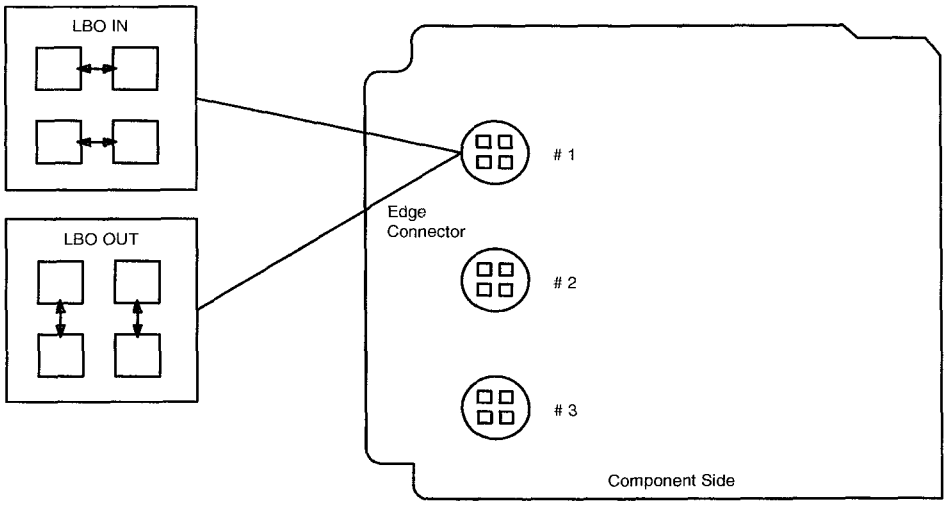
- STS path parameters derived from B3 coding violations
- DS3 path parameters derived from P-bit coding violations
- DS3 path parameters derived from frame and multiframe (F&M) bit errors
- DS3 line errors based on B3ZS violations
- DS3 P-bit and F&M bit performance monitoring for both directions of transmission
- C-bit parity and Far End Block Errors (FEBE) option performance monitoring for both directions of transmission.

Power Circuitry

The BBG11B 3DS3 circuit pack receives two sources of –48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG11B 3DS3 Hardware Settings

The location of the BBG11B 3DS3 circuit pack LBO jumpers is shown in Figure 7-15. The 3DS3 LBO settings are shown in the table.



3DS3 LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

Figure 7-15. 3DS3 Line Build-Out Jumpers

BBG11B 3DS3 Quick Reference Summary

Transmit Functions

The 3DS3 circuit pack transmit functions are as follows:

- Receives three B3ZS encoded DS3 signals from a DSX-3
- Recovers three DS3 clocks and NRZ data
- Optionally checks and/or corrects P-bit parity errors
- Synchronizes the data signals to STS-1 signal rate
- Inserts STS-1 path overhead
- Provides three STS-1 signals to the TSI circuit packs.

Receive Functions

The following receive functions are performed by the BBG11B 3DS3 circuit pack:

- Desynchronizes the incoming STS-1 signals
- Terminates the STS-1 paths
- Optionally checks and/or corrects P-bit parity errors
- B3ZS encodes the outgoing DS3 signals
- Pre-equalizes the DS3 signals (with LBO) and transmits them to the DSX-3.

Control Functions

The major control functions are as follows:

- Protection switching for TSI and 3DS3 circuit packs
- STS-1 path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Detects STS-1 path AIS coming from the fiber
- Detects STS-1 path unequipped signal coming from the fiber
- Inserts DS3 AIS toward the fiber and DSX-3
- Detects DS3 AIS coming from the fiber
- Detects DS3 OOF coming from the fiber
- Detects DS3 B3ZS violation threshold crossings from the DSX-3
- Inserts and detects STS-1 path yellow signal to/from the fiber
- Inserts and detects STS-1 path trace
- Detects DS3 line failure (LOS and BER).

BBG12 3STS1E Circuit Pack Description

Purpose of Circuit

The BBG12 3STS1E circuit pack provides bidirectional transport of up to three EC-1 signals through the DDM-2000 OC-12 Multiplexer.

BBG12 3STS1E Faceplate Indicators

The BBG12 3STS1E circuit pack faceplate indicators are shown in Figure 7-16. The red FAULT LED is lit by the SYSCTL on detection of the BBG12 3STS1E circuit pack failure or by the loss of the circuit pack +5 V DC. In the event of an incoming signal failure, this LED will flash on and off. The green ACTIVE LED lights when the circuit pack is active (carrying service).

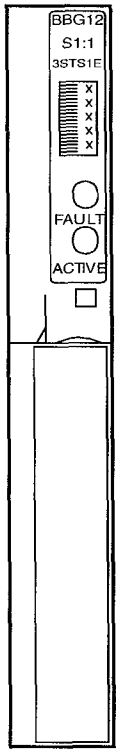


Figure 7-16. BBG12 3STS1E Circuit Pack

General Description of Operation

The BBG12 3STS1E circuit pack provides bidirectional transport of three EC-1 signals through the DDM-2000 OC-12 Multiplexer. The 3STS1E circuit pack performs maintenance and provisioning functions associated with the STS-1 and EC-1 signals. The 3STS1E circuit pack interfaces to the TSI circuit pack at the STS-1 rate, to the STSX-1, and to the SYSCTL, and it receives timing signals from the TSI circuit pack.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-17 provides an overall block diagram of the BBG12 3STS1E circuit pack. The transmit direction is the direction towards the fiber and the receive direction refers to the direction towards the STSX-1. In the transmit direction, the BBG12 3STS1E receives up to three incoming B3ZS encoded EC-1 signals from the STSX-1 cross-connection panel. A closed protection relay contact routes each EC-1 signal to a circuit that splits the signal and sends one output to the companion (standby) circuit pack and the other to its own receiver. The BBG12 3STS1E receiver performs equalization and clock recovery, B3ZS decoding, and optional automatic AIS insertion. It performs pointer processing on the input data stream and outputs three corresponding data streams, time-aligned with a single frame signal, to the TSI circuit packs.

Receive Direction. The BBG12 3STS1E receives two STS-1 data signal inputs for each of the three EC-1 channels: one from the working TSI circuit pack and one from the standby TSI circuit pack. A jumper allows the user to insert or remove a LBO network (225 ft. of 734A-type cable equivalent) to provide the required signal level and shape at the STSX-1 cross-connection panel.

Control Circuitry

The BBG12 3STS1E circuit pack interfaces with the SYSCTL circuit pack via the intrashelf control bus. The BBG12 3STS1E circuit pack provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and EC-1 signals, as well as the circuit pack inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the BBG12 3STS1E responds to control signals from the SYSCTL (such as active and fault LED controls).

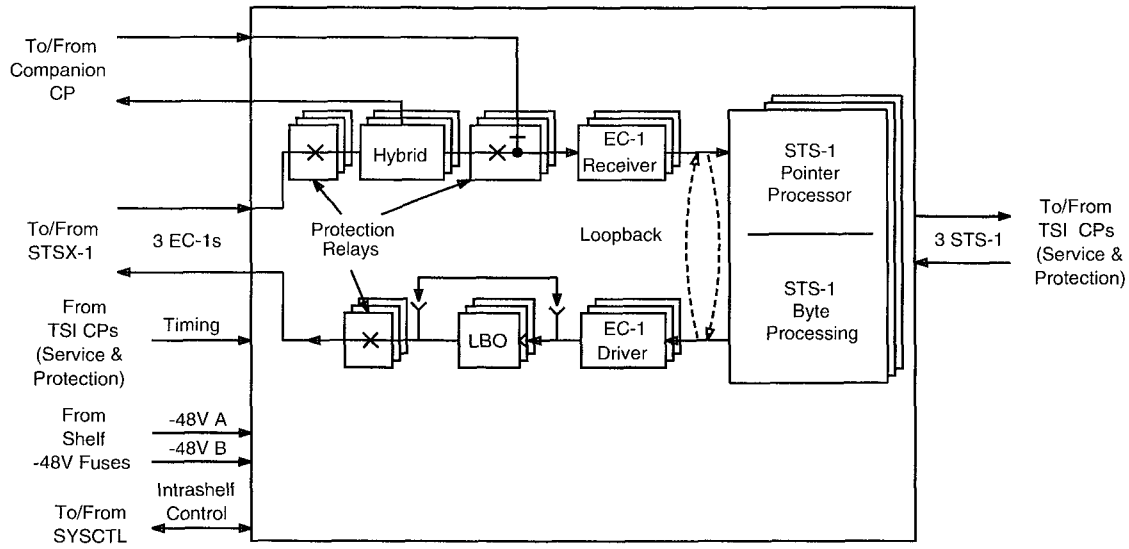


Figure 7-17. BBG12 3STS1E Circuit Pack Block Diagram

Timing Circuitry

The BBG12 3STS1E circuit pack derives its timing information from the recovered clock of the incoming EC-1 signals. In the transmit direction, a 51.84 MHz clock is recovered from the incoming EC-1 signal and is used to recover EC-1 data. In the receive direction, the 3STS1E circuit pack receives its timing from the working and standby TSI circuit packs. The 3STS1E circuit pack selects between the supplied timing signals as requested by the SYSCTL circuit pack via the intrashelf control bus.

Protection Circuitry

Optional 1x1 nonrevertive BBG12 3STS1E circuit pack protection is provided. Switch points for the STS-1 side of the BBG12 3STS1E are located on the TSI circuit packs. Switch points for the EC-1 side are implemented with relays on the 3STS1E circuit pack. To ensure that the relays can be operated when the circuit pack fails, the relay is controlled by the SYSCTL via the control interfaces. Also, if power to the board is lost, the relay switches autonomously to the standby state. When a new board is inserted, it defaults to the standby state until provisioned active by the SYSCTL.

On the BBG12 3STS1E side, the EC-1 inputs from an STSX-1 cross-connection panel are sent to both the active and standby BBG12 3STS1E circuit packs. Only the active unit selects the EC-1 input. The SYSCTL circuit pack supervises the state of the active and standby units so that the relay state of each is always the inverse of the other. The hybrid on the active unit splits the EC-1 input signals and sends them to the standby unit and to its own receiver. To implement a protection switch on the EC-1 side, the SYSCTL switches the relays on each unit to their opposite state.

When a BBG12 3STS1E is removed, shorting contacts on the backplane connector operate so that the EC-1 input signal from its companion unit is returned for proper termination.

Fault Detection Circuitry

Monitoring and Testing. The BBG12 3STS1E circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous, and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the BBG12 3STS1E circuit pack is inserted or recovers from a transient failure.

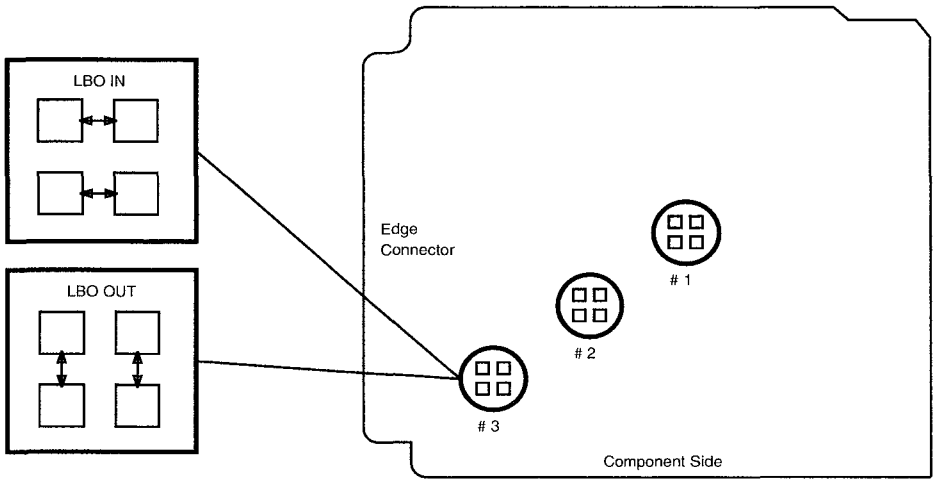
Loopbacks. Two loopbacks (terminal and facility loopbacks) are provided on the BBG12 3STS1E circuit pack. The terminal loopback (STS-1 loopback) loops the incoming STS-1 signal back toward the TSI circuit pack. The facility loopback (STSX-1 loopback) loops the incoming EC-1 signal back toward the STSX-1 cross-connection panel.

Power Circuitry

The BBG12 3STS1E circuit pack receives two sources of –48 volts that are in turn diode ORed, fused, and filtered before conversion to +5 volts to power the rest of the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BBG12 3STS1E Hardware Settings

The location of the BBG12 3STS1E circuit pack LBO jumpers is shown in Figure 7-18. The 3STS1E LBO settings are shown in the table.



3STS1E LBO Settings

Cable Length (Ft)			LBO Setting
734A Cable	Mini-Coax KS-19224	735A Cable	
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

Figure 7-18. 3STS1E Line Build-Out Jumpers

BBG12 3STS1E Quick Reference Summary

Transmit Functions

The 3STS1E circuit pack transmit functions are as follows:

- Receives three B3ZS-encoded EC-1 signals from an STSX-1
- Recovers three STS-1 clocks from three incoming data streams
- B3ZS decodes and descrambles three incoming data streams
- Frame synchronizes the incoming EC-1 signal using the STS-1 pointer processor
- Provides three STS-1 signals to the TSI circuit packs.

Receive Functions

The following receive functions are performed by the BBG12 3STS1E circuit pack:

- Receives three incoming STS-1 signals from the TSI circuit pack
- B3ZS-encodes and scrambles data, converts data to bipolar format, and sends it to the STSX-1
- Pre-equalizes the EC-1 signals (with line build-out) and transmits them to the STSX-1.

Control Functions

The major control functions are as follows:

- Protection switching for TSI and 3STS1E circuit packs
- STS-1 path overhead processing
- Internal fault detection
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Detects STS-1 path AIS coming from the fiber
- Inserts STS-1 path AIS toward the fiber and STSX-1
- Detects EC-1 line failures (LOS, LOF, AIS, and BER)
- Detects EC-1 line signal degrade BER.

BCP3 TSI FLEX Circuit Pack Description

Purpose of Circuit

The BCP3 time slot interchange flexible (TSI FLEX) circuit pack provides a programmable TSI interface between the Main-B circuit packs and the Function Units circuit packs and distributes timing from the TGS circuit packs to the transmission circuit packs.

BCP3 Faceplate Indicators

The BCP3 circuit pack faceplate indicators are shown in Figure 7-19. The red FAULT LED lights on detection of circuit pack failure or by loss of circuit pack +5 V DC. The green ACTIVE LED lights indicating that the BCP3 circuit pack is active (carrying service).



Figure 7-19. BCP3 Circuit Pack

General Description of Operation

The BCP3 provides the 51.84 MHz clock and the 8-kHz frame pulse to all Main-B and Function Units service and protection circuit packs. In the receive direction, the BCP3 receives twelve 51.84 Mb/s STS-1s from an active Main-B circuit pack and groups them into sets of three STS-1s. Each set of three STS-1s is connected to both active and standby Function Unit circuit packs. In the transmit direction, the BCP3 accepts twelve STS-1s from active Function Unit circuit packs and transfers them to the Main-B-1 and Main-B-2 circuit packs. The BCP3 also interfaces to the SYSCTL and receives timing signals from the TGS circuit packs.

Cross-connections can be made from Main to Main or Main to any Function Unit.

Detailed Description of Operation

Transmission Circuitry

Figure 7-20 provides an overall block diagram of the BCP3 circuit pack.

Transmit Direction. In the transmit direction, under control of the SYSCTL circuit pack, the BCP3 selects 12 STS-1 signals from the Function Unit slots and sends them to the Main-B slots.

Receive Direction. Under control of the SYSCTL circuit pack, the BCP3 selects 12 STS-1 signals from the Main-B slots. The 12 STS-1 signals are transmitted to the Function Unit slots.

Clock and Frame SYNC Distribution

Each BCP3 circuit pack receives a 51.84-MHz clock and an associated 8-kHz frame pulse from each of the active and standby TGS circuit packs. Each BCP3 provides balanced clocks at 51.84 MHz and balanced frame sync at 8 kHz to the Main-B-1 and Main-B-2 circuit packs, and the four active and four standby Function Unit circuit packs. It also provides a pair of clock and frame sync to the other BCP3 circuit pack. The BCP3, under control of the SYSCTL circuit pack, normally selects signals from the active TGS. If a failure of the clock or frame is detected, the BCP3 can automatically switch to the standby TGS circuit pack. The SYSCTL can inhibit autonomous clock selection.

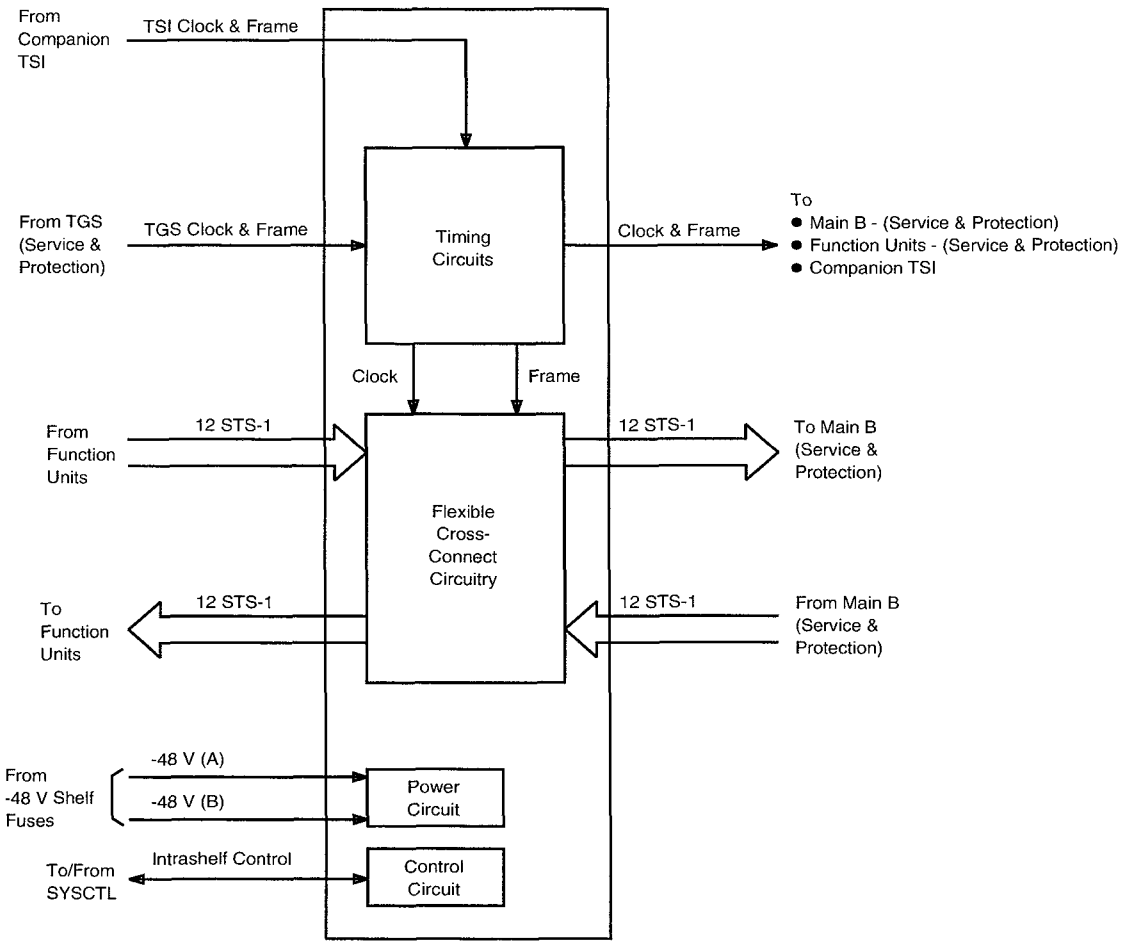


Figure 7-20. BCP3 Circuit Pack Block Diagram

Maintenance Features and Modes

The BCP3 circuit pack communicates with the SYSCTL circuit pack via a control interface.

Transmit Direction. The BCP3 receives 12 sets of STS-1 data signals, one each from the active and standby Function Unit circuit packs. One set is selected by SYSCTL request.

Receive Direction. The BCP3 receives two sets of 12 STS-1 data signals, one each from the active and standby Main-B circuit packs. One set is selected by SYSCTL provisioning.

Performance Monitoring. The BCP3 circuit pack monitors the STS path bit interleaved parity (BIP-8) on all selected inputs from the Main-B and Function Unit circuit packs.

Other Functions: ■Circuit pack insertion and removal detection

- FAULT LED (red) control (via control interface)
- ACTIVE LED (green) control (via control interface)
- +5 volt power module failure
- Circuit pack version and type recognition (EEPROM via control interface).

Power Circuitry

The BCP3 receives –48 volts which are diode ORed, fused, and filtered prior to conversion to the +5 volt source for the circuit pack. A failure of the fuse or converter causes the red FAULT LED to light.

BCP3 Quick Reference Summary

Interface Functions

STS-1 signal interface functions performed by the BCP3 are as follows:

- Transmission of selected STS-1 signals from Function Units to the Main-B circuit packs
- Transmission of selected STS-1 signals from Main-B to the Function Unit circuit packs.

Timing signal interface functions are as follows:

- Clock and frame selection from active and standby TGS circuit packs
- Clock and frame distribution to Main-B circuit packs
- Clock and frame distribution to Function Units
- Clock and frame distribution to companion BCP3 circuit pack.

Control Functions

- Protection switching for all protected circuit packs
- Inventory information (*CLEI* code, date of manufacture, etc.)
- STS-1 and STS-3c path protection switching.

Maintenance Functions

Maintenance functions provided by the BCP3 circuit pack are as follows:

- Circuit pack fault detection and reporting
- STS path BIP-8 performance monitoring
- Insertion of STS path AIS
- Insertion and detection of path unequipped signal
- Detection of STS-1 and STS-3c path fail BER (10^{-3})
- Detection of STS-1 and STS-3c path BER signal degrade (10^{-5} to 10^{-9}).

21D/21D-U OLIU Circuit Pack Description

Purpose of Circuit

The 21D/21D-U OLIU circuit pack is used to interconnect colocated OC-3 and OC-12 shelves at the OC-3 rate. It performs the optical/electrical conversion between the optical interconnect signal level 3 (IS-3) and STS-3 signals. It also does the multiplexing between STS-3 and three STS-1 signals and provides SONET transport overhead access.

21D and 21D-U OLIU Faceplate Indicators

The 21D/21D-U OLIU circuit pack faceplate indicators are shown in Figure 7-21. The red FAULT LED lights on detection of circuit pack hardware failure or by loss of circuit pack +5 V DC. In the event of an incoming signal failure, this LED will flash ON and OFF. The green ACTIVE LED lights when the circuit pack is active (carrying service).

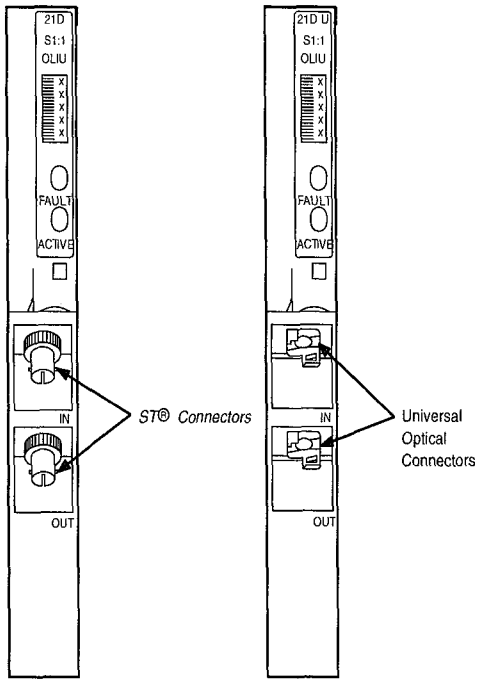


Figure 7-21. 21D and 21D-U OLIU Circuit Packs

General Description of Operation

The 21D/21D-U OLIU circuit pack multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives an LED transmitter to create the IS-3 output.

The received IS-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. Finally, the STS-1 signals run through a pointer-processing step (interpretation and regeneration) to guarantee frame alignment to the local system clock before they are sent to the TSI slots. Fiber access is via a pair of *ST* (21D) or universal (21D-U) lightguide cable connectors from the 21D/21D-U OLIU faceplate. The 21D/21D-U OLIU operates ***only*** on multimode cable.

Detailed Description of Operation

Figure 7-22 is an overall block diagram of the 21D/21D-U OLIU circuit pack.

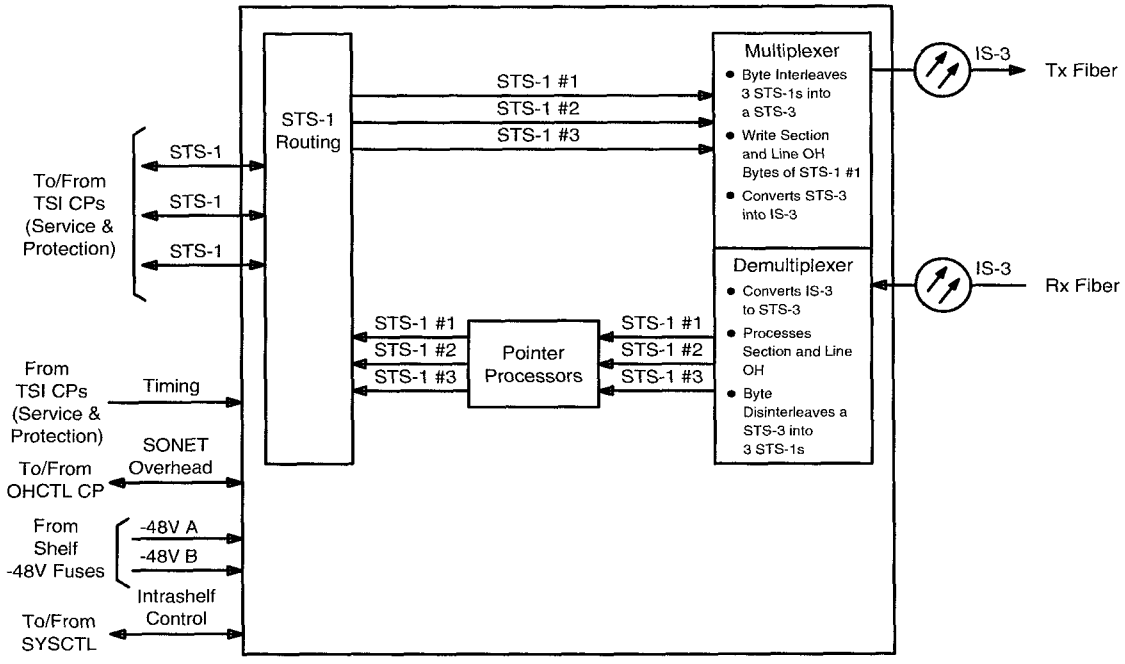


Figure 7-22. 21D/21D-U OLIU Circuit Pack Block Diagram

Transmission Circuitry

Transmit Direction. The 21D/21D-U OLIU circuitry selects the three STS-1 signals from the TSI, adds SONET transport overhead, then byte-interleaves and scrambles the signal in a frame synchronous scrambler. The output from the multiplexer is an STS-3 signal that is used to amplitude modulate the LED transmitter, converting the electrical signal to an NRZ-encoded IS-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an IS-3 optical signal to equivalent electrical pulses. The received signal may be either NRZ- or RZ-encoded. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data, providing a retimed STS-3 signal. The demultiplexer circuit accepts the STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes IS-3 transport overhead. The overhead information is sent to the OHCTL circuit pack via the intrashelf control bus and the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the pointer processor that performs pointer interpretation and generation on each received STS-1, using the local timing signals. The output of the pointer processor is three STS-1 signals, frame synchronous to each other.

Control Circuitry

The 21D/21D-U OLIU circuit pack interfaces with the SYSCTL and OHCTL circuit packs.

The 21D/21D-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming STS-1 and IS-3 signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 21D/21D-U OLIU responds to control signals from the SYSCTL, such as LED operation and protection switching.

The 21D/21D-U OLIU accesses the IS-3 transport overhead and routes it via the transport overhead channel interface to the OHCTL.

Timing Circuitry

Each TSI circuit pack sends timing signals to each 21D/21D-U OLIU circuit pack. The 21D/21D-U OLIU monitors activity on both timing inputs. It normally selects the signals from the active TSI as requested by the SYSCTL. If there is a failure of the active input, the SYSCTL may command the 21D/21D-U OLIU to select the OLIU input.

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 21D/21D-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 21D/21D-U OLIU circuit pack is protection switched with the IS-3 line.

The 21D/21D-U OLIU provides selectors for STS-1 and timing signals from the TSI circuit packs. The 21D/21D-U OLIU monitors these inputs and selects one as directed by SYSCTL.

Fault Detection Circuitry

The 21D/21D-U OLIU circuit pack has in-service and out-of-service built-in test capability. An out-of-service test is performed whenever the 21D/21D-U OLIU resets or is commanded to reset by the SYSCTL through the serial interface. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the 21D/21D-U OLIU circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The 21D/21D-U OLIU circuit pack provides PM circuitry for the following performance parameters:

- Section severely errored frame seconds (SEFS) count
- Line parameters based on B2 coding violations.

Power Circuitry

Power for the 21D/21D-U OLIU circuit pack is provided by a DC-to-DC converter located on the 21D/21D-U OLIU circuit pack. The converter supplies +5 volts and –5.2 volts. Both A and B –48 volt backplane busses supply power to the converter through diode ORed circuit pack-mounted power select circuits and circuit pack-mounted fuses. A failure of the fuse or converter causes the red FAULT LED to light.

21D/21D-U OLIU Quick Reference Summary

Transmit Functions

Major transmit functions of the 21D/21D-U OLIU circuit pack are as follows:

- Selects STS-1 inputs from TSI circuit packs
- Adds SONET transport overhead
- Byte-interleaves and scrambles the three selected STS-1 or optional STS-3c signals to produce an STS-3 or STS-3c signal
- Converts the STS-3 or STS-3c signal to an IS-3 or IS-3c optical signal for transmission over the optical fiber.

Receive Functions

The following are major receive functions of the 21D/21D-U OLIU circuit pack:

- Receives an optical IS-3 or IS-3c signal and converts it to an electrical STS-3 or STS-3c signal
- Extracts STS-3 or STS-3c clock and retimes the received data
- Demultiplexes the STS-3 or STS-3c signal into three STS-1 signals
- Extracts transport overhead
- Processes the STS-1 or STS-3c pointers and frame-synchronizes the STS-1 signals
- Sends the three STS-1 signals to both TSIs.

Control Functions

The major control functions are as follows:

- Protection switching for TSI circuit packs
- Transport overhead processing
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS
- Inserts STS-1 path unequipped signal
- Inserts and detects IS-3 line AIS
- Inserts and detects far-end receive line failure (FERF)
- Detects IS-3 line failures (LOS, LOF, AIS, and BER)
- Detects IS-3 line signal degrade BER.

21G/21G-U/21G2-U OLIU Circuit Pack Description

Purpose of Circuit

The 21G/21G-U/21G2-U OLIU circuit pack performs the optical/electrical conversion between the OC-3 and STS-3 signals, multiplexing/demultiplexing between STS-3 and three STS-1 signals and SONET transport overhead access. The 21G/21G-U/21G2-U can be used in either the Main or Function Unit slots in an OC-3 shelf, or the Function Unit slots only in an OC-12. In the OC-3 shelf, the 21G/21G-U/21G2-U OLIU circuit pack also provides routing of the STS-1s between the OC-3 interface and other Main and Function Unit slots in the shelf and will support the STS-1 add/drop feature. In the OC-12 shelf, the routing function is performed in the TSI circuit pack.

21G/21G-U/21G2-U OLIU Faceplate Indicators

The 21G2-U OLIU is the same as the 21G/21G-U OLIUs but has improved receiver overload sensitivity, eliminating the need for a Hi/Low power switch for loopback testing. The 21G2-U can be used in place of the 21G/21G-U in all applications.

The 21G/21G-U/21G2-U OLIU circuit pack faceplate indicators are shown in Figure 7-23. The red FAULT LED lights on detection of circuit pack hardware failure. In the event of an incoming signal failure, this LED will flash ON and OFF. The green ACTIVE LED lights when the circuit pack is active (carrying service).

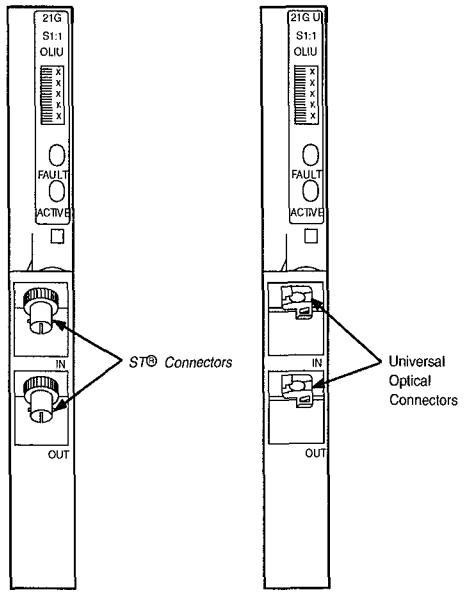


Figure 7-23. 21G and 21G-U/21G2-U OLIU Circuit Packs

General Description of Operation

The 21G/21G-U/21G2-U OLIU multiplexes three STS-1 signals to an STS-3, inserts the SONET transport overhead bytes (line and section), and scrambles the resulting signal. This STS-3 signal drives the laser transmitter to create the OC-3 output.

The received OC-3 signal is converted back to an electrical STS-3. This STS-3 is descrambled and demultiplexed to three STS-1 signals, and transport overhead is accessed. Some of the overhead (for example, section datacom channel) is passed via serial data links to the control packs, while other bytes (for example framing, parity check) are processed on-board. The STS-1 signals go through a pointer processor to guarantee frame alignment to the local system clock before being routed to the other Main and Function Unit slots.

The 21G/21G-U/21G2-U OLIU provides timing signals to and receives timing signals from the TGS circuit packs.

Fiber access for the 21G OLIU is via a pair of *ST* lightguide cable connectors from the OLIU faceplate. A faceplate-mounted universal optical connector allows the 21G-U/21G2-U OLIU to accept fiber terminated with *ST*, SC, or FC connectors. Various combinations of buildouts and connectors are also available. See Section 10, "Technical Specifications" for a list of universal buildout attenuators. The 21G/21G-U/21G2-U OLIU photonics comply with SONET long-reach specifications. While single-mode fiber is suggested for optimum performance, multimode facilities are also supported.

Detailed Description of Operation

Figure 7-24 is an overall block diagram of the 21G/21G-U/21G2-U OLIU circuit pack.

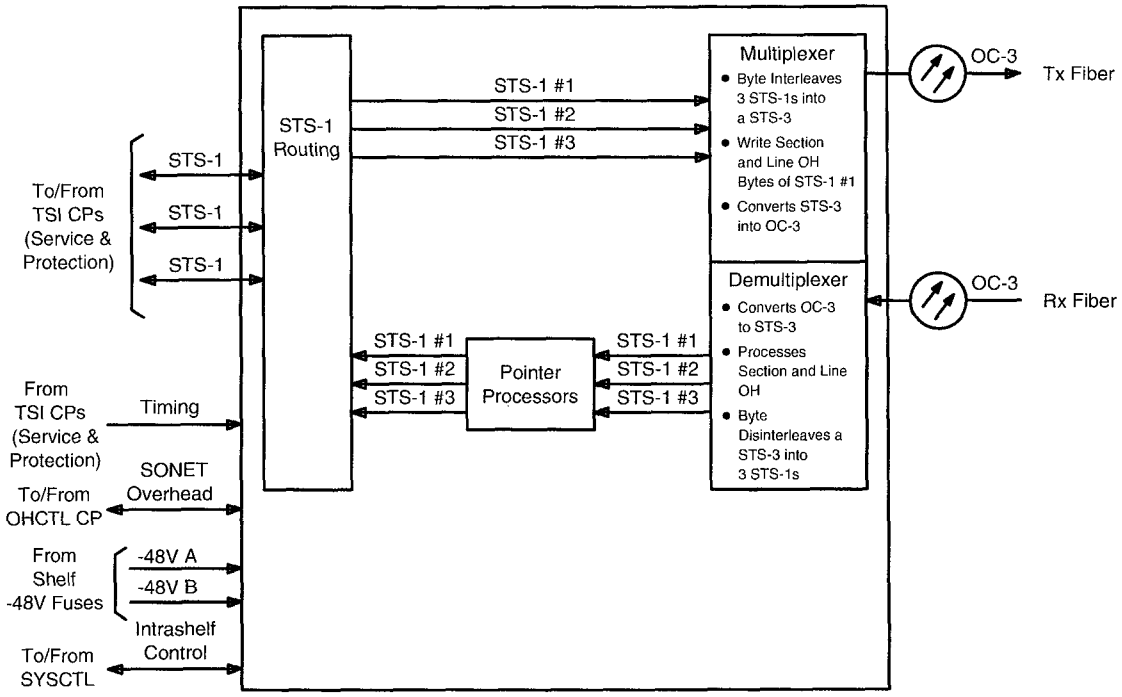


Figure 7-24. 21G/21G-U/21G2-U OLIU Circuit Pack Block Diagram

Transmission Circuitry

Transmit Direction. The STS-1 router selects three of the STS-1 signals received from other Main and Function Unit slots, or from TSI slots in the OC-12 shelf, and sends them to the multiplexer. The multiplexer circuitry takes the three STS-1 signals from the output of the router, adds SONET transport overhead, then byte-interleaves and scrambles the signal in a frame synchronous scrambler. The output from the multiplexer is in the SONET STS-3 format and is used to amplitude modulate the laser transmitter, which converts the electrical signal to an NRZ-encoded SONET compatible OC-3 optical signal.

Receive Direction. In the receive direction, the optical receiver converts the light pulses from an NRZ-encoded OC-3 signal to equivalent electrical pulses. The output from the optical receiver goes into a timing recovery device. The device recovers received clock (155.520 MHz) and uses it to retime the received data. The demultiplexer circuit accepts the retimed STS-3 bit stream, frames on the incoming signal, descrambles it, demultiplexes it into three STS-1 signals, and processes SONET transport overhead. The overhead information is sent to the SYSCTL pack via the intrashelf control bus and the transport overhead channel interface.

The STS-1 outputs from the demultiplexer are sent to the pointer processor which performs pointer interpretation and generation on each received STS-1 using the local timing signals. The output of the pointer processor is three STS-1 signals, frame synchronous to each other. The STS-1 router sends each of the three STS-1 signals to the appropriate Main or Function Unit in the OC-3 shelf, or TSI slots in the OC-12 shelf.

Control Circuitry

The 21G/21G-U/21G2-U OLIU circuit pack interfaces with the system controller (SYSCTL) and with the overhead controller (OHCTL) circuit packs.

The 21G/21G-U/21G2-U OLIU provides maintenance elements for reporting the status of the circuit pack, status of the incoming optical and electrical signals, as well as inventory information (*CLEI* code, date of manufacture, etc.). These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the OLIU responds to control signals from the SYSCTL such as STS-1 routing, protection switching, and LED control commands.

The 21G/21G-U/21G2-U OLIU accesses the SONET transport overhead and routes it via the transport overhead channel interface to the AUXCTL slot and/or to the SYSCTL. The transport overhead is routed from the Main slots to both the AUXCTL and SYSCTL slots and from the Function Unit slots to the AUXCTL slot.

Timing Circuitry

Each TGS circuit pack sends timing signals to each OLIU. Each OLIU monitors the timing inputs from both TGS circuit packs. The OLIU normally selects the timing signals from the active TGS circuit pack. Each OLIU provides timing signals derived from the incoming optical signal to both TGS circuit packs for line (formerly loop) timing and DS1 timing outputs (BITS).

Protection Circuitry

Optional 1+1 nonrevertive unidirectional line protection switching compliant with SONET specifications is provided. The 21G/21G-U/21G2-U OLIU is protection switched by the SYSCTL in response to an external command, incoming signal failure, or internal equipment fault. The 21G/21G-U/21G2-U OLIU circuit pack is protection switched with the optical line.

The 21G/21G-U/21G2-U OLIU interfaces with STS-1 signals from the circuit packs in the Main and Function Unit slots in an OC-3 shelf, or TSI slots in an OC-12 shelf, and selects the signals from the service or protection slot of each pair as directed by the SYSCTL.

The 21G/21G-U/21G2-U OLIU provides selectors for timing signals from the TGS circuit packs, monitors these inputs, and autonomously selects either one. The SYSCTL can inhibit autonomous selection and make its own selection.

Fault Detection Circuitry

The 21G/21G-U/21G2-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service testing is continuous and errors are reported when they occur to the SYSCTL via the intrashelf control bus. An out-of-service test is performed whenever the 21G/21G-U/21G2-U OLIU circuit pack is inserted or recovers from a transient failure.

Performance Monitoring

The 21G/21G-U/21G2-U OLIU provides PM circuitry for the following performance parameters:

- Laser bias current threshold (21G and 21G-U only)
- Transmit optical power threshold (21G and 21G-U only)
- SEFS
- Line parameters derived from B2 coding violations.

Power Circuitry

Power for the 21G/21G-U OLIU circuit pack is provided by two DC-to-DC converters located on the 21G/21G-U OLIU circuit pack. One converter supplies +5 volts and the other supplies –5.2 volts. Both A and B –48 volt backplane busses supply power to the converters through diode ORed circuit pack-mounted power select circuits and a circuit pack-mounted fuse. Failure of the fuse or either converter causes the red FAULT LED to light.

21G/21G-U OLIU Hardware Settings

The location of the 21G/21G-U OLIU circuit pack optical power output level switch is shown in Figure 7-25. This switch allows the 21G/21G-U OLIU to be looped back without an external optical attenuator cable. The optical power output level switch in the LOW POWER position attenuates the transmit optical power by 5 dB.

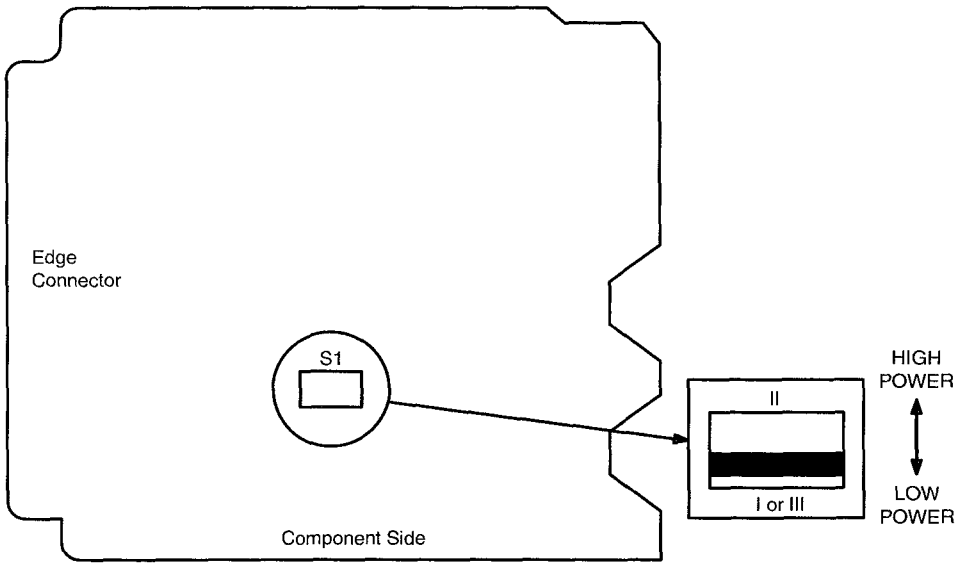


Figure 7-25. 21G/21G-U OLIU Output Level Switch

NOTE: The 21G2-U OLIU does not have a High/Low transmitter power switch due to improved overload sensitivity of the receiver used on the 21G2-U. Refer to Table 10-5 for OLIU Link Budget information.

21G/21G-U/21G2-U OLIU Quick Reference Summary

Transmit Functions

The following are the major transmit functions of the 21G/21G-U/21G2-U OLIU circuit pack:

- Selects STS-1 inputs from MXRVO, DS3, STS1E, or other OLIU circuit packs
- Provides STS-1 signal cross-connections
- Adds SONET transport overhead
- Byte-interleaves and scrambles the three selected STS-1 signals to an STS-3 or STS-3c signal
- Converts the STS-3 or STS-3c electrical signal to an optical signal and transmits it over the fiber
- Monitors laser bias and output power (21G and 21G-U only).

Receive Functions

The following are major receive functions of the 21G/21G-U/21G2-U OLIU circuit pack:

- Receives an optical OC-3 or OC-3c signal and converts it to an electrical STS-3 or STS-3c signal
- Extracts STS-3 clock and retimes the received data
- Demultiplexes the STS-3 or STS-3c signal into three STS-1 signals
- Extracts transport overhead
- Processes the STS-1 or STS-3c pointers and frame-synchronizes the STS-1 signals
- Provides STS-1 signal cross-connections
- Processes the received clock and provides a reference clock to the TGS circuit packs (OC-3 shelf only).

Control Functions

The following are the major control functions of the 21G/21G-U/21G2-U OLIU circuit pack:

- Switches protection for the optical line and DS3, MXRVO, STS1E, and TGS circuit packs on the OC-3 shelf. On the OC-12 shelf, switches protection for the TSI and TGS circuit packs.
- Processes transport overhead
- Stores inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The following are the major maintenance signal functions of the 21G/21G-U/ 21G2-U OLIU circuit pack:

- Inserts and detects STS-1 path AIS
- Inserts and detects SONET line AIS and inserts and detects line far-end-receive failure (FERF)
- Inserts STS-1 path unequipped signal
- Detects OC-3 line failures (LOS, LOF, AIS, and BER)
- Detects STS-1 LOP
- Detects OC-3 line signal degrade BER.

23G/23G-U OLIU Circuit Pack Description

Purpose of Circuit

The 23G/23G-U OLIU circuit pack provides a 1310 nm long reach interface between an optical OC-12 line and 12 STS-1 electrical signals.

23G/23G-U OLIU Faceplate Indicators

The 23G/23G-U OLIU circuit pack faceplate indicators are shown in Figure 7-26. The red FAULT LED lights on detection of circuit pack hardware failure or by loss of circuit pack +5 V, –5.2 V, +15 V, and/or –2.3 V DC. The green ACTIVE LED lights when the circuit pack is active (carrying service).

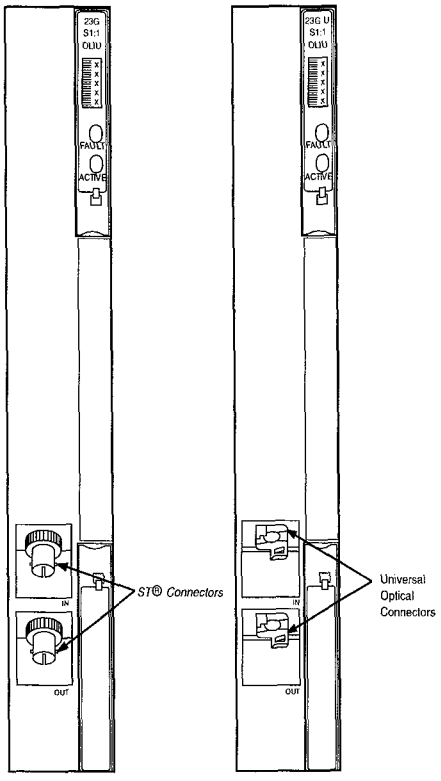


Figure 7-26. 23G and 23G-U OLIU Circuit Packs

General Description of Operation

The 23G/23G-U OLIU circuit pack provides an interface between an OC-12 optical line and 12 STS-1 signals. The 23G/23G-U OLIU provides 24 STS-1 input ports, 12 from service and 12 from protection TSI circuit packs. It selects up to 12 STS-1 inputs, performs pointer processing and frame alignment on each STS-1, inserts transport overhead, and combines and scrambles the 12 STS-1 signals into an STS-12 (622.08 Mb/s) signal. The 23G/23G-U OLIU then performs an electrical-to-optical conversion and outputs an OC-12 optical signal for transmission on an optical fiber.

The 23G/23G-U OLIU receives an optical OC-12 signal and converts it to an electrical signal. It frames on and descrambles the signal, processes the transport overhead, and demultiplexes the STS-12 into 12 STS-1 signals. It performs pointer processing and frame alignment on each STS-1. The 23G/23G-U OLIU outputs 24 STS-1 signals, 12 to service and 12 to protection TSI circuit packs.

The 23G/23G-U OLIU performs maintenance and provisioning functions associated with the STS-1 and OC-12 inputs and outputs. It provides access to the line and section overhead in the STS-12 signal and interfaces to the TSI circuit pack at the STS-1 rate and to the optical line at the OC-12 rate. It interfaces to the SYSCTL and OHCTL and sends recovered timing signals to the TGS circuit packs. The 23G/23G-U OLIU receives its timing signals from the TSI circuit packs.

Fiber access is via a pair of *ST* (23G) or universal (23G-U) lightguide cable connectors from the 23G/23G-U OLIU faceplate. Single-mode fiber is suggested for optimum performance. The 23G/23G-U OLIU photonics comply with SONET long-reach specifications.

For 23G applications requiring external optical attenuators, the faceplate-mounted transmit (OUT) connector is designed to accept a lightguide buildout. Available buildouts are A3010B - 5 dB, A3010D - 10 dB, and A3010F - 15 dB. For 23G-U applications, see Section 10, "Technical Specifications," for a list of universal buildout attenuators.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-27 is a functional block diagram of the 23G/23G-U OLIU. The 23G/23G-U OLIU receives an STS-1 rate clock and an associated frame pulse from each of the working and standby TSI circuit packs. The 23G/23G-U OLIU, under control of the SYSCTL, normally selects signals from the working TSI. If a failure of the working clock is detected, the 23G/23G-U OLIU can be switched to the standby TSI under SYSCTL control. An STS-12 rate clock is generated from the STS-1 clock and used in creating the STS-12 signal. Under control of the SYSCTL circuit pack, the 23G/23G-U OLIU selects one group of 12 STS-1 signals from either of the 12 active or 12 standby STS-1 inputs. The 23G/23G-U OLIU performs pointer processing and frame alignment, and adds transport overhead to the selected STS-1 signals. The 23G/23G-U OLIU provides access to the transport overhead which is sent to and received from the OHCTL.

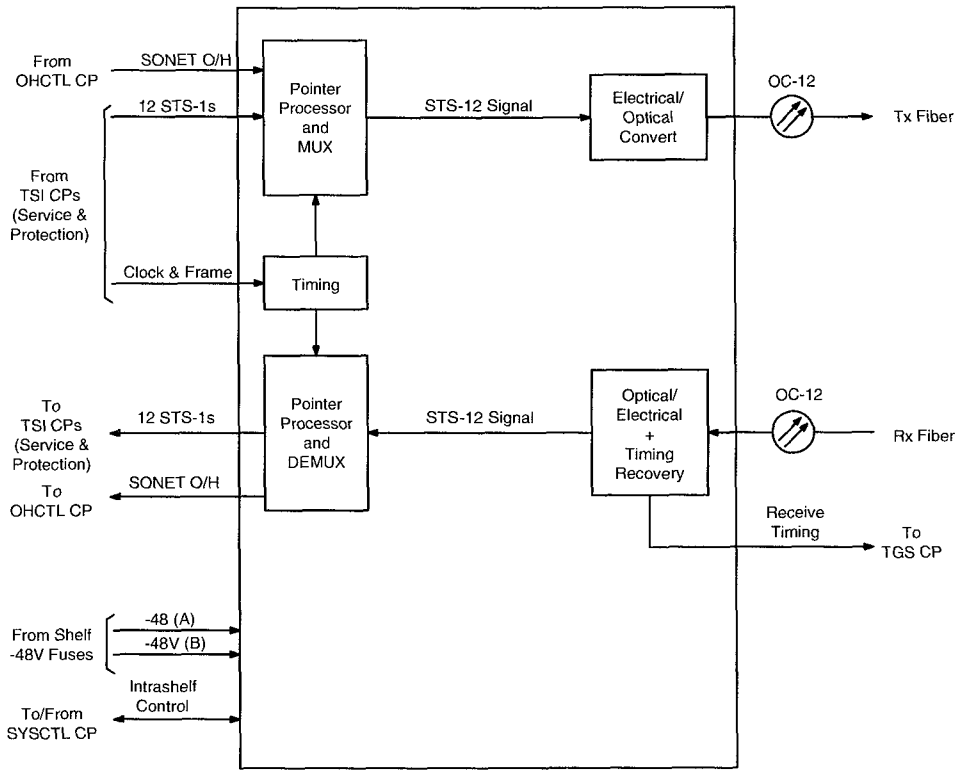


Figure 7-27. 23G/23G-U OLIU Circuit Pack Block Diagram

The STS-1 signals are byte-interleaved and scrambled in a frame synchronous scrambler to produce a SONET format compatible STS-12 signal. The STS-12 signal is used to amplitude modulate a laser transmitter to convert the electrical signal to an NRZ-encoded SONET compatible OC-12 optical signal.

Receive Direction. The 23G/23G-U OLIU circuit pack receives an OC-12 optical signal that is an NRZ-coded SONET compatible signal. An optical receiver converts the optical OC-12 signal to an electrical STS-12 signal. An STS-12 rate clock is recovered and used to retime the data.

The 23G/23G-U OLIU frames on the retimed STS-12 data, demultiplexes it into 12 STS-1 signals, and provides the transport overhead access.

The 23G/23G-U OLIU performs pointer interpretation, frequency justification, and pointer generation on each of the STS-1 signals, using the local clock and frame from the selected TSI circuit pack. The result is 12 STS-1 signals that are frame synchronous with each other and with the local clock and frame sync.

Each STS-1 signal is bridged to the service and protection TSI circuit packs.

The 23G/23G-U OLIU sends a clock derived from the recovered receive clock to the TGS circuit packs for loop timing. The 23G/23G-U OLIU provides transport overhead access in the receive direction.

Control Circuitry

The 23G/23G-U OLIU circuit pack interfaces with the SYSCTL and the OHCTL circuit packs.

Control and Maintenance Functions . The 23G/23G-U OLIU provides maintenance elements for reporting the status of the circuit pack and the incoming STS-1 and OC-12 signals to the SYSCTL. Conversely, the 23G/23G-U OLIU responds to control signals from the SYSCTL.

- SYSCTL: The 23G/23G-U OLIU communicates with the SYSCTL circuit pack via a control interface. The 23G/23G-U OLIU provides maintenance elements for reporting the status of the circuit pack and the incoming STS-1 and OC-12 signals. These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 23G/23G-U OLIU responds to control signals from the SYSCTL, such as LED and protection switching controls.
- Transport Overhead Channel Interface: The 23G/23G-U OLIU accesses the SONET overhead and routes this data to the OHCTL.

Timing Circuitry

Each TGS circuit pack sends timing signals to the 23G/23G-U OLIU circuit pack via the TSI circuit packs.

The 23G/23G-U OLIU circuit pack sends a clock signal to both TGS circuit packs for loop timing.

Protection Circuitry

The 23G/23G-U OLIU provides STS-1 data path selectors for implementing a 1x1 protection switch between TSI circuit packs. The selectors are controlled by the SYSCTL.

The 23G/23G-U OLIU is protection switched by the SYSCTL in response to fault indications on the 23G/23G-U OLIU, or in response to fault indications on a transmission circuit pack with which it interfaces, or in response to external commands.

Fault Detection Circuitry

The 23G/23G-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service device testing is continuous, and errors are reported to the SYSCTL when they occur via the intrashelf control bus. Incoming and outgoing optical power thresholds are also monitored.

There is no electrical loopback in the 23G/23G-U OLIU. All loopbacks are external optical loopbacks which require an attenuator.

Performance Monitoring

The 23G/23G-U OLIU provides PM circuitry for the following maintenance parameters:

- Parity error counts
- Incoming OC-12 OOF counts
- Outgoing OC-12 laser bias current threshold
- Line parameters based on B2 coding violations.

Power Circuitry

The 23G/23G-U OLIU circuit pack uses board-mounted DC-DC power converters that converts –48 V received from the backplane to +5 V, –5.2 V, +15 V, and –2.3 V for use on the circuit pack. The 23G/23G-U OLIU interfaces with both the A and B feeders and provides a "diode-ORed" so that loss of one feeder will not affect the 23G/23G-U OLIU. A fuse element is provided at the –48 V input to the DC-DC converter.

23G/23G-U OLIU Quick Reference Summary

Transmit Functions

The major transmit functions of the 23G/23G-U OLIU circuit pack are as follows:

- Selects 12 STS-1 signals from the TSI circuit packs
- Adds SONET transport overhead
- Byte-interleaves and scrambles the STS-1 signals to produce an STS-12 signal
- Modulates a laser transmitter to produce an OC-12 signal.

Receive Functions

The major receive functions of the 23G/23G-U OLIU circuit pack are as follows:

- Receives an OC-12 optical signal and converts an OC-12 signal to an electrical STS-12 signal
- Extracts STS-12 clock and retimes the received data
- Demultiplexes the STS-12 signal into 12 STS-1 signals
- Extracts and processes the STS-1 transport overhead
- Processes the STS-1 pointer and frame-synchronizes the STS-1 signals
- Processes the receive clock and provides a loop-timing clock to the TGS circuit packs.

Control Functions

Control functions are as follows:

- Protection switching for TSI circuit packs
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The 23G/23G-U OLIU major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS
- Inserts STS-1 path unequipped signal
- Inserts and detects OC-12 line AIS
- Inserts and detects OC-12 line FERF
- Detects OC-12 line failures (LOS, LOF, AIS, and BER)
- Detects OC-12 line signal degrade BER.

23H/23H-U OLIU Circuit Pack Description

Purpose of Circuit

The 23H/23H-U OLIU circuit pack provides a 1550 nm long reach interface between an optical OC-12 line and 12 STS-1 electrical signals.

23H/23H-U OLIU Faceplate Indicators

The 23H/23H-U OLIU circuit pack faceplate indicators are shown in Figure 7-28. The red FAULT LED lights on detection of circuit pack hardware failure or by loss of circuit pack +5 V, –5.2 V, +15 V, and/or –2.3 V DC. The green ACTIVE LED lights when the circuit pack is active (carrying service).

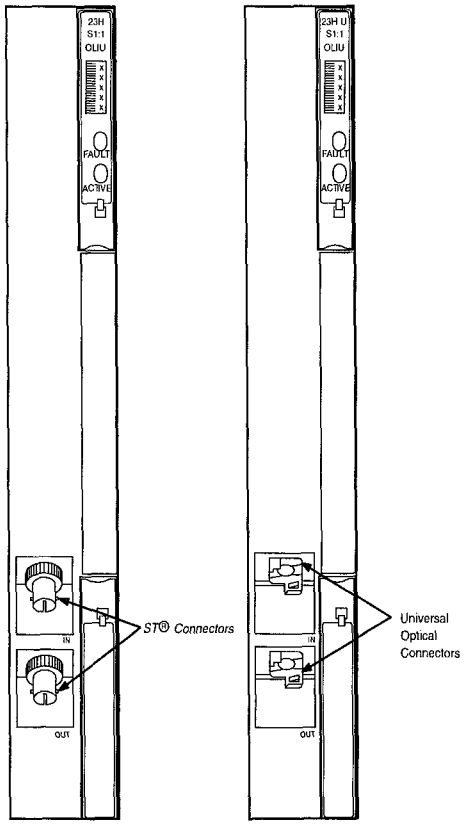


Figure 7-28. 23H and 23H-U OLIU Circuit Packs

General Description of Operation

The 23H/23H-U OLIU circuit pack provides an interface between an OC-12 optical line and 12 STS-1 signals and can be used in ring applications. The 23H/23H-U OLIU provides 24 STS-1 input ports, 12 from service and 12 from protection TSI circuit packs. It selects up to 12 STS-1 inputs, performs pointer processing and frame alignment on each STS-1, inserts transport overhead, and combines and scrambles the 12 STS-1 signals into an STS-12 (622.08 Mb/s) signal. The 23H/23H-U OLIU then performs an electrical-to-optical conversion and outputs an OC-12 optical signal for transmission on an optical fiber.

The 23H/23H-U OLIU receives an optical OC-12 signal and converts it to an electrical signal. It frames on and descrambles the signal, processes the transport overhead, and demultiplexes the STS-12 into 12 STS-1 signals. It performs pointer processing and frame alignment on each STS-1. The 23H/23H-U OLIU outputs 24 STS-1 signals, 12 to service and 12 to protection TSI circuit packs.

The 23H/23H-U OLIU performs maintenance and provisioning functions associated with the STS-1 and OC-12 inputs and outputs. It provides access to the line and section overhead in the STS-12 signal and interfaces to the TSI circuit pack at the STS-1 rate and to the optical line at the OC-12 rate. It interfaces to the SYSCTL and OHCTL and sends recovered timing signals to the TGS circuit packs. The 23H/23H-U OLIU receives its timing signals from the TSI circuit packs.

Fiber access is via a pair of *ST* (23H) or universal (23H-U) lightguide cable connectors from the 23H/23H-U OLIU faceplate. Single-mode fiber is suggested for optimum performance. The 23H/23H-U OLIU photonics meets SONET long reach specifications. The 23H/23H-U is not hardened for uncontrolled environments and is used in CO applications.

For 23H applications requiring external optical attenuators, the faceplate-mounted transmit (OUT) connector is designed to accept a lightguide buildout. Available buildouts are A3010B - 5 dB, A3010D - 10 dB, and A3010F - 15 dB. For loopback testing requiring 19 dB attenuation, use the 4C Test Cable. For 23H-U applications, see Section 10, "Technical Specifications," for a list of universal buildout attenuators.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-29 is a functional block diagram of the 23H/23H-U OLIU. The 23H/23H-U OLIU receives an STS-1 rate clock and an associated frame pulse from each of the working and standby TSI circuit packs. The 23H/23H-U OLIU, under control of the SYSCTL, normally selects signals from the working TSI. If a failure of the working clock is detected, the 23H/23H-U OLIU can be switched to the standby TSI under SYSCTL control. An STS-12 rate clock is generated from the STS-1 clock and used in creating the STS-12 signal. Under control of the SYSCTL circuit pack, the 23H/23H-U OLIU selects one group of 12 STS-1 signals from either of the 12 active or 12 standby STS-1 inputs. The 23H/23H-U OLIU performs pointer processing and frame alignment and adds transport overhead to the selected STS-1 signals. The 23H/23H-U OLIU provides access to the transport overhead which is sent to and received from the OHCTL.

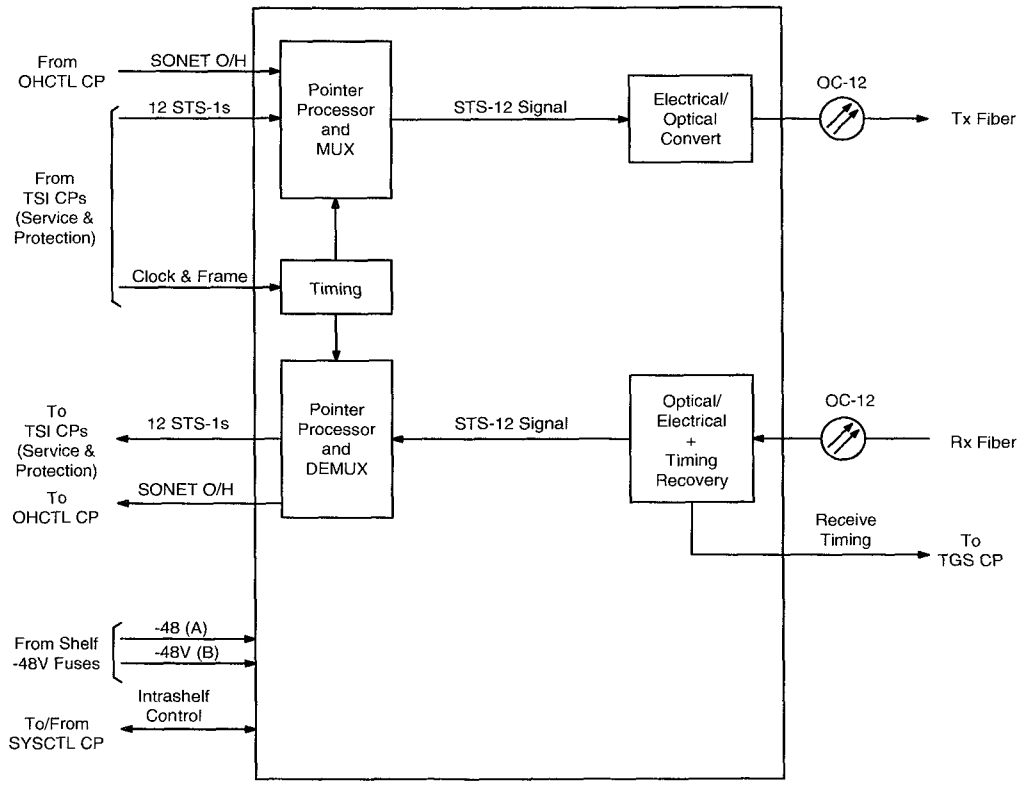


Figure 7-29. 23H/23H-U OLIU Circuit Pack Block Diagram

The STS-1 signals are byte-interleaved and scrambled in a frame synchronous scrambler to produce a SONET format compatible STS-12 signal. The STS-12 signal is used to amplitude modulate a laser transmitter to convert the electrical signal to an NRZ-encoded SONET compatible OC-12 optical signal.

Receive Direction. The 23H/23H-U OLIU circuit pack receives an OC-12 optical signal that is an NRZ-coded SONET compatible signal. An optical receiver converts the optical OC-12 signal to an electrical STS-12 signal. An STS-12 rate clock is recovered and used to retime the data.

The 23H/23H-U OLIU frames on the retimed STS-12 data, demultiplexes it into 12 STS-1 signals, and provides the transport overhead access.

The 23H/23H-U OLIU performs pointer interpretation, frequency justification, and pointer generation on each of the STS-1 signals, using the local clock and frame from the selected TSI circuit pack. The result is 12 STS-1 signals that are frame synchronous with each other and with the local clock and frame sync.

Each STS-1 signal is bridged to the service and protection TSI circuit packs.

The 23H/23H-U OLIU sends a clock derived from the recovered receive clock to the TGS circuit packs for loop timing. The 23H/23H-U OLIU provides transport overhead access in the receive direction.

Control Circuitry

The 23H/23H-U OLIU circuit pack interfaces with the SYSCTL and the OHCTL circuit packs.

Control and Maintenance Functions. The 23H/23H-U OLIU provides maintenance elements for reporting the status of the circuit pack and the incoming STS-1 and OC-12 signals to the SYSCTL. Conversely, the 23H/23H-U OLIU responds to control signals from the SYSCTL.

- SYSCTL: The 23H/23H-U OLIU communicates with the SYSCTL circuit pack via a control interface. The 23H/23H-U OLIU provides maintenance elements for reporting the status of the circuit pack and the incoming STS-1 and OC-12 signals. These maintenance elements are used by the SYSCTL for fault detection and isolation. Conversely, the 23H/23H-U OLIU responds to control signals from the SYSCTL, such as LED and protection switching controls.
- Transport Overhead Channel Interface: The 23H/23H-U OLIU accesses the SONET overhead and routes this data to the OHCTL.

Timing Circuitry

Each TGS circuit pack sends timing signals to the 23H/23H-U OLIU circuit pack via the TSI circuit packs.

The 23H/23H-U OLIU circuit pack sends a clock signal to both TGS circuit packs for loop timing.

Protection Circuitry

The 23H/23H-U OLIU provides STS-1 data path selectors for implementing a 1x1 protection switch between TSI circuit packs. The selectors are controlled by the SYSCTL.

The 23H/23H-U OLIU is protection switched by the SYSCTL in response to fault indications on the 23H/23H-U OLIU, or in response to fault indications on a transmission circuit pack with which it interfaces, or in response to external commands.

Fault Detection Circuitry

The 23H/23H-U OLIU circuit pack has in-service and out-of-service built-in test capability. In-service device testing is continuous, and errors are reported to the SYSCTL when they occur via the intrashelf control bus. Incoming and outgoing optical power thresholds are also monitored.

There is no electrical loopback in the 23H/23H-U OLIU. All loopbacks are external optical loopbacks which require an attenuator.

Performance Monitoring

The 23H/23H-U OLIU provides PM circuitry for the following maintenance parameters:

- Parity error counts
- Incoming OC-12 OOF
- Outgoing OC-12 laser bias current threshold
- Line parameters based on B2 coding violations.

Power Circuitry

The 23H/23H-U OLIU circuit pack uses board-mounted DC-DC power converters that convert –48 V received from the backplane to +5 V, –5.2 V, +15 V, and –2.3 V for use on the circuit pack. The 23H/23H-U OLIU interfaces with both the A and B feeders and provides a "diode-ORed," so that loss of one feeder will not affect the 23H/23H-U OLIU. A fuse element is provided at the –48 V input to the DC-DC converter.

23H/23H-U OLIU Quick Reference Summary

Transmit Functions

The major transmit functions of the 23H/23H-U OLIU circuit pack are as follows:

- Selects 12 STS-1 signals from the TSI circuit packs
- Adds SONET transport overhead
- Byte-interleaves and scrambles the STS-1 signals to produce an STS-12 signal
- Modulates a laser transmitter to produce an OC-12 signal.

Receive Functions

The major receive functions of the 23H/23H-U OLIU circuit pack are as follows:

- Receives an OC-12 optical signal and converts an OC-12 signal to an electrical STS-12 signal
- Extracts STS-12 clock and retimes the received data
- Demultiplexes the STS-12 signal into 12 STS-1 signals
- Extracts and processes the STS-1 transport overhead
- Processes the STS-1 pointer and frame-synchronizes the STS-1 signals
- Processes the receive clock and provides a loop-timing clock to the TGS circuit packs.

Control Functions

Control functions are as follows:

- Protection switching for TSI circuit packs
- Inventory information (*CLEI* code, date of manufacture, etc.).

Maintenance Signal Functions

The 23H/23H-U OLIU major maintenance signal functions are as follows:

- Inserts and detects STS-1 path AIS
- Inserts STS-1 path unequipped signal
- Inserts and detects OC-12 line AIS
- Inserts and detects OC-12 line FERF
- Detects OC-12 line failures (LOS, LOF, AIS, and BER)
- Detects OC-12 line signal degrade BER.

177B Apparatus Blank Description

Purpose of Apparatus Blank

The 177B apparatus blank (Figure 7-30) must be installed in all unused Function Unit slots to ensure adequate cooling by controlling air flow through the shelf.

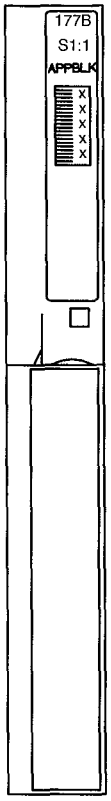


Figure 7-30. 177B Apparatus Blank

177C Apparatus Blank Description

Purpose of Apparatus Blank

The 177C (Figure 7-31) must be installed in the Main-A-1 and Main-A-2 slots to ensure adequate cooling by controlling air flow through the shelf.

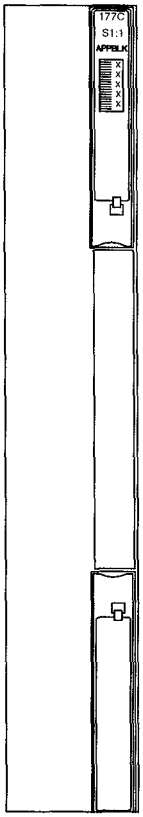


Figure 7-31. 177C Apparatus Blank

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. 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 (SYSCTL) also reports the software version for the system. Refer to the **`rtrv-eqpt`** command in Section 11, "Commands and Reports."

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

Security

DDM-2000 OC-12 Multiplexers provide security capabilities to protect against unauthorized access to the system through the CIT, data communications channel (DCC), and TL1/X.25 interfaces. When security is enabled (default is disabled for the CIT and DCC and always enabled for TL1/X.25), four types of users are allowed access to the system with a valid login and password:

- Privileged users can execute all commands
- General users can execute any commands not restricted to privileged users
- Maintenance users can execute some of the General level and all "reports only" level commands that are not restricted to privileged users
- Reports-only users can only execute commands that retrieve reports from the system.

When the system is first initialized, three default logins and passwords are provided which must be changed by a privileged user before security is enabled. At initialization, privileged users are those users who use the default logins and passwords. Replacement of the SYSCTL circuit pack causes the system to default back to the default logins and passwords. Up to 100 logins and passwords can be added, deleted, and changed by three authorized privileged users. Login and password security can be enabled or disabled. Timeouts can be provisioned independently for front and rear access CIT interfaces and the synchronous optical network (SONET) section DCC. Timeout is disabled on the TL1/X.25 interface. For more information on provisioning, see System Turnup/Circuit Order in the TOP section of this manual (Volume II).

Authorized privileged users can establish general user and reports-only user logins using the **`set-lgn`** command. Authorized privileged users can also "lockout" access by general and reports-only users without deleting the login and password file.

The following commands are restricted to privileged users over the CIT and DCC interfaces. See LTP 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide,* for TL1/X.25 command access privileges.

- **init-sys**—Initialize System
- **rstr-passwd**—Restore login and password file
- **rtrv-lgn**—Retrieve Login
- **rtrv-passwd**—Retrieve login and password file
- **set-feat**—Set Features
- **set-fecom**—Set Far-End Communications
- **set-lgn**—Set Login
- **set-secu**—Set Security
- **set-sync**—Set Synchronization characteristics.

When security is enabled, the following commands become restricted to privileged users only:

- **cpy-prog**—Copy Program
- **dlt-osacmap**—Delete OS application context ID map
- **dlt-tadrmap**—Delete target identifier (TID) Address Map
- **ent-osacmap**—Enter OS application context ID map
- **ent-tl1msgmap**—Enter TL1 message map for OS
- **ent-ulsdcc**—Enter Upper Layer Section DCC
- **init-pm**—Initialize Performance Monitoring
- **ins-prog**—Install Program
- **reset**—System Reset
- **set-date**—Set network element (NE) Date and time
- **set-ne**—Set NE name.
- **set-x25**—Set X.25 baud rate for OS.

Reports-only users can execute the following commands:**?** (help), **logout**, **rlgn**, **set-passwd** (their own), **toggle**, and all **rtrv** commands **except**, **rtrv-lgn**, and **rtrv-passwd**.

For details on these and other commands, see Section 11, "Commands and Reports."

Software Upgrades

The DDM-2000 OC-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.

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.

Beginning with R5.1 an enhanced software download feature allows new generic to be downloaded to the DDM-2000 system while the current version is still running. When the appropriate command (**apply**) is initiated, the new generic is executed with no disruption of DCC. Execution of the new generic can be scheduled, allowing coordination of cutover of several NEs in the subnetwork.

For details on these and other commands, see Section 11, "Commands and Reports."

Software Compatibility

DDM-2000 OC-3 and OC-12 Multiplexers connected in the same subnetwork must be running compatible software. For more information on software compatibility, refer to the software compatibility tables in Section 9, "Maintenance Description."

Controller Maintenance and Memory Administration

Controller Maintenance

The controller for the DDM-2000 OC-12 Multiplexer consists of the 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/TL1 interface and a communications interface to remote shelves via the DCC bytes in the OC-N section overhead. Both circuit packs have a processor, and both have volatile random access memory (RAM) and nonvolatile memory.

* Registered trademark of Microsoft Corporation.

The DDM-2000 OC-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 shelf's transmission values are automatically uploaded to the SYSCTL. When a transmission circuit pack is replaced, provisioning data stored on the SYSCTL is automatically downloaded to the replacement circuit pack. Manual action is not required to maintain system provisioning after a circuit pack is replaced.

Certain non-service-affecting provisioned data, such as alarm delay are stored only on the SYSCTL circuit pack. This means that when a SYSCTL circuit pack is replaced, the new SYSTCL circuit pack should be initialized by pressing the INIT button during the 10-second interval while the CR alarm LED is flashing after the SYSCTL circuit pack is inserted. This action is the same as entering the **`init-sys:sysctl`** command which sets the SYSCTL circuit pack parameters to their default values. Refer to the **`init-sys`** command in Section 11, "Commands and Reports," and to "Install or Replace SYSCTL," in the TOP section of this manual (Volume II). If parameters other than the default values are needed, the values must be entered using the CIT. If the INIT function is not performed, whatever values that are stored in nonvolatile memory on the new SYSCTL circuit pack are used. Failure to follow the proper procedure may not cause transmission errors or loss of service but could affect maintenance. For example, an invalid TID could produce confusing TL1 reports to the OS.

System Backup and Restoral

The CPro-2000 Graphical User Interface and Provisioning Tool includes a backup and restoral feature to protect provisioning information in ring networks. This feature saves a copy of a node's provisionable parameters so they can be restored at a later date, if necessary.

The feature provides backup and restoral for:

- Cross-connections
- DS3 port options
- EC-1 port options
- OC-12 line options.

See LTP 190-523-101, *CPro-2000 User Manual,* for more information on this feature.

Service-Affecting Actions

Although the DDM-2000 OC-12 Multiplexer is designed to minimize LOS due to equipment failure or human action, there are certain controller related actions that can cause a loss of provisioning data and possibly LOS. These actions include:

- Replacing a transmission circuit pack when the SYSCTL is failed or removed can result in a loss of provisioning data and LOS
- Replacing a transmission circuit pack in a shelf without power can result in a loss of provisioning data. LOS 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 LOS 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 unexpected events; however, no LOS occurs. Refer to the "Install or Replace SYSCTL" procedure in the TOP section of this manual (Volume II).
- Provisioning data is maintained through a software download to the SYSCTL. Replacing the SYSCTL circuit pack with incompatible software and intentionally overriding the software check could result in a loss of data.

Multiplexing and Mapping

The following paragraphs describe 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 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. The STS-12 signal is then converted to an OC-12 signal for transport on the high-speed optical line.

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.

OC-3 to OC-12

When a Function Unit is equipped with a 21-type 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.

When the Function Unit service and protection slots are equipped with OLIUs, they can be provisioned as ring (0x1) low-speed interfaces or linear (1+1) optical extensions using the **`set-oc3`** command. The cross-connections can then be made 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 is a feature package option which must be enabled using the **set-feat** command.

A Function Unit can be optionally equipped with 21-type 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 signals are multiplexed into an STS-12 signal and converted into an OC-12 signal for transport over the OC-12 line.

When the Function Unit service and protection slots are equipped with OLIUs, they can be provisioned as ring (0x1) low-speed interfaces or linear (1+1) optical extensions using the **set-oc3** command. The cross-connections can then be made using the **ent-crs-sts3c** command. See Section 11, "Commands and Reports," for more information on this provisioning.

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. At the OC-12 interface, these internal STS-1 signals are multiplexed into an STS-12 and converted to an optical OC-12 signal.

Cross-connections are made 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

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 LBOs) 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, PM thresholds can be customized for each installation using the CIT.

Default Provisioning

Installation provisioning is minimized with default values set in the factory. Each parameter is given a default. The defaults for software parameters are maintained in the SYSCTL circuit pack. All provisioning data is stored in nonvolatile memory to prevent data loss during power failures.

Remote Provisioning

Software control of many provisioning parameters allows remote provisioning of the DDM-2000 OC-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, for example, transmission data, except for the LBO settings, from every other circuit pack in the shelf is automatically uploaded to the nonvolatile memory of the new SYSCTL circuit pack.

Feature Package Provisioning

Certain software features are available only through a special licensing agreement with Lucent Technologies. 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. This feature is optional and may not be active on all systems. For details on these and other commands, refer to Section 11, "Commands and Reports."

Data Communications Channel (DCC) Provisioning

The appropriate DCC is automatically provisioned by setting the application parameter in the **set-oc3** command. The DCC uses the SONET overhead to communicate between NEs and follows the active SONET transmission line.

- In rings, there is one DCC assigned for the "m1" ring and another DCC for the "m2" ring.
- When Function Unit slot pairs are provisioned for linear (1+1) applications (connected to OC-3 linear extensions), there is one DCC for each pair.
- When Function Unit slot pairs are provisioned for ring (0x1) applications, there is one DCC for each slot.

The network side/user side parameter may need to be provisioned for each DCC. See "Open Systems Interconnection Provisioning."

Port State Provisioning

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

Ports without signals (undriven) are in the AUTO state until changed to the IS 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 NMON state or from the NMON state to the AUTO 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 IS to AUTO.

Channel State Provisioning

Channel state provisioning is a feature provided on DDM-2000 OC-12 Multiplexers that suppresses reporting of alarms and events for STS-1 channels by supporting multiple states at the OC-12 ports (AUTO, IS, and NMON) 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 AUTO state until a valid signal, a framed signal that is not alarm indication signal (AIS) or unequipped is received on that channel. While in AUTO state, no alarms or events are reported on the channel by the DDM-2000 OC-12 Multiplexer. On receiving a valid signal, which occurs when the end-to-end circuit is completely provisioned, the channel automatically changes to the IS state, and normal alarm and event reporting starts. An additional state, NMON, is also supported in which alarm and event reporting is suppressed regardless of the validity of the signal being received on the channel. Like the port state provisioning capability provided for 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.

Line State Provisioning

Line state provisioning is a feature provided on DDM-2000 OC-12 Multiplexers that suppresses alarm reporting and PM by supporting multiple states (IS and NMON) for OC-3 lines. See the **set-state-oc3** and **rtrv-state-oc3** commands.

Open Systems Interconnection (OSI) Provisioning

DDM-2000 OC-12 Multiplexers support OSI interworking between DDM-2000 OC-3 and OC-12 Multiplexers. In a subnetwork, the NEs on each side of an optical span must have their "user-side/network-side" (OSI terminology) parameters provisioned to opposite values using the CIT.

Local procedures should determine the "user" and "network" side of a span. For example, the central office (CO) terminal can be designated the network side and the remote terminal (RT) site the user side. It does not matter as long as the two sides are opposite values. See "Operations Interworking" for more provisioning information.

The network service access point (NSAP) is a multiple part address that uniquely identifies a NE for OSI interworking purposes. A unique NSAP is programmed into the SYSCTL circuit pack at the factory. See the **ent-ulsdcc** command in Section 11, "Commands and Reports," for more information on NSAP provisioning.

A single NE must be provisioned, using the **set-ne** command, to be the directory services network element (DSNE) for the subnetwork. Until this DSNE is provisioned and given time (this could be several minutes depending on the size of the subnetwork) to register the other NEs in the subnetwork, TL1 communications, remote logins, and network status functions may not work for all NEs in the subnetwork.

When a NE is removed from a subnetwork, either by physically removing it or disabling the SONET DCC, the **dlt-tadrmap** command should be used to remove the NE from the subnetwork database so alarms can be cleared.

Operations Interworking Provisioning

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

Operations interworking is available among systems that are connected through the SONET DCC. Lucent systems that support operations interworking include FT-2000 OC-48 Lightwave System, DDM-2000 OC-3 and OC-12 Multiplexers, DDM-2000 FiberReach Multiplexer, and the *SLC*-2000 Access System. Table 8-1 lists the current releases for Lucent SONET products that offer operations interworking through the DCC:

Table 8-1. SONET Networking Software Compatibility

	OC-3					OC-12	
Release	**7.2**	**8.0**	**8.1**	**9.0**	**9.1**	**5.0**	**5.1**
OC-3, R7.2	X	X	X	X	X	X	X
OC-3, R8.0	X	X		X	X	X	X
OC-3, R8.1	X		X	X		X	
OC-3, R9.0	X	X	X	X		X	
OC-3, R9.1	X	X			X	X	X
OC-12, R5.0	X	X	X	X	X	X	
OC-12, R5 1	X	X			X		X
FiberReach, R1.0	X*	X*	X*	X		X*	
FiberReach, R2.0	X*	X*	X*	X	X	X*	X*
FiberReach, R2.1	X*	X*			X		X*
SLC-2000, R3 3	X	X	X	X	X	X	X
SLC-2000, R4.2	X			X		X	
SLC-2000, R4.4	X	X	X		X		X
FT-2000, R6.0 §	X	X		X		X	
FT-2000, R7.0	X	X	X	X	X	X	X
FT-2000, R7.1	X	X			X		X

* FiberReach requires an OC-3 Release 9.0 or later host, Releases 7 2 and 8.0 cannot host FiberReach.

Single-Ended Operations

The DDM-2000 single-ended operations and maintenance philosophy is supported in subnetworks with mixed Lucent 2000 Product Family systems over the DCC. With this feature, users can do OAM&P on a centralized basis, saving travel time and money. Both the CIT and operations interfaces can access the NEs.

Single-ended operations (operations interworking) features include the following:

- Centralized survivable OS access (OS gateway network element [OSGNE])
- Remote login (remote technician access)
- Remote office alarms and user panel
- Remote software download and copy
- Directory services network element (DSNE).

See also LPT 824-102-147, *2000 Product Family Operations Interworking Guide.*

Centralized Survivable OS Access (OSGNE)

A DDM-2000 subnetwork may have one or more NEs serving as GNEs. An NE is automatically provisioned as an OSGNE upon establishing an X.25 link to its X.25 interface. For example, two NEs could each be connected via their X.25/TL1 interface to the same type of OS with one OSGNE serving as a backup for the other. For more details on engineering a Telecommunications Management Network (TMN) with multiple GNEs, see LPT 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide.*

The OS can use more than one NE as an OSGNE to provide redundancy and/or to distribute TL1 message volume across multiple X.25 links. The OSGNE serves as a single interface to the OS for the NEs in the same Lucent 2000 Product Family subnetwork using X.25 interfaces. The OSGNE receives operations information from all the NEs through the DCC and reports this information, as well as its own information, to the OS. The operations information is in the form of TL1 messages. Through the OSGNE, the OS can send TL1 commands to any NE in the SONET subnetwork.

Remote Login

Each DDM-2000 Multiplexer terminal can remotely log into other DDM-2000 NEs in the same SONET subnetwork. Operations interworking also allows remote logins between DDM-2000 and the *SLC®*-2000 Access System and from the FT-2000 OC-48 Lightwave System to other Lucent 2000 Product Family systems in the same subnetwork.

Remote Office Alarms and User Panel

Through the SONET DCC, an NE can receive alarm and status information from remote Lucent 2000 Product Family NEs that are in the same SONET subnetwork. Office alarms and user panel LEDs can also be remotely activated through the DCC. The set of remote NEs that an NE can exchange status information with is determined by the value of the local alarm group parameter. This parameter is provisioned at each local NE and specifies whether that local NE does or does not exchange remote NE status with other NEs in the same SONET subnetwork. Members of an alarm group exchange information through one or more alarm gateway NEs (AGNEs) that are defined in the same alarm group. The AGNE(s) and remote NEs use the DCC to receive and report alarm and status information from and to all NEs in the same alarm group. The AGNE rebroadcasts all alarm and status information from one NE to all the other NEs in the same alarm group. This information is used to activate user panel LEDs and office alarms for each NE in the alarm group. At least one NE in each alarm group must be provisioned as the AGNE.

Remote Software Download and Copy

The DDM-2000 OC-3 and OC-12 Multiplexers can upgrade the system software while in-service. DDM-2000 OC-3 and OC-12 Multiplexers use flash erasable programmable read-only memory (flash EPROM) chips to provide this capability. Software can be downloaded locally using a PC through the EIA-232-D interface on the user panel or remotely over the SONET DCC. Software can be downloaded from a PC to a remote NE even when the local shelf is a different member of the DDM-2000 product family or *SLC*®-2000 from the remote shelf. For example, a DDM-2000 OC-12 at the CO and a DDM-2000 FiberReach at the RT site, the remote software download capability eliminates the need for a technician to travel to the remote site.

Directory Services Network Element (DSNE)

Lucent's 2000 Product Family supports open systems interconnection (OSI) 7-layer protocol stack architecture over the SONET DCC. This architecture requires network layer 3 names, called network service access points (NSAPs), for addressing NEs; while users at remote OSs and at NE CITs use application layer 7 names called target identifiers (TIDs). The NE in each Lucent 2000 Product Family subnetwork that translates between NSAPs and TIDs is called the DSNE.

Any NE in a SONET subnetwork can act as a DSNE except DDM-2000 FiberReach. Only one NE can be provisioned to be the DSNE at one time, in any subnetwork. Lucent 2000 Product Family NEs added to a subnetwork are automatically registered by the DSNE and have access to all interworking features.

Alarm Groups

When network sizes were smaller, every NE broadcasted its network status to all other NEs. This status information included:

- Alarm/status level
- User panel condition
- Alarm Cutoff (ACO) status
- TBOS status
- Parallel telemetry status
- Miscellaneous discrete information

An alarm group is a set of NEs that share status information between themselves. Alarm groups can be nodes in a ring, nodes of a linear extension, nodes of an OC-12 service, or any other logical grouping such as a maintenance group or geographical group. In DDM-2000 all NEs are defaulted into an alarm group (number 255). Users provision NEs into alarm groups, 1-255, by assigning each member an alarm group number to support operations interworking, large networks, and to avoid sending unnecessary information to every NE. For example, 24 NEs could be provisioned into three alarm groups each with eight NEs that share a community of interest.

All members of the same alarm group share NE status information but do not share information with other alarm groups.

Depending on provisioning, a member of an alarm group can:

- Know the alarm/status of all members of the same alarm group and, if the NE is at the CO, activate audible office alarms for the alarm group.
- List a report of the alarm or status condition of other NEs in the group.
- Display composites of other member's user panel information. If the site identification of a remote NE is from 1 to 8, display the user panel status at the site instead of a composite display. As a feature, the same site/NE identification can appear more than once in a subnetwork, as long as, it is in different alarm groups. This supports creating large networks by interconnecting several small subnetworks without having to change the site/NE identification.
- Relay other members' parallel telemetry alarm/status closure states to the OS.
- Send and receive miscellaneous discrete alarm/status closure states to and from alarm group members at a CO.
- Send and receive ACO requests to and from members of the same alarm group with the same site number. This supports the ability for a user to activate ACO for a group of NEs having the same site number and subnetwork connectivity to another member NE in the group.

By default, all NEs belong to alarm group number "255" and, if not changed, NE status is sent to all NEs in the network. The maximum alarm group size is equal to the maximum subnetwork size. NEs at the CO can perform CO alarm activation functions.

Alarm Gateway Network Element (AGNE)

One NE in an alarm group must be provisioned as an AGNE. The AGNE broadcasts NE status information to members of its alarm group. Considerations for choosing a NE as an AGNE include being central to the group to minimize communications links and being easily accessible for maintenance purposes. A backup AGNE can be provisioned and "shadow" the primary AGNE by sending duplicate status reports to members of the group. Additional AGNEs can be provisioned for redundancy, but it is recommended that at most 2 AGNEs be provisioned per alarm group to avoid DCC communications congestion.

For subnetworks having more than 16 NEs, the AGNE and GNE should be separate NEs. The AGNE is a "collection point" and does not have to be a NE in a CO, for example.

Operations Interworking Guidelines

In a mixed network, each NE counts as one. Larger networks may be supported for particular applications or with new software releases should subnetwork growth be a concern. Also, there is no limitation on the size of the networks formed by partitioning a large network into a number of smaller subnetworks by disabling the DCC on the appropriate OC-N interfaces. Software upgrades and DCC partitioning can be done in service without affecting traffic. If larger subnetworks are needed, contact your Lucent Technologies account manager.

Table 8-2 summarizes the network size guidelines:

Table 8-2. OC-12 Multiplexer—Maximum Number of NEs in a Subnetwork

	Ring	Ring
Releases	**R5.0**	**R5.1**
Number of NEs *	32	50

* The NE release that supports the smallest number of NEs determines the maximum subnetwork size. Subnetworks that include FT-2000 OC-48 Lightwave Systems or earlier releases of DDM-2000 OC-3 or FiberReach WBS may be limited further. Refer to the User/Service Manual for the specific products or LPT 824-102-147, *2000 Product Family Operations Interworking Guide* for more information on operations interworking.

- Range of values for Alarm Group number — 1 to 255
- Maximum number of NEs per Alarm Group — 50
- Maximum number of Directory Services NE per subnetwork — 1
- Maximum number of incoming TL1 logins per RNE — 8
- Maximum number of outgoing TL1 logins per GNE — 105

Cross-Connection Provisioning

Cross-Connection Types

DDM-2000 OC-12 Multiplexers have time slot interchange (TSI) features. This offers users flexibility in directing traffic in and out of these systems to support a wide variety and range of customer applications.

The DDM-2000 OC-12 Multiplexer can be provisioned for cross-connect routing of signals. For rings, STS-1 signals may be manually cross-connected in several ways. For bidirectional drop services, the normal "twoway" 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.

Ring (0x1) Cross-Connections

For ring (0x1) interfaces, a manual "twoway" cross-connection command (**ent-crs-sts1**) is used to connect a signal in the high-speed slot to one or both Function Unit slots equipped with 21-type OLIU circuit packs.

Linear (1+1) Cross-Connections

For linear (1+1) interfaces, manual "twoway" cross-connection commands (**ent-crs-sts1** and **ent-crs-sts3c**) are used to connect a signal in the high-speed slot to one or both Function Unit slots equipped with 21-type OLIU circuit packs.

Video Cross-Connections

For video cross-connections at central office video (COV) and remote terminal video (RTV) sites, an incoming STS-3c signal from each Function Unit slot equipped with 21-type OLIUs are connected to ring 1 and ring 2 respectively in a one-way unprotected mode. This provides up to eight different STS-3c signals on the ring.

For video cross-connections at RT site applications, up to four incoming STS-3c signals from ring 1 and four from ring 2 are dropped to FN ()-1 and FN ()-2 slots respectively and continued on both rings to the next node.

The primary commands associated with these cross-connections are:

- The **set-oc3** command has a parameter for identifying this application
- The **ent-crs-sts3c** command has parameters for identifying either COV or RTV nodes
- The **set-state-oc3** command is used to set unused input ports of the Function Unit OLIUs at RTV sites to the NMON state to prevent optical alarms.

Drop and Continue Cross-Connections

End-to-end survivable service facilities need to cross multiple rings interconnected at multiple (dual) wire centers. To support these applications, a drop-and-continue cross-connection is provided for a signal from a high-speed channel to be dropped to a specified low-speed port or channel and continued on to the next node in the same direction while also adding a corresponding signal from the low-speed port or channel to the high-speed channel in the other rotation of the ring.

Drop and continue cross-connections are used in DRI applications. Drop and continue cross-connections are only allowed if the Function Units are equipped with 3STS1E, 3DS3, or 21-type OLIUs. If OLIUs are used, the Function Unit slots must be provisioned as linear (1+1).

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.

Pass-Through Cross-Connections

Pass-through cross-connections allow a high-speed STS-1 or STS-3 channel to be "passed-through" between two high-speed ring interfaces. This is used in all path switched ring applications at nodes where traffic is not dropped.

In path switched rings, pass-through grooming (passing a signal on a ring time slot that is different from the ring time slot on which it was received) is not supported. 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 "twoway" (**ent-crs**) command. The high-speed time slot address entering must be the same time slot address leaving in pass-through connections.

Manual OC-12 Ring Cross-Connections

Cross-connections in DDM-2000 OC-12 Multiplexers are made by specifying the SONET rate (STS-1 or STS-3c), the end point addresses (access identifiers), the cross-connection type (twoway, drop and continue, etc.) and, in some cases, the ring direction (ring=mb1, ring=mb2, etc.). In DDM-2000 OC-12 Multiplexers, each single cross-connection command establishes a two-way cross-connection.

All nodes in the ring must be provisioned for STS-1 or STS-3c cross-connections. Refer to Section 11, "Commands and Reports," for more information on these commands.

DDM-2000 OC-12 rings provide flexible routing of STS-1 or STS-3c signals between high-speed and Function Unit interfaces. These "manual" cross-connections are entered using the CIT and are shown in Table 8-3 through Table 8-10. These cross-connection types can be "mixed and matched" in a single system (for example, STS-1s, STS-3cs, pass-through and drop and continue).

Table 8-3 throughTable 8-10 list the various types of supported cross-connections. Following the tables are descriptions of applications and the cross-connections each application requires.

Table 8-3. 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

* Cross-connection type is not entered because default is twoway.

Table 8-4. DDM-2000 OC-12 Manual STS-3c Cross-Connections (Termination).

From		To	"To" CP Type	Example Command *
mb-{1,4,7,10}	<-->	a-1	21-type OLIU	ent-crs-sts3c:mb-1,a-1
mb-{1,4,7,10}	<-->	b-1	21-type OLIU	ent-crs-sts3c:mb-4,b-1
mb-{1,4,7,10}	<-->	c-1	21-type OLIU	ent-crs-sts3c:mb-7,c-1
mb-{1,4,7,10}	<-->	d-1	21-type OLIU	ent-crs-sts3c:mb-10,d-1

* Cross-connection type is not entered because default is twoway.

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

From		To	"To" CP Type	Example Command *
mb-1	<-->	mb-1	23-type OLIU	ent-crs-sts1:mb-1,mb-1
mb-2	<-->	mb-2	23-type OLIU	ent-crs-sts1:mb-1,mb-2
mb-3	<-->	mb-3	23-type OLIU	ent-crs-sts1:mb-1,mb-3
mb-4	<-->	mb-4	23-type OLIU	ent-crs-sts1:mb-1,mb-4
mb-5	<-->	mb-5	23-type OLIU	ent-crs-sts1:mb-1,mb-5
mb-6	<-->	mb-6	23-type OLIU	ent-crs-sts1:mb-1,mb-6
mb-7	<-->	mb-7	23-type OLIU	ent-crs-sts1:mb-1,mb-7
mb-8	<-->	mb-8	23-type OLIU	ent-crs-sts1:mb-1,mb-8
mb-9	<-->	mb-9	23-type OLIU	ent-crs-sts1:mb-1,mb-9
mb-10	<-->	mb-10	23-type OLIU	ent-crs-sts1:mb-1,mb-10
mb-11	<-->	mb-11	23-type OLIU	ent-crs-sts1:mb-1,mb-11
mb-12	<-->	mb-12	23-type OLIU	ent-crs-sts1:mb-1,mb-12

* Cross-connection type is not entered because default is twoway. 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-3c Cross-Connections (Rings Pass-Through)

From		To	"To" CP Type	Example Command *
mb-{1,4,7,10}	<-->	mb-{1,4,7,10}	23-type OLIU	ent-crs-sts3c:mb-7,mb-7

* Cross-connection type is not entered because default is twoway. Address on the left side MUST BE identical to the address on the right side. There is no interchange function for "pass-through" signals.

Table 8-7. DDM-2000 OC-12 Manual STS-1 Cross-Connections (Rings Drop and Continue)

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

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

Table 8-8. DDM-2000 OC-12 Manual STS-3c Cross-Connections (Rings Drop and Continue)

From		To	"To" CP Type	Example Command *
mb-{1,4,7,10}	<-->	a-1	21-type OLIU	ent-crs-sts3c:mb-1,a-1:cct=dc,ring=mb1
mb-{1,4,7,10}	<-->	b-1	21-type OLIU	ent-crs-sts3c:mb-4,b-1:cct=dc,ring=mb1
mb-{1,4,7,10}	<-->	c-1	21-type OLIU	ent-crs-sts3c:mb-7,c-1:cct=dc,ring=mb2
mb-{1,4,7,10}	<-->	d-1	21-type OLIU	ent-crs-sts3c:mb-10,d-1:cct=dc,ring=mb2

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

Table 8-9. DDM-2000 OC-12 Manual STS-3c Cross-Connections (RTV)

From		To	"To" CP Type	Example Command
mb-{1,4,7,10}	<-->	a-1	21-type OLIU	ent-crs-sts3c;mb-1,a-1:cct=rtv
mb-{1,4,7,10}	<-->	b-1	21-type OLIU	ent-crs-sts3c;mb-4,b-1:cct=rtv
mb-{1,4,7,10}	<-->	c-1	21-type OLIU	ent-crs-sts3c;mb-7,c-1:cct=rtv
mb-{1,4,7,10}	<-->	d-1	21-type OLIU	ent-crs-sts3c;mb-10,d-1:cct=rtv

Table 8-10. #DDM-2000 OC-12 Manual STS-3c Cross-Connections (COV)

From		To	"To" CP Type	Example Command
{a,b,c,d}-1	<-->	mb-{1,4,7,10}	23-type OLIU	ent-crs-sts3c:a-1,mb-4:cct=cov

Video/Broadband Applications

For video cross-connections at COV and RTV sites, up to four incoming STS-3c signals from each 21-type OLIU in FN ()-1 and FN ()-2 slots are connected to ring 1 and ring 2 respectively in a one-way unprotected mode.

OC-12 Path Protected Ring Application

This is a path protected ring application with multiple NEs in a two-fiber ring. The Main optical units of each node in the ring are equipped with ring OLIU circuit packs, the 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.

OC-12 Path Protected Ring Drop and Continue Application

This is a path protected ring application with multiple NEs in a two-fiber ring. All but two nodes are normal ring application nodes (see previous application). Two nodes are defined to be the drop and continue nodes and may or may not be neighbors (no intermediate nodes). They function to provide two copies of each service on the ring to another ring (DRI) or to wire centers (dual wire center service). Special drop and continue cross-connections are used to support this feature. The 3STS1E, 3DS3, and 21-type OLIU 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 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 (Volume II). 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 may 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-sts3c`**, **`ent-crs-sts3c`**, **`rtrv-crs-sts3c`**, **`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:
   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-1.**

   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.

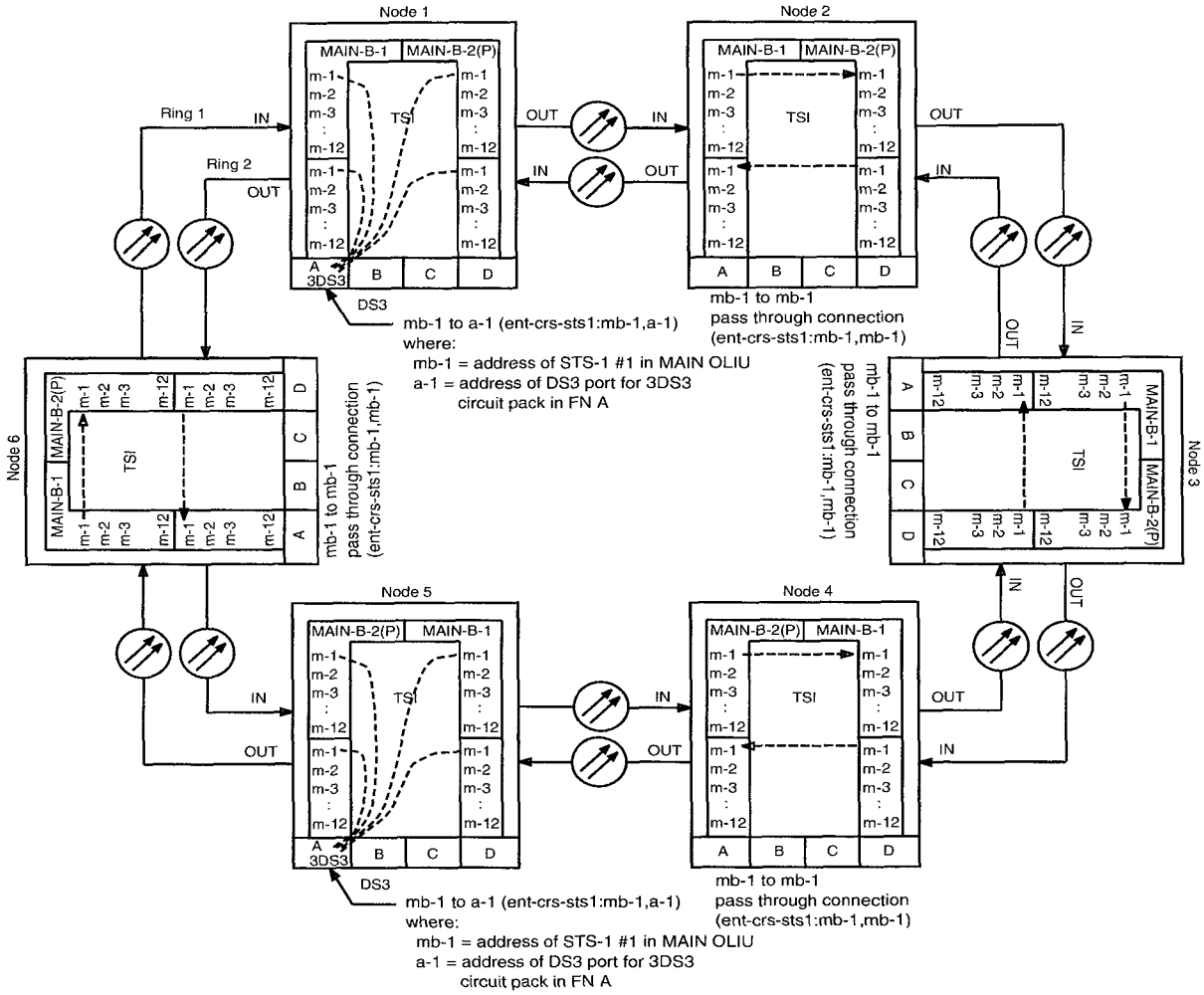


Figure 8-1. OC-12 Ring Configuration Cross-Connections — DS3 to DS3 With STS-1 Cross-Connections

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 [Volume II]).
6. Log in or remote log in to all the nodes and verify appropriate drop or pass-through ring cross-connections.
7. Test both paths around the ring. Since DDM-2000 OC-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 **sw-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 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 (Volume II).

In Figure 8-2 (one half of a drop and continue DRI application), CO 1 and CO 2 are drop and continue nodes. Traffic continued at CO 1 used Ring 2, which is the fiber connecting CO 1 to CO 2. Likewise, continued traffic at CO 2 used Ring 1, which is the fiber connecting CO 2 to CO 1.

When a new service is added to the ring, use the normal procedures to add service to all nodes of a ring except to the drop and continue nodes. Before a drop and continue cross-connection can be made to a low-speed Function Unit, the slots must be equipped with 3STS1E, 3DS3, or 21-type OLIU circuit packs. These circuit pack types are the interface for drop and continue applications. If OLIUs are used, the Function Unit slots must be provisioned for linear (1+1) applications.

NOTE:
Unless you have a specific application requiring DS3 interfaces, such as video or DS3 clear channel, it is recommended that DRI be done with SONET 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 "Gateway Between SONET and Asynchronous 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 "mb2," which means to continue the signal on Ring 2 toward CO 2.

Similarly at CO 2, the other drop and continue node, the cross-connection command requires the same two parameters. The cct is "dc" and the parameter ring is "mb1," which means to continue the signal on Ring 1 toward CO 1.

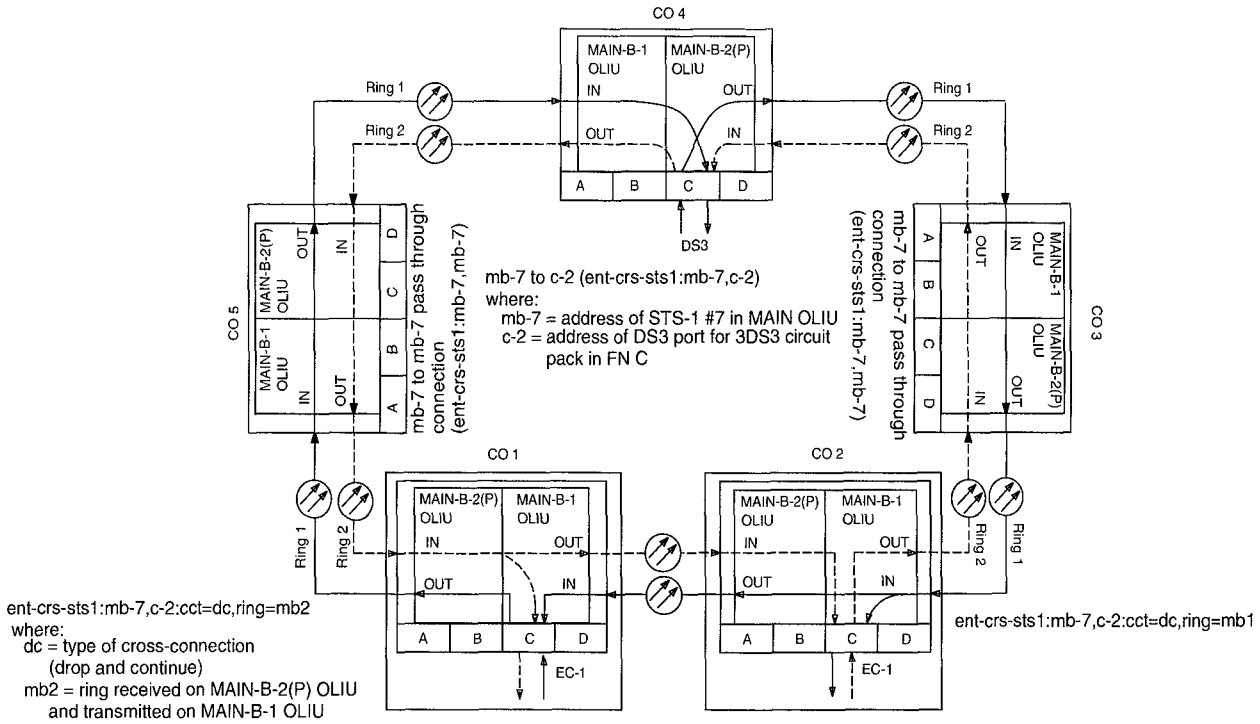


Figure 8-2. Drop and Continue Nodes

OC-12 Ring Network Drop and Continue Cross-Connection Example

Figure 8-3 shows a DRI network.

1. The user wants to provision a fully protected service using drop and continue cross-connections in this dual ring topology. The service is a DS3 at RT2 (bottom node in figure) to CO 4 (top node in figure).
2. All nodes 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 subnetwork and the other is a part of the lower subnetwork. They are connected by EC-1 signals provided by 3STS1E low-speed circuit packs. The figure shows these connections in Function Unit C 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:c-2,mb-7 at RT2 (twoway drop)
   ent-crs-sts1:mb-7,mb-7 at RT3 and RT1 (pass-through)
   ent-crs-sts1:mb-7,c-2:cct=dc,ring=mb1 at CO 1 (lower NE)
   ent-crs-sts1:mb-7,c-2: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-7,c-2:cct=dc,ring=mb2 at CO 1 (upper NE)
   ent-crs-sts1:mb-7,c-2:cct=dc,ring=mb1 at CO 2 (upper NE)
   ent-crs-sts1:mb-7,mb-7 at CO 3 and CO 5 (pass-through)
   ent-crs-sts1:c-2,mb-7 at CO 4 (two-way 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").

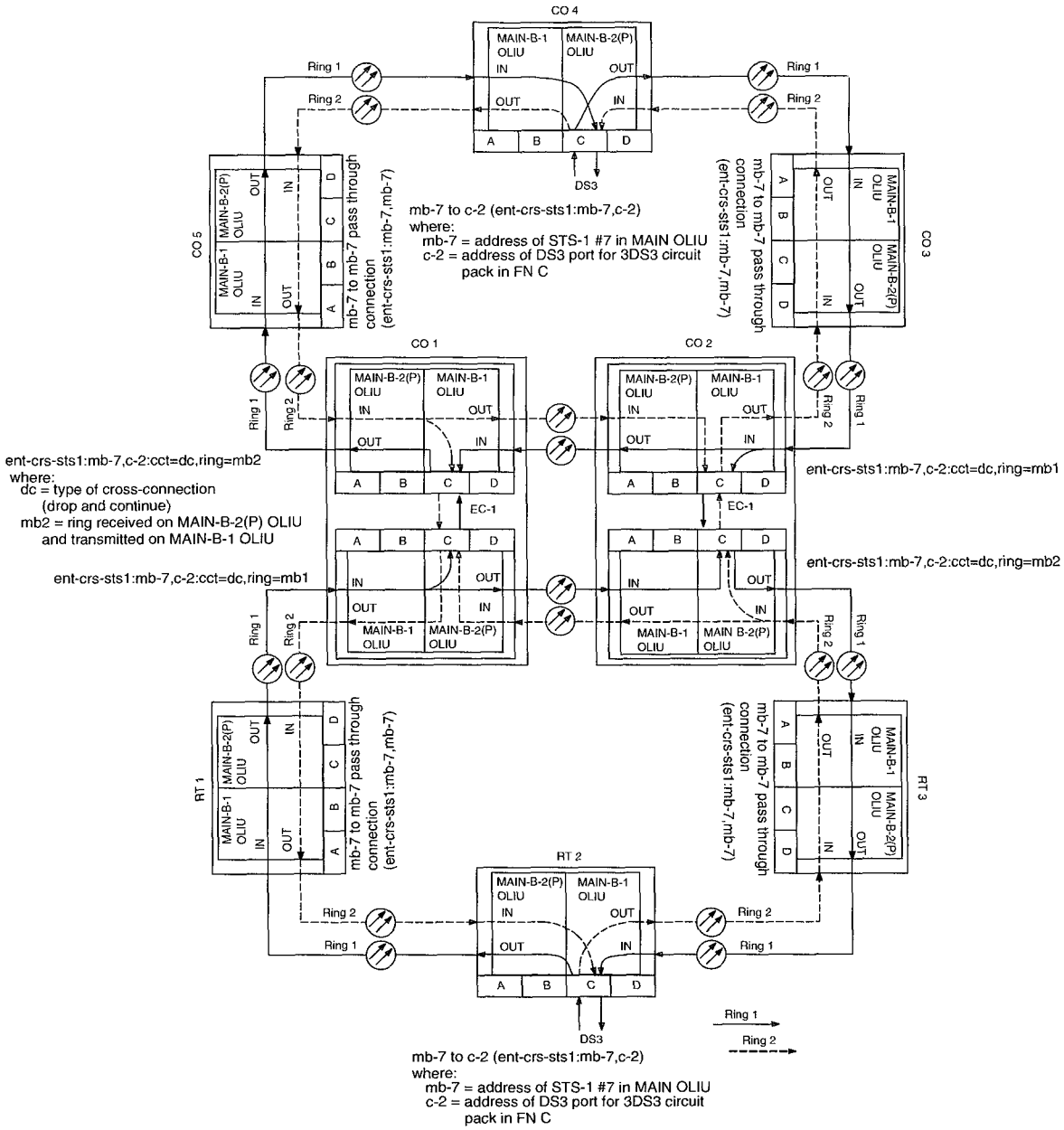


Figure 8-3. Example Dual Ring Configuration Cross-Connections

Single Homed OC-3/OC-12 VT1.5 Path Switched Ring (0x1)

Figure 8-4 shows an example of an OC-3/OC-12 VT1.5 path switched ring (0x1) single homing application. The figure is placed after the example explanation and can be removed for reference.

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

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

Some points to note for this application are:

- Ring (0x1) can be thought of as a "ring on ring" with many of the characteristics of a single ring.
- Pass-through cross-connections may be required at the VT and STS level.
- The OC-3 ring can be composed of any three STSs in the OC-12.
- An OC-12 STS may be the first STS in one extension, the second STS in another, and the third STS in another.

Example Cross-Connections

The OC-12 (STS level) cross-connections are:

- At CO: mb-1:a-3

  mb-1 is dropped to the third STS in the OC-3 between CO and CO-1.

- At RT1: mb-1:a-1

  mb-1 is dropped to the first STS in the OC-3 between RT1 and RT1-1.

- At RT2: mb-1:c-2

  mb-1 is dropped to the second STS in the OC-3 between RT2 and RT2-2.

- At RT3: mb-1:b-3

  mb-1 is dropped to the third STS in the OC-3 between RT3 and RT3-3.

- At RT4: mb-1:mb-1

  mb-1 is passed through RT4 at the STS level.

These cross-connections can be thought of as establishing one STS of an OC-3 ring embedded in the OC-12 system. This is sometimes referred to as a "ring on ring." In the example, the OC-3 nodes are CO-1, RT1-1, RT2-2, and RT3-3. The STS itself traverses all nine nodes. An "ordinary" STS (for example, one that carries a DS3 from an originating node to a terminating node) can drop at only two locations (terminate in two-way at the source and destination), and pass-through cross-connections are needed at the intermediate nodes. There can be multiple drop (ring 0x1) type cross-connections to optical extensions.

The VT cross-connections that follow drop or pass through individual VTs in the STSs. This is like an ordinary OC-3 ring, except that, the same OC-12 STS can be dropped to different STSs in the various OC-3s. In an ordinary ring, the same time slot (for example m-1-1-1) is used all the way around the ring. In a ring-on-ring application, the time slot identification can change in each extension. The same VTG/VT will be used but the STS can change.

The OC-3 (VT level) cross-connections are:

- At CO-1: a-1-4:m-3-2-1

  The first VT in the second VTG is assigned between CO and CO-1. This slot will be used to transport the DS1 that will terminate on port a-1-4.

- At RT1-1: b-2-1:m-1-2-1

  The above DS1 will leave the system from port b-2-1 at RT1-1. The VTG/VT slot (-2-1) is set by the cross-connection at CO-1. Because OC-12 STS mb-1 is dropped to the first STS in this OC-3 extension (m-1), port b-2-1 is cross-connected to m-1-2-1.

- At RT2-2: m-2-2-1:m-2-2-1

  At RT2, time slot mb-1 is dropped to the second STS going to RT2-2 (m-2). The VT/VTG assignment remains -2-1. A VT pass-through cross-connection is needed to enable future DS1s to be dropped at RT2-2. If drops will never be needed, STS pass-through cross-connections can be used.

- At RT3-3: m-3-2-1:m-3-2-1

  The VT above must also be passed through RT3-3. As before, the VTG/VT is -2-1. The OC-12 time slot is dropped to the third STS in the OC-3 in this segment.

With these cross-connections, DS1s originating at any of the four OC-3 nodes can be terminated at any one of the others with VT cross-connections at those nodes only. The STS "pipe" is in place with the OC-12 cross-connections. As was the case with the example DS1, two VT drop cross-connections and two pass-through cross-connections are needed.

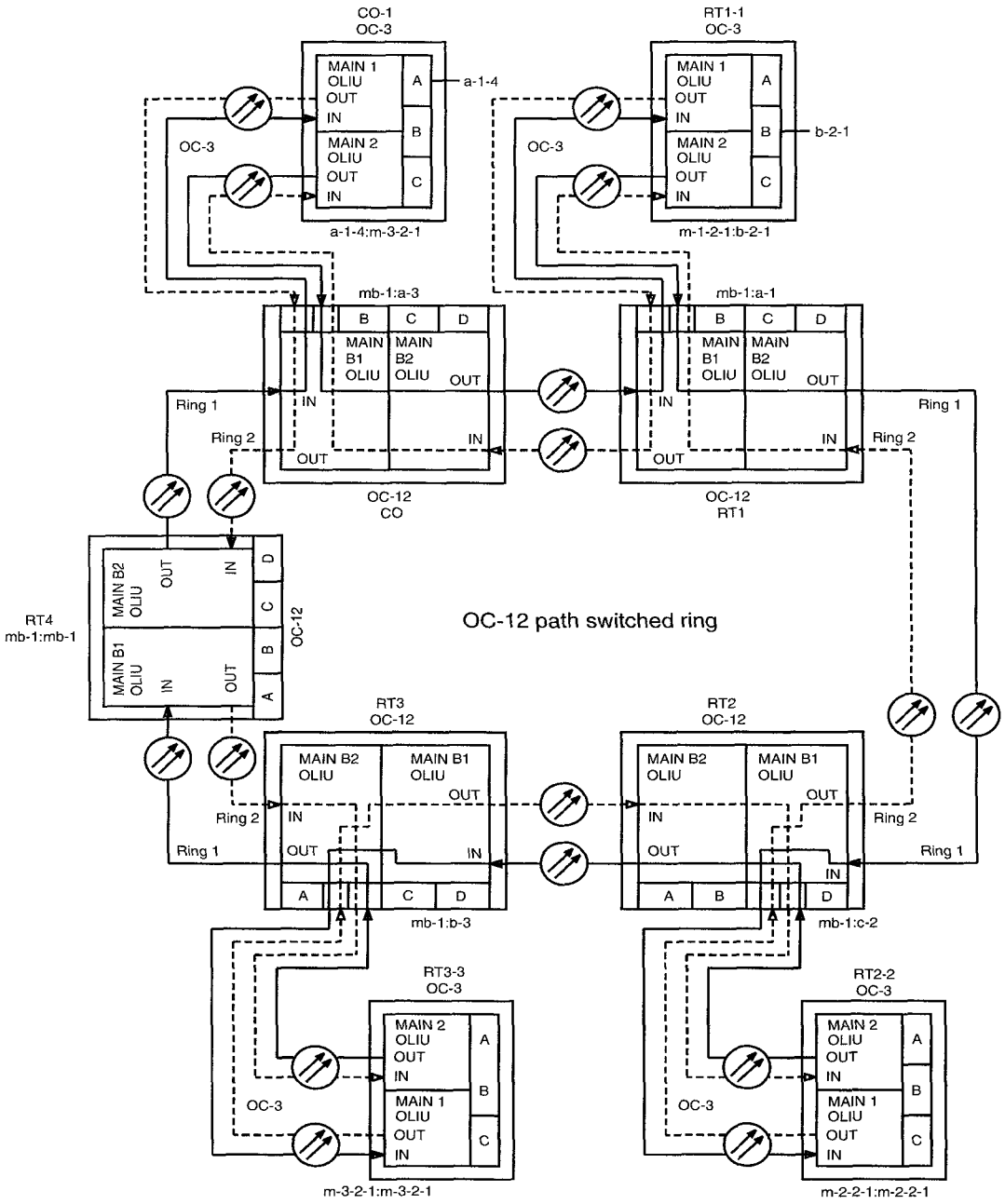


Figure 8-4. Example Single Homed OC-3/OC-12 Ring (0x1) Configuration Cross-Connections

Dual Homed OC-3/OC-12 VT1.5 Path Switched Ring (0x1)

Figure 8-5 is an example of an OC-3/OC-12 VT1.5 path switched ring (0x1) dual homed application. This application is similar to the single homed application except, for single homed 0x1 applications, both OC-12 Function Unit slots must be equipped while, for dual homed 0x1 applications, one OC-12 Function Unit slot must be empty (Node 5 slot 2 and Node 4 slot 1 in the example).

The DDM-2000 OC-12 ring supports ring (0x1) OC-3/IS-3 interfaces in its Function Unit slots. These interfaces must be provisioned as ring (0x1). Signals pass through the DDM-2000 OC-12 transport ring and exit to the DDM-2000 OC-3 ring. OC-12 Function Unit slot fn(A)-1 of Node 5 is connected to OC-3 Main-1 and OC-12 Function Unit slot fn(A)-2 of Node 4 is connected to OC-3 Main-2.

Protection switching is not done on the DDM-2000 OC-12 shelf for these lines or paths on these lines. VT1.5 or STS-1 level path switching is done on the DDM-2000 OC-3 Multiplexer shelf. In 0x1 operation, the OC-12 ring passes the contents of the STS-1 time slots between the OC-12 high-speed line and the low-speed OC-3/IS-3 lines without terminating or performing any line or path protection switching on them.

Example Cross-Connections

The OC-12 (STS level) cross-connections are:

- At Node 4: mb-1:a-1
- At Node 5: mb-1:a-1

The OC-3 (VT level) cross-connection is:

- At Node 1: b-2-1:m-1-2-1

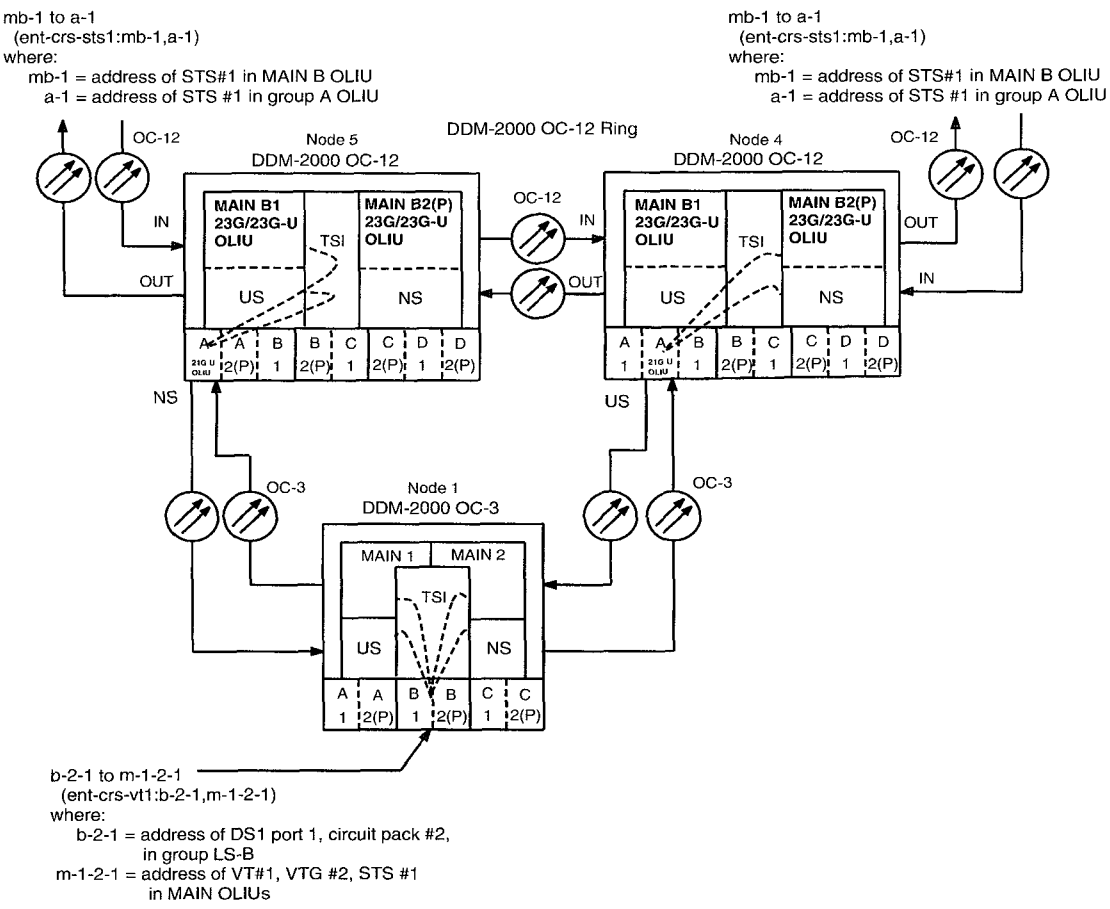


Figure 8-5. Example Dual Homed OC-3/OC-12 Ring (0x1) Cross-Connections

For dual homed applications, OLIUs must be installed in the proper slots at the OC-12 nodes to support the traffic direction that is required. For example, in Figure 8-6, a 21-type OLIU must be installed in Node 6 Function Unit b-2 allowing DS1 traffic from Node 1 to be routed to Node 6 when the proper cross-connections are made. At the DS1 drop point of the OC-3 ring, a 21-type OLIU must be installed in Function Unit b-1 of the OC-3 drop shelf.

Example Cross-Connections

The OC-12 (STS level) cross-connections are:

- At Node 4: mb-1:b-1
- At Node 5: mb-1:b-1
- At Node 6: mb-1:b-2

The OC-3 (VT level) cross-connections are:

- At Node 1: b-2-1:m-1-2-1
- At Node 7: m-2-2-1:b-2-1

For more examples of OC-3/OC12 dual homing cross-connections, see the TOP (Volume II) section of this manual.

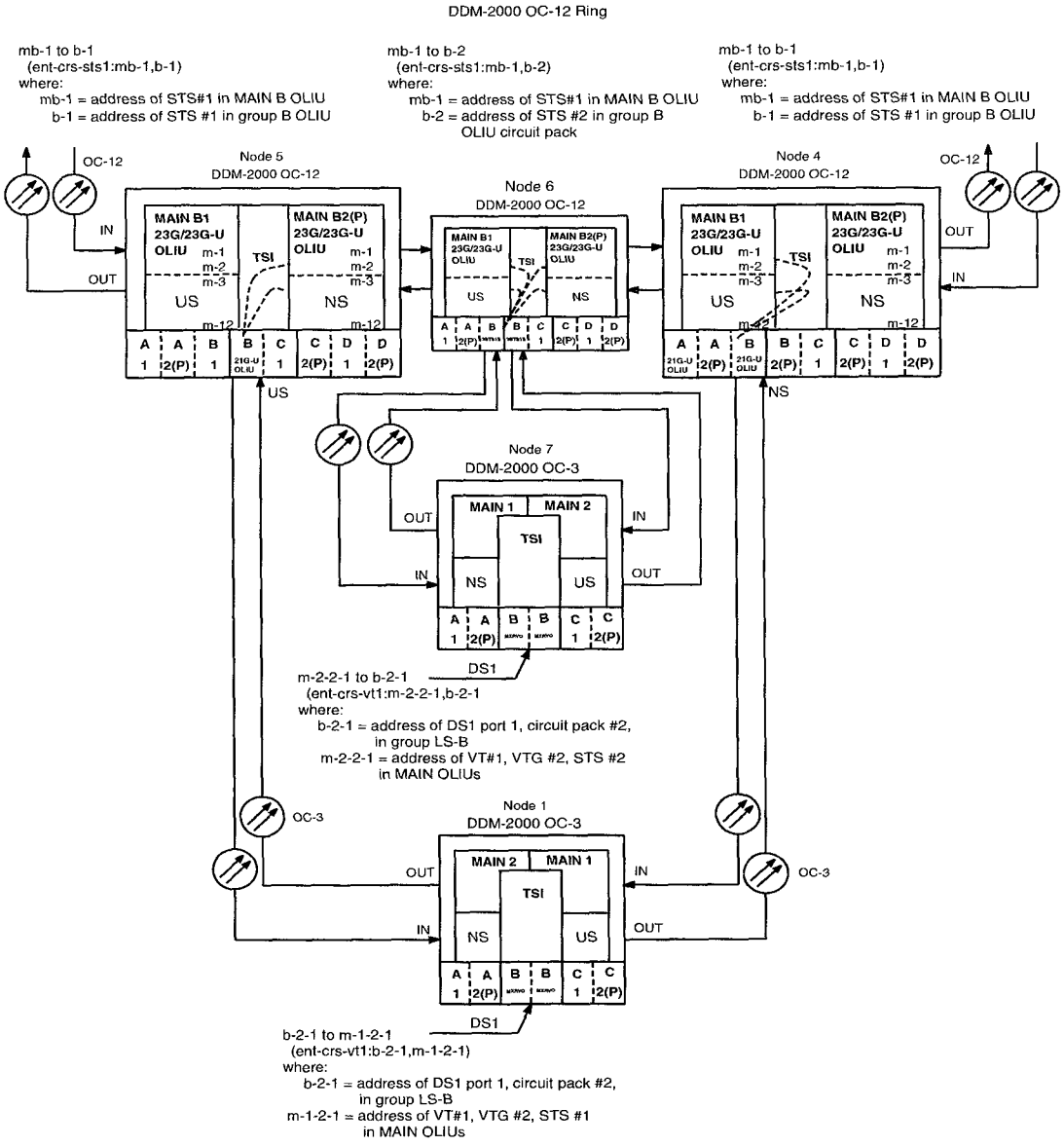


Figure 8-6. Example Dual Homed OC-3/OC-12 Ring (0x1) Cross-Connections with Intermediate Node

Switch Selectable Parameters

Table 8-11 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 8-12.

Craft Interface Terminal (CIT) Selectable Parameters

Table 8-12 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 TID parameter is provided in the "Identifiers" part immediately following Table 8-12.

Table 8-11. Parameters Provisionable via Hardware Switches

Parameter	Range	Pack	Command (Note)
Product ID (S1)	"Product Identification"	SYSCTL	**rtrv-ne**
TBOS termination (S2)	last, not last	SYSCTL	
Optical transmitter power	high, low	21G/21G-U OLIU	**rtrv-oc3**
DS1 reference format *	SF, ESF	TGS	**rtrv-sync**
DS1 reference line coding *	AMI,B8ZS	TGS	**rtrv-sync**
Shelf timing mode	free-running, external DS1, line timed	TGS	**rtrv-sync**
SYNC output LBO †	5 settings (cable dependent)	TGS	**rtrv-sync**
DS1 output provisioned mode	MULT/SYNC OUT	TGS	**rtrv-sync**
3DS3 LBO	2 settings (cable dependent)	3DS3	
3STS1E LBO	2 settings (cable dependent)	3STS1E	

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

* For both DS1 in and out.

† Operational only when in SYNC OUT mode.

Table 8-12. Parameters Provisionable via CIT

Parameter	Range	Default (Note 1)	Command (Note 2)
Date	current value	70-01-01	**set-date**
Time	current value	00:00:00	**set-date**
Target ID (system name)	20 characters	Site#NE#	**set-ne**
Site number	1-64	64	**set-ne**
Network element #	1-5	5	**set-ne**
Shelf number	1-8	1	**set-ne**
CO/RT select	CO, RT	RT	**set-ne**
TBOS address	1-8	1	**set-ne**
TBOS link	primary, secondary, normal, no TBOS	no TBOS	**set-ne**
TBOS remote	enabled, disabled	disabled	**set-ne**
DSNE **	yes, no	no	**set-ne**
AGNE	yes, no	no	**set-ne**
Alarm group number	1-255	255	**set-ne**
STS Uneqpd./AIS insert	Uneqpd., AIS	AIS	**set-ne**
CIT page length	0 (pager off), 3-150 rows	24	**set-link**
PM thresholds	See PM Table		**set-pmthres**
Alarm holdoff delay	0-30 sec	2	**set-attr-alm**
Alarm clear delay	0-30 sec	15	**set-attr-alm**
Power minor almn. level	MN, MJ	MN	**set-attr-alm**
OC-3 degrade threshold	10^{-5} — 10^{-9}	10^{-6}	**set-oc3**
OC-3 interface applications	1+1, 0x1, video	0x1	**set-oc3**
Sync Messaging	K byte, S byte, disabled	K byte	**set-oc3/set-oc12**
AIS alm. level of NSA OC-3 Line AIS	CR, MJ, MN, NA	NA	**set-oc3**
OC-3 line state	IS, NMON	IS	**set-state-oc3**
STS-1 signal degrade	10^{-5} — 10^{-9}	10^{-6}	**set-sts1**
NSA STS-1 path AIS alarm level	MN, NR	MN	**set-sts1**
SA STS-1 path AIS alarm level	CR, MN, NA, NR	MN	**set-sts1**
STS-1 channel state	NMON, AUTO †	AUTO †	**set-state-sts1**
STS-3c signal degrade threshold	10^{-5} to 10^{-9}	10^{-6}	**set-sts3c**
NSA STS-3c path AIS alarm level	MN, NR	MN	**set-sts3c**
SA STS-3c path AIS alarm level	CR, NA	CR	**set-sts3c**

See notes and footnotes at end of table.

Table 8-12. Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
STS-3c channel state	AUTO, NMON	AUTO †	**set-state-sts3c**
OC-12 degrade threshold	10^{-5} — 10^{-9}	10^{-6}	**set-oc12**
AIS almn. level of NSA OC-12 line AIS	CR, MJ, MN, NA	NA	**set-oc12**
DS3 VMR mode	VMR, VM, clear channel	VMR	**set-t3**
Clear channel DS3 AIS insertion	yes, no	no	**set-t3**
DS3 signal failure alarm level	CR, MJ, MN, NA	NA	**set-t3**
DS3 failure threshold	10^{-3} , 10^{-6} BER	10^{-3}	**set-t3**
DS3 PM mode	off, on	on	**set-t3**
DS3 PM frame	m13, cbit	m13	**set-t3**
DS3 PM format	pbit, fmbit, cbit	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 BER 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, NA	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 description	26 characters	control #	**set-attr-cont**
Far end communication over DCC	enabled, disabled	enabled	**set-fecom**
DCC identity for OSI ntwks.	userside, networkside	see command pgs	**set-fecom**
Set Security	enabled, disabled, lockout	disabled	**set-secu**
CIT security	enabled, disabled, lockout	disabled	**set-secu**
CIT timeout (minutes)	0-120	15	**set-secu**
DCC security	enabled, disabled, lockout	disabled	**set-secu**
DCC timeout (minutes)	0-120	15	**set-secu**
SYNC mode switching	revertive, nonrevertive	revertive	**set-sync**
Sync Timing Source¶	main-b-1, main-b-2	main-b-1	**set-sync**
AIS Threshold	level 5, level 4, level 3, level 2	level 5	**set-sync**
Auto. Synch. Reconfig.	enabled, disabled	disabled	**set-sync**

See notes and footnotes at end of table.

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Table 8-12. Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
Feature Package ‡ OC-3c (STS-3c)	enabled, disabled	disabled	**set-feat**
X.25 packet size	128, 256	256	**set-x25**
NSAP OrganizationID (Operator ID) Reserved (Reserved) Routing Data (Domain/Area)	 6 hex digits 4 hex digits 8 hex digits	 000000 0000 00000000	 **ent-ulsdcc** **ent-ulsdcc** **ent-ulsdcc**
VC ckt. type X.25 attach. SNPA: LCN for PVCs or DTE address for SVC OS type (ACID)	PVC, SVC LCN, DTE see command pgs. see command pgs.	PVC LCN1 (PVC) LCN2 (PVC) LCN3 (PVC)	**ent-osacmap** **ent-osacmap** **ent-osacmap**
ACID (OS type or funct.) TL1 message type Action to assoc. message type to OS	see command pgs. see command pgs. enabled, disabled	 enabled	**ent-tl1msgmap** **ent-tl1msgmap** **ent-tl1msgmap**
Cross-connection type Ring ID for drop&continue	twoway,dc mb1, mb2	twoway see command pgs	**ent-crs-sts1** **ent-crs-sts1**
Cross-connection type Ring ID for drop&continue	twoway,dc,cov,rtv mb1, mb2	twoway see command pgs	**ent-crs-sts3c** **ent-crs-sts3c**
Outgoing STS-1 path trace message	62 characters	see command pgs	**set-trace-sts1**
Expected STS-1 path trace message	62 characters	see command pgs	**set-trace-sts1**

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-.

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

‡ This command is restricted to privileged users only.

¶ 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 subnetwork must be set to "yes" for proper DCC communications.

Identifiers (IDs)

The following identifiers are used for the shelf, site, network element (NE), target, CO/RT, network services access point (NSAP) address, gateway network element (GNE), directory services network element (DSNE), and alarm group network element (AGNE). See also the *Lucent 2000 Product Family Operations Interworking Guide*, LTP 824-102-147 and the *DDM-2000 Operations Systems Engineering Guide*, LTP 824-102-151.

- **Shelf ID:** The shelf ID is a parameter with values of from 1 to 8. The shelf ID provides a convenient way to log into a selected shelf in a bay using the CIT. Therefore, each shelf (OC-3 or OC-12) in a bay must be assigned a unique shelf ID. The recommended numbering is to start at the bottom of the bay and assign the bottom shelf with a shelf ID of 1 and work up to the top of the bay.
- **Site ID:** The site ID is a parameter with values of from 1 to 64 site addresses. The same site IDs can be used if the NEs are in different alarm groups. The site ID is displayed on the 7-segment display on the SYSCTL circuit pack to indicate to which site the USER panel alarm LEDs apply. For site IDs greater than eight, a dash is displayed on the 7-segment display. The same site ID should be assigned to all shelves in the same bay or cabinet. If the NE is part of a subnetwork with an FT-2000, then it may be necessary to use more than one site number in a bay. It is recommended that the site ID be assigned consecutively starting at the CO site unless parallel telemetry is used. If parallel telemetry is used, the CO site should be assigned as site 7 and the remote sites should be assigned numbers 1 through 6. See the TOP section of Volume II for procedures on setting the Site ID.
- **Network Element ID:** The network element ID is a parameter with values of from 1 to 5. NEs (OC-3 or OC-12 shelves) at a specific site that belong to the same subnetwork must be assigned a unique NE ID. The NE ID is combined with the site ID to form a default value for the TID. In an OC-3 or OC-12 only network, there will only be one shelf per subnetwork at each site. Therefore, all the shelves in the subnetwork could be assigned a NE ID of 1. In a mixed network, there may be up to five NEs per site that are part of the same subnetwork. In this case, each NE with the same site number must be assigned a unique NE ID.
- **TID:** The target identifier (TID) is a 20-character parameter that is set through the CIT using the **`set-ne`** command. The TID is used in the **`rlgn`** command to identify an NE to which a remote login session is being established. The TID is also used by an OS system to identify NEs using the TL1 message-based communications protocol.

After the **init-sys:all** command is entered, the system sets the TID to a default value obtained by combining the site ID with the NE ID. The TID must be unique among all NEs. The default TID may be changed using the **set-ne** command to a unique user-assigned value recognized by the OS.

- **CO/RT:** The CO/RT parameter for CO or RT identifies the system as having the characteristics of a CO or RT. The default is RT. The parameter controls the TBOS display type, operation of the miscellaneous discretes, and the external fan control.
- **NSAP:** The network services access point (NSAP) is a multiple part address that uniquely identifies the NE. The NSAP is used for subnetwork communications using the OSI protocol. The NSAP is set to unique values assigned to control hardware at the factory and does not have to be modified by the user. The user can only modify the values defined by the **ent-ulsdcc** command. The Routing Domain and Area parameters must not be changed from their default values when interworking with FT-2000 OC-48 Lightwave Systems.
- **GNE (OSGNE):** An NE that has an active TL1/X.25 link to an OS is automatically an OSGNE. Subnetworks can have multiple OSGNEs.
- **DSNE:** In a subnetwork, one and only one shelf **must** be provisioned as a DSNE by setting its DSNE parameter to "yes" using the **set-ne** command. The DSNE parameter must be set to "yes" to provide proper DCC communications. The DSNE provides directory service (target identification to NASP address translation) for all NEs in a subnetwork.
- **AGNE:** In an alarm group, a NE must be designated as a AGNE by setting its AGNE parameter to "yes" using the **set-ne** command. An AGNE is an NE in an alarm group, through which members of an alarm group exchange alarm and status information. By default, all NEs are in the same alarm group (255). For subnetworks having more than 16 NEs, the AGNE and GNE should be separate NEs. The AGNE is a "collection point" and does not have to be a NE in a CO, for example.

Performance Monitoring (PM) Parameters

Table 8-13 describes the PM parameters provisionable via the CIT.

Table 8-13. 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) Laser Bias Current * (21G/21G-U only)	-1 dB, -2 dB enabled/disabled	-1 dB, -2 dB enabled/disabled	sect 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) 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)	1-55365 [5537] 1-900 [40] 1-900 [30] 1-900 [30] 1-63 [20] 1-63 [30] 1-63 [2]	1-5315040 [531504] 1-65535 [900] 1-65535 [90] 1-65535 [90] 1-4095 [60] 1-4095 [90] 1-255 [4]	line line line line line line line
OC-3 Line	B2 Coding Violations (CV) B2 Errored Seconds (ES) B2 Errored Seconds Type A (ESA) B2 Errored Seconds Type B (ESB) B2 Severely Errored Seconds (SES) B2 Unavailable Seconds (UAS) Line Protection Switch Counts (PSC-L)	1-13841 [1384] 1-900 [40] 1-900 [30] 1-900 [30] 1-63 [20] 1-63 [30] 1-63 [2]	1-1328736 [132874] 1-65535 [900] 1-65535 [90] 1-65535 [90] 1-4095 [60] 1-4095 [90] 1-255 [4]	line line line line line line line
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)	1-4613 [461] 1-900 [40] 1-900[30] 1-900 [30] 1-63 [20] 1-63 [30]	1-442848 [44285] 1-65535 [900] 1-65535 [90] 1-65535 [90] 1-4095 [60] 1-4095 [90]	line line line line line line
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)	1-4510 [451] 1-900 [40] 1-900 [30] 1-900 [30] 1-63 [20] 1-63 [30]	1-432960 [43296] 1-65535 [900] 1-65535 [90] 1-65535 [90] 1-4095 [60] 1-4095 [90]	sts1 sts1 sts1 sts1 sts1 sts1

Table 8-13. Performance Monitoring Parameters Provisionable via the CIT (Contd)

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	set-pmthres
DS3 Path for P-Bit, F&M Bit, and C-Bit from Fiber and DSX	CV-P Coding Violations	1-16383 [40]	1-1048575 [3820]	t3
	ES-P Errored Seconds	1-900 [25]	1-65535 [250]	t3
	SES-P Severely Errored Seconds	1-63 [4]	1-4095 [40]	t3
	UAS-P Unavailable Seconds	1-63 [10]	1-4095 [10]	t3
	SEFS	1-63 [2]	1-4095 [8]	t3
DS3 Line	CV-L Coding Violations	1-16383 [40]	1-1048575 [3865]	t3
	Errored Seconds, Line (ES-L)	1-900 [25]	1-65535 [250]	t3
	Severely Errored Seconds, Line (SES-L)	1-63 [4]	1-4095 [40]	t3

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

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. Specific trouble clearing and maintenance procedures are provided in the operation and maintenance (TOP) section of this manual (Volume II).

Three-Tiered Operations

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

The first operations tier consists of light-emitting diodes (LEDs) and pushbuttons on the user panel and circuit pack faceplates. These allow routine tasks to be performed without a craft interface terminal (CIT) or any test equipment. The user panel provides system-level alarm and status information for both the local and remote terminals (RT). The circuit pack faceplate FAULT LEDs allow fast and easy fault isolation to a particular circuit pack.

The second operations tier provides access to DDM-2000 OC-12 Multiplexer operations from a CIT over an EIA-232-D interface. System details that cannot be obtained from the first operations tier alone can be obtained over the CIT interface. A VT-100 compatible terminal or terminal emulator software running on a personal computer (PC) can be used as a CIT. Command and prompt modes are available with extensive on-line help features. The CIT interface supports

operations, administration, maintenance, and provisioning (OAM&P) activities such as performance monitoring (PM), on any and all network elements (NE) in the SONET subnetwork from a single DDM-2000.

An optional graphical user interface (CPro-2000) tool is also available. Using the graphical user interface tool, which runs on an *MS-DOS** PC, a user can take advantage of the graphics to do many provisioning related activities.

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

Parallel telemetry consists of individual closures that can be remoted to an operations center. These closures provide information on alarm status, fault location, transmission signal failure indications, and user definable miscellaneous discretes. These are not "dry" contact closures. They can handle only a limited amount of current and are polarized to operate with the proper voltage polarity. TBOS offers more information over its 2400 b/s RS-422 interface. The TBOS interface offers eight displays with one display dedicated to each shelf in a DDM-2000 alarm group. Each display provides 63 information points (DDM-2000 OC-3 and OC-12 to OS) and 64 control points (OS to DDM-2000 OC-3 and OC-12).

The DDM-2000 OC-12 Multiplexer supports a full-featured TL1/X.25 interface to multiple OSs. The DDM-2000 OC-12 Multiplexer supports alarm surveillance and PM with OSs, such as Bellcore's Network Monitoring and Analysis (NMA) OS.

The DDM-2000 OC-12 Multiplexer supports automated service provisioning with memory administration such as Bellcore's Operations System Intelligent Network Element (OPS/INE). The DDM-2000 OC-12 Multiplexer also supports remote recovery and control functions, installation provisioning, and security over the TL1/X.25 link. The TL1/X.25 interface provides significantly more detailed information, such as identifying specific circuit packs and facilities, and control capabilities than the parallel telemetry or TBOS interfaces.

The *SLC*®-2000 Access System supports the same X.25 interface and TL1 message set as the DDM-2000 OC-12 Multiplexer. Newer releases of the *SLC*-2000 Access System add digital loop carrier (DLC) specific functionality in the existing messages (for example, for DLC related alarms) and in addition support DLC specific commands (for example, DS0 level provisioning). See LTP 363-208-000, *SLC-2000 Access System, Applications, Planning, and Ordering Guide*, for more information.

* Registered trademark of Microsoft Corporation.

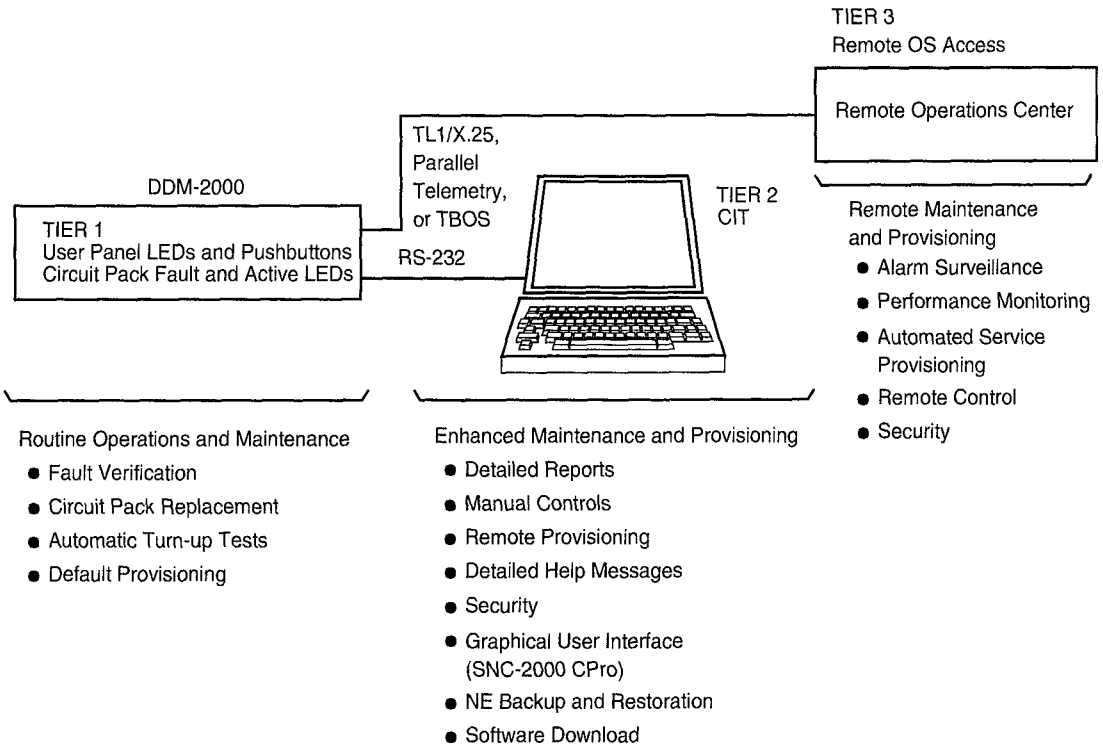


Figure 9-1. Three-Tiered Operations

Single-Ended Maintenance Philosophy

As a loop-optimized product, the DDM-2000 OC-12 Multiplexer allows operation and maintenance of all remote systems in an OC-12 or OC-3/OC-12 Multiplexer subnetwork from the central office (CO) shelf. A subnetwork consists of DDM-2000 systems interconnected by optical lines with the SONET data communications channel (DCC) enabled. Similarly, a technician working at a remote site can gain access to the CO shelf associated with that DDM-2000 OC-12 Multiplexer, as well as with other remote sites in the same subnetwork. The DDM-2000 OC-12 Multiplexer uses the SONET DCC to provide CIT remote access, user panel remote access, and OS remote access. The DDM-2000 OC-12 Multiplexer uses the International Standards Organization (ISO) compliant open systems interconnection (OSI) protocol for communicating between DDM-2000 shelves over the DCC.

Single-Ended Operations (Operations Interworking)

Figure 9-2 shows the single-ended operations (SEO) capability that provides remote access to all DDM-2000 systems in a network from a single location. This minimizes technician travel because most maintenance, provisioning, and administration can be performed on the entire subnetwork by accessing any DDM-2000 Multiplexer in the subnetwork. The SEO capability is provided by the DDM-2000 Multiplexers regardless of the subnetwork topology as long as DCC connectivity is available. The SEO (DCC) capability can be disabled between DDM-2000 shelves to create network maintenance boundaries (for example, interoffice applications) or for security reasons.

The single-ended maintenance philosophy is supported in subnetworks with mixed 2000 Product Family systems. SEO are supported between DDM-2000 and *SLC*-2000 systems. SEO between DDM-2000 and FT-2000 OC-48 Lightwave systems requires DCC connectivity. See Section 2, "Applications," and Section 8, "Administration and Provisioning," for more information on operations interworking applications.

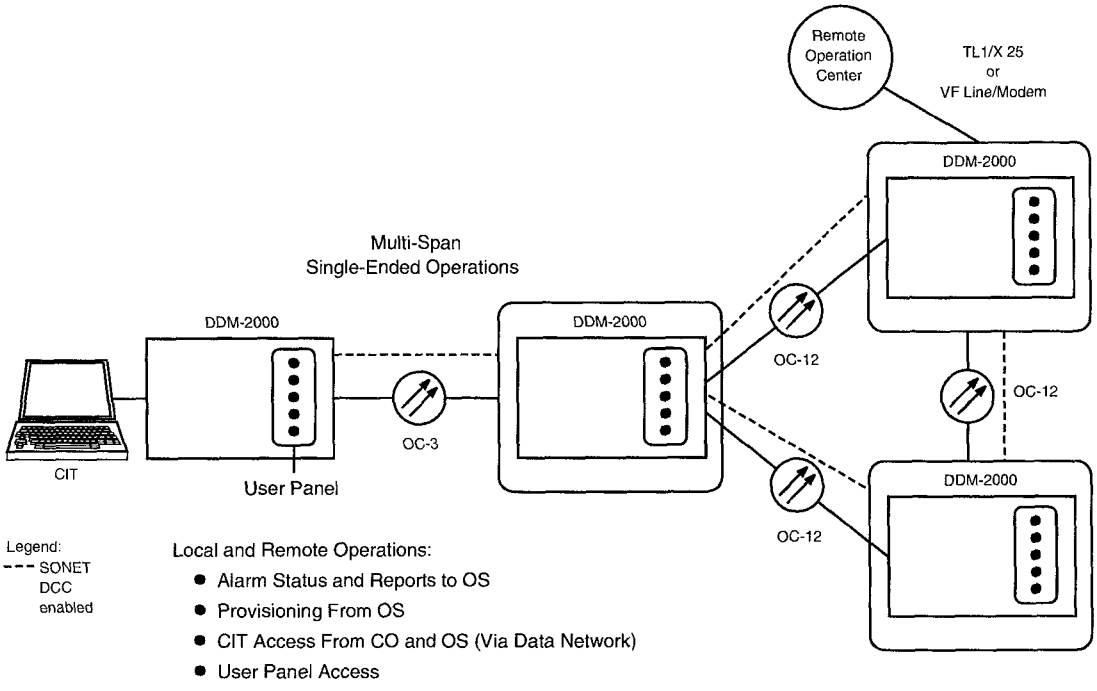


Figure 9-2. Single-Ended Operations

In-service (IS) Upgrades

Software Upgrades

Table 9-1 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 (Volume II).

Table 9-1. DDM-2000 OC-12 In-service Software Upgrade Compatibility (Note)

	Upgrade to*	
Current Release	**5.0.n**	**5.1**
3.1.n (Ring)	C	C
5.0.n (Ring)	X	X
5.1 (Ring)	NA	X

Note: All DDM-2000 OC-12 shelves in a subnetwork should be using the same version of software. An "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.

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

X Requires local or remote software download only to upgrade the system.

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

Table 9-2 lists the software compatibility within a subnetwork for the DDM-2000 OC-3 and OC-12 Multiplexers. All configurations listed support SEO. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-2. DDM-2000 OC-3 and OC-12 Software Compatibility (Note)

OC-3 Release	OC-12 Release	Interconnection Method	Notes
7.2	5.0/5.1	22-type and 21-type OLIU	Supports OC-3/OC-12 interworking
8.0	5.0/5.1	22-type † or 21-type OLIU	Supports OC-3/OC-12 interworking
8.1	5.0	22-type † or 21-type OLIU	Supports OC-3/OC-12 interworking
9.0 *	5.0	22-type and 21-type OLIU	Supports OC-3/OC-12 interworking, 0x1 interfaces, and DRI
9.1 *	5.0/5.1	22-type and 21-type OLIU	Supports OC-3/OC-12 interworking, 0x1 interfaces, and DRI

Note: All NEs in a ring network, which may be part of a larger network, must be running the same software. Similarly, all NEs in a linear network, which may be part of a larger network, must be running the same software. In a subnetwork, which may consist of a mixture of ring and linear networks, all NEs must be running compatible software according to the table. An "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. Only 21-type OLIUs can be used in OC-12.

† The 21-type or 22-type OLIUs can be used in the DDM-2000 OC-3 shelf. Only 21-type OLIUs can be used in OC-12.

Table 9-3 lists the dual ring interworking (DRI) software compatibility for the DDM-2000 OC-12 Multiplexer for both EC-1 and OC-3 interfaces. The table lists all possible software combinations. Combinations not listed are not supported.

Table 9-3. DDM-2000 OC-3 Multiplexer DRI Software Compatibility

OC-12	OC-3 and FT-2000	Notes
Release 5.0 (Ring)	OC-3 Releases 7.2 (Ring), 9.0 and 9.1 (Ring) FT-2000 Releases 4.1, 5.0, 6.0, and 7.0	FT-2000 Releases 4.1 and 5.0 have no DCC connectivity
Release 5.1 (Ring)	OC-3 Release 7.2 (Ring) and 9.1 (Ring) FT-2000 Releases 7.0 (Ring), 7.1 and 7.2	FT-2000 Releases 4.1 and 5.0 have no DCC connectivity

See LTP 824-102-147, *2000 Product Family Operations Interworking Guide,* for more information on operations interworking.

Maintenance Signaling

The DDM-2000 OC-12 Multiplexer provides maintenance signaling compliant with the SONET standard (TR-253). The DDM-2000 OC-12 Multiplexer inserts 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 inserts and detects the following signals, which notify upstream equipment of a failure detected downstream:

- Line far-end-receive failure (FERF)
- STS-1 path yellow.

The DDM-2000 OC-12 Multiplexer also inserts and detects STS unequipped signals. Figure 9-3 is an example of the AIS, yellow, and FERF signals generated in response to an unprotected incoming OC-12 line failure.

Figure 9-4 shows maintenance signals used by the DDM-2000 OC-12 Multiplexer in an STS path switched ring application. In this figure, 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.

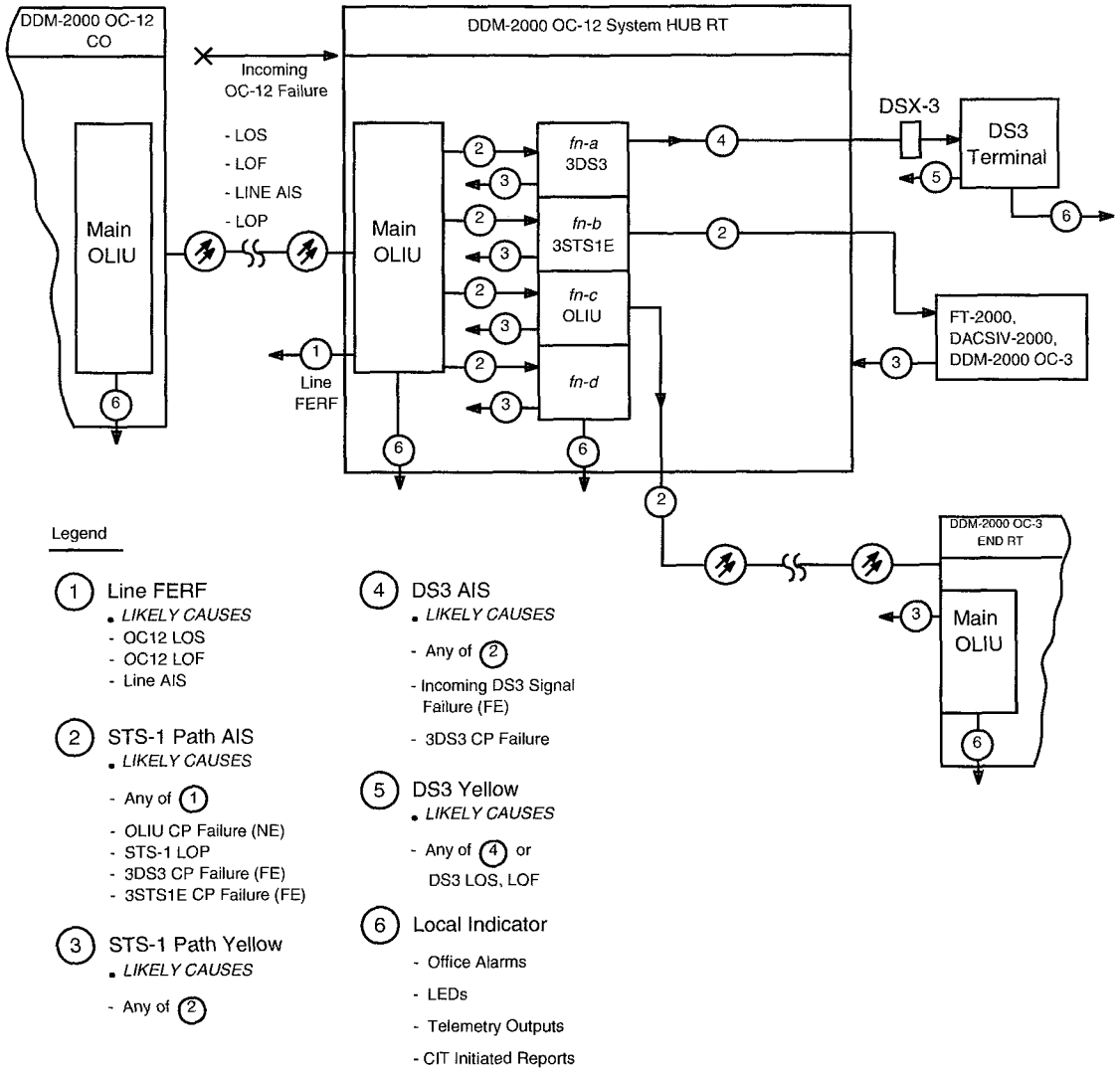
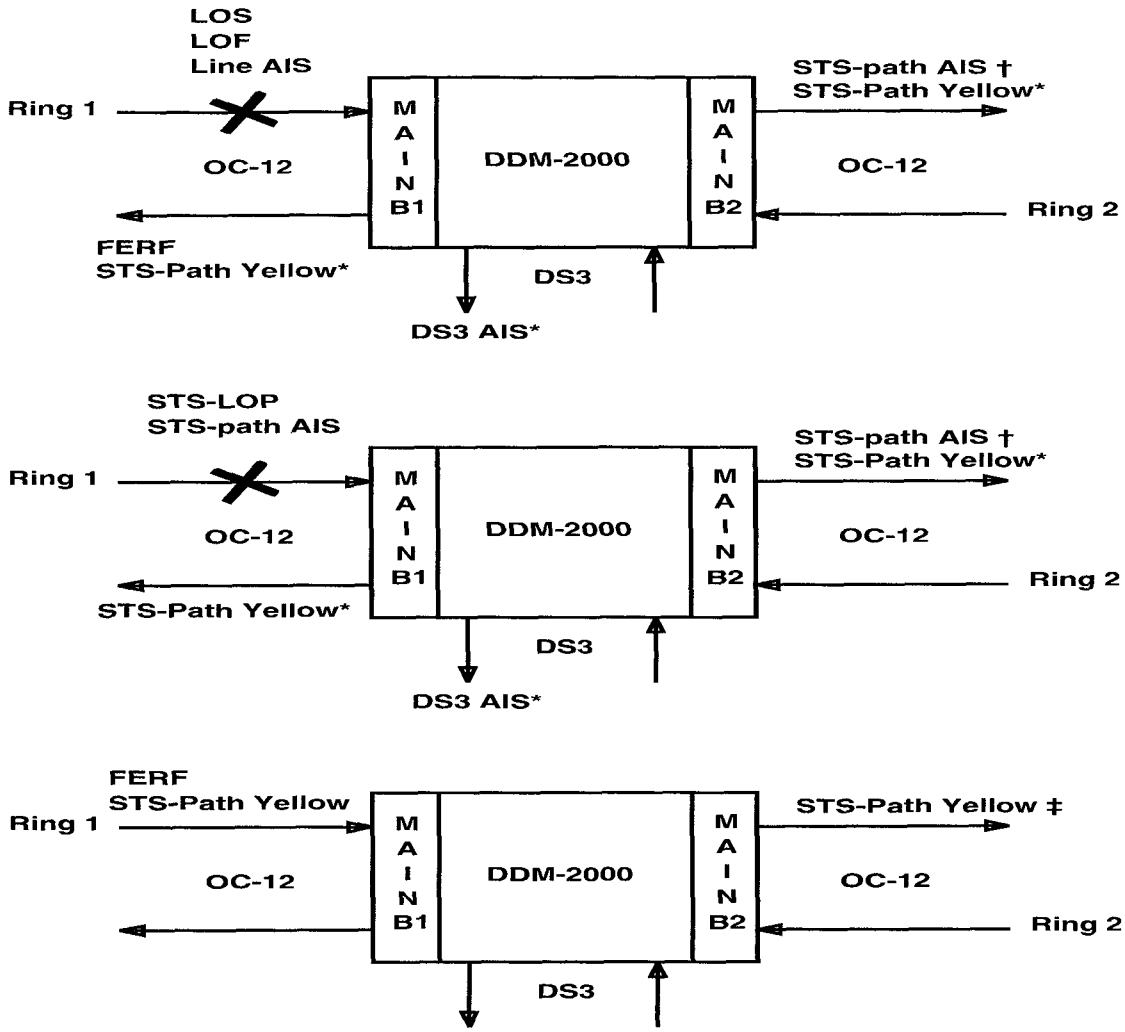


Figure 9-3. Example of Main Signal as a Result of Unprotected Incoming OC-12 Failure



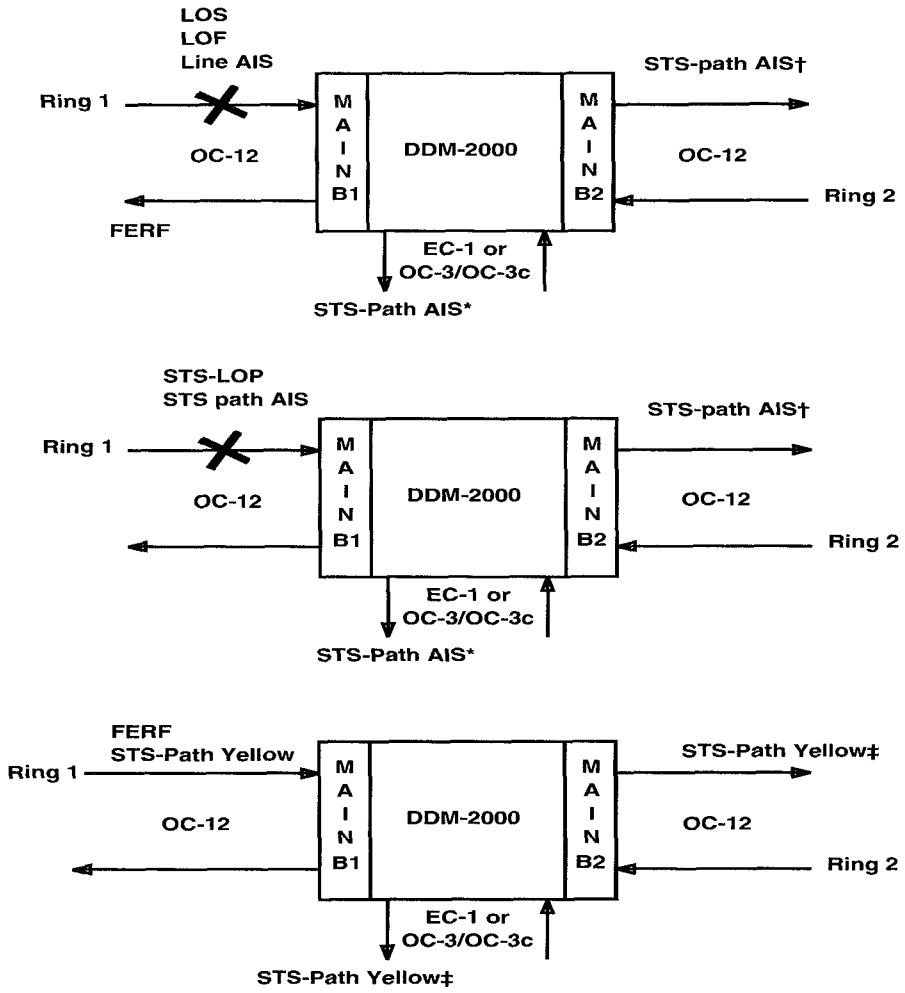
* STS-path yellow, DS3 AIS and STS-path AIS are sent on STS-1 paths selected from the failed ring (ring 1)

† 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 9-4. Maintenance Signaling — Path Switched Ring Applications (Sheet 1 of 4)

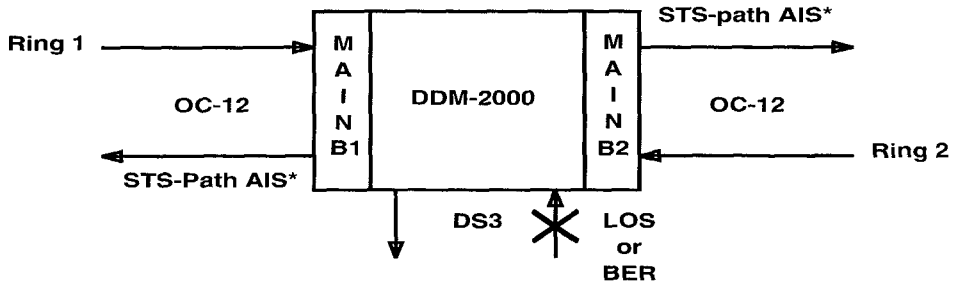


* **Signal is sent on STS-1 paths selected from the failed ring (ring 1)**

† **Signal is sent on pass-through and continue paths only**

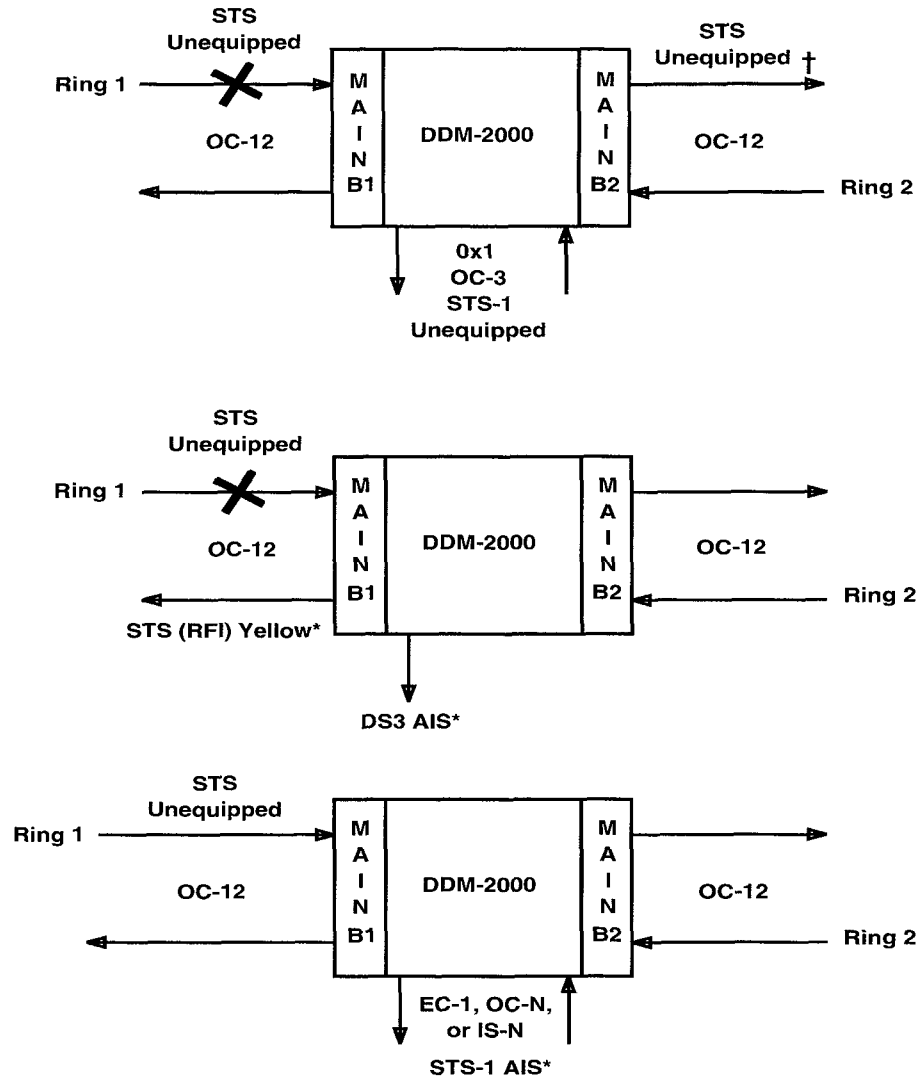
‡ **STS path yellow is passed to the EC-1 or OC-12 interface depending on whether the STS-1 path is a drop or pass-through connection**

Figure 9-4. Maintenance Signaling — Path Switched Ring Applications (Sheet 2 of 4)



* The incoming DS3 failure causes insertion of STS path AIS only if the DS3 ring interface has been provisioned for dual ring interworking (DRI)

Figure 9-4. Maintenance Signaling — Path Switched Ring Applications (Sheet 3 of 4)



* **Signal is sent on STS-1 paths selected from the failed ring (ring 1)**

† **Signal is sent on pass-through and continue paths only**

Figure 9-4. Maintenance Signaling — Path Switched Ring Applications — STS-Unequipped (Sheet 4 of 4)

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 (CC) 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 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 OSs are not notified through the telemetry interfaces until a failure lasts at least as long as the alarm holdoff delay. Alarm clear delays prevent premature clearing of alarms. Alarm indications are not cleared until a fault condition has been clear for at least

as long as the alarm clear delay. Incoming signal failure conditions, AIS, and FERF signals, are subject to the provisionable holdoff delay and a fixed 15-second clear delay. Yellow signals are not subject to holdoff or clear delays. Circuit pack failures (except control circuit pack failures) are subject to the provisionable holdoff and clear delays. Refer to the **`set-attr-alm`** and **`rtrv-attr-alm`** commands in Section 11, "Commands and Reports."

Protection Switching

The DDM-2000 OC-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 9-5 illustrates examples of unidirectional and nonrevertive line protection switches. Note the squares at locations A and C. Each square represents the transmit or receive section of an OLIU. Figure 9-5(a) and Figure 9-5(b) are associated with the Service (S) OLIU and Figure 9-5(d) and Figure 9-5(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 9-5(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 9-5(a) is on the service OLIU circuit packs, is lit. The fiber/OLIU set not selected is the standby set, and the ACTIVE LED on its corresponding OLIU is not lighted.

Contrary to other transmission circuit packs, ACTIVE LEDs on both OLIUs may be lit at the same time on the same shelf. For example, in Figure 9-5(b) the receive fiber going to location C has been cut. Location C selects the protection fiber/ OLIU set as active, resulting in the lighting of ACTIVE LEDs on both the OLIUs at location C. Location A did not switch to its protection set but continues to remain on the service set. This example illustrates the SONET standard of unidirectional APS. Since each location sends APS information to the other end, both ACTIVE LEDs on the OLIUs at location A are also lit.

After the cut service fiber is repaired, location C **will not** switch back (revert) and select the service set as its active fiber/OLIU set. This example, Figure 9-5(c), illustrates the SONET standard of nonrevertive APS.

Figure 9-5(d) and Figure 9-5(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 OC-12 LOS
- OC-12 LOF
- OC-12 Line AIS
- OC-12 BER exceeding10^{-3}.

An OC-12 BER exceeding a provisionable10^{-5} to10^{-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.

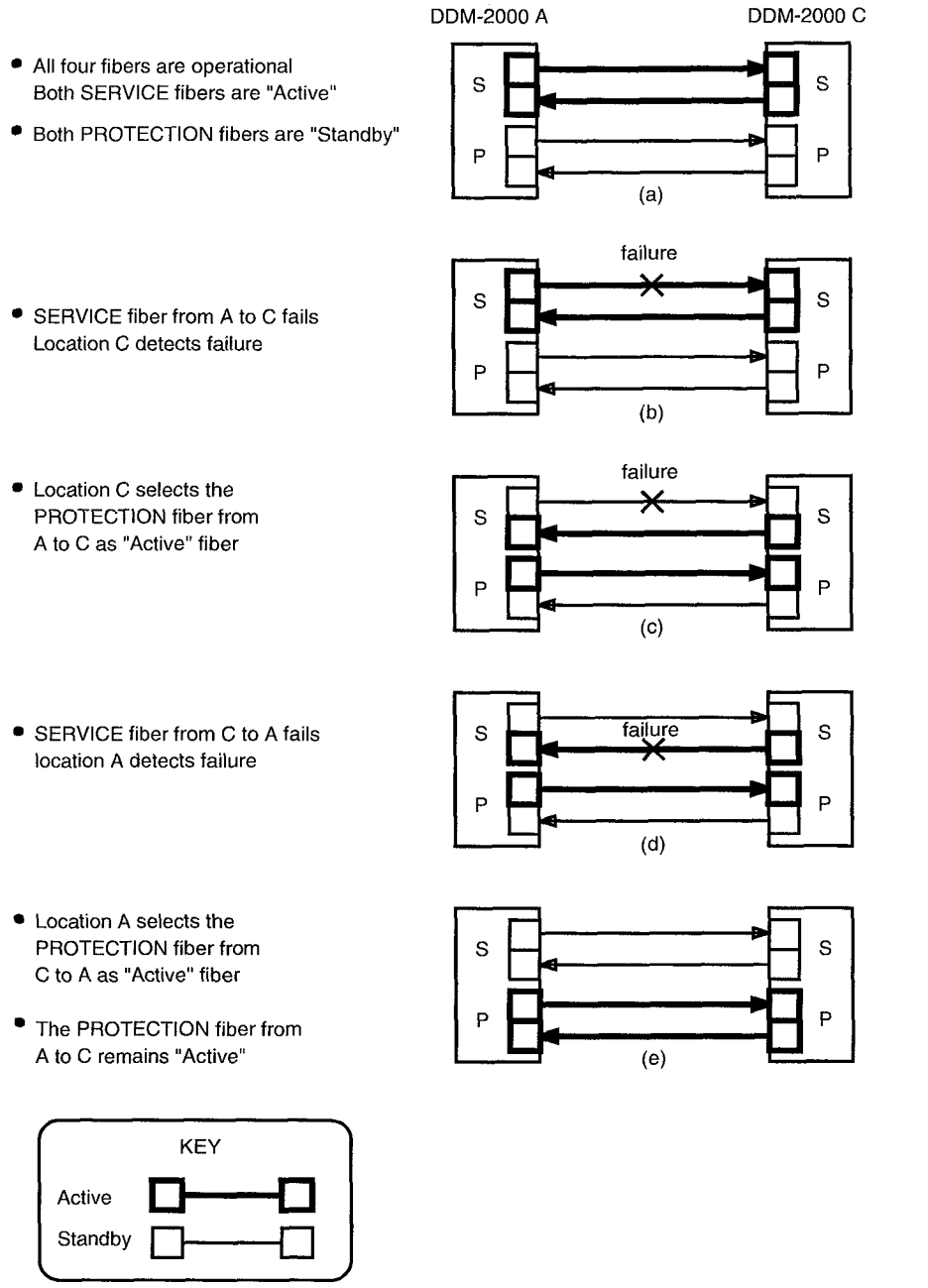


Figure 9-5. Unidirectional Line Protection Switching

Equipment Protection

The 3DS3, 3STS1E, BCP3 TSI, 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 line-timing modes, the synchronization references are 1×1 protected. If neither reference is available, the system automatically switches to "holdover" timing mode.

When the TGS is provisioned for synchronization messaging, the system can determine the quality of the line-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, 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 line-timing) when an unprotected timing reference failure clears. If provisioned for nonrevertive mode switching, the system must be manually switched from holdover mode to the provisioned timing mode (external timing or line-timing) when an unprotected timing reference failure clears. Refer to the **rtrv-sync**, **set-sync**, and **switch-sync** commands in Section 11, "Commands and Reports."

Path Protection Switching (Path Switched Rings)

The path switched ring application is based on the Bellcore TR-TSY-000496/ GR-1400 path protection switching scheme.

The path protection switched ring has two single-fiber, counter-rotating rings as shown in Figure 9-6. This architecture has distinct advantages over a linear architecture. Each node on the ring terminates four fibers: a transmit and receive fiber in each direction. Eight fibers are needed to connect the same NE in a nonterminal position of a linear add/drop 1+1 protected arrangement: two transmit and two receive in each direction, without providing the same level of protection that the ring provides. The architecture of the ring is designed to protect against any single point of failure, including a node failure, single fiber cut, or dual fiber cut. Node failure or dual fiber failure in a linear network affects traffic to all downstream nodes. A node failure in a ring only affects traffic dropped at the failed node.

The DDM-2000 OC-12 ring provides STS-1 path protection switching to support DS3, EC-1, and OC-3/IS-3 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.

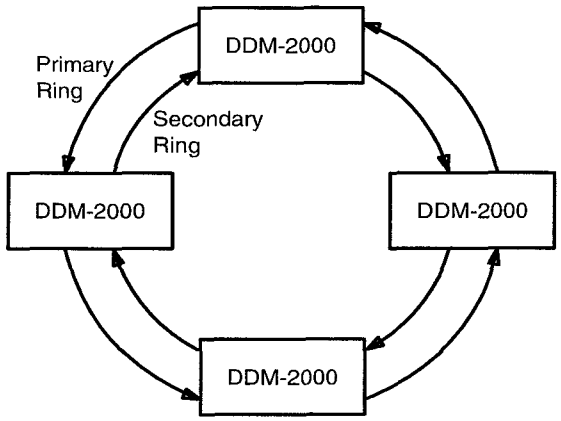


Figure 9-6. Two-Fiber Unidirectional Ring

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 9-7(a). 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 AIS, LOP, path unequipped and path BER performance. This function at the ring exit point is called a "tail-end switch." Path switching is nonrevertive. On pass-through paths, detected hard failures (LOS, LOF, LOP, line AIS, and STS-1 path AIS) result in path AIS insertion in the outgoing signals. This allows the terminating node to detect path failure and 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 9-7(b) shows how traffic is switched when a dual-fiber cut occurs. Nonrevertive switching is provided 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`** commands in Section 11, "Commands and Reports."

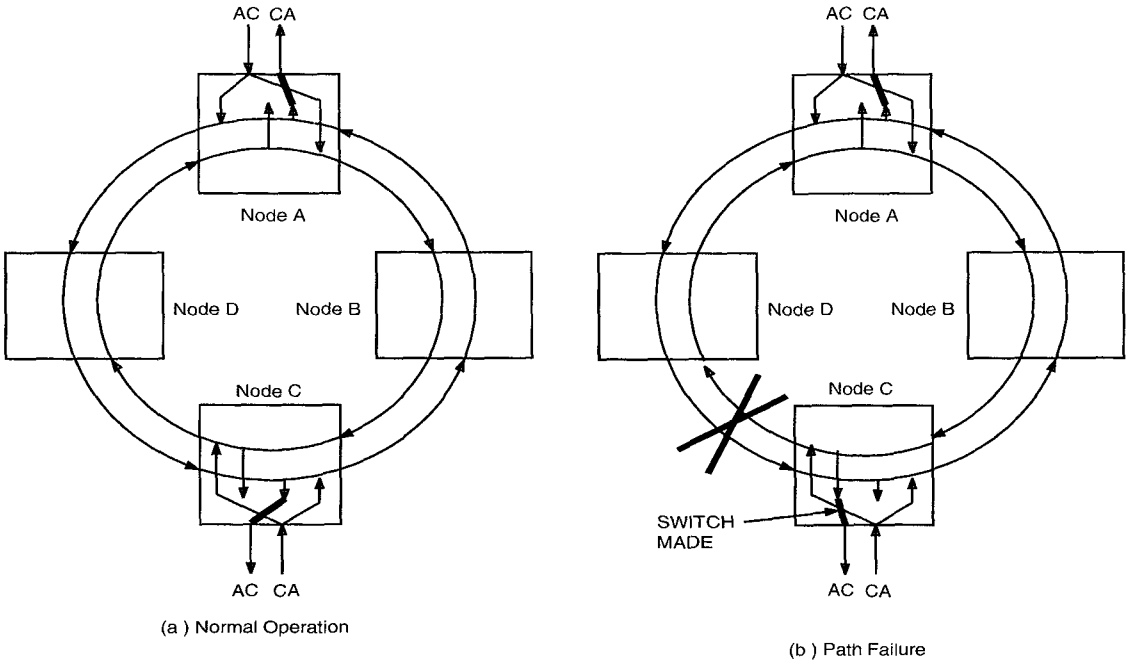


Figure 9-7. Path Protection Switching

Dual Ring Interworking (DRI) Path Protection Scheme

Interconnected rings or 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 9-8 shows DRI path protection switching. Note that the upper ring could be an FT-2000 OC-48 Lightwave System bidirectional line switched ring. In the receive direction, a DRI node that passes a signal between rings performs two steps:

1. VT1.5 and/or STS-1 signals to be passed between rings are "dropped and continued." This means the signal is dropped at that node to the Function Unit and simultaneously copied into the OC-3/OC-12 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 9-8.

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 cross-connection command.

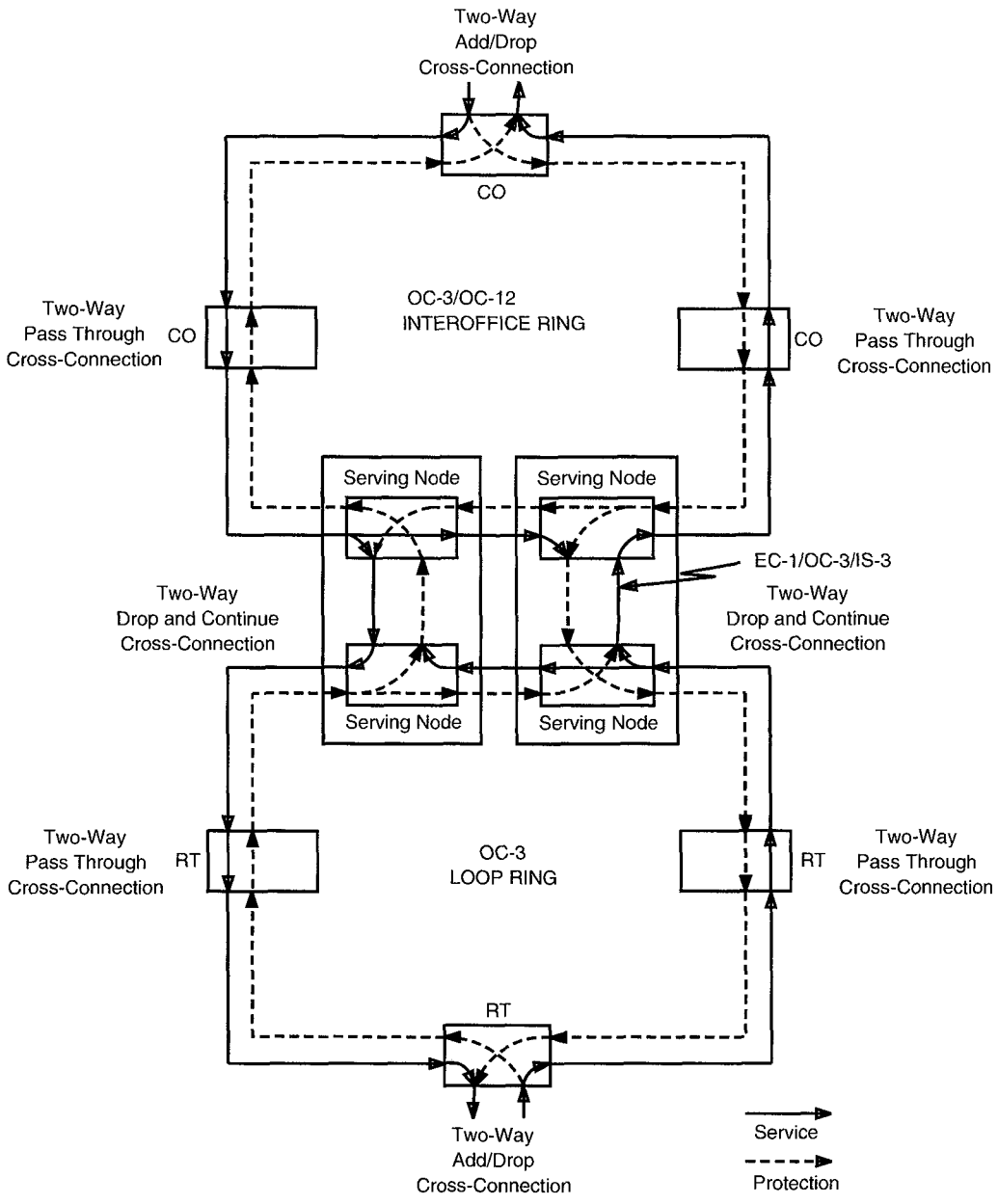


Figure 9-8. DRI Path Protection Switching

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

A DDM-2000 OC-3 ring shelf can function in a ring-on-ring application using the 0x1 interface capability of the OC-12 or FT-2000 OC-48 Lightwave System ring. The OC-3 shelf functions in the normal path switched ring mode. VT/STS path protection switching is done on the OC-3 shelf.

In single homing, the OC-3 ring shelf interconnects through its main-1/main-2 ring interface either directly or through another OC-3 ring shelf to the low-speed OC-3 0x1 interface on a single OC-12 or FT-2000 OC-48 Lightwave System shelf.

In dual homing, the OC-3 ring shelf interconnects directly or through another OC-3 ring shelf with the OC-3 interfaces on two separate and normally non-colocated OC-12 or FT-2000 OC-48 Lightwave System shelves.

Status of ACTIVE LED on Rings

In ring applications, ACTIVE LEDs on each Main OLIU are always lit because it is not known if a signal on that OLIU is currently being selected by a far-end NE.

Loopbacks

The DDM-2000 OC-12 Multiplexer allows technicians to do loopbacks on all low-speed DS3 and EC-1 interfaces. Low-speed DS3 and EC-1 electronic loopbacks, directed toward the high-speed OC-12, are individually controllable from the CIT. Facility loopbacks can also be set up towards the DSX on all low-speed DS3 and EC-1 interfaces. Active electronic loopbacks are noted by the user panel's abnormal (ABN) indicator and in the alarm and status report. See the **`opr-lpbk-ds3`**, **`opr-lpbk-ec1`**, **`rls-lpbk-ds3`**, and **`rls-lpbk-ec1`** commands in Section 11, "Commands and Reports."

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 21-type 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.

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."

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."

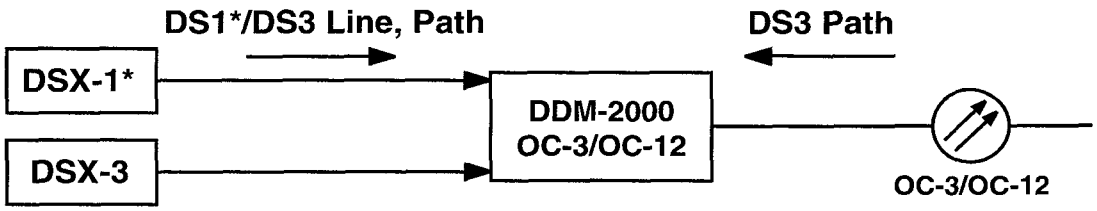
Performance Monitoring (PM)

The DDM-2000 OC-12 Multiplexer uses 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 9-4 lists the SONET and DS3 performance parameters monitored by the DDM-2000 OC-12 Multiplexer. These parameters are thresholded to indicate degraded performance. When a PM threshold is crossed, it is reported to the OS connected to an X.25 or TBOS link. 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.

Figure 9-9 shows DS1/DS3 line and path and DS3 path PM.



*** OC-3 Shelves Only.**

Figure 9-9. DS1/DS3 Line and Path and DS3 Path Performance Monitoring

The following are definitions and explanations for the terms used in the figure:

- Line — A line is a physical transport vehicle that provides the means of moving digital information between two points in a network. The line is characterized by a metallic transmission medium and its specific coding type. A line is bounded by its two end points, known as line terminations. A line termination is the point where the electrical, bipolar line signal is generated and transmitted, or received and decoded.
  - DS1 (DDM-2000 OC-3 Only) — DS1 line for AMI or B8ZS coding is monitored and the errored second (ES-L) data is displayed for the incoming signal from the DSX-1.
  - DS3 — DS3 line for B3ZS coding is monitored and the data is displayed in CV-L, ES-L, and SES-L registers for the incoming signal from the DSX-3.
- Path — A path is a framed digital stream between two points in a network and represents digital signal transport at a specified rate, independent of the equipment and media providing the physical means of transporting the signal. A path is defined by its two end points, called path terminations, where its frame structure is generated and decoded. A path may be carried wholly within one transport segment (line), or it may span a sequential arrangement of two or more transport segments.

— DS1 (DDM-2000 OC-3 Only) — DS1 near-end path is monitored for SF framing and both near-end and far-end paths are monitored for ESF framing. The data is displayed in ES-P, SES-P, and UAS-P categories. CV-P is also displayed.

— DS3 — DS3 path incoming from the fiber (high-speed side) is monitored for both P-bits and F&M bits and the data is displayed in CV-P, ES-P, SES-P, and UAS-P registers. In addition, severely errored frame seconds (SEFS) are also monitored and displayed.

DS3 path incoming from the DSX-3 (low-speed side) is also monitored, in addition to monitoring the path from the fiber, for both P-bits and F&M bits. The same registers are also displayed for the data from the DSX-3. DS3 path from both the fiber and the DSX-3 are monitored for C-Bits and are displayed in the same registers as above. The far-end data (FEBE bits) is monitored and displayed as well.

DS3 Performance Monitoring (PM)

DS3 Path PM

DDM-2000 OC-12 provides three DS3 path PM options using the BBG11B DS3 circuit pack: P-bit (parity bit), adjusted F&M bit, and C-bit. The options are selected using a command that also sets the PM mode to "on" (default) or "off", which enables or disables the monitoring and reporting of DS3 path PM data (see Table 9-4).

P-Bit

When provisioned for P-bit, the system calculates and provides counts of DS3 P-bit coding violations (CV), errored seconds (ES), severely errored seconds (SES), and unavailable seconds (UAS) incoming from the fiber and DSX. Quarter-hour and current day registers are provided with provisionable threshold crossing alerts (TCAs) on a per shelf basis. SEFS are also monitored.

Because P-bits can be corrected at nodes provisioned for violation monitor and removal (VMR) along a DS3 path, the DS3 P-bit PM data may not provide a complete report of the end-to-end DS3 path errors.

Adjusted F&M Bit

Adjusted F&M bit PM provides an alternative method for determining and accumulating DS3 path performance data based on an error estimation technique using errors on the F&M framing bits to approximate the actual error counts in the DS3 path payload. F&M bits are not corrected at nodes provisioned for VMR along a DS3 path. When provisioned for adjusted F&M bit, the system calculates

and provides estimated counts of DS3 adjusted F&M bit CV, ES, SES, and UAS incoming from the fiber and DSX. Quarter-hour and current day registers are provided with provisionable TCAs on a per-shelf basis. SEFS are also monitored.

C-Bit

When the DS3 path PM C-bit option is selected, both near-end and far-end (far-end block errors) PM data are monitored and displayed.

The system provides counts of DS3 C-bit parity CV-P, ES-P, SES-P, and UAS-P incoming from both the DSX-3 and the fiber. The type of PM is provisioned per DS3 service by a CIT command.

For C-bit PM, the DS3 service can be provisioned in VM or VMR modes. In VMR mode, the C-bit errors are not corrected as in the P-bit option.

Quarter-hour and day registers are provided with provisionable TCAs. The TCAs are provisionable on a per-shelf basis. SEFS counts are also provided.

DS3 Line Performance Monitoring

DS3 line parameters include CVL, ESL, and SESL. DS3 line PM provides provisionable bit error ratios (TCAs) for all DS3 line parameters. For CVL parameters, bit errors can also be provisioned in ratios such as 10^{-7}, 10^{-8}, and 10^{-9}.

DS3 Performance Monitoring Parameters

Table 9-4 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 9-4. DDM-2000 OC-12 Multiplexer Performance Monitoring Parameters

Facility	Measured Parameter
OC-3 Optics	Laser Bias Current *
	Laser Transmit Power *
OC-12 Optics	Laser Bias Current †
OC-3 Section	Severely Errored Frame Seconds (SEFS)
OC-12 Section	Severely Errored Frame Seconds (SEFS)
EC-1 Line	B2 Coding Violations (CV)
	B2 Errored Seconds (ES)
	B2 Errored Seconds Type A (ESA)
	B2 Errored Seconds Type B (ESB)
	B2 Severely Errored Seconds (SES)
	B2 Unavailable Seconds (UAS)
OC-3 Line	B2 Coding Violations (CV)
	B2 Errored Seconds (ES)
	B2 Errored Seconds Type A (ESA)
	B2 Errored Seconds Type B (ESB)
	B2 Severely Errored Seconds (SES)
	B2 Unavailable Seconds (UAS)
	Line Protection Switch Counts (PSC-L)
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)
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)

See footnotes at end of table.

Table 9-4. Performance Monitoring Parameters (Contd)

Facility	Measured Parameter
DS3 Path for P-Bit, F&M Bit, and C-Bit (From Fiber and DSX)	CV-P Coding Violations Severely Errored Frame Seconds (SEFS) ES-P Errored Seconds SES-P Severely Errored Seconds UAS-P Unavailable Seconds
DS3 Line	Line Coding Violations (CVL) Errored Seconds (ESL) Severely Errored Seconds (SESL)

* 21G-U OLIU only.

† 23G/23G-U and 23H/23H-U OLIUs only.

‡ Current and previous day parameters only.

Optical Parameters

Performance Monitoring (PM) Enabling

Collection of optical parameters are initiated when a slot is equipped with an OLIU circuit pack. Parameters continue to be available in reports and generate appropriate TCAs until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Laser Bias Current

The laser bias current is monitored continuously to detect degraded performance of the laser. A TCA is generated if the laser bias current exceeds a fixed threshold of 1.5 times the nominal value. Laser bias current is monitored independently for service and protection optical facilities. This parameter is monitored 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. TCAs are generated if the optical transmit power falls below fixed thresholds of –1 dB and –2 dB. Optical transmit power is monitored independently for service and protection optical facilities. This parameter is monitored only by the 21G/21G-U OLIU.

OC-3 and OC-12 Section Parameters

Performance Monitoring (PM) 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 TCAs until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Severely Errored Frame Seconds (SEFS)

This parameter counts the number of seconds during which an OOF, LOS, or OLIU circuit pack failure occurred. SEFSs are counted and thresholded independently for the service and the protection lines.

OC-3 and OC-12 Line Parameters

Performance Monitoring (PM) 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 TCAs until the OLIU is removed and the **update** command or the UPD/INIT button is pressed.

Line Coding Violations (B2 Parity)

To monitor the performance of the OC-3 and OC-12 lines, the line BIP-8 (B2 parity) is calculated, written, and checked for errors. The line B2 parity violation counter is incremented for each line BIP error detected. Each line BIP-8 can detect up to eight errors per STS-1 frame. The contents of the three or 12 line B2 parity violation counters associated with the OC-3 and OC-12 line are added to form a composite B2 parity violation count. CVs are not counted during seconds that contain a line AIS, LOS, LOF, or during a UAS. The B2 parity violations are counted and thresholded independently for the service and protection lines.

Errored Seconds (ES)

An "errored second" is a second in which one or more B2 parity violations are detected. An ES "type A" is a second in which exactly one B2 parity violation is detected. An ES "type B" is a second in which more than one and less than 32 for OC-3, or more than one and less than 124 for OC-12, B2 parity violations are detected. Seconds that are UAS are not counted as ES. A second that contains a line AIS, LOS, LOF, or is a UAS is not counted as a type A or type B ES. All three of these parameters are counted and thresholded independently for the service and protection lines.

Severely Errored Seconds (SES)

A SES is a second in which 32 or more for OC-3, or 124 or more for OC-12, B2 parity violations are detected, or one in which a loss of signal, loss of frame or line AIS occurs. A UAS is not counted as a SES. SESs are counted and thresholded independently for the service and protection lines.

Unavailable Seconds (UAS)

A UAS is a second during which the OC-3 or OC-12 line is "unavailable." A line is considered "unavailable" from the beginning of X consecutive SESs until the beginning of Y consecutive seconds, none of which is severely errored. An X is equal to 10 seconds or, in the case of a failure, the line signal failure. A Y is equal

to 10 seconds of no SES or line signal failure. If there is an unprotected circuit pack failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. UAS are counted and thresholded independently for the service and protection lines.

Line Protection Switch Counts

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

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 IS state. Parameters continue to be available in reports and generate appropriate TCAs until the input signal is removed and the **update** command or the UPD/INIT button is pressed. Alternatively, the EC-1 low-speed line parameters can be disabled by setting the EC-1 port state to 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. CVs are not counted during seconds that contain a line AIS, LOS, LOF, or during a UAS. The B2 parity violations are counted and thresholded for the EC-1 line.

Errored Seconds (ES)

An "errored second" is a second in which one or more B2 parity violations are detected. An ES "type A" is a second in which exactly one B2 parity violation is detected. An ES "type B" is a second in which more than one, and less than 12, B2 parity violations are detected. Seconds that are UAS are not counted as ES. A second that contains a line AIS, LOS, LOF, or is a UAS is not counted as a type A or type B ES. All three of these parameters are counted and thresholded for the EC-1 line.

Severely Errored Seconds (SES)

A SES is a second in which 12 or more B2 parity violations are detected or one in which a LOS, LOF, or line AIS occurs. A UAS is not counted as a SES. SES are counted and thresholded for the EC-1 line.

Unavailable Seconds (UAS)

A UAS is a second during which the EC-1 line is "unavailable." A line is considered "unavailable" from the beginning of X consecutive SES until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the line signal failure. Y is equal to 10 seconds of no SES or line signal failure. If there is an unprotected circuit pack failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. UAS are counted and thresholded 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 TCAs 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. CVs are not counted during seconds that contain a line AIS, LOS, LOF, LOP, STS path AIS, or during a UAS. The B3 parity violations are counted and thresholded for each STS-1 path terminated by the system.

Errored Seconds (ES)

An "errored second" is a second in which one or more B3 parity violations are detected. Seconds that are UAS are not counted as ES. An ES "type A" is a second in which exactly one B3 parity violation is detected. An ES "type B" is a second in which more than one and less than nine B3 parity violations are detected. All three of these parameters are counted and thresholded independently for each STS-1 path terminated by the system.

Severely Errored Seconds (SES)

A SES is a second in which nine or more B3 parity violations are detected. SES are counted and thresholded separately for each STS-1 path terminated by the system. A UAS is not counted as a SES.

Unavailable Seconds (UAS)

An STS-1 path is considered "unavailable" from the beginning of X consecutive SES until the beginning of Y consecutive seconds, none of which is severely errored. An X is equal to 10 seconds or, in the case of a failure, the STS-1 path signal failure. A Y is equal to 10 seconds of no SES or STS path signal failure. If there is an unprotected STS-1 path terminating equipment failure (3DS3 or OLIU), UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery.

DS3 Path Parameters

Performance Monitoring (PM) 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 VM or VMR mode, and an STS-1 cross-connection is present (see Table 9-5). Parameters continue to be available in reports and generate appropriate TCAs until the input signal to the DS3 interface is removed and the **update** command or the UPD/INIT button is pressed (transitioning to the AUTO state). Alternatively, the DS3 path parameter can be disabled by setting the DS3 path port to the CC mode using the **set-t3** command. The PM mode parameter should be set to "on" (default), using the **set-t3** command to start PM data monitoring and reporting.

Table 9-5. DS3 Performance Monitoring Modes

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

CV-P Coding Violations

CV-P coding violations are a count of the number of P-bit, adjusted F&M bit, or near-end and far-end C-bit parity errors in the DS3 signal received from the fiber and the DSX-3. To detect degradation of the signal, these errors are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode. By provisioning all NEs in the DS3 path to the VM mode, coding violations can be used as a DS3 path performance parameter when the P-bit option is selected. When the F&M-bit or C-bit option is selected, NEs could be provisioned in VMR or VM mode (see Table 9-6).

Severely Errored Frame Seconds (SEFS)

SESF are a count of the number of seconds during which an OOF or AIS condition exists for a DS3 signal received from the fiber or the DSX-3, or during an unprotected DS3 circuit pack failure. SEFSs are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode.

Errored Seconds (ES-P)

An "errored second" is a second in which one or more DS3 P-bit, adjusted F&M-bit, or near-end and far-end C-bit coding violations are detected. ES-P are not counted during UAS. ES are counted and thresholded independently for each DS3 path terminated by the system.

Severely Errored Seconds (SES-P)

An SES-P is a second in which 44 or more DS3 P-bit, adjusted F&M-bit, or near-end and far-end C-bit coding violations are detected. SES-P are not counted during UAS. SES are counted and thresholded independently for each DS3 path terminated by the system.

Unavailable Seconds (UAS-P)

A UAS-P is a second during which the DS3 path is "unavailable." A DS3 path is considered "unavailable" from the beginning of X consecutive SES until the beginning of Y consecutive seconds, none of which is severely errored. An X is equal to 10 seconds or, in the case of a failure, the DS3 signal failure. A Y is equal to 10 seconds of no SES or DS3 signal failures. If there is an unprotected DS3 circuit pack failure, UAS are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. UAS are counted and thresholded independently for each DS3 path terminated by the system. This applies to P-bit, adjusted F&M bit, and near-end and far-end C-bit options.

Table 9-6. DS3 Performance Monitoring (PM) Modes

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

DS3 Line Parameters

Coding Violations (CV-L)

This parameter is a count of B3ZS bipolar violations (BPV) occurring over the accumulation period. BPVs that are part of the zero substitution code are excluded.

Errored Seconds (ES-L)

This parameter is a count of seconds containing one or more BPVs, or one or more LOS (from the DSX-3) defects.

Severely Errored Seconds (SES-L)

This parameter is a count of seconds during which BPVs exceed 44, or one or more LOS defects occur.

Performance Monitoring Data Storage and Reports

The DDM-2000 OC-12 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-sts1`**, **`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 TCA to alert the OS (via the TBOS or TL1/X.25 interface) to the condition. A summary of all TCAs is available in the PM TCA summary report. Current quarter-hour and current day thresholds for each parameter are provisionable, via the CIT, on a per-shelf basis. Therefore, if values other than the defaults are to be used, only one value needs to be set for each parameter. Generation of TCAs can be disabled independently for each performance parameter. Performance data is still collected if thresholding is disabled. Refer to the **rtrv-pmthres-line**, **rtrv-pmthres-sect**, **rtrv-pmthres-sts1**, **rtrv-pmthres-t3**, **set-pmthres-line**, **set-pmthres-sect**, **set-pmthres-sts1**, **set-pmthres-t3**, and **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 PM TCA point. When the TL1/X.25 interface is used, threshold crossings are reported to the OS via **REPT EVT** messages.

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 PM 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."

Reports

This section provides information in reports available through the CIT. For reports available through the X.25 link, refer to LTP 824-102-151, *DDM-2000 Multiplexers Operations Systems Engineering Guide*.

Database Change Transmission to OS

All provisioning changes are automatically reported to the OS over the TL1/X.25 interface.

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-passswd**, **rtrv-secu**, **rtrv-ec1**, **rtrv-sts1**, **rtrv-sts3c**, **rtrv-crs-sts1**, **rtrv-sync**, and **rtrv-t3** commands in Section 11, "Commands and Reports."

Maintenance History Report

A maintenance history report containing the past 500 alarm, status, protection switching, and CIT (for example, provisioning, loopback request, manual protection, etc.) events is provided. This summary contains real time and date stamps indicating when each condition was detected and when it cleared. CIT events contain a time stamp indicating when the command was entered. Alarm and status entries in the retrieve history report are not subject to holdoff and clear delay. See the **rtrv-hsty** command in Section 11, "Commands and Reports."

State Reports

The state reports list the states of all slots, channels, low-speed ports, and OC-3/IS-3 lines on the system. The **rtrv-state-eqpt** report includes the protection switching state ("active" or "standby") and protection switching priority of all protected lines and equipment in the system. The **rtrv-state-path** command includes protection status information for STS-1 and STS-3c paths. See the **rtrv-state-eqpt**, **rtrv-state-ec1**, **rtrv-state-oc3**, **rtrv-state-sts1**, **rtrv-state-sts3c**, and **rtrv-state-path** commands in Section 11, "Commands and Reports."

Equipment Report

This report displays the equipage and version information for one or more slots. Refer to the **rtrv-eqpt** command in Section 11, "Commands and Reports."

Network Map Report

This report shows the names ("Target Identifiers," or "TIDs") of other 2000 Product Family systems in the subnetwork. The report also identifies the directory services network element (DSNE) for the subnetwork. Refer to the **rtrv-map-network** and **rtrv-map-neighbors** commands in Section 11, "Commands and Reports."

Technical Specifications

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Technical Specifications 10

Overview

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

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* * T1.102-1993, TR-499 Iss. 5	VMR, VM, or clear channel
EC-1	*ANSI* T1.102-1993 & TR-253, Iss. 2	
OC-3	*ANSI* T1.106/88, *ANSI* T1.105/91 TR-253, Iss. 2, TR-496, Iss. 3	
OC-12	*ANSI* T1.106/88, *ANSI* T1.105/91 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 (BBG11/11B 3DS3)

- Electrical Specification

  The low-speed DS3 interface transmits/receives a standard electrical DS3 signal as specified in *ANSI* T1.102-1993, Section 5 (44.736 Mb/s rate, DSX-3 interconnect specification, bipolar 3-zero substitution [B3ZS] encoding). However, the signal does not have to contain a standard DS3 frame.

  Line build-out is provisionable as follows:

  — 734A/D: 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 (CC) transport of any DSX-3 compatible signal (M13 mode, framed CC, unframed CC). 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 (LOS)

  — Line coding violations (CV-L).

  The alarm level for each of the monitored parameters can be provisioned to CR, MJ, MN or status. B3ZS coding violation failure threshold is user settable to 10^{-3} or 10^{-6} BER.

- Performance Monitoring (PM) (see Table 10-14)

  — DS3 Parity Errors (P-bits)

  DDM-2000 OC-12 Multiplexers provide for DS3 P-bit violation monitoring and removal (VMR) 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 (SEFS)

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

Table 10-2. DS3 Performance Monitoring (PM) Mode

	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 SEFS 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 VM or VMR mode. When the F&M bit or C-bit option (C-bit is Release 5.0 and later releases) is selected, network elements (NE) could be provisioned in VMR or VM mode. See Table 10-3.

Table 10-3. Enhanced DS3 Performance Monitoring Modes

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

  - — Errored Seconds (ES-P)

    ES-P are not counted during UAS. ES-P are counted and thresholded independently for each DS3 path terminated by the system.

— Severely Errored Seconds (SES-P)

A SES-P is a second in which 44 or more DS3 P-bit, adjusted F&M bit, or C-bit (C-bit is Release 5.0 and later releases) coding violations are detected. SES-P are not counted during UAS-P. SES-P are counted and thresholded independently for each DS3 path terminated by the system.

— Unavailable Seconds (UAS-P)

An "unavailable second" is a second during which the DS3 path is unavailable. A DS3 path is considered unavailable from the beginning of X consecutive SES-P until the beginning of Y consecutive seconds, none of which is severely errored. X is equal to 10 seconds or, in the case of a failure, the DS3 signal failure. A Y is equal to 10 seconds of no SES-P or DS3 signal failures. If there is an unprotected DS3 circuit pack failure, UAS-P are counted from within 1 second of circuit pack failure to within 1 second of circuit pack recovery. UAS-P are counted and thresholded independently for each DS3 path terminated by the system. This applies to P-bit, adjusted F&M bit, and C-bit (C-bit is Release 5.0 and later releases) options.

— Severely Errored Frame Seconds (SEFS)

SEFS are a count of the number of seconds during which an OOF or AIS condition exists for a DS3 signal received from the fiber, or the DSX-3, or during an unprotected DS3 circuit pack failure. SEFS are counted and thresholded independently for all DS3 interfaces provisioned in VM or VMR mode.

— Line Coding Violations (CV-L) (Release 5.0 and later)

This parameter is a count of B3ZS bipolar violations (BPV) occurring over the accumulation period. BPVs that are part of the zero substitution code are excluded.

— Errored Seconds LIne (ES-L) (Release 5.0 and later)

This parameter is a count of seconds containing one or more BPVs, or one or more LOS (from the DSX-3) defects.

— Severely Errored Seconds LIne (SES-L) (Release 5.0 and later)

This parameter is a count of seconds during which BPVs exceed 44, or one or more LOS defects occur.

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* T1.102-1993 (51.844 Mb/s rate, STSX-1 interconnect specification, B3ZS encoded and scrambled).

  Line buildout is provisionable as follows:

  — 734A/D: 0 to 450 ft.

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

  — 735A: 0 to 250 ft.

- Format Specification

  The EC-1 low-speed interface provides clear channel transport of any STS-1 signal compatible with the electrical STS-1 interface specifications in *ANSI* T1.102.

- Alarm Thresholding

  The following parameters are monitored at the EC-1 interface to the STSX-1:

  — LOS

  — LOF

  — LOP

  — Line AIS

  — B2 thresholding signal fail

  — B2 thresholding signal degrade.

  The alarm level for each of the monitored parameters can be provisioned for CR, MJ, MN, or status. B2 signal degrade thresholds are user settable in the range from 10^{-6} to 10^{-9} BER.

- 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/21G2-U and 21D/21D-U (IS-3) OLIUs. The 21G/21G-U/21G2-U OLIU is fully SONET compliant. The 21D/21D-U OLIU is a low-cost 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

The DDM-2000 OC-3 and OC-12 Multiplexers provide Lucent Technologies' universal optical connector on all OLIUs. The universal optical connectors are receptacles on the faceplate of the OLIUs that allow a single OLIU to support either *ST®*, FC-PC, or SC connectors as needed. Both 0 dB and attenuating buildouts are supported.

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 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 Lucent. See the "OC-12 Ordering — Miscellaneous Equipment and Tools" section of LTP 363-206-200 *DDM-2000 OC-3 and OC-12 Multiplexers Applications, Planning, and Ordering Guide*, for ordering information.

Long Reach OC-3 Interface (21G/21G-U/ 21G2-U OLIU)

- Optical Specification

  The 21G/21G-U/21G2-U OLIU photonics meet or exceed SONET specifications (TR 253, Iss. 2 - LR-1 MLM category). The multilongitudinal laser transmitter supplies an non return to zero (NRZ) coded signal. The PINFET receiver allows direct optical loopback without the use of an external attenuator, when the TRANSMIT POWER switch is on the low setting.

  The 21G/21G-U/21G2-U 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 Figure 10-1. Transmit and receive powers are referenced to points S and R as shown in Figure 10-1. Table 10-5 and Table 10-6 provide detailed specifications and link budget information for the 21G/21G-U/21G2-U OLIU.

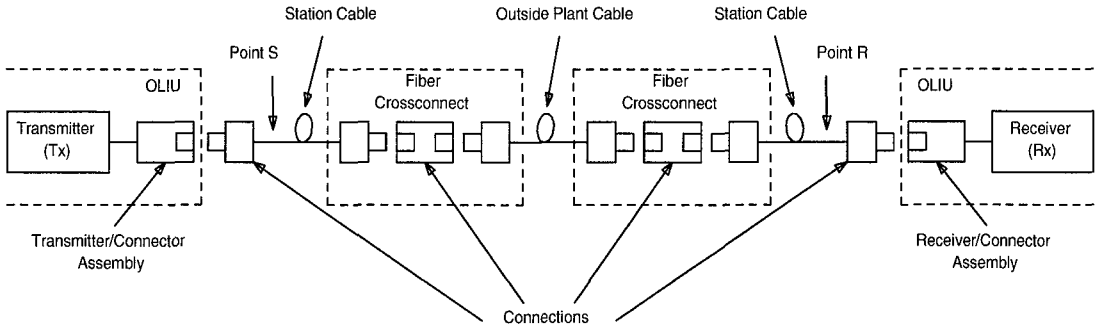


Figure 10-1. Optical System Interfaces (Points S and R)

- Alarm Thresholding

  The following parameters are monitored at the OC-3 interface.

  — LOS

  — LOF

  — LOP

- — Line AIS
- — B2 thresholding signal fail
- — B2 thresholding signal degrade.

B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.

- Performance Monitoring (see Table 10-14)
  - — Section severely errored frame seconds (SEFS)
  - — Line parameter B2
  - — Laser bias current (21G/21G-U only)
  - — Transmit power (21G/21G-U only)
  - — Receive power.

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

- Optical Specification

  The 21D/21D-U OLIU is a short-reach 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.

  Table 10-4, Table 10-5, and Table 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.

  - — LOS
  - — LOF
  - — LOP
  - — Line AIS
  - — B2 thresholding signal fail
  - — B2 thresholding signal degrade.

  B2 signal degrade thresholds are user settable in the range from 10^{-5} to 10^{-9} BER.

- Performance Monitoring (seeTable 10-14)
  - — Section SEFS
  - — B2 parameters.

Table 10-4 lists the 21G/21G-U/21G2-U and 21D/21D-U OLIU specifications.

Table 10-4. 21G/21G-U/21G2-U and 21D/21D-U OLIU Specifications

System Information:		
Terminal Equipment Identification	21G/21G-U/21G2-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 (21G/21G-U only)	No TEC
FDA Classification	Class I	Class I
Optical Source	InGaAsP Laser, MLM Structure	LED
Faceplate Optical Connector	Lucent *ST* C3000-A-2 (21G) UOC Buildout Assembly * (21G-U) Single Mode	Lucent *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	Lucent *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	21G2-U (Note 3)	21G/21G-U* (Note 2) Tx High	21G/21G-U* (Note 2) Tx Low	21D/21D-U/ 22D-U
Minimum Wavelength (l_{Tmin})	1282/1280* nm	1282/1280* nm	1282/1280* nm	1270/1260* nm
Maximum Wavelength (λ_{Tmax})	1325/1335* nm	1325/1335* nm	1325/1335* nm	1380 nm
Spectral Width ($\delta\lambda_{rms}$)	4.0 nm	4.0 nm	4 0 nm	170 nm ¶¶
Maximum Transmitter Power (P_{Tmax})	0.0 dBm	-2.5 dBm	-7.5 dBm	-14.0 dBm
Minimum Transmitter Power (P_{Tmin})	-5.0 dBm	-5.0 dBm	-11.4 dBm	-18.8/-21.8 dBm
Maximum Received Power (P_{Rmax})	0.0 dBm	-7 0 dBm	-7.0 dBm	-14.0 dBm
Minimum Received Power (P_{Rmin})	-34.0 dBm	-34.0 dBm	-34.0 dBm	-33.8/-31.8* dBm
Minimum System Gain (S-R)‡	29 0 dB	29.0 dB	22.6 dB	15/10.0* dB
Optical Path Penalty (P_O)§	1.0 dB	1.0 dB	1.0 dB	1.6 dB
Connector Loss¶	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Unallocated Margin**	1.5 dB	1.5 dB	1.5 dB	2.0 dB
Minimum Loss Budget	0.0 dBm	4.5 dB††	0.0 dB	0.0 dB
Maximum Loss Budget‡‡	**25.0 dB**	**25.0 dB**	**18.6 dB**	**9.9/4.9* dB**
Maximum Span Length§§	55 km	55 km	41 km	(Note 4)

Notes:

1. All terminology is consistent with TR-253, Iss. 2. All specifications for 21G/21G-U/21G2-U OLIU meets or exceeds long reach (LR) values described in TR-253, Iss. 2.
2. The High/Low transmitted power switch on the 21G/21G-U OLIU circuit pack allows for loopbacks or small outside plant (OSP) budgets without external attenuators.
3. The 21G2-U does not have a High/Low transmitter power switch. When transmitting from a 21G2-U to a 21G-U, 22F-U, 22D-U or 22G-U OLIU an external attenuator may be required. An attenuator is not required when transmitting to 22F2-U or 22G2-U OLIUs.
4. 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 (FWHM) spectral width.

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

	Maximum Span Length (km)	
Fiber Bandwidth	**21G/21G-U/21G2-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

Notes:

1. Maximum 21G/21G-U/21G2-U MM Link Budget (dB) for multimode operation is 22.0 dB for high power and 15.6 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	TEC
FDA Classification	Class I	Class I
Optical Source	InGaAsP Laser, MLM Structure	InGaAs Laser SLM Structure
Faceplate Optical Connector	Lucent Buildout Assembly* (23G) UOC Buildout Assembly † (23G-U) Single Mode	Lucent Buildout Assembly (23H)* UOC Buildout Assembly † (23H-U) Single Mode
Receiver Information:		
Optical Device Temperature Controller	None	None
Optical Detector	Ge APD/InGaAs PIN	InGaAs APD
Faceplate Optical Connector	*ST* C2000-A-2 (23G) UOC Buildout Assembly † (23G-U) Multimode	Lucent *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. For 23H-U loopback testing requiring 10 dB, use A3060D1 SC, A3070D1 *ST*, or A3080D1 *FC* attenuators as applicable.

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 (23H) –8.0 (23H-U) dBm
Minimum Received Power (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 (23H) 10.0 (23H-U) dB
Maximum Loss Budget§§	23.0/19.5 dB‡	27.2 dB‡
Maximum Span Length¶¶	51/43 km	100 km

Notes:.

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.

¶ 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 (23H) or 10 (23H-U) 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	21G2-U	22F/ 22F-U	22G-U*	22G2-U	21D/21D-U/ 22D-U	22F2-U
21G/21G-U (high power)	4.5	0.0	4.5	4.5	0.0	11.5	0.0
21G/21G-U (low power)	0.0	0.0	0.0	0.0	0.0	6.5	0.0
21G2-U	7.0	0.0	7.0	7.0	0.0	14.0	0.0
22F/22F-U/ 22F2-U	0.0	0.0	0.0	0.0	0.0	6.0	0.0
22G-U*	7.0	0.0	7.0	7.0	0.0	14.0	0.0
22G2-U	7.0	0.0	7.0	7.0	0.0	14.0	0.0
21D/21D-U/ 22D-U	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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

Note that the minimum link budget is not always symmetrical. A transmitter/ receiver pair may have one minimum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) OLIU transmitting to a 21D/21D-U (controlled environment) OLIU has a minimum link budget of 6.5 dB. In the opposite direction, though, a 21D/21D-U (controlled environment) OLIU transmitting to a 21G/21G-U (low power) OLIU has a minimum link budget of 0.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs.

NOTE:
When using universal optical buildout attenuators for OLIUs equipped with Universal Optical Connectors (for example, 22G-U and 22D-U), the buildout must have the same type fiber on both sides, that is, single-mode to single-mode or multimode to multimode. The buildout must also match the mode of the fiber. Therefore, when a single-mode jumper is used, the buildout would be on the transmit side (OUT) of the OLIU and when a multimode jumper is used, the buildout would be on the receive side (IN) of the OLIU. When using in-line attenuators for non-U OLIUs, place the attenuator in the bay frame PANDUIT. Make sure that the mode type of the attenuator matches the mode of the fiber to ensure proper attenuation.

Table 10-10 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

Table 10-10. OC-3 Rate OLIU Mixes — Maximum Link Budgets for SM Fiber (dB)

	Receiver					
Transmitter	21G/ 21G-U	21G2-U	22F	22G-U*/ 22G2-U	21D/21D-U/ 22D-U (Ctrld. Env.)	21D/21D-U/ 22D-U (Unctrld. Env.)
21G/21G-U (high power)	25.0	25.0	25.0	25.0	24.8	22.8
21G/21G-U (low power)	18.6	18.6	18.6	18.6	18.4	16.4
21G2-U	25.0	25.0	25.0	25.0	24.8	22.8
22F	15.0	15.0	15.0	15.0	14.8	12.8
22G-U*/22G2-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/22G2-U). The second column of margins applies to links having two IS-3 (21D/21D-U or 22D-U) OLIUs.

	At Least One OC-3 OLIU	IS-3 OLIUs Only
MM Optical Path Penalty (dB)	4.0	1.6
Connector Loss (dB)	1.5	1.5
Unallocated Margin (dB)	1.5	2.0

NOTE:
The maximum link budget is not always symmetrical. A transmitter/receiver pair may have one maximum link budget in one direction and another in the opposite direction. For example, a 21G/21G-U (low power) transmitting to a 22F has a maximum MM link budget of 15.6 dB. In the opposite direction, though, a 22F transmitting to a 21G/21G-U (low power) has a maximum SM link budget of 12.0 dB. Be careful of this asymmetry when planning and engineering a link having mixed OLIUs.

Table 10-11. OC-3 Rate OLIU Mixes—Maximum Link Budgets for MM Fiber (dB)

	Receiver					
Transmitter	21G/ 21G-U	21G2-U	22F	22G-U*/ 22G2-U	21D/21D-U/ 22D-U (Ctrld. Env.)	21D/21D-U/ 22D-U (Unctrld. Env.)
21G/21G-U (high power)	22.0	22.0	22.0	22.0	21.8	19.8
21G/21G-U (low power)	15.6	15.6	15.6	15.6	15.4	13.4
21G2-U	22.0	22.0	22.0	22.0	21.8	19.8
22F	12.0	12.0	12.0	12.0	11.8	9.8
22G-U*/22G2-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 DDM-2000 OC-3 and OC-12 Multiplexers provide Lucent's universal optical connector on all OLIUs. This connector is a two-part connector consisting of a faceplate-mounted block and an optical buildout. The faceplate block optionally supports an *ST*, SC, or FC-type optical buildout.

A 0 dB *ST*-type connector is shipped as standard with each OLIU. Optional SC, or FC 0 dB, or attenuated buildouts can be ordered separately as listed in Table 10-12. 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
A3060B1 SC 5 dB buildout	SM-SM	5	107406142
A3060D1 SC 10 dB buildout	SM-SM	10	107406159
A3060F1 SC 15 dB buildout	SM-SM	15	107406167
A3070 *ST*® 0 dB buildout	SM-SM & MM-MM	0	106795354
A3070B1 *ST* 5 dB buildout	SM-SM	5	107406183
A3070D1 *ST* 10 dB buildout	SM-SM	10	107406191
A3070F1 *ST* 15 dB buildout	SM-SM	15	107406209
A3080 FC 0 dB buildout	SM-SM & MM-MM	0	106795404
A3080B1 FC 5 dB buildout	SM-SM	5	107406225
A3080D1 FC 10 dB buildout	SM-SM	10	107406233
A3080F1 FC 15 dB buildout	SM-SM	15	107406241
A2060B SC 5 dB buildout	MM-MM	5	106795271
A2060D SC 10 dB buildout	MM-MM	10	106795289
A2060F SC 15 dB buildout	MM-MM	15	106795297
A2070B *ST* 5 dB buildout	MM-MM	5	106795313
A2070D *ST* 10 dB buildout	MM-MM	10	106795321
A2070F *ST* 15 dB buildout	MM-MM	15	106795339

SONET Overhead Bytes

The only use of SONET overhead bytes for proprietary signaling is the K2 byte for synchronization messaging. See Section 6, "System Planning and Engineering," for more information on synchronization messaging.

Performance

Wander/Jitter

- For SONET optical interfaces, the maximum time interval error (MTIE) does not exceed 60 nanoseconds phase variation when timed with a wander-free reference.
- Jitter transfer, tolerance, and generation requirements are met as specified in TR-253 and TR-499.
- 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, one-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 four 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.
- Line-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 line-timing reference, providing a temperature stability of ±8.8 ppm (–40°C to +75°C). 24-hour holdover stability will be better than ±4.6 ppm.

The DS1 timing output used for network synchronization (BBF2B only) provides long-term accuracy traceable to the OC-12 line. SONET synchronization messaging is used to output DS1 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 LOS, LOF, line AIS or a BER exceeding 10^{-3}, while a BER exceeding a provisionable threshold between 10^{-5} and 10^{-9} causes a signal degrade to be declared. 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 LOS, path 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

Table 10-13 lists the worst-case measured one-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

	Drop Interface			
Mode	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. PM parameters are provisionable via the CIT.

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-12 Optics	Laser Bias Current *	enable/disable	enable/disable	sect
OC-3 Optics	Optical Transmit Power *(21G/21G-U only)	-1 dB, -2 dB	-1 dB, -2 dB	sect
	Laser Bias Current* (21G/21G-U only)	enable/disable	enable/disable	sect
OC-12 Section	SEFS	1-63 [10]	1-4095 [30]	sect
OC-3 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)	1-4613 [461]	1-442848 [44285]	line
	B2 Errored Seconds (ES)	1-900 [40]	1-65535 [900]	line
	B2 Errored Seconds Type A (ESA)	1-900 [30]	1-65535 [90]	line
	B2 Errored Seconds Type B (ESB)	1-900 [30]	1-65535 [90]	line
	B2 Severely Errored Seconds (SES)	1-63 [20]	1-4095 [60]	line
	B2 Unavailable Seconds (UAS)	1-63 [30]	1-4095 [90]	line
	Line Protection Switch Counts (PSC-L)	1-63 [2]	1-255 [4]	line
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
DS3 Path †	P-bit Error Counts	1-4026 [403]	1-386500 [38650]	t3
	SEFS	1-63 [10]	1-4095 [30]	t3

Table 10-14. Performance Monitoring Parameters Provisionable via the CIT (Contd)

Enhanced DS3 Path for P-Bits, F&M Bits, and C-Bits from Fiber and DSX §	CV-P Coding Violations ES-P Errored Seconds SES-P Severely Errored Seconds UAS-P Unavailable Seconds SEFS	1-16383 [40] 1-900 [25] 1-63 [4] 1-63 [10] 1-63 [2]	1-1048575 [3820] 1-65535 [250] 1-4095 [40] 1-4095 [10] 1-4095 [8]	t3 t3 t3 t3 t3
DS3 Line ‡	CV-L Coding Violations Errored Seconds, Line (ES-L) Severely Errored Seconds, Line (SES-L)	1-16383 [40] 1-900 [25] 1-63 [4]	1-1048575 [3865] 1-65535 [250] 1-4095 [40]	t3 t3 t3

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

† Prior to Release 3.1.

‡ Release 5.0 and later releases.

§ DS3 path from the fiber Release 3.1 and later releases; DS3 path from the fiber and DSX and C-Bit option are Release 5.0 and later releases.

Operations Interfaces (OI)

This section presents the operations 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 CIT interface, the user panel, and the equipment indicators. DDM-2000 OC-12 Multiplexers support office alarms, parallel telemetry, user-definable miscellaneous discretes, serial (TBOS) telemetry interfaces, and TL1/X.25.

Craft Interface Terminal (CIT)

The system provides two EIA-232-D compatible CIT interfaces—a front access interface, configured as a DCE, and a rear access CIT interface, configured as a DTE—to allow a permanent modem connection without requiring a null modem. A null modem is required to connect an ASCII terminal to the DTE interface or a modem to the DCE interface. The CIT interfaces provide data rates of 300, 1200, 2400, 4800, 9600, and 19200 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 Connection

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)

A CIT is recommended for installation, maintenance, and administrative activities. A PC is required for software download and to run CPro-2000 software. 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 19200 baud and should be compatible with most *ANSI* 3.64 ASCII terminals; however, it is optimized for standard screens with display areas of 24 lines by 72 (or more) columns. A pager function is included in the DDM-2000 OC-12 Multiplexer to accommodate screen lengths from 3 lines to 150 lines.

Those CITs compatible with DDM-1000 (see 363-206-100 for a list of DDM-1000 compatible terminals) should be directly compatible with the DDM-2000 OC-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.

Personal Computer Specifications for Software Download

The PC used for software download software should have:

- A minimum of 640K of 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.

Compatible Modems

A compatible modem must meet the following minimum requirements:

- 300, 1200, 2400, 4800, 9600, or 19200 baud
- Full duplex
- 8 data bits
- No parity bits
- 1 start bit
- 1 stop bit
- No flow control.

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

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

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

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* Trademark of Paradyne Corporation.

† Registered trademark of Hayes Microcomputer Products, Inc.

‡ Registered trademark of Penril Corporation.

§ Trademark of NCR Corporation.

¶ Registered trademark of AT&T.

CPro-2000 Graphical User Interface and Provisioning Tool

The CPro-2000 Graphical User Interface and Provisioning Tool is a *Microsoft Windows*[*] based user interface that can optionally be used with the DDM-2000 OC-3 Multiplexer. The tool simplifies and mechanizes administration, maintenance, and provisioning operations. The CPro-2000 Graphical User Interface and Provisioning Tool supports DDM-2000 OC-3 Multiplexers, DDM-2000 OC-12 Multiplexers, and FT-2000 OC-48 Lightwave Systems. A minimum platform configuration is:

- 486 SX *IBM*[†] compatible desktop or laptop PC
- Disk drive — one 1.44 Megabyte (3.5 inch)
- Hard disk with at least 40 Megabytes of available space
- 8 Megabyte RAM
- *MS-DOS** operating system version 5.0 or later
- *Windows* version 3.1, *Windows* NT, or *Windows* 95
- Serial port (EIA-232-D) — configured as COM1 or COM2
- Mouse
- VGA color monitor.

CPro-2000 has been tested with AT&T, *NCR*, *IBM*, *NEC*[‡], and *Gateway*-2000[§] personal computers.

User Panel

The user panel contains red LEDs for CR and MJ alarms, yellow LEDs for MN and PMN alarms and for abnormal (ABN), far-end activity (FE-ACTY), and near-end activity (NE-ACTY) status. These LEDs are used in conjunction with the far-end identification (FE-ID) 7-segment display on the front panel of the adjacent SYSCTL circuit pack to provide CIT-less single-ended operations.

A green PWR ON LED is lit when the shelf is receiving –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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* Registered trademark of Microsoft Corporation.

† Registered trademark of International Business Machines Corporation.

‡ Registered trademark of Nippon Renki Kabushiki Kaisha.

§ Registered trademark of Gateway 2000, 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 CR, MJ, and MN alarms. Each contact closure is rated at 1 A, 60 V, maximum. The CR and MJ alarms can be wire-ORed. The CR alarm relays are fail-safe against unprotected power failures.

Serial Telemetry

Serial telemetry is provided using the TBOS protocol. TBOS telemetry provides detailed 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 OC-12 Multiplexers to monitor and control colocated equipment at the remote site. At the RT site, 21 alarm or status environmental inputs can monitor environmental conditions (for example, open door, high temperature); these inputs are activated by contact closures. The 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. Prior to Release 5.0, only 15 discretes were available. Four environmental control outputs are provided to control external equipment (for example, pumps or generators). The miscellaneous discrete outputs (control outputs at an RT, alarm/status outputs at a CO) tolerate –60 V maximum open circuit voltage and 35 mA maximum current. Transient voltages up to –135 V are tolerated for up to 1 ms. The miscellaneous discrete inputs (control inputs at a CO, alarm/status inputs an RT) provide –48 V nominal (–60 V maximum) open circuit voltage and 2 mA maximum current. The miscellaneous discrete output closures generated by the optoisolator require external voltage and ground to operate.

The 21 alarm or status inputs can be reported through a TL1/X.25 interface. The first 10 of these can also be reported through discrete telemetry outputs at the CO end. The first 15 of these inputs can also be reported through TBOS scan points.

Orderwire

The DDM-2000 OC-12 Multiplexer uses the E1 byte in the SONET overhead and provides a 64 Kb/s CMOS or 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 DDM-2000 OC-12 Multiplexer has been tested with the *DANTEL** Orderwire Assembly A18-04588-02.

See the "OC-12 Ordering — Miscellaneous Equipment and Tools" section for ordering information.

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 OSs, such as Bellcore's NMA and OPS/INE OSs. The DDM-2000 OC-12 Multiplexer TL1/X.25 interface is based on Bellcore TR-TSY-000833, Issue 5. The DDM-2000 OC-12 Multiplexer supports the X.25 permanent virtual circuits (PVCs) and switched virtual circuits (SVC) assigned as shown in Table 10-16.

* Registered trademark of Dantel, Inc.

Table 10-16. TL1/X.25 Interface — VC Assignments

PVC ID	SVC ID	Logical Group #	Logical Channel #	Use
1		0	1	Command/Response Messages and (User Definable §)
2		0	2	Autonomous Maintenance Messages, and Command/Response* Messages, and (User Definable §)
3 †		0	3	Autonomous Provisioning Messages (REPT DBCHG), Command/Response Messages, and (User Definable §)
	1 ‡	0	16	Autonomous Maintenance and Provisioning Messages, Command/Response Messages, and (User Definable §)
	2 §	0	17	User Definable §
	3 §	0	18	User Definable §
	4 §	0	19	User Definable §
	5 §	0	20	User Definable §
	6 §	0	21	User Definable §

* Release 2.0 and later.

† Release 2.1 (linear), 3.1 (rings), and later.

‡ Release 2.2 (linear), 3.1 (rings), and later.

§ Release 5.0 (rings) and later.

¶ Default values.

In Release 5.0 and later, DDM-2000 OC-12 supports the following OS types: tl1Maintenance, tl1MemoryAdministration, tl1Test, tl1PeerComm, tl1Other1, tl1Other2, and tl1CR. Any TL1 autonomous message can be mapped to any OS type (except tl1CR, which is command/response only). Also, in Release 5.0, DDM-2000 OC-12 supports nine VCs and any of these VCs can be active at a given time. In addition, any of the OS types can be mapped to any of the nine VCs.

At the packet layer, DDM-2000 OC-12 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	128 bytes * or 256 bytes
Window Size	2 packets
D bit support	NO
M bit support	YES

* Release 5.0 (rings) and later.

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 Multiplexers use synchronous, full duplex, and continuous carrier communication. Data rates of 1200, 2400, 4800, 9600, and 19200 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	Transmitted 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 (Group 1)
  Dimensions: 14 in. H x 21.25 in. W x 13.25 in. D (Group 4)
- Weight (Max.): 83 lb. (38 kg)
- Appearance: Coordinated with other equipment in the Lucent 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 Lucent 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 Lucent 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 Lucent, 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.

* Registered trademark of National Fire Protection Association, Inc.

† Registered trademark of National Standards Institution, Inc.

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 drain.

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
Ring Shelf * E/W 21G/21G-U OLIU (4 OC-3)	211	4.4	5.3
DDM-2000 Fan Shelf	53	1.1	1.3

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

The following items should be noted:

- 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 –40.0 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, 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 two-way channel within a SONET multiplexer should be less than 1.75 minutes per year in a CO environment* and 5.25 minutes per year in a RT environment.† Bellcore *objectives* for outages are 0.25 minutes per year for the CO‡ and 0.75 minutes per year for RT environments.§

The outage requirements and objectives apply to any part of the product needed to process an incoming high-speed or low-speed signal (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 Table 10-22 and Table 10-23, respectively.

Operation System Interface Availability

The Bellcore objective states that the OS outage should be less than 28 minutes per year (50 percent hardware, 50 percent software).* Therefore, the objective applies to the TBOS and TL1/X.25 interfaces. This objective applies to circuitry needed to maintain communication from the DDM-2000 OC-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 one-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. †

DDM-2000 OC-12 Multiplexer circuit packs are subjected to an environmental stress testing (EST) program. The purpose of the program is to eliminate early life failures, conduct failure mode analysis on defective circuit packs, and use corrective action to make the product more reliable. All new circuit pack codes in manufacturing are subjected to EST. However, based on field return data, when

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

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

the early life failures for any circuit pack codes have been minimal and the infant mortality factor is below 2.5, these circuit pack codes may be subjected only to sampling EST.

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 two-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 environment.

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

Circuit Pack	CO		RT	
	FITS (Note 2)	MTBF (Years)	FITS (Note 2)	MTBF (Years)
BBF2B (TGS)	2311	49.40	3467	32.93
BBG5 (SYSCTL)	5284	21.60	7926	14.40
BBG8 (SYSCTL)	12806	8.91	19208	5.94
BCP1 (OHCTL)	5050	22.61	7575	15.07
BCP2 (TSI)	2922	39.07	4383	26.05
BCP3 (TSI)	2692	42.41	4038	28.27
BCP4 (OHCTL)	19240	5.93	28860	3.96
BBG11 (3DS3)	3144	36.31	4716	24.21
BBG11B (3DS3)	3144	36.31	4716	24.21
BBG12 (3STS1E)	2586	44.14	3879	29.43
21D/21D-U (OLIU)	1599	71.39	2399	47.59
21G-U/21G2-U (OLIU)	6348	17.98	9522	11.99
23G (OLIU)	10029	11.38	15044	7.59
23G-U (OLIU)	9023	12.65	13535	8.43
23H (OLIU)	12836	8.89	19254	5.93
23H-U (OLIU)	11552	9.88	17328	6.59

Notes:

1. Calculations are based on Bellcore RPP Issue 4 data. All KS and Lucent components considered as quality level III. All components evaluated at 40°C ambient and 50 percent electrical stress.
2. FITS is the number of failures per billion hours of operation (10^9).

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.

Commands and Reports

11

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Commands and Reports

11

Overview

This chapter describes the command and report features of the American Standard Code for Information Interchange (ASCII) terminal interface to a DDM-2000 OC-12 Multiplexer. It provides detailed information about each command, as well as system report outputs and explanations.

Command Page Format

This chapter includes DDM-2000 commands that are presented as one- or multiple-page entries in alphabetical order. The name of each command appears at the top of each page.

Each entry is presented in a common format:

- The **NAME** part gives the name of the command and summarizes its function.
- The **INPUT FORMAT** 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. Some commands are not affected by any other command and will not have this part included on the command page.

Entries which are to be typed exactly as shown are printed in `bold type`. System responses are printed in `courier type`. Descriptive names 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 an address, it must appear immediately after the command name.

Parameters identifies a variable name assigned to some provisionable attribute of the command. The value of the parameter is defined on each command page.

Parameters are separated with commas (,). The parameters may be entered in any order, but they must be entered in the *name=value* format.

Brackets ([ ]) are not part of the command line. Parameters enclosed in brackets are optional. Default values are provided for these parameters.

Any command can be entered on a single line.

DDM-2000 is case 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. Where lists of items appear in braces { }, any one (and only one) of these items may be used to form the address.

Each address is made up of several components that are combined to indicate a specific location on the DDM-2000. The following list shows the potential values for each address component. Refer to this list when reviewing Table 11-1.

slot type: Possible values are: `main, m, fn, ls, tg, sysctl, auxctl, tsi, userpanel,` and `all`.

group: Possible values are: `m, a, b, c, d,` and `all`.

Note carefully in the Table 11-1 when this value is followed by a dash (—) and when it is not.

slot within a group (abbreviated as slot):
Possible values are: `1-8,` and `all`.

line: Possible values are: `1, 2,` and `all`.

This identifies a line within a slot. Note carefully in Table 11-1 when `all` is not allowed.

STS-1: Possible values are: `1-12,` and `all`.

special: Possible values are: `cit, dcc, tbos, partlm, x25, env, cont,` and `ref`.

environmental alarm or control point (abbreviated as alm/cont point):
Possible values are: `1-21,` and `all`.

Table 11-1. DDM-2000 OC-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-alll 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	all main-{b,all}	all main-b
	OC-12 line	all main-b-{1,2,all}	all main-b-1
	OC-3 line pair	all fn-{a,b,c,d,all}	all fn-b
	OC-3 line	all fn-{a,b,c,d,all*}-{1,2,all}	all fn-c-2
Ports	DS3 port	{a,b,c,d,all*}-{1-3,all}	a-2
	DS1 sync. ref. port	ref-{1,2}	ref-1
	EC-1 port	{a,b,c,d,all*}-{1-3,all}	b-3
Channels	STS-1 channel (within OC-12)	{mb,all*}-{1-12,all}	mb-4
	STS-3c channel (within OC-12)	mb-{1,4,7,10,all} mb{1,2}-{1,4,7,10,all}	mb-4 mb1-2
	STS-1 channel (within OC-3)	{a,b,c,d,all*}-{1-3,all}	c-all b-3

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

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

Object	Entity	Address	Example
STS-1 Cross-connections	Main	mb-{1-12,all}	mb-4
	Function unit	{a,b,c,d}-{1-3,all}	a-2
	3STS1E port	{a,b,c,d}-{1-3,all}	b-1
	3DS3 port	{a,b,c,d}-{1-3,all}	a-2
	Function unit (OLIU)	{a,b,c,d}-{1-3,all}	d-3
Operation Interfaces	User panel	userpanel	userpanel
	CIT	cit-{1,2,all}	cit-1
	Section data comm. channel	dcc-{m,a,b,c,d,all} (Linear fecom/security) dcc-{m,a,b,c,d,all*}{1,2} (Rings, fecom only) dcc-all (Rings security)	dcc-mb dcc-mb2 dcc-all
	TBOS	tbos-1	tbos-1
	Parallel telemetry	partlm	partlm
	X.25 link	x25	x25
	Env. alarm input	env-{1-21,all}	env-1
	Env. control input	cont-{1-4,all}	cont-1

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

The 2000 Product Family includes many SONET products that are capable of interworking with each other. At times, references to other SONET products may appear in DDM-2000 reports. The following list shows standard abbreviations for the various members of the 2000 Product Family.

Complete Product Name	Abbreviated Product Name
unknown	unknown*
DDM-2000 OC-3	DDM-OC3
DDM-2000 OC-12	DDM-OC12
DACS IV-2000	DACS-IV
FT-2000	FT-2000
SLC®-2000 Access System	SLC-2000
DDM-2000 FiberReach	FbrRch
Foreign	Foreign†

* Indicates the type of product is unknown.
† Indicates that the product is not compatible with other SONET products.

Command Mode and Prompt Mode

There are two entry modes: command mode (no prompts) and prompt mode. In the command mode (the default), the command line and any user responses are terminated by the semicolon (;) or carriage return (<CR>).

The prompt mode is designed for users that are not familiar with DDM-2000. To enter the prompt mode, terminate any line with a carriage return (ENTER or RETURN key) or question mark (?). Prompts generally appear in the form:

```
Prompt Message [Default value]=
```

with the default value enclosed in square brackets ([. .]). There are two types of default values:

Static default values, which assume the same value each time the command is invoked

Current default values, which reflect the 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 is used to erase character input.
- At sign (@) is used to erase an entire line of input.
- Question mark (?) is used to get help and to enter prompt mode at any time.
- Comma (,) is used to separate parameters from each other.
- Equal sign (=) is used to separate parameter names from parameter values.
- Control T (^T) is the `toggle` command. See the `toggle` command page for additional details.
- Carriage return (ENTER or RETURN key) or exclamation point (!) are used to end a line of input.
- Semicolon (;) is used to end a command. The system will use default values for all optional parameters for which a value has not been given.
- CANcel, DELete, and CTRL-x are used to abort a command which has been entered but has not yet started to execute. All commands can be aborted anytime before the "In Progress...." message is printed. Test commands (except `test-sysctl`) can be aborted at any time during execution using these keys. Reports may be aborted at any time using these keys.
- Colon (:) is used to separate the command name, address, and parameters.

Paged Reports

Reports are paged. When the end of the page has been reached, the prompt "`more? [yes]=`" is displayed if more report text remains. Page length can be set with the `set-link` command.

Confirmation Requests

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 or CANcel/DELete to quit) =`" is printed. To execute the command, enter "y" and carriage return. To change the value of any of the parameters, enter "n" and carriage return and you will be reprompted for all parameters. To abort the command, enter CANcel or DELete.

Output Descriptions

The output for most commands is described on the following manual pages. Refer to the "Detailed Alarm and History Reports" part of this section for more complete examples and explanations of the alarm and status report (`rtrv-alm`) and the history report (`rtrv-hsty`).

Alarm Level Prompt

When the system is ready to accept a new command, it prints the system prompt "<". If there is an active alarm or status condition, the level of the highest level active alarm in the system is printed before the "<". For example, the system prompt is "MN <" when a minor alarm condition exists in the system.

Security

The option of system security is provided for DDM-2000 systems. Three privileged user logins and a maximum of 100 nonprivileged user logins, consisting of general users , maintenance users, and Reports-Only users, are available. Privileged users may set system security on 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. Maintenance users may only execute commands that access the system, extract reports, and execute maintanance functions. Reports-Only users may only obtain reports and execute several basic commands.

When system security is enabled, all users are then required to enter a valid login and password pair to access the system.

The following commands are always restricted to privileged users only:

- `init-sys` (initialize system)
- `rstr-passwd` (restore password)
- `rtrv-lgn` (retrieve login)
- `rtrv-passwd` (retrieve passwords)
- `set-fecom` (set far-end communication)
- `set-lgn` (set login)
- `set-secu` (set security)
- `set-feat` (set feature)
- `set-sync` (set synchronization)

When security is enabled on a system, the following commands become restricted to privileged users only:

- `cpy-prog` (copy program)
- `dlt-osacmap` (delete OS application context ID map entry)
- `dlt-tadrmap` (delete TID address map)
- `ent-osacmap` (enter OS application context ID map entry)
- `ent-ulsdcc` (enter upper layer section DCC)
- `ent-tllmsgmap` (enter TL1 message map for Operations Systems)
- `init-pm` (initialize performance-monitoring)
- `ins-prog` (install program)
- `reset` (reset system software)
- `set-date` (set date)
- `set-ne` (set network element)
- `set-x25` (set X.25 link)

When security is enabled on a system, only the following commands may be executed by Reports-Only users:

- `?` (help)
- `logout` (log out)
- `rlgn` (remote login)
- `set-link` (set link)
- `set-passwd` (set password)
- `^T` (toggle)
- all `rtrv` commands except `rtrv-lgn` and `rtrv-passwd`.

Refer to the `set-secu` command for more details on system security.

DDM-2000 OC-12 Command Menu

Table 11-2 lists the DDM-2000 OC-12 commands by category and indicates what type of user is able to execute each command.

Table 11-2. DDM-2000 OC-12 Command Menu

Command Category	Verb	Modifier	Security Level
CONFIGURATION	rtrv-	alm	Privileged, General, Maintenance, Reports-Only
		state	Privileged, General, Reports-Only
		state-eqpt	Privileged, General, Maintenance, Reports-Only
		state-path	Privileged, General, Maintenance, Reports-Only
		state-sts1	Privileged, General, Maintenance, Reports-Only
		state-sts3c	Privileged, General, Maintenance, Reports-Only
		state-oc3	Privileged, General, Maintenance, Reports-Only
		eqpt	Privileged, General, Maintenance, Reports-Only
		feat	Privileged, General, Maintenance, Reports-Only
		fecom	Privileged, General, Maintenance, Reports-Only
		hsty	Privileged, General, Maintenance, Reports-Only
		oc3	Privileged, General, Maintenance, Reports-Only
		oc12	Privileged, General, Maintenance, Reports-Only
		t3	Privileged, General, Maintenance, Reports-Only
		ec1	Privileged, General, Maintenance, Reports-Only
		sync	Privileged, General, Maintenance, Reports-Only
		link	Privileged, General, Maintenance, Reports-Only

Table 11-2. DDM-2000 OC-12 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
CONFIGURATION (Continued)	rtrv-	attr-alm	Privileged, General, Maintenance, Reports-Only
		attr-cont	Privileged, General, Maintenance, Reports-Only
		attr-env	Privileged, General, Maintenance, Reports-Only
		ne	Privileged, General, Maintenance, Reports-Only
		map-neighbor	Privileged, General, Maintenance, Reports-Only
		map-network	Privileged, General, Maintenance, Reports-Only
		osacmap	Privileged, General, Maintenance, Reports-Only
		crs-sts1	Privileged, General, Maintenance, Reports-Only
		ulsdcc	Privileged, General, Maintenance, Reports-Only
		sts1	Privileged, General, Maintenance, Reports-Only
		sts3c	Privileged, General, Maintenance, Reports-Only
		tl1msgmap	Privileged, General, Maintenance, Reports-Only
		trace-sts1	Privileged, General, Maintenance, Reports-Only
		x25	Privileged, General, Maintenance, Reports-Only
	set-	oc1	Privileged, General
		oc3	Privileged, General
		t3	Privileged, General
		ec1	Privileged, General
		sync	Privileged
		date	Privileged only if Security enabled. Privileged, General if Security disabled.
		link	Privileged, General, Maintenance, Reports-Only

Table 11-2. DDM-2000 OC-12 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
CONFIGURATION (Continued)	set-	attr-alm	Privileged, General
		attr-cont	Privileged, General
		attr-env	Privileged, General
		ne	Privileged only if Security enabled. Privileged, General if Security disabled.
		state-t3	Privileged, General
		state-ec1	Privileged, General
		state-oc3	Privileged, General
		state-sts1	Privileged, General
		state-sts3c	Privileged, General
		fecom	Privileged
		feat	Privileged
		sts1	Privileged, General
		sts3c	Privileged, General
		trace-sts1	Privileged, General
		vt1	Privileged, General
		x25	Privileged only if Security enabled. Privileged, General if Security disabled.
	upd		Privileged, General
	init-	sys	Privileged
	switch-	line	Privileged, General, Maintenance
		tsi	Privileged, General, Maintenance
		fn	Privileged, General, Maintenance
		sync	Privileged, General, Maintenance
		path-sts1	Privileged, General, Maintenance
		path-sts3c	Privileged, General, Maintenance
	opr-	lpbk-t3	Privileged, General, Maintenance
		lpbk-ec1	Privileged, General, Maintenance
	rls-	lpbk-t3	Privileged, General, Maintenance
		lpbk-ec1	Privileged, General, Maintenance

Table 11-2. DDM-2000 OC-12 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
CONFIGURATION (Continued)	test-	trmsn-t3	Privileged, General, Maintenance
		alm	Privileged, General, Maintenance
		led	Privileged, General, Maintenance
		sysctl	Privileged, General, Maintenance
		tlm-par	Privileged, General, Maintenance
		tlm-ser	Privileged, General, Maintenance
	ins-	prog	Privileged only if Security enabled. Privileged, General if Security disabled.
	ent-	crs-sts1	Privileged, General
		ulsdcc	Privileged only if Security enabled. Privileged, General if Security disabled.
		tl1msgmap	Privileged only if Security enabled. Privileged, General if Security disabled.
		osacmap	Privileged only if Security enabled. Privileged, General if Security disabled.
	dlt-	crs-sts1	Privileged, General
		crs-sts3c	Privileged, General
		tadrmap	Privileged only if Security enabled. Privileged, General if Security disabled.
		osacmap	Privileged only if Security enabled. Privileged, General if Security disabled.
	cpy-	prog	Privileged only if Security enabled. Privileged, General if Security disabled.
FAULT	rtrv-	alm	Privileged, General, Maintenance, Reports-Only
		state-eqpt	Privileged, General, Maintenance, Reports-Only
		state-path	Privileged, General, Maintenance, Reports-Only
		eqpt	Privileged, General, Maintenance, Reports-Only
		hsty	Privileged, General, Maintenance, Reports-Only
	opr-	aco	Privileged, General, Maintenance
	reset		Privileged only if Security enabled. Privileged, General if Security disabled.

Table 11-2. DDM-2000 OC-12 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
PERFORMANCE	rtrv-	pm-tca	Privileged, General, Maintenance, Reports-Only
		pm-sect	Privileged, General, Maintenance, Reports-Only
		pm-line	Privileged, General, Maintenance, Reports-Only
		pm-t3	Privileged, General, Maintenance, Reports-Only
		pm-sts1	Privileged, General, Maintenance, Reports-Only
		pmthres-sect	Privileged, General, Maintenance, Reports-Only
		pmthres-line	Privileged, General, Maintenance, Reports-Only
		pmthres-sts1	Privileged, General, Maintenance, Reports-Only
		pmthres-t3	Privileged, General, Maintenance, Reports-Only
		alm	Privileged, General, Maintenance, Reports-Only
		state-eqpt	Privileged, General, Maintenance, Reports-Only
		state-path	Privileged, General, Maintenance, Reports-Only
		eqpt	Privileged, General, Maintenance, Reports-Only
		hsty	Privileged, General, Maintenance, Reports-Only
	set-	pmthres-sect	Privileged, General, Maintenance, Reports-Only
		pmthres-line	Privileged, General, Maintenance, Reports-Only
		pmthres-sts1	Privileged, General, Maintenance, Reports-Only
		pmthres-t3	Privileged, General, Maintenance, Reports-Only
	init-	pm	Privileged only if Security enabled. Privileged, General if Security disabled.

Table 11-2. DDM-2000 OC-12 Command Menu (Contd)

Command Category	Verb	Modifier	Security Level
SECURITY	rtrv-	lgn	Privileged
		secu	Privileged, General, Maintenance, Reports-Only
		passwd	Privileged
	set-	lgn	Privileged
		secu	Privileged
		passwd	Privileged, General, Maintenance, Reports-Only
	rstr-	passwd	Privileged
MISCELLANEOUS	help		Privileged, General, Maintenance, Reports-Only
	logout		Privileged, General, Maintenance, Reports-Only
	rlgn		Privileged, General, Maintenance, Reports-Only
	toggle		Privileged, General, Maintenance, Reports-Only

Starting a CIT Session

Procedures in the "Operation and Maintenance" section of this manual describe how to "Connect a CIT and Establish a Session" with the DDM-2000.

CPro-2000

CPro-2000 is a software package from Lucent Technologies to help users of DDM-2000 Multiplexer systems set up and use an advanced, yet simple, craft operations environment on a personal computer using *Microsoft* Windows** 3.1 in the enhanced mode. CPro-2000 provides the user with the normal CIT access to DDM-2000 as well as a mouse-driven graphical user interface (GUI). The user may issue commands to DDM-2000 by using the mouse to select items from a menu and/or objects from the graphics display.

CPro-2000 Release 1.0 supports OC-3 software releases. CPro-2000 Release 2.0 supports OC-3 and OC-12 software releases, as well as FT-2000 Release 5.0. CPro-2000 Release 2.1 includes all of the releases supported by 2.0 and FT-2000 Release 6.0. CPro-2000 Release 3.0 includes support for DDM-2000 FiberReach. For complete iinformation on CPro-2000, refer to 190-523-101 and/or 365-576-1xx, *CPro-2000 User Manual.*

Commands

The following pages provide detailed information about the user interface commands supported by DDM-2000. Detailed report information is located at the end of this chapter.

* Registered trademark of Microsoft Corporation.

NAME

apply: Locally Overwrite the Executing Software Generic with a New Software Generic

INPUT FORMAT

```
apply;
```

DESCRIPTION

This command can be issued by the user to initiate the installation of a dormant copy of a software generic stored in the network element's flash memory; therefore replacing the currently executing software generic.

Once the `apply` command completes, the software in memory is left undisturbed, so that it can be copied to other similar network elements.

CAUTION:
Normal alarming and protection switching are disabled for the DDM-2000 system while this command is used to copy the dormant program.

NOTE 1:
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.

NOTE 2:
When the `apply` command is submitted, a thirty minute delay is automatically started before the command begins executing.

Users can remotely apply the dormant software generic to be the executing one by first remotely logging into the target network element and then initiating this command.

If security is enabled and this command is entered by a non-privileged user, the following denial message is displayed:

```
PICC
/* Privileged, Illegal Command Code  */
```

If the command syntax is correct, the following message will be displayed:

```
/* Testing for program copy ..  */
```

If this command is issued and the dormant copy of software generic is either missing (does not reside in the flash memory) or is determined to have been corrupted, the following denial message is displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Dormant file corrupted or missing. */
```

After testing for program apply, the following confirmation message will be displayed:

```
/* Caution! Execution of this command will erase the current
   generic n.n.n at Target Identifier and replace it with
   generic m.m.m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful
   This command will terminate any active CIT and TL1 sessions.
   This command will take time to install the new program.  Check
   the Software Release Description for the time estimates. */


Execute? (y/n or CANcel/DELete to quit) =
```

When this command is used to install a new release of program that is significantly different from the program currently running on the system, the following confirmation message will be displayed after testing for program apply:

```
/* Caution! Execution of this command will erase the current
   generic n.n.n at Target Identifier and replace it with
   generic m m.m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful.
   This command will terminate any active CIT and TL1 sessions.
   Check the Software Release Description for the time estimates. */

/* Caution! Major changes exist between these two generics such
   that they may not be compatible.  Check the TOPS and program
   compatibility information for additional information or actions
   needed. */


Execute? (y/n or CANcel/DELete to quit) =
```

When the user gives a positive response to the confirmation message, the following message is displayed:

```
In progress; Program installation will start in 30 minutes
System will Reset when program installation is complete.
```

After displaying the above message, the program apply is to begin thirty minutes after the issuing of this command. Once the new generic is installed, the system will reset and wait for the user to login again.

If the program apply fails, the following failure message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Program apply failed. Target Identifier
   will restart its current program, if possible
   Before attempting another apply, check the User's Manual
   to review a list of possible problems and their solutions. */
```

RELATED COMMANDS

cpy-prog

ins-prog

rtrv-ne

NAME

cpy-prog: Copy Program

INPUT FORMAT

`cpy-prog:`*`TID;`*

DESCRIPTION

NOTE:
Starting with OC-12 Release 5.1, the copy function of this command has changed to a 2-step process. Please read this command page carefully to understand how each software release operates.

For OC-12 Release 5.0 and earlier:

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.

For OC-12 Release 5.0 and earlier, This command copies the system controller program from the local network element to a remote network element.

The controller program is copied directly from the local controller's memory to a remote controller's memory. The local and remote systems must have DCC connectivity.

This command provides remote program copy capability from the local controller's memory to a remote controller's memory. The `ins-prog` command has been enhanced to support local program installation to a network element from a personal computer (PC) connected to the CIT port of the target system.

The `ins-prog` command also supports a remote program installation to a DDM-2000 OC-3 or a DDM-2000 FiberReach system from a PC connected to the CIT port of another DDM-2000 or *SLC*®-2000 system.

NOTE:
For OC-12 Release 5.0 and earlier, If security is enabled on any CIT or DCC port on a system, then this command is available to privileged users only for all CIT or DCC ports on the system. If security is not enabled on *some* systems in the network, users on unsecured systems will be able to copy controller program onto systems with security enabled.

For OC-12 Release 5.1 and later:

Starting with DDM-2000 OC-12 Release 5.1, the software to be copied may be a non-executing, dormant copy of a software generic. When executing this command, the local network element will internally check whether the currently executing software generic or a dormant software generic should be copied into the memory of the target network element, where it would reside as a dormant copy also. To review this command's functionality in OC-12 Release 5.0 and earlier, the user should refer to the beginning of this command page or the appropriate User/Service Manual.

The `apply` command is used later to overwrite the currently executing generic with a copy of the generic included in the dormant software.

NOTE:
If security is enabled on any CIT or DCC port on a system, then this command is available to privileged users only for all CIT or DCC ports on the system. If security is not enabled on *some* systems in the network, users on unsecured systems will be able to copy either executing or dormant program onto systems with security enabled.

The input parameter is:

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

If the command syntax is correct, the following message will be displayed:

```
/* Testing for program copy ..  */
```

If the system name specified is the name of the local system instead of the remote system, the following error message will be displayed and the user will be asked to reenter the TID.

```
/* Invalid Target Identifier (TID) */
/* Enter the name (TID) of the far end system. */
TID=
```

If the system name specified is unknown to the local system, the following error message will be displayed and the user will be asked to reenter the TID.

```
/* Unknown Target Identifier (TID) */
/* Enter the name (TID) of the far end system. */
TID=
```

If the system name specified currently has a duplicate TID alarm condition, the following denial message will be displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* Duplicate Target Identifier  */
```

If a user attempts to copy program from one product type to a different product type (for example, DDM-2000 OC-12 program into an FT-2000 system), the following denial message will be displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* <TID> is a different product type;
   Incompatible software  */
```

The above message is displayed before any association is established between the local and target network elements (NEs).

If the remote system has a communication failure or a "P" is displayed in the SYSCTL 7-segment LED display, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication failure. */
```

For OC-12 Release 5.1 and later releases, if the dormant copy is either corrupted or not found, and it is the only software generic that can be copied (the executing release and the dormant release have different release numbers), the following denial message is displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Dormant file corrupted or missing  */
```

A user should not attempt to copy program from an OC-12 shelf using Release 5.1 or later (a release capable of receiving, storing, or sending compressed files) into a remote OC-12 shelf using Release 5.0 or earlier (a release that is not capable of receiving compressed files). The currently executing software generic cannot be copied to the destination network element because it has a different release number from the dormant copy. The copy request will be denied and the following message is displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Execute APPLY command locally first and then try again. */
```

The above request is denied because no copy from the source NE to the destination NE is possible until the executing software release number matches the dormant software release number. To correct this problem, the `apply` command must be issued in the source NE first before trying again.

After testing for program copy, the following confirmation message will be displayed for OC-12 Release 5.0 and earlier:

```
/* Caution! Execution of this command will erase the current
   generic n.n.n at Target Identifier and replace it with
   generic m.m m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful.
   This command will terminate any other active CIT sessions.
   This command will take time to install the new program.  Check
   the Software Release Description for the time estimates  */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 Release 5.1 and and later, The following confirmation message will be displayed:

```
/* Caution! Execution of this command will overwrite the current
   dormant generic (if any) at Target Identifier. */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 Release 5.0 and earlier, When this command is used to copy a new release of program that is significantly different from the program currently running on the system, the following confirmation message will be displayed after testing for program copy:

```
/* Caution! Execution of this command will erase the current
   generic n.n.n at Target Identifier and replace it with
   generic m m.m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful.
   This command will terminate any other active CIT sessions
   This command will take time to install the new program.  Check
   the Software Release Description for the time estimates. */

/* Caution! Major changes exist between these two generics such
   that they may not be compatible   Check the TOPS and program
   compatibility information for additional information or actions
   needed. */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 Release 5.1 and and later, when this command is used to copy a new release of program (into the dormant memory of remote system) that is significantly different from the program currently running on the system, the following confirmation message will be displayed after testing for program copy:

```
/* Caution! Execution of this command will overwrite the current
   dormant generic (if any) at Target Identifier. */

/* Caution! Major changes exist between these two generics such
   that they may not be compatible.  Check the TOPS and program
   compatibility information for additional information or actions
   needed. */

Execute? (y/n or CANcel/DELete to quit) =
```

See "Install New Generic Program" in the TOP section of this manual for complete instructions before using this command. Use the `rtrv-map-network` command to obtain the exact TID for the target system. The current program version may also be obtained from the initial screen when logged into the system with a craft interface terminal (CIT).

When the user gives a positive response to the confirmation message, the program copy begins and the following message is displayed:

```
In progress  ..  ... ... ........  .......  ... ...... ....
```

The number of dots and how fast they are displayed depend on the size of the program to be copied, number of DCC spans between the local and remote systems, and DCC traffic.

When the program has successfully been copied to the remote system, the following message is displayed:

```
/* Generic program m.m m is copied. */
```

For OC-12 Release 5.1 and and later, if this command experiences memory space problems at the target network element (that is, the software will not fit in the space allocated in flash memory reserved for it), the currently executing software generic will be overwritten.

If the program copy fails, the following failure message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Program copy failed to Target Identifier
   Before attempting another copy, check the User's Manual
   to review a list of possible problems and their solutions. */
```

RELATED COMMANDS

rtrv-map-network

rtrv-ne

ins-prog

NAME

dlt-crs-sts1: Delete Cross-Connection STS-1

INPUT FORMAT

`dlt-crs-sts1:`*`Address1`*`,`*`Address2`*`[:`*`cct`*`=CrsType];`

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command deletes STS-1 cross-connections.

This command is available with all OC-12 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-3 port. 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 the cross-connection type. The valid values are:

`twoway` Two-way cross-connections apply to terminating, hubbing, add/drop, hairpin, pass-through, 0x1 ring, and 0x1 DS3 configurations. This is the default value.

`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, 21-type OLIU or 3DS3 low-speed circuit packs.

NOTE:
The *`cct`* parameter is an optional parameter if the cross-connection type to be deleted is `twoway`. The *`cct`* parameter is required for other CrsType values.

Address1, *Address2*, and *CrsType* must match an existing STS-1 cross-connection, or execution of the command will complete with the following message:

```
/* The specified STS-1 cross-connection does not exist
   and cannot be deleted  */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution!  Execution of this command may affect service.
   You have selected the dlt-crs-sts1 command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

ent-crs-sts1

rtrv-crs-sts1

NAME

dlt-crs-sts3c: Delete Cross-Connection STS-3c

INPUT FORMAT

`dlt-crs-sts3c:`*`Address1`*`,`*`Address2`*`[:cct=CrsType];`

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command deletes STS-3c cross-connections. STS-3c signals are identified by the first STS-1 address in the STS-3c signal. The following chart shows the mapping for STS-3c addresses to the internal STS-1 signal structure:

STS-3c Mapping

Interface	Address	Internal STS-1 #s
Main-b	mb-1	1,2,3
	mb-4	4,5,6
	mb-7	7,8,9
	mb-10	10,11,12
FN-A	a-1	1,2,3
FN-B	b-1	1,2,3
FN-C	c-1	1,2,3
FN-D	d-1	1,2,3

This command is available with OC-12 ring releases.

The input parameters are:

`Address1` and *`Address2`*

These are the addresses of the two STS-3c channels that are to be deleted. In OC-12 ring releases, the cross-connect mode is automatically set to manual (`crs=`*`manual`*) and cannot be changed. Valid connections are listed below. Where items appear in braces { }, any one (and only one) of these items may be used to form the address.

```
mb-{1,4,7,10} to {a,b,c,d}-1

mb-{1,4,7,10} to mb-{1,4,7,10}
```

For pass through signals, Address1 and Address2 must be the identical time slot.

cct CrsType specifies whether the cross-connection is two-way , drop and continue, or for video applications at CO and RT sites. 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.
`cov`	Video cross-connections at CO site.
`rtv`	Video cross-connections at RT sites.

The *cct* parameter is an optional parameter if the cross-connection type to be deleted is `twoway`. The *cct* parameter is required for other CrsType values.

Address1, *Address2*, and *CrsType* must match an existing STS-3c cross-connection, or execution of the command will be denied with the following message:

```
SNVS
/*  Status, Not in Valid State  */
/*  The specified STS-3c cross-connection does not exist. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution!  Execution of this command may affect service.
   You have selected the dlt-crs-sts3c command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

ent-crs-sts3c

rtrv-crs-sts3c

NAME

dlt-osacmap: delete OS application context ID map entry

INPUT FORMAT

`dlt-osacmap:vc=`*VCType*`,snpa=`*SNPA*;

DESCRIPTION

This command deletes data terminal equipment (DTE) calling addresses of operations systems (OS) that are assigned to the switched virtual circuit (SVC), and/or the permanent virtual circuit (PVC) in the X.25 subnetwork application context map. This map lists both the PVCs and the DTE calling addresses for the SVC available in the X.25 channel and maps them to operation systems application contexts. The DTE entries of both SVC and the PVC can be deleted. The PVC entries can be deleted and replaced by SVC entries, or can be changed using the `ent-osacmap` command.

NOTE 1:
If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

NOTE 2:
While this command is allowed at all network elements in the subnetwork, only the table at the active gateway network element (GNE) node is active.

The input parameters are:

`vc` VCType is the virtual circuit type X.25 attachment for the OS.

- *PVC* permanent virtual circuit (default value).
- *SVC* switched virtual circuit.

`snpa` SNPA is the X.25 subnetwork point of attachment for the OS. It is either the logical channel number (LCN) corresponding to the PVC or the DTE calling address corresponding to the SVC entries in the table. SNPA is 1 to 15 digits and must match an existing entry in the table.

If the `VCType` and/or `snpa` entered is not known by the NE, the command will be denied with the following message:

```
IDNV
 /* Input, Data Not Valid, invalid data entered. */
 /* The corresponding VCType/SNPA value is not found in OSACMAP. */
```

When this command is entered at an active GNE, the following confirmation message will be displayed:

```
/* Caution! Operations System access is affected by this command.

   Caution!  When executed, this command causes the NE's affected
   VC to be reset  This action will drop all currently active
   logins on the affected VC.

   You have selected the dlt-osacmap command with these parameters:

    VCType = x
    SNPA = x */

Execute? (y/n or CANcel/DELete to quit) =
```

When this command is entered at a network element that is not an active GNE, the following confirmation message will be displayed:

```
/* Caution!  This NE is not an active GNE   Entries in this table are
   not active.  Only the information at an active GNE is valid.

   You have selected the dlt-osacmap command with these parameters:

    VCType = x
    SNPA = x */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

ent-tl1msgmap

rtrv-tl1msgmap

ent-osacmap

rtrv-osacmap

NAME

dlt-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 node (where `DSNE=yes`) stores and maintains the network map, listing all active nodes in the network.

When a node is removed from an OSI network, the DSNE must be updated to reflect that the node is no longer active. Entering this command at the DSNE will remove the obsolete node entry from the DSNE network map and from all `rtrv-map-network` reports at all nodes. This command will also remove any communication failure alarms related to removing the node from the network.

This command can only be executed at the DSNE and will only succeed if the communication status of the network element (NE) being deleted is "FAILED". The command `rtrv-map-network` may be used to list the communication status of a network element.

NOTE:
When security is enabled, this command is available to privileged users only.

The input parameter is:

`tid` TID (Target IDentifier) is a character string consisting of up to 20 alphabetic, numeric and 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 DSNE */
```

If the TID to be deleted is not listed in the DSNE network map, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System name does not exist. */
```

Only network elements whose communication status is "FAILED" may be removed from the network map. If a user attempts to remove a network element whose communication status is not "FAILED," the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Can only delete network elements with
   FAILED communication status  */
```

When more than one network element is defined as the DSNE, an alarm will result. If a user attempts to remove a network element while the network has more than one DSNE defined, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Due to a network provisioning problem (duplicate DSNE),
   this TID can not be deleted from the network map at this time. */
```

If the user attempts to execute this command while the DSNE is in a busy state (for example, handling initial registration), the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/*DIB is currently locked, try again later  */
```

RELATED COMMANDS

rtrv-map-network

NAME

ent-crs-sts1: Enter Cross-Connection STS-1

INPUT FORMAT

ent-crs-sts1:*Address1*,*Address2*[:*cct*=CrsType][,*ring*=RingId];

DESCRIPTION

This command sets bidirectional STS-1 cross-connections between main and function unit slots 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 all OC-12 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-3 port that are to be cross-connected. For STS-1 ring pass-through traffic, *Address1* and *Address2* must be the same time slot. Valid addresses are listed on the following pages.

NOTE:
All cross-connections are bidirectional.

cct CrsType specifies the cross-connection type. The valid values are:

twoway Twoway cross-connections apply to terminating, hubbing, add/drop, pass-through, hairpin, 0x1 ring, and 0x1 DS3 configurations. Twoway is the default value. An OC-3 ring may be connected to an OC-12 ring in any 0x1 ring configuration (dual or single-homed).

dc Drop and continue cross-connections support dual ring interworking applications. Drop and continue connections are only allowed if the function unit address is equipped with the 3STS1E, 21 type OLIU or 3DS3 circuit packs.

If the addresses indicate a pass-through cross-connection, the CrsType is not prompted for but is automatically set to **twoway**. The confirmation message indicates that a CrsType of **twoway** has been selected for the user. If a CrsType other than **twoway** is entered on the command line when the addresses indicate a pass-through cross-connection, the request is rejected.

If the CrsType is not `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.

ring This parameter is available with all ring releases. RingId is the ring identification for drop and continue connections.

For `dc` type connections, it specifies which ring rotation will be continued as well as dropped at this network element. The valid values are:

`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.

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 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. */
```

If the cross-connection request is to an STS1E or 27-type low-speed interface, the EC-1 port or OC-1 line state *cannot* be set to NMON or the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* The addressed port is in NMON state. */
```

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 with (`cct=dc`) and the low-speed address is for a function unit where the *application* parameter (for the `set-oc3` command) is set to "0x1", the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Drop and continue is not supported for the 0x1 application */
```

If this command is issued while the low-speed address is for a function unit where the *application* parameter (in the **set-oc3** command) is set to ***video***, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* STS-1 cross-connection is not supported with video application */
```

If the addresses indicate a pass-through cross-connection and the CrsType is not **twoway**, the request is denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Invalid cross-connection request */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs  */
```

After entering this command, the following confirmation message is displayed. The `RingId` parameter is displayed in the confirmation message only if the `CrsType` parameter is set to `dc`.

```
/* 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-crs-sts3c: Enter Cross-Connection STS-3c

INPUT FORMAT

`ent-crs-sts3c:`*`Address1`*`,`*`Address2`*`[:`*`cct`*`=CrsType][,`*`ring`*`=RingId];`

DESCRIPTION

This command sets both bidirectional and unidirectional STS-3c cross-connections between main-b slots and function unit slots. and between main-b-1 and main-b-2 OLIU circuit packs. The function unit slots must be equipped with 21G or 21D type OLIU circuit packs.

All cross-connections are done using the BCP3 TSI circuit packs in the TSI slots. BCP3-type TSI circuit packs must be used to establish STS-3c cross-connections.

NOTE:
The STS-3c cross-connection is an optional feature that requires a special license from Lucent Technologies. This feature must first be enabled via the `set-feat` command before the cross-connection request takes place.

The STS-3c signals are identified (addressed) by using the first STS-1 address contained in each STS-3c signal. The following chart shows the mapping of STS-3c addresses to the internal STS-1 structure:

STS-3c Mapping Table

Interface	Address	Internal STS-1 #s
Main-b	mb-1	1,2,3
	mb-4	4,5,6
	mb-7	7,8,9
	mb-10	10,11,12
FN-A	a-1	1,2,3
FN-B	b-1	1,2,3
FN-C	c-1	1,2,3
FN-D	d-1	1,2,3

This command is available with OC-12 ring releases.

The input parameters are:

Address1 and *Address2*
These are the addresses of the two STS-3c channels that are to be cross-connected. 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.

`mb-{1,4,7,10} to {a,b,c,d}-1`
Allowed when function groups A and/or B and/or C and/or D are equipped with OLIU (21G or 21D) circuit packs.

`mb-{1,4,7,10} to mb-{1,4,7,10}`
Allowed to cross-connect pass through signals. Address1 and Address2 must be the identical time-slot.

cct CrsType specifies whether the cross-connection is two-way , drop and continue, or for video applications at CO and RT sites. The valid values are:

`twoway`	Two-way cross-connections apply to add/drop and pass through cross-connections. This is the default value.
`dc`	Drop and continue cross-connections support dual ring applications.
`cov`	Video cross-connections at CO site. Up to four incoming STS-3c signals from OLIU packs in FN-x-1 and FN-x-2 slots will be locked to ring 1 and ring 2, respectively.
`rtv`	Video cross-connections at RT sites. Up to four STS-3c signals from ring 1 and ring 2 are dropped to FN-x-1 and FN-x-2 slots, respectively, and continued on both rings to the next nodes in the network.

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

`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.

If this command is invoked using addresses where active STS-3c cross-connections or active STS-1 cross-connections within the STS-3c address 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 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 */
```

The following denial message will be displayed if the cross-connection request is made before enabling the STS-3c feature through the `set-feat` command:

```
SNVS
/* Status, Not in Valid State */
/* Optional STS-3c feature is disabled. To enable, use set-feat. */
```

The following denial message will be displayed if the cross-connection request is made with `twoway` or *dc* options in the *cct* parameter and when the application parameter in the `set-oc3` command is *NOT* set to *1+1* option:

```
SNVS
/* Status, Not in Valid State */
/* The specified function unit is not a 1+1 application. */
```

The following denial message will be displayed if the cross-connection request is made with `cov` or `rtv` options in the *cct* parameter and when the application parameter in the `set-oc3` command is *NOT* set to `video` option:

```
SNVS
/* Status, Not in Valid State */
/* The specified function unit is not a video application. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed. The `RingId` parameter is displayed in the confirmation message only if the `CrsType` parameter is set to `dc`.

```
/* Caution!   Network cross-connections are affected by this command.
   You have selected the ent-crs-sts3c command with these parameters:

   Address1 = address
   Address2 = address
   CrsType = value
   RingId = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

set-feat

rtrv-feat

set-oc3

rtrv-oc3

dlt-crs-sts3c

rtrv-crs-sts3c

rtrv-crs-sts1

NAME

ent-osacmap: enter OS application context ID map

INPUT FORMAT

`ent-osacmap:vc=`*VCType*`,snpa=`*SNPA*`,acid=`*ACID*;

DESCRIPTION

This command creates entries in the X.25 subnetwork application context map. This map lists the permanent virtual circuits (PVCs) and switched virtual circuit (SVC) available in the X.25 channel and maps them to operation systems (OS) application contexts. For the SVC, this command lists the data terminal equipment (DTE) calling addresses used by the various OS application contexts. Defaults for the PVCs are provided, which should apply to most situations.

NOTE 1:
If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

NOTE 2:
While this command is allowed at all network elements in the subnetwork, only the table at the active GNE node is active.

The input parameters are:

`vc` This parameter is the virtual circuit type X.25 attachment for the OS.

- *PVC* permanent virtual circuit (default value).
- *SVC* switched virtual circuit.

`snpa` SNPA is the X.25 subnetwork point of attachment address for the OS. It is either logical channel number (LCN) 1, 2, 3, 4, 5, 6, 7, 8, or 9 if VCType is *PVC* or it is the Data Terminal Equipment (DTE) calling address, which is 1 to 15 digits if VCType is *SVC*. Up to nine VCs can be mapped to any combination of PVCs and SVCs (that is, PVCs could be removed and replaced by SVCs).

`acid` ACID is a string of up to 23 alphanumeric characters, which is the application context ID to be assigned to a particular SNPA address. Each OS has a value of ACID assigned. Default values exist for OS applications supported by DDM-2000. Supported values are:

- *tl1CR* (Assigned to PVC "1" as default value).
- *tl1Maintenance* (Assigned to PVC "2" as default value).

tl1MemoryAdministration
(Assigned to PVC "3" as default value).

NOTE:
The values *tl1Other1*, *tl1Test*, and *tl1Other2* are provided as additional ACID values for the OS application that are supported by DDM-2000.

If a user attempts to enter an additional SNPA (LCN/DTE calling address) when the maximum supported number already exists, the following denial message will appear:

```
SLEM
/* Status, List Exceeds Maximum */
/* Maximum number of SNPA entries (LCN/DTE address)
   already exists. */
```

When this command is entered at an active GNE, the following confirmation message will be displayed:

```
/* Caution! Operations System access is affected by this command.

   Caution!  When executed, this command causes the NE's affected
   VC to be reset.  This action will also drop all currently
   active logins on the affected VC

   You have selected the ent-osacmap command with these parameters:

    VCType = x
    SNPA = x
    ACID = x */

Execute? (y/n or CANcel/DELete to quit) =
```

When this command is entered at a network element that is not an active GNE, the following confirmation message will be displayed:

```
/* Caution!  This NE is not an active GNE.  Entries in this table are
   not active.  Only the information at an active GNE is valid.

   You have selected the ent-osacmap command with these parameters:

    VCType = x
    SNPA = x
    ACID = x */

Execute? (y/n or CANcel/DELete to quit) =
```

NOTE:
The same ACID can appear more than once in the table.

RELATED COMMANDS

ent-tl1msgmap

rtrv-tl1msgmap

dlt-osacmap

rtrv-osacmap

NAME

ent-tl1msgmap: Enter Tl1 Message Map for Operation Systems

INPUT FORMAT

ent-tl1msgmap:acid=*ACID*,**msgtype=***MessageType*,**action=***Action*;

DESCRIPTION

NOTE:
If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

This command maps the DDM-2000 TL1 message types to the operations systems (OS) for this network element in the subnetwork. This command provides a filter for TL1 messages by specifying TL1 message classes (known as *MessageTypes*) and allowing the user to determine which message classes should be received at each type of OS (specified in the *ACID* parameter).

There are default message classes that exist for the ACIDs supported by DDM-2000. The following table shows the default mappings supported by DDM-2000. Most users should be able to use these mappings as defined. However, users may change the default mapping by using this command. Users may check the current provisioning by using the ***rtrv-tl1msgmap*** command.

```
/* DDM-2000 TL1 Autonomous Message Map
=================================================
    ACID                  ALM ENV CON DB  EVT PM  SW
=================================================
tl1Maintenance           | x | x | x |   | x | x | x |
tl1MemoryAdministration  |   |   |   | x |   |   |   |
tl1Test                  |   |   |   |   |   |   |   |
tl1PeerComm              |   |   |   |   |   |   |   |
tl1Other1                | x | x | x | x | x |   | x |
tl1Other2                |   |   |   |   |   |   |   |

      x - enabled
<blank> - disabled
*/
```

Each message type can be assigned to more than one ACID. However, if more than one assignment is made, a 9600 or higher baud x.25 link is recommended.

The input parameters are:

`ACID` Application Context ID (ACID) is a string of up to 23 alphanumeric characters, which is the OS function. The valid ACID values are:

tl1Maintenance

tl1MemoryAdministration

tl1Test

tl1PeerComm

tl1Other1

tl1Other2.

`msgtype` MessageType is one of the supported classes of TL1 messages that the system generates. These message types are *not* sent to the OS unless they are enabled and associated with an ACID. The supported message types are:

ALM To report the occurrence of an event that requires immediate attention by the craft at the OS. Report is sent via the `REPT ALM` message.

ENV To report the occurrence of an environmental alarm to the OS. Report is sent via the `REPT ALM ENV` message.

CON To report the active status conditions at the network element. Report is sent via the `REPT COND` message.

DB To report database changes that have occurred as a result of line termination and cross-connection provisioning commands and changes due to external events such as circuit pack insertion or removal. Report is sent via the `REPT DBCHG` message.

EVT To report events that do not require alarmed notifications or to report a status change of the network element. Report is sent via the `REPT EVT` message.

PM To report performance monitoring data from the network element. Report is sent via the `REPT PM` message.

SW To report equipment protection switches at the network element. Report is sent via the `REPT SW` message.

`action` Action is either **`enabled`** or **`disabled`** and associates the MessageType to the OS.

When this command is entered, the following confirmation message will be displayed:

```
/* Caution!  Operations Systems Autonomous message mapping is
   affected by this command.

   You have selected the ent-tl1msgmap command with these parameters:

    ACID = x
    MessageType = x
    Action = x           */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-tl1msgmap

NAME

ent-ulsdcc: Enter Upper Layer Section DCC

INPUT FORMAT

ent-ulsdcc:[**L3org**=*OrganizationID*][,**L3res**=*Reserved*][,**L3rou**=*RoutingData*];

DESCRIPTION

CAUTION:
Execution of this command with parameters other than the default values at the directory services network element (DSNE) will disrupt all DCC communications. Errors in provisioning this command could result in silent alarm failures. Command parameters should *only* be changed by users who intend to provision the SONET subnetwork and partition DCC communications.

This command provisions parameters of Layers 3 through 7 of the open systems interconnection (OSI) 7-layer protocol stack. This stack refers to the OSI reference model which is a logical structure for network operations. This model defines a standard communication protocol between network elements as specified by the International Standards Organization (ISO).

This command is used to provision the user-settable fields of the Layer 3 network service access point (NSAP) address. The NSAP address is a 20-byte address required by OSI to provide unique identification within the OSI network. Each DDM-2000 is programmed with a unique NSAP address at the factory. For current software releases, only a single routing area can be supported and it is not possible to establish DCC connections between separate routing areas. Therefore, the default factory values are adequate to operate current networks. NSAP provisioning, using this command, will be used as part of future upgrade procedures. However, this command may be used now to change the user-settable portions of the NSAP to further uniquely identify the network element and to begin setting the addressing and routing structure of the SONET subnetwork. To facilitate future software upgrades, parameters should be set to the same values at each network element in the subnetwork.

NOTE:
If security is enabled, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

The input parameters are:

`L3org` OrganizationID is a 6-digit hexadecimal field used to provision into the NSAP address the allocated company code assigned by the *ANSI**-administered USA Registration Authority for OSI Organization Names. The original value for this parameter is 000000.

`L3res` Reserved is a 4-digit hexadecimal field that currently has not been assigned a specific purpose by the SONET standards. Users may populate this field to further uniquely identify the NSAP address. The original value for this parameter is 0000.

`L3rou` RoutingData is an 8-digit hexadecimal parameter that covers two logical fields of the NSAP address. They are:

`Routing Domain` This field identifies a unique routing domain within an administrative domain.

`Area` This field identifies the area within the routing domain to which the NSAP address belongs.

The original value for this parameter is 00000000.

If an incorrect number of digits is entered for a specific parameter, the following message is issued and the user is reprompted:

```
/* Invalid data entry
   Enter a <num> digit hexadecimal number */
```

The `<num>` specifies four, six, or eight digits, as required.

* Registered trademark of American National Standards Institute, Inc.

After entering this command, the following confirmation message is displayed:

```
/* Caution!  Network Element access is affected by this command.

   Caution! When executed, this command causes the NE to
   restart the program   This action will erase all of
   the performance monitoring data and the history file
   If possible, it will reinitialize the date and time with
   the far end via the DCC.  Otherwise, the
   date and time will assume default values.
   You have selected the ent-ulsdcc command with these parameters:

   L3org = xxxxxx
   L3res = xxxx
   L3rou = xxxxxxxx */
Execute?  (y/n or CANcel/DELete to quit) =
```

The full confirmation message is displayed if a change is made to any of the three parameters.

If the user enters the same parameter values as currently defined, the system does not reset. The following brief confirmation message is displayed:

```
/* Caution!  Network Element access is affected by this command.
   You have selected the ent-ulsdcc command with these parameters:

   L3org = xxxxxx
   L3res = xxxx
   L3rou = xxxxxxxx */
Execute?  (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-ulsdcc

NAME

help: Provide In-context Help

INPUT FORMAT

?

DESCRIPTION

Help (?) provides help within a craft dialog on the CIT. Help is provided automatically when an invalid input is entered and can also be requested at any time by typing "?". The "?" displays a help message and then displays another prompt.

The help message is either a description of format of the required entry or a menu of choices.

NAME

init-pm: Initialize Performance Monitoring

INPUT FORMAT

`init-pm:reg=`*`Register`*;

DESCRIPTION

This command initializes all current day and/or all current quarter-hour performance-monitoring (PM) storage registers. Registers for previous day and previous quarter-hours are not affected.

NOTE:
If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

The input parameter is:

`reg` Register is the class of registers to be initialized and may be one of the following:

- `day` Day registers
- `qh` Quarter-hour registers
- `all` Day and quarter-hour registers

RELATED COMMANDS

rtrv-pm-line

rtrv-pm-sect

rtrv-pm-sts1

rtrv-pm-tca

NAME

init-sys: Initialize System

INPUT FORMAT

`init-sys:`*`Address`*;

DESCRIPTION

CAUTION:
Execution of this command may affect service. The command `init-sys:all` should NOT be used on an in-service system. This command should only be used at the end of installation before system turnup.

This command initializes provisionable parameters to their default values. The time and date parameters are reset from the far end.

NOTE:
After entering the `init-sys` command, the system will show transient DCC failures that are recorded in the Alarm and History reports. This is a normal, expected system response.

The command `init-sys:all` should be used only at the end of installation before system turnup. The command `init-sys:sysctl` should only be used after a SYSCTL is replaced. To clear a system problem, the `reset` command should be used since it resets the system software without changing the provisioned parameters except for the page parameter in `set-link`, which is reset to default value in this case.

NOTE:
This command is available to privileged users only.

The input parameter is:

`Address` Address determines whether just system controller parameters are initialized or whether all parameters on the entire system are initialized. Address may have the following values:

`sysctl` The address `sysctl` can be used after a system controller is replaced on an in-service system. It is the equivalent of pressing the UPD/INIT button within 10 seconds of the processor start-up sequence (while the CR LED on the user panel is flashing). This command restores the following list of parameters to their default values.

NOTE:
Parameters can be provisioned using the following commands listed below the parameters.

Alarm delays
`set-attr-alm`

NSAP
`ent-ulsdcc`

Security
`set-lgn`
`set-passwd`
`set-secu`

CIT link configuration
`set-link`

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

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

Synchronization Characteristics
`set-sync`

Environmental alarm names and alarm levels
`set-attr-env`

Environmental control names
`set-attr-cont`

Far-end communications enabled/disabled
`set-fecom`

STS-1 Trace Value
`set-trace-sts1`

Idle value
`set-ne`

`all` The address `all` is used only at the end of an installation before turning over the system. This ensures that all parameters in the system have the proper default values before any system-specific provisioning is done.

CAUTION:
The address `all` should NOT be used on an in-service system.

NOTE:
The `init-sys:all` command is available to privileged users only.

This parameter initializes all the parameters listed under `sysctl` PLUS the following:

Loopbacks
- `opr-lpbk-ec1`
- `opr-lpbk-t3`

Cross-connections
- `dlt-crs-sts1`
- `ent-crs-sts1`

OC-12/OC-3 signal degrade thresholds
- `set-oc12`
- `set-oc3`
- `set-ec1`
- `set-sts1`

Signal failure thresholds
- `set-t3`
- `set-ec1`
- `set-state-ec1`
- `set-state-t3`

Protection Switching (`manual`)
- `switch-fn`
- `switch-line`
- `switch-sync`

Feature Options
- `set-feat`

System name (TID)
- `set-ne`

PMN
- `set-attr-alm`

Site Id, NE Id and Shelf Id
`set-ne`

TBOS and CO/RT selection
`set-ne`

UserSide/NetworkSide settings on DCC
`set-fecom`

In addition to initializing parameters, entering the address `all` will clear all performance monitoring data and alarms. For failure conditions that still exist after parameters are initialized, the alarms will be redeclared. Time and date parameters are not affected by this command.

Executing an `init-sys:sysctl` with no TGS packs equipped will set the following parameters to default values:

Feature Options

Directory Services Network Element (DSNE)

System name (TID)

PMN

Site Id, NE Id and Shelf Id

TBOS Address

TBOS Enabled

TBOS link

CO/RT selection

UserSide/NetworkSide settings on DCC

DCC channel enable/disable

When the command `init-sys:sysctl` is entered, the following confirmation message will be displayed:

```
/* CAUTION!
   Execution of this command will set ALL parameters on the
   controller to their original default values.
   This may disrupt this system's operations interfaces.
   Refer to the DDM-2000 User/Service Manual before executing
   this command.

   Caution!  When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file,
   and reinitialize the date and time with the far end
   system.

   Proceed with EXTREME CAUTION!

   You have selected the init-sys command with these parameters:

   Address = sysctl */
Execute? (y/n or CANcel/DELete to quit) =
```

NOTE:
Executing `init-sys:sysctl` may cause the system to respond with the following message: `Parameters set to default values.` This means that the circuit pack in a specified slot has failed or has been removed, and the parameters for ports associated with that slot have been set to their default values.

Entering the command `init-sys:all` will cause the following confirmation message to be displayed:

```
/* CAUTION!

   THIS COMMAND SHOULD NEVER BE EXECUTED ON AN IN-SERVICE SYSTEM!

   This command will set ALL parameters in the whole system
   to their original default values.
   This may result in a lengthy service outage and may disrupt
   this system's operations interfaces.

   Caution!  When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file,
   and reinitialize the date and time with the far end
   system.

   PROCEED WITH EXTREME CAUTION!

   You have selected the init-sys command with these parameters:

   Address = all */
Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

reset

upd

NAME

ins-prog: Install Program

INPUT FORMAT

`ins-prog:`*`TID;`*

DESCRIPTION

NOTE:
Starting with OC-12 Release 5.1, the function of this command has changed. Please read this command page carefully to understand how each software release operates.

For OC-12 Release 5.0 and earlier:

CAUTION:
Normal alarming and protection switching are disabled for the *TID* specified while this command is in progress.

For OC-12 Release 5.0 and earlier, this command installs a new program into the system controller. This command supports a local program installation to a network element from a personal computer (PC) connected to the CIT port of the target system. The command `cpy-prog` is used to copy the system controller program from a local network element to a remote network element.

NOTE:
This command cannot be executed during a remote login session.

For OC-12 Release 5.0 and earlier, this command also supports remote program Installation to a DDM-2000 controller from a PC connected to the CIT port of another DDM-2000 system.

NOTE:
For OC-12 Release 5.0 and earlier, if security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf. If security is not enabled on *all* shelves in the network, users on unsecured shelves will be able to install software that affects shelves with security enabled.

For OC-12 Release 5.1 and later:

Starting with DDM-2000 OC-12 Release 5.1, the software to be installed may be a non-executing dormant copy of a software generic. When executing this command, the local network element will support local or remote program installation into the memory of the target network element where it will reside as a dormant copy.

The `apply` command is used later to overwrite the currently executing generic with a copy of the generic included in the dormant software.

NOTE:
This command cannot be executed during a remote login session.

OC-12 Release 5.1 and later releases also support a remote program installation to flash memory as standby copy from a PC connected to the CIT port of another DDM-2000 system.

NOTE:
This command must be executed from a PC with the program to be installed in its hard disk or on a set of floppy disks.

NOTE:
For OC-12 Release 5.1 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 into the shelves' dormant memory 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 the command syntax is correct, the following message will be displayed:

```
/* Testing for program installation ... */
```

This command can only be completed successfully if it is executed from a CIT or modem port but not if it is received over the DCC. This command cannot be executed during a remote login session. If this command is executed during a remote login session, the following message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* This command cannot be executed from within a rlgn session. */
```

If the system name specified is unknown to the local system, the following error message will be displayed and the user will be asked to reenter the TID.

```
/* Unknown Target Identifier (TID) */
/* Enter the name (TID) of the local or far end system. */
TID=
```

If the system name specified currently has a duplicate TID alarm condition, the following denial message will be displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* Duplicate Target Identifier. */
```

If this command is not executed from a PC, the following denial message will be displayed:

```
SSTP
/* Status, execution STOPped */
/* PC communication link could not be established.
   Please connect PC with program to be installed and start again  */
```

If this command is used to install a program for a certain product type while the Target Identifier TID of the shelf into which the program will be loaded identifies a different product type (for example, a program to be installed is for DDM-2000 OC-3 product type, while the target product type is FT-2000), the request will be denied and the following message is displayed:

```
IITA
/* Input, Invalid TArget identifier (TID) */
/* <TID> is a different product type;
   Incompatible software  */
```

If this command is used to install a program locally to a DDM-2000 but the PC contains DLC Subsystem program, the following denial message will be displayed:

```
SSTP
/* Status, execution STOPped */
/* Incompatible program  */
```

If the communication link between the PC and the system that it connects to fails, the following denial message will be displayed:

```
SSTP
/* Status, execution STOPped */
/* PC communication link failure. */
```

To support remote program installation from a PC, the PC, the local system that the PC connects to, and the target system must be running compatible programs. To support local program installation from a PC, the PC, and the local (target) system that the PC connects to must be running compatible programs. If the programs are not compatible, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication protocol failure. */
```

For remote program installation, if the target system has a communication failure, has a "P" displayed in its SYSCTL 7-segment LED display, or does not support remote program installation from a PC, the following denial message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication failure. */
```

If communication cannot be established when attempting to download software to a local site from a PC, the following message will be displayed:

```
SSTP
/* Status, execution SToPped */
/* Communication link cannot be established.
   Please connect PC with DDM-2000 upgrade
   program and start again. */
```

If a user attemps to execute this command in OC-12 Release 5.1 and later releases (where a compressed version of software is being used), into a shelf using OC-12 Release 5.0 and earlier (where the network element is not capable of receiving compressed files), the request will be denied and the following message displayed:

```
SROF
/* Status, Requested Operation Failed */
   Network Element not able to accept compressed software. */
```

For OC-12 Release 5.0 and earlier, When this command is used to download software to a local site from a PC or to download software to a remote site, the following confirmation message will be displayed after testing for program installation:

```
/* Caution! Execution of this command will erase the current
   generic n n.n at Target Identifier and replace it with
   generic m.m.m   If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful
   This command will terminate any other active CIT sessions.
   This command will take time to install the new program.  Check
   the Software Release Description for the time estimates. */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 Release 5.1 and later, the following confirmation message will be displayed after testing for program installation:

```
/* Caution! Execution of this command will overwrite the current
   dormant generic (if any) at Target Identifier. */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 Release 5.0 and earlier, When this command is used to download a new release of software that is significantly different from software currently running on the remote system, or to download software to a local system from a PC where the software to be downloaded is significantly different from software currently running on the local system, the following confirmation message is displayed:

```
/* Caution! Execution of this command will erase the current
   generic n.n n at Target Identifier and replace it with
   generic m.m m.  If this fails prior to completion,
   the control system will likely become inoperable
   until another install program attempt is successful.
   This command will terminate any other active CIT sessions.
   This command will take time to install the new program   Check
   the Software Release Description for the time estimates  */

/* Caution! Major changes exist between these two generics such
   that they may not be compatible   Check the TOPS and software
   compatibility information for additional information or actions
   needed  */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 Release 5.1 and later, when this command is used to download a new release of software (into the dormant memory of remote system) that is significantly different from software currently running on the remote system, or to download software into the dormant memory of a local system from a PC where the software to be downloaded is significantly different from software currently running on the local system, the following confirmation message is displayed:

```
/* Caution! Execution of this command will overwrite the current
   dormant generic (if any) at Target Identifier. */

/* Caution! Major changes exist between these two generics such
   that they may not be compatible.  Check the TOPS and software
   compatibility information for additional information or actions
   needed. */

Execute? (y/n or CANcel/DELete to quit) =
```

When a user gives a positive response to the confirmation message, the following message is displayed:

```
In progress   ..... .... ....... ... .........  .... . ....
```

The number of dots and how fast they are displayed depend on the size of the program to be installed, baud rate, and for remote program installation, number of DCC spans between the local and remote systems, and DCC traffic.

See "Install New Generic Program" in the TOP section of this manual for complete instructions before using this command. Use the `rtrv-ne` or `rtrv-map-network` commands to obtain the exact TID for the system. The command `rtrv-eqpt` provides the current program version. The current program version may also be obtained from the initial screen and every report header line when logged into the system with a craft interface terminal (CIT). The current program version is also available on the user panel.

Each time a carriage return is entered, the system will also print a header line containing the TID and program version.

RELATED COMMANDS

rtrv-eqpt

rtrv-ne

NAME

logout: Terminate CIT Session

INPUT FORMAT

```
logout;
```

DESCRIPTION

This command terminates a user CIT session.

If this command is entered during a local session, it will terminate all sessions established by the user. If entered during a remote session, this command will terminate the remote session and return the user to the local session.

RELATED COMMANDS

rlgn

toggle

NAME

opr-aco: Operate Alarm Cutoff

INPUT FORMAT

```
opr-aco;
```

DESCRIPTION

This command silences the audible office alarms. Alarms remain silent until a new alarm condition arises.

If this command is executed while there is an active alarm condition in the system, it will:

- Silence active audible office alarms
- Light the alarm cut-off (ACO) LED on the user panel
- Set the parallel telemetry ACO output point
- Clear all parallel telemetry outputs except the system ID and ACO outputs.

This command is equivalent to pushing the ACO button on the user panel, activating the TBOS ACO control point, or activating the parallel telemetry ACO input.

For any DDM-2000 Multiplexer shelf in a network that has co-located DDM-2000 shelves (same *site* parameter settings), any one of the following actions will silence audible office alarms on all shelves at the same site:

- Pressing the ACO button
- Executing the OPR-ACO command
- Activating the parallel telemetry ACO input
- Setting the TBOS ACO control point.

NAME

opr-lpbk-ec1: Operate-Loopback-EC1

INPUT FORMAT

`opr-lpbk-ec1:`*`Address`*`[:lpbktype=`*`LoopbackType`*`];`

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command executes a loopback on a low-speed STS1E interface towards the optical fiber (terminal) or DSX (facility), as shown in the following Figure:

Both the terminal and facility loopback can be set at the same time. The loopback remains in place until it is released by the `rls-lpbk-ec1` command.

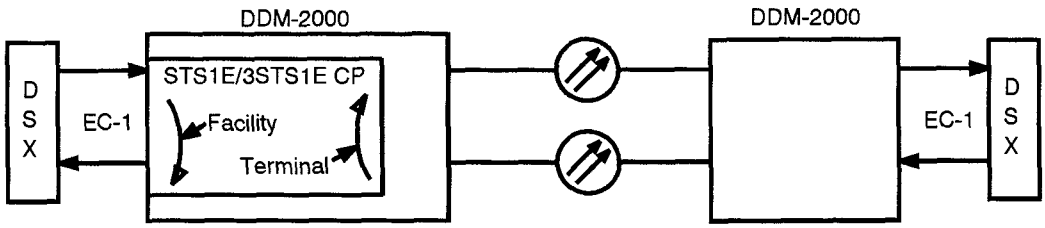


Figure 11-1. EC1 Loopback

The input parameters are:

Address Address of EC-1 port(s) to be looped back.
Valid EC-1 Port Addresses: `{a,b,c,d}-{1-3,all}`

lpbktype loopbacktype specifies whether the loopback is terminal or facility

terminal terminal loopback directed towards the high-speed facility. This is a default value.

facility facility loopback directed towards the DSX.

If a slot is determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Address not equipped for STS1E */
/* Enter low-speed EC-1 port address: {a,b,c,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 */
```

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the opr-lpbk-ec1 command with these parameters:

   Loopbacktype=loopbacktype
   Address=address */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rls-lpbk-ec1

NAME

opr-lpbk-t3: Operate-Loopback-T3

INPUT FORMAT

`opr-lpbk-t3:`*`Address`*`[:lpbktype=`*`LoopbackType`*`];`

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command executes a loopback on a DS3 port towards the optical fiber (terminal) or DSX (facility), as shown in Figure 11-2.

The terminal and facility loopback cannot be set at the same time. The loopback remains in place until released by the `rls-lpbk-t3` command.

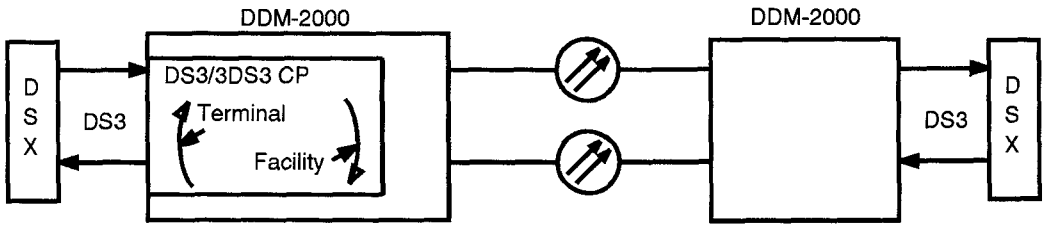


Figure 11-2. DS3 Loopback

The input parameters are:

Address Address of DS3 port(s) to be looped back.
Valid DS3 Port Addresses: `{a,b,c,d}-{1-3,all}`

lpbktype loopbacktype specifies whether the loopback is terminal or facility

terminal terminal loopback directed towards the high-speed facility. This is a default value.

facility facility loopback directed towards the DSX.

If the loopback type is not consistent with the address, the following denial message is displayed:

```
SNVS
   /* Status, Not in Valid State */
   /* loopback type is not consistent with the address  */
```

If the command cannot be completed due to hardware problems on the circuit pack, the following message is displayed:

```
/* Address CPname CP failed */
```

Address and *CPname* refer to the slot address and provisioned circuit pack type for the slot, respectively.

If a slot is in AUTO state or determined to have the wrong circuit pack type for the command, the following message is displayed:

```
/* Slot is in AUTO state or Address is not equipped  - no
   loopback established */
/* Enter DS3 port Address:   */
```

If the command cannot be completed due to hardware problems on the SYSCTL, the following message is displayed:

```
/* SYSCTL failed - no loopback established */
```

If this command is invoked to establish other than an existing loopback type (that is, if a facility loopback is requested when a terminal loopback already exists or vice versa) for the same address, the following denial message will be displayed:

```
SNVS
   /* Status, Not in Valid State */
   /* Establishing new loopback type (facility/terminal) requires that
      existing loopback type (terminal/facility) associated with this
      address must be released  */
```

When input for terminal loopback, 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:

   Loopbacktype=loopbacktype
   Address=address */

Execute? (y/n or CANcel/DELete to quit) =
```

When input for facility loopback, this command will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command will affect the DS3
   performance monitoring data and may affect service.
   You have selected the opr-lpbk-t3 command with these parameters:

   Loopbacktype=loopbacktype
   Address=address */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rls-lpbk-t3

NAME

reset: Reset the System Software Program

INPUT FORMAT

```
reset;
```

DESCRIPTION

CAUTION:
Execution of this command may affect performance-monitoring data.

This command resets the system software program. All history and performance-monitoring (PM) data is lost. All alarm information is lost and "rediscovered." The date and time are lost and "rediscovered" from the far end or set to default (`70-01-01` for date and `00:00:00` for time). No provisioning information is lost or changed, except for the *page* length parameter in `set-link`, which is reset to the default value.

An automatic date and time recovery process takes place by reading the date and time from the remote shelf connected to the main-b interface of the local shelf (in linear applications). In ring applications, the date and time data is recovered from the remote shelf connected to main-b-1 the local shelf.

NOTE 1:
Unlike other commands, an abbreviated version of this command name may not be entered. The user must type the complete command name when entering this command or the command request will be denied.

NOTE 2:
If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

NOTE 3:
If a reset is done on any shelf, all adjacent shelves (shelves at the other ends of the optical interfaces that terminate on the shelf being reset) may show transient "section DCC channel failed" alarms. This is a normal system response.

When input, this command displays the following confirmation message:

```
/* Caution! When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file.
   If possible, it will reinitialize the date and time with
   the far end system.
   You have selected the reset command. */

Execute? (y/n or CANcel/DELete to quit) =
```

During system start-up after reset or other initialization, the user who is connected to a CIT port cannot log in. When the user presses RETURN, the following message is issued:

```
/*  System Initialization is in progress.
    Try to log in again later. */
```

NAME

rlgn: Remote Login

INPUT FORMAT

`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 and has a compatible product type may be accessed with this command.

The alarm and status report for the far-end system is printed automatically when this command is executed.

The input parameter is:

TID TID is the target identifier (system name) of the desired remote shelf.

If the command is successfully completed and security is enabled the user will be prompted for login and password (similar to a local login session).

NOTE:
A remote login session may be terminated unexpectedly if a user elsewhere in the network enables or disables DCC.

If a user attempts to login to a remote shelf where another remote session is already established, the following denial message will be displayed:

```
RNBY
/* Resource, Ne is BusY */
/* A remote session is not allowed.
   Try again later. */
```

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 remotely 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 the user attempts to log into a system whose product type does not support remote logins from the local NE, the following denial message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* Remote session cannot be established
   A remoted login to this product type is not allowed. */
```

If a nonprivileged user remotely logs into a remote NE through a DCC in `lockout` state, the following denial message will be displayed:

```
PIPW
/* Privilege, Illegal PassWord */
/* Access Blocked. */
```

If an unknown TID is entered, the following message will be displayed and the user will be reprompted for the TID:

```
/* TID entered is not found. */
```

RELATED COMMANDS

logout

toggle

rtrv-map-neighbor

rtrv-map-network

NAME

rls-lpbk-ec1: Release-Loopback-EC1

INPUT FORMAT

`rls-lpbk-ec1:`*`Address`*[`:lpbktype=`*`LoopbackType`*];

DESCRIPTION

This command releases a previously established loopback on a low-speed STS1E interface.

The input parameters are:

`Address` Address of EC-1 port(s) where a loopback is to be released. Valid EC-1 Port Addresses: `all, {a,b,c,d}-{1-3,all}`

`lpbktype` loopbacktype specifies whether the loopback is terminal or facility

- *`terminal`* terminal loopback directed towards the high-speed facility. This is a default value.
- *`facility`* facility loopback directed towards the DSX.

If the user attempts to release a `facility` loopback type at a valid address when only a `terminal` loopback type has been established, or attempts to release a `terminal` loopback type at a valid address when only a `facility` loopback type has been established, the attempt will be denied and the following denial message displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Specified loopback does not exist. */
```

RELATED COMMANDS

opr-lpbk-ec1

NAME

rls-lpbk-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: `all, {a,b,c,d}-{1-3,all}`

If the loopback type is not consistant with the address, the following denial message is displayed:

```
SNVS
   /* Status, Not in Valid State */
   /* loopback type is not consistant with the address. */
```

RELATED COMMANDS

opr-lpbk-t3

NAME

rstr-passwd: Restore Logins, Passwords, and User Types

INPUT FORMAT

`rstr-passwd:`*`login`*`,`*`passwd`*`,`*`user_type`*`,`*`clr`*`;`

DESCRIPTION

NOTE:
This command is available to privileged users only.

This command is *only* used to restore the login, password (in encrypted and encoded form), and user type information from an external workstation into the network element (NE). The restored information is information that would have been previously loaded from the NE into the external workstation through the `rtrv-passwd` command.

This command is intended to be used *only* in expert mode by an external PC workstation and not at a CIT.

The input parameters are:

`login` This is the login name that was established by the security administrator on the NE before the `rtrv-passwd` command was executed.

`passwd` This is the current encrypted and encoded password selected by the owner of the login before the `rtrv-passwd` command was executed.

`user_type` This is the user access class assigned to this login by the security administrator before the `rtrv-passwd` command was executed. This parameter may have one of the following values:

`privileged`
The privileged user may execute any commands including restricted commands.

`general` The general user may execute any commands that are not restricted to privileged users.

`maintenance`
The maintenance user may only execute commands that access the system, extract reports, and execute maintenance functions through a specific set of commands. No privileged commands are allowed to be executed by maintenance users.

`reports-only`
The reports-only user may only execute basic commands that extract reports from the system.

`clr` This parameter indicates whether the login data existing on the NE should be deleted before the login, password, and user type information can be restored. This parameter may have one of the following values:

`clear` Clear the NE login file before restoring the login information (used only when `user_type` is privileged).

`noclear` Append the restored login information to the network element login file.

If this command is executed with the parameter `clr` set to `clear`, all login information in the NE login file will be cleared. Then the new login information is restored from the external workstation. However, all active login sessions will not be terminated.

Attempts to input invalid parameter(s) data will result in the user being denied execution of this command. The following denial message is displayed:

```
IDNV
/* Input Data Not Valid, invalid data entered. */
```

An invalid parameter indicates that either a login does not match the valid login definition, the length of the encrypted password (after decoding it into encrypted form) is invalid, a `user_type` is invalid (for example, a misspelled `user_type`), or a `clr` value is invalid (that is, other than clear or noclear).

If this command attempts to restore another login line when the NE's maximum number of supported logins is reached, the following denial message will appear:

```
SLEM
/* Status, List, Exceeds Maximum */
/* Maximum number of logins already exists
   Cannot enter another login. */
```

If the user attempts to restore another `privileged` user when the maximum number of `privileged` users has already been reached, this attempt will be denied and the following message will be displayed:

```
SLOM
/* Status, List, Over Maximum allowed */
/*  Maximum number of privileged users already exists  */
```

If an attempt is made to restore an already existing `privileged` user's login/password information with a *`user_type`* of either **`general`**, **`maintenance`**, or **`reports-only`**, this attempt is denied and the following message is displayed:

```
SDNC
/* Status, Data Not Consistent */
/* Privileged user logins cannot be restored as
   General, maintenance or Reports-only. */
```

If an attempt is made to restore a user's login/password information, with a *`user_type`* of either **`general`**, **`maintenance`**, or **`reports-only`** and *`clr`*`=clear`, the attempt will be denied and the following message is displayed:

```
SDNC
/* Status, Data Not Consistent */
/* for clr=clear, user_type must be set to privileged. */
```

RELATED COMMANDS

rtrv-passwd

set-lgn

set-passwd

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

`rtrv-alm[:alm=`*`AlarmLevel`*`];`

DESCRIPTION

This command displays a report of active alarm and status conditions at the local network element. The report includes the source address of the alarm as well as date and time of the alarm, whether or not the condition is service-affecting, and a short description of the condition.

The input parameter is:

`alm` AlarmLevel for which a report is desired. This parameter may have one of the following values:

```
all (default)
cr
mj
mn
pmn
other (abnormal, ne-acty, status conditions)
```

Alarms are listed from greatest to least severity. Within a severity level, newer alarms are listed first.

NOTE:
Due to the large number of conditions reported, the RTRV-ALM report pages have been located at the end of this section for easier reference. Please refer to the RTRV-ALM table (Table 11-3) for a complete description of report outputs.

RELATED COMMANDS

rtrv-hsty

rtrv-ntalm

NAME

rtrv-attr-alm: Retrieve Attribute Alarm

INPUT FORMAT

```
rtrv-attr-alm;
```

DESCRIPTION

This command displays current alarm attributes, as provisioned by the `set-attr-alm` command.

The output report appears as follows:

```
/* System Alarm Attributes Report
================================================================================
Alarm Delay (almdel)=almdel, Clear Delay (clrdel)=clrdel, PMN=pmn
*/
```

The output parameters are:

`Alarm Delay` This shows the alarm holdoff delay in seconds for incoming signal and equipment failures. This parameter is an integer with a range of 0 through 30.

`Clear Delay` This shows the alarm clear delay in seconds for equipment failures. This parameter is an integer with a range of 0 through 30.

`PMN` PMN is the office alarm level to be raised during a power minor alarm condition. This parameter has the values MJ (major) or MN (minor) indicating the alarm level. 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` This is the address of the control point.

`Description` This is the provisioned description of the environmental control point.

NOTE:
This command will be denied if it is entered in a system whose SYSCTL CO/RT parameter is set to CO (via the `set-ne` command). Use the `rtrv-ne` command to determine the switch setting. The following denial message will be displayed:

```
ENRI
/* Equipage, Not equipped for Retrieving specified Information */
/* Environmental controls can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-env

rtrv-ne

set-attr-cont

set-attr-env

NAME

rtrv-attr-env: Retrieve Attribute Environment

INPUT FORMAT

`rtrv-attr-env`[:*Address*];

DESCRIPTION

This command displays the provisioned alarm and provisioned name and provisioned alarm type of miscellaneous discrete environmental alarm/status points, as set by the `set-attr-env` command.

The input parameter is:

Address The address of the environmental input point.
Valid Addresses: `env-{1-21}`, `env-{all}` (default)

The output report appears as follows:

```
/* Environmental Alarm Provisioning Report
=============================================================
Address  Alarm  Alarm Type      Description
=============================================================
env-1     CR    MISC            Fire
env-2     NA    Power           OpenDoor
env-3     MN    code-7          environment3
 .        .                      .   .   .
 .        .       .              .   .
 .        .       .                  .
env-15    MN    Misc            externalMinor
env-21    MN    Misc            generatorOn
*/
```

The output parameters are:

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

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

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

`Alarm-Type` This is the user-defined classification of the environmental alarm/status point.

`Description` Provisioned description of the environmental alarm/status point.

NOTE:
This command will be denied if it is entered in a system whose SYSCTL CO/RT parameter is set to CO (via the `set-ne` command). Use the `rtrv-ne` command to determine the switch setting. The following denial message will be displayed:

```
ENRI
/* Equipage, Not equipped for Retrieving specified Information */
/* Environmental alarms can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

rtrv-ne

set-attr-cont

set-attr-env

NAME

rtrv-crs-sts1: Retrieve Cross-Connection STS-1

INPUT FORMAT

`rtrv-crs-sts1`[:*Address*];

DESCRIPTION

This command retrieves STS-1 cross-connections within the DDM-2000 system. Cross-connections are entered using the `ent-crs-sts1` command.

For OC-12, STS-3c cross-connections are possible between MAIN-B slots and any function unit slots and will be displayed in this report.

STS-3c cross-connections are an optional feature that requires a special license from Lucent Technologies. See Chapter 8, "Administration and Provisioning," for additional information.

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 Ring Addresses: `all, mb-{1-12,all}, {a,b,c,d}-{1-3,all}`

The output report appears on the following page.

```
/* Cross-Connection Map Report
=============================================================================
Address  Address                Cross Connect  Ring Id
   1        2                       Type
=============================================================================
------------------------------STS-3C-----------------------------------
mb-10     c-1                    twoway         -
mb-11     c-2                    twoway         -
mb-12     d-1                    dc             mb1
 c-1     mb-10                   twoway         -
 c-2     mb-11                   twoway         -
 d-1     mb-12                   dc             mb1
------------------------------STS-1------------------------------------
mb-1      mb-1                   twoway         -
mb-4       a-1                   twoway         -
mb-7       b-1                   dc             mb1
 a-1      mb-4                   twoway         -
 b-1      mb-7                   dc             mb1
*/
```

The above report lists both STS-1 and STS-3c cross connections (if applicable) in separate sections. The output report shows the channels in an order that reflects the physical layout of the system (for example, the high-speed slots are shown first, followed by those associated with function unit A, function unit B, etc.).

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`). Two-way cross-connections apply to terminating, hub, add/drop, pass-through, hairpin, 0x1 ring, and 0x1 DS3 configurations. For detailed information on the mentioned cross-connection types, refer to `ent-crs-sts1` command page.

`Ring Id` This 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`.

RELATED COMMANDS

dlt-crs-sts1

ent-crs-sts1

NAME

rtrv-crs-sts3c: Retrieve Cross-Connection STS-3c

INPUT FORMAT

`rtrv-crs-sts3c[:`*`Address`*`];`

DESCRIPTION

This command retrieves STS-3c cross-connections within the DDM-2000 system. Cross-connections are entered using the `ent-crs-sts3c` command.

This command is available with OC-12 ring releases.

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

`Address` The address of one or more STS-3c channels for which cross-connections are to be reported. The default address is `all` STS-3c channels in the system.

Valid OC-12 ring STS-3c Addresses are: `all, mb-{1,4,7,10,all},{a,b,c,d}-1`

The output report appears on the following page.

```
/* Cross-Connection Map Report
================================================================
Address  Address                Cross Connect  Ring for
   1        2                       Type       Drop&Cont
================================================================
-------------------------------STS-3C-------------------------
mb-1     mb-1                      twoway         -
mb-4      a-1                      dc             mb1
mb-7      b-1                      rtv            -
 a-1     mb-4                      dc             mb1
 b-1     mb-7                      rtv            -
-------------------------------STS-1--------------------------
mb-10     c-1                      twoway         -
mb-11     c-2                      twoway         -
mb-12     d-1                      dc             mb1
 c-1     mb-10                     twoway         -
 c-2     mb-11                     twoway         -
 d-1     mb-12                     dc             mb1
*/
```

The output report shows the STS-3c 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 report also shows the STS-1 channels (if applicable) in a separate section. The STS-1 channels are listed in the same order as described for the STS-3c channels.

The output parameters are:

`Address 1` Address 1 is the address of an STS-3c channel.

`Address 2` Address 2 is the address of an STS-3c channel.

`Cross Connect Type`
This column specifies whether the cross-connection is two-way (`twoway`) , drop and continue (`dc`), video cross-connections at CO site (`cov`), or video cross-connections at RT sites (`rtv`).

`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`.

RELATED COMMANDS

ent-crs-sts3c

dlt-crs-sts3c

NAME

rtrv-ec1: Retrieve EC-1

INPUT FORMAT

`rtrv-ec1`[:*Address*];

DESCRIPTION

This command retrieves information about each EC-1 port. This information includes attributes set by the `set-ec1` command as well as parameters set by switches on the circuit pack.

The input parameter is:

Address This is the address of one or more EC-1 ports. The default address is `all` EC-1 ports in the system.

Valid Addresses: `all, {a,b,c,d}-{1-3,all}`

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 on a network element (NE).

The input parameter is:

`Address` Address identifies one or more slot(s). The default is `all` slots. Valid Slot Addresses: `all, main-{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`

A sample output report appears on the following page.

```
/* Equipage and Version Report
=============================================================================
   Slot      Circuit  Apparatus  Series      CLEI       ECI      Serial
   Address    Pack       Code     Number      Code       Code     Number
   =========================================================================
   -------------------------------------------------------------------------
   tg-1      TGS       BBF2B      S3:3     SNPQA16AAA  688751  93MV08036171
                                            PID=AGAEC
   tg-2      TGS       BBF2B      S1:1     SNPQAJCAAA  680153  92MV09585817
                                            PID=AEKCG
   -------------------------------------------------------------------------
   main-a-1  -         -          -        -           -       -
   main-a-2  -         -          -        -           -       -
   main-b-1  OLIU      23G        S1:3     SNPQWAVAAC  682351  92MV07654909
   main-b-2  OLIU      23G        S1:4     SNPQWXCVIA  681391  93MV09513420
   -------------------------------------------------------------------------
   tsi-1     TSI       BCP3       S2:41    SNPQBRRAUL  687933  93MV10032913
   tsi-2     TSI       BCP3       S2:41    SNPQBKMABL  684973  93MV10148184
   -------------------------------------------------------------------------
   fn-a-1    OLIU      21G        S1:2     SNTRABCAAB  670537  90MV12066805
   fn-a-2    OLIU      21G        S1:2     SNTRABCAAB  670537  90MV12066805
   fn-b-1    3DS3      BBG11      S1:5     SNRELPWCWQ  689123  91MV69312421
   fn-b-2    -         -          -        -           -       -
   fn-c-1    OLIU      21G        S1:2     SNTRABCAAB  670537  92MV04595265
   fn-c-2    OLIU      21G        S1:2     SNTRABCAAB  670537  92MV04595265
   fn-d-1    -         -          -        -           -       -
   fn-d-2    -         -          -        -           -       -
   -------------------------------------------------------------------------
   sysctl    SYSCTL    bbg8       S1:1     SNC11WOAAA  205700  94MV00000017
   -------------------------------------------------------------------------
   auxctl    OHCTL     bcp4       S1:1     SNC11VLAAA  205701  94MV00000010

             Program version X.X.X
   */
```

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`	*Common Language** 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 that is currently stored on the circuit pack.
`PID`	Program identification code identifies the version of firmware on one or more socketed devices on the circuit pack.

The report always contains a line for every slot included in the range of the address whether or not the slot is equipped.

Hyphens (-) indicate information in that field is not applicable (that is, type and version information for slots that are not equipped).

Question marks (?) indicate that the information is unknown (for example, an unrecognized circuit pack, because the system is unable to read version information from a circuit pack inserted into a slot in the AUTO state)

---

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

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

If 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 a 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.

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 (NE's) section data communication channels (DCC), as set by the `set-fecom` command.

The DCC is an embedded overhead communications channel in the SONET line used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between NEs.

The input parameter is:

Address Address is the address of the DCC. The default value is `dcc-all`.
Valid Ring Addresses (1+1): `dcc-{mb1,mb2,a,b,c,d,all}`
Valid Ring Addresses (dual 0x1 or video): `dcc-all, dcc-{mb1,mb2,a1,a2,b1,b2,c1,c2,d1,d2}`

The far-end communication output report appears as follows:

```
/* Far End Communication Configuration Report
================================================================
   DCC          Communications    DCC
 Address                         NS/US
================================================================
 dcc-c             disabled       ns
 dcc-m-b           enabled        us
 dcc-d             enabled        us
 dcc-b             disabled       ns

*/
```

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.

DCC NS/US	DCC user side/network side (NS/US) parameter settings are available with the BBG8 controller to identify the setting of each end of the DCC in the Network Element. This identification is needed for OSI communications and is required for all nodes in the subnetwork. To avoid alarms, only one end of a span may be designated as the user side and only one end of a span may be designated as the network side.

RELATED COMMANDS

rtrv-map-neighbor

rtrv-map-network

rtrv-x25

set-fecom

NAME

rtrv-hsty: Retrieve History

INPUT FORMAT

```
rtrv-hsty;
```

DESCRIPTION

This command displays an event-history report. This report contains a list of the most recent system events. This report will contain up to 500 events. The events are listed in last-in, first-out order, and are date- and time-stamped.

NOTE:
Due to the large number of conditions reported, the RTRV-HSTY report pages have been located at the end of this section for easier reference. Please refer to the RTRV-HSTY table (Table 11-4) for a complete description of report outputs.

RELATED COMMANDS

rtrv-alm

NAME

rtrv-lgn: Retrieve Login

INPUT FORMAT

```
rtrv-lgn;
```

DESCRIPTION

This command retrieves login authorization information. This report lists each user's login and privileges. The report does not contain passwords.

NOTE:
This command is available to privileged users only.

The output report appears as follows:

```
/* Login Provisioning Report
================================================================
  Login          User Type
================================================================
  name           privileged
  name           privileged
  name           privileged
----------------------------------------------------------------
  name           general
   .                 .
   .                 .
----------------------------------------------------------------
  name           maintenance
   .                 .
   .                 .
----------------------------------------------------------------
  name           reports-only
   .                 .
                     .
*/
```

The output parameters are:

`Login` This column lists the login names.

`User Type` This column indicates the type of authorization each user is assigned. The valid values are `privileged`, `general`, `maintenance`, and `reports-only`.

Privileged logins are listed first in the report, followed by general logins, maintenance logins, and then reports-only logins. Each category of logins is separated by a row of hyphens.

NOTE:
There are always three (and only three) privileged logins on the DDM-2000 system.

RELATED COMMANDS

set-lgn

set-secu

rtrv-secu

NAME

rtrv-link: Retrieve CIT Link Configuration

INPUT FORMAT

```
rtrv-link;
```

DESCRIPTION

This command displays the currently-provisioned parameters for the user's craft interface link, as set by the `set-link` command. This includes the link which the user is logged into, the baud rate, and the page length of reports.

In OC-12 Release 5.0 and later, the baud rate is set by autobaud and is not a provisionable parameter.

The output report appears as follows:

```
/* Interface Link Configuration Report
================================================================
Link=link, PageLength (pg)=pg, Baud=baud (auto)
*/
```

The output parameters are:

`Link` Link identifies the CIT link from which the command was executed and may have the following values:

- `cit-1` This indicates the front-access port.
- `cit-2` The rear-access port.
- `dcc-x` A SONET DCC port used for remote access (`dcc-mb`, `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 page will be paged.

`Baud` Baud identifies the data rate for this link. The CIT data rate is automatically set to agree with the terminal or workstation connected to the link. The (`auto`) after the data rate indicates that the data rate is set by the autobaud routine on the SYSCTL circuit pack. After connecting to the CIT port, press

<enter><enter> or <CR><CR> (double carriage return) or "AA" or "aa" to allow the system to automatically set its baud rate to the rate of the terminal or workstation attached to the port.

RELATED COMMANDS

set-link

rtrv-ne

NAME

rtrv-map-neighbor: Retrieve Neighbor Map

INPUT FORMAT

```
rtrv-map-neighbor;
```

DESCRIPTION

This command displays network elements (NEs) that can be accessed by the local NE, and its immediate DCC neighbors.

The output report appears as follows:

```
/* Neighbor Map for local_system
================================================================================
                                    Link
System Name                Connected    Comm.     Product
  (TID)                    Through      Status    Type
================================================================================
local_system                                      DDM-2000 OC-12
Site7NE1                   main-b-1               DDM-2000 OC-12
Site3NE1                   main-b-2     FAILED    FT-2000
*/
```

The above report contains one line for each neighbor system with which the local system is communicating via SONET section DCC. The local system name is listed first in the report.

If multiple DSNEs are accidentally provisioned in a subnetwork, a warning message is displayed followed by the Neighbor Map report, which may display inaccurate information (for example, if this command is executed from a DSNE node, another DSNE and a NE might be listed as neighbors. If this command is executed from a non-DSNE node, a DSNE and another non-DSNE node might be listed as neighbor to the local system). In these events, the user must always check the `rtrv-alm` and `rtrv-map-network` reports for more details. In such cases, the output report might appear as follows:

```
/* Neighbor Map for local_system
=============================================================================
                                    Link
System Name             Connected   Comm.    Product
  (TID)                 Through     Status   Type
=============================================================================

-----------------------------------------------------------------------
WARNING!  The information displayed may be incomplete.  Check
          Rtrv-Alm report for further details.
-----------------------------------------------------------------------
local_system                                         DDM-2000 OC-12
Site7NE1                main-b-1                     FT-2000
Site3NE1                main-b-2    FAILED           DDM-2000 OC-12
*/
```

The multiple DSNE situation is transparent in the above report (because the *NE Type* is not listed) and would have already created an alarm event. To recover from the above condition, the user must reprovision the incorrect DSNE as a non-DSNE, reset it, and obtain the **Network Map** report, which shows the NE_Types of NEs listed in the report. Furthermore the user is reminded that if at a certain NE, the multiple DSNE situation is not detected, the warning message will not be displayed and the report will show that there is only a single DSNE. To avoid confusing situations, the user is encouraged to *always* check the **rtrv-alm** report.

In the event no DSNE is provisioned for a subnetwork or because of a DCC failure, none of the NEs in the subnetwork can be identified as a DSNE, and the Neighbor Map report appears as follows:

```
/* Neighbor Map for local_system
=============================================================================
                                    Link
System Name             Connected   Comm.    Product
  (TID)                 Through     Status   Type
=============================================================================

Notice: No DSNE can be identified; local system is displayed.

local_system                                         DDM-2000 OC-12
*/
```

The above situation must have already created an alarm event in the **rtrv-alm** report.

The following sample report will be displayed for an NE that has a duplicate Site/NE parameter setting (the DSNE did not register the NE that it considered duplicate):

```
/* Neighbor Map for local_system
================================================================================
                                        Link
System Name                 Connected   Comm.     Product
  (TID)                     Through     Status    Type
================================================================================

Notice: No DSNE can be identified; local system is displayed.

local_system                                      DDM-2000 OC-12
*/
```

If the user were to run the rtrv-map-neighbor report from a certain node in a subnetwork after a DCC link failure condition, the local node's neighbor map report will not show the node at the other end of the failed DCC link.

The user is always encouraged to check the `rtrv-alm` report.

The output report parameters are:

`System Name`	This column contains the system name (or TID) of the local NE's direct DCC neighbors.
`Connected Through`	This column indicates the address of the OC-3 or OC-12 lines through which the local system is connected to the system identified in the `System Name` column.
`Link Comm. Status`	This column contains the word FAILED if there is a communication failure with the system identified in first line, first column of the report. If communication with the system identified as local NE is good, it is illustrated by a blank in this column.
`Product Type`	Product Type identifies the members of the Lucent Technologies 2000 Product Family that could be listed in this report. In larger subnetworks, various product families will interwork. The Lucent Technologies 2000 Product Family product types capable of interworking are listed after Table 11-1.

If local NE is an OC-12 shelf and any function unit (for example, fn-b) has OC-3 packs in both slots, and the OC-3 packs are being used in a Single-Homed 0X1 ring application to connect function unit 1 (fn-b-1) to an OC-3 shelf and function unit 2 (fn-b-2) to another OC-3 shelf; the corresponding neighbor map report will list each neighbor with the specific function unit and slot number under

Connected Through. The report will look as follows:

```
/* Neighbor Map for NE1
================================================================================
                                    Link
System Name                Connected    Comm.    Product
  (TID)                    Through      Status   Type
================================================================================

NE1                                                DDM-2000 OC-12
NE2                        fn-b-1                  DDM-2000 OC-3
NE3                        fn-b-2                  DDM-2000 OC-3
NE4                        main-b-1                FT-2000
NE5                        main-b-2                FT-2000
*/
```

NOTE 1:
The `rtrv-map-neighbor` report may be incomplete if there are network elements with the same TBOS or Site/NE parameter settings. These duplicate parameter settings will cause an alarm to be raised. Refer to the TOP section for additional information.

NOTE 2:
Any time local network element is unable to recognize its neighbor's TID, the neighbor map report will indicate this by showing a "?" under the TID column. Also, if the rest of the information (Connected Through, Link Comm. Status, and Product Type) is not known, each corresponding field or column will display a "?".

RELATED COMMANDS

rtrv-fecom

rtrv-map-network

rtrv-ne

set-fecom

set-ne

NAME

rtrv-map-network: Retrieve Network Map

INPUT FORMAT

```
rtrv-map-network;
```

DESCRIPTION

This command causes the display of all network elements (NEs) that are registered in the DSNE and can be accessed through DCC by the local NE.

The output report appears as follows:

```
/* Network Map for local-system
==========================================================================
System Name          Comm.   Product              NE          Alarm
  (TID)              Status  Type                 Type        Group
==========================================================================
Site4NE1             FAILED  DACS IV-2000                      56
local_system                 DDM-2000 OC-12                    3
Site3NE1                     DDM-2000 OC-12                    56
Site5NE1                     FiberReach                        201
Site6NE1                     FiberReach                        201
Site8NE1                     FiberReach                        201
Site9NE1                     FiberReach                        250
Site10NE1                    FiberReach                        250
Site11NE                     FiberReach                        250
Site7NE1                     FT-2000              DSNE         3
*/
```

The above report contains one line for each system with which the local system is communicating via the SONET section DCC. The local system name is listed first in the report.

If multiple DSNEs are accidentally provisioned for a subnetwork, a warning message is displayed followed by the Network Map report, which may display inaccurate information (for example, if this command is executed from a DSNE node, multiple DSNEs and other NEs of the same subnetwork are listed).

If this command is executed from a non-DSNE node, only one DSNE may be listed, along with non-DSNE nodes). If these events occur, the user must always check the `rtrv-alm` report.

The output report may appear as follows:

```
/* Network Map for local-system
=============================================================================
System Name            Comm    Product                 NE          Alarm
  (TID)                Status  Type                    Type        Group
=============================================================================

-----------------------------------------------------------------------------
WARNING! The information displayed may be incomplete. Check
         Rtrv-Alm report for further details.
-----------------------------------------------------------------------------

Site4NE1               FAILED  DACS IV-2000                          3
local_system                   DDM-2000 OC-12                        3
Site3NE1                       DDM-2000 OC-12                        3
Site6NE1                       DDM-2000 OC-12                      201
Site8NE1                       FiberReach                          201
Site9NE1                       FiberReach                          250
Site10NE1                      FiberReach                          250
Site11NE                       FiberReach                          250
Site5NE1                       FT-2000                 DSNE        201
Site7NE1                       FT-2000                 DSNE          3
*/
```

The above situation would have already created the "Duplicate DSNE" alarm event. To recover from the above (multiple DSNE) condition, the user must reprovision the incorrect DSNE as a non-DSNE and reset it. Furthermore the user is reminded that if at a certain NE the multiple DSNE situation is not detected, the warning message will not be displayed and the report will show that there is only a single DSNE. Again, to avoid confusing situations, the user is encouraged to *always* check the `rtrv-alm` report.

In the event no DSNE is provisioned for a subnetwork or (because of a DCC failure) none of the NEs in the subnetwork can be identified as a DSNE, the Network Map report appears as follows:

```
/* Network Map for local-system
================================================================================
System Name           Comm.   Product                NE          Alarm
  (TID)               Status  Type                   Type        Group
================================================================================

Notice: No DSNE can be identified; local system is displayed.

local_system                  DDM-2000 OC-12                      3
*/
```

The above situation will have already created a corresponding alarm event. Check the **rtrv-alm** report.

The following sample report might be displayed for an NE that has a duplicate Site/NE parameter setting (the DSNE did not register the NE that it considered duplicate):

```
/* Network Map for local-system
================================================================================
System Name           Comm.   Product                NE          Alarm
  (TID)               Status  Type                   Type        Group
================================================================================

Notice: No DSNE can be identified; local system is displayed.

local_system                  DDM-2000 OC-12                      3
*/
```

The output report parameters are:

`System Name` This column contains the system name (or TID) of the local system and other systems in the subnetwork.

`Communication Status` This column contains the word FAILED if there is a communication failure with the system identified in the first line, first column of the report. If communication with the system identified as local NE is good, it is illustrated by a blank in this column.

`Product Type` Product Type identifies the members of the Lucent Technologies 2000 Product Family that could be listed in this report. In larger subnetworks, various product families will interwork. The 2000 Product Family product types capable of interworking are listed at the beginning of this chapter after Table 11-1.

`NE Type` The possible value for this parameter is:

`DSNE` Specified for the NE designated by the user as the Directory Services Network Element.

`Alarm Group` Alarm Group is a set of NEs grouped together. Their alarms are reported through an NE [known as an alarm gateway network element (AGNE)] which is a member of the same Alarm Group. Valid values are 1 to 255. This parameter can have the value of "0", indicating that the corresponding NE belongs to no Alarm Group.

NOTE 1:
The `rtrv-map-network` report may be incomplete if there are network elements with the same TBOS parameter settings. These duplicate parameter settings will cause an alarm to be raised. Refer to the TOP section for additional information.

NOTE 2:
Any time the local NE is unable to recognize a TID, the network map report will indicate this by showing a "?" under the TID column; also if the rest of the information is not known, each corresponding field or column will display a"?."

RELATED COMMANDS

rtrv-fecom

rtrv-map-neighbor

rtrv-ne

set-fecom

set-ne

NAME

rtrv-ne: Retrieve Network Element

INPUT FORMAT

```
rtrv-ne;
```

DESCRIPTION

This command displays the information that is provisioned by the `set-ne` command and set by switches on the SYSCTL pack. It also displays TIDs of the network elements currently provisioned to be alarm gateway network elements (AGNEs) and the directory services network element (DSNE) serving this local NE.

The output report appears as follows:

```
/* System Provisioning Report
============================================================
TID=system_name
Alarm Group=number
AGNE=yes|no
AGNE Address=TID1
AGNE Address=TID2   ****entry if more AGNEs exist****
GNE=active|not active
DSNE=yes|no
DSNE Address=TID
Site=number
NE=number
IDLE=ais|unequipped
Shelf=number
CO/RT Selector=location
TBOS:  Address=number
       Link=setting   (Link Active only if Selector = CO)
       Remote Reporting=setting
Product=value  (hw)
Dormant_Release=dormant_release
*/
```

The (hw) after a parameter value indicates that the parameter is set by hardware switches on the BBG8 system controller

The output parameters are:

`TID` This is the system name, indicated by a string of up to 20 alphanumeric characters. The default value for `TID` is that set by the site and NE values and is a string of the form "Site*m*NE*n*". The `TID` must be unique for each element in a subnetwork.

`Alarm Group` Alarm Group is used to identify all Network Elements that should be sharing NE Status, Alarm information and telemetry information with each other. For small networks of similar NEs, all NEs might be in the same Alarm Group. For larger applications such as DDM-2000 with FiberReach rings, one Alarm Group might be assigned to DDM-2000 shelves and one or more different Alarm Groups might be assigned for FiberReach.

`AGNE` AGNE indicates whether this system is an alarm gateway network element (AGNE) that provides the NE alarm status communications for all NEs in this Alarm Group. It has a value of `yes` or `no`.

`AGNE Address` The AGNE Address is the Target Identifier (TID) of the AGNE for this Alarm Group. It can be the TID of this NE or any other NE in the Alarm Group. More than one NE can be an AGNE for backup reasons. If more than one AGNE exists for this Alarm Group, it is also listed here. AGNE Addresses for NEs in other Alarm Groups are not listed here. If an AGNE is not defined, this parameter is left blank.

`GNE` The GNE field is used to identify whether this system is the gateway network element (GNE), providing TL1 interface. It has a value of either `active` or `not active`.

`DSNE` The DSNE is used to identify whether this system is the Directory Services Network Element. There should be one and only one DSNE provisioned for a network. In mixed product networks refer to the User Service Manual for further instructions on DSNE provisioning.

`DSNE Address` The DSNE Address is the TargeT identifier (TID) of the DSNE. It can be the TID of this NE or any other NE in the subnetwork. If a DSNE is not defined, this parameter is left blank.

`Site` Site is the site address. The value is 1 through 64 (`1-64`).

`NE` NE is the network element address (`1-5`).

`IDLE` If value is `ais`, the system will insert an Alarm Indication Signal toward the SONET line when channels are not cross-connected or not equipped with path terminating equipment. If value is `unequipped`, the system will insert the unequipped signal toward the SONET line when channels are not cross-connected or not equipped with path terminating equipment.

`Shelf` Shelf is the shelf address (`1-8`). It identifies the physical position of the shelf in a bay.

`CO/RT Selector`
Two types of TBOS displays are provided to support central office and remote terminal applications. The CO/RT Selector identifies either a central office (CO) shelf or a remote terminal

(RT) shelf to control the TBOS display formats and operation of the miscellaneous discrete points and fan control relays.

`TBOS:`

`Address` Address specifies the TBOS display address (`1-8`). This number identifies the TBOS display associated with a shelf and determines the TBOS poll to which a DDM-2000 will respond.

`Link` When multiple CO DDM-2000s are connected to the same TBOS link, this parameter is used to provision a backup function. The TBOS backup function assures that each DDM-2000 on the TBOS link is polled for its TBOS display even if one or more of the DDM-2000s fails to respond to the telemetry remote when polled. Link may be set to the following values:

- `normal` 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 is set to `enabled`, the shelf will report all its status and alarm conditions to other shelves via the SONET DCC. When the TBOS remote reporting is set to `disabled`, the shelf will not report its status and alarm conditions to other shelves. The `disabled` option is used when there are more than 8 DDM-2000 shelves in a SONET network.

`Product`
: Product is a keyword that is set by switches on the BBG8 SYSCTL and the value of the SHELFID pin (DDM shelf or ARM shelf) of the backplane to identify the product to be supported.

`DDM-2000 OC-3`
: The shelf is part of a DDM-2000 network. The software also checked for the OHCTL and determined that the product is OC-3 (BBG9 or BBG10).

`DDM-2000 OC-12`
: The shelf is part of a DDM-2000 network. The software also checked for the OHCTL and determined that the product is OC-12 (BCP4).

`SLC-2000 ARM`
: The shelf is part of a *SLC*®-2000 ARM network. The software also checked for the OHCTL and determined that the product is OC-3 (BBG9 or BBG10).

`DDM-2000 FiberReach`
: The shelf is part of a FiberReach network. The OHCTL is not a part of the shelf.

`Dormant_Release`
: This parameter is reported starting with OC-12 Release 5.1. If a dormant software generic or release is currently stored by the network element, this parameter will report the release number in the form XX.XX.XX. The value of this parameter can be either one of the following:

`XX.XX.XX`	A dormant software generic exists locally.
`none`	N0 dormant software generic exists locally or the dormant software is corrupted.

RELATED COMMANDS

rtrv-map-network

NAME

rtrv-oc3: Retrieve OC3

INPUT FORMAT

`rtrv-oc3`[:*Address*];

DESCRIPTION

This command displays the configuration of OC-3 lines, as set by the `set-oc3` command.

The input parameter is as follows:

Address Address identifies the OC-3 line(s). The default is `all`.
Valid Addresses: `all, fn-{a,b,c,d}-{1,2,all}, fn-all`

The output report for OC-12 Releases 5.0 appears as follows:

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

For OC-12 Release 5.1 and later ring releases, the output report appears as follows:

```
/* OC-3 Line Provisioning Report
================================================================================
 Line     Signal Degrade  Optical        Sync   Application   AIS
Address     Threshold     Power (hw)     Message              Alarm
================================================================================
address         n            x          message  application  alm
address         n            x          message  application  alm
  .             .            .                                 .
  .             .            .              .
*/
```

The `Concat` mode is only visible in linear DDM-2000 releases where the STS-3c mode has been enabled with the `set-feat` command.

The output parameters are:

`Line Address` Address of the OC-3 line.

`Signal Degrade Threshold`
This is the bit error rate (BER) threshold shown as a logarithm to the base 10. The value of *n* is an integer with a range of -5 through -9 corresponding to BERs of 10^{-5} through 10^{-9}, respectively.

`Optical Power` This is the current setting of the optical power switch on the OLIU circuit pack carrying the specified OC-3 signal. The (hw) after `Optical Power` indicates that the optical power setting is determined by a hardware switch on the OLIU circuit pack. This parameter may have the following values:

`high` High optical power

`low` Low optical power

— A hyphen indicates that optical power is not settable by switches on the OLIU circuit pack.

`Kbyte Message` The valid values for this parameter are `enabled`, indicating that proprietary Sync messages are used, and `disabled`, indicating that proprietary Sync messages are not used. The Sync messages use the K2 byte in the SONET overhead to determine synchronization quality. These values are set by the `set-oc3` command.

`Sync Message` Beginning with OC-12 Release 5.1, this parameter indicates the type of synchronization messaging that has been provisioned for that OC-3 optical interface by the `set-oc3` command. The valid values for this parameter are `Kbyte` (default value), `Sbyte`, and `disabled`. The sync messages use the K2 byte or the S1 byte in the SONET line overhead to determine synchronization quality.

`Application` This parameter is available in all OC-12 ring releases only. This report parameter defines additional behavior assigned to this function unit. If this parameter is set to `0x1`, the function unit is part of an OC-12 0x1 ring application. If this parameter is set to `video` or `0x1`, there is no protection switching between the packs in a function unit pair.

`AIS Alarm` This parameter specifies the alarm level of a non-service-affecting OC-3 line AIS failure condition. The valid values are:

- `cr` Critical alarm
- `mj` Major alarm
- `mn` Minor alarm
- `na` Not alarmed, but reported (default).

RELATED COMMANDS

rtrv-sync

NAME

rtrv-oc12: Retrieve OC12

INPUT FORMAT

`rtrv-oc12[:`*`Address`*`];`

DESCRIPTION

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

The input parameter is as follows:

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

NOTE:
If slot 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

For Release 5.0, the output report appears as follows:

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

*/
```

For O-12 Release 5.1 and later ring releases the output report appears as follows:

```
/* OC-12 Line Provisioning Report
=============================================================
 Line     Signal Degrade   Sync       AIS
Address     Threshold      Message    Alarm
=============================================================
address          -n        message    alm
address          -n        message    alm
                  .           .         .
                  .                     .
  .               .                     .

*/
```

The output parameters are:

`Line Address` Address of the OC-12 line.

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

`Kbyte Message` This parameter represents 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.

`Sync Message` Beginning with OC-3 release 11.0, OC-12 release 5.1 and later ring releases, this parameter indicates the type of synchronization messaging that has been provisioned for that OC-12 optical interface by the `set-oc12` command. The valid values for this parameter are `Kbyte` (default value), `Sbyte`, and `disabled`. The sync messages use the K2 byte or the S1 byte in the SONET line overhead to determine synchronization quality.

`AIS Alarm` This parameter specifies the alarm level of a non-service-affecting OC-12 line AIS failure condition. The valid values are

- `cr` Critical alarm
- `mj` Major alarm
- `mn` Minor alarm
- `na` Not alarmed, but reported (default)

RELATED COMMANDS

set-oc3

set-oc12

NAME

rtrv-osacmap: Retrieve Operation Systems Application Context Map

INPUT FORMAT

```
rtrv-osacmap;
```

DESCRIPTION

This command displays the Operation Systems Application Context Map information that is created by the `ent-osacmap` command. This information provides association information between OS application contexts and X.25 channel assignments.

NOTE:
While this command is allowed at all Network Elements in the subnetwork, only the table at a GNE node is active.

The output report appears as follows:

```
/* OS Application Context Map Report
==========================================================
VC Type  SNPA Address      ACID
==========================================================
pvc      1                tl1_application_context
pvc      2                tl1_application_context
pvc      3                tl1_application_context
svc      address          tl1_application_context
svc      address          tl1_application_context
svc      address          tl1_application_context
*/
```

The above report shows allocation of PVCs for LCNs 1, 2, and 3. The other SNPA addresses contain some allocated SVCs.

NOTE:
The above report is sorted by the VC Type, and then by SNPA within the VC Type parameters.

The output parameters are:

`VC Type` VCType is the X.25 SubNetwork Virtual Channel Type. The valid values are:

PVC Permanent Virtual Circuit

SVC Switched Virtual Circuit.

`SNPA Address`

SNPA Address is the X.25 SubNetwork Point of Attachment address for the OS. It is either the Logical Channel Number (LCN) if VCType is *PVC* or it is the Data Terminal Equipment (DTE) calling address, which is 1 to 15 digits if VCType is *SVC*.

NOTE:
Up to nine VCs can be mapped to any combination of PVCs and/or SVCs (that is, the allocation of PVCs can be removed and replaced by SVCs).

`ACID` ACID is a string of up to 23 alphanumeric characters, which is the Application Context ID to be assigned to a particular SNPA Address. Each OS has a value of ACID assigned. Default values exist for OS applications supported by DDM-2000. The supported applications types are:

tl1Maintenance

tl1MemoryAdministration

tl1Test

tl1PeerCom

tl1Other1

tl1Other2.

When this command is entered at a node that is not an active GNE, the following caution message will be displayed before the report is printed:

```
/* Caution! This OS Application Context Map Report is not active
            Only the map at a GNE is active. */
```

RELATED COMMANDS

ent-tl1msgmap

rtrv-tl1msgmap

ent-osacmap

dlt-osacmap

NAME

rtrv-passwd: Retrieve Passwords

INPUT FORMAT

```
rtrv-passwd;
```

DESCRIPTION

This command displays the logins, passwords (in encrypted form), and user type for all logins in the system. This command should *only* be used to back up this information to an external workstation.

Additional workstation software and the `rstr-passwd` command will be used to re-create this information on the network element when a new controller is installed.

NOTE:
This command is available to privileged users only.

The output report appears as follows:

```
/* Password Provisioning Report
=============================================================
Login : Password : User Type :
=============================================================
ATT01:08:sdfsdt-g:privileged:
ATT02:08:67&&8#1g:privileged:
ATT03:08:57s&8#1g:privileged:
DDM-2000:07:kdsm5:-:general:
george:09:RVoc6*bQ1:maintenance:
pete:08:RTnu8*bB:reports-only:
*/
```

The output parameters are:

`Login`	The login name established by the security administrator.
`Password`	The length and current encrypted password selected by the user of the login.
`User Type`	The access class assigned to this login by the security administrator.

RELATED COMMANDS

rstr-passwd

rtrv-lgn

set-lgn

set-passwd

NAME

rtrv-pm-line: Retrieve Performance Monitoring Line

INPUT FORMAT

`rtrv-pm-line:`*`Address`*`;`

DESCRIPTION

This command displays performance-monitoring data associated with the OC-3, OC-12, or EC-1 lines terminated on the system.

NOTE:
If Main slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the output report for this command will include data for what is considered at the time as the valid system pack type.

The input parameters are:

Address Address of the OC-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 SES	This parameter shows the number of severely errored seconds. An OC-12 severely errored second contains 124 or more errors. An EC-1 severely errored second contains 12 or more errors.
B2 ESA	This parameter shows the number of Type A errored seconds in the data collection interval. A Type A errored second is a second with a single error.
B2 ESB	This parameter shows the number of Type B errored seconds in the data collection interval. A Type B errored second is a second with more than one error but less than the number of errors in a severely errored second.
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, which are always printed.

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

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

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a `reset` or `set-date` command is entered into the system or if the OLIU/EC-1 circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

rtrv-pmthres-line

set-pmthres-line

NAME

rtrv-pm-sect: Retrieve Performance Monitoring Section

INPUT FORMAT

`rtrv-pm-sect:`*`Address`*`;`

DESCRIPTION

This command displays performance-monitoring data associated with the OC-3 and OC-12 optics and the STS-3 and STS-12 section.

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

`Address` Address of the OC-3 or OC-12 line(s). The address `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 on the following page.

```
/* 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(s).

`Start Time`	This indicates the time on the system clock when the data collection started.
`Transmit Power -1dB`	This column shows whether a -1 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack and has a value of `yes` or `no`.
`Transmit Power -2dB`	This column shows whether a -2 dB transmit power threshold crossing has occurred in the data collection interval starting at the time reported in the previous column. This parameter applies only to the 21G OLIU circuit pack and has a value of `yes` or `no`.
`Laser Bias`	This column indicates the TCA of the OLIU laser bias threshold setting. This parameter applies only to the 21G, 23G, 23H and 23R OLIU circuit packs.
`SEFS`	This column displays the number of severely errored frame seconds.

NOTE:
Rows that are all zeros or "no's" are not printed except for current day and current quarter hour, which are always printed.

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

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

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a `reset` or `set-date` command is entered into the system or if the OLIU circuit pack is inserted or removed. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

rtrv-pmthres-sect

set-pmthres-sect

NAME

rtrv-pm-sts1: Retrieve Performance Monitoring STS-1

INPUT FORMAT

`rtrv-pm-sts1:`*`Address`*`;`

DESCRIPTION

This command reports path performance-monitoring (PM) data associated with STS-1 signals terminating on the network element. For most STS-1 cross-connected paths, data is collected on the active path of the signals and only the active path is reported. For STS-1 cross-connections, path termination exists if one of the interfaces is not SONET (for example, a BBG4B DS3 interface).

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 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, EC1, 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-sts1

set-pmthres-sts1

NAME

rtrv-pm-t3: Retrieve Performance Monitoring T3

INPUT FORMAT

`rtrv-pm-t3:`*`Address`*`;`

DESCRIPTION

This command displays performance-monitoring (PM) data associated with one or more DS3 signals passing through the system. This report is enhanced to display the performance monitoring data for the DS3 line and path incoming from the DSX-3, in addition to the previously displayed data for the DS3 path incoming from the fiber.

The line and path PM data from the DSX-3, as well as all near-end and far-end C-bit parity PM data are available ONLY when a BBG11B pack is active (in-service) in a function unit slot. When a function unit slot is equipped with one of these new circuit packs, the DS3 line PM data will always be displayed regardless of what type of mode the DS3 service has been provisioned for. If the *clear channel (cc)* mode is selected, the report will display the DS3 line PM data and dash lines (-) for both directions of all DS3 path PM data.

The input parameters are:

Address Address of the DS3 signal(s).
Valid DS3 Port Addresses: `all, {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  Type        Start   SEFS        CV        ES      SES      UAS
         Direction   Time
================================================================================
address  line        time                n         n       n
         dsx-p                  n        n         n       n        n
         dsx-pfe                n        n         n       n        n
address  fiber-p                n        n         n       n        n
         fiber-pfe              n        n         n       n        n
   */
```

The output parameters are:

`Address` This shows the address of the DS3 signal incoming from the DSX-3 or the fiber.

`Type Direction`
This shows the type of the PM data (line, path, path far-end) and the direction from which the signal is received (dsx-3 or fiber).

`Start Time` This indicates the time on the system clock when the data collection started. The parameters are reported as a combination of their type and direction from which they are received. For *`line`* parameters, refer to CV-L, ES-L, and SES-L definitions. For *`dsx-p`* and *`fiber-p`* parameters, see SEFS, CV-P, ES-P, SES-P, and UAS-P definitions. For far-end *`dsx-pfe`* and *`fiber-pfe`* path parameters, refer to SEFS, CV-PFE, ES-PFE, SES-PFE, and UAS-PFE definitions.

`CV-L` This indicates the number of B3ZS coding violations occurring over the accumulation period for the DS3 signal incoming from the DSX-3.

`ES-L` This indicates the number of seconds with at least one B3ZS coding violation or LOS for the DS3 signal incoming from the DSX-3.

`SES-L` This indicates the number of seconds with greater than 44 B3ZS coding violations or LOS for the DS3 signal incoming from the DSX-3.

`SEFS` This indicates the number of out of frame seconds or AIS seconds for the DS3 signal incoming from the DSX-3 or the fiber.

`CV-P` This shows the number of P-bit, adjusted F&M bit, or C-bit parity coding violations for the DS3 signal incoming from the DSX-3 or the fiber.

`ES-P` This shows the number of path errored seconds for the DS3 signal incoming from the DSX-3 or the fiber.

`SES-P` This shows the number of path severely errored seconds for the DS3 signal incoming from the DSX-3 or the fiber. A severely errored second contains 44 or more errors.

`UAS-P` This shows the number of path unavailable seconds of service for the DS3 signal incoming from the DSX-3 or the fiber. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred.

`CV-PFE` This shows the number of FEBE bits path coding violations at the far-end for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the `set-t3` command. This applies to a DS3 signal incoming from the DSX-3 or the fiber.

`ES-PFE` This shows the number of far-end path errored seconds for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the `set-t3` command. This applies to a DS3 signal incoming from the DSX-3 or the fiber.

`SES-PFE` This shows the number of far-end path severely errored seconds for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the `set-t3` command. This applies to a DS3 signal incoming from the DSX-3 or the fiber. A severely errored second contains 44 or more errors.

`UAS-PFE` This shows the number of far-end path unavailable seconds for a C-bit framed DS3 service that has been provisioned for cbit frame and cpbit format using the `set-t3` command. This applies to a DS3 signal incoming from the DSX-3 or the fiber. A count of unavailable seconds begins after 10 consecutive severely errored seconds has occurred.

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

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

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

A blank indicates that the report field does not apply.

A question mark (?) following a count indicates that the count includes data for less than the full counting interval. This may occur if a `reset` or `set-date` command is entered into the system or if the DS3 circuit pack is inserted or removed, or a facility loopback is established. If the count is both overflowed and incomplete, only the greater-than symbol (>) appears.

An asterisk (*) following a count for a parameter indicates that a threshold crossing has occurred for that parameter.

RELATED COMMANDS

init-pm

rtrv-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 (PM) counter exceeds a user-selected threshold.

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the output report for this command will include data for what is considered at the time as the valid system pack type.

The output report appears as follows:

```
/* TCA Performance Monitoring Summary Report
=============================================================================
Address   Optics  Section   Line   STS-1     DS3     DS3
                                   Path      Path    Line
=============================================================================
address     n        n       n
address     n        n       n
address                              n
address                              n         n       n
address                              n         n
```

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, PSC, or PJC).
`STS-1 Path`	This shows the total number of TCAs associated with STS-1 path performance monitoring parameters (B3 CV, B3 ES, B3 ES Type A, B3 ES Type B, B3 SES, or B3 UAS).
`DS3`	This shows the total number of TCAs associated with DS3 path performance monitoring parameters (severely errored frame seconds, P-bit, adjusted F&M bit, or C-bit parity CV-P, ES-P, SES-P, UAS-P) incoming from the fiber and the DSX-3. The report will also show the total number of TCAs for DS3 line performance monitoring parameters (CV-L, ES-L, SES-L). For ports on the BBG11 circuit packs, path and line TCAs for the DS3 signal incoming from the DSX-3 will be displayed with a port address (a,b-3,...). Path TCAs for the DS3 signal incoming from the fiber, will be displayed with a channel address (m-1, mb-10,...).

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 OC-3 and OC-12 line performance parameter thresholds, as set by the `set-pmthres-line` command.

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The output report appears as follows:

```
/* Line Performance Monitoring Thresholds Report
================================================================
Parameter                                    Thresholds
                                          Quarter    Day
                                           Hour
================================================================
B2 Coding Violations OC12 (B2CVOC12)        n          n
B2 Coding Violations OC3 (B2CVOC3)          n          n
B2 Coding Violations 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.
`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. This parameter applies only to the 21G, 23G, 23H and 23R OLIU circuit packs.

`Severely Errored Frame Seconds` — This parameter displays the threshold values for the SEFS count. A parameter threshold of zero indicates that the thresholding is disabled.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

set-pmthres-sect

NAME

rtrv-pmthres-sts1: Retrieve Performance Monitoring Threshold STS-1

INPUT FORMAT

```
rtrv-pmthres-sts1;
```

DESCRIPTION

This command retrieves the system's STS-1 path performance monitoring (PM) thresholds, as set by the `set-pmthres-sts1` command.

The output report appears as follows:

```
/* STS-1 Path Performance Monitoring Thresholds Report
================================================================
Parameter                                    Thresholds
                                          Quarter      Day
                                           Hour
================================================================
B3 Code Violations (B3CV)                    n           n
B3 Errored Seconds (B3ES)                    n           n
B3 Errored Seconds Type A (B3ESA)            n           n
B3 Errored Seconds Type B (B3ESB)            n           n
B3 Severely Errored Seconds (B3SES)          n           n
B3 Unavailable Seconds (B3UAS)               n           n
*/
```

The first column of the report contains the names of the path performance monitoring parameters. The second and third columns contain the quarter-hour and day thresholds for each parameter. The output parameters are:

`Quarter Hour` This column contains the quarter-hour thresholds for each performance monitoring parameter.

`Day` This column contains the day thresholds for each performance-monitoring parameter.

`B3CV` This parameter shows the threshold for coding violations. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent Bit Error Ratio (BER) of 10^{n}. A threshold of zero indicates that the thresholding is disabled.

`B3ES` This parameter shows the threshold for errored seconds.

`B3ESA` This parameter shows the threshold for type A errored seconds.

B3ESB	This parameter shows the threshold for type B errored seconds.
B3SES	This parameter shows the threshold for the number of severely errored seconds.
B3UAS	This parameter shows the threshold for unavailable seconds of service.

RELATED COMMANDS

init-pm

set-pmthres-sts1

rtrv-pm-sts1

rtrv-pm-tca

NAME

rtrv-pmthres-t3: Retrieve Performance Monitoring Threshold T3

INPUT FORMAT

```
rtrv-pmthres-t3;
```

DESCRIPTION

This command displays the system's current DS3 performance parameter thresholds, as set by the `set-pmthres-t3` command.

The output report appears as follows:

NOTE:
All DS3 line parameters, in addition to DS3 C-bit parity and all other path parameters for the incoming signal from the DSX-3, are only applicable when a BBG11B pack is active (in-service) in a function unit slot.

```
/* DS3 Performance Monitoring Thresholds Report
=============================================================================
   Parameter                                          Thresholds
                                                  Quarter      Day
                                                    Hour
=============================================================================
 Coding Violations-Line (CVL)                        n           n
 Errored Seconds-Line (ESL)                          n           n
 Severely Errored Seconds-Line (SESL)                n           n
 Severely Errored Frame Seconds (SEFS)               n           n
 P-bit Coding Violations-Path (PCV)                  n           n
 F&M bit Coding Violations-Path (FMCV)               n           n
 C-bit Coding Violations-Path (CP)                   n           n
 Errored Seconds-Path (ESP)                          n           n
 Severely Errored Seconds-Path (SESP)                n           n
 Unavailable Seconds-Path (UASP)                     n           n
 Severely Errored Frame Seconds-Far End (SEFSFE)     n           n
 C-bit Coding Violations-Path Far End (CPFE)         n           n
 Errored Seconds-Path Far End (ESPFE)                n           n
 Severely Errored Seconds-Path Far End (SESPFE)      n           n
 Unavailable Seconds-Path Far End (UASPFE)           n           n
 */
```

A threshold of zero indicates that thresholding is disabled.

The output parameters are:

CVL — These parameters display the threshold for the coding violations count of the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

ESL — These parameters display the threshold for the errored seconds count of the DS3 line with at least one B3ZS coding violation.

SESL — These parameters display the threshold for the severely errored seconds count of the DS3 line with greater than 44 B3ZS coding violations.

SEFS — These parameters display the threshold values for severely errored frame seconds. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

PCV — These parameters display the threshold for the DS3 P-bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

FMCV — These parameters display the threshold for the DS3 F&M bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

CP — These parameters display the threshold for the DS3 C-bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^n.

ESP — These parameters display the threshold for the DS3 P-bit, Adjusted F&M bit, or C-bit errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

SESP — These parameters display the threshold for the DS3 P-bit, Adjusted F&M bit, or C-bit severely errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

UASP — These parameters display the threshold for the DS3 P-bit, Adjusted F&M bit, or C-bit unavailable seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

SEFSFE — These parameters display the threshold values for the far-end DS3 C-bit severely errored frame seconds. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

CPFE	These parameters display the threshold for the DS3 far-end C-bit coding violation counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative threshold value indicates that the coding violation threshold is specified in terms of an equivalent bit error ratio (BER) of 10^{n}.
ESPFE	These parameters display the threshold for the DS3 far-end C-bit errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
SESPFE	These parameters display the threshold for the DS3 far-end C-bit severely errored seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.
UASPFE	These parameters display the threshold for the DS3 far-end C-bit unavailable seconds counts. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber.

RELATED COMMANDS

init-pm

rtrv-pm-t3

rtrv-pm-tca

set-pmthres-t3

set-t3

NAME

rtrv-secu: Retrieve Security

INPUT FORMAT

```
rtrv-secu;
```

DESCRIPTION

This command retrieves CIT and DCC ports security and timeout information.

The output report appears as follows:

```
/* Port Security Configuration Report
================================================================
Access        Security        Timeout,
 Link                         minutes
================================================================
cit-1         lockout          0
cit-2         enabled         60
dcc-mb        lockout         15
                .              .
  .             .              .
  .             .              .
*/
```

The output parameters are:

`Access Link` — Access link is the address of a CIT or DCC interface. Valid Addresses: `dcc-{mb,a,b,c,d}`, `cit-{1,2}`

`Security` — Security shows whether security is enabled, disabled, or in lockout state on the listed CIT or DCC port. The valid values are `enabled`, `disabled`, or `lockout`. When security is enabled, a user must enter a valid login and password to begin a session. When security is in `lockout` state, only a `privileged` user is permitted to access the system through the locked out CIT/DCC ports.

`Timeout` — This parameter shows the time duration, in minutes, before an inactive session is terminated on a specified CIT or DCC interface. If timeout is zero (0), then there is no timeout.

RELATED COMMANDS

rtrv-lgn

set-secu

NAME

rtrv-state-eqpt: Retrieve State Equipment

INPUT FORMAT

`rtrv-state-eqpt`[:*Address*];

DESCRIPTION

This command displays slot, port, and protection switching state information for the network element (NE).

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the report will include data for what is considered at the time as the valid system pack type.

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 on the following page.

```
/* Equipment State Report
   ================================================================
   Address   Circuit    Port      Switch      Switch
             Pack     State(s)    State     Priority
   ================================================================
   address    pack        p          s        priority
   address    pack        p          s        priority
     .                    .          .           .
     .                    .                      .
   ----------------------------------------------------------------
   address    pack        p          s        priority
     .          .         .
     .          .                    .           .
   address    pack        p          s        priority
*/
```

In the output report, slot types are separated by a row of dashes. Within each slot type, slots are listed in order of their addresses, with protection slots listed last. Slots for control circuit packs (SYSCTL, AUXCTL) are not listed in this report.

The output parameters are:

`Address` Address is the address of a slot.

`Circuit Pack` Circuit pack is the circuit pack name. A hyphen (-) means not applicable or not equipped.

`Port State(s)` The state of the signal, from the DS-3 or EC-1 signals, is reported.

Port State (`p`) may be blank or one of the following values:

`i` (In Service) In this state, the port is monitored for failures, and the appropriate alarm is generated if a failure is detected. To retire the alarm and transition the associated port to the auto state, the update function must be performed after the input signal is removed.

`a` (Automatic) In this state, the port will automatically be put in-service if a good signal is detected. This state is not allowed for OC-N signals.

`n` (Not Monitored) In this state, the signal is not monitored or alarmed. The port will not automatically go to the in-service state when a signal is detected.

— Not applicable (not equipped).

The port state is always blank for timing circuits, for protection slots for 1x1 and 1xn protected circuit packs, and for OLIU circuit packs. The port state is always blank for both OLIU circuit packs in function units provisioned for the 0x1 ring, video and 1+1 applications.

`Switch State` This indicates whether the circuit pack is active or standby, corresponding to the state of the protection switching relays. Switch state(s) may be one of the following:

`active` For OC-N lines in a 1+1 line-protected configuration, active means the signal being received on this line is selected by the near end protection switch and the signal being transmitted on this line is selected by the far end. For ring applications, each OLIU in the main-b slots and the TSI in the tsi slots is feeding its ring channels incoming from the fiber to

	the other side for pass-through connections and is sending drop channels to the function units. Some or all of the received ring channels incoming from this OLIU may be active. This can be determined using the `rtrv-state-path` command on this system. Some or all of the transmitted ring channels outgoing to the fiber may also be active. This can be determined by using the `rtrv-state-path` command on *all* remote systems.
`active-fn`	For a 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 the function unit's OC-3 lines, the signal being transmitted is selected by the far end, but the received signal is not selected by the near end protection switch.
`active-rx`	For the function unit's OC-3 lines, the signal being received on this line is selected by the near end protection switch, but the signal being transmitted is not selected by the far end.
`active-?`	For the function unit's OC-3 lines, the protection line is failed in the receive direction. The state of the protection line in the transmit direction is unknown; the signal transmitted on the protection line *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 pass-through or 0x1 ring or video 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.

`APS-signal degrade`
Automatic protection switching has occurred due to a signal degrade.

`APS-pack failure`
Automatic protection switching has occurred due to a circuit pack failure.

`APS-automatic lock`
Traffic is forced and held onto the protection pack, unable to revert to the service pack until midnight. This occurs following four automatic switches from service to protection during a 10-minute interval.

`manual` Traffic has been manually switched to protection.

— No manual or automatic switch requests are active.

For ring applications, the switch priority in this report applies only to the equipment switching of the 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-oc3: Retrieve state of OC-3 lines.

INPUT FORMAT

`rtrv-state-oc3[:`*`Address`*`];`

DESCRIPTION

This command retrieves OC-3 line states.

The input parameter is:

`Address` Address is the address of the OC-3 lines whose state is to be reported. The default is `all` OC-3 lines. Other valid addresses are:
`fn-all, fn-{a,b,c,d}-{1,2,all}`

The output report appears as follows. Only lines that are equipped with OC-3 type OLIU circuit packs will be displayed in the output report.

```
/* OC-3 Line State Report
================================================================
Address     Line State
================================================================
fn-a-2      nmon
fn-b-2      is
fn-c-1      nmon
fn-c-2      is
fn-d-2      is
*/
```

The output parameters are:

`Address` Address is the address of an OC-3 line.

`Line State` Line State is the state of the OC-3 line identified in the address field. It may have one of the following values:

- `is` In-service. The line is monitored. Alarm, status conditions, and PMON data are reported normally.
- `nmon` Not Monitored. Alarm or status conditions for the line are not reported. Section and line performance monitoring data collection will be stopped in this state. The line state will not change to "in service" if a good signal is detected. The line will remain in this state until the state is changed again with this command.

RELATED COMMANDS

rtrv-state-eqpt

set-state-oc3

set-oc3

rtrv-oc3

NAME

rtrv-state-path: Retrieve State Path

INPUT FORMAT

`rtrv-state-path`[:*Address*];

DESCRIPTION

This command displays signal path state information for path-protected signals dropped at the network element (NE). To determine which of the transmitted ring channels outgoing to the fiber are active, it may be necessary to also use the `rtrv-state-eqpt` command on all remote systems.

Any application that is path protected is reported.

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), the report will include data for what is considered at the time as the valid system pack type.

Any application that is path protected is reported.

The input parameter is:

Address The *address* is any drop or drop and continue STS-1 path or STS-3c path. The default is `all` for all paths in the system.

Valid STS-1 Addresses for OC-12 OLIUs:
`all, {mb1,mb2}-{1-12,all}`

Valid STS-3c Addresses:
`all, {mb1,mb2}-{1,4,7,10,all}`

The output report appears as follows:

```
/* Path Protection Switch State Report
   ==========================================================
   ---------- Ring 1 ----------  ---------- Ring 2 ----------
   Address  Act   APS Condition   Address  Act   APS Condition
   ==========================================================
   address   x     condition      address   x    condition
   address   x     condition      address   x    condition
      .      .        .              .      .
      .      .        .              .             .
      .               .              .      .
   */
```

The output parameters are:

`Address` The `address` is any STS-1 and/or STS-3c 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.

This column may contain one of the following:

`Y` The path is provisioned as drop, or drop and continue, and this side is active (path protection switching is allowed).

`(blank)` The path is provisioned as drop, or drop and continue, and this side is in standby.

`APS Condition` This column lists the condition that caused the automatic protection switch to occur and appears on the path where the condition was detected. (The manual protection switch request is not shown because the system is nonrevertive.) The condition may be one of the following:

`signal failure`

`pack removal`

`pack failure`

`signal degrade`

Only manual or automatic protection switch (APS) requests that are higher priority than the currently active requests will cause a protection switch to occur. Currently, only the `manual` protection switch request is

allowed, and because it is a lower priority than the APS requests, only APS requests will appear in the report. The APS conditions will remain active while the condition that caused the switch still exists. When that failure clears, the APS condition is changed to blank if no other APS requests exist.

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.

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during and upgrade), the report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address is the address of the STS-1 channels whose state is to be reported. The default is `all` STS-1 channels. Other valid addresses: `{mb}-{1-12,all}`. `{a,b,c,d}-{1-3,all}`.

The output report appears as follows.

```
/* STS-1 Channel State Report
================================================================
Address      Channel State
================================================================
mb-1         AUTO
mb-2         IS
mb-3         NMON
  .            .
  .            .
*/
```

NOTE:
An empty report is displayed if there are no cross-connections.

The output parameters are:

`Address` Address is the address of an STS-1 channel.

`Channel State` Channel State is the state of the STS-1 channel identified in the address field. It may have one of the following values:

- `auto` Automatic. There is not a good signal on this channel. [STS-1 AIS or STS-1 loss of pointer (LOP) condition may be present.] Alarm or status conditions associated with this channel are not reported. Performance monitoring is not done for the channel. If a good signal is detected on this channel, then the channel will be put in the in-service state automatically.
- `is` In-service. The channel is monitored. Alarm and status conditions are reported normally.
- `nmon` Not Monitored. The channel is not being monitored. Alarm and status conditions are not reported for this channel. Performance monitoring is not done for the channel. The channel will remain in this state until the state is changed (with the `set-state-sts1` command) or until the cross-connection involving this channel is deleted.

RELATED COMMANDS

set-state-sts1

upd

NAME

rtrv-state-sts3c: Retrieve State of STS-3c Channels

INPUT FORMAT

`rtrv-state-sts3c[:`*`Address`*`];`

DESCRIPTION

This command retrieves STS-3c channel states.

This command is available with all OC-12 ring releases.

The input parameter is:

`Address` Address is the address of the STS-3c channels whose state is to be reported. The default is `all` STS-3c channels. Other valid addresses are: `{mb}-{1,4,7,10,all}`.

The output report appears as follows. Only channels that are cross-connected will be displayed in the output report.

```
/* STS-3c Channel State Report
================================================================
Address      Channel State
================================================================
mb-1         auto
mb-4         is
mb-7         nmon
mb-10        is
  .
               .
  .            .
*/
```

The output parameters are:

`Address` Address is the address of an STS-3c channel.

`Channel State` Channel State is the state of the STS-3c channel identified in the address field. It may have one of the following values:

- `auto` Automatic. There is no good signal on this channel. Alarm or status conditions associated with this channel are not reported. If a good signal is detected on this channel, then the channel will be put in the "In Service" state automatically.
- `is` In Service. The channel is monitored. Alarm and status conditions are reported normally.
- `nmon` Not Monitored. The channel is not being monitored. Alarm and status conditions are not reported for this channel. The channel will remain in this state until the state is changed (with the `set-state-sts3c` command) or until the cross-connection involving this channel is deleted (ring releases).

RELATED COMMANDS

dlt-crs-sts3c

ent-crs-sts3c

rtrv-crs-sts3c

set-state-sts3c

update

NAME

rtrv-sts1: Retrieve STS1

INPUT FORMAT

`rtrv-sts1`[:*Address*];

DESCRIPTION

This command retrieves two types of provisioned parameters for STS-1 channels. The parameter types are:

- signal degrade alarm threshold
- alarm level for sa/nsa STS path AIS condition

NOTE:
If slots 1 and 2 are equipped with different pack types (for example, during an upgrade), this report will include data for what is considered at the time as the valid system pack type.

The input parameter is:

Address Address is the address of the STS-1 channels whose parameters are to be reported. The default is `all` STS-1 channels. Other valid addresses are: `{mb}-{1-12,all}`.

Only STS-1 channels that are cross-connected will be displayed in the output report.

When the default address is entered, the output report appears as follows:

```
/* STS1 Channel Provisioning Report
=================================================================
SignalDegrade = value

STS-1 AIS Alarm Information
Address      AIS Alarm            AIS Alarm
           Service Affecting  Non Service Affecting
=================================================================
address          sa                 nsa
address          sa                 nsa
  .              .                  .
  .              .                  .
*/
```

If the address is anything but `all`, then the report appears as follows:

```
/* STS-1 Channel Provisioning Report
=================================================================
Address        AIS Alarm            AIS Alarm
           Service Affecting  Non Service Affecting
=================================================================
address        sa                   nsa
address        sa                   nsa
  .              .                    .
  .              .                    .
  .              .
*/
```

If the nsa parameter is not valid for the application, for example a non-ring application, then the report appears as:

```
/* STS-1 Channel Provisioning Report
=============================================
Address        AIS Alarm
           Service Affecting
=============================================
address        sa
address        sa
  .             .
  .             .
  .
*/
```

The output parameters are:

`SignalDegrade` This is the signal degrade threshold value.

`address` This is the address of the provisioned channel.

`AIS Alarm` One or more columns of information will show the AIS alarm values for service affecting (SA) and non-service affecting (NSA) alarms. SA alarms may have one of the following values:

- `cr` Critical alarm (default for ring channels)
- `mn` Minor alarm (non-ring channels only, default)
- `na` Not alarmed, but reported
- `nr` not alarmed and not reported (non-ring channels only).

NSA alarms may have one of the following values:

- `mn` Minor alarm (default)
- `nr` Not alarmed and not reported.

RELATED COMMANDS

set-sts1

NAME

rtrv-sts3c: Retrieve STS3c

INPUT FORMAT

`rtrv-sts3c`[:*Address*]

DESCRIPTION

This command retrieves information about the dropped STS-3c channels. This information consists of the signal degrade threshold value and the STS-3c path AIS alarm value that was provisioned using `set-sts3c` command.

The input parameter is:

Address Address is the address of the STS-3c channels whose state is to be reported. The default is `all` STS-3c channels. Other valid addresses are: `{mb}-{1,4,7,10,all}`.

Only STS-3c channels that are cross-connected will be displayed in the output report. The output report appears as follows:

```
/* STS-3c Channel Provisioning Report
================================================
SignalDegrade = value

STS-3c AIS Alarm Information
Address       AIS Alarm           AIS Alarm
           Service Affecting  Non Service Affecting
================================================
address       sa                    nsa
address       sa                    nsa
  .           .                     .
  .           .                     .
  .                                 .
*/
```

The output parameters are:

`SignalDegrade` This is the signal degrade value. The signal degrade has a value in the range -5 through -9 and default value of -6.

`address` This is the address of the provisioned channel.

`AIS Alarm` One or more columns of information will show the AIS alarm values for service affecting (SA) and non-service affecting (NSA) alarms. SA alarms may have one of the following values:

- `cr` Critical alarm (default for ring channels)
- `mn` Minor alarm (non-ring channels only, default)
- `na` Not alarmed, but reported
- `nr` not alarmed and not reported (non-ring channels only)

NSA alarms may have one of the following values:

- `mn` Minor alarm (default)
- `nr` Not alarmed and not reported

RELATED COMMANDS

set-sts3c

NAME

rtrv-sync: Retrieve Synchronization

INPUT FORMAT

```
rtrv-sync;
```

DESCRIPTION

This command displays the provisioning and operational information on the synchronization attributes of the DDM-2000, as set by the `set-sync` command.

The following pages show output reports for this command and explain the various fields on the reports. Output reports will vary according to the provisioned timing mode and the software release.

The `(hw)` after a parameter value on the following reports indicate that the parameter is set by hardware switches on the TGS circuit pack.

The synchronization output report on the following page is the general format for a system equipped with TGS circuit packs that include DS1 timing outputs in the sync mode.

The following report is for OC-12 Release 5.0 and earlier:

```
/* Synchronization Report
 ================================================================================
 Parameter                    Value(s)
 ================================================================================
 Sync Source (src)            address  timing_message

 DS1 Line Code/Format         tg-1=xxxx/xxx (hw)  tg-2=xxxx/xxx (hw)

 Shelf Timing
   Provisioned Mode           mode (hw)
   Active Timing Mode         mode (hw)
   DS1 Reference Input State  ref-1=mode       ref-2=mode
   Active Circuit Pack        pack
   Active Reference/Line      ref
   Mode Switching (mdsw)      mode
   Last Reference Switch      YY-MM-DD HH:MM:SS

 DS1 Outputs
   Provisioned Mode           mode (hw)
   DS1 Output Mode (omd)      mode
   DS1 Output State           refout-1=state   refout-2=state
   Active Reference           ref

 Sync Message Information
   OC-N Line      Input Message     Output Message
--------------------------------------------------------------------------------
   address          Message           Message
   address          Message           Message
   address          Message           Message

 Sync Autoreconfiguration    mode
*/
```

The following report is for OC-12 Release 5.1 and later releases.

```
/* Synchronization Report
 ================================================================
 Parameter                    Value(s)
 ================================================================
 Sync Source (src)            address  timing_message

 DS1 Line Code/Format         tg-1=xxxx/xxx (hw)  tg-2=xxxx/xxx (hw)

 Shelf Timing
   Provisioned Mode           mode (hw)
   Active Timing Mode         mode (hw)
   DS1 Reference Input State  ref-1=mode       ref-2=mode
   Active Circuit Pack        pack
   Active Reference/Line      ref
   Mode Switching (mdsw)      mode
   Last Reference Switch      YY-MM-DD HH:MM:SS

 DS1 Outputs
   Provisioned Mode           mode (hw)
   DS1 Output Mode (omd)      mode
   AIS Threshold (aisthres)   thres (Message)
   DS1 Output State           refout-1=state   refout-2=state
   Active Reference           ref

 Sync Message Information
   OC-N Line      Input Message     Output Message     Type
----------------------------------------------------------------
   address          Message            Message          Type
   address          Message            Message          Type
   address          Message            Message          Type

 Sync Autoreconfiguration    mode
*/
```

The output parameters for the reports are as follows. Some parameters may not apply to all the reports. The output parameters are:

`Sync Source` The sync source is the optical line provisioned from which shelf (and optionally, DS1 sync output) timing is derived. If the shelf timing mode is set for `LineTimed` and DS1 sync output timing is also selected, `Sync Source` is both the source for shelf timing and DS-1 sync outputs. If the shelf timing mode is set for `External` and DS1 sync output timing is also selected, `Sync Source` is only the source for DS-1 sync outputs. The valid values for this parameter are:

`main-b-1`	OC-12 Ring Releases (default)
`main-b-2`	OC-12 Ring Releases

— (dash)	Timing mode is hardware provisioned to be FreeRunning or External without DS1 sync outputs (`mult`).

The choices for Sync Source (except the dash) are followed by one of these messages:

`for Shelf only` Sync Source is set for line-timed shelf.

`for Shelf and DS1 Outputs`
Sync Source is set for line-timed 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

`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.
`LineTimed`	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 system. The value may be any of the values listed previously in `Provisioned Mode` or one of the following:

`Holdover`	Timing generator is operating in holdover mode because the provisioned references are not available or because the system has been manually switched to holdover mode.
`No Timing`	Timing circuit packs have been removed.
`?`	Timing mode is unreadable.

`DS1 Reference Input State`

Input State refers to the primary state of the DS1 `External` timing reference ports, with values as follows:

`is`	in-service
`auto`	automatic

`Active Circuit Pack`

Active Circuit Pack indicates which timing generator circuit pack is currently active. The value is `tg-1`, `tg-2`, or `-` (empty slot).

`Active Reference/Line`

Active Reference is the active external reference for the timing generator. When Active Reference is reported, Active Line is not reported. When the Provisioned Mode is `External`, Active Reference has the following values:

`ref-1`	The active timing reference is set to the timing reference "one".
`ref-2`	The active timing reference is set to the timing reference "two".
—	Not applicable. DS1 references are in auto input state.

Active Line is the active LineTimed reference for the timing generator. When Active Line is reported, Active Reference is not reported. When Provisioned Mode is `LineTimed`, Active Line has the following values:

`main-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.

`Mode Switching`
Mode Switching indicates whether the mode switching for the timing generator is revertive or nonrevertive.

`Revertive`	Revertive mode switching. If the system is provisioned for revertive mode switching, it will automatically switch from holdover mode to the provisioned mode (`LineTimed` or `External` timing) when a good reference becomes available.
`Nonrevertive`	Nonrevertive mode switching. If the system is provisioned for nonrevertive mode, it will switch to holdover mode (as a result of a timing reference failure) and remain in this mode until it is manually switched back to the provisioned timing mode by the **`switch-sync`** command.
— (dash)	Not applicable. Provisioned mode is `FreeRunning`.

`Last Reference Switch`
Last Reference Switch Time is the date and time of the last switch of the `External` timing reference. It has an initial power-up value of "NA" which is retained until a reference switch occurs. The value of Switch Time (the instant a switch occurs) is obtained from the system clock. This parameter is reported only when the Provisioned Mode is `External`.

`DS1 Outputs`
DS1 Outputs is the DS1 timing outputs and can be provisioned by hardware switches on the circuit pack. If the DS1 outputs are mult, then only Provisioned Mode is reported for this section.

`Provisioned Mode`

`mult` In the `External` timing mode, the `mult` is used to distribute the incoming DS1 reference to other shelves in the bay.

`sync out`
This mode indicates that timing is derived from a terminating OC-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.

`AIS Threshold`
In OC-12 Release 5.1 and later ring releases, this parameter indicates the provisioned sync message quality level and its equivalent sync message phrase for the active reference at which, or greater incoming quality level numbers, DS1 AIS will be transmitted on the sync output of the BBF2B TGS circuit pack. If the `syncmsg` parameter within the **`set-oc3`** or **`set-oc12`** command is set to `disabled`, then the word `disabled` will be reported with the provisioned value of this parameter. It may be set to one of the following options:

`level5`	default value. (K2: Internal Clock, S1: Traceable SONET Clk, or disabled)
`level4`	(K2: Stratum 3, S1: Traceable Stratum 3, or disabled)
`level3`	(K2: Stratum 2, S1: Traceable Stratum 2, or disabled)
`level2`	(K2: Sync Quality Unknown, S1: Sync Trace Unknown, or disabled)

For a definition of quality levels, refer to the Sync Message Information section of this command pages.

`DS1 Output State`
The output state is the status of the DS1 output when in the *`sync out`* mode, and may be one of the following:

`good` This status indicates that the DS1 output is traceable to the incoming OC-12 line.

AIS — DS1 AIS is inserted if a failure exists that prohibits tracing of the DS1 output to the incoming optical line. It is also inserted due to certain incoming synchronization message quality levels on the active timing source.

- — Indicates the slot is in the auto state.

? — The circuit pack is unreadable, or slot is equipped and empty.

Active Reference

This shows the actual line that the DS1 timing output is being derived from, with the following values:

main-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 only if the kbyte message parameter is set to **enabled**. In OC-12 release 5.1 and later releases, this section of the report is available only if any of the optical interfaces has been provisioned for kbyte (default) or Sbyte sync messaging (using the **set-oc3/oc12** commands).

OC-N Line

This parameter identifies the addresses of optical interfaces that can carry sync messages.

Input Message

disabled — Indicates that the field is not applicable (for example, if synchronization messaging is disabled).

? — Indicates that the message is not readable (for example, due to a line failure).

This column identifies the Kbyte input message received on each optical interface line, and may have one of the following values:

Don't Use — The interface is not suitable for synchronization timing (Quality Level 7).

`Timing Looped Back`
: The network element connected to this interface is line-timed from it (Quality Level 7).

`Stratum 4`
: The interface is receiving timing from a Stratum 4 clock source (Quality Level 6).

`Internal Clock`
: This interface is receiving timing from a system in holdover or free running (Quality Level 5).

`Stratum 3`
: The interface is receiving timing from a Stratum 3 clock source (Quality Level 4).

`Stratum 2`
: The interface is receiving timing from a Stratum 2 clock source (Quality Level 3).

`Sync Quality Unknown`
: This interface is receiving timing from a good quality clock source (Quality Level 2).

`Stratum 1`
: The interface is receiving timing from a Stratum 1 clock source (Quality Level 1).

OC-12 release 5.1 and later releases, the type of sync messaging can be provisioned to `Kbyte` or `Sbyte` using the `set-oc3` or `set-oc12` command. In these releases, both versions of sync messages could appear in the report if the optical interfaces have been provisioned for the two types of messages. If `Sbyte` is selected, the following input messages will be applicable for the optical interface:

`Don't Use`
: The interface is not suitable for synchronization timing (DUS, Quality Level 7). This message is equivalent to `Don't Use` in Kbyte messaging. There is no message equivalent to `Timing Looped Back` in Sbyte messaging.

`Reserved`
: The interface is receiving the Reserved message on S1 byte (RES, Quality Level 7). Upon receiving this message, the system treats it the same as `Don't Use` message.

`Undefined`
: The interface is receiving a message on S1 byte that is not defined by the standards (Quality Level 7). Upon

receiving this message, the system treats it the same as `Don't Use` message.

`Traceable SONET Clk`
The interface is receiving timing from a system in holdover or free running (SIC, Quality Level 5). This message is equivalent to `Internal Clock` in Kbyte messaging.

`Traceable Stratum 3`
The interface is receiving timing from a Stratum 3 clock source (ST3, Quality Level 4). This message is equivalent to `Stratum 3` in Kbyte messaging.

`Traceable Stratum 2`
The interface is receiving timing from a Stratum 2 clock source (ST2, Quality Level 3). This message is equivalent to `Stratum 2` in Kbyte messaging.

`Sync Trace Unknown`
This interface is receiving timing from a good quality clock source (STU, Quality Level 2). This message is equivalent to `Sync Quality Unknown` in Kbyte messaging.

`PRS Traceable`
The interface is receiving timing from a Stratum 1 clock source (PRS, Quality Level 1). This message is equivalent to `Stratum 1` in Kbyte messaging.

`Output Message`
This identifies the output message sent out on each OC-N interface line. The valid values for this parameter are the same as those listed for `Input Message`. In addition to the above Input Messages, beginning with OC-12 release 5.1 and later releases, if the sync source is provisioned for Sbyte type of sync messaging and is receiving "Traceable Stratum 3", "Traceable Stratum 2", or "PRS Traceable" messages, then the output messages on any of the optical interfaces provisioned for Kbyte will be "Stratum 3", "Stratum 2", or "Stratum 1", respectively.

`Type` In OC-12 release 5.1 and later releases, this column identifies the type of sync messaging the optical interface was provisioned for using the `set-oc3` and/or `set-oc12` command. The valid values are:

`Kbyte`

`Sbyte`

`disabled`

NOTE:
For OC-1 interfaces, this column will only display `Kbyte`.

`Sync Autoreconfiguration`
This capability allows the system to choose the best timing source to use when it is provisioned for line timing. The valid values are `enabled` and `disabled`.

RELATED COMMANDS

rtrv-oc3

rtrv-oc12

rtrv-state

set-sync

set-oc3

set-oc12

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}, all`

The output report appears as follows:

```
/* T3 Port Provisioning Report
=============================================================================
 Port     Mode   AIS   Alarm    Failure    State     PM       PM        PM
Address                Level   Threshold           Mode    Frame    Format
=============================================================================
address  mode    ais    alarm      fth      state    pmmd    frame      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-N loss of signal or STS path AIS incoming from the fiber.

— DS3 AIS is inserted towards the fiber upon detection of DS3 LOS incoming from the DSX-3.

NOTE:
AIS is always inserted if the violation monitor removal mode is provisioned for `vmr` or `vm`.

`Alarm Level` Alarm describes the alarm level for an incoming DS3 signal failure and has the following values:

`CR`	Critical alarm
`MJ`	Major alarm
`MN`	Minor alarm
`NA`	No alarm

If the system is provisioned for and reporting no alarm but an alarm exists, the NE ACTY LED on the user panel will be illuminated, and the fault LED on the circuit pack will flash. The condition will be reported in the alarm and status report as a near end activity.

`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 shows the performance monitoring (PM) mode of the DS3 interface, and may be one of the following values:

`on`	DS3 PM enabled on this port (default value).
`off`	DS3 PM disabled on this port (PM data is not monitored or reported).
—	Indicates no DS3 path PM because `cc` was selected for `Mode`. The DS3 PM report will display the line PM data and dash lines (-)

for both directions of the DS3 path PM data when a BBG11B pack is active (in-service) in a function unit slot.

`PM Frame`

This parameter indicates the type of framing for the incoming DS3 signal from both the fiber and the DSX-3. It may have one of the following values:

- `m13` — The incoming DS3 signal is in M13 framing type (default value).
- `cbit` — The incoming DS3 signal is in C-bit framing type.
- — — Indicates no DS3 path PM because `cc` was selected for `Mode`. The DS3 PM report will display the line PM data and dash lines (-) for both directions of the DS3 path PM data when a BBG11B pack is active (in-service) in a function unit slot.

`PM Format`

This parameter indicates the type of path PMON that will appear in the DS3 PM report. This parameter will appear only if the `vmr` or `vm` mode has already been selected. This parameter may have one of the following values:

- `pbit` — When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 P-bit CV, ES, SES, and UAS (default value).
- `fmbit` — When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 adjusted F&M bit CV, ES, SES, and UAS.
- `cpbit` — When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 CP-bit parity near-end and far-end CV, ES, SES, and UAS.
- — — Indicates no DS3 path PM because `cc` was selected for `Mode`. The DS3 PM report will display the line PM data and dash lines (-) for both directions of the DS3 path PM data when a BBG11B pack is active (in-service) in a function unit slot.

RELATED COMMANDS

set-state-t3

set-t3

NAME

rtrv-tl1msgmap: Retrieve Message Map for Operation Systems

INPUT FORMAT

```
rtrv-tl1msgmap;
```

DESCRIPTION

This command displays the table that associates the OS Application Context Identifier (ACID) to TL1 autonomous message types. This allows the DDM-2000 network element to direct messages to the proper OS destination.

The output report appears as follows:

```
/* TL1 Autonomous Message Map
=============================================================================
    ACID                  ALM ENV CON DB  EVT PM  SW
=============================================================================
tl1Maintenance           | x | x | x |   | x | x | x |
tl1MemoryAdministration  |   |   |   | x |   |   |   |
tl1Test                  |   |   |   |   |   |   |   |
tl1PeerComm              |   |   |   |   |   |   |   |
tl1Other1                | x | x | x | x | x |   | x |
tl1Other2                |   |   |   |   |   |   |   |

      x - enabled
<blank> - disabled
*/
```

The output parameters are:

ACID — ACID is the Application Context ID to be assigned to a particular SNPA or SubNetwork Point of Attachment on the x.25 channel. Each ACID defines the type of TL1 messages to be sent by the network element. Default MessageType mappings exist for ACIDs supported by DDM-2000. Supported ACID values are:

tl1Maintenance

tl1MemoryAdministration

tl1Other1

tl1Test

tl1PeerComm

tl1Other2.

`msgtype` MessageType is one of the supported classes of TL1 messages that the system generates. These message types are not sent to the OS unless they are enabled and associated to an ACID. The supported message types are:

ALM - REPT ALM

ENV - REPT ALM ENV

CON - REPT COND

DB - REPT DBCHG

EVT - REPT EVT

PM - REPT PM

SW - REPT SW.

RELATED COMMANDS

ent-osacmap

dlt-osacmap

rtrv-osacmap

ent-tl1msgmap

NAME

rtrv-trace-sts1: Retrieve Path Trace Characteristics

INPUT FORMAT

`rtrv-trace-sts1:`*`Address`*`;`

DESCRIPTION

This command retrieves the provisioned transmit and receive path traces for the STS cross-connected STS-1 channel. The command also outputs the actual receive path trace, and the status of the path trace.

NOTE:
For OC-12, this feature is only applicable to the STS path terminated to a BBG11B circuit pack.

The input parameter is:

`Address` This is a STS-1 channel address of the SONET path terminating signal for which the path trace is assigned.

Valid Addresses (within OC-12): `mb-{1-12,all}`

The output report appears on the following page.

```
/* STS-1 Path Trace Report
================================================================================
Address
Parameter Value
================================================================================
m-1
Status: MISMATCH
INCTRC: ActualReceiveTraceWhichDoesNotMatchProvisionedReceiveTrace789123
EXPTRC: ProvisionedTransmitTraceyzabcdefghijklmnopqrstuvwxyz1234567891
TRC   : ProvisionedReceiveTracexyzabcdefghijklmnopqrstuvwxyz1234567891
--------------------------------------------------------------------------------
m-2
Status: GOOD
INCTRC: AID2Receivelmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
EXPTRC: AID2Transmitmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
TRC   : AID2Receivelmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
--------------------------------------------------------------------------------
m-3
Status: MISMATCH
INCTRC:
EXPTRC: AID2Transmitmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
TRC   : AID2Receivelmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz1234567891
--------------------------------------------------------------------------------
mb-1
Status: MISMATCH
INCTRC: ActualReceiveTraceWhichDoesNotMatchProvisionedReceiveTrace789123
EXPTRC: ProvisionedTransmitTraceyzabcdefghijklmnopqrstuvwxyz1234567891
TRC   : ProvisionedReceiveTracexyzabcdefghijklmnopqrstuvwxyz1234567891
--------------------------------------------------------------------------------
mb-2
Status: GOOD
INCTRC: AID2Receivelmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
EXPTRC: AID2Transmitmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
TRC   : AID2Receivelmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
--------------------------------------------------------------------------------
mb-3
Status: MISMATCH
INCTRC:
EXPTRC: AID2Transmitmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
TRC   : AID2Receivelmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz1234567891
--------------------------------------------------------------------------------
 .    .   .   .   .
 .    .   .   .   .
mb-12
Status: MISMATCH
INCTRC:
EXPTRC: AID2Transmitmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz
TRC   : AID2Receivelmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz1234567891
*/
```

The output parameters are:

Address This is a channel address of the SONET path terminating signal for which the path trace is assigned.

Status STS path trace status. This is a status report of the incoming trace. For `rtrv-trace-sts1` messages, *Status* may have one of the following values:

GOOD	Good. This indicates that the *INCTRC* and the *EXPTRC* match.
MISMATCH	Mismatch. This indicates that the *INCTRC* and the *EXPTRC* do not match.
UNAVAILABLE	Unavailable. This indicates that there is no *INCTRC* because there has been a path interruption. This is also true for the STS path terminating to other than a BBG4B or BBG11B circut pack for which the path trace is unavailable.

INCTRC Incoming Path trace message. This indicates the incoming Path Trace (J1) content.

EXPTRC Expected incoming Path trace message. This indicates the expected Path Trace (J1) content.

TRC Outgoing Path trace message. This identifies the path trace message to be transmitted.

If the STS-1 channel for which the `rtrv-trace-sts1` command was issued is not available, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Address points to a non-existent channel. */
```

RELATED COMMANDS

set-pthtrc-sts1

NAME

rtrv-ulsdcc: Retrieve Upper Layer Section DCC

INPUT FORMAT

```
rtrv-ulsdcc;
```

DESCRIPTION

This command retrieves the network service access point (NSAP) as provisioned by the `ent-ulsdcc` command. The NSAP is a 20-byte address that provides unique identification for each network element in the system. Only certain portions of this address are user-settable.

The output report appears as follows:

```
/* Upper Layer Section DCC Provisioning Report
================================================================
                Parameter   Value      Provisionable
================================================================
NSAP address:   L3idp       value        no
                L3dfi       value        no
                L3org       value        YES
                L3res       value        YES
                L3rou       value        YES
                L3sys       value        no
                L3sel       value        no
*/
```

The output parameters are:

`NSAP Address` This is the 20-byte address assigned to a network element.

`Parameter` This identifies the following seven parameters that make up the NSAP address:

- `L3idp` This part of the NSAP address is assigned according to the International Standards Organization (ISO) standards. For SONET systems, the value is set to `39/0840` to indicate that U.S. American National Standards Institute (*ANSI*) is the registration authority responsible for the assignment of the NSAP address.
- `L3dfi` This part of the NSAP address specifies the format for the rest of the NSAP address. For SONET systems, the value is set to `128`.

`L3org` This part of the NSAP address contains the allocated hexadecimal company code assigned by the *ANSI*-administered USA Registration Authority for OSI Organization Names.

`L3res` This part of the NSAP address currently has not been assigned a specific purpose by the SONET standards.

`L3rou` This part of the NSAP address indicates the `routing domain`, identifying a unique routing domain within an Administrative Domain, and the `area`, identifying the area within the `routing domain` to which the NSAP address belongs. Both parts of this address are hexadecimal values.

`L3sys` This part of the NSAP address is assigned by IEEE administrators to U.S.-manufactured systems to guarantee a globally-unique NSAP.

`L3sel` This part of the NSAP address is used to differentiate multiple NSAP addresses within a system. For DDM-2000, this parameter is always set to zero and is not user-settable.

`Value` This field indicates the numerical value of each portion of the NSAP Address.

`Provisionable`
This field indicates whether each portion of the NSAP address is user-settable. The valid values are `YES` or `no`.

RELATED COMMANDS

ent-ulsdcc

NAME

rtrv-x25: Retrieve X.25 link

INPUT FORMAT

```
rtrv-x25;
```

DESCRIPTION

Three output reports are displayed when this command is entered. The first report displays the X.25 link packet size information provisioned by the `set-x25` command, and the second report shows the status of the X.25 communication. The third report provides an X.25 event history.

The X.25 link packet size output report appears as follows:

```
/* X.25 Link Provisioning Report
============================================================
TID=system_name
GNE=x

------------------------------------------------------------
PKT=pkt
*/
```

The output parameters are:

`TID` This is the system name, indicated by a string of up to 20 alphanumeric characters. The default value for `TID` is that set by the site and NE values and is a string of the form `"SitemNEn"`. The `TID` must be unique for each element in a subnetwork.

`GNE` This parameter indicates whether this system is a gateway network element (GNE), providing a TL1 interface. It has a value of `active` or `not active`.

`PKT` `Pkt` is a string with possible values of 128 or 256. 256 is the default value. The X.25 packet size is active only if this system is a GNE, otherwise it is inactive.

The second report shows the state of various X.25 communication entities. The output report appears as follows:

```
/* X 25 Communication Report
================================================================================
Entity                  State    DTE Calling Address    Code (hex)
================================================================================
X 25 lcn  1 (pvc)       up                              06
X.25 lcn  2 (pvc)       up                              06
X.25 lcn  3 (pvc)       up                              06
X.25 lcn 16 (svc)       up       5086901234             06
X.25 lcn 17 (svc)       down                            00
X.25 lcn 18 (svc)       down                            00
X.25 lcn 19 (svc)       down                            00
X 25 lcn 20 (svc)       down                            00
X.25 lcn 21 (svc)       down                            00
X.25 interface          down                            01
lapb                    down                            00
physical line           down                            00
*/
```

The output parameters for this report are:

`Entity` This column shows the various X.25 communication entities. The entities are:

`X.25 lcn 1 (pvc)`
This communication channel is considered to be `up` upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 2 (pvc)`
This communication channel is considered to be `up` upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 3 (pvc)`
This communication channel is considered to be `up` upon the successful acknowledgement of the RESET_REQ_IND packet with a RESET_CONFRM packet. This does *not* imply that TL1 communication is active.

`X.25 lcn 16 (svc)`
: This communication channel is considered to be `up` upon the successful acknowledgement of the CALL_REQ_IND packet with a CALL_ACC_CONN packet. This does *not* imply that TL1 communication is active.

`X.25 interface`
: This communication channel is considered to be `up` upon the successful acknowledgement of the RESTART_PACKET packet and the RESTART_CONFRM packet. This means that layer 3 is active and ready to establish the pvc or svc communication channel.

`lapb`
: When this communication channel is `up`, layer 2 is active and ready to send or receive a RESTART_PACKET.

`physical line`
: This X.25 physical line is up only if the `lapb` is up. A `down` physical line does not necessarily mean that the physical connection (for example, a cable) is broken but that the interfacing equipment does not acknowledge the communication with the DDM-2000.

`State`
: This parameter is explained in each one of the above entities.

`DTE Calling Address`
: SVCs are defined by their X.25 DTE Calling Address. The allowed values for this parameter are defined as 1 to 15 Binary Coded Decimal (BCD) digits. Furthermore, this parameter would only be displayed when the SVC `State` is `up` and would not be shown when the SVC `State` is `down` or if the X.25 Communication `Entity` is a PVC, X.25 interface, lapb or a physical line. There is no default value.

`Code (hex)`
: This column shows a hexadecimal output of the protocol states in the DDM-2000 software. This is used by RTAC personnel for diagnostic purposes.

A third output report lists an X.25 event history. The output report appears as follows:

```
/* X.25 Event History
================================================================
Date    Time        Entity   Event                  Data (hex)
================================================================
01-01  00:18:48    lcn 16   xmt   CLR_CONFRM        10 10 17
01-01  00:18:47    lcn 16   rcv   CLR_REQ_IND       10 10 13 00 00
01-01  00:18:03    lcn 16   xmt   CALL_ACC_CONN     10 10 0f
01-01  00:00:21    lcn  2   rcv   RESET_CONFRM      10 03 1f
01-01  00:00:21    lcn  3   rcv   RESET_CONFRM      10 03 1f
01-01  00:00:21    lcn  1   xmt   RESET_REQ_IND     10 01 1b 00 00
01-01  00:00:21    lcn  2   xmt   RESET_REQ_IND     10 02 1b 00 00
*/
```

The output parameters for this report are:

`Date` This column shows the date the X.25 event occurred.

`Time` This column shows the time the X.25 event occurred.

`Entity` This column shows the X.25 communication entity where the event occurred.

`Event` This column lists the event and whether it was transmitted (**`xmt`**) or received (**`rcv`**) by the DDM-2000.

`Data` This column shows a hexadecimal representation of frame or packet information related to the event. This is used by RTAC personnel for diagnostic purposes.

RELATED COMMANDS

set-x25

NAME

set-attr-alm: Set Alarm Attribute

INPUT FORMAT

`set-attr-alm[:almdel=`*`AlarmDelay`*`][,clrdel=`*`ClearDelay`*`][,pmn=`*`PMN`*`];`

DESCRIPTION

This command sets the alarm holdoff and clear delays.

The input parameters are:

`almdel` AlarmDelay is the delay for incoming signal and equipment failures. It sets an interval of time that a fault condition is present before an alarm is declared. The delay is in seconds, between 0 and 30, with a default value of 2.

> **NOTE:**
> If a signal degrade threshold is exceeded, the recovery interval for the signal degrade condition may be longer than the provisioned holdoff delay, and an alarm will result. For example, suppose an OC-3 interface with an alarm delay of 20 seconds and a signal degrade threshold of 10^{-6} has a signal degrade failure of 10 seconds. Since the recovery interval for a 10^{-6} error rate threshold is 15 seconds, the total length of the alarm condition (10 seconds of failure plus 15 seconds of recovery) will exceed the provisioned alarm delay of 20 seconds, and an alarm will be declared.

`clrdel` ClearDelay is the delay in time before an alarm can be declared to be clear. For equipment failures and signal failures (including AIS and FERF), the clear delay time interval begins when the alarm failure clears. For equipment failures, the delay is between 0 and 30 seconds, with a default value of 15 seconds. For signal failures, clear delay is fixed at 15 seconds.

`pmn` PMN is the Power Minor alarm level, which can be either minor (`MN`) or major (`MJ`). The default is Minor.

When input, this command will cause the following confirmation message to be displayed:

```
/* Caution! Alarm or maint  thresholds are affected by this command.
    You have selected the set-attr-alm command with these parameters:

    AlarmDelay = nn
    ClearDelay = nn */
    PMN = nn */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-attr-alm

NAME

set-attr-cont: Set Attribute Control

INPUT FORMAT

`set-attr-cont:`*`Address`*`:desc=`*`Description`*`;`

DESCRIPTION

This command is used to provision (define) the name of the environmental control points.

The input parameters are:

`Address` Address identifies the control point to be provisioned. There is no default for this parameter.
Valid Addresses: `cont-{1-4}`

`desc` Description is a descriptive name for the control point. The description may be an alphanumeric string, upper- and lower-case with no spaces, up to 26 characters long. Symbolic characters may be included in the descriptive name of the control point.

The following symbolic characters have special meanings either for the CIT interface or for the X.25 TL1 interface and cannot be included in the description:

;	semicolon	?	question mark
@	at sign		space
\	back slash	!	exclamation point
:	colon	=	equal sign
"	double quote	,	comma

All control characters and special keys cannot be included in the description.

NOTE:
This command will be denied if entered in a system whose CO/RT parameter is set to CO (via the `set-ne` command). The following denial message will be displayed:

```
ENSI
/* Equipage, Not equipped for Setting specified Information */
/* Environmental controls can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

NAME

set-attr-env: Set Attribute Environment

INPUT FORMAT

`set-attr-env:`*`Address`*`[:alm=`*`Alarm`*`][,almtype=`*`AlarmType`*`][,desc=`*`Description`*`];`

DESCRIPTION

This command is used to provision (set) the alarm level of the environmental input points. Active inputs appear as entries in the alarm and history reports of the local network element (NE) and generate autonomous TL1 messages through the gateway network element (GNE). Inputs 1 through 21 also appear in the TBOS alarm display. Parallel telemetry outputs appear at the CO NE and are limited to inputs 1 through 10.

The input parameters are:

`Address` Address identifies the environmental point to be provisioned. There is no default value for this parameter.
Valid Addresses: `env-{1-21}`, `env-{all}`

> **NOTE:**
> The *`address`* `env-{all}` is allowed only when `alm` is the only parameter used for this command. The *`address`* `env-{all}` is not allowed when the `almtype` and/or `desc` parameters are used.

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

- `cr` Critical alarm
- `mj` Major alarm
- `mn` Minor alarm (default)
- `na` Not alarmed, but reported.

`almtype` AlarmType. This parameter is used to classify the type of alarm. The description may be an alphanumeric string, upper- and lowercase with no spaces, up to 10 characters long. The original value of AlarmType is "Misc."

`desc` Description is a descriptive name for the point. The description may be an alphanumeric string, upper- and lowercase with no spaces, up to 26 characters long.

The following symbolic characters have special meanings either for the CIT interface or for the X.25/TL1 interface and cannot be included in the description:

;	semicolon	?	question mark
@	at sign		space
\	back slash	!	exclamation point
:	colon	=	equal sign
"	double quote	,	comma

All control characters and special keys cannot be included in the description.

NOTE:
This command will be denied if entered in a system that has the CO/RT parameter set to CO (via the `set-ne` command). The following denial message will be displayed:

```
ENSI

/* Equipage, Not equipped for Setting specified Information */
/* Environmental alarms can be provisioned only in RT systems. */
```

RELATED COMMANDS

rtrv-attr-cont

rtrv-attr-env

rtrv-ne

set-attr-cont

NAME

set-date: Set Date and Time

INPUT FORMAT

`set-date:`[`date=`*`Date`*][`,time=`*`Time`*];

DESCRIPTION

This command sets the date and time. Executing this command will corrupt the current quarter hour and day performance-monitoring (PM) bins.

NOTE 1:
If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

NOTE 2:
In the event of a shelf reset, an automatic date and time recovery process takes place by reading the date and time from the remote shelf connected to the main-b interface of the local shelf (in linear applications). In ring applications, the date and time data is recovered from the remote shelf connected to main-b-1 of the local shelf. In both linear and ring applications, if the automatic recovery fails, both date and time are set to default (`70-01-01` for date and `00:00:00` for time).

The input parameters are:

`date` Date is entered as six digits YYMMDD, where YY is the last two digits of the year, MM is the month, and DD is the day. Default is the current system day.

`time` Time is entered as six digits HHMMSS, where HH is hours (00-23), MM is minutes (00-59), and SS is seconds (00-59). Default is the current system time.

When input, this command will cause the following confirmation message to be displayed:

```
/*Caution! Execution of this command will corrupt the
    current quarterhour and current day performance monitoring data
    You have selected the set-date command with these parameters:

    Date = YYMMDD
    Time = HHMMSS */

Execute? (y/n or CANcel/DELete to quit) =
```

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.

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 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.

NOTE:
This command is available to privileged users only.

The input parameters are:

`feat` Feature is the feature option available to the user, and it may have one of the following values:

- `sts3c` This feature allows STS-3c service (concatenated signals) to be supported.

`act` Action is the action the user wants to perform on the listed feature and it may have one of the following values:

- `enabled` This enables a feature option. This action will also unblock the use of commands needed by this feature.
- `disabled` This disables a feature option. This action will also block the use of commands needed by this feature. The user may be required to reprovision the shelf before disabling a feature.

If a user fails to remove all equipment or reprovision parameters associated with a feature before disabling that feature, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System must be reprovisioned to disable <Feature>. */
```

If this command is entered and no TGS packs are equipped, there is no place to store a backup copy of the feature options. Thus, the command will be denied with the following message:

```
EQWT
/* EQuipage, Wrong Type */
/* No change in provisioning - both timing slots are unequipped */
```

Enabling a feature will cause the following confirmation message to be displayed:

```
/* ACCESS TO, AND USE OF THIS <feature> FEATURE IS PERMITTED ONLY
   IF SPECIFICALLY AND EXPRESSLY AUTHORIZED UNDER THE RELEVANT
   DDM-2000 SOFTWARE AGREEMENT BETWEEN AT&T AND CUSTOMER.

   You have selected the set-feat command with the parameters:
   Feature = feature
   Action = action  */

Execute? (y/n or CANcel/DELete to quit) =
```

Disabling a feature will cause the following confirmation message to be displayed:

```
/* Caution! Execution of this command will disable all of the
   system capabilities associated with the <feature> feature
   and circuit packs which support that feature will no longer
   provide access to that feature.

   You have selected the set-feat command with these parameters:
   Feature = feature
   Action = action  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-feat

NAME

set-fecom: Set Far-End Communications

INPUT FORMAT

`set-fecom:`*`Address`*[`:com=`*`Communications`*][`,nsus=`*`NS/US`*];

DESCRIPTION

This command enables or disables communication over the section data communication channels (DCC). A DCC is an embedded overhead communications channel in the SONET line used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements (NEs).

NOTE:
This command is available to privileged users only.

The input parameters are:

Address — Address identifies the address of the DCC.
Valid Ring Addresses (0x1 or video): `dcc-all, dcc-{mb1,mb2,a1,a2,b1,b2,c1,c2,d1,d2}`
Valid Ring Addresses (1+1): `dcc-all, dcc-{mb1,mb2,a,b,c,d}`

`com` — This parameter indicates whether communication over a specified DCC is enabled or disabled. The valid values are `enabled` or `disabled`. The default value is `enabled`.

`nsus` — NS/US (NetworkSide/UserSide) is the identification of the DCC identity for the NE. Each DCC on the NE must define its NS/US identity in the OSI network. When the NS/US parameter is the same at both ends, an alarm is active. NetworkSide/UserSide may have the following parameter values:

- *ns* — Network Side (ns) defines this end of the DCC to be a network site. For DDM-2000 networks either termination of the DCC can be this value as long as the other termination is different. Default values are listed on the following page.
- *us* — User Side (us) defines this end of the DCC to be a user site. For DDM-2000 networks, either termination of the DCC can be this value as long as the other termination is different. Default values are listed on the following page.

The following chart shows default settings for the NS/US parameter:

1+1 Application	**dcc-a**		**dcc-b**		**dcc-c**		**dcc-d**	
21-type OLIUs	ns		ns		ns		ns	
0x1 or Video Applications	**dcc-a1**	**dcc-a2**	**dcc-b1**	**dcc-b2**	**dcc-c1**	**dcc-c2**	**dcc-d1**	**dcc-d2**
21-type OLIUs	ns	us	ns	us	ns	us	ns	us
Rings Applications	**dcc-m1**		**dcc-m2**					
23-type OLIUs	us		ns					

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. */
```

When this command is input, the following confirmation message will be displayed:

```
/* Caution!  Network element access is affected by this command.
   You have selected the set-fecom command with these parameters:

   Address = address
   Communications = enabled
   NS/US = value */

Execute? (y/n or CANcel/DELete to quit) =
```

If the **nsus** parameter is changed, the following caution message will be displayed before the confirmation message:

```
/* Caution!  Network Element access is affected by this command.

   Caution! When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file
   If possible, it will reinitialize the date and time with
   the far end via the DCC   Otherwise, the
   date and time will assume default values.
   You have selected the set-fecom command with these parameters:

   Address = address
   Communications = enabled
   NS/US = value */
```

The **nsus** parameter can only be changed if the DCC is disabled or alarmed (down). It will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* NS/US can not be changed when DCC is active and unalarmed. */
```

To change the NetworkSide/UserSide parameter may require the use of the **set-fecom** command to disable the DCC.

RELATED COMMANDS

rtrv-fecom

rtrv-map-neighbor

rtrv-map-network

NAME

set-lgn: Set Login

INPUT FORMAT

`set-lgn`[:`act`=*Action*];

DESCRIPTION

This command enters, edits, and deletes logins and passwords. Prior to the first use of this command, the 3 default logins are `ATT01`, `ATT02`, and `ATT03` (all upper-case letters) for Release 5.0 and earlier. For Release 5.1 and later, the 3 default logins are `LUC01`, `LUC02`, and `LUC03`. The default password is `DDM-2000`.

NOTE 1:
This command is available to privileged users only.

NOTE 2:
To enable security, a privileged user must execute the `set-secu` command. Creating logins and passwords does *not* automatically enable security.

A maximum of 100 (general, maintenance and reports-only user) logins is supported. When security is enabled, the following four types of users are permitted to access the system with a valid login and password:

`privileged user`	The privileged user may execute any commands, including restricted commands.
`general user`	The general user may execute any commands that are not restricted to privileged users.
`maintenance`	The maintenance user may only execute commands that access the system, extract reports, and execute maintenance functions through a specific set of commands. No privileged commands are allowed to be executed by maintenance users.
`reports-only`	The reports-only user may only execute commands that access the system and extract reports.

All users may use the `set-passwd` command to modify their own passwords.

The input parameters are:

`act` Action has one of the following values:

`enter` Enter a new login and password pair (default value). Login is a case-sensitive alphanumeric string consisting of a minimum of five and a maximum of ten alphabetic characters and/or numbers. When entering a new login, the type of user (`privileged user`, `general user`, `maintenance` or `reports-only`) must be specified and a password should also be assigned to the new user. A user may then use the `set-passwd` command to modify his/her own password after the login has been activated.

Password is a case-sensitive string of alphanumeric and symbolic characters. Password may have a minimum of six and a maximum of ten characters. Additionally, the password must include at least two numeric characters and one symbolic (non-alphabetic and non-numeric) character. The following symbolic characters have special meanings either for the User Interface or for the X.25 TL1 interface and cannot be included in a password:

;	semicolon		space
@	at sign	?	question mark
\	back slash	!	exclamation point
:	colon	=	equal sign
"	double quote	,	comma

Additionally, the following control characters and special keys CANNOT be included in a password:

<CR>	carriage return	*<tab>*	tab key
<bksp>	backspace key	*<esc>*	escape key
<del>	delete key		

`edit` Change an existing login and/or password.

`delete` Delete an existing login.

The `set-lgn` command executes in prompt mode. Based on the action selected, there are three different dialogs shown on the following pages. In these dialogs, the user input is indicated with bold type.

The following screen shows the dialog to enter a login:

```
set-lgn:act=enter;
enter the new login = new_login
enter password for new login = new_password
reenter password for new login = new_password
enter user type for this login = user_type

/* Caution! Network Element access is affected by this command.
   You have selected the set-lgn command with these parameters:

   Action = enter
   Login = new_login
   User Type = user_type */

Execute? (y/n or CANcel/DELete to quit) =
;
```

NOTE:
Passwords will not be displayed when they are entered.

The following screen shows the dialog to edit a login:

```
set-lgn:act=edit;
enter the login to be changed = old_login
enter the new login = new_login
enter password for new login = new_password
reenter password for new login = new_password
enter user type for this login = user_type

/* Caution! Network Element access is affected by this command.
   You have selected the set-lgn command with these parameters:

   Action = edit
   Old Login = old_login
   New Login = new_login
   Old User Type = user_type
   New User Type = user_type  */

Execute? (y/n or CANcel/DELete to quit) =
;
```

The following screen shows the dialog to delete a login:

```
set-lgn:act=delete;
enter the login to be deleted = user_login
/* Caution! Network Element access is affected by this command.
   You have selected the set-lgn command with these parameters:

   Action = delete
   Login = user_login  */

Execute? (y/n or CANcel/DELete to quit) =
;
```

If the login value does not match the valid login definition (syntactically incorrect), the following message will appear:

```
/* Entry does not follow rules for logins  */
/* Logins must be 5 to 10 alphabetic characters and/or numbers;
   characters allowed are A  Z, a..z and/or 0..9 */
```

The user may try once again to enter a login. If the user enters a login that does not match the valid login definition, the following denial message will be displayed:

```
IDEI
/* Input, Data Entry Invalid */
/* Entry does not follow rules for passwords and logins. */
```

If the entered password value does not match the valid password definition (syntactically incorrect), the following message will appear:

```
/* Entry does not follow rules for passwords. */
/* Passwords must be 6 to 10 characters, with at least 2 non
   alphabetic characters and additionally, at least 1 symbolic.
   Characters allowed are:  A..Z or a..z, 0..9, all symbolic
   characters, EXCEPT the following:

        ;   semicolon          ?   question mark
        @   at sign                space
        :   colon              =   equal sign
        "   double quote       ,   comma
        \   back slash         !   exclamation point

*/
```

The user may try once again to enter a password. If the user enters a password that does not match the valid password definition, the following denial message will be displayed:

```
IDEI
/* Input, Data Entry Invalid */
/* Entry does not follow rules for passwords and logins. */
```

Privileged user logins can be edited to change the login name, password, or both. However, privileged logins cannot be deleted. If an attempt is made to delete a privileged user login, the following denial message will be displayed:

```
SDNC
/* Status, Data Not Consistent */
/* Privileged user logins cannot be deleted. */
```

If an attempt is made to add a privileged user login, the following message will keep displaying until a valid user type (general, maintenance, or reports-only) is entered:

```
/* Not a valid response */
/* Select from: */
   1. general
   2. maintenance
   3. reports-only
enter user type for this login [general] =
```

When a user selects the `edit` or `delete` option for a login but the login entered does not exist, the following message will be displayed:

```
IIUS
/* Input, Invalid USer identifier */
/* login <value> is unknown. */
```

If a user invokes this command with `Action=enter` and the entered login matches the login definition (syntactically correct) but *also* matches an already existing valid login, the attempt will be denied and the following denial message will be displayed:

```
IIUS
/* Input, Invalid USer identifier */
/* login <value> is unknown. */
```

If a user attempts to enter another login when the maximum supported logins already exists, the following denial message will appear:

```
SLEM
/* Status, List, Exceeds Maximum */
/* Maximum number of logins already exists.
   Cannot enter another login. */
```

RELATED COMMANDS

rtrv-lgn

set-passwd

set-secu

NAME

set-link: Set CIT Link Configuration

INPUT FORMAT

`set-link:pg=`*`pagelength`*`;`

DESCRIPTION

This command sets the configuration of the current user's craft interface terminal (CIT) link.

The input parameter is:

`pg` PageLength is the vertical size of the displayed page in lines. The value may be an integer between 3 and 150 with a default of 24. If the page length is set to zero, no pager is used and system output is sent directly to the screen. The page length is set to the default value each time a new CIT session is started.

RELATED COMMANDS

rtrv-link

NAME

set-ne: Set Network Element

INPUT FORMAT

set-ne:tid=*TID*[,**dsne**=*DSNE*][,**almgrp**=*AlarmGroup*][,**agne**=*AGNE*]
[,**site**=*Site*][,**ne**=*NE*][,**shelf**=*Shelf*][,**cort**=*CO/RT*]
[,**tbaddr**=*TBOSAddress*][,**tblink**=*TBOSLink*]
[,**tbrem**=*TBOSRemote*][,**idle**=*IdleChannelSignal*];

DESCRIPTION

This command sets the network element (NE) characteristics (parameters) of a DDM-2000.

NOTE:
If security is enabled on any CIT or DCC port on a shelf, then this command is available to privileged users only for all CIT or DCC ports on the shelf.

In a steady-state network with an existing DSNE, allow 5 minutes between changes to individual nodes.

After a reset of the DSNE, wait 20 to 30 minutes before issuing the `set-ne` command to any remote network element.

The input parameters are:

`tid` TID is a string of up to 20 characters, and may include upper- and lowercase letters, numbers, and the following characters: "-", "+", "%", "#", ".". Prior to the first use of this command, the initial value is `Site`*x*`NE`*y*, where *x* and *y* are the site and network element numbers. The *TID* will be printed at the beginning of the output for all commands. For proper operation of TL1/X.25 OS interfaces, the *TID* must be unique for each NE.

NOTE:
Changing the `TID` (system name) does not change the network address, which is determined by the NSAP but does affect proper TL1 message reporting.

CAUTION:
Changing the `TID` will cause all active TL1 logins to this NE to be dropped. New TL1 logins to this NE will have to be activated using the new TID value.

`dsne` DSNE has a value of `yes` or `no`, which indicates whether this system is the directory services network element (DSNE). The DSNE is the network element for OSI releases where the map listing all active nodes in the network is maintained. The default value for this parameter is `no`. One (and only one) NE in the subnetwork must be designated as a DSNE for proper DCC communication between nodes.

`almgrp` AlarmGroup (AG) has a numeric value of `1` through `255`. All NEs in the subnetwork, whether nearby or not, that have the same AG number are members of the same group. All members of the AG will share NE Status information with each other and with any Alarm Status NE (ASNE) monitoring this Alarm Group but not with NEs of different Alarm Groups. The default AG number for DDM-2000 is `255` and may not have to be changed if a single AG is desired.

The default AG number for FT-2000 is also `255`. When a subnetwork with mixed Product Family 2000 network elements is first engineered, both DDM-2000 and FT-2000 by default will belong to the same AG. The default AG number for FiberReach is `255`, which means that by default FiberReach nodes are also in the same AG as DDM-2000 and FT-2000.

`agne` AGNE (Alarm Gateway NE) has a value of `yes` or `no`, which indicates whether this system is an alarm gateway network element. The default value for this parameter is *no*. One AGNE is needed for each Alarm Group to support the message communications for NE Status features (FE activity, office alarms, parallel telemetry, miscellaneous discretes, remote ACO, and FE user panel status). Any member of the Alarm Group can be an AGNE but some may be preferred because of their position in the subnetwork or location near a maintenance center. Other NEs of the same Alarm Group may be provisioned as backup AGNEs if required. At least one NE in each Alarm Group must be designated as an `agne`. Alarm Groups without an AGNE have "AGNE communication failure" alarms.

`site` Site is the numeric identification (1-64) used by all NEs at the same location or site. The default value is 64.

`ne` Network Element is the numeric identification (1-5) of the system at a site. NEs at the same site must have unique NE settings. The default value is 5.

NOTE:
Refer to the TOP section (Volume II) for specific procedures for setting Site and NE values at multiple network elements.

`shelf` Shelf is the numeric identification (1-8) of the system in a bay arrangement at a site. NEs at the same site must have unique Shelf

settings. The Shelf parameter is used by the local CIT interface to identify which system to connect to the CIT. The default value is 1.

`cort` The CO/RT parameter for "CO" (Central Office) or "RT" (Remote Terminal) identifies the system as having characteristics of a CO or an RT. The values for CO/RT are `co` and `rt` with `rt` as the default value. The value of CO/RT controls the TBOS display type, the operation of the miscellaneous discretes, and the external fan control.

`tbaddr` TBOSAddr sets the TBOS display address (1-8) of the NE. This address is used if the TBOS Link is enabled. The default value is 1 but must be changed if it conflicts with existing settings of other enabled TBOS displays.

`tblink` TBOSLink sets the TBOS Link function. The default value is `noTBOS`. A TBOS link can support up to 8 displays within an alarm group. *Note:* each alarm group can have only one TBOS link. Link may be set to the following values:

- `normal` The NE has a TBOS link, but does not provide any backup functions. Of all the shelves connected to the TBOS link, only one may be set to primary and only one may be set to secondary. The remaining NEs (up to 6) should be set to normal.
- `primary` The NE is serving as the primary TBOS backup and will respond for any other NE on the same TBOS link if the polled NE fails to respond to the telemetry remote poll within 50 msec. The primary backup NE will respond for the nonresponsive NE by reporting TBOS point 59 (communications failure) and reporting all other TBOS points polled in the display as clear.
- `secondary` The NE is serving as the secondary TBOS backup and responds the same as the primary TBOS backup, except the secondary backup does not respond to polls for other NEs until about 100 msec after the poll is received. If after 100 msec neither the polled NE nor the primary backup NE has responded to the telemetry remote poll, the secondary TBOS backup NE will respond for the nonresponsive NE.
- `noTBOS` No TBOS interface is directly connected to the shelf.

`tbrem` TBOSRemote sets the TBOS Remote reporting status. TBOS Remote may be set to the following values:

- `enabled` The shelf will report all its status and alarm conditions to other shelves via the SONET DCC.

`disabled` The shelf will not report its status and alarm conditions to other shelves. This option is used when there are more than 8 NEs in a SONET network. The default value is `disabled`.

`idle` IdleChannelSignal determines whether or not an AIS or Unequipped signal should be inserted toward the SONET line in VT1.5 and STS-1 channels that are not cross-connected. The value may be one of the following:

`ais` STS-1 or VT1.5 AIS is inserted towards the SONET line from SONET interfaces (OLIUs and STS1Es) if the channel is not cross-connected or if a low-speed slot is not equipped but the function unit is STS-1 cross-connected.

`unequipped` The STS-1 or VT1.5 Unequipped signal is inserted towards the SONET line from SONET interfaces (OLIUs and STS1Es) if the channel is not cross-connected or if a low-speed slot is not equipped but the function unit is STS-1 cross-connected.

If the user executes this command while the DSNE is in a busy state (for example, handling an initial registration), the following denial message will be displayed:

```
SNVS
 /* Status, Not in Valid State */
 /* DIB is currently locked, try again later. */
```

If the user enters a duplicate TID (within the same subnetwork), the following denial message will be displayed (after entering *y* for the confirmation message):

```
SRCN
 /* Status, Requested CoNdition already exists */
 /* The system name entered (TID) already exists.
    Enter a unique system name. */
```

Some of these parameters are backed up on the TGS packs (dsne, tid, site, ne, shelf, cort, tbaddr, tblink, tbrem). Starting with OC-12 Release 5.1, an attempt to provision any of these parameters with no TGS packs equipped will be denied with the following message:

```
SNVS
 /* Status, Not in Valid State */
 /* System must be equipped with at least one TGS circuit
    pack to provision selected parameters.  */
```

When this command is entered, the following confirmation message will be displayed:

```
/* Caution! Network Element access is affected by this command.

   You have selected the set-ne command with these parameters:

    TID = SitenNEn
    DSNE = yes|no
    AlarmGroup = number
    AGNE = yes|no
    Site = site
    NE = ne
    IDLE = ais|unequipped
    Shelf = shelf
    CO/RT = co|rt
    TBOSAddress = number
    TBOSLink = value
    TBOSRemote = enabled|disabled */

Execute? (y/n or CANcel/DELete to quit) =
```

Changing the `dsne, cort, tbaddr, tblink, tbrem, site, ne,` or `shelf` parameters will cause the network element to reset. Before these parameters are changed, the following caution message will be displayed prior to the confirmation message:

```
/* Caution!  Network Element access is affected by this command

   Caution! When executed, this command causes the NE to
   restart the program.  This action will erase all of
   the performance monitoring data and the history file
   If possible, it will reinitialize the date and time with
   the far end via the DCC.  Otherwise, the
   date and time will assume default values.
   You have selected the set-ne command with these parameters:
```

RELATED COMMANDS

ins-prog

reset

rlgn

rtrv-ne

rtrv-map-network

NAME

set-oc3: Set OC-3 Characteristics

INPUT FORMAT

`set-oc3:`*`Address`*[`:dgr=`*`SignalDegradeThreshold`*][`,kbyte=`*`Kbyte`*]
[`,app=`*`Application`*][`,aisalm=`*`Alarm`*]; (Rings Only)

`set-oc3:`*`Address`*[`:dgr=`*`SignalDegradeThreshold`*]
[`,syncmsg=`*`SynchronizationMessaging`*][`,app=`*`Application`*]
[`,aisalm=`*`Alarm`*]; (Rings Release 5.1 and later)

DESCRIPTION

This command sets several characteristics (parameters) of a specified OC-3 line or line pair. For OC-12 ring or linear applications, the address is expressed as a line pair.

The input parameters are:

`Address` Address identifies the OC-3 line(s) or line pair(s).
Valid 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`

NOTE:
This parameter is only applicable to Release 5.0. This parameter is no longer be used for DDM-2000 OC-12 Release 5.1 and later releases. For later releases, the `syncmsg` parameter is used in place of the `kbyte` parameter.

Kbyte specifies the usage of the K byte overhead for Sync Messages. Both the sending and receiving messages are affected. If Kbyte is `enabled`, proprietary Sync Messages are used. If Kbyte is `disabled`, proprietary Sync Messages are not used. The default value is `enabled`.

`syncmsg` This parameter is available in OC-12 Release 5.1 and later releases. Synchronization messaging allows timing to be reconfigured in a network upon a node or fiber failure. This parameter has one of the following values:

`Kbyte` This is the default value. When this option is selected, both K2 and S1 byte sync messages are transmitted, but only K2 byte is received and interpreted for sync messaging.

`Sbyte` When this option is selected, only the S1 byte is sent and received for sync messaging. K2 byte will always send a "Don't Use" message.

> **NOTE:**
> To minimize the amount of time that DDM-2000 is in holdover mode when upgrading a ring network from `Kbyte` to`Sbyte` messages, it is recommended that the user first upgrade the nodes farthest away from the external timing source, and then proceed to nodes closer to the timing source.

`disabled` When this option is selected, interpretation of both K2 and S1 bytes will be disabled and hence a "Don't Use" message will be transmitted on both bytes at all times.

`app` This parameter is available in OC-12 ring releases only. Application is a keyword that further characterizes the behavior of the function unit in complex networks. This parameter cannot be changed if any cross-connection exists to this function slot. Parameter value is one of the following:

`0x1` The function unit is part of an OC-12 dual or single-homed, 0x1 ring application. The automatic protection switching and alarms will follow the rules for the dual or single-homed 0x1 ring applications. For single-homed 0x1 ring applications, both `fn` slots must be equipped. For dual-homed 0x1 ring applications, one `fn` slot must be empty. `0x1` is the default value.

`1+1` This applies to OC-12 ring releases. The function unit is an optical extension of a path switched ring. The automatic protection switching and alarms will follow the rules for optical extension applications.

`video` This applies to OC-12 ring releases. There is no protection switching between the packs in a function unit pair. This option is used in conjunction with the video broadcast application.

`aisalm` Alarm is the provisioned alarm level of the NSA OC-3 line AIS and has the following values:

- `cr` Critical alarm
- `mj` Major alarm
- `mn` Minor alarm
- `na` Not alarmed, but reported (default).

The application parameter requires that no cross-connection exist to the addressed function unit if the application type is to be changed. If the port is cross-connected, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Cross-connection exists   Application cannot be changed. */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

When input, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds and sync messages
   are affected by this command
   You have selected the set-oc3 command with these parameters:

   Address = x
   SignalDegradeThreshold = -n
   Kbyte = value
   NonServiceAffectingAIS= value
   ConcatenationMode = value
   Application = value */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 release 5.1 and later releases, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds and sync messages
   are affected by this command.
   You have selected the set-oc3 command with these parameters:

   Address = x
   SignalDegradeThreshold = -n
   SynchronizationMessaging = value
   NonServiceAffectingAIS= value
   ConcatenationMode = value
   Application = value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-oc3

rtrv-sync

NAME

set-oc12: Set OC-12 Characteristics

INPUT FORMAT

`set-oc12:`*`Address`*`[:dgr=`*`SignalDegrade`*`][,kbyte=`*`Kbyte`*`][,aisalm=`*`Alarm`*`];`
(OC-12 Release 5.0)

`set-oc12:`*`Address`*`[:dgr=`*`SignalDegrade`*`][,syncmsg=`*`SynchronizationMessaging`*`]`
`[,aisalm=`*`Alarm`*`];`
(OC-12 Release 5.1 and later)

DESCRIPTION

This command sets the Signal Degrade (DGR) threshold, the line AIS alarm level and the K byte message status of the specified OC-12 line pair.

The input parameters are:

Address Address identifies the OC-12 line or line pair.
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`

NOTE:
This parameter will no longer be used for DDM-2000 OC-12 Release 5.1 and later rings releases.

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.

`syncmsg` This parameter is available in OC-12 Release 5.1 and later rings releases. Synchronization messaging allows timing to be reconfigured in a network upon a node or fiber failure. Parameter value is one of the following:

`Kbyte` This is the default value. When this option is selected, both K2 and S1 byte sync messages are transmitted, but only K2 byte is received and interpreted for sync messaging.

`Sbyte` When this option is selected, only the S1 byte is sent and received for sync messaging. K2 byte will always send a "Don't Use" message.

`disabled` When this option is selected, interpretation of both K2 and S1 bytes will be disabled and hence a "Don't Use" message will be transmitted on both bytes at all times.

`aisalm` For ring releases, the AIS alarm values for Main-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. Alarm is the provisioned alarm level of the non-service affecting (NSA) OC-12 line AIS and has the following values:

- `cr` Critical alarm
- `mj` Major alarm
- `mn` Minor alarm
- `na` Not alarmed, but reported (default)

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

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
      NonServiceAffectingAIS= value */

Execute? (y/n or CANcel/DELete to quit) =
```

For OC-12 Release 5.1 and later ring releases, this command will cause the following confirmation request to be displayed:

```
/* Caution! Alarm or maint. thresholds are affected by this command.
    You have selected the set-oc12 command with these parameters:

      Address = x
      SignalDegradeThreshold = -n
      SynchronizationMessaging = x
      NonServiceAffectingAIS= value */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-oc12

rtrv-sync

NAME

set-passwd: Set Password

INPUT FORMAT

```
set-passwd;
```

DESCRIPTION

This command changes a user's password. All users can change their own passwords. Privileged users can change other users' passwords by using the `set-lgn` command.

The following screen shows the dialog to change a password. In the dialog, the user input is shown in bold type.

NOTE:
Passwords will not be displayed when they are entered.

```
   <set-passwd;

enter your old password = old_password
enter your new password = new_password
reenter your new password = new_password
;
```

There are no default values for the old and new passwords.

A valid password is a case-sensitive ASCII string containing a minimum of six and a maximum of ten characters. The password must also include at least two numeric characters and one symbolic (non-alphabetic and non-numeric) character. The following symbolic characters have special meanings either for the User Interface or for the x.25 TL1 interface and cannot be included in a password:

;	semicolon	?	question mark
@	at sign		space
:	colon	=	equal sign
"	double quote	,	comma
\	back slash	!	exclamation point

Additionally, the following control characters and special keys CANNOT be included in a password:

<CR>	carriage return	*<tab>*	tab key
<bksp>	backspace key	*<esc>*	escape key
<del>	delete key		

If the entered password value does not match the valid password definition (syntactically incorrect), the following message will be displayed:

```
/* Entry does not follow rules for passwords. */
/* Passwords must be 6 to 10 characters, with at least 2 non
   alphabetic characters and additionally, at least 1 symbolic.
   Characters allowed are:  A..Z or a..z, 0..9, all symbolic
   characters, EXCEPT the following:

        ;   semicolon          ?   question mark
        @   at sign                space
        :   colon              =   equal sign
        "   double quote       ,   comma
        \   back slash         !   exclamation point

*/

enter your new password:
```

The user may try once again to enter a password. If the user tries again to enter a password that does not match the valid password definition, the following denial message will be displayed:

```
IDEI
/* Input, Data Entry Invalid */
/* Entry does not follow rules for passwords and logins  */
```

If a user is changing a password and the password entered does not match the present valid password, it will be rejected and the user will be prompted to try again. The user is allowed only one retry. If the user attempts and fails a second time, the entry will be denied with the following message and the old password will remain in effect:

```
PIPW
/* Privilege, Illegal PassWord  */
/* The old password remains in effect. */
```

If the new password that a user enters when changing a password meets the password definition requirements (syntactically correct), but does not match on its two entries (`enter your new password; reenter your new password`), the following message will be displayed:

```
/* The first and second entries of new password did not match. */
```

The user may try once again to change the password. If the user fails a second time to match the two entries, the following denial message will be displayed and the old password will remain in effect:

```
IDNC
/* Input, Data Not Consistent */
/* First and second entries of new password did not match.
   The old password remains in effect  */
```

RELATED COMMANDS

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 following parameter descriptions.

NOTE:
Parameters are shown in uppercase letters for readability. Parameters may be entered in either upper- or lowercase letters.

DESCRIPTION

This command sets the performance parameter thresholds of OC-3 or OC-12 lines and activates and deactivates the processing of threshold crossings for performance parameters.

Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

`QHB2CVOC12` This parameter 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.

DayB2CVEC1 — This parameter sets the threshold for EC-1 coding violation counts on a daily basis.

QHB2ES — This parameter sets the threshold for the ES type A count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and a default value of 40.

DayB2ES — This parameter sets the threshold for the ES type A count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 900.

QHB2ESA — This parameter sets the threshold for the ES type A count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and default value of 30.

DayB2ESA — This parameter sets the threshold for the ES type A count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 90.

QHB2ESB — This parameter sets the threshold for the ES type B count on a quarter-hourly basis. This parameter is an integer with range 0 through 900 and default value of 30.

DayB2ESB — This parameter sets the threshold for the ES type B count on a daily basis. This parameter is an integer with range 0 through 65535 and default value of 90.

QHB2SES — This parameter sets the threshold for the SES count on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 20.

DayB2SES	This parameter sets the threshold for the SES count on a daily basis. This parameter is an integer with range 0 through 4095 and default value of 60.
QHB2UAS	This parameter sets the threshold for the UAS count on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 30.
DayB2UAS	This parameter sets the threshold for the UAS count on a daily basis. This parameter is an integer with range 0 through 4095 and default value of 90.
QHPSCL	This parameter sets the threshold for the line protection switch counts on a quarter-hourly basis. This parameter is an integer with range 0 through 63 and default value of 2.
DayPSCL	This parameter sets the threshold for the line protection switch counts on a daily basis. This parameter is an integer with range 0 through 255 and default value of 4.

The following tables show the error counts equivalent to different BER thresholds for OC-12, OC-3, and EC-1.

B2 OC12 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVOC12)	Equivalent Day Threshold (DayB2CVOC12)
-7	55364	5315052
-8	5537	531505
-9	554	53151
-10	55	5315

B2 OC3 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVOC3)	Equivalent Day Threshold (DayB2CVOC3)
-7	13841	1328736
-8	1384	132874
-9	138	13287
-10	14	1329

B2 EC1 Line Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB2CVEC1)	Equivalent Day Threshold (DayB2CVEC1)
-7	4613	442848
-8	461	44285
-9	46	4428
-10	5	443

RELATED COMMANDS

init-pm

rtrv-pm-line

rtrv-pm-tca

rtrv-pmthres-line

set-pmthres-sect

NAME

set-pmthres-sect: Set Performance Monitoring Threshold Section

INPUT FORMAT

```
set-pmthres-sect:[TxPwr1dB=n][,TxPwr2dB=n][,LaserBias=n]
                 [,Qhsefs=nn][,Daysefs=nnnn];
```

DESCRIPTION

This command sets the performance-monitoring thresholds of an OC-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`. This parameter applies only to the 21G, 23G, 23H and 23R OLIU circuit packs.

`Qhsefs` This parameter sets the threshold for SEFS on a quarter-hourly basis. This parameter is an integer with range of 0 through 63 and default value of 10. Entering a parameter value of zero (0) will disable thresholding for this parameter.

`Daysefs` This parameter sets the threshold for SEFS on a daily basis. This parameter is an integer with range of 0 through 4095 and a default value of 30. Entering a parameter value of zero (0) will disable thresholding for this parameter.

RELATED COMMANDS

init-pm

rtrv-pm-sect

rtrv-pm-tca

rtrv-pmthres-sect

NAME

set-pmthres-sts1: Set Performance Monitoring Threshold STS-1

INPUT FORMAT

`set-pmthres-sts1`:[`QHB3CV`=*nnnn*][,`DayB3CV`=*nnnnnn*][,`QHB3ES`=*nnn*]
[,`DayB3ES`=*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 following parameter descriptions.

NOTE:
Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command provisions STS-1 path performance parameter thresholds as well as enabling and disabling the processing of threshold crossings for the various parameters. Entering a parameter value of zero (0) will disable thresholding for that parameter.

The input parameters are:

`QHB3CV` This parameter sets the threshold for the coding violations count on a quarter-hourly basis. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 4510. The default value is 451.

`DayB3CV` This parameter sets the threshold for the coding violations count on a daily basis. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 432960. The default value is 43296.

`QHB3ES` This parameter sets the threshold for errored seconds on a quarter-hourly basis. This parameter has an integer range of 0 through 900, and a default value of 40.

`DayB3ES` This parameter sets the threshold for errored seconds on a daily basis. This parameter has an integer range of 0 through 65535, and a default value of 900.

QHB3ESA	This parameter sets the threshold for type A errored seconds on a quarter-hourly basis. A type A ES is a second with a single error. This parameter has an integer range of 0 through 900, and a default value of 30.
DayB3ESA	This parameter sets the threshold for type A errored seconds on a daily basis. A type A ES is a second with a single error. This parameter has an integer range of 0 through 65535, and a default value of 90.
QHB3ESB	This parameter sets the threshold for type B errored seconds on a quarter-hourly basis. A type B ES is a second with more than one error, but less than the number of errors in a severely errored second. This parameter has an integer range of 0 through 900, and a default value of 30.
DayB3ESB	This parameter sets the threshold for type B errored seconds on a daily basis. A type B ES is a second with more than one error, but less than the number of errors in a severely errored second. This parameter has an integer range of 0 through 65535, and a default value of 90.
QHB3SES	This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis. This parameter has an integer range of 0 through 63, and a default value of 20.
DayB3SES	This parameter sets the threshold for the severely errored frame seconds count on a daily basis. This parameter has an integer range of 0 through 4095, and a default value of 60.
QHB3UAS	This parameter sets the threshold for unavailable seconds on a quarter-hourly basis. This parameter has an integer range of 0 through 63, and a default value of 30.
DayB3UAS	This parameter sets the threshold for unavailable seconds on a daily basis. This parameter has an integer range of 0 through 4095, and a default value of 90.

The following table shows the error counts equivalent to different BER thresholds.

B3 STS-1 Path Errors

BER Threshold	Equivalent 15 Min. Threshold (QHB3CV)	Equivalent Day Threshold (DayB3CV)
-7	4510	432960
-8	451	43296
-9	45	4330
-10	5	433

RELATED COMMANDS

init-pm

rtrv-pmthres-sts1

rtrv-pm-sts1

rtrv-pm-tca

NAME

set-pmthres-t3: Set Performance Monitoring Threshold T3

INPUT FORMAT

```
set-pmthres-t3:[QHCVL=nnnnn][,DayCVL=nnnnnnn][,QHESL=nnn]
        [,DayESL=nnnnn][,QHSESL=nn][,DaySESL=nnnn][,QHSEFS=nn]
        [,DaySEFS=nnnn][,QHPCV=nnnnn][,DayPCV=nnnnnnn]
        [,QHFMCV=nnnnn][,DayFMCV=nnnnnnn][,QHCP=nnnnn][,DayCP=nnnnnnn]
        [,QHESP=nnn][,DayESP=nnnnn][,QHSESP=nn][,DaySESP=nnnn]
        [,QHUASP=nn][,DayUASP=nnnn][,QHSEFSFE=nn][,DaySEFSFE=nnnn]
        [,QHCPFE=nnnnn][,DayCPFE=nnnnnnn][,QHESPFE=nnn][,DayESPFE=nnnnn]
        [,QHSESPFE=nn][,DaySESPFE=nnnn][,QHUASPFE=nn][,DayUASPFE=nnnn];
```

NOTE:
All DS3 line parameters, in addition to DS3 C-bit parity and all other path parameters for the incoming signal from the DSX-3, are only applicable when a BBG11B pack is active (in-service) in a function unit slot.

where *nnn....* is a numerical value in the range given in the parameter description listed below.

NOTE:
Parameters are shown in upper-case letters for readability. Parameters may be entered in either upper- or lower-case letters.

DESCRIPTION

This command sets the performance parameter thresholds of a DS3 signal as well as activating and deactivating the processing of threshold crossings for error performance parameters. Entering a value of zero (0) for a parameter will disable thresholding for that parameter.

The input parameters are:

QHCVL — This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 16383. The default value is 40.

`DayCVL` This parameter sets the threshold for the coding violations count on a daily basis for the DS3 line B3ZS data. A negative value for this parameter indicates that the threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 1048575. The default value is 3865.

`QHESL` This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for the DS3 line with at least one B3ZS coding violation. This parameter has an integer range of 0 through 900, with a default value of 25.

`DayESL` This parameter sets the threshold for the errored seconds count on a daily basis for the DS3 line with at least one B3ZS coding violation. This parameter has an integer range of 0 through 65535, with a default value of 250.

`QHSESL` This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for the DS3 line with greater than 44 B3ZS coding violations. This parameter has an integer range of 0 through 63, with a default value of 4.

`DaySESL` This parameter sets the threshold for the severely errored seconds count on a daily basis for the DS3 line with greater than 44 B3ZS coding violations. This parameter has an integer range of 0 through 4095, with a default value of 40.

`QHSEFS` This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63, with a default value of 2.

`DaySEFS` This parameter sets the threshold for the severely errored frame seconds count on a daily basis. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 8.

`QHPCV` This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the `pbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 16383. The default value is 40.

`DayPCV` This parameter sets the threshold for the coding violations count on a daily basis for the `pbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 1048575. The default value is 3820.

`QHFMCV` This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the `fmbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 16383. The default value is 40.

`DayFMCV` This parameter sets the threshold for the coding violations count on a daily basis for the `fmbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 1048575. The default value is 3820.

`QHCP` This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the near-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 16383. The default value is 40.

`DayCP` This parameter sets the threshold for the coding violations count on a daily basis for the near-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This

parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 1048575. The default value is 3820.

`QHESP` This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for `pbit`, `fmbit`, and `cpbit` type of formats. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 900, with a default value of 25.

`DayESP` This parameter sets the threshold for the errored seconds count on a daily basis for `pbit`, `fmbit`, and `cpbit` type of formats. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 65535, with a default value of 250.

`QHSESP` This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for `pbit`, `fmbit`, and `cpbit` type of formats. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63, with a default value of 4.

`DaySESP` This parameter sets the threshold for the severely errored seconds count on a daily basis for `pbit`, `fmbit`, and `cpbit` type of formats. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 40.

`QHUASP` This parameter sets the threshold for the unavailable seconds count on a quarter-hourly basis for `pbit`, `fmbit`, and `cpbit` type of formats. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63, with a default value of 10.

`DayUASP` This parameter sets the threshold for the unavailable seconds count on a daily basis for `pbit`, `fmbit`, and `cpbit` type of formats. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 10.

`QHSEFSFE` This parameter sets the threshold for the severely errored frame seconds count on a quarter-hourly basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This parameter is monitored by reading the received X-bits in the DS3 C-bit parity frame. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This

parameter has an integer range of 0 through 63, with a default value of 2.

`DaySEFSFE` This parameter sets the threshold for the severely errored frame seconds count on a daily basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This parameter is monitored by reading the received X-bits in the DS3 C-bit parity frame. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 8.

`QHCPFE` This parameter sets the threshold for the coding violations count on a quarter-hourly basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 16383. The default value is 40.

`DayCPFE` This parameter sets the threshold for the coding violations count on a daily basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. A negative value of this parameter indicates that the parity count threshold is specified in terms of an equivalent BER expressed as a logarithm to the base 10. This parameter has a range of -10 through -7, corresponding to BERs of 10^{-10} through 10^{-7}, and an integer range of 0 through 1048575. The default value is 3820.

`QHESPFE` This parameter sets the threshold for the errored seconds count on a quarter-hourly basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 900, with a default value of 25.

`DayESPFE` This parameter sets the threshold for the errored seconds count on a daily basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 65535, with a default value of 250.

`QHSESPFE` This parameter sets the threshold for the severely errored seconds count on a quarter-hourly basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal

from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63, with a default value of 4.

`DaySESPFE` This parameter sets the threshold for the severely errored seconds count on a daily basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 40.

`QHUASPFE` This parameter sets the threshold for the unavailable seconds count on a quarter-hourly basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 63, with a default value of 10.

`DayUASPFE` This parameter sets the threshold for the unavailable seconds count on a daily basis for the far-end `cpbit` type of format. The type is selected using the `set-t3` command. This is a path parameter that applies to the incoming DS3 signal from both the DSX-3 and the fiber. This parameter has an integer range of 0 through 4095, with a default value of 10.

The following table shows the error counts equivalent to different BER thresholds.

`DS3 P-bit, F&M bit, and C-bit Coding Violations`

BER Threshold	Equivalent 15 Min. Threshold (QHCV)	Equivalent Day Threshold (DayCV)
-7	3979	381972
-8	398	38197
-9	40	3820
-10	4	382

`DS3 Line Coding Violations`

BER Threshold	Equivalent 15 Min. Threshold (QHCVL)	Equivalent Day Threshold (DayCVL)
-7	4026	386519
-8	402	38651
-9	40	3865
-10	4	386

RELATED COMMANDS

init-pm

rtrv-pm-t3

rtrv-pm-tca

rtrv-pmthres-t3

set-t3

NAME

set-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.

The three default logins are `ATT01`, `ATT02`, and `ATT03` (all uppercase letters) for OC-12 Release 5.0 and earlier. For OC-12 Release 5.1 and later, the three default logins are `LUC01`, `LUC02`, and `LUC03` (all upper-case letters). The default password is `DDM-2000`. Privileged users should change these defaults before enabling security or setting security to a lockout state.

NOTE:
This command is available to privileged users only.

The input parameters are:

`address` Address is the address of one or more CIT and/or DCC ports. There is no default address.
Valid Addresses: `dcc-all, cit-{1,2,all}`

`sec` Security determines whether security is enabled, disabled, or in lockout state on the specified CIT and DCC port(s). Enabling security requires users to enter a valid login and password pair to access the system via the specified CIT or DCC-all.

The values for this parameter are `enabled`, `disabled` (default value), and `lockout`.

When security is in lockout state, `privileged` is the only user type permitted to access the system through the locked out CIT/DCC port; all `non-privileged` users, even with a valid login and password pair, are not allowed to access the system.

NOTE:
When in lockout state, non-privileged users are not deleted from the login/password database but are simply blocked from accessing the system. Existing `active` login sessions initiated by non-privileged users are not affected (that is, not dropped) if security is set to `lockout`.

`to` Timeout specifies the time, in minutes, before an inactive session is automatically terminated. This has a value ranging from 0 to 120 minutes, and a default value of 15 minutes. Setting this parameter to 0 will disable the timeout function.

Execution of this command affects all subsequent attempts to establish login sessions but does not affect currently active sessions.

When security is enabled, the following four types of users are permitted to access the system with a valid login and password:

`privileged 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.

`maintenance` The maintenance user may only execute commands that access the system, extract reports, and execute maintenance functions through a specific set of commands. This user may not execute any privileged commands.

`reports-only` The reports-only user may only execute commands that extract reports from the system and several other basic commands.

When security is enabled on a system, only the following commands may be executed by reports-only users:

- `?` (help)
- `logout` (logout)
- `rlgn` (remote login)
- `set-passwd` (set password)
- `set-link` (set link)
- `^T` (toggle)
- all `rtrv` commands except `rtrv-lgn` and `rtrv-passwd`.

In addition to `set-secu`, the commands `init-sys`, `rtrv-lgn`, `set-fecom`, `set-feat`, `set-lgn`, `set-sync`, `rtrv-passwd`, and `rstr-passwd` are restricted to privileged users only. The following commands also become restricted to privileged users only when security is enabled on a system:

- `cpy-prog` (copy program)
- `dlt-tadrmap` (delete TID address map)

- `ent-ulsdcc` (enter upper layer section DCC)
- `init-pm` (initialize performance-monitoring)
- `ins-prog` (install program)
- `reset` (reset system software)
- `set-date` (set date)
- `set-ne` (set network element)
- `ent-tl1msgmap` (enter TL1 message map)
- `set-x25` (set X.25 link)
- `ent-osacmap` (enter OS application context id map)
- `dlt-osacmap` (delete OS application context id map)

Entering this command will cause the following confirmation message to be displayed:

```
/* Caution!  Network Element access is affected by this command
   You have selected the set-secu command with these parameters:

   Address = address
   Security = security
   Timeout = n */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-lgn

rtrv-secu

set-fecom

set-lgn

NAME

set-state-ec1: Set EC-1 Port State

INPUT FORMAT

`set-state-ec1:`*`Address`*`:ps=`*`PrimaryState`*`;`

DESCRIPTION

This command sets the state of the low speed EC-1 ports. This command is used to turn on and off the monitoring of signal failures from a specified port.

The input parameters are:

`Address` Address identifies the EC-1 port(s).
Valid Addresses: `all, {a,b,c,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-oc3: Set OC-3 Line State

INPUT FORMAT

`set-state-oc3:`*`Address`*`:ps=`*`PrimaryState`*`;`

DESCRIPTION

This command sets the state of one or more OC-3 lines. This command is used to turn on and off the monitoring of signal failures from a specified line.

The input parameters are:

`Address` Address identifies the OC-3 line(s).
Valid addresses:
`fn-all, fn-{a,b,c,d}-{1,2,all}`

`ps` PrimaryState is the line state which may have one of the following values:

- `nmon` Set the line state to not monitored. Do not report alarm or status conditions for the line. Section and line performance monitoring data collection will be stopped in this state. Do not change the line state to in-service if a good signal is detected. The line will remain in this state until the state is changed again with this command. DCC status is still monitored and reported in this state. To disable DCC, the `set-fecom` command is used.
- `is` Set the line state to be monitored for good signal at the specified line. Reporting of alarm, status conditions, and PMON data is in normal state.

If a line state of `nmon` is entered, the following message will be displayed:

```
/* Line(s) address will not be monitored or alarmed in
   this state */
```

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-oc3 command with these parameters:

   Address = x
   PrimaryState =x */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-state-eqpt

rtrv-state-oc3

upd

set-fecom

NAME

set-state-sts1: Set State of STS-1 Channels

INPUT FORMAT

`set-state-sts1:`*`Address`*`:ps=`*`PrimaryState`*`;`

DESCRIPTION

This command sets the states of STS-1 channels. It is used to turn on and off the monitoring of signal failures and maintenance signals for specified channels.

The input parameters are:

`Address` Address identifies the STS-1 channel(s). Valid addresses are:

```
all, {mb}-{1-12,all}
{a,b,c,d}-{1-3,all}.
```

Channel states can be set for:

- STS-1 channels within OC-12 interfaces that are cross-connected to DS3 interfaces
- 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 */
```

If the path address specified in the command is an STS-1 channel that is part of an STS-3c cross-connected channel, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected  */
```

The following confirmation message will be displayed after the command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected set-state-sts1 command with these parameters:

   Address = x
   PrimaryState = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

If an attempt is made to execute this command when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

RELATED COMMANDS

ent-crs-sts1

dlt-crs-sts1

rtrv-crs-sts1

rtrv-state-sts1

upd

NAME

set-state-sts3c: Set State of STS-3c Channels

INPUT FORMAT

`set-state-sts3c:`*`Address`*`:ps=`*`PrimaryState`*`;`

DESCRIPTION

This command sets the states of STS-3c 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 OC-12 ring releases.

The input parameters are:

`Address` Address identifies the STS-3c channel(s).
Valid addresses are: `{mb}-{1,4,7,10,all}`.

Channel states can be set for STS-3c channels that are dropped (non-terminated) from an OC-12 high speed interface to OC-3c interfaces in the function unit slots.

`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 (ring releases).

If a primary state of **nmon** is entered, the following message will be displayed:

```
/*  Channel(s) address will not be monitored or
    alarmed in this state */
```

If the path address specified in the command is an STS-1 cross-connected channel, or is a video STS-3c cross-connected channel, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected. */
```

The following confirmation message will be displayed after command entry:

```
/* You have selected set-state-sts3c command with these parameters:

   Address = x
   PrimaryState = x  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

dlt-crs-sts3c

ent-crs-sts3c

rtrv-crs-sts3c

rtrv-state-sts3c

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 alarm due to signal failures from a specified port.

The input parameters are:

`Address` Address identifies the DS3 port(s).
Valid DS3 Port Addresses: `{a,b,c,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-alarmed."

NOTE:
If a port is in the `nmon` state, it must be returned to the `auto` state, using this command, before any circuit packs associated with that port can be removed from the equipment list by the `upd` command.

If a port state of `nmon` is entered, the following message will be displayed:

```
/*  Port(s) address will not be alarmed in this state */
```

The following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected the set-state-t3 command with these parameters:

   Address = x
   PrimaryState =x */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-state

rtrv-t3

upd

NAME

set-sts1: Set STS-1 Characteristics

INPUT FORMAT

`set-sts1:`*`address`*`:dgr=`*`SignalDegrade`*`[,nsa=`*`Alarm`*`][,sa=`*`Alarm`*`];`

DESCRIPTION

This command provisions the following three types of parameters for STS-1 channels:

Signal Degrade Alarm Threshold:
This parameter is only provisioned for ring channels (for example, incoming STS-1 channels on optical linear extensions in ring systems are not monitored). Possible values are 10^{-5} through 10^{-9}, with a default value of 10^{-6}. Only the BCP3 TSI circuit pack supports the provisionable signal degrade function.

Alarm Level for Service Affecting/Non-service Affecting STS Path AIS Condition:
The alarm level for a service affecting path AIS condition can be provisioned for both ring and non-ring channels. The alarm level for a non-service affecting path AIS condition can only be provisioned for ring releases.

The input parameters are:

`Address` Address identifies the STS-1 channels.
Valid Ring and Linear Addresses: `all, mb-{1-12,all}`

`dgr` *`SignalDegrade`* specifies a bit error rate (BER) threshold for the STS-1 channel in terms of a logarithm to base 10. When this threshold is crossed, an alarm will be raised and automatic protection switching to the STS-1 protection path will be initiated. The only valid address for the SignalDegrade parameter is `all`. To provision the signal degrade function, this command requires that the TSI slot(s) be equipped with BCP3 TSI circuit packs. For OC-12, the signal degrade is an integer with range -5 through -9 and default or original value of -6.

`nsa` This parameter is available in OC-12 ring releases. This parameter is the provisioned alarm level of the non-service affecting STS-1 path AIS and has the following values:

- `mn` Minor alarm (default)
- `nr` Not alarmed and not reported.

`sa` This parameter is the provisioned alarm level of the service affecting STS-1 path AIS and has the following values:

- `cr` Critical alarm (default for ring channels)
- `mn` Minor alarm (non-ring channels only, default)
- `na` Not alarmed, but reported
- `nr` Not alarmed and not reported (non-ring channels only)

If the signal degrade parameter is entered and the address used is any value other than "all" the command will be denied with the following message:

```
/* The only valid address for the signal degrade parameter is { all }.
   To set the signal degrade parameter enter
 set-stsl:all:dgr=value; */
```

To provision the AIS parameters requires that either an STS-1 or at least one VT cross-connection exist in the specified address range or the command will not execute, and the following message will be displayed.

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected. */
```

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  */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

In OC-12 ring releases, the following confirmation message will be displayed after command entry:

```
/* Caution!  Alarm or maint. thresholds are affected by this command.
   You have selected the set-sts1 command with this parameter:

   SignalDegrade = <value>
   ServiceAffectingAIS = <value>
   NonServiceAffectingAIS = <value> */

   Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-sts1

NAME

set-sts3c: Set STS-3c Characteristics

INPUT FORMAT

`set-sts3c:`*`Address`*`:dgr=`*`SignalDegrage`*`[,nsa=`*`Alarm`*`][,sa=`*`Alarm`*`];`

DESCRIPTION

This command provisions the signal degrade alarm threshold of dropped non-terminated STS-3c channels from the high-speed ring channels. The command also provisions the alarm level for an STS-3c path AIS condition on a channel dropped from a high-speed ring. Incoming STS-3c channels on an optical extension are not monitored.

This command is used only for path protected ring applications. The signal degrade parameter provisions all STS-3c cross-connected channels on a per shelf basis. The AIS alarm level parameter provisions the addressed STS-3c cross-connected channels.

The BCP3 TSI circuit pack supports the provisionable signal degrade function.

The input parameters are:

`Address` Address identifies the STS-3c channels.
Valid Addresses: `all, mb-{1,4,7,10}`

`dgr` SignalDegrade specifies the bit error rate (BER) threshold for the active STS-3c 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. The SignalDegrade is a per shelf parameter and must be set with the form:
`set-sts3c:`*`all`*`:dgr=`*`value`*`;`

The signal degrade is an integer with range -5 through -9 and default value of -6. Only dropped signals are monitored.

`nsa` Alarm is the provisioned alarm level of the non-service affecting STS-3c path AIS and has the following values:

- `mn` Minor alarm (default)
- `nr` not alarmed and not reported

`sa` Alarm is the provisioned alarm level of the service affecting STS-3c path AIS and has the following values:

- `cr` Critical alarm (default)
- `na` Not alarmed, but reported

If the signal degrade parameter is entered and the address used is any value other than `all`, the command will be denied with the following message:

```
/* The only valid address for the signal degrade parameter
   is { all }.  To set the signal degrade parameter enter
   set-sts3c:all:dgr=value; */
```

Before provisioning the STS-3c AIS paramete, the DDM-2000 must have an STS-3c cross-connection and channel state for the specified address. If no cross-connection or channel state exists, or the command will not execute and the following message will be displayed:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected. */
```

The command requires that both TSI slots 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  */
```

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-sts3c command with this parameter:

   SignalDegrade = <value>
   ServiceAffectingAIS = <value>
   NonServiceAffectingAIS = <value> */

   Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-sts3c

NAME

set-sync: Set Synchronization Characteristics

DESCRIPTION

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 line timed.

Each DDM-2000 can be provisioned to one of these timing modes:

- Free running from an internal oscillator.
- Line-timed from an incoming optical interface. This timing reference is used to generate all outgoing signals. If the optical line is protected, the line selected for transmission is also the line selected as the timing reference.
- 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:
This command is available to privileged users only for all CIT or DCC ports on the shelf.

INPUT FORMAT

The following parameters are available for this command when provisioned for a specific synchronization reference. Parameters may vary depending upon whether the application is linear or rings.

LINEAR SYSTEMS - LINE TIMED

`set-sync:[mdsw=ModeSwitching];` (BBF2 pack type)

RING SYSTEMS - LINE TIMED

`set-sync:[mdsw=ModeSwitching][,src=SynchronizationSource]`
`[,auto=SyncAutoreconfiguration];` (BBF2 or BBF2B pack type)
`set-sync:[mdsw=ModeSwitching][,src=SynchronizationSource]`
`[aisthres=AISThreshold][,auto=SyncAutoreconfiguration];`
(BBF2B pack type ONLY), For OC-12 Release 5.1 and later.

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)

RING SYSTEMS - EXTERNAL TIMING

`set-sync:[mdsw=ModeSwitching];` (BBF2 pack type)

`set-sync:[mdsw=ModeSwitching][,src=SynchronizationSource];`
(BBF2B pack type)
`set-sync:[mdsw=ModeSwitching][,src=SynchronizationSource]`
`[,aisthres=AISThreshold];`
(BBF2B pack type ONLY) For OC-12 Release 5.1 and later.

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 `LineTimed`) after one of the references becomes good.

`nonrevertive` Nonrevertive mode switching.
If the system switches to holdover timing mode due to a failure of the timing references, it will *not* automatically switch back to the provisioned timing mode (`External` or `LineTimed`) mode after the reference becomes good. The **`switch-sync`** command must be used to restore the system to the provisioned timing mode (`External` or `LineTimed`)

`src` SynchronizationSource. This parameter selects the line from which shelf line timing and/or the DS1 synchronization output will be derived. For ring releases, the BBF2 or BBF2B TGS circuit packs may be used. `Src` may have one of the following values:

`main-b-1` Ring Releases (default)

`main-b-2` Ring Releases

`aisthres`
AISThreshold. This parameter is available with OC-12 Release 5.1 and later ring releases. It is applicable to the BBF2B circuit pack type only. This parameter sets the incoming synchronization message quality level of the active reference upon receiving of which AIS signal is transmitted on the DS1 output of the BBF2B TGS circuit pack. As long as the incoming quality level number is at or greater than the provisioned level, AIS will be transmitted. This parameter is listed in ascending quality order and may have one of the following values:

`level5` This is the default value. Send DS1 AIS for incoming quality level 5 (K2: Internal Clock, S1: Traceable SONET Clk) or greater (that is, quality level 6 or 7).

`level4` Send DS1 AIS for incoming quality level 4 (K2: Stratum 3, S1: Traceable Stratum 3) or greater.

`level3` Send DS1 AIS for incoming quality level 3 (K2: Stratum 2, S1: Traceable Stratum 2) or greater.

`level2` Send DS1 AIS for incoming quality level 2 (K2: Sync Quality Unknown, S1: Sync Trace Unknown) or greater.

`auto` SyncAutoreconfiguration allows the system to choose the best timing source to use when it is provisioned for Line Timing. The synchronization source selection is based on the synchronization messages received from the available timing (synchronization) sources. Automatic Protection Switching takes place to the standby timing source when the active source fails. The switch is nonrevertive, and there will not be an automatic switch back to the former timing reference. When SyncAutoreconfiguration is enabled, the system automatically reconfigures between line timing sources **`main-b-1`** and **`main-b-2`**. Use the **`switch-sync`** command to manually switch to the other timing source.

`enabled`	SyncAutoreconfiguration is active.
`disabled`	SyncAutoreconfiguration is not active (default).

If hardware provisioning switches are set for FreeRunning timing mode, execution of this command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* System provisioned for free-running. */
```

When sync messages are active (as set by the `set-oc3` and/or `set-oc12` commands) and a user requests to set the timing source to a LineTime source which has a sync message that does not support timing, the command will be completed, but the following message will be displayed:

```
/* Source selected currently is unusable for timing.
   Timing will switch to holdover or if Sync Autoreconfiguration is
   enabled, timing may switch to other source. */
```

If this command is entered and both timing slots are empty, the command will be denied with the following message:

```
EQWT
/* EQuipage, Wrong Type */
/* No change in provisioning - both timing slots are unequipped */
```

For sync autoreconfiguration, several other parameters must be set before this feature can be enabled. If these parameters are not set, the sync autoreconfiguration request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* <message reason>
Sync Autoreconfiguration cannot be enabled */
```

Valid message reasons include the following:

- K byte messages disabled
- Sync messages disabled (for OC-12 Release 5.1 and later releases).
- Shelf not line timed

If an attempt is made to execute this command when a mix of incompatible OLIU packs exists in the Main slots, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

The following confirmation message will be displayed after the command entry:

```
/* Caution! Execution of this command may affect service.
   You have selected the set-sync command with these parameters:

   ModeSwitching = x
   SynchronizationSource = x
   OutputMode = x */

Execute? (y/n or CANcel/DELete to quit) =
```

When SyncAutoreconfiguration is available, (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
   OutputMode = x
   SyncAutoreconfiguration = x */

Execute? (y/n or CANcel/DELete to quit) =
```

In OC-12 Release 5.1 and later releases, the following confirmation message will be displayed after command entry:

```
/* Caution!  Execution of this command may modify network
   synchronization and affect service.
   You have selected the set-sync command with these parameters:

   ModeSwitching = x
   SynchronizationSource = x
   OutputMode = x
   AISThreshold = x
   SyncAutoreconfiguration = x */

Execute? (y/n or CANcel/DELete to quit) =
```

When SyncAutoreconfiguration is available and its value is being changed from `enabled` to `disabled`, the following confirmation message will be displayed after command entry:

```
/* Caution!  Execution of this command may modify network
   synchronization and affect service   Executing this command with
   auto=disabled will disable autonomous selection of source for
   shelf timing.
   You have selected the set-sync command with these parameters:

   ModeSwitching = x
   SynchronizationSource = x
   OutputMode = x
   SyncAutoreconfiguration = disabled */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-sync

set-oc3

switch-sync

NAME

set-t3: Set T3 Characteristics

INPUT FORMAT

set-t3:*Address*:[**md**=*Mode*][,**ais**=*AlarmIndicationSignal*][,**alm**=*AlarmLevel*]
[,**fth**=*FailureThreshold*][,**pmmd**=*PMMode*][,**frame**=*Frame*][,**fmt**=*Format*];

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command sets the characteristic parameters of one or more DS3 ports. These characteristics include alarm levels, failure thresholds, AIS conditions, and performance monitoring.

The input parameters are:

Address Address is the address of the DS3 port(s) to be provisioned. One or all ports may be specified. 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**, **frame**, and **fmt** parameters will not be used. Also in this case, the **pmmd**, **frame**, and **fmt** parameters will keep their current values. The current values for both parameters will be available to be used whether the value of **md** is set to **vm** or **vmr**.

ais AlarmIndicationSignal determines whether or not a DS3 AIS should be inserted. The value may be **yes** or **no**. 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

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

`fth` FailureThreshold sets the Failure Threshold in terms of a logarithm to the base 10. The value may be either -6 or -3, corresponding to BERs of 10^{-6} and 10^{-3}, respectively. The default value is -3. When the failure threshold is crossed, an alarm will be raised and automatic protection switching of the service line will be initiated.

`pmmd` PMMode is only used for performance-monitoring (PM). Setting this parameter does not affect the transmitted or received signal. This parameter will appear only if the `vmr` or `vm` mode has already been selected. 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.

`frame` Frame 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 have one of the following values:

`m13` The incoming DS3 signal from both the fiber and the dsx-3 is of the M13 framing type. This is the default value.

`cbit` The incoming DS3 signal from both the fiber and the dsx-3 is of the C-bit framing type.

`fmt` Format supports the PMMode and Frame parameters and sets the type of PMON that will appear in the DS3 PM report. This parameter will appear only if the `vmr` or `vm` mode has already been selected. If the `cc` mode is selected, these parameters will not be visible to the user. This parameter may have one of the following values:

`pbit` When this value is selected, the DS3 PM report will display counts of SEFS as well as DS3 P-bit CV, ES, SES, and UAS (default value). This option is valid for both `frame` types.

`fmbit` When this value is selected, the DS3 PM report will provide counts of SEFS as well as DS3 adjusted F&M bit CV, ES, SES, and UAS. This option is valid for both `frame` types.

`cpbit` When this value is selected, the DS3 PM report will provide counts of SEFS as well as DS3 CP-bit parity CV, ES, SES, and UAS for both near-end and far-end (FEBE) data. This option is valid ONLY for `cbit` type of `frame`.

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
   PMMode = x
   Format = x */

Execute? (y/n or CANcel/DELete to quit) =
```

NOTE:
The above display will only prompt for the alarm indication signal (AIS) if the Mode is set to `cc`. The above display will only prompt for the PMMode and Format if the Mode parameter is set to `vmr` or `vm`.

If the m13 frame and cpbit format options have both been selected, the following denial message will be displayed:

```
/* <address> - invalid combination of frame and format --
provisioning unchanged */
```

The following confirmation message will be displayed after command entry in the same releases as above:

```
/* Caution! Execution of this command may affect service.
You have selected the set-t3 command with these parameters:

   Address = x
   Mode = x
   AlarmIndicationSignal = x
   AlarmLevel = x
   FailureThreshold = x
   PMMode = x
   Frame = x
   Format = x */

Execute? (y/n or CANcel/DELete to quit) =
```

NOTE:
The above display will only prompt for the alarm indication signal (AIS) if the Mode is set to cc. The above display will only prompt for the PMMode, Frame, and Format if the Mode parameter is set to vmr or vm.

If multiple addresses are specified, the following caution message will be printed out immediately before the confirmation request message:

```
/* Caution: This command addresses multiple objects within this
system.  Selections other than CurrentValues will affect all
addressed objects. */
```

RELATED COMMANDS

rtrv-t3

set-state-t3

NAME

set-trace-sts1: Set STS Path Trace Characteristics

INPUT FORMAT

`set-trace-sts1:`*`Address`*`[:`*`EXPTRC=Expectedincomingpathtrace`*`]`
`[,`*`TRC=OutgoingPathTrace`*`];`

DESCRIPTION

This command assigns user-selectable alphanumeric character strings to the transmit and receive path trace fields of an STS cross-connected STS-1 signal. The allowed ASCII characters include the letters "A" through "Z" and "a" through "z", numbers "0" through "9", and the following special characters:

# (pound sign)	$ (dollar sign)
% (percent sign)	& (ampersand)
((open parenthesis)	) (close parenthesis)
+ (plus)	* (asterisk)
| (pipe)	- (hyphen)
[(open square bracket)	] (close square bracket)
{ (open bracket)	} (close bracket)
' (apostrophe)	` (grave accent)
. (period)	/ (slash)
< (less than)	> (greater than).

NOTE:
This feature is only applicable to STS paths terminating to a BBG11B circuit pack.

The input parameters are:

Address This is a STS-1 channel address of the SONET path terminating signal for which the path trace is assigned.
Valid Addresses (within OC-12): `mb-{1-12}`

EXPTRC EXPTRC specifies the expected incoming path trace message. It is a string of 62 or less alphanumeric characters.

TRC TRC specifies the outgoing path trace message. It is a string of 62 or less alphanumeric characters.

If the channel is not cross-connected to a STS-1 PTE, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Valid cross-connection does not exist  STS Path trace cannot be set. */
```

If the STS-1 channel for which this command was issued is not available, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Address points to a non-existent channel. */
```

If an attempt is made to set the path trace for an STS path other than the one terminated to a 3DS3 (BBG11B) circuit pack, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Check the eqquipage. BBG4B for OC-3 and BBG11B for
   OC-12 is required  */
```

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

When input, this command will cause the following confirmation request to be displayed:

```
/* You have selected the set-pthtrc command with these
   parameters:

   Address = address
   EXPTRC = message
   TRC = message

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-trace-sts1

rtrv-crs-sts1

set-sts1

NAME

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 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.

If an attempt is made to execute this command, when a mix of incompatible OLIU packs exists in Main, the request will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* Both main slots must be equipped with compatible OLIU packs. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the switch-fn command with these parameters:

   Address = x
   Priority = pri */

Execute? (y/n or CANcel/DELete to quit) =
```

If this command is executed with priority `inhibit` or `forced`, then automatic protection switching will be disabled until this command is executed again with priority `reset`.

RELATED COMMANDS

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 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.

If the function unit specified in the command does not have its Application value (`set-oc3`) set to *1+1*, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified function unit is not a 1+1 application  */
```

When OC-3 line state provisioning is supported, if the OC-3 line state of a protection pack in a function unit specified in the command is set to **nmon**, and a manual switch is requested on that function unit, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

On entry, the following confirmation message is displayed:

```
/* The line protection switching request is unidirectional
   It may be necessary to perform a switch-line at the far end
   to switch both transmit and receive to the same line */

/* Caution!  Execution of this command may affect service.
   You have selected the switch-line command with these parameters:

   Address = x
   Priority = pri */

Execute? (y/n or CANcel/DELete to quit) =
```

If this command is executed with priority **`inhibit`**, **`lockout`** or **`forced`**, then automatic protection switching will be disabled until this command is executed again with priority **`reset`**.

RELATED COMMANDS

rtrv-state

rtrv-state-eqpt

rtrv-state-oc3

NAME

switch-path-sts1: Switch Path STS-1

INPUT FORMAT

`switch-path-sts1:`*`Address`*`:pri=`*`Priority`*`;`

DESCRIPTION

This command controls STS-1 path switching on path protected ring configurations. Path switching is always unidirectional (one-way).

The input parameters are:

`Address` Address is the address of the STS-1 channel currently carrying dropped or drop and continue traffic. When this command is executed, traffic will be switched away from this path to the other path on the ring. There is no default for this parameter. Traffic that drops to a function unit provisioned for the 0x1 ring or video 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.

NOTE:
A drop and continue path is simultaneously dropped to a low-speed interface and passed through.

If the path address specified in the command is not equipped or the STS-1 channel is not drop, add/drop, or drop and continue cross-connected, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not equipped and/or cross-connected. */
```

If the path address specified in the command is a pass-through path or a dropped path to a 0x1 ring application in the function unit, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path cannot be switched  */
```

NOTE:
A pass-through path passes directly from the OC-N receiver to the OC-N transmitter. The service carried with this path is not dropped at this node.

If an equal or higher priority switch already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If `-all` appears in the address and if an equal or higher priority switch already exists on some of the addressed paths or the path is part of an STS-3c cross-connected channel, the command will already exists on some of the addressed paths, the command will list these exceptions as follows:

```
/* sts1 address equal or higher priority switch exists
   sts1 address vt cross-connected signals exist
        .
        .
*/
```

If `-all` appears in the address and the path is not equipped, not cross-connected, or is a pass-through or 0x1 ring connection, the path will be silently skipped.

Since DDM-2000 path switching is unidirectional, the user will receive the following notification message immediately before the confirmation request:

```
/* The path protection switching request is unidirectional.
   It may be necessary to perform a switch-path-sts1 at the far end
   to switch both transmit and receive to the same path. */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution! Execution of this command may affect service.
   You have selected the sw-path-sts1 command with these parameters:

   Address=
   Priority=        */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-state-eqpt

rtrv-state-path

NAME

switch-path-sts3c: Switch Path STS3c

INPUT FORMAT

`switch-path-sts3c:`*`Address`*`:pri=`*`Priority`*`;`

DESCRIPTION

This command controls STS-3c path switching on path protected ring configurations. Path switching is always unidirectional (one-way).

This command is available with OC-12 Release 5.0 and later ring releases.

The input parameters are:

`Address` Address is the address of the STS-3c channel currently carrying dropped or drop and continue traffic. When this command is executed, traffic will be switched away from this path to the other path on the ring. There is no default for this parameter. Valid addresses are: `mb[1,2]-[1,4,7,10,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 higher priority condition exists on the standby path.

If the path address specified in the command is not equipped or the STS-3c channel is not dropped, 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 an STS-1 cross-connected channel, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* The specified path is not properly cross-connected. */
```

If the 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 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, or some paths are STS-1 cross-connected channels, the command will list these exceptions.

```
/* sts3c address equal or higher priority switch exists
   sts3c 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.

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-sts3c 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-sts3c command with these
   parameters:

   Address=address
   Priority=value  */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-crs-sts3c

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 `Line-Timed`.
`circuitpack`	Selects protection switching of timing circuit packs.
`src`	Selects the optical line from which shelf line-timing and/or the DS1 synchronization output will be derived. This parameter is available with OC-12 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 `Line-Timed` 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 `Line-Timed`, 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 no synchronization source switch can be completed due to the equippage of the alternate sources, the command will be denied with the following message:

```
EQWT
/* EQuipage, Wrong Type */
/* Alternate sync sources improperly equipped */
```

If this command is executed with `Priority=inhibit` or with `SyncFunction=mode`, then automatic protection switching will be disabled until this command is executed again with the same SyncFunction and with `Priority=reset`.

If an equal or higher priority switch (for example, `pri`=inhibit) already exists on the addressed path, the command will be denied with the following message:

```
SPSP
/* Status, Protection Switch Priority */
/* Equal or higher priority switch exists */
```

If the SyncFunction is `src` and the priority of `reset` or `inhibit` is entered, the request will be denied with the following denial message:

```
IDNC
/* Input, Data Not Consistent */
/* Reset not allowed for source switching  */
```

or

```
IDNC
/* Input, Data Not Consistent */
/* Inhibit not allowed for source switching. */
```

If the switch request is issued for the SyncFunction value of `src` and SyncAutoreconfiguration is not enabled, the command will be denied with the following message:

```
SNVS
/* Status, Not in Valid State */
/* SyncAutoreconfiguration is not enabled. */
```

The reference switching (reset, inhibit, manual) applies only to DS1 references. The command will not be executed if `reference` is entered for the synchronization function and the provisioned synchronization mode is not `External`.

If this command is entered and both timing slots are empty, the command will be denied and the following denial message will be displayed:

```
ENEQ
/* Equipage, Not EQuipped */
```

After entering this command, the following confirmation message is displayed:

```
/* Caution!  Execution of this command may affect service
   You have selected the switch-sync command with these parameters:

   SyncFunction=s
   Priority=pri */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

rtrv-state-eqpt

rtrv-sync

set-sync

NAME

test-alm: Test Office Alarms

INPUT FORMAT

`test-alm:[md=`*`Mode`*`][,r=`*`Repeat`*`];`

DESCRIPTION

This command tests the audible and visible office alarms and associated user panel LEDs.

The specific office alarm test turns on a specific alarm for 10 seconds and turns it off for 10 seconds, after which the office alarm reverts to its normal operation.

The general office alarm test cycles through the various alarm levels (CR, MJ, MN) at 4-second intervals as shown in the following table:

General Alarm Test

Step	Time (Seconds)	ALARM LEVEL CR	MJ	MN
1	0-4	*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 alarm cutoff (ACO) button functions normally while this test is executing. Depressing ACO silences audible office alarms.

Input parameters are:

`md` Mode identifies the office alarm test to be performed. It takes the following values:

- `all` General test of all office alarms (default)
- `cr` Specific test of critical alarm
- `mj` Specific test of major alarm
- `mn` Specific test of minor alarm.

`r` Repeat specifies the number of times that Steps 2 through 4 should be repeated. It is an integer with a range of `1` through `10` and a default value of `1`.

This command can be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
test-alm: DENY
SSRB
/* Status, System Resource Busy */
```

NAME

test-led: Test LED Indicators

INPUT FORMAT

`test-led`:[*Address*]:[`r`=*Repeat*];

DESCRIPTION

This command activates circuit pack or user panel LEDs for 10 seconds on, then 10 seconds off, after which the LED reverts to normal operation. This command does not affect office alarms.

This test can also be done by pressing the alarm cutoff (ACO) button on the user panel.

The input parameters are:

Address This is the address of any slot(s) or `userpanel`, with a default value of `all`.
Valid Addresses: `all, main-b-{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
/* Controller Diagnostic Test Report
================================================================================
Test PASSED
*/
```

If the test fails, one of the following messages may be displayed, indicating that one or both controller circuit packs have failed:

```
test-sysctl: COMPLD
/* Controller Diagnostic Test Report
================================================================================
SYSCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* Controller Diagnostic Test Report
================================================================================
OHCTL CP FAILED
*/
```

```
test-sysctl: COMPLD
/* Controller Diagnostic Test Report
================================================================================
SYSCTL CP FAILED
OHCTL CP FAILED
*/
```

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[1-10]`	Specific test of miscellaneous discrete point number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

`r` Repeat specifies the number of times that the test should be repeated. It is an integer with a range of 1 through 10 and a static default value of 1.

This command can be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

NAME

test-tlm-ser: Test Telemetry Serial

INPUT FORMAT

`test-tlm-ser`:[`d`=*`Display`*][,`p`=*`Point`*][,`r`=*`Repeat`*];

DESCRIPTION

This command initiates specific and general tests of the TBOS outputs. During the test, the telemetry points addressed by the command are turned ON and all other points are turned OFF for 20 seconds. When the test completes, all points return to normal operation.

The input parameters are:

`d` Display is the particular TBOS display being used and has a provisionable value between 1 and 8. For a central office (CO) and the associated remotes, the TBOS display values may be provisioned. For a remote terminal (RT), only the current values may be used for this test.

`p` Point is the particular TBOS point(s) to be tested and has the following values:

`1-63`

`even`

`odd`

`all` (default)

`r` Repeat is the number of times the test is to be repeated and has a range of 1-10, and a default of 1.

This command may be aborted by pressing the "CANcel" or "DELete" key while the command is in progress.

The following denial message will be displayed if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

RELATED COMMANDS

test-tlm-par

test-alm

NAME

test-trmsn-t3: Test Transmission T3

INPUT FORMAT

`test-trmsn-t3:`*`Address`*`:[dirn=`*`Direction`*`][,dur=`*`Duration`*`];`

DESCRIPTION

CAUTION:
Execution of this command will affect service. This command causes the insertion of a test signal on the selected channel in the MUX or DEMUX direction and will affect service on the selected channel.

This command sets up an automated transmission test for a low-speed DS3 port. The direction of the test can be towards either the MUX (towards the optical fiber) or the DEMUX (towards the DSX) transmission directions. The test signal is a framed DS-3 signal which DDM-2000 checks for P-bit parity errors. Only one channel is tested each time; multiple channels may not be tested simultaneously. Before this command is executed, the signal must be appropriately looped back.

This command is used for installation of new equipment and for maintenance. In either case, the signal must be appropriately looped back.

If the test is run in the MUX direction and an external loopback is established at the far end, then the far end must be provisioned for clear channel (CC) mode with no AIS in order to test the entire transmission path. If an external loopback is used and the far end is provisioned for VMR Mode, only errors in the receive direction will be monitored.

If the test is run using a DS3 internal loopback, DDM-2000 automatically puts the path in clear channel mode while the loopback is active. When the loopback is released, the mode returns to its previous state.

DDM-2000 checks for the presence if a loopback before beginning the test. If no looback exists, the system will return a warning message before peforming the test.

NOTE:
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 11-3.
- **`demux`** The test signal is inserted in the DEMUX direction and the received signal is monitored from the DEMUX direction as shown in Figure 11-4.

`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.

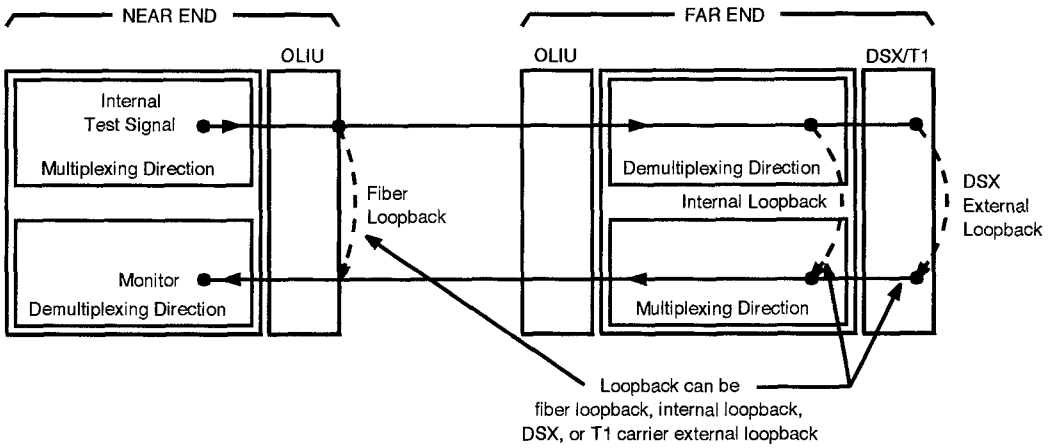


Figure 11-3. Automated Transmission Test of DS3 Signal in MUX Direction

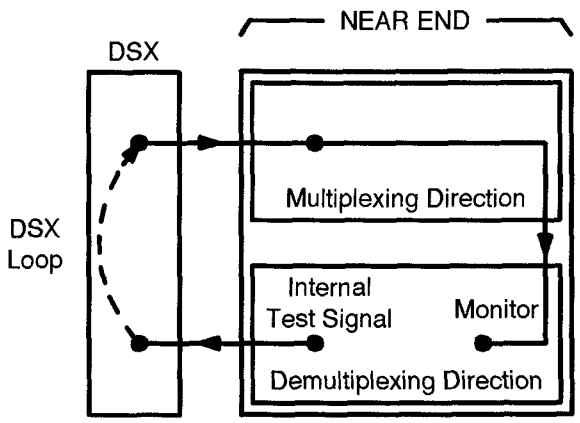


Figure 11-4. Automated Transmission Test of DS3 Signal in DEMUX Direction

This command displays the following output report:

```
/* DS-3 Transmission Test Report
=============================================================
DS-3 Port = addr, Direction = dirn, Duration = dur minutes
=============================================================
Elapsed        Errored
Time(sec)      Seconds
=============================================================
 n               n       Out Of Frame
 .
                 .
 .               .
  */
```

The output parameters are:

`DS3 Port`	The address of the DS3 port
`Direction`	The direction of the transmission test
`Duration`	The duration of the test in minutes
`Elapsed Time`	Elapsed time of the test in seconds
`Errored Seconds`	Total number of errored seconds

A question mark (`?`) as the rightmost character in the `Errored Seconds` column indicates uncertain data because of a protection switch during the test.

The message "Out Of Frame" appears in the report if an out-of-frame condition is detected during the test.

If an equipment failure is detected during the test, the following message is displayed:

```
/* Hardware Failed - Test Aborted */
```

The system checks for the presence of a loopback at the beginning of the test. If a loopback does not exist, the test continues and the following message appears before and after the report:

```
/* Preliminary hardware test indicates no loopback  */
```

If the test is interrupted or aborted, the following message is displayed:

```
/* Test Manually Aborted */
```

The following denial message will be output if the test cannot be performed due to other activity in the system:

```
SSRB
/* Status, System Resources Busy */
```

When this command is entered, the following confirmation message is displayed:

```
/* Establish appropriate loopbacks (manual or electronic)
   prior to test execution, if appropriate. */

/* Caution! Execution of this test may interrupt service
   You have selected the test-trmsn-t3 command with these parameters:

   Address = x
   Direction = dirn
   Duration = dur */
Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

opr-lpbk-t3

rls-lpbk-t3

rtrv-pm-t3

NAME

toggle: Toggle Between Local and Remote Sessions

INPUT FORMAT

^t (Press "t" while holding the CTRL key)

DESCRIPTION

This command toggles the user between the local and remote sessions. It provides a quick and easy way to switch from the local session to the remote session, while not terminating either one. The user must have established two valid sessions with network elements (NEs) in the local NE's subnetwork before this command executes successfully.

This command may be entered *only* between command executions; that is, *only* at the system prompt. If entered as a response to a parameter prompt, an error message will be displayed.

This command does not display a typical completion message. When entered, the TID for the NE switched to is displayed, followed by the date and time. This line is followed by a prompt from that system.

The following denial message will be output if the toggle cannot be performed.

```
SNVS
/* Status, Not in Valid State */
/* No remote login is active */
```

If the toggle request fails due to a far end communication failure (after trying for 45 seconds or more), the following denial message will be displayed:

```
SROF
/* Status, Requested Operation Failed */
/* Far end Communication failure */
```

RELATED COMMANDS

logout

rlgn

NAME

upd: Update Equipment List

INPUT FORMAT

```
upd;
```

DESCRIPTION

CAUTION:
Execution of this command may affect service.

This command updates the system data base (as recorded in the nonvolatile memory) to reflect the existing hardware configuration and incoming signals.

This command can be executed either by pushing the Update/Initialize button, located on the SYSCTL circuit pack, or by entering the command from the CIT. When the Update/Initialize button is pushed, a dot (.) will appear on the 7-segment display.

NOTE 1:
`upd` may be performed at any time *except* before or during the 10-second window after powering up the System Controller (SYSCTL) while the CR LED is flashing.

NOTE 2:
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 the following cases.

  Automatic Upgrades — no alarms occur and there is no need to update:

  1. For timing slots — from BBF2 to BBF2B-type TGS packs.
  2. For low-speed slots — from any BBG11/BBG11B to any other BBG11B/BBG11-type 3DS3 pack
  3. For 1+1 slot pairs — from any 23 to any other 23-type OLIU packs

  Manual Upgrades — "unexpected CP type" alarm will occur, and an update must be done:

  1. For low-speed slots — from BBG12 3STS1E to 21-type OLIU packs for ring applications.
  2. For low-speed slots — from BBG11/BBG11B 3DS3 to 21-type OLIU packs for ring applications.

  Manual Upgrades — "unexpected CP switches" alarm will occur and an update must be done:

  1. For timing slots — between BBF2B and BBF2 TGS packs.

  Following the documented upgrade procedures (slot 1 of 1x1 or 1+1 pairs), the old type circuit pack is removed and replaced with the new type circuit pack. Activating the update function will clear the alarm for new pack type and make the new circuit pack settings active.

  Note: Upgrading from a 1x1 3STS1E or 3DS3 to an OC-3/IS-3 will force the application to 1+1.

ALARM RESTRICTIONS

Pressing the UPD button or issuing the `update` command will *not* change provisioning if the following alarms exist. The user will have to correct the alarmed condition before executing this command. These alarms are:

- illegal CP type
- CP not allowed -(*reason*)
- invalid CP switches.

SYSTEM RESTRICTIONS AND CORRECTIVE ACTIONS

Pressing the UPD button or issuing the `update` command will not retire a "CP removed", "unexpected CP type", or "unexpected CP switches" alarm or allow the system to accept the new provisioning request if certain system conditions exist. The user will have to correct the condition before updating the system.

If a restriction is detected, the following message will be displayed:

```
/* Address not equipped properly -- provisioning unchanged. */
```

The system restriction and corrective actions needed are:

- **Port status in NMON or IN SERVICE**
  If a low-speed circuit pack is removed before the incoming signal is removed or while the associated port or ports are in the *nmon* state, the system will not recognize that the service is no longer being carried on the port and will not remove the circuit pack from the equipment list. Note that this restriction does not apply to OLIU circuit packs in systems that support OC-N line states.
  Corrective Action: If the port is in the *nmon* state, it must be moved to the *auto* state, using the `set-state-t3` or `set-state-ec1` command, before the circuit pack can be removed and the system can be updated. If an incoming signal is present, it must first be removed, then the circuit pack can be removed, and the system can be updated.
- **Manual cross-connection exists**
  A manual cross-connection is entered into the system when an arrangement other than the default is desired and to support various applications.
  Corrective Action: The system will not recognize a circuit pack removal until the manual cross-connection to the addressed circuit pack is deleted. (See the `dlt-crs-sts1` and `rtrv-crs-sts1` commands for more information on manual cross-connections.)

For 1+1, 1x1 and 0x1 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.

- **Upgrades from Slot 2**
  Upgrades from Slot 2 of a 1x1 or 1+1 pair are not permitted when Slot 1 is equipped.
  Corrective Action: The documented upgrade procedures to change one type of circuit pack for another require that the change first be made in slot 1 of a slot pair when slot 1 is equipped.

- **Timing Source removed**
  When the sync timing source is provisioned to be LineTimed and the addressed circuit pack is selected for timing, the slot state will not change to *auto*.
  Corrective Action: Insert an OLIU circuit pack that supports the timing selected or change the timing source.

- **Sync Autoreconfiguration Selected**
  When the sync timing is provisioned for Autoreconfiguration and the addressed circuit pack is one of the sources for timing, the slot state will not change to *auto*.
  Corrective Action: Insert an OLIU circuit pack that supports the timing selected or change the timing provisioning.

- **Change Time setting from Line to External**
  If a system's sync timing source switch from Line to External timing is attempted by changing the switches on the TGS pack to an External timing setting while leaving the sync timing in Autoreconfiguration mode *enabled*, the attempt to switch from Line to External Timing will fail.
  Corrective Action: In order to switch from Line to External timing you MUST ensure that in addition to setting the switches on the TGS pack to External timing, the Sync Autoreconfiguration parameter is set to *disabled*.

If a protection switch request of `forced`, `inhibit`, or `lockout` is specified to a slot that is now empty, entering the `upd` command may cause the protection switch to occur possibly affecting service. When this occurs, the following confirmation message will be displayed:

```
/* Caution!  Execution of the update command may interrupt
   service because of an active protection switch request on
   an empty slot.  It also updates the equipment list and
   initializes ALL parameters associated with empty slots. */

Execute? (y/n or CANcel/DELete to quit) =
```

RELATED COMMANDS

dlt-crs-sts1

rtrv-crs-sts1

rtrv-crs-vt1

rtrv-state-eqpt

rtrv-state-path

Detailed Alarm and History Reports

This section provides details of the Retrieve Alarm and Retrieve History commands with explanations of specific output messages.

Each command includes an **INPUT FORMAT** part, providing the syntax for the command, and a **DESCRIPTION** part, providing the details of the command input and output parameters. Following the **DESCRIPTION** part is a table listing the output messages associated with each command and a description of each message.

NAME

rtrv-alm: Retrieve Alarm and Status

INPUT FORMAT

`rtrv-alm[:alm=`*`AlarmLevel`*`]`;

DESCRIPTION

This command displays a report of active alarm and status conditions of the local network element. The report includes the source address of the alarm, as well as the date and time of the alarm, whether or not the condition is service affecting, and a short description of the condition.

Use the `rtrv-ntalm` to report far-end (network) alarm conditions.

The input parameter is:

`alm` AlarmLevel for which a report is desired. This parameter may have one of the following values:

`all`

`cr`

`mj`

`mn`

`pmn`

`other`

Alarms are listed from greatest to least severity. Within a severity level, newer alarms are listed first.

Example Alarm Report:

```
/* Active Alarms and Status Report
================================================================
 Alarm        Source     Date   Time       Srv   Description
 Level        Address      Detected
================================================================
 Condition    address    MM-DD HH:MM:SS    srv   description
                              .
                              .
                              .
 Condition    address    MM-DD HH:MM:SS    srv   description
*/
```

The output parameters are:

`Alarm Level` Alarm level is the alarm or status condition being reported. A status condition is named status if there is no user panel LED illuminated for that condition. An alarm condition is the name of the topmost LED on the user panel that is illuminated and may be one of the following conditions:

`CRITICAL`

`MAJOR`

`MINOR`

`PWR MINOR`

`abnormal (status LED)`

`ne-acty (status LED)`

`status (no LED)`

`Source Address` Source address is the address of the event. An event source may be a slot, channel, port, or an operations interface. See Table 11-1 at the beginning of this chapter for the address of slots, ports, channels, and operations interfaces, respectively.

`Date Detected`	Month (MM) and day (DD) of the event.
`Time Detected`	Time (Hours, Minute, Seconds) of event occurrence.
`Srv`	Srv indicates whether the condition is service affecting or not, and may have the following values:
	`SA` Service affecting
	`NSA` Not service affecting
	- Not applicable for this condition (not service affecting).
`Description`	Table 11-3 lists the meanings and likely causes of the conditions reported in the alarm and status report. For conditions with more than one possible cause, the most likely causes are listed first.

RELATED COMMANDS

rtrv-hsty

rtrv-ntalm

Table 11-3. RTRV-ALM Descriptions

Description	Meaning
`-48V power/fuse failed`	A –48 volt power feeder or a fuse on the user panel has failed.
`-48V power/fuse FA|FB failed`	A –48 volt power feeder or a fuse on the user panel has failed. (FA or FB identifies failure if BBG8 controller used.)
`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-map-network` command will report the name of the system(s) with which this system is not communicating. Likely cause: An unprotected OC-n line failure in the subnetwork; a controller failure, reset, or initialization on another shelf; section DCC channel failure on this or another shelf; failure of the OHCTL CP.
`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 11-3. 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.
DS3 loopback (to Fiber)	A loopback (toward the optical fiber) is active on the specified T3 port. See the `opr-lpbk-t3` and `rls-lpbk-t3` commands.
DS3 loopback (to DSX)	A loopback (toward the DSX) is active on the specified T3 port. See the `opr-lpbk-t3` and `rls-lpbk-t3` commands.
DS3 trmsn test IP	A transmission test using the internal test signal generator and monitor is in progress on the specified T3 port. See the `test-trmsn-t3` command.
DSNE not reachable	This alarm condition can be caused by the following cases: 1. When a non-DSNE starts up and it does not identify or get registered by a DSNE within a time interval, it will raise this alarm condition. 2. Any node (NE) registered with the DSNE will raise this alarm condition if it can no longer reach the DSNE because of a change in provisioning by the `set-ne` command to "DSNE = no". See the `set-ne` and `rtrv-ne` commands for DSNE provisioning information. 3. Any Network Element registered with the DSNE will raise this alarm condition if it can no longer reach the DSNE because of a DCC failure between local Network Element and the DSNE. Other likely causes: OC-n line failure in the subnetwork, a controller failure, reset, or initialization of the DSNE.
dormant/executing code mismatch	This alarm condition is raised when the network element detects that it contains dormant software with a release number that does not match the release number of the executing software.
duplicate DSNE	A network element has been provisioned as a directory services network element (DSNE) in a subnetwork that already has a DSNE. Only one NE in the subnetwork may be provisioned as the DSNE to ensure proper DCC communication between nodes. See the `set-ne` and `rtrv-ne` commands for DSNE provisioning information.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
`duplicate site/ne address`	Two or more shelves in the alarm group have the same site address and the same network element address.
`duplicate TBOS display`	Two or more shelves in the alarm group have the same TBOS display number.
`duplicate TID`	Two or more shelves in the network have the same system name or "TID" set by the `set-ne` command.
`EC1 loopback (to Fiber)`	A loopback (toward the optical fiber) is active on the specified EC1 port. See the `opr-lpbk-ec1` and `rls-lpbk-ec1` commands for more information.
`EC1 loopback (to DSX)`	A loopback (toward the DSX) is active on the specified EC1 port. See the `opr-lpbk-ec1` and `rls-lpbk-ec1` commands for more information.
`environmentn`	The specified environmental alarm point (miscellaneous discrete input) is active. The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the `rtrv-attr-env` and `set-attr-env` commands.
`excessive holdover`	The system has been in holdover mode for more than 4 hours. This may cause degraded performance (high error rates) on the transmitted and/or received signals. Whenever this condition exists, the condition "`holdover mode active`" also exists. Likely Causes: See "`holdover mode active.`"
`externalMinor`	The external minor alarm input (environmental alarm input 15) is active. Typically, this input will be connected to the power shelf and will indicate that the DC power or the cooling fan in a remote terminal cabinet has failed. The actual message that appears in the alarm and status report for this condition can be provisioned; this is the default message. See the `rtrv-attr-env` and `set-attr-env` commands.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
`fan control relay failed`	The thermostat on the SYSCTL indicates that the cooling fan should be turned on, and the fan control relay on the SYSCTL CP failed to operate or the fan control relay output (backplane connector P62) does not connect to a fan. The system will continue to operate but might overheat if the SYSCTL controls a fan, leading to degraded or interrupted transmission and/or circuit pack failures. Likely causes: Telemetry output common pin on P62 is not grounded; SYSCTL CP failure.
`fan shelf failed`	The system has detected a failure of the DDM-2000 fan shelf. The system will continue to operate but it may overheat. The fan must be replaced within *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 11-3. 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 b. The system automatically switched to holdover mode due to failure of the timing references, as follows: 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.
illegal CP type	An illegal or unknown circuit pack type has been inserted into the shelf. The circuit pack should be removed from the shelf.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
`inc. 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.
`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.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
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.
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.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
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 11-3. 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.

Table 11-3. 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 11-3. 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.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
inc. STS1 sig. degrade (BER)	For STS-1 path switched ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold. Likely causes: Failure at a fiber or failure of an OLIU circuit pack at some point in the STS-1 path.
inc. STS1 unequipped	The system has detected the unequipped code (SONET path overhead signal code label byte=0) on an in-service STS-1 channel. Likely cause: An upstream STS-1 cross-connect has been deleted.
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 values	The Userside/Networkside parameter values are set the same at both ends of the DCC.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
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.
inhibit auto. OS messages	This message occurs when TL1 autonomous alarm reporting is inhibited by the TL1 `inh-msg` command. This message is cleared by enabling autonomous message reporting with the TL1 `alw-msg` command.
invalid CP switches	When associated with a TG slot, this message means that the timing mode switch settings on the TGS CP are invalid.
lockout of protection	When associated with an OC-3 line, this message means that the identified protection line is not selected as the active receiving line, and a protection switch to make this the active receiving line will not be allowed. Note: Line switching is unidirectional. Because of this, the specified line might still be active (if the far end is selecting the specified line to receive traffic), and the far end might still be free to switch the line it is selecting to receive traffic. The lockout will remain in effect until the protection switch is reset or until a protection switch "inhibit" request is entered. See the `switch-line` command.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
manual sync. mode switch	The synchronization mode has been manually switched to holdover or free-running and will remain in that mode until the switch request is reset. See the switch-sync command.
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. For OC-12 Release 5.1 and later, this condition will appear if the network element determines that it is time to install a new software generic (originally, the action that caused this event to take place should have been the initiating of the apply command).
section DCC channel failed	The system cannot communicate with the far-end system through the SONET section data communications channel (DCC). Likely causes: SYSCTL or OHCTL CP failure, reset, or initialization at the far end; failed program installation at far end; program installation in progress at the far end; SYSCTL or OHCTL CP failure at the near end.
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.
TID address map full	The size of the directory services network element (DSNE) database has been exceeded. Likely cause: Network elements have been removed from the network but not from the DSNE database. See the dlt-tadrmap command.
TGS CP failed	Internal equipment failure of the specified TGS CP, or the systems at both ends of the span are loop-timed from each other.

Table 11-3. RTRV-ALM Descriptions (Contd)

Description	Meaning
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.
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.

NAME

rtrv-hsty:Retrieve History

INPUT FORMAT

```
rtrv-hsty;
```

DESCRIPTION

This command displays an event-history report. This report contains a list of the most recent system events. This report contains up to 500 events. The events are listed in last-in, first-out order and are date- and time-stamped.

The output report appears as follows:

```
/* Maintenance History Report
=============================================================
Date    Time      Sys.Alm.      Source       Event
                   Level                     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, or PMN alarms for troubles that never really became alarms, since holdoff delays may prevent the troubles from reaching an alarm condition.

The alarm level may be one of the following:

CRITICAL	Critical Alarm
MAJOR	Major Alarm
MINOR	Minor Alarm
PWR MINOR	Power Minor Alarm
abnormal	Abnormal condition
ne-acty	Near-End Activity
fe-acty	Far-End Activity
status	Status condition
-	No active alarm or status condition in the system.

Source — The source of the event. An event source may be the entire system or a slot, a channel, or an operations interface. If security is enabled, it may also be a CIT or a login name. Refer to "Commands" and Table 11-1 at the beginning of this section for the addresses of lines, slots, ports, channels, and operations interfaces.

Event Description — Table 11-4 lists the meaning and likely cause of each of the messages that appear in the maintenance history report.

In addition to the messages listed here, any of the messages that appear in the alarm and status report can appear in the history report to record the onset of alarm and status conditions.

Also, all CIT and TL1 commands that affect the state of the system (provisioning commands; protection switching commands; loopbacks; transmission, alarm, and telemetry tests) will appear in the report.

NOTE:
Any messages that appear in the RTRV-ALM report may also appear in the history report.

Table 11-4. RTRV-HSTY Descriptions

Description	Meaning
`-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.
`AGNE communication good`	An AGNE communication failure has been cleared.
`APS - CP failed`	An automatic protection switch was done because the system detected a circuit pack failure.
`APS channel good`	A failure of the SONET automatic protection switching channel has cleared.
`APS - sig. degraded`	An automatic protection switch was done because the system detected a degraded signal on the OC-N line or path.
`APS - sig. failed`	An automatic protection switch was done because the system detected a failure of the OC-N line or path (incoming AIS, loss of signal, or bit error rate higher than 10^{-3}).
`auto sync. mode switch`	An automatic protection switch of the synchronization mode is active. When the failure that caused the switch to be done clears, the switch will be reset automatically if automatic mode switching is enabled. (See the `set-sync` and `rtrv-sync` commands.)

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
`CIT timeout`	A craft interface terminal (CIT) session was automatically terminated because there was no activity on the CIT for the provisioned time. (See the `set-secu` command.)
`communication good`	A communication failure has cleared. The system can now communicate, via the SONET section DCC, with another system with which it had previously lost communication.
`control`**n** `rlsd`	The system has released the specified miscellaneous discrete environmental control because it has been requested to do so through the serial telemetry or discrete telemetry interface. This message will appear only in a remote terminal. Any name may be provisioned in place of the `control`**n** part of this message.
`cpy-prog compl.`	The software copy procedure has been completed. This message will show at the source NE.
`disconnect`	The craft interface terminal has been disconnected.
`DS1 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 not reachable clrd`	Communication has been restored between the DSNE and other network elements in the subnetwork, or other NE(s) can now reach the DSNE.
`duplicate 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 11-4. 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.
inc. EC1 good	A failure of the EC-1 signal has been cleared.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
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. An upstream failure (in the MUX direction) has cleared.
inc. STS1 LOP EC1 clrd	A loss-of-pointer condition on the STS-1 signal of the EC-1 line has been cleared.
inc. STS1 LOP OC12 *slot* clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.
inc. STS1 LOP OC3 *slot* clrd	The system is no longer detecting a loss-of-pointer (LOP) condition on the specified STS-1 signal.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
`inc. STS1 sig. degrade clrd`	A failure of the specified STS-1 signal has cleared.
`inc. STS1 sig. failed clrd`	A failure of the specified STS-1 signal has cleared.
`inc. STS1 unequipped clrd`	A failure of the specified STS-1 signal has cleared.
`inc. STS1 yellow clrd`	The STS-1 yellow signal is no longer being received.
`ins-prog compl.`	The software installation procedure has been completed. This message will show at the source NE.
`login:`*`login_id`*	A login session with a user's 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, or the system was in Lockout state.
`logout:`*`login_id`*	A login session with a user's login identification has ended on the specified CIT port.
`logout:`*`login_id DISCONNECT`*	A login session with a user's login identification has ended by a disconnect on the specified CIT port.
`main-{1,2} protection switch`	Equipment switching in a ring application has occurred due to equipment failure.
`OLIU CP good`	The failure of the specified circuit pack has cleared.
`OLIU CP inserted`	A circuit pack was inserted into the shelf.
`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 abnormal termination at the far end NE.
`reset`	The system software program has been reset.
`rlgn:`*`login_id DENY`*	A remote login session was attempted but denied because of an invalid login and password pair, or the DCC connecting the remote system was in Lockout state.

Table 11-4. RTRV-HSTY Descriptions (Contd)

Description	Meaning
section DCC channel good	The failure of the SONET section data communications channel has cleared.
STS1 channel in service	An STS1 channel was put in the "in service" state. This happens automatically when a "good" signal is detected on the channel (neither AIS, unequipped signal, nor "loss of pointer" condition is present), unless the channel has been provisioned to the "not monitored" state.
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-sync, switch-line, 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.
sysctl channel states initialized	A read failure of the channel state data base occurred during restart, and recovery using backup copies also failed. The channel state data on SYSCTL was used.
sysctl port states initialized	A read failure of the port state data base occurred during restart, and recovery using backup copies also failed. The port state data on SYSCTL was used.
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.

A SONET Overview

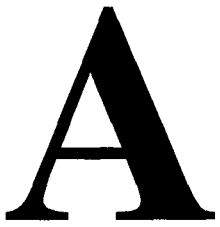


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A SONET Overview

A

Overview

This section briefly describes the Synchronous Optical Network (SONET).

History

In the early 1980's, the American National Standards Institute (ANSI) recognized the need for an optical signal standard for future broadband transmission. The ANSI T1X1 subcommittee began working on optical signal and interface standards in 1984. In 1985, Bellcore proposed a network approach to fiber system standardization to T1X1. The proposal suggested a hierarchical family of signals whose rates would be **integer multiples** of a basic modular signal. The proposal further suggested a synchronous multiplexing technique, leading to the coining of the term *Synchronous Optical NETwork* (SONET).

The International Telephone and Telegraph Consultative Committee (CCITT) first showed interest in 1986. Conferences held through 1987 and 1988 resulted in coordinated specifications for both the American National Standard (SONET) and the CCITT-International Standard, Synchronous Digital Hierarchy (SDH). Approval of both sets of standards occurred in late 1988.

Basic Purpose

The basic purpose of SONET is to provide a standard synchronous optical hierarchy with sufficient flexibility to accommodate digital signals that currently exist in today's network as well as those planned for the future.

SONET currently defines standard rates and formats and optical interfaces. These and other related issues continue to evolve through the ANSI committees. SONET ultimately will permit an optical midspan meet in a multivendor environment.

The American National Standard defines the following:

- Optical parameters (*ANSI** T1.106-1988)
- Electrical parameters (*ANSI* T1.102-1993 Draft)
- Multiplexing schemes to map existing digital signals (for example, DS1, DS2, and DS3) into SONET payload signals (*ANSI* T1.105-1991)
- Criteria for optical line automatic protection switch (APS) (*ANSI* T1.105-1991)
- Overhead channels to support standard operation, administration, maintenance, and provisioning (OAM&P) functions (*ANSI* T1.105-1991).

*

Technical Overview

SONET Signal Hierarchy

The SONET signal hierarchy is based on a basic "building block" frame called the synchronous transport signal - level 1 (STS-1), as shown in Figure A-1 on the following page. The STS-1 frame has a reoccurring rate of 8000 frames per second. Each frame is 125 microseconds.

The STS-1 frame consists of:

- 90 columns (each column is an 8-bit byte)
- 9 rows.

* Registered trademark of America National Standards Institute

The STS-1 frame is transmitted serially starting from the left with row 1 column 1 on through column 90, then row 2 column 1 through 90, continuing on, row-by-row, until all 810 bytes (9 X 90) of the STS-1 frame have been transmitted.

Since each STS-1 frame consists of 810 bytes and each byte has 8 bits, the frame contains 6480 bits a frame. There are 8000 STS-1 frames per second, at the STS-1 signal rate of 51,840,000 (6480 X 8000) bits a second.

The first three columns in each of the nine rows carry the SECTION and LINE overhead bytes. Collectively, these 27 bytes are referred to as transport overhead.

The remainder of the frame, columns 4 through 90, is reserved for payload signals (for example, DS1, DS3, and path overhead) and is referred to as the STS-1 synchronous payload envelope (STS-1 SPE). The optical counterpart of the STS-1 is the optical carrier level 1 signal (OC-1), which is the result of a direct optical conversion. The electrical counterpart of the STS-1 is the electrical carrier level 1 signal (EC-1).

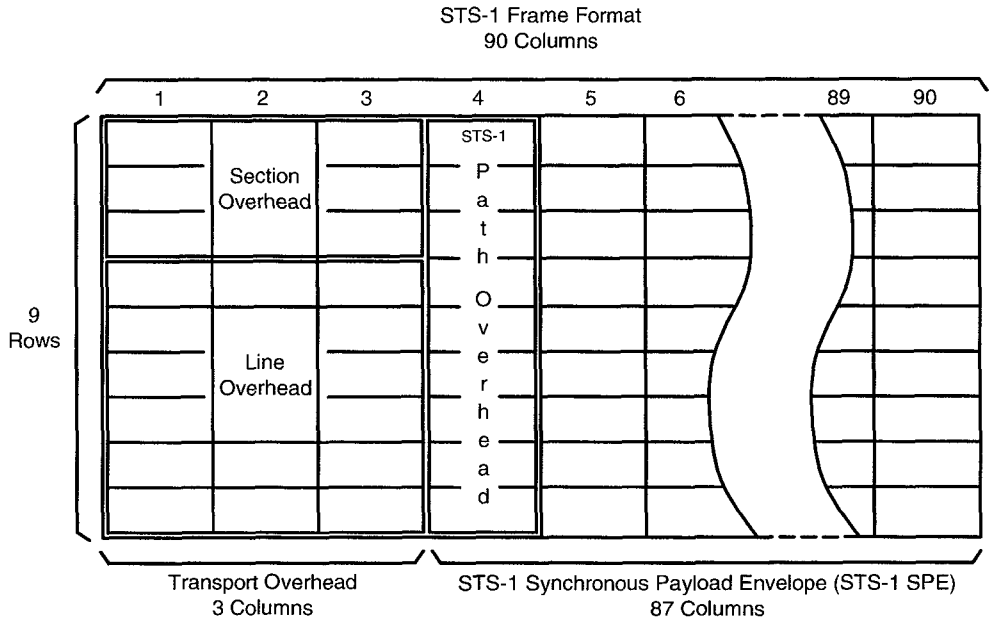


Figure A-1. SONET STS-1 Frame — Simplified Version

SONET Layers

SONET divides its processing functions into three layers. These three layers are associated with equipment that reflects the natural divisions in network spans. Figure A-2 shows these defined layers in a signal path. They include:

- **SECTION** and **Section Terminating Equipment** - the transmission spans between lightwave terminating equipment and the regenerators. The spans between the regenerators are also considered sections. Section terminating equipment provides regenerator functions and terminates the section overhead to provide single-ended operations and section performance monitoring.
- **LINE** and **Line Terminating Equipment** - the transmission span between terminating equipment (STS-1 cross-connections) that provides line performance monitoring. If there are no intervening repeaters, the line terminating equipment also functions as section terminating equipment.
- **STS-1 and VT Path** and **Path Terminating Equipment** - the transmission span for an end-to-end tributary (DS1 or DS3) signal that provides functions including signal labeling and path performance monitoring for signals as they are transported through a SONET network. STS-1 path terminating equipment can also provide cross-connections for lower rate (that is, DS1) signals. A virtual tributary (VT) is a sub-DS3 payload and is described later in more detail.

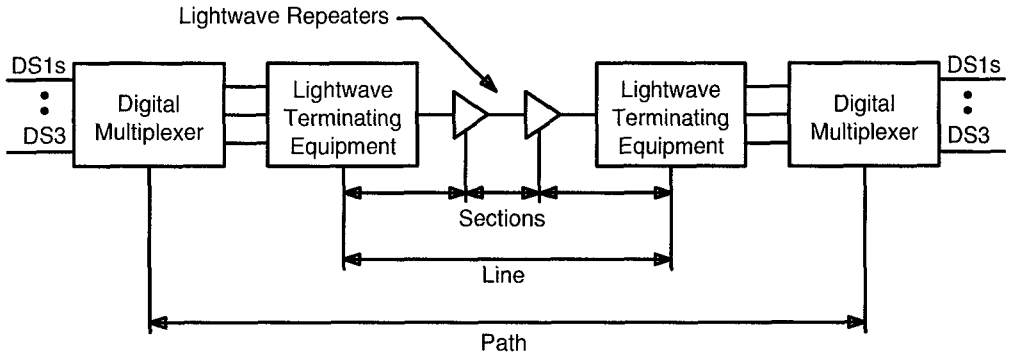


Figure A-2. Section, Line, and Path Definitions

Each SONET layer has a set of overhead bytes as shown in Figure A-3. These bytes carry information used by various network elements.

- **Section Overhead** contains information that is used by all SONET equipment including repeaters.
- **Line Overhead** is used by all SONET equipment except repeaters.
- **Path Overhead** is carried within the payload envelope.
  - **STS-1 path overhead** remains with the STS-1 SPE until its asynchronous signal is extracted (for example, DS-3) or until its individual VT1.5 signals are demultiplexed.
  - **VTN (N= 1.5, 2, 3, or 6) path overhead** remains with the VTN until its asynchronous signal is extracted.

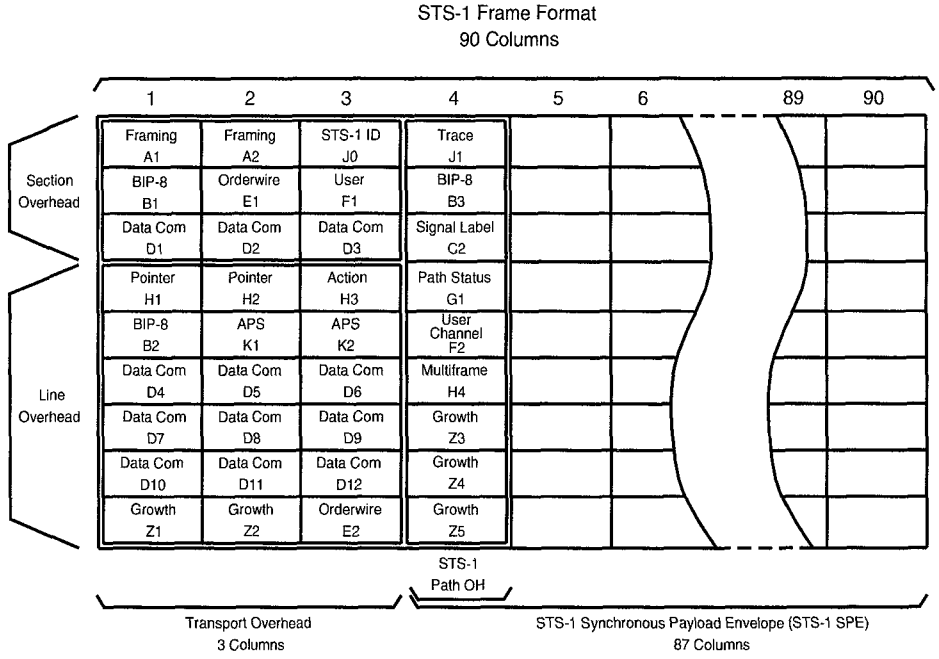


Figure A-3. SONET Frame Format

SONET Frame Structure

The following pages provide more detailed information on the function of various overhead bytes for each SONET layer.

Section Overhead

- Framing (A1, A2)
  - — Provides framing for each STS-1.
- STS-1 ID (J0)
  - — Provides the order of appearance in a byte-interleaved STS-*N* frame; for example, STS-1 #1, STS-1 #2.....STS-1 #48. In future applications, this byte will provide a section trace function. For information on STS-*N* signals, see the "Higher Rate Transport" part of this section.
- Section Bit-Interleaved Parity (BIP-8) (B1)
  - — Provides SECTION performance monitoring and is calculated over all bits of the previous STS-*N* frame. Defined only for STS-1 #1 of an STS-*N* signal.
- Section Orderwire (E1)
  - — Provides a local orderwire for voice communication channel between section terminating network elements, such as repeaters. Defined only for STS-1 #1 of an STS-*N* signal.
- Section User Channel (F1)
  - — Set aside for the user's purpose. Defined only for STS-1 #1 of an STS-*N* signal.
- Section Data Communications Channel (D1, D2, D3)
  - — Is a 192 kb/s message-based channel. Used for alarms, maintenance, control, monitoring, and other communication needs between section terminating equipment. Defined only for STS-1 #1 of an STS-*N* signal.

Line Overhead

- Line Pointer (H1, H2)
  - — Two bytes indicate the offset in bytes between the pointer action byte (H3) and the first byte (J1) of the STS-1 synchronous payload envelope (SPE).
- Pointer Action (H3)
  - — One byte is allocated for frequency justification.
- Line Bit-Interleaved Parity (BIP-8) (B2)
  - — This byte is for line performance monitoring. This byte is provided in all STS-1 signals within an STS-*N* signal.
- Line Automatic Protection Switching (APS) (K1, K2)
  - — Two bytes used for APS signaling between line level entities. In addition, bits 6, 7, and 8 of K2 are used for line alarm indication signal (AIS) and line far-end receive failure (FERF). Defined only for STS-1 #1 of an STS-*N* signal.
- Line Data Communications Channel (D4 - D12)
  - — Is a 576 kb/s message-based channel.
- Line Growth (Z1, Z2)
  - — Two bytes are set aside for future functions. In STS-1 #1, the Z1 byte is relabeled S1 for synchronization status messages, and only bits 5 through 8 are used. The Z2 byte is relabeled M0 for STS-1 line far end block error (FEBE), and only bits 5 through 8 are used.
- Line Orderwire (E2). Defined only for STS-1 #1 of an STS-*N* signal.
  - — One byte is allocated to be used as an express orderwire between line terminating equipment.

Path Overhead

There are two types of path overheads:

— STS-1 path overhead

— VT path overhead.

STS-1 Path Overhead

The STS-1 path overhead is assigned to and remains with the STS-1 SPE until the payload is extracted and is used for functions that are necessary to transport all synchronous payload envelopes.

- STS-1 Path Trace (J1)
  - — Repetitively transmits a 64 byte, fixed length, string so that an STS-1 path receiving terminal can verify its continued connection to the intended transmitter.
- STS-1 Path Bit-Interleaved Parity (BIP-8) (B3)
  - — Provides each STS-1 path performance monitoring. This byte is calculated over all bits of the previous STS-1 SPE before scrambling.
- STS-1 Path Signal Labels (C2)
  - — Indicates the construction of the STS-1 SPE. A value of 00000000 indicates an unequipped STS-1 SPE. Values for various payload mappings are defined in TR-NWT-000253, Issue 2.
- STS-1 Path Status (G1)
  - — Conveys the STS-1 path terminating status, far end block errors (FEBE), and yellow alarm signal conditions back to an originating STS-1 path terminating equipment.
- STS-1 Path User Channel (F2)
  - — Reserved for user communication.
- VT Multiframe Indicator (H4)
  - — Provides a general multiframe indicator for VT-structured payloads.
- Growth (Z3 - Z5)
  - — Reserved for future functions.

VT Path Overhead

There is one byte of VT path overhead called V5. It occurs on every fourth frame; that is, 2000 times a second.

This byte provides for VT paths the same functions that B3, C2, and G1 provide for STS paths, namely:

- Error checking
- Signal label
- Path status.

The bit assignments of the VT path overhead are specified in the following list and are illustrated in Figure A-4:

— Bits 1 and 2 are used for error performance monitoring (BIP-2).

— Bit 3 is a VT path far-end-block-error (FEBE) indication that is sent back toward an originating VT PTE when errors are detected by the BIP-2.

— Bit 4 and Bit 8 are used for remote defect indication (RDI)

— Bits 5 through 7 provide a VT signal label.

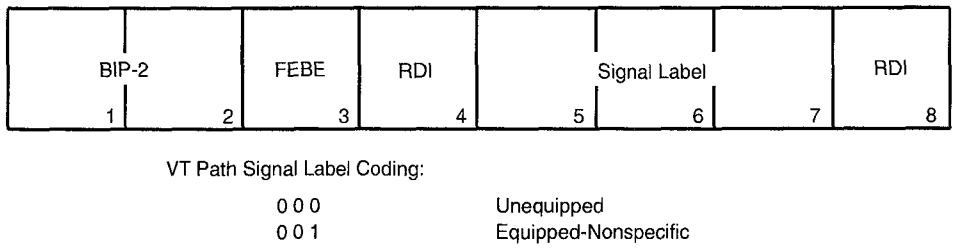


Figure A-4. VT Path Overhead Byte

SONET Multiplexing Procedure

SONET has provisions for multiplexing asynchronous DS1s, synchronous DS1s, and asynchronous DS3s. Refer to Figure A-5 and Figure A-6.

The first stage in multiplexing is mapping the input DS1 or DS3 tributary. In the case of DS1 inputs, three time slots (DS0s) are added to the incoming signal thus becoming a VT1.5. An asynchronous DS1 that fully meets the specified rate is mapped into the VT1.5 SPE as clear channel input since no framing is needed.

- Each VT1.5 carries a single DS1 payload.
- Four VT1.5s are bundled into a VT group (VT-G).
- Seven VT-Gs are byte-interleaved into an STS-1 frame.

The VT-G to-STS-1 multiplex is a simple byte-interleaving process, so individual VT signals are easily observable within the STS-1. Thus, cross-connections and add/drop can be accomplished without the back-to-back multiplexing/multiplexing steps required by asynchronous signal formats. The structured VTs are now multiplexed into the STS-1 SPE, and the path, line, and section overhead are added. The final multiplexing, as shown in Figure A-5, provides the scrambled STS-*N* signal to the optical conversion stage.

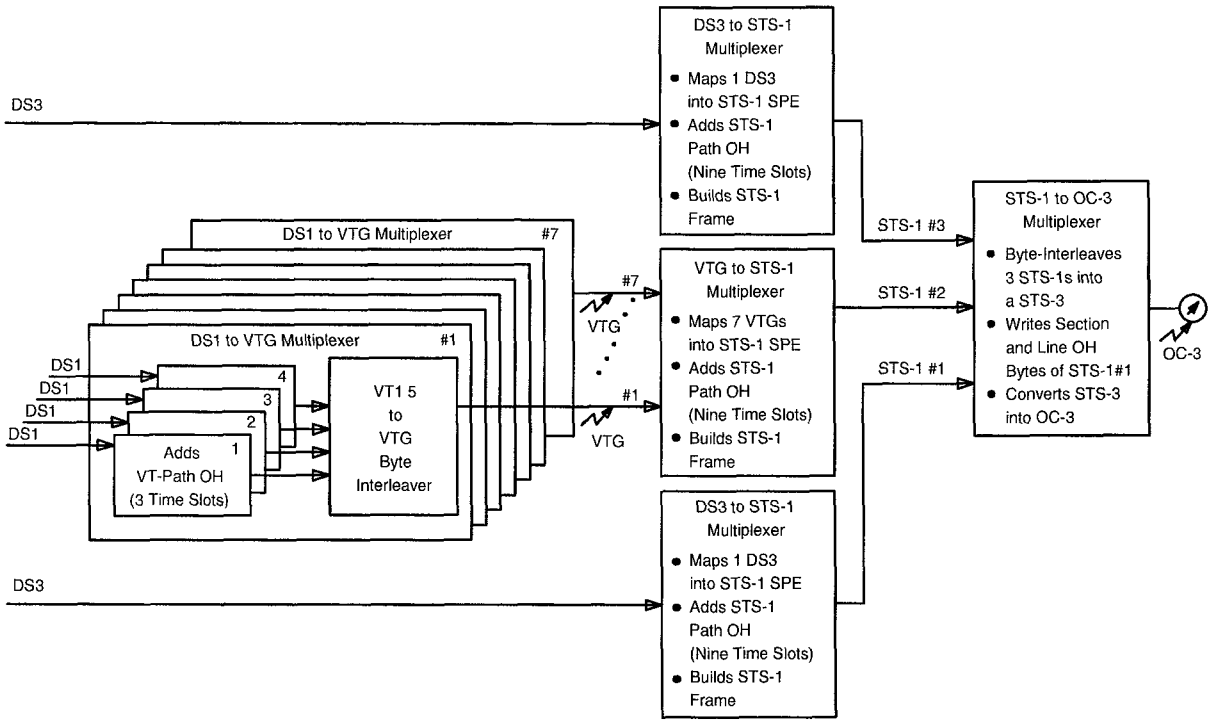


Figure A-5. SONET Multiplexing Procedure

SONET Demultiplexing Procedure

As shown in Figure A-6, demultiplexing is the inverse of multiplexing. The unscrambled STS-1 signal from the optical conversion stages is processed to extract the section and line overhead and accurately locate the SPE. The next stage processes the path overhead and demultiplexes the VTs. A standard DS3 signal will be provided to the asynchronous network after path overhead processing. For DS1 signals, the individual DS1 VTs are then processed to extract VT overhead and, via the VT pointer, accurately locate the DS1 SPE. Finally, desynchronization of the DS1 SPE provides a standard DS1 signal to the asynchronous network.

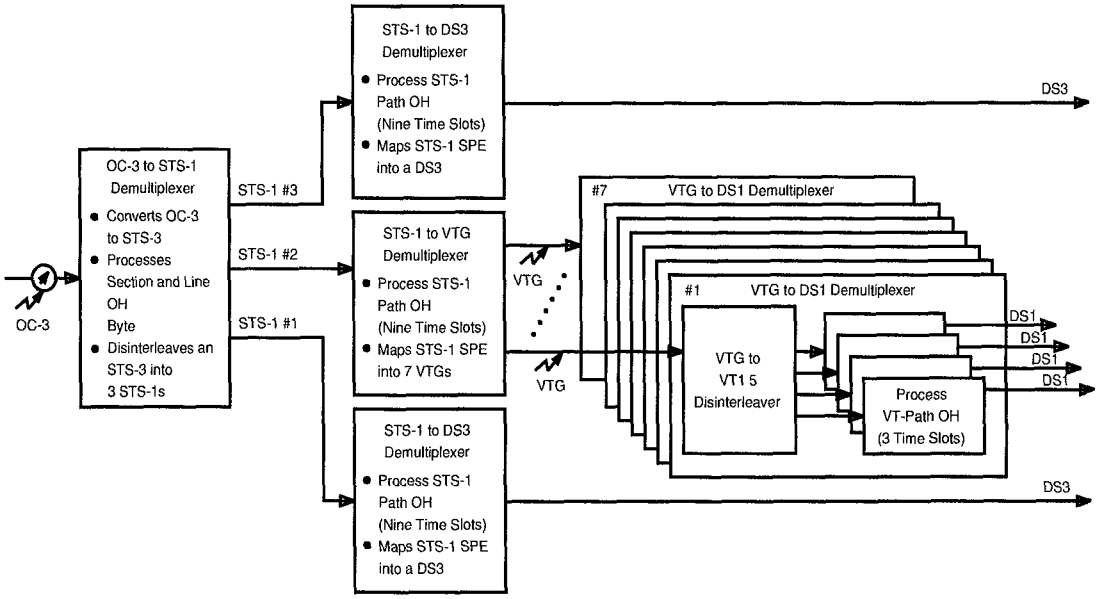


Figure A-6. SONET Demultiplexing Procedure

Two key points should be noted at this time. First, the SONET frame is a fixed time (125 µs) and no bit-stuffing is used. Second, as shown in Figure A-7, the synchronous payload envelope can *float* within the frame using byte-stuffing. This is to permit compensation for small variations in frequency between the clocks of the two systems that may occur if the systems are independently timed (plesiochronous timing). The SPE can also drift across the 125-µs frame boundary. SONET STS pointers are used to locate the SPE relative to the transport overhead.

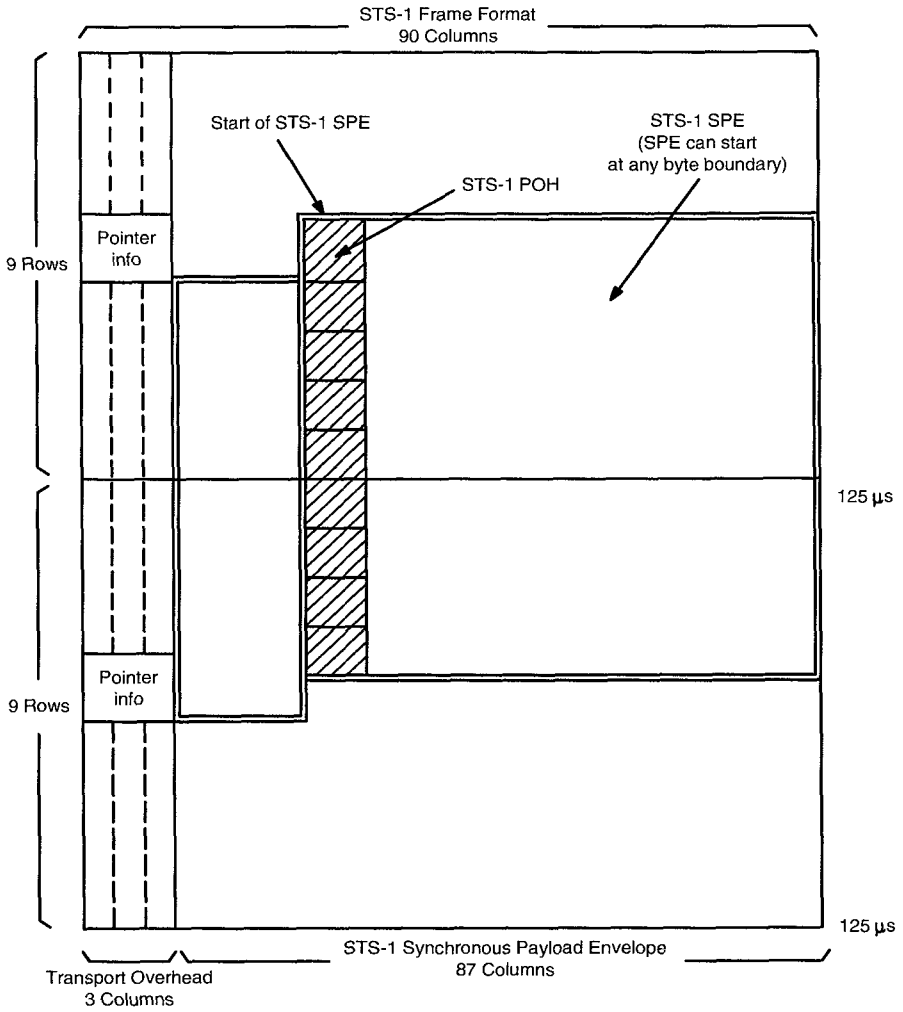


Figure A-7. STS-1 Synchronous Payload Envelope in Interior of STS-1 Frame

SONET Digital Multiplexing Schemes

Asynchronous Multiplexing

Currently, fiber optic facilities are primarily used to carry DS3 signals. The DS3 signal consists of a combination of the following payload signals:

- 28 DS1s
- 14 DS1Cs
- 7 DS2s.

Typically, 28 DS1 signals are multiplexed into a DS3 signal, using an M13 format. Refer to Figure A-8. M13 format is a process that includes bit-interleaving four DS1 into a DS2 signal and then bit-interleaving seven DS2 signals into a DS3. The DS3 rate is not a direct multiple of the DS1 or the DS2 rates due to the bit-stuffing synchronization technique used in asynchronous multiplexing.

Identification of DS0s contained in any DS-*N* signal, except DS1, is complex and DS0s cannot be directly extracted. Thus, an asynchronous DS3 signal must be demultiplexed down to the DS1 level to access and cross-connect DS0 and DS1 signals.

Another disadvantage of the M13 format is there is no end-to-end overhead channel for use by OAM&P groups.

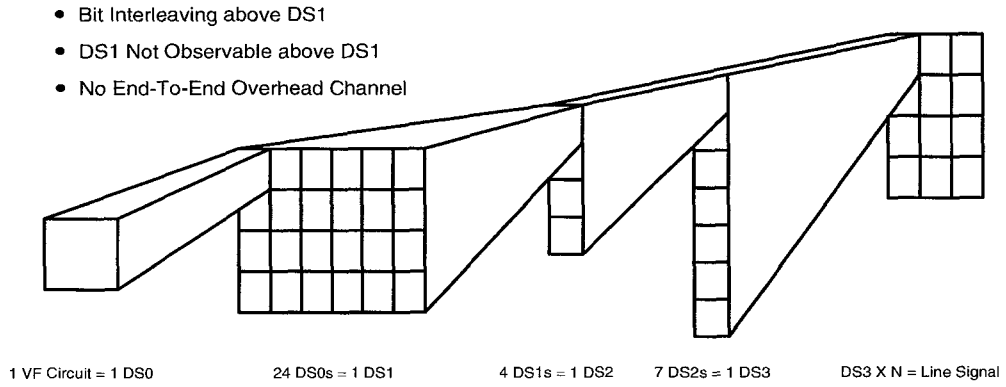


Figure A-8. Asynchronous Multiplexing

Synchronous Multiplexing

SONET's method of *byte-interleaving* DS1s to a higher signal rate permits economical extraction of a single DS1 without the need to demultiplex the entire STS-1 SPE. In addition, SONET provides overhead channels for use by OAM&P groups.

In SONET, a single asynchronous DS3 signal is mapped into an STS-1 SPE (Figure A-9).

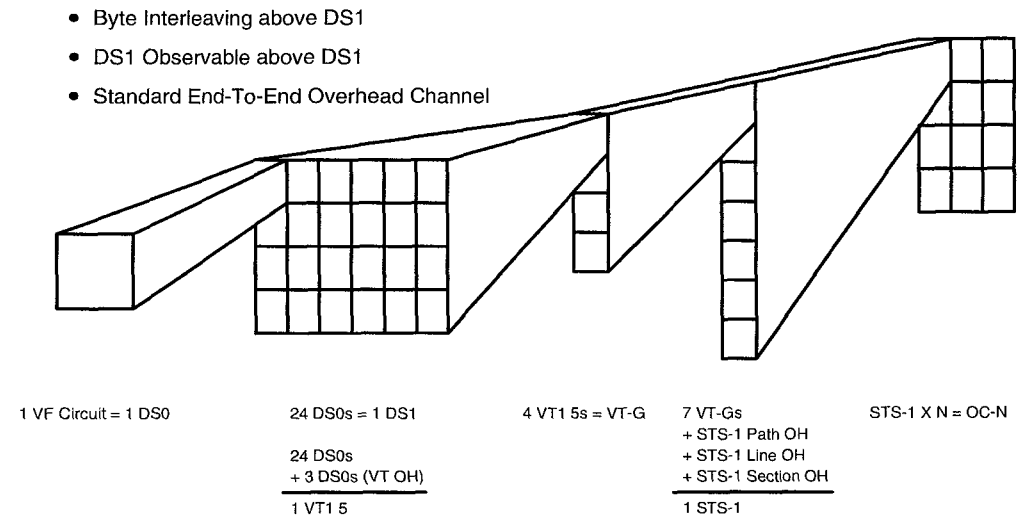


Figure A-9. Synchronous Multiplexing

Virtual Tributary Signals

Sub-DS3 asynchronous signals (DS1, DS1C, DS2 and E1) are *byte-interleaved* into a digital signal called a virtual tributary (VT). The VT is a structure designed for the transport and switching of sub-DS3 payloads. Like the STS-1 signal, the VT signal has a floating pointer that allows each VT SPE to move within the VT structure. There are four sizes of virtual tributaries (VT1.5, VT2, VT3, VT6). Higher rate payloads are transported as one or more concatenated STS-1 signals.

Concatenated Mode

For services requiring multiples of the STS-1 rate, STS-1 path payloads may be shared to create a single broadband payload called a concatenated STS-*N*c (OC-*N*c). STS-1 signals are mapped into an STS-*N*c SPE and transported as a concatenated STS-*N*c signal. This STS-*N*c signal can be carried by an STS-*N* or OC-*N* (or higher level) line signal.

The STS-*N* signal is multiplexed, switched, and transported through the network as a single entity. A concatenation indicator, used to show that the STS-1s of the STS-*N*c signal are linked together, is contained in the STS-1 payload pointer of all but the first STS-1. The line and section overhead is sent on the first STS-1 and the payload pointer for the first STS-1 is applied to all STS-1 signals in the concatenated signal.

Figure A-10 shows an example of an STS-3c SPE. It consists of 3 x 87 columns and 9 rows of bytes. The order of transmission is row by row, from left to right.

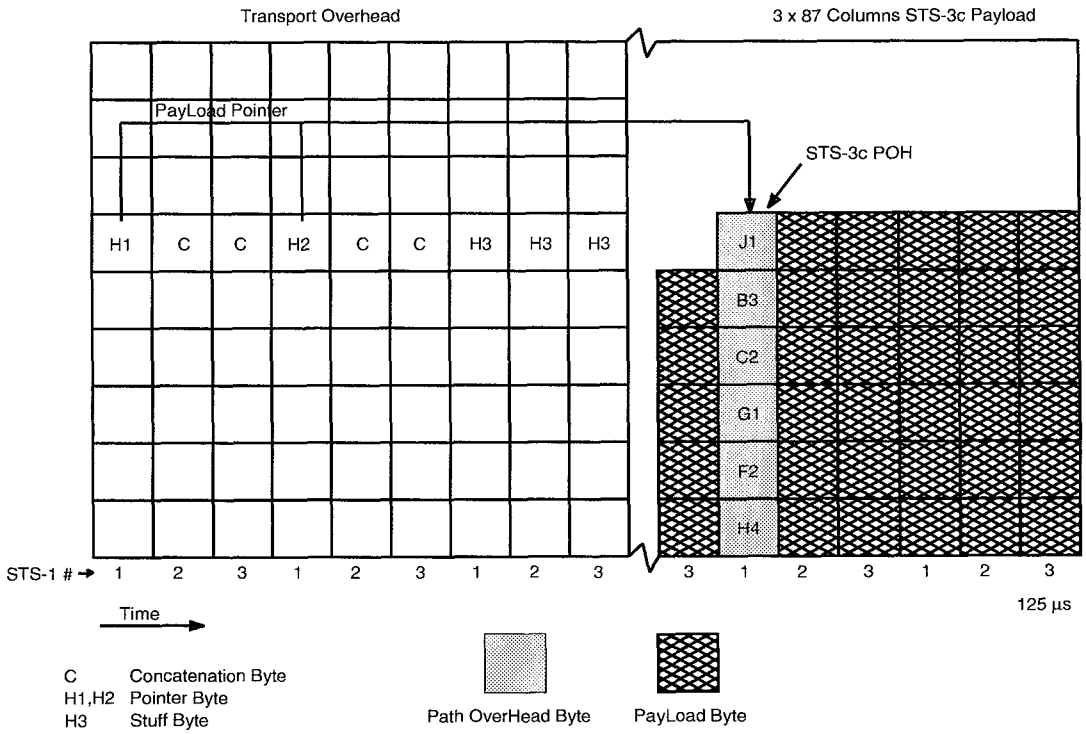
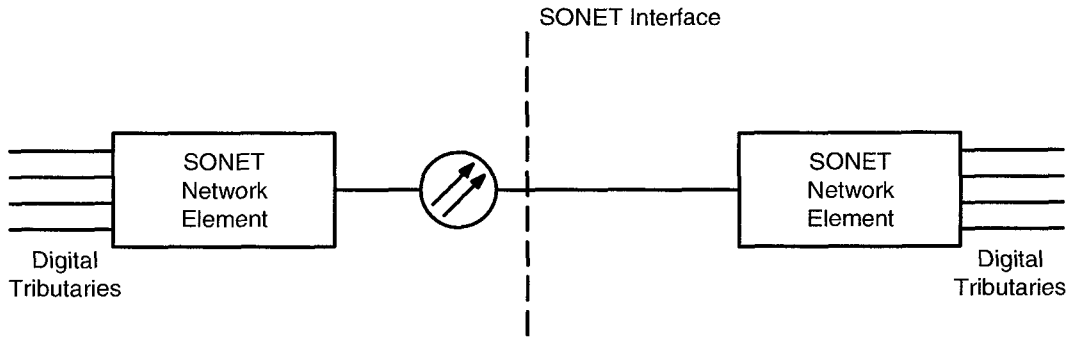


Figure A-10. STS-3c Concatenated Payload

SONET Interface

The SONET interface (Figure A-11) provides the optical midspan meet between SONET network elements. A SONET network element is the hardware and software that processes one or more layers of the SONET signal.



Standard optical interconnect at SONET interface

Family of standard rates at N X 51.84 Mb/s
[Synchronous Transport Signal (STS-1)]

Overhead channels defined for interoffice operations and maintenance functions

Figure A-11. SONET Interface

SONET Payloads

Table A-1 shows the digital signals that can be transported as SONET payloads.

Table A-1. SONET Payloads

Input Tributary	Equivalent Channels	Rate	SONET Signal	Rate
DS1	24 DS0s	1.544 Mb/s	VT1.5	1.728 Mb/s
E1 (CEPT)	32 DS0s	2.048 Mb/s	VT2	2.304 Mb/s
DS1C	48 DS0s	3.152 Mb/s	VT3	3.456 Mb/s
DS2	96 DS0s	6.312 Mb/s	VT6	6.912 Mb/s
DS3	672 DS0s	DS3	44.736 Mb/s	STS-1
DS4NA	2016 DS0s	139.624 Mb/s	STS-3c	150.336Mb/s
ATM		149.76 Mb/s	STS-3c	150.336Mb/s
FDDI		125.00 Mb/s	STS-3c	150.336Mb/s
Future payloads		up to 150 Mb/s		
Future broadband payloads		Greater than 150 Mb/s		

DS1 and DS3 signals are the most important of these signals in the current network. Broadband payloads, such as asynchronous transfer mode (ATM) and fiber distributed data interface (FDDI), with rates of 150 Mb/s and higher, are also important. Other payloads may be defined for specific applications.

Higher Rate Transport

Higher rate SONET signals are created by byte-interleaving *N* STS-1 to form an STS-*N* signal. The STS-*N* is then scrambled and converted to an optical carrier - level *N* (OC-*N*) signal. The OC-*N* has a line rate of exactly *N* times the OC-1 signal (see Table A-2).

Table A-2. SONET Transport Rates

OC Level	Line Rate (Mb/s)	Capacity
OC-1	51.84	28 DS1s or 1 DS3
OC-3	155.52	84 DS1s or 3 DS3s
OC-9	466.56	252 DS1s or 9 DS3s
OC-12	622.08	336 DS1s or 12 DS3s
OC-18	933.122	504 DS1s or 18 DS3s
OC-24	1244.16	672 DS1s or 24 DS3s
OC-36	1866.24	1008 DS1s or 36 DS3s
OC-48	2488.32	1344 DS1s or 48 DS3s

Conclusion

The intent of this section is to present a short overview of SONET. More detailed expositions can be found in various literature. An excellent description of SONET can be found in Reference 3.

REFERENCES

1. ANSI T1.106-1988 •American National Standard for Telecommunications - Digital Hierarchy Optical Interface Specifications, Single Mode,• and ANSI T1.105-1991 •American National Standard for Telecommunications - Digital Hierarchy Optical Rates and Formats Specification.•
2. CCITT Recommendations G.707, G.708, G.709.
3. R. Ballert and Y. C. Ching, •SONET: Now It's the Standard Optical Network,• *IEEE Communications Magazine*, Vol. 27, No. 3 (March 1989): 8-15.
4. ANSI T1.102-1993 Draft •American National Standard for Telecommunications - Digital Hierarchy Electrical Interface Specifications.•

Glossary

0x1
See Ring (0x1) Low Speed Interface.

1+1
The 1+1 protection switching architecture protects against failures of the optical transmit/receive equipment and their connecting fiber facility. One bidirectional interface (two fibers plus associated OLIUs on each end) is designated "service," and the other is designated "protection." In each direction, identical signals are transmitted on the service and protection lines ("dual-fed"). The receiving equipment monitors the incoming service and protection lines independently, and selects traffic from one line (the "active" line) based on performance criteria and technician/OS control. In 1+1 both service and protection lines could be active at the same time. Also referred to as linear (1+1) low speed interface.

1xN, 1x1
1xN protection switching pertains to circuit pack protection that provides a redundant signal path through the DDM-2000 (it does not cover protection switching of an optical facility; see "1+1"). In 1xN switching, a group of N service circuit packs share a single spare protection circuit pack. 1x1 is a special case of 1xN, with N=1. In 1x1 only one is active at a time.

A

ABN
Abnormal (status condition)

ACO
Alarm Cutoff — A pushbutton switch available on the user panel that can be used to retire an audible office alarm.

ACO/TST
Alarm Cutoff and Test — The name of a pushbutton on the user panel.

Active
Active identifies a 1+1 protected OC-N line which is currently selected by the receiver at either end as the payload carrying signal or a 1x1 or 1xn protected circuit pack that is currently carrying service. (See Standby.)

ADM
Add/Drop Multiplexer.

AGNE
Alarm Gateway Network Element — A defined NE in an alarm group through which members of the alarm group exchange information.

AIS
Alarm Indication Signal — A code transmitted downstream in a digital network that shows that an upstream failure has been detected and alarmed.

AMI
Alternate Mark Inversion — A line code that employs a ternary signal to convey binary digits, in which successive binary ones are represented by signal elements that are normally of alternating, positive and negative polarity but equal in amplitude, and in which binary zeros are represented by signal elements that have zero amplitude.

ANSI
American National Standards Institute

APS
Automatic Protection Switch

ARM
Access Resource Manager

AS&C
Alarm, Status, and Control

ASCII
American Standard Code for Information Interchange — A standard 8-bit code used for exchanging information among data processing systems and associated equipment.

ASN.1
Abstract Syntax Notation 1

ASNE
Alarm Server Network Element.

ATM
Asynchronous Transfer Mode

Auto
Automatic — One possible state of a DS1 or DS3 port. In this state, the port will automatically be put "in service" if a good signal is detected coming from the DSX panel.

Automatic Protection Switc
A protection switch that occurs automatically in response to an automatically detected fault condition.

Automatic Synchronization Reconfiguratio
A feature that allows another synchronization source to be automatically selected and the synchronization source provisioning to be automatically reconfigured in the event of a synchronization source failure or network synchronization change, for example, a fiber cut.

AUXCTL
Auxiliary Control — The name of the slot to the left of the SYSCTL slot on the DDM-2000 OC-3 and FiberReach wideband shelves and to the right of the SYSCTL slot on the DDM-2000 OC-12 shelf.

Available Time
In performance monitoring, the 1-second intervals.

B

B3ZS
Bipolar 3-Zero Substitution — A line coding method that replaces a string of three zeros with a sequence of symbols having some special characteristic.

B8ZS
Bipolar 8-Zero Substitution — A line coding method that replaces a string of eight zeros with a sequence of symbols having some special characteristic.

Backbone Ring
A host ring.

BDFB
Battery Distribution and Fuse Bay.

BER
Bit Error Ratio — The ratio of bits received in error to the total bits sent.

BIP
Bit Interleaved Parity — A method of error monitoring over a specified number of bits, that is, BIP-3 or BIP-8.

BITS
Building Integrated Timing Supply — A single clock that provides all the DS1 and DS0 synchronization references required by clocks in a building.

BRI
Basic Rate Interface

Broadband
Any communications channel with greater bandwidth than a voice channel; sometimes used synonymously with wideband.

C

CC
Clear Channel — A provisionable mode for the DS3 output that causes parity violations not to be monitored or corrected before the DS3 signal is encoded.

CCITT
International Telephone and Telegraph Consultative Committee — An international advisory committee under United Nations' sponsorship that has composed and recommended for adoption worldwide standards for international communications. Recently changed to the International Telecommunications Union Telecommunications Standards Sector (ITU-TSS).

CEV
Controlled Environment Vault

CD-ROM
Compact Disk, Read Only Memory

CDTU
Channel and Drop Test Unit

Channel
A logical signal within a port. For example, for an EC-1 port, there is one STS-1 channel and sometimes 28 VT1.5 channels. See Port.

Channel State Provisioning
A feature that allows a user to suppress reporting of alarms and events during provisioning by supporting multiple states (automatic, in-service and not monitored) for VT1.5 and STS-1 channels. See Port State Provisioning.

CIT
Craft Interface Terminal

CLF
Carrier Line Failure Status

CLK
Clock

CMISE
Common Management Information Service Element

CMOS
Complementary Metal Oxide Semiconductor

CO
Central Office

COACH
A system of on-line support tools aimed at providing product news and bulletins, diagnostic services, compatibility information, and on-line documents.

CP
Circuit Pack

CPE
Customer Premises Equipment

CR
Critical (alarm status)

CSA
Carrier Serving Area

CSU
Channel Service Unit

CS&O
Customer Support and Operations

CV
Coding Violation (a performance-monitoring parameter)

CVFE
Coding Violation Far-End — An indication returned to the transmitting terminal that an errored block has been detected at the receiving terminal.

D

DACS III-2000
Digital Access and Cross-Connect System that provides clear channel switching at either the DS3 or the STS-1 rates, eliminating the need for manual DSXs.

DACS IV-2000
Digital Access and Cross-Connect System that provides electronic DS3/STS-1 or DS1/VT1.5 cross-connect capability, eliminating the need for manual DSXs.

DCC
Data Communications Channel — The embedded overhead communications channel in the SONET line. It is used for end-to-end communications and maintenance. It carries alarm, control, and status information between network elements in a SONET network.

DCE
Data Communications Equipment — In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

DDM-1000
Lucent's Dual DS3 Multiplexer — A digital multiplexer that multiplexes DS1, DS1C, or DS2 signals into a DS3 signal or a 90 Mb/s or 180 Mb/s optical signal.

DDM-Plus
Lucent's optical and electrical DS1 transport system. DDM-Plus transports up to four DS1s per pair of optical fiber and can provide T1 extension over existing copper wires.

DDM-2000
Lucent's next generation network multiplexers that multiplex DS1, DS3, or EC-1 inputs into EC-1, OC-1, OC-3, or OC-12 outputs.

Default Provisioning
The parameter values that are preprogrammed as shipped from the factory.

Demultiplexing
A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DEMUX
Demultiplexer - "the DEMUX direction" is from the fiber toward the DSX.

Digital Multiplexer
Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

DLC
Digital Loop Carrier

DPLL
Digital Phase-Locked Loop

DRI
Dual Ring Interworking. Two ring networks interconnected at two common nodes.

Drop and Continue
A technique that allows redundant signal appearances at two central offices in a DRI network, allowing protection against central office failures.

DS1
Digital Signal Level 1 (1.544 M/bs)

DS1 Circuit Pack
The DS1 interface circuit pack interfaces to the DSX-1 panel.

DS3
Digital Signal Level 3 (44.736 M/bs)

DS3 Circuit Pack
The DS3 circuit pack interfaces to the DSX-3 panel.

DSn
Digital Signal Rate n — One of the possible digital signal rates at DDM-2000 OC-3 and OC-12 interfaces: DS1 (1.544 Mb/s) or DS3 (44.736 Mb/s).

DSNE
Directory Services Network Element — A designated network element that is responsible for administering a database that maps network element names (TIDs) to addresses [NSAPs (network service access points)] in an OSI subnetwork. There can be one DSNE per ring. Can also be a GNE.

DSX
Digital Cross-Connect Panel — A panel designed to interconnect equipment that operates at a designated rate. For example, a DSX-3 interconnects equipment operating at the DS3 rate.

DT
Distant Terminal

DTE
Data Terminating Equipment — That part of a data station that serves as a data source (originates data for transmission), a data sink (accepts transmitted data), or both.

Dual 0x1 Cross-Connection
In a single-homed application, the DDM-2000 OC-3/OC-12 Multiplexer uses a dual 0x1 cross-connection to map the VT1.5 channels between the DDM-2000 FiberReach OC-1 and the DDM-2000 OC-3/OC-12 rings. This dual 0x1 architecture means that the VT1.5 path switching is one in the DDM-2000 FiberReach and not in the host DDM-2000. Individual DS1 signals within an STS-1 can therefore be dropped to DDM-2000 OC-3 shelves at several nodes around the ring. See Single 0x1.

Dual Homing
In DDM-2000 FiberReach, a network topology in which two OC-3 shelves serve as DDM-2000 FiberReach Multiplexer hosts supporting up to twelve OC-1 rings. Each DDM-2000 FiberReach Multiplexer ring is interconnected between the two separate hosts. Two *SLC*-2000 Access Systems serving as DDM-2000 FiberReach hosts can support up to four OC-1 rings. See Single Homing."

E

EC-1, EC-n
Electrical Carrier — The basic logical building block signal with a rate of 51.840 Mb/s for an EC-1 signal and a rate of n times 51.840 Mb/s for an EC-n signal. An EC-1 signal can be built in two ways: A DS1 can be mapped into a VT1.5 signal and 28 VT1.5 signals multiplexed into an EC-1 (VT1.5 based EC-1), or a DS3 can be mapped directly into an EC-1 (DS3 based EC-1).

ECI
Equipment Catalog Item — The bar code number on the faceplate of each circuit pack used by some inventory systems.

EEPROM
Electrically Erasable Programmable Read-Only Memory

EIA
Electronic Industries Association

EMC
Electromagnetic Compatibility

EMI
Electromagnetic Interference

EOOF
Excessive Out of Frame

EPROM
Erasable Programmable Read-Only Memory

EQ
Equipped (memory administrative state)

ES
Errored Seconds — A performance monitoring parameter. ES "type A" is a second with exactly one error; ES "type B" is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

ESD
Electrostatic Discharge

ESF
Extended Super Frame (format for DS1 signal)

EST
Environmental Stress Testing

F

FCC
Federal Communications Commission

FDDI
Fiber Distribution Data Interface

FE
Far-End. Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

FE-ACTY
Far End Activity — An LED on the user panel.

FEBE
Far End Block Error — An indication returned to near-end transmitting node that an errored block has been detected at the far end.

FE ID
Far End Identification — The 7-segment display on the faceplate of the SYSCTL circuit pack.

FEPROM
Flash EPROM — A new technology that combines the nonvolatility of EPROM with the in-circuit reprogrammability of EEPROM (electrically-erasable PROM).

FERF
Far-End-Receive Failure — An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure.

FE SEL
Far End Select — An LED on the user panel.

FIT
Failures in10^{-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 has an active X.25 link. Can also be a DSNE.

GR
Bellcore General Requirement

Group
The eight slots that may be equipped.

GTP
General Telemetry Processor

GUI
Graphical User Interface

H

Hairpin Routing
A cross-connection between Function Units. For example, Function Unit C to Function Units A or B. Cross-connections go through Main, but no bandwidth or time slots are taken from the backbone ring. Eliminates need for another shelf.

HECI
Humans Equipment Catalog Item

Holdover
An operating condition of a network element in which its local oscillator is not locked to any synchronization reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

I

IC
Internal Clock. Used in synchronization messaging.

ID
Identifier. See shelf ID and site ID.

IEC
International Electrotechnology Commission

IMF
Infant Mortality Factor

INC
Incoming Status

INCM
A parallel telemetry point used to indicate incoming low-speed failures.

I/O
Input/Output

IP
Internetwork Protocol

IR
Intermediate Reach. A term used to describe distances of from 15 to 40 km between optical transmitter and receiver without regeneration. See long reach.

IS
In Service — One possible state of a DS1, DS3, or EC-1 port. Other possible states are "auto" (automatic) and "nmon" (not monitored).

ISCI
Intershelf Control Interface

ISI
Intershelf Interface

ISDN
Integrated Services Digital Network

IS-3
An intraoffice short reach proprietary interface provided by the 21D/21D-U and 22D-U optical line interface units.

ISO
International Standards Organization. See OSI.

IVHS
Intelligent Vehicle Highway System

J

Jitter
Timing jitter is defined as short-term variations of the significant instants of a digital signal from their ideal positions in time.

L

LAN
Local Area Network

LAPD
Link Access Procedure "D"

LBO
Line Build Out — An equalizer network between the DDM-2000 OC-3 and OC-12 Multiplexers and the DSX panel. It guarantees the proper signal level and shape at the DSX panel.

LCN
Local Communications Network

LEC
Local Exchange Carrier

LED
Light Emitting Diode — Used on a circuit pack faceplate to show failure (red) or service state. It is also used to show the alarm and status condition of the system.

Line Timing
The capability to directly derive clock timing from an incoming OC-N signal while providing the user the capability to provision whether switching to an alternate OC-N from a different source (as opposed to entering holdover) will occur if the OC-N currently used as the timing reference for that NE becomes unsuitable as a reference. For example, intermediate nodes in a linear network are line timed. See Loop Timing.

Local
See Near-End.

Locked Cross-Connection
This is a variation of the ring cross-connection that allows the user to lock the path selector to a specified rotation of the ring. Any signal received from the other rotation of the ring is ignored.

LOF
Loss of Frame — A failure to synchronize to an incoming signal.

Loop Timing
Loop timing is a special case of line timing. It applies to NEs that have only one OC-N interface. For example, terminating nodes in a linear network are loop timed. See Line Timing.

LOP
Loss of Pointer — A failure to extract good data from an STS-1 payload.

LOS
Loss of Signal — The complete absence of an incoming signal.

LR
Long Reach. A term used to describe distances of 40 km or more between optical transmitter and receiver without regeneration. See intermediate reach.

LS
Low Speed

M

Main
Slots on the DDM-2000 shelf in which the OLIU circuit packs are installed.

Midspan Meet
The capability to interface between two lightwave terminals of different vendors. This applies to high-speed optical interfaces.

MD
Mediation Device

MJ
Major Alarm

MM
Multimode

MML
huMan-Machine Language defined by ITU-TSS, formerly CCITT.

MN
Minor Alarm

MPEG
Moving Picture Experts Group

MSDT
Multi-Services Distant Terminal

MTBF
Mean Time Between Failures

MTBMA
Mean Time Between Maintenance Activities

Multiplexing
The process of combining several distinct digital signals into a single composite digital signal.

Mult
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

MXBIU
Multiplexer and Backplane Interface Unit

MXRVO Circuit Pack
The MXRVO circuit pack multiplexes seven VT-G signals from the DS1 circuit packs to an STS-1 signal for connection to the OLIU circuit packs.

N

NE
Near-End. The network element the user is at or working on. Also called local.

NE
Network Element — The basic building block of a telecommunications equipment within a telecommunication network that meets SONET standards. Typical internal attributes of a network element include: one or more high- and low-speed transmission ports, built-in intelligence, synchronization and timing capability, access interfaces for use by technicians and/or operation systems. In addition, a network element may also include a time slot interchanger.

NE-ACTY
Near End Activity — An LED on the user panel.

NEBS
Network Equipment-Building System

nm
Nanometer (10u-9d meters)

NMA
Network Monitoring and Analysis — An operations system designed by Bellcore which is used to monitor network facilities.

NMON
Not Monitored — A provisioning state for equipment that is not monitored or alarmed.

Node
In SONET a node is a line terminating element.

Non-Revertive
A protection switching mode in which, after a protection switch occurs, the equipment remains in its current configuration after any failure conditions that caused a protection switch to occur clear or after any external switch commands are reset. (See Revertive.)

NRZ
Nonreturn to Zero

NSA
Not Service Affecting

NSAP
Network Services Access Point — An address that identifies a network element. Used for maintenance subnetwork communication using the OSI protocol.

NTF
No Trouble Found

O

OAM&P
Operations, Administration, Maintenance, and Provisioning

OC, OC-n
Optical Carrier — The optical signal that results from an optical conversion of an STS signal; that is, OC-1 from STS-1 and OC-n from STS-n.

OC-1
Optical Carrier Level 1 Signal (51.84 Mb/s)

OC-3
Optical Carrier Level 3 Signal (155 Mb/s)

OC-3c (STS-3c)
Optical Carrier Level 3 Concatenated Signal — Low-speed broadband signal equivalent to three STS-1s linked together with a single path overhead.

OC-12
Optical Carrier Level 12 Signal (622 Mb/s)

OHCTL
The overhead controller circuit pack provides user access to the SONET overhead channels.

OLIU
Optical Line Interface Unit

OOF
Out of Frame

OOL
Out of Lock

Operations Interface
Any interface that provides information on the system performance or control. These include the equipment LEDs, user panel, CIT, office alarms, and all telemetry interfaces.

OPS/INE
Operations System/Intelligent Network Element

OS
Operations System — A central computer-based system used to provide operations, administration, and maintenance functions.

OS-GNE
Operations System - Gateway Network Element

OSI
Open Systems Interconnection — Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

OSGNE
Operations System Gateway Network Element — An OSGNE serves as a single interface to the OS for NEs in the same subnetwork using X.25 interfaces.

OSMINE
Operations Systems Modifications for the Integration of Network Elements.

OSP
Outside Plant

P

Pass Through
Paths that are cross-connected directly across an intermediate node in a ring network.

P-bit
Performance Bit

PC
Personal Computer

PCU
Power Conversion Unit

PID
Program Identification

PINFET
Positive Intrinsic Negative Field Effect Transistor

PJC
Pointer Justification Count

Plesiochronous Network
A network that contains multiple maintenance subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly different at any particular instant. For example in SONET networks, each timing traceable to their own Stratum 1 clock are considered plesiochronous with respect to each other.

PLL
Phased-Locked Loop

PM
Performance Monitoring — Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

PMN
Power Minor Alarm

POH
Path Overhead

POP
Points of Presence

Port
The physical, electrical, or optical interface on a system. For example, DS1, DS3, EC-1, OC-3, and OC-12. See Channel.

Port State Provisioning
A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service and not monitored) for low speed ports. See Channel State Provisioning.

POTS
Plain Old Telephone Service

Proactive Maintenance
Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect (for example, performance monitoring).

Protection Line
As defined by the SONET standard, the protection line is the pair of fibers (one transmit and one receive) that carry the SONET APS channel (K1 and K2 bytes in the SONET line overhead). On a DDM-2000 OC-3 system, a *protection* line is a pair of fibers that terminate on an OLIU circuit pack in the `main-2`, `fn-a-2`, `fn-b-2`, or `fn-c-2` slot. (See "Service Line.")

PRM
Performance Report Message

PROTN
Protection

Product Family 2000
Lucent's line of SONET standard network products providing total network solutions.

PRS
Primary Reference Source

PSU
Power Supply Unit

PVC
Permanent Virtual Circuit

PWR
Power

R

RAM
Random Access Memory

Reactive Maintenance
Refers to detecting defects/failures and clearing them.

Remote
See Far-End.

REN
Ringer Equivalent Number

Revertive
A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the service equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur clear or after any external switch commands are reset. (See "Non-Revertive.")

RGU
Ringing Generator Unit

Ring
A configuration of nodes comprised of network elements connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over a protection line. Ring (0x1) Low Speed Interface

Formerly referred to as dual 0x1 or single 0x1. In ring applications, the DDM-2000 OC-3 and OC-12 Multiplexers use a 0x1 interface meaning both fibers carry service as opposed to a linear (1+1) low speed interface where one fiber is used for service and the other for protection. See 1+1.

RPP
Reliability Prediction Procedure — Described in Bellcore TR-NWT-00032.

RT
Remote Terminal — An unstaffed equipment enclosure that may have a controlled or uncontrolled environment.

RTAC
AT&T Regional Technical Assistance Center (1-800-225-RTAC)

RZ
Return to Zero

S

SA
Service Affecting

SCADA
Supervisory Control and Data Acquisition

SD
Signal Degrade

SDH
Synchronous Digital Hierarchy

Self-Healing
Ring architecture in which two or more fibers are used to provide route diversity. Node failures only affect traffic dropped at the failed node.

SEFS
Severely Errored Frame Seconds

SEO
Single-Ended Operations — The maintenance capability that provides remote access to all DDM-2000 systems from a single location over the DCC.

Service Line
On a DDM-2000 system, a service (or "working") line is a pair of fibers (one transmit and one receive) that terminate on an OLIU circuit pack in the `main-1`, or `fn-a-1`, or `fn-b-1`, or `fn-c-1` slot. As defined by the SONET standard, the SONET APS channel is not defined on a service (or "working") line. (See "Protection Line.")

SES
Severely Errored Seconds — This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occurs.

SF
Super Frame (format for DS1 signal)

Shelf ID
A switch settable parameter with values of from 1 to 8. Used to log into a selected shelf in a bay using the CIT.

SID
System Identification

Single 0x1 Cross-Connection
In a dual-homed application, the DDM-2000 OC-3/OC-12 Multiplexer uses a single 0x1 cross-connection to map the VT1.5 channels between the DDM-2000 FiberReach OC-1 and the DDM-2000 OC-3/OC-12 rings. This single 0x1 architecture maps low speed to high speed on a specified ring rotation. The high speed to low speed drop is made on the same specified ring with no path switching. Protection is provided at the VT1.5 end points. See Dual 0x1.

Single Homing
In DDM-2000 FiberReach, a network topology in which a single OC-3 shelf serves as a DDM-2000 FiberReach Multiplexer host supporting up to six OC-1 rings. A *SLC*-2000 Access System serving as a host can support up to two OC-1 rings. See Dual Homing.

Site ID
A switch settable parameter with values of from 1 to 8. Displayed on SYSCTL circuit pack to indicate to which site the user panel alarms and LEDs apply.

SLIM
Subscriber Loop Interface Module

SM
Single Mode

SONET
Synchronous Optical Network

SPE
Synchronous Payload Envelope

SPOTS
Super POTS

SQU
Sync Quality Unknown. Used in synchronization messaging.

SRD
Software Release Description

Standby
Standby identifies a 1+1 protected OC-N line which is not currently selected by the receiver at either end as the payload carrying signal, or a 1x1 or 1xn protected circuit pack that is not currently carrying service. (See Active.)

Star Topology
For DDM-2000 FiberReach, this refers to a configuration of multiple point-to-point OC-1 extensions from a single DDM-2000 OC-3/OC-12 Multiplexer.

Status
The indication of a short-term change in the system.

STS, STS-n
Synchronous Transport Signal — The basic logical building block signal with a rate of 51.840 Mb/s for an STS-1 signal and a rate of n times 51.840 Mb/s for an STS-n signal.

STS-1 SPE
STS-1 Synchronous Payload Envelope — A 125-microsecond frame structure composed of STS path overhead and the STS-1 payload.

STS-3c
Synchronous Transport Level 3 Concatenated Signal. See OC-3c.

Subnetwork
Group of SONET network elements that share a SONET data communications channel.

Synchronization Messaging
SONET synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

SYSCTL
The system controller circuit pack that provides overall administrative control of the terminal.

T

T1EXT
T1 Carrier Extension Circuit Pack

T1X1 and T1M1
The ANSI committees responsible for telecommunications standards.

TA
Bellcore Technical Advisory

TABS
Telemetry Asynchronous Byte Serial (Protocol)

TARP
TID Address Resolution Protocol

TBOS
Telemetry Byte-Oriented Serial (Protocol) — Defines one physical interface for direct connection between the telemetry remote and the monitored equipment. An RS-422 port is used to provide the operations system with sufficient alarm and status information to localize a problem to a given DDM-2000 and to determine the severity of the problem.

TCA
Threshold-Crossing Alert — A condition set when a performance-monitoring counter exceeds a user-selected threshold. A TCA does not generate an alarm but is available on demand through the CIT and is shown by TBOS and causes a message to be sent to NMA via the X.25/TL1 interface.

TCVCXO
Temperature-Compensated Voltage-Controlled Crystal Oscillator — A highly stable and accurate clock source used in the DDM-2000 TGS circuit pack.

TGS
The timing generator circuit pack generates clock signals for distribution to the transmit circuits. It operates in the free-running, loop-timing, phase-lock, and holdover modes.

TID
Target Identifier — The Bellcore name for the system name.

TL1
Transaction Language 1 — A Bellcore machine-to-machine communications language that is a subset of ITU-TSS, formerly CCITT's, human-machine language.

TLB
Timing Looped Back. Used in synchronization messaging.

TOP
Task Oriented Practice

TR
Bellcore Technical Requirement

TSA
Time Slot Assignment

TSI
Time Slot Interchange

TSO
Technical Support Organization — Supports RTAC and the customers.

U

UAS
Unavailable Seconds. In performance monitoring, the count of seconds in which a signal is declared failed or, in which, 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

Unidirectional
A protection switching mode in which the system at each end of an optical span monitors both service and protection lines and independently chooses the best signal (unless overridden by an equipment failure or by an external request, such as a forced switch or lockout). In a system that uses unidirectional line switching, both the *service* and *protection* lines may be *active* simultaneously, with one line carrying traffic in one direction and the other line carrying traffic in the other direction. The K1 and K2 bytes in the SONET line overhead are used to convey to the far end which line the near end receiver has chosen, so that an "active" indication may be made at the far end.

UOC
Universal Optical Connector — Receptacles on the faceplate of some OLIUs that accept *ST*®, SC, or FC connectors.

UPD/INIT
A pushbutton on the user panel.

V

VF
Voice Frequency

VLSI
Very Large Scale Integration — Refers to very complex state of the art integrated circuits.

VM
Violation Monitor — A mode of the DS3 circuit pack in which it will monitor but not remove P-bit parity violations on the DS3 signal received from the fiber.

VMR
Violation, Monitor, and Removal — A mode of the DS3 circuit pack in which it will monitor and remove P-bit parity violations on the DS3 signal received from the fiber.

VONU
Virtual Optical Network Unit

VT
Virtual Tributary — A structure designed for transport and switching of a sub-DS3 payload.

VT1.5
A 1.728 Mb/s virtual tributary

VT-G
Virtual Tributary Group — A 9-row by 12-column SONET structure (108 bytes) that carries one or more VTs of the same size. Seven VT groups (756 bytes) are byte-interleaved within the VT-organized STS-1 synchronous payload envelope.

W

WAN
Wide Area Network

Z

Zero Code Suppression
A technique used to reduce the number of consecutive zeros in a line-codes signal (B3ZS for DS3 signals and B8ZS for DS1 signals).

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Lucent Technologies
Bell Labs Innovations



DDM-2000 OC-12 Multiplexer Release 5 and Higher

User/Service Manual (TOP) - Volume II

363-206-290
Issue 2
November 1996

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Security Statement

In rare instances, unauthorized individuals make connections to the telecommunications network through the use of remote access features. In such event, applicable tariffs require that the customer pay all network charges for traffic. Lucent Technologies cannot be responsible for such charges and will not make any allowance or give any credit for charges that result from unauthorized access

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Lucent Technologies provides a 5-year limited warranty to this product. For more information, consult your local Account Executive.

Document Ordering Information

The ordering number for this document is LTP 363-206-290. To order this document, call 1-800-432-6600 or 1-317-322-6484. For more ordering information, refer to "How to Order Documents" in the section "About this Document" in Volume I.

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Lucent Technologies' Transmission Systems Business Unit received ISO 9001 certification for its Merrimack Valley manufacturing facility and associated development organizations on September 15, 1992. Merrimack Valley manufactures systems for transporting data, voice, and images over public and private telecommunications networks. Major product lines consist of digital access and cross connect systems, network multiplex systems, and lightwave systems.

ISO 9001 is an international quality standard recognized by more than 50 countries. ISO 9001 is the most comprehensive standard in the ISO 9000 series, requiring well documented and implemented controls for design development, production, delivery, installation, and servicing. Its purpose is to ensure manufacturers produce products with consistently high levels of quality and services.

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Document Title: DDM-2000 OC-12 Multiplexer Release 5 and Higher User/Service Manual (TOP) - Volume II

Document No.: 363-206-290 Issue 2 Date: November 1996

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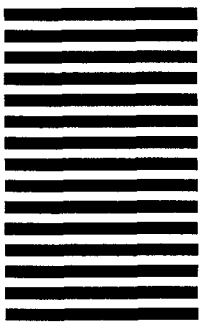
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- ☐ Add more troubleshooting information
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Operation and Maintenance (TOP)

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- Task Index System Turnup/Circuit Order

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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:

- Equip (turn up) a shelf in a looped-back condition for the first time.
- Establish an end-to-end system after both ends have been equipped.
- Establish initial end-to-end DS3, EC-1, or STS-3c service.
- Add, convert, or discontinue DS3, EC-1, or STS-3c service to an in-service system.

- Add new OC-12 shelf or span to existing ring configuration.
- Upgrade software to a new release.
- Upgrade an OC-12 point-to-point system to path switched ring.
- Upgrade an OC-3 path switched ring system to an OC-12 path switched ring system.
- Establish OC-3/IS-3 dual ring interworking (DRI) OC-12 to OC-3 or FT-2000 OC-48.
- Establish EC-1 dual ring interworking (DRI) OC-12 to OC-3 or FT-2000 OC-48.
- Upgrade OC-3/OC-12 DRI from EC-1 to OC-3/IS-3.
- Upgrade OC-12/FT-2000 OC-48 DRI from EC-1 to OC-3.
- Establish OC-3/IS-3 single-homed or dual-homed access via DDM-2000 OC-12 backbone ring.
- Establish OC-3/IS-3 optical span extensions between OC-12 ring and FT-2000.
- Establish OC-3/IS-3 optical span extensions between OC-12 ring and OC-3.
- Establish OC-12 single-homed or dual-homed access via FT-2000 OC-48 backbone ring.

The **Operation** tab covers procedures for operating the system such as connecting and using the craft interface terminal (CIT), displaying alarm and status conditions, installing a new generic program, etc.

The **Trouble Clearing** tab covers alarms and trouble reports.

The **Detailed Level Procedures** (DLP) tab contains all of the DLPs, beginning with DLP-500, used in this manual.

How To Use This TOP Section

Procedures in this TOP consist of the following:

a. Task Index (**IXL**) - an index listing tasks that may need to be performed in establishing, operating, and maintaining the DDM-2000 OC-3 Multiplexer system. Each colored tab in this manual contains a separate index (**IXL-001**) and it is always first under each tab.

b. Non-Trouble-Clearing Procedure (**NTP**) - a director level procedure that lists normal work items to perform other than trouble clearing.

c. Trouble Analysis Procedure (**TAP**) - a director level procedure that contains step-by-step trouble-clearing instructions to locate and/or fix troubles.

d. Detailed Level Procedures (**DLP**) - detailed step-by-step instructions.

e. Isolation Diagrams (**ISD**) - Diagrams or instructions that may be helpful in understanding the procedures.

All procedures in each section of this TOP are in numerical order, regardless of the type of procedure (see Table A.) Table A, which lists all the procedures used in this TOP, is provided as a reference only. It should not be used alone in finding instructions for performing tasks.

To find the instructions for performing acceptance, system turnup/circuit order, operation, or trouble clearing tasks, proceed as follows:

1. Find your job in the Task Index (for example: **Acceptance IXL-001**) under the appropriate colored tab and go to the referenced procedure. Or you may use the Master Task Index (**IXL-001**) in this introduction.
2. Turn to the indicated director level, detail level, or trouble-clearing procedure listed under the "GO TO" column for the task being performed.
3. Perform all the items in the director level procedure in the indicated order unless it sends you to another director-level procedure. When you complete a director-level procedure, you have finished the task. Where more detailed information is required, you will be sent to a Detailed Level Procedure **DLP-( ).** You may also be sent to a Detailed Level Procedure by another Detailed Level Procedure. All DLPs are in the Detailed Level Procedures tab section of this manual.
4. **IMPORTANT**: Unless otherwise directed, when you complete a 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 a procedure refers to software releases as Release 5 or later, it refers to all ring software releases with a numerical value or 5 or higher.
9. If you need assistance in clearing a trouble after completing all the applicable trouble-clearing procedures in this section, contact your local or regional maintenance assistance group. The telephone number for the Lucent Technologies Regional Technical Assistance Center (RTAC) is **1-800-225-RTAC**.

Circuit packs being returned for repair should be sent to the following address:

Lucent Technologies
Returned Goods Dept.
Dept. JC0221210
1600 Osgood Street
North Andover, Massachusetts 01845

Telephone: 1-508-960-5179
or
FAX to: 1-508-960-1705

Screen Display and Panel Stamping Fonts

The procedures in this manual use a `monospace` font to identify actual text on a screen or a response displayed from the system. A **bold** font identifies panel stamping such as alarm names or circuit pack names. Also, the **bold** font is used throughout this manual for emphasis.

DDM-2000 OC-12 Installation

LTP 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.

Lucent Technologies recommends that ONLY designated Lucent Technologies cables be used with DDM-2000. Failure to use these cables will void the product warranty.

Safety Instructions

Product Safety Labels

These instructions involve lasers, lightwave optical cable and connectors, and precautions when handling circuit packs to prevent damage from electrostatic discharge. The appropriate user/service manual contains admonishments in the form of ***DANGERS, WARNINGS,*** and ***CAUTIONS*** that must be followed at all times.

These admonishments have the following definitions:

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

The alert symbol ⚠ appears throughout these products and the appropriate user/service manual to alert the user to the presence of important operating and maintenance (servicing) instructions for the DDM-2000 Multiplexers.

Lightwave Safety Guidelines

General Laser Information

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

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

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

Lasers and Eye Damage

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

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

Classification of Lasers

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

Lightwave Safety Precautions

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

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

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

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

Safety Precautions for Enclosed Systems

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

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

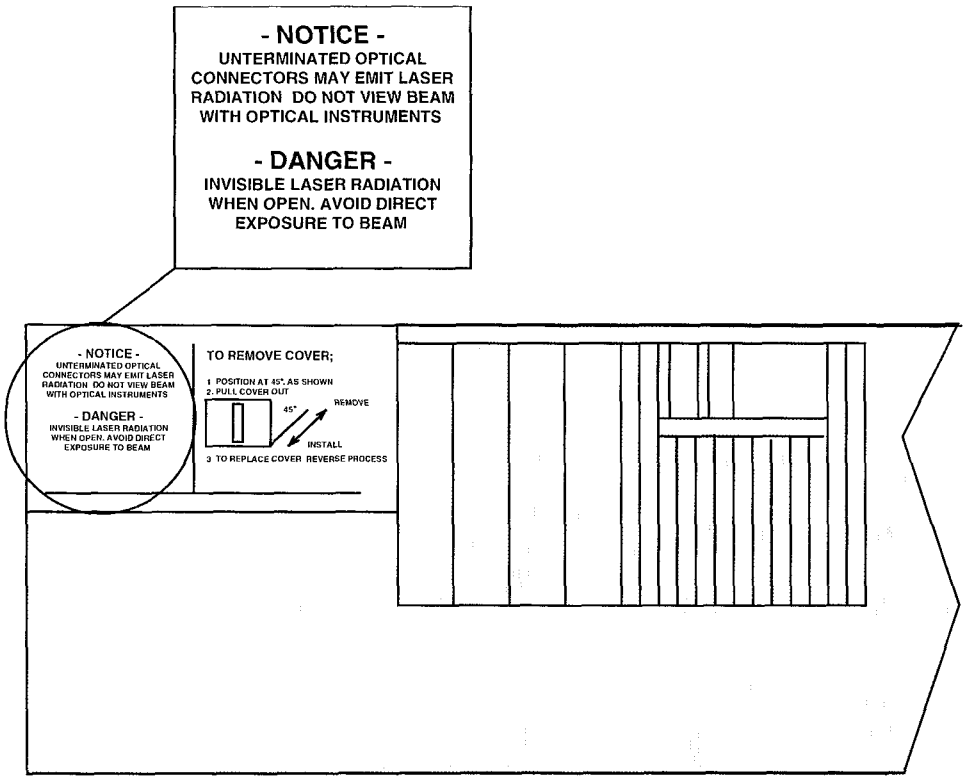


Figure 1. Safety Label Position on DDM-2000 OC-12 Shelf

Safety Precautions for Unenclosed Systems

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

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

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

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

Electrostatic Discharge (ESD) Considerations

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

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

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

To reduce the possibility of ESD damage, shelves are equipped with grounding jacks to enable personnel to ground themselves using wrist straps (Figure 2) while handling circuit packs or working on a shelf(s). The jacks for connection of wrist straps are located at the lower right-hand corner of each shelf and are labeled. When grounding jacks are not provided, an alligator clip adapter enables connection to bay frame ground.

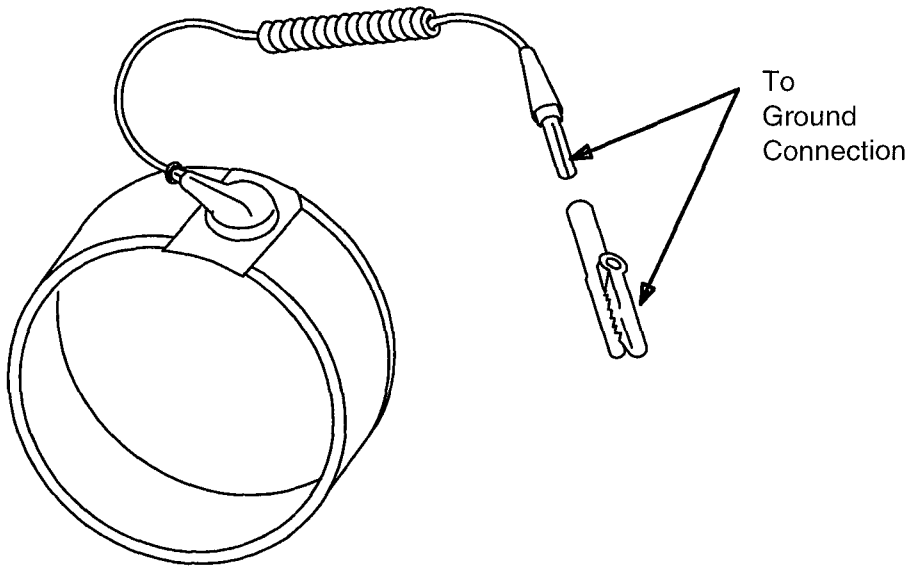


Figure 2. Static Control Wrist Strap

General Safety Instructions

GENERAL SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
4. Slots and openings in this product's back or bottom are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided. For information on proper ventilation requirements, consult the "Equipment Installation Considerations" section of LTP 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual* or LTP 363-206-208, *DDM-2000 OC-12 Multiplexer Installation Manual* or LTP 363-206-310, *DDM-2000 FiberReach Multiplexer Installation Manual.*
5. This product should be operated only from the type of power source indicated on the marking label. For information on proper electrical distribution and power requirements, refer to the "Power" and "Technical Specifications" sections of the appropriate user/service manual.
6. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the product.
7. To reduce the risk of electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit packs may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.
8. ⚠ **CAUTION:**
   Disconnect two (2) power connections when removing power from the system.
9. Use only Lucent Technologies manufactured UL* recognized circuit packs. Recognized circuit packs are listed in the appropriate user/service manual.

SAVE THESE INSTRUCTIONS.

* Registered trademark of Underwriters Laboratories, Inc

Installation Safety Instructions

INSTALLATION SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Installation and maintenance procedures must be followed and performed by trained personnel only.
3. All DS1 and DS3 interfaces should not leave the building premises unless connected to telecommunication devices providing primary or secondary protection, as applicable.
4. For information on proper mounting instructions, consult LTP 363-206-204, *DDM-2000 OC-3 Multiplexer Installation Manual* or LTP 363-206-208, *DDM-2000 OC-12 Multiplexer Installation Manual* or LTP 363-206-310, *DDM-2000 FiberReach Multiplexer Installation Manual.*
5. Never install telecommunication wiring during a lightning storm.
6. Never install telecommunication connections in wet locations.
7. Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the DS1 or DS3 interface.
8. Use caution when installing or modifying telecommunication lines.

SAVE THESE INSTRUCTIONS.

Master Task Index

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

ABN Indication - Clear . . . . . Trouble Clearing: TAP-109

Accept DDM-2000 OC-12 (Looped Back) —
Optical Operation . . . . . Acceptance: NTP-003

Accept DDM-2000 OC-12 System (Network) . . . . . Acceptance: NTP-004

Accept DDM-2000 OC-12 Multiplexer (Equipped) —
Overview . . . . . Acceptance: NTP-002

Add New DDM-2000 OC-12 Node (Shelf)
To Path Switched Ring . . . . . Circuit Order: NTP-021

Add New DS3 Group for DS3 Service —
Path Switched Ring
In Service . . . . . Circuit Order: NTP-018

Add New STS1E Service/Group for EC-1 Interface —
Path Switched Ring
In Service . . . . . Circuit Order: NTP-024

Alarm - DDM-2000 OC-12 Multiplexer
Critical (CR) - Clear . . . . . Trouble Clearing: TAP-101

Alarm - DDM-2000 OC-12 Multiplexer
Major (MJ) - Clear . . . . . Trouble Clearing: TAP-102

Alarm - DDM-2000 OC-12 Multiplexer
Minor (MN) - Clear . . . . . Trouble Clearing: TAP-112

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Alarm - NE ACTY/FE ACTY Only - Clear . . . . . Trouble Clearing: TAP-117

Alarm - Power Minor (PMN) - Clear . . . . . Trouble Clearing: TAP-104

Alarm Group - Establish New . . . . . Detailed Level Procedure: DLP-559

Alarm/Status Condition —
Display Using FE SEL . . . . . Detailed Level Procedure: DLP-525

Brownout Condition —
Flashing L in FE ID Display . . . . . Trouble Clearing: TAP-111

Change Timing Mode on TGS Circuit Pack . . . Detailed Level Procedure: DLP-539

Circuit Pack —
Replace (Reference Only) . . . . . Detailed Level Procedure: DLP-518

CIT - Connect and Establish Session . . . . . Detailed Level Procedure: DLP-516

CIT - Activate Optional System Features . . . Detailed Level Procedure: DLP-509

CIT - Set (Upgrade) Login/Password Security . . Detailed Level Procedure: DLP-541

Convert DS3 Service to EC-1 Service —
Path Switched Ring . . . . . Circuit Order: NTP-026

Copy Diskettes (Floppy Disks)
and Make Backups . . . . . Detailed Level Procedure: DLP-529

Critical (CR) Alarm - DDM-2000 OC-12 Multiplexer
Clear . . . . . Trouble Clearing: TAP-101

Discontinue DDM-2000 OC-12 Node (Shelf)
From Path Switched Ring Network . . . . . Circuit Order: NTP-022

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Discontinue DS3 Service — Path Switched Ring	Circuit Order: NTP-019
Discontinue EC-1 Interface — Path Switched Ring	Circuit Order: NTP-025
Discontinue OC-3/IS-3 Span	Circuit Order: NTP-009
Discontinue OC-3c/IS-3c (STS-3c) Service	Circuit Order: NTP-010
Diskettes (Floppy Disks) — Copy and Make Backups	Detailed Level Procedure: DLP-529
Display Terminal Alarm/Status Condition — Using FE SEL	Detailed Level Procedure: DLP-525
DS3 Service — Add New DS3 Service/Group — Path Switched Ring In Service	Circuit Order: NTP-018
DS3 Service/Group — Discontinue — Path Switched Ring	Circuit Order: NTP-019
DS3 Service — Establish Initial End-to-End — Path Switched Ring Group Equipped But Not In Service	System Turnup: NTP-017
EC-1 Interface — Establish Initial — Path Switched Ring Group Equipped But Not In Service	System Turnup: NTP-023
EC-1 Interface — Add New STS1E Service/Group — Path Switched Ring In Service	Circuit Order: NTP-024

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
EC-1 Interface — Discontinue — Path Switched Ring	Circuit Order: NTP-025
Equip DDM-2000 OC-12 Multiplexer (Looped Back)	System Turnup: NTP-002
Establish Single-Homed OC-3/IS-3 Access — via DDM-2000 OC-12 Backbone Ring	System Turnup: NTP-003
Establish Single-Homed OC-12 Access — via FT-2000 OC-48 Backbone Ring	System Turnup: NTP-015
Establish Dual-Homed OC-3/IS-3 Access — via DDM-2000 OC-12 Backbone Ring	System Turnup: NTP-004
Establish Dual-Homed OC-12 Access — via FT-2000 OC-48 Backbone Ring	System Turnup: NTP-027
Establish Video Broadcast Access — via DDM-2000 OC-12 Backbone Ring	System Turnup: NTP-005
Establish STS-3c Transport Access — via DDM-2000 OC-12 Backbone Ring	System Turnup: NTP-006
Establish OC-3/IS-3 Optical Span Extension — Extension Between FT-2000 and DDM-2000 OC-12 Ring	Circuit Order: NTP-007
Establish OC-3/IS-3 Optical Span Extension — Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3	Circuit Order: NTP-008

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Establish OC-3/IS-3 Dual Ring Interworking — DDM-2000 OC-12 to OC-3 or FT-2000 Ring Configurations OC-3 Optical Fiber Spans	System Turnup: NTP-011
Establish EC-1 Dual Ring Interworking — DDM-2000 OC-12 to OC-3 or FT-2000 Ring Configurations OC-3/IS-3 Optical Fiber Spans	System Turnup: NTP-014
Establish End-to-End DDM-2000 OC-12 System — Path Switched Ring Network	System Turnup: NTP-020
Establish Initial End-to-End DS3 Service — Path Switched Ring Group Equipped But Not In Service	System Turnup: NTP-017
Establish Initial EC-1 Interface — Path Switched Ring Group Equipped But Not In Service	System Turnup: NTP-023
Establish New Alarm Group — System In Service	Detailed Level Procedure: DLP-559
Establish Remote Login	Detailed Level Procedure: DLP-517
Fan Pack - Replace	Detailed Level Procedure: DLP-545
Fan Shelf Alarm - Clear	Trouble Clearing: TAP-118
Fan Shelf Assembly - Test	Detailed Level Procedure: DLP-536
Fan Shelf Filter - Replace	Detailed Level Procedure: DLP-537
FAULT Indication (Flashing) - Clear	Trouble Clearing: TAP-110

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
FE SEL — Display Terminal Alarm/Status Condition	Detailed Level Procedure: DLP-525
Generic Software Version Identification — Retrieve	Detailed Level Procedure: DLP-526
Install/Replace Lightguide Buildout	Detailed Level Procedure: DLP-538
Install SYSCTL — New Shelf	Detailed Level Procedure: DLP-557
Replace SYSCTL — In Service	Detailed Level Procedure: DLP-501
Install Software Generic Program — New Shelf Installation Only BBG8 SYSCTL and BCP4 OHCTL Installed	Detailed Level Procedure: DLP-520
Install New Software Generic Program — In-Service System Local Shelf Download	Detailed Level Procedure: DLP-527
Install New Software Generic Program — In-Service System Remote Shelf Download	Detailed Level Procedure: DLP-530
LEDs — Test	Detailed Level Procedure: DLP-507
Login — Establish Remote	Detailed Level Procedure: DLP-517
Maintenance Philosophy	Trouble Clearing: TAD-100
Major (MJ) Alarm - DDM-2000 OC-12 Multiplexer Clear	Trouble Clearing: TAP-102

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Minor (MN) Alarm - DDM-2000 OC-12 Multiplexer Clear	Trouble Clearing: TAP-112
NE ACTY/FE ACTY Alarm Only - Clear	Trouble Clearing: TAP-117
OC-3/IS-3 Optical Span — Discontinue	Circuit Order: NTP-009
OC-3c/IS-3c (STS-3c) Service — Discontinue	Circuit Order: NTP-010
Option Settings - Check (Set)	Detailed Level Procedure: DLP-510
Power Minor (PMN) Alarm - Clear	Trouble Clearing: TAP-104
Remote Login — Establish	Detailed Level Procedure: DLP-517
Replace Circuit Pack (Reference Only)	Detailed Level Procedure: DLP-518
Replace Existing OLIU With Different Type OLIU	Detailed Level Procedure: DLP-540
Service — Add New DS3 Group — Path Switched Ring System In Service	Circuit Order: NTP-018
Service — Discontinue DS3 — Path Switched Ring	Circuit Order: NTP-019
Service — Establish Initial End-to-End DS3 — Path Switched Ring Group Equipped But Not In Service	System Turnup: NTP-017

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Service — Discontinue OC-3c/IS-3c (STS-3c)	Cicruit Order: NTP-010
Shelf (Node) — Add — To Path Switched Ring	Circuit Order: NTP-021
Shelf — Equip DDM-2000 OC-12 Multiplexer (Looped Back)	System Turnup: NTP-002
Span — OC-3IS-3 Optical — Discontinue	Circuit Order: NTP-009
Software Program — Install New Shelf Installation	Detailed Level Procedure: DLP-520
Software Program — Install In Service Local Shelf Download	Detailed Level Procedure: DLP-527
Software Program — Install In Service Remote Shelf Download	Detailed Level Procedure: DLP-530
Software Program — Upgrade	Detailed Level Procedure: DLP-527
Software Version Identification - Retrieve	Detailed Level Procedure: DLP-526
Sync Messaging — Change Kbyte to Sbyte	Detailed Level Procedure: DLP-560
SYSCTL — Replace	Detailed Level Procedure: DLP-501
SYSCTL — Install New	Detailed Level Procedure: DLP-557
Telemetry — Upgrade TBOS/Parallel to TL1/X.25	Detailed Level Procedure: DLP-533

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Test LEDs	Detailed Level Procedure: DLP-507
Test (Accept) DDM-2000 (Looped Back) - Optical Operation	Acceptance: NTP-003
Test (Accept) End-to-End System - OC-12 Point to Point	Acceptance: NTP-004
Test (Accept) DDM-2000 OC-12 Multiplexer (Equipped) — Overview	Acceptance: NTP-002
Timing — Change	Detailed Level Procedure: DLP-539
Trouble Report - Clear	Trouble Clearing: TAP-105
Upgrade BBF2 TGS to BBF2B TGS	Detailed Level Procedure: DLP-542
Upgrade DDM-2000 OC-12 — Release 3 to Release 5	Circuit Order: NTP-016
Upgrade DDM-2000 OC-12/FT-2000 Dual Ring Interworking Network From EC-1 to OC-3 In Service	Circuit Order: NTP-012
Upgrade DDM-2000 OC-3/OC-12 Dual Ring Interworking Network From EC-1 to OC-3/IS-3 In Service	Circuit Order: NTP-013
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 to Path Switched Ring Out of Service	Circuit Order: NTP-031

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Upgrade DDM-2000 OC-12 Point-to-Point to Path Switched Ring In Service	Circuit Order: NTP-032
Upgrade Timing	Detailed Level Procedure: DLP-542
Upgrade TBOS/Parallel Telemetry to TL1/X.25	Detailed Level Procedure: DLP-533

Numerical List of TOP Procedures

Table 1. Numerical List of TOP Procedures (Note)

Acceptance Tab	
IXL-001	Acceptance Task Index
NTP-002	Overview of Acceptance (Test) Procedures for DDM-2000 OC-12 Multiplexer (Equipped)
NTP-003	Accept (Test) DDM-2000 OC-12 Multiplexer Shelf (Looped-Back)
NTP-004	Test (Accept) End-to-End OC-12 System (Network)
System Turnup/Circuit Order Tab	
IXL-001	Task Index
NTP-002	Equip DDM-2000 OC-12 Multiplexer (Looped-Back)
NTP-003	Establish Single-Homed OC-3/IS-3 Access via DDM-2000 OC-12 Backbone Ring
NTP-004	Establish Dual-Homed OC-3/IS-3 Access via DDM-2000 OC-12 Backbone Ring
NTP-005	Establish Video Broadcast Access via DDM-2000 OC-12 Backbone Ring
NTP-006	Establish STS-3c Transport Access via DDM-2000 OC-12 Backbone Ring
NTP-007	Establish OC-3/IS-3 Optical Span Extension Between FT-2000 and DDM-2000 OC-12 Ring
NTP-008	Establish OC-3/IS-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3
NTP-009	Discontinue OC-3/IS-3 Optical Span
NTP-010	Discontinue OC-3c (STS-3c) Service
NTP-011	Establish OC-3/IS-3 Dual Ring Interworking DDM-2000 OC-12 to OC-3 or FT-2000 Ring Configurations OC-3/IS-3 Optical Fiber Spans
NTP-012	Upgrade DDM-2000 OC-12/FT-2000 Dual Ring Interworking Network from EC-1 to OC-3/IS-3 In Service
NTP-013	Upgrade DDM-2000 OC-3/OC-12 Dual Ring Interworking Network from EC-1 to OC-3/IS-3 In Service
NTP-014	Establish EC-1 Dual Ring Interworking DDM-2000 OC-12 to OC-3 or FT-2000 OC-3/IS-3 Optical Fiber Spans
NTP-015	Establish Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

System Turnup/Circuit Order Tab	
NTP-016	Upgrade DDM-2000 OC-12 Release 3 to Release 5 System In Service
NTP-017	Establish Initial End-to-End DS3 Service Path Switched Ring Group Equipped But Not In Service
NTP-018	Add New DS3 Group for DS3 Service System In Service
NTP-019	Discontinue End-to-End DS3 Service
NTP-020	Establish End-to-End DDM-2000 OC-12 System OC-12 Optical Fiber Spans Path Switched Ring Network
NTP-021	Add New DDM-2000 OC-12 Node (Shelf) To DDM-2000 OC-12 Path Switched Ring
NTP-022	Discontinue DDM-2000 OC-12 Node (Shelf) From DDM-2000 OC-12 Path Switched Ring Network
NTP-023	Establish Initial Low Speed EC-1 Interface Path Switched Ring Group Equipped But Not In Service
NTP-024	Add New STS1E Low Speed Group for EC-1 Interface Path Switched Ring System In Service
NTP-025	Discontinue EC-1 Interface Path Switched Ring
NTP-026	Convert DS3 Group Service to EC-1 Group Service Path Switched Ring
NTP-027	Establish Dual-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring
NTP-028	Unused
NTP-029	Unused
NTP-030	Unused
NTP-031	Upgrade DDM-2000 OC-12 Point-to-Point Network to Path Switched Ring Out of Service
NTP-032	Upgrade DDM-2000 OC-12 Point-to-Point Network to Path Switched Ring In Service

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

System Turnup/Circuit Order Tab	
NTP-033	Unused
NTP-034	Upgrade DDM-2000 OC-3 Ring Network to OC-12 Ring Network In Service
Operations Tab	
IXL-001	Task Index
Trouble Clearing Tab	
IXL-001	Task Index
TAD-100	Maintenance Philosophy
TAP-101	Clear Critical (CR) Alarm
TAP-102	Clear Major (MJ) Alarm
TAP-103	Clear Multiple Failure
TAP-104	Clear Power Minor (PMN) Alarm
TAP-105	Clear Trouble Report
TAP-106	Isolate and Clear Failure
TAP-107	Clear Far End Alarm Using Craft Interface Terminal (CIT)
TAP-108	Clear Obscure Failure Condition
TAP-109	Clear Abnormal (ABN) Indication
TAP-110	Clear Flashing FAULT LED Indication
TAP-111	Clear Brownout Condition Flashing L in FE ID Display
TAP-112	Clear Minor (MN) Alarm
TAP-113	Clear Obscure Minor (MN) Alarm
TAP-114	Clear External Minor Alarm at RT
TAP-115	Clear LED Test Trouble
TAP-116	Clear Trouble During Program Upgrade
TAP-117	Clear NE ACTY/FE ACTY Alarm Only
TAP-118	Clear Fan Shelf Alarm
TAP-119	Clear STS-1 AIS Alarm Conditions
TAP-120	Clear OLIU or Fiber Trouble Path Switched Ring
TAP-121	Clear OLIU or Fiber Trouble Linear Extensions

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab

DLP-500	Install BCP4 OHCTL Circuit Pack New Shelf
DLP-501	Replace BBG8 SYSCTL Circuit Pack In Service
DLP-502	Install TGS Circuit Packs
DLP-503	Install FUNCTION UNITS OLIU Circuit Packs
DLP-504	Connect Optical Loop for FUNCTION UNITS OLIUs
DLP-505	Install BCP3 TSI Circuit Packs
DLP-506	Install BBG11 3DS3 Circuit Packs
DLP-507	Perform LED Test
DLP-508	Perform DS3 Transmission Test
DLP-509	Activate Optional System Features Using CIT
DLP-510	Set Circuit Pack Options
DLP-511	Perform Optical Fiber Connections and Verification of Optical Facility for MAIN OLIUs
DLP-512	Check Local Office Alarms
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	Install Software Generic Program New Shelf Installation Only BBG8 SYSCTL and BCP4 OHCTL Installed
DLP-521	Condition and Connect Modems to Establish Communication from Remote CIT Location
DLP-522	Clean Optical Fibers, Connectors and Lightguide Buildouts (LBOs)
DLP-523	Make Cross-Connections Using CIT Video Broadcast via OC-12 Backbone Ring
DLP-524	Make Cross-Connections Using CIT STS-3c Transport via OC-12 Backbone Ring
DLP-525	Operate FE SEL Pushbutton on SYSCTL
DLP-526	Retrieve Generic Software Version ID
DLP-527	Install New Software Generic Program In-Service System Local Shelf Download
DLP-528	Introduction to the PC
DLP-529	Copy Diskettes and Make Backups

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab	
DLP-530	Install New Software Generic Program In-Service System Remote Shelf Download
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 23G/23G-U or 23H/23H-U OLIU
DLP-535	Install 23G/23G-U or 23H/23H-U OLIU
DLP-536	Test ED-8C733-30, G8 Fan Shelf
DLP-537	Replace ED-8C733-30, G5 Fan Filter
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
DLP-546	Make STS-1 (DS3) Cross-Connections Using CIT Path Switched Ring Configuration
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 Out of Service
DLP-551	Perform Optical Fiber Connections and Verification of Optical Facility for FUNCTION UNITS OLIUs
DLP-552	Perform End-to-End OC-3 Optical Line Test
DLP-553	Perform DS3 Transmission Test Dual Ring Interconnection
DLP-554	Make Cross-Connections Using CIT Single/Dual Homing OC-12/OC-3 Ring Configuration
DLP-555	Remove –48 V DC User Panel Fuse

See note at end of table.

Table 1. Numerical List of TOP Procedures (Contd) (Note)

Detailed Level Procedures (DLP) Tab	
DLP-556	Make Cross-Connections Using CIT Single/Dual Homing and OC-12 Extensions OC-12/OC-48 Configurations
DLP-557	Install BBG8 SYSCTL New Shelf Only BCP4 OHCTL Installed
DLP-558	Provision STS-1 Path Trace
DLP-559	Establish New Alarm Group System In Service
DLP-560	Sync Messaging Change Kbyte to Sbyte

Table 1 is provided as a reference only, and should not be used alone in finding instructions for performing tasks.

Acceptance Task Index

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Acceptance Procedures (Shelf Equipped)

NOTE:
The following procedures are for use in testing the DDM-2000 OC-12 Multiplexer system after another organization has equipped it. The procedures test the DDM-2000 OC-12 system *after* all circuit packs have been installed and the shelves are looped back or after a system has been established end-to-end. They are not intended to be used for initial system turnup or in establishing an end-to-end system. System turnup procedures are found in this manual under the System Turnup/Circuit Order tab.

Accept (Test) DDM-2000 OC-12 Multiplexer (Equipped)
Overview . . . . . Acceptance: NTP-002

Accept (Test) DDM-2000 OC-12 Multiplexer
(Looped Back) . . . . . Acceptance: NTP-003

Accept (Test) End-to-End DDM-2000 OC-12
System (Network) . . . . . Acceptance: NTP-004

Acceptance Procedures (Shelf Unequipped)

NOTE:
Procedures for installing and testing DDM-2000 OC-12 system bays, shelves, and cables are found in LTP 363-206-208, *DDM-2000 OC-12 Multiplexer Installation Manual.*

Overview of Acceptance (Test) Procedures for DDM-2000 OC-12 Multiplexer (Equipped)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

A. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE:
This procedure is an overview of acceptance procedures that may be performed on the DDM-2000 OC-12 Multiplexer. It assumes that the DDM-2000 OC-12 shelf or system has been installed and equipped with circuit packs. It also assumes that the system is being tested (accepted) by an organization that *did not* install it. This procedure is for reference only. It contains a list of items that may be performed in doing acceptance of a shelf or system and is not intended to be done in sequence.

Verify that office battery has been applied to the shelf. (**PWR ON** LED lighted on User Panel.) **DLP-519**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
B. Set (check) circuit pack option switch settings, if required.	**DLP-510**
C. Test (accept) DDM-2000 OC-12 Multiplexer (looped back). [**Acceptance: NTP-003**]	
D. Test (accept) end-to-end DDM-2000 OC-12 System [**Acceptance: NTP-004**]	
E. If required, perform DS3 transmission tests on each DS3 port.	
A. Single Ring Configuration	**DLP-508**
B. Dual Ring (DRI) Configuration	**DLP-553**
C. Single/Dual Homing Configuration	**DLP-508**
F. If required, perform OC-3c transmission tests.	**DLP-543**
G. Verify/set option settings using **`rtrv-ne/set-ne:`** commands.	
H. Verify/set option settings using **`rtrv-( )/set-( ):`** commands.	**DLP-509**

Accept (Test) DDM-2000 OC-12 Multiplexer Shelf (Looped-Back)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

---

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION:
DDM-2000 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. CAUTION:
Before looping a shelf, verify/set DSNE parameter of the **rtrv-ne:/set-ne:** *command to* **no**. *This parameter will be set as required when the shelf is integrated into a network. Only one DSNE is allowed in a network.*

NOTE 1:
An `inconsistent DCC values` alarm will occur when the **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:
An `AGNE communication failure` alarm will also occur when the **OLIUs** are looped back. This alarm occurs because at least one shelf in the network must be set as an AGNE but the default for the shelf is AGNE=**no**. To clear the alarm during a fiber loopback, use the **set-ne:***tid***:agne=yes** command.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
Optical loops should be installed on **MAIN OLIU**s and then on **FUNCTION UNITS OLIU**s.

Verify that all **OLIU**s have optical loops installed between their respective **IN** and **OUT** optical connectors.

A. **23G/23G-U** or **23H/23H-U OLIU** **DLP-534**
B. **21G/21G-U/21G2-U** or **21D/21D-U OLIU** **DLP-504**

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 **BBG8 SYSCTL** and **BCP4 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**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. Release **ACO** pushbutton. Verify that all LEDs on DDM-2000 OC-12 Multiplexer go off.

5. ⚠ CAUTION:
The **`init-sys:all`** *command should* **NOT** *be used on an in-service system.*

NOTE 1:
A craft interface terminal (CIT) is required to access the optional features of the DDM-2000.

NOTE 2:
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to their default values. STS-1 and/or STS-3c cross-connections may have been made which should be deleted before the system is placed in service. The **`init-sys:all`** command may be used to reset all provisionable parameters and cross-connections to default values.

NOTE 3:
An `inconsistent DCC values` alarm will occur when the **`init-sys:all`** command is executed. To clear the alarm, use the **`set-fecom:`***`address`*`:com=disable`** command to disable the DCC.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
An AGNE communication failure alarm will also occur when the **init-sys:all** command is executed because the AGNE parameter of the **set-ne:** command is set to **no** again. To clear the alarm, use the **set-ne:***tid*:**agne=yes** command.

If required, use the command **init-sys:all** to reset provisionable parameters to default values.

6. NOTE:
These procedures assume that the DDM-2000 has been connected to the DSX-( ) cross-connect points, as required. **3DS3** and/or **3STS1E** circuit packs must be inserted, as required, before performing these tests.

Perform transmission tests for each group, as required. Refer any failures to organization that installed the DDM-2000.

A. DS3 Single OC-12 Ring Test in **Demux** Direction	**DLP-508**
B. DS3 Dual Ring (DRI) Test in **Demux** Direction	**DLP-553**
C. DS3 Single/Dual Homing Test in **Demux** Direction	**DLP-508**

7. Test ED-8C733-30, G8 fan shelf. **DLP-536**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
8. ⇒ NOTE: A craft interface terminal (CIT) is required to access the optional features of the DDM-2000 OC-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**
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**]	

Test (Accept) End-to-End DDM-2000 OC-12 System (Network)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

---

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⚠ CAUTION 1:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⚠ CAUTION 2:
The `init-sys:all` *command should* **NOT** *be used on an in-service system.*

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

NOTE 4:
During installation and/or initial testing, provisionable parameters may have been set which need to be reset to default values. STS-1 and/or STS-3c cross-connections may have been made which should be deleted before the system is placed in service. The **init-sys:all** command will reset all provisionable parameters and cross-connections to default values. If parameters have already been set to their proper values and you are sure they are set correctly, you may not want to perform this step. Some parameters will have to be reset later before service is established.

NOTE 5:
An `inconsistent DCC values` alarm will occur when the **init-sys:all** command is executed, if fecom has not been enabled at both ends of the system.

NOTE 6:
A network requires that at least one shelf be designated as an AGNE. An `AGNE communication failure` alarm will occur when the **init-sys:all** command is executed because the AGNE parameter of the **set-ne:** command is set to **no** again. The alarm will clear when you use the **set-ne:***tid*:**agne=yes** command to designate an AGNE.

If required, use the command **init-sys:all** to reset provisionable parameters to default values.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE 1:
If external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches may not be set correctly. The specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Use **rtrv-sync** command at each node to verify proper timing options. At least one node in the network should be set for *DS1 External* or *Free Running.* Verify **TGS** circuit pack options are set correctly [**DLP-510**].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **rtrv-ne:** and **set-ne:** commands to verify/set ONE shelf as the DSNE.

Use the **rtrv-ne:** and **set-ne:** commands to verify/set the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. Determine the optical loss of the optical facility from office records or by making the required measurements.

5. ⇒ NOTE:
There are no option switches on **23G/23G-U**, **23H/23H-U**, **21G2-U** or **21D/21D-U OLIU**s.

If **21G/21G-U OLIU**s are installed, ensure **HIGH/LOW POWER** option switches are set to agree with the loss of the optical facility. **DLP-510**

6. Use **`rtrv-fecom:`** and **`set-fecom:com=enabled`** commands to verify/enable the DCC channel between all nodes, as required.

7. ⇒ NOTE:
The **`rtrv-map-network`** and **`rtrv-map-neighbor`** commands may be used to retrieve a map of the network, including the systems in the network and how they are connected.

Ensure all DDM-2000 OC-12 shelves (**OLIU**s) in the network have been properly connected to the optical facility. Verify the integrity of each optical span.

A. **MAIN OLIU**s **DLP-511**
B. **FUNCTION UNITS OLIU**s **DLP-551**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled at any node in a system, it **must** be enabled at all nodes of the system.

⇒ NOTE 2:
The **rtrv-oc12:** and **rtrv-oc3:** commands retrieve the `OC-12 Line Provisioning Report` and `OC-3 Line Provisioning Report`. This report displays the provisioned configuration of OC-12 and OC-3 lines. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc12:** and **rtrv-oc3:** command format.

Use the **rtrv-oc12:** and **rtrv-oc3:** commands to obtain the `OC-12 Line Provisioning Report` and `OC-3 Line Provisioning Report` and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc12:** and **set-oc3:** commands to enable or disable the Kbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed node in a linear system, it **must** be enabled at all line-timed nodes of a linear system.

NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⇒ NOTE 1:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line test to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each shelf** to enable far end communications.

⇒ NOTE 2:
The **`rlgn`** command can be used to log in to each shelf at optical span being tested.

Perform end-to-end OC-12 and OC-3 line tests on all optical spans. Report any failures to the organization that installed the DDM-2000.

A. OC-12 Lines	**DLP-548**
B. OC-3 Lines	**DLP-552**

11. Perform end-to-end DS3 transmission test in the **mux** direction for each function unit group, if required.

A. DS3 Single OC-12 Ring Test in **Mux** Direction	**DLP-508**
B. DS3 Dual Ring (DRI) Test in **Mux** Direction	**DLP-553**
C. DS3 Single/Dual Homing Test in **Mux** Direction	**DLP-508**

12. Perform end-to-end OC-3c (STS-3c) transmission test in the **mux** direction for each **FUNCTION UNITS** group, as required. **DLP-543**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Check local office alarm interface as required.	DLP-512
14. Check office telemetry interface as required.	
A. Parallel Telemetry	DLP-513
B. Serial Telemetry	DLP-514
15. Test protection switching function, if required.	DLP-515
16. The system is ready for service to be established.	
17. Activate remaining 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. IBM* 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/IS-3c (STS-3c) service after all necessary bay, shelf, and cable installation has been done.

Shelf — Equipping (Looped Back)

Equip DDM-2000 OC-12 Multiplexer —
(Looped Back) . . . . . System Turnup: NTP-002

System — Establish New Alarm Group

Establish New Alarm Group—
System In Service . . . . . Detailed Level Procedure: DLP-559

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* Registered trademark of International Business Machines Corporation.

† Registered trademark of Microsoft Corporation.

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

System — Establish End-to-End

Establish Single-Homed OC-3/IS-3 Access —
via DDM-2000 OC-12 Backbone Ring . . . . . System Turnup: NTP-003

Establish Single-Homed OC-12 Access —
via FT-2000 OC-48 Backbone Ring . . . . . System Turnup: NTP-015

Establish Dual-Homed OC-3/IS-3 Access —
via DDM-2000 OC-12 Backbone Ring . . . . . System Turnup: NTP-004

Establish Dual-Homed OC-12 Access —
via FT-2000 OC-48 Backbone Ring . . . . . System Turnup: NTP-027

Establish Video Broadcast Access —
via DDM-2000 OC-12 Backbone Ring . . . . . System Turnup: NTP-005

Establish STS-3c Transport Access —
via DDM-2000 OC-12 Backbone Ring . . . . . System Turnup: NTP-006

Establish OC-3/IS-3 Optical Span Extension —
Extension Between FT-2000 and
DDM-2000 OC-12 Ring . . . . . Circuit Order: NTP-007

Establish OC-3/IS-3 Optical Span Extension —
Extension Between DDM-2000 OC-12 Ring
and DDM-2000 OC-3 . . . . . Circuit Order: NTP-008

Establish OC-3/IS-3 Dual Ring Interworking —
DDM-2000 OC-12 to OC-3 or FT-2000 Ring Configurations
OC-3 Optical Fiber Spans . . . . . System Turnup: NTP-011

Establish EC-1 Dual Ring Interworking —
DDM-2000 OC-12 to OC-3 or FT-2000 Ring Configurations
OC-3/IS-3 Optical Fiber Spans . . . . . System Turnup: NTP-014

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Establish End-to-End DDM-2000 OC-12 System —
Path Switched Ring Network . . . . . System Turnup: NTP-020

Service — Establish Initial DS3

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

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.

Service — Adding New DS3

Add New DS3 Service/Group —
Path Switched Ring
In Service . . . . . Circuit Order: NTP-018

EC-1 Interface — Adding

Add New STS1E Low Speed Service/Group for EC-1 Interface —
Path Switched Ring
In Service . . . . . Circuit Order: NTP-024

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Conversions

Change Kbyte Sync Messaging to
Sbyte Sync Messaging . . . . . Detailed Level Procedures: DLP-560

Convert DS3 Group Service to EC-1 Group Service —
Path Switched Ring . . . . . Circuit Order: NTP-026

Service — Discontinue DS3

Discontinue End-to-End DS3 Service/Group —
Path Switched Ring . . . . . Circuit Order: NTP-019

Service — Discontinue EC-1 Interface

Discontinue EC-1 Interface —
Path Switched Ring . . . . . Circuit Order: NTP-025

Service — Discontinue OC-3c/IS-3c (STS-3c)

Discontinue OC-3c/IS-3c (STS-3c) Service . . . . . Circuit Order: NTP-010

Span — Discontinue

Discontinue OC-3/IS-3 Span . . . . . Circuit Order: NTP-009

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

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Upgrades

Upgrade DDM-2000 OC-12 Release 3 to Release 5
In Service . . . . . Circuit Order: NTP-016

Upgrade DDM-2000 OC-12/FT-2000 Dual Ring Interworking Network From EC-1 to OC-3
In Service . . . . . Circuit Order: NTP-012

Upgrade DDM-2000 OC-3/OC-12 Dual Ring Interworking Network From EC-1 to OC-3/IS-3
In Service . . . . . Circuit Order: NTP-013

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 Software Generic Program — In-Service System
Local Shelf Download . . . . . Detailed Level Procedure: DLP-527

Upgrade Software Generic Program — In-Service System
Remote Shelf Download . . . . . Detailed Level Procedure: DLP-530

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Upgrade TBOS/Parallel Telemetry to TL1/X.25	DLP-533
Upgrade Timing	DLP-542

Examples of System Configurations - Turnup Procedures

The following figures are for reference only and are not intended to suggest any working configuration. They are used to support this **IXL-001**.

The figures in this section show a variety of subnetwork configurations and associated flow diagrams. Figure 1 depicts a large network configuration consisting of FT-2000 OC-48, DDM-2000 OC-3, OC-12, and FiberReach. The remainder of the figures illustrate individual subnetworks necessary to establish the large network configuration. Some subnetwork configurations can be established as stand-alone subnetworks and added later to the overall large network configuration (For Example, the OC-3 ring subnetworks in Figures 6 and 7). Other subnetworks require you establish the host subnetwork first (For Example, the single-homed OC-3 access ring via the FT-2000 ring in Figures 2 and 3). The shaded areas in each figure show the configuration being established.

The following is a list of the configurations shown in this section:

Figure 2 Single-Homed OC-3 Access via FT-2000 Ring

Figure 4 Single-Homed FiberReach Access via DDM-2000 OC-3 Ring

Figure 6 End-to-End DDM-2000 OC-3 Path Switched Ring System

Figure 8 OC-3 Optical Extension Between FT-2000 and DDM-2000 OC-3

Figure 10 OC-3 Shelf/Optical Span Extension Added to DDM-2000 OC-3

Figure 12 Dual-Homed FiberReach Access via DDM-2000 OC-3 Ring

Figure 14 End-to-End DDM-2000 OC-12 Path Switched Ring System

Figure 16 OC-3 Optical Extension Between DDM-2000 OC-3 Ring and OC-12 ring

Figure 18 OC-3 Optical Extension Between FT-2000 OC-48 Ring and DDM-2000 OC-12 ring

Figure 20 OC-3 Dual Ring Interworking - FT-2000 OC-48 Ring to DDM-2000 OC-3 ring

Figure 22 Single-Homed OC-12 Access via FT-2000 OC-48 Ring

Figure 24 Single-Homed OC-3 Access via DDM-2000 OC-12 Ring

Figure 26 Dual-Homed OC-3 Access via FT-2000 OC-48 Ring

Figure 28 Dual-Homed OC-12 Access via FT-2000 OC-48 Ring

Figure 30 Dual-Homed OC-3 Access via DDM-2000 OC-12 Ring

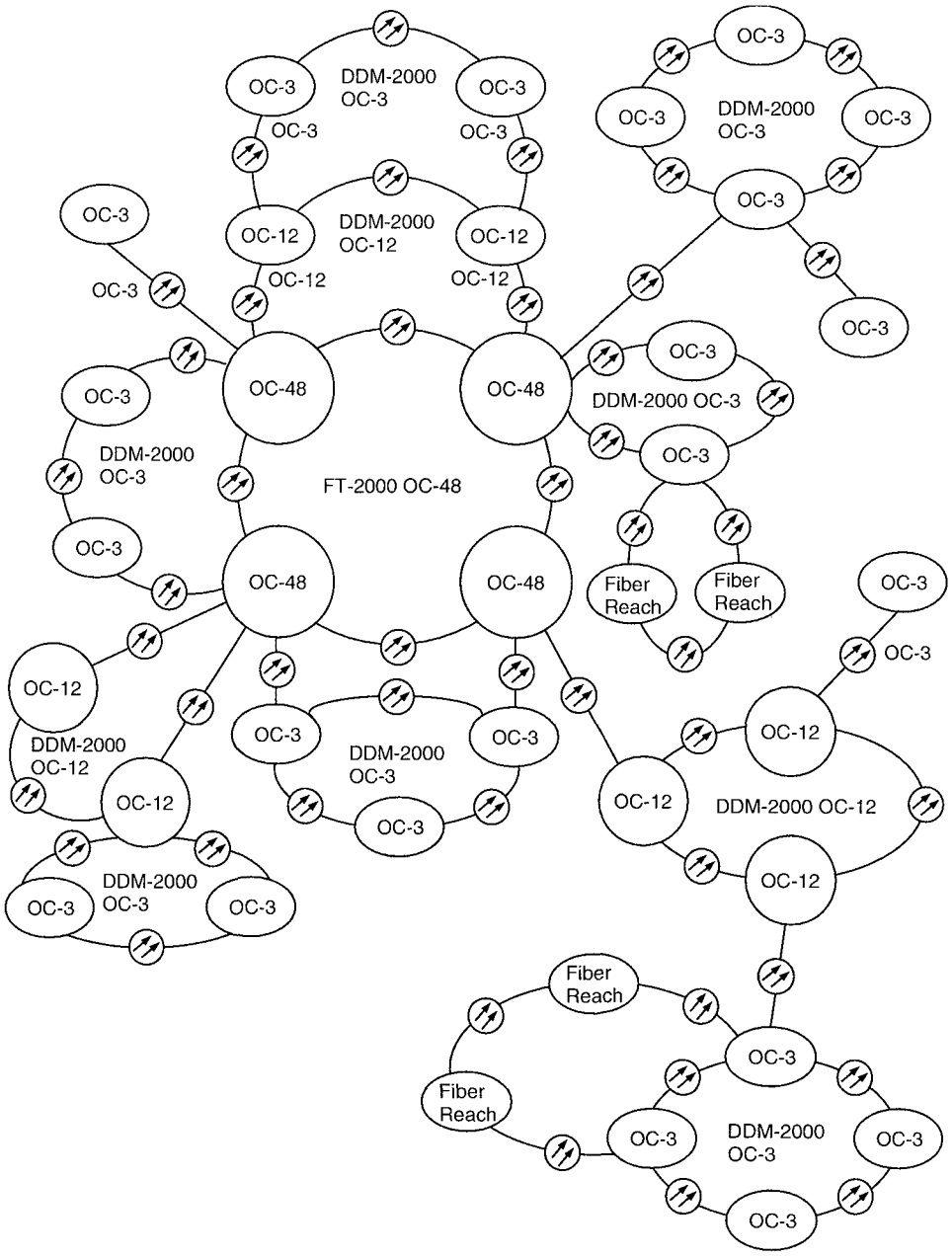


Figure 1. DDM-2000/FT-2000 Large Network Configurations

Establish Single-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring
See Figure 3

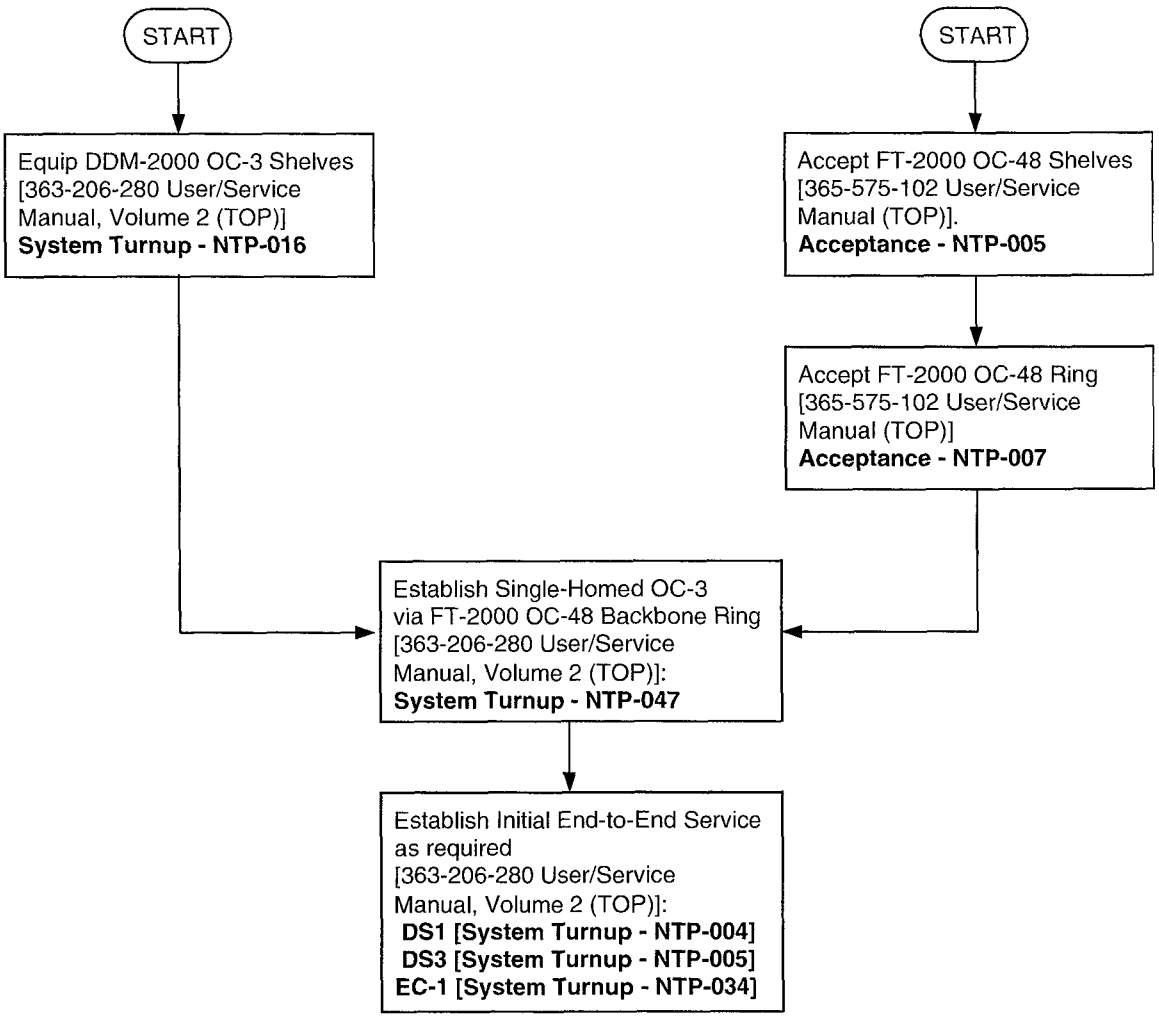


Figure 2. DDM-2000/FT-2000 Large Network Configurations — Single Homed OC-3 Access via FT-2000 Backbone Ring

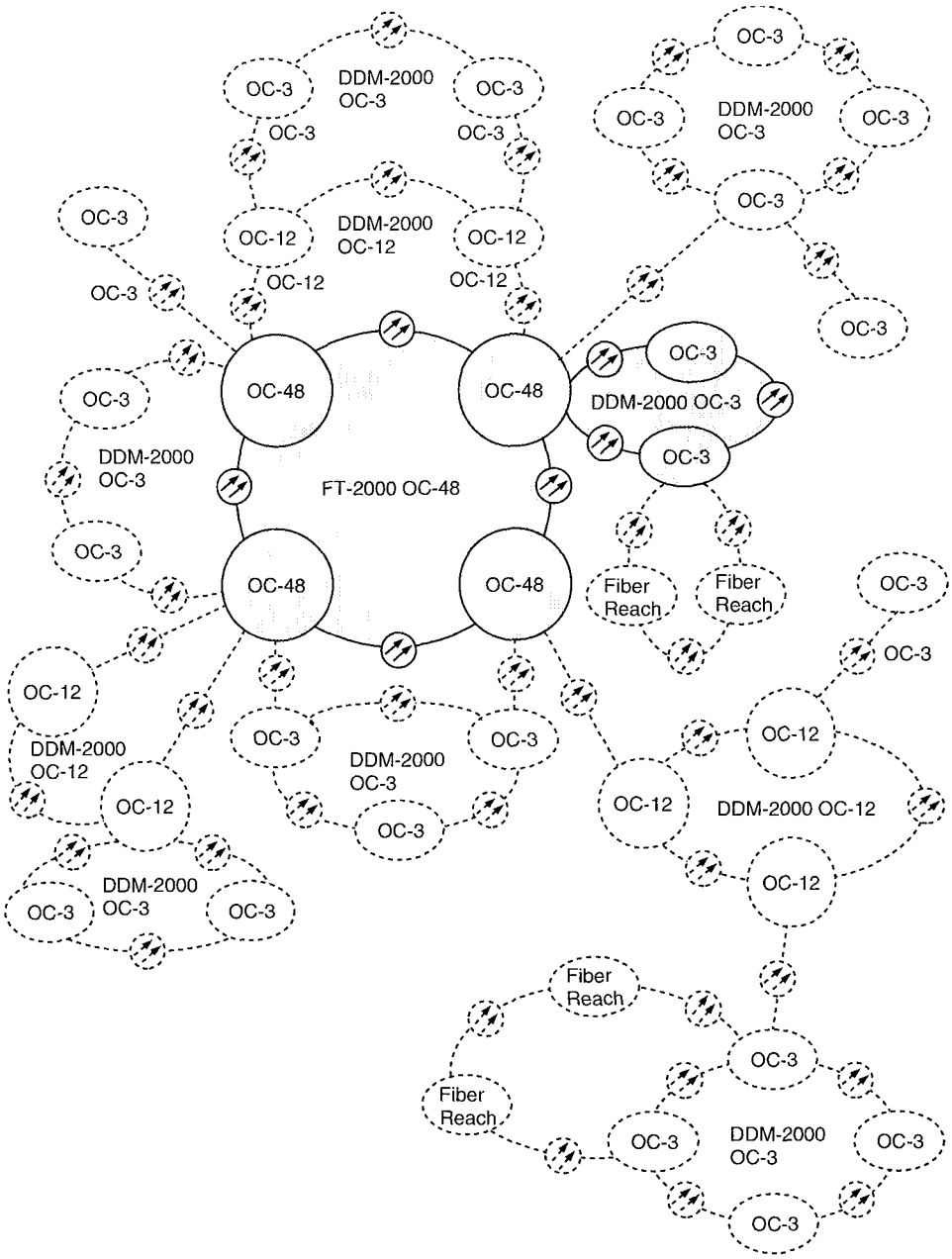


Figure 3. DDM-2000/FT-2000 Large Network Configurations — Single Homed OC-3 Access via FT-2000 Backbone Ring

Establish Single-Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring See Figure 5

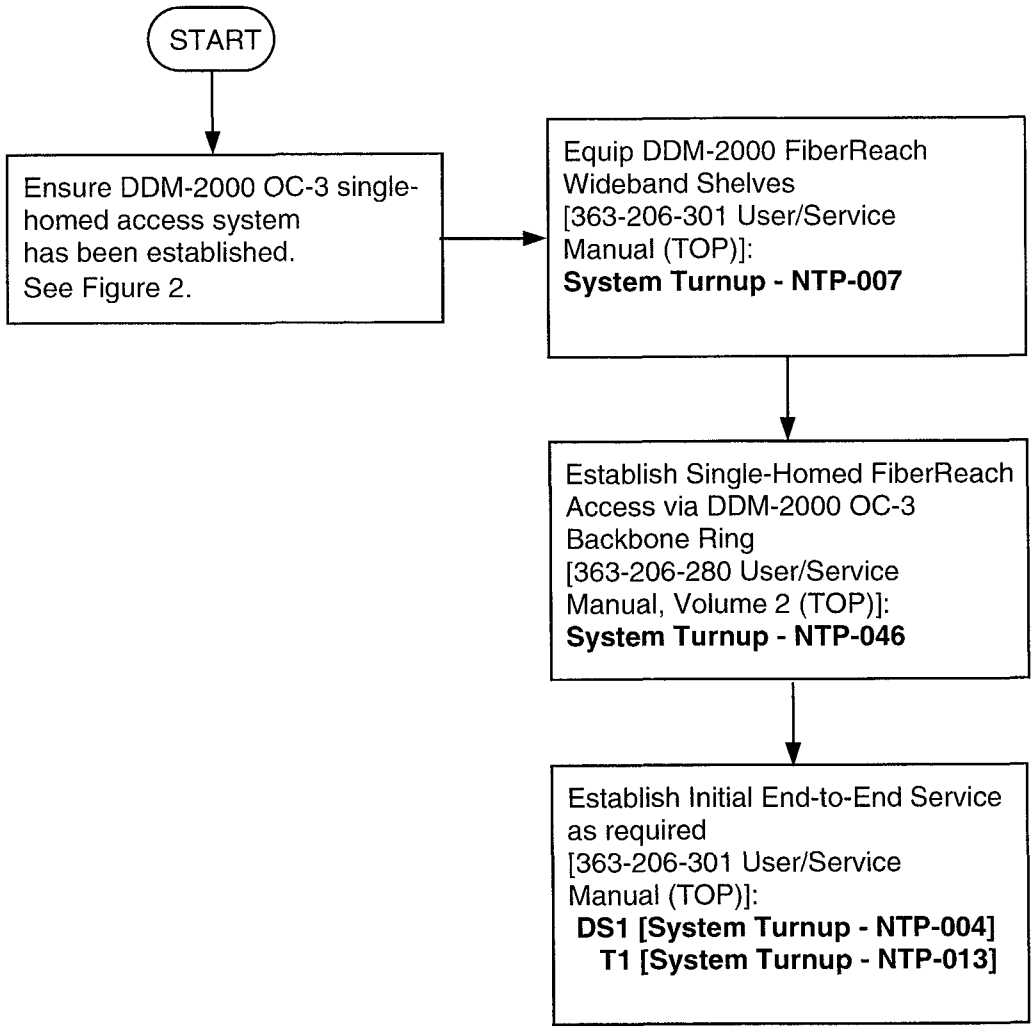


Figure 4. DDM-2000/FT-2000 Large Network Configurations — Single Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

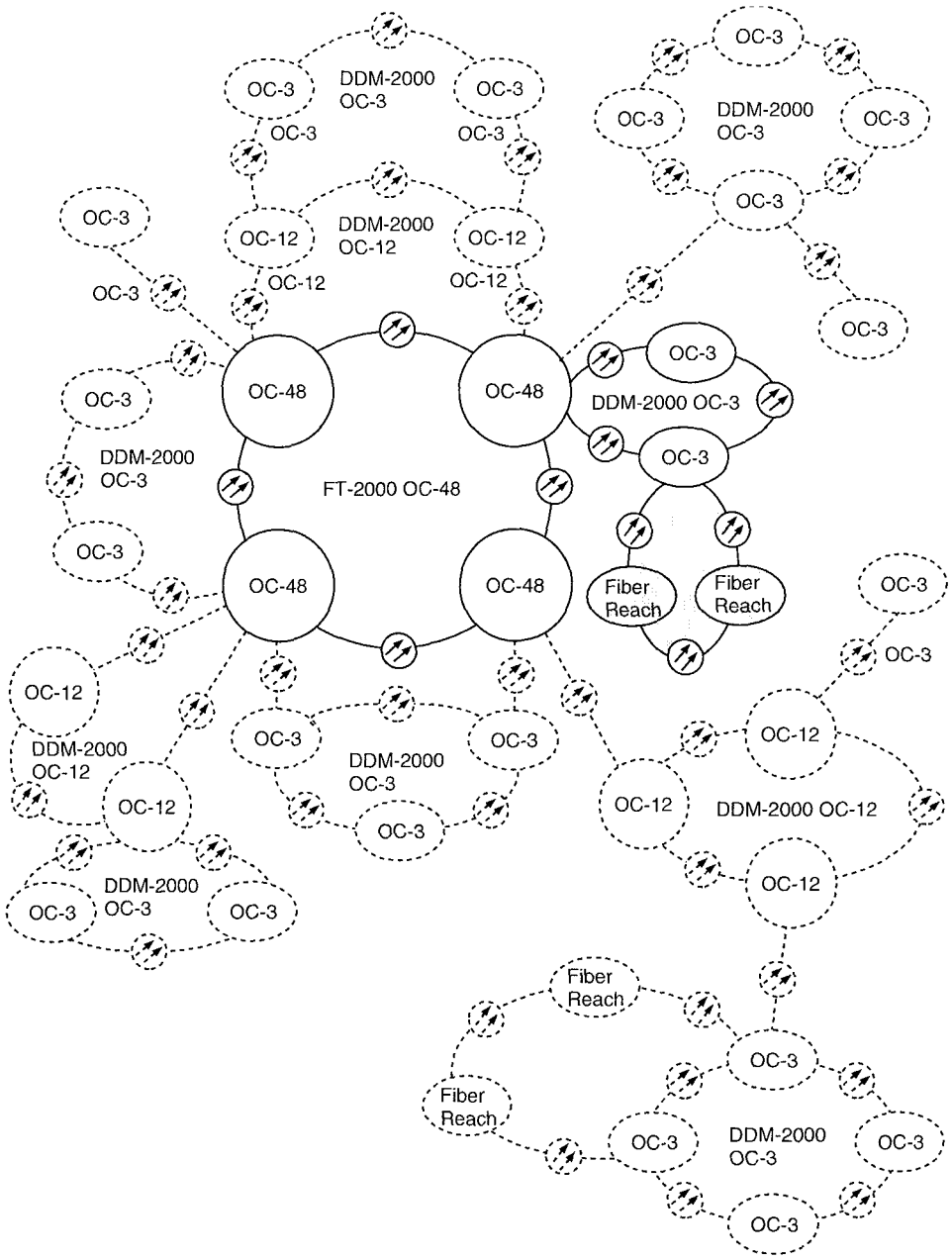


Figure 5. DDM-2000/FT-2000 Large Network Configurations — Single Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

Establish End-to-End DDM-2000 OC-3 System - Path Switched Ring
See Figure 7

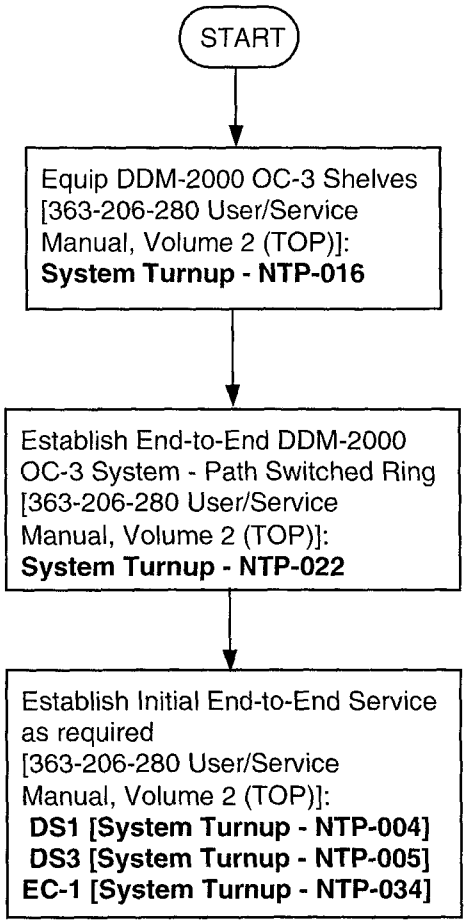


Figure 6. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-3 Path Switched Ring

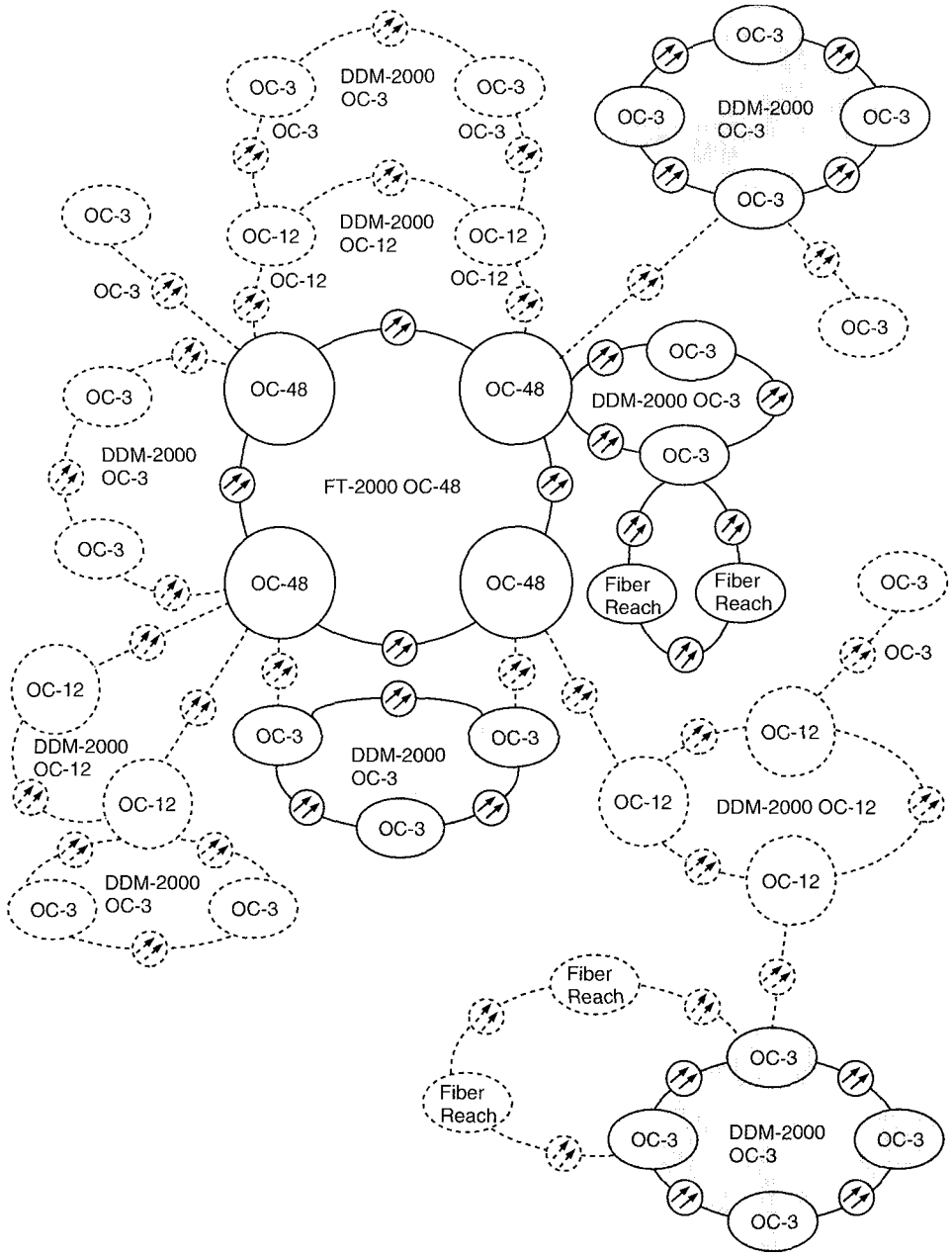


Figure 7. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-3 Path Switched Ring

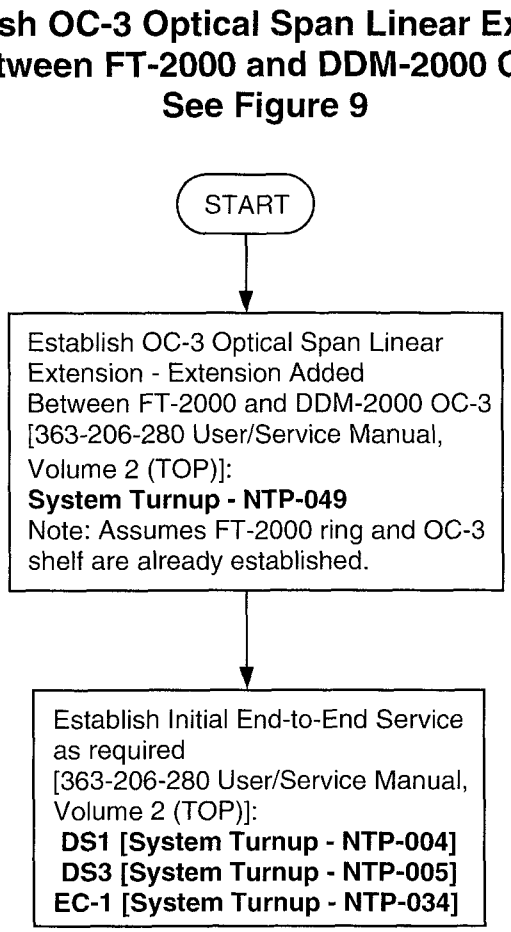


Figure 8. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Linear Extension Between FT-2000 and DDM-2000 OC-3

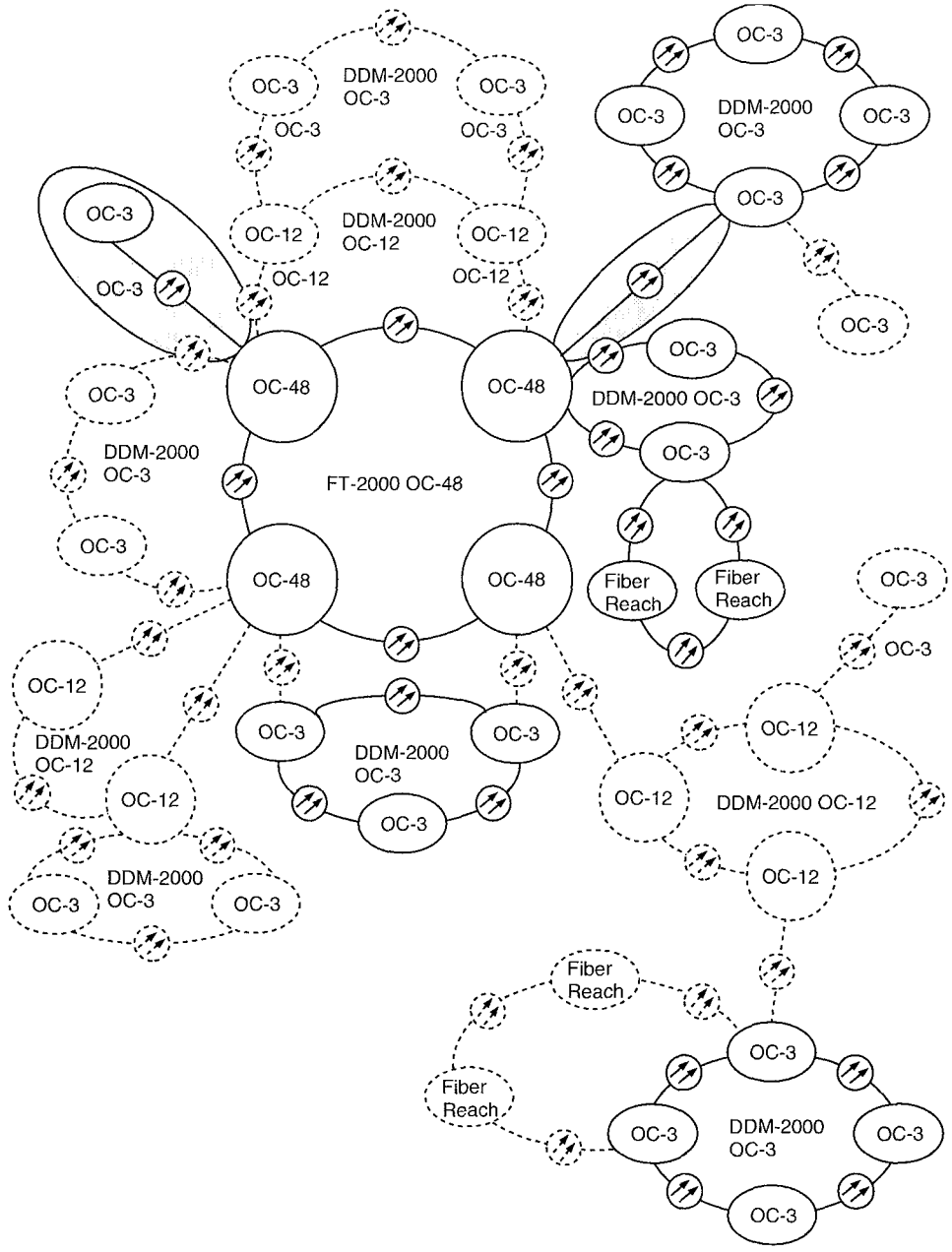


Figure 9. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Linear Extension Between FT-2000 and DDM-2000 OC-3

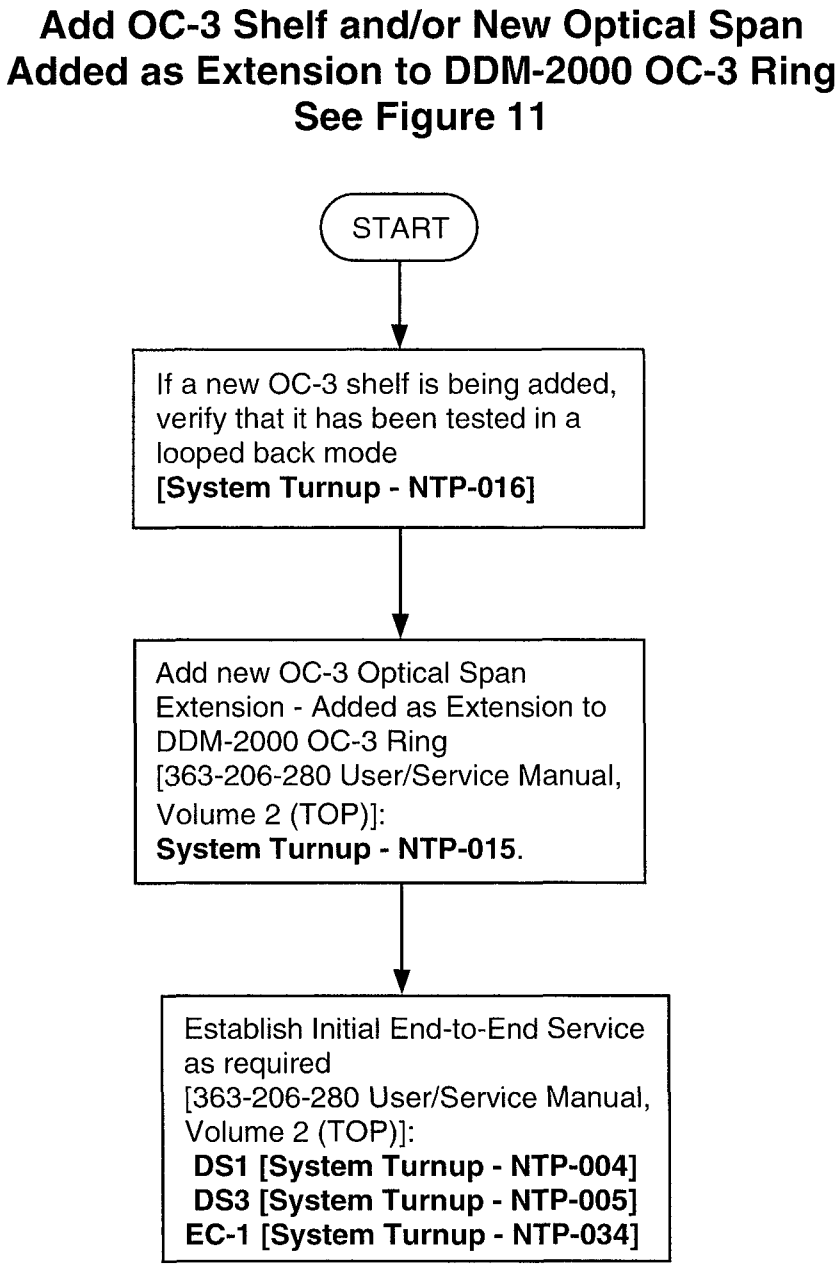


Figure 10. DDM-2000/FT-2000 Large Network Configurations — OC-3 Shelf and/or Optical Span Added as Extension to DDM-2000 OC-3 Ring

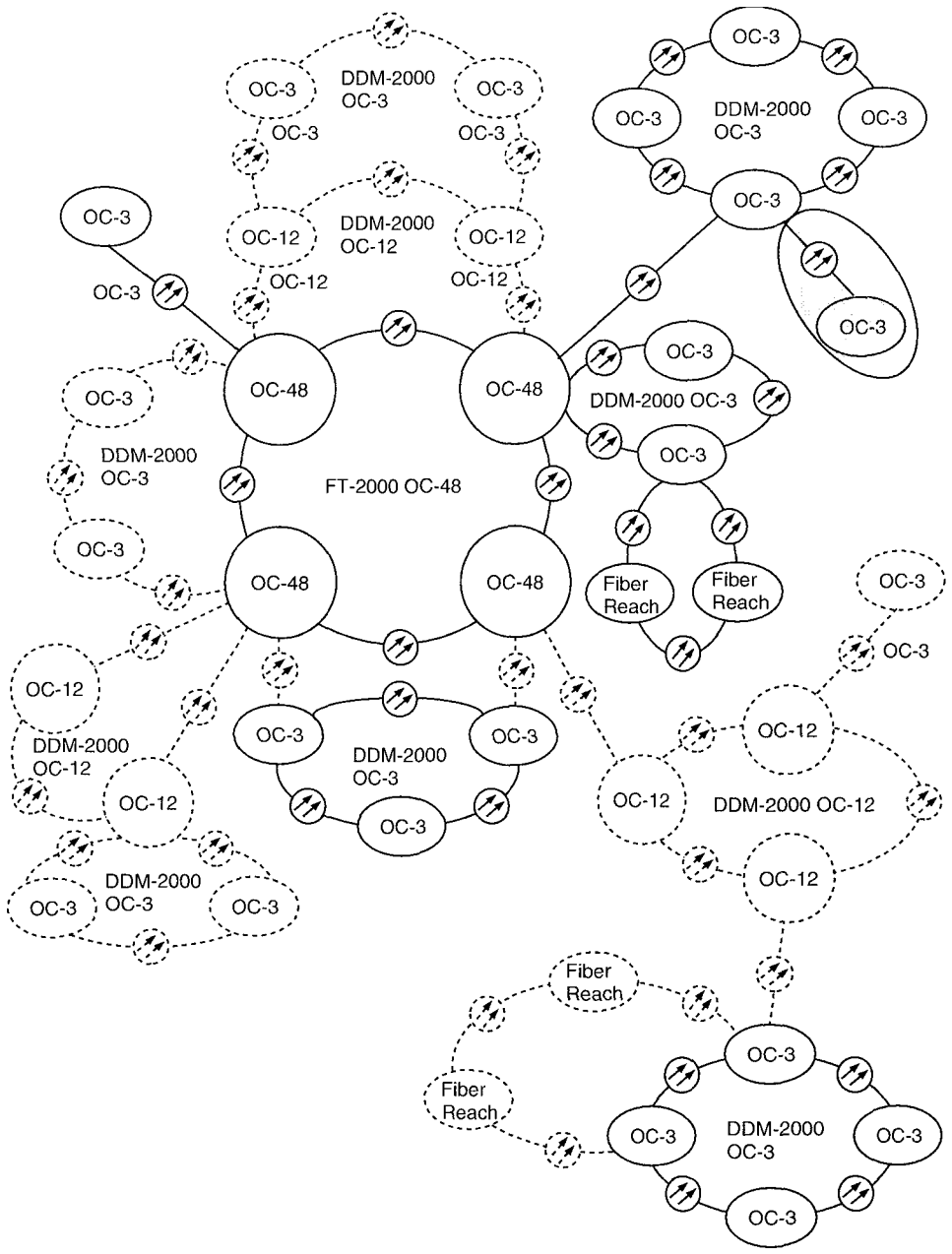


Figure 11. DDM-2000/FT-2000 Large Network Configurations — OC-3 Shelf and/or Optical Span Added as Extension to DDM-2000 OC-3 Ring

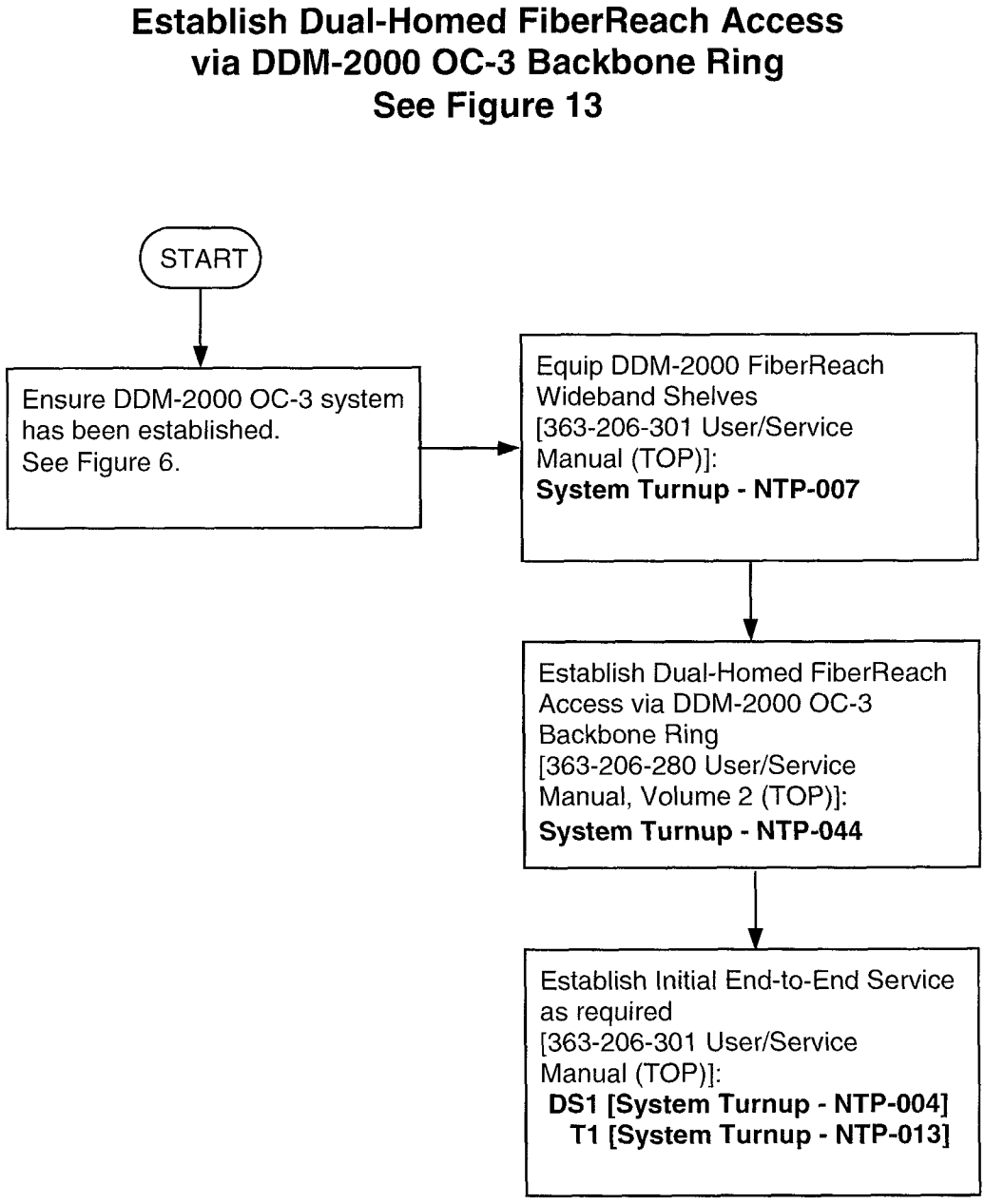


Figure 12. DDM-2000/FT-2000 Large Network Configurations — Dual Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

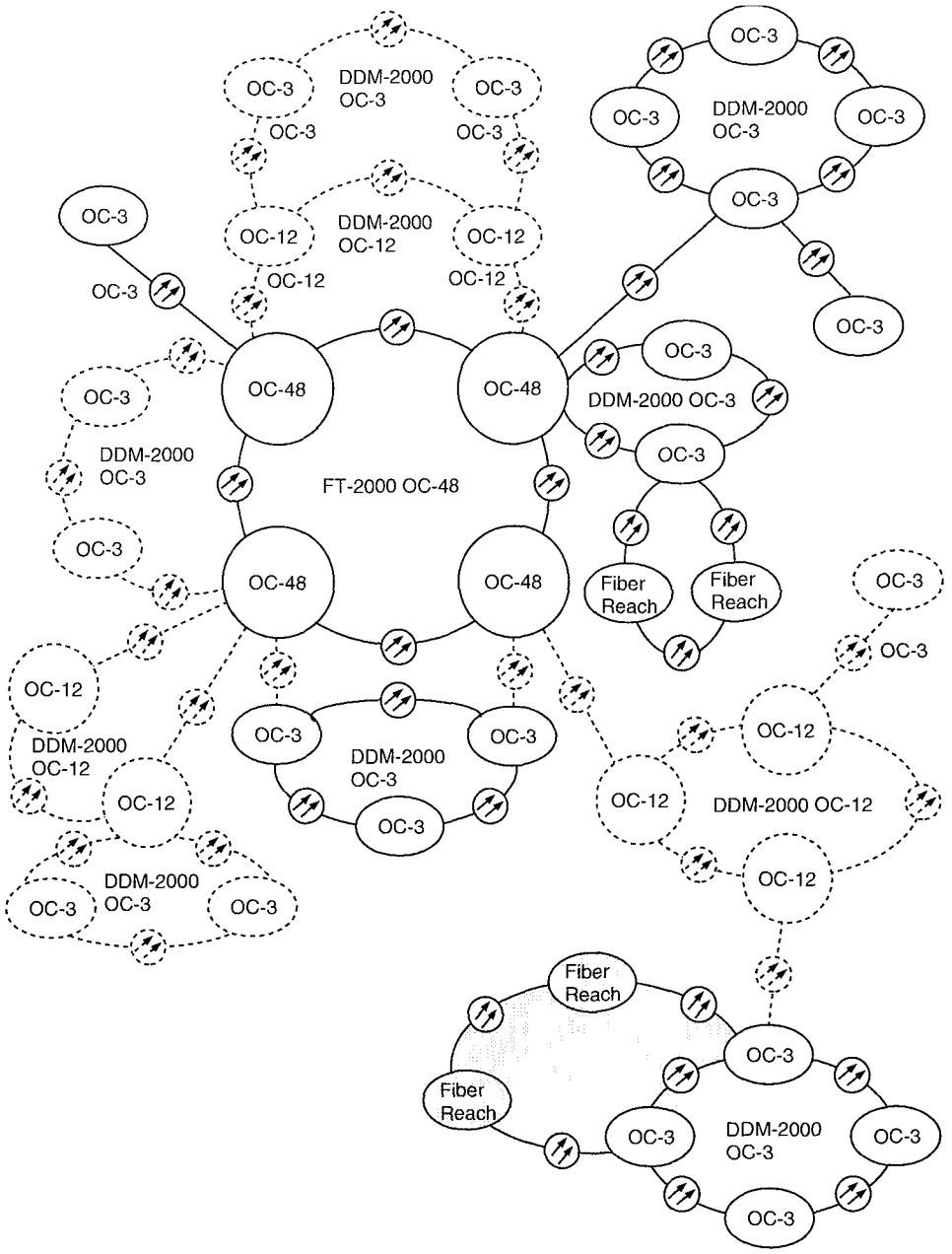


Figure 13. DDM-2000/FT-2000 Large Network Configurations — Dual Homed FiberReach Access via DDM-2000 OC-3 Backbone Ring

Establish End-to-End DDM-2000 OC-12 System - Path Switched Ring
See Figure 15

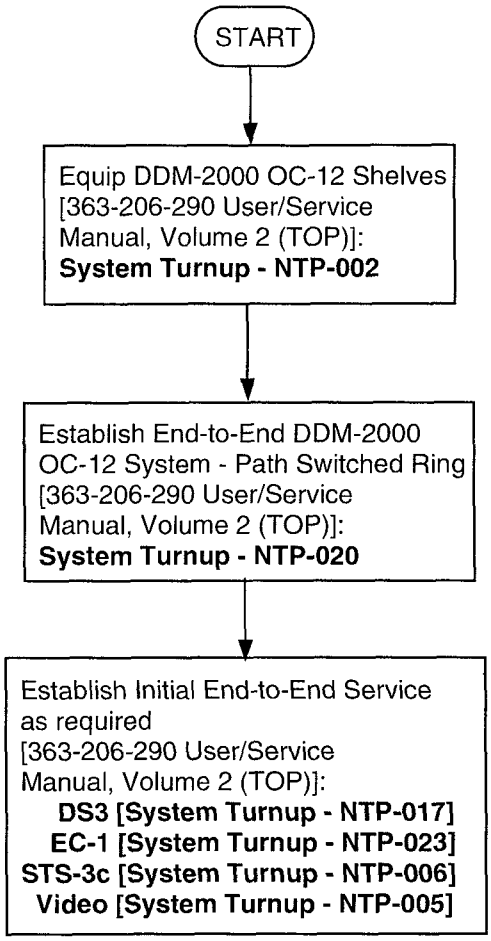


Figure 14. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-12 Path Switched Ring

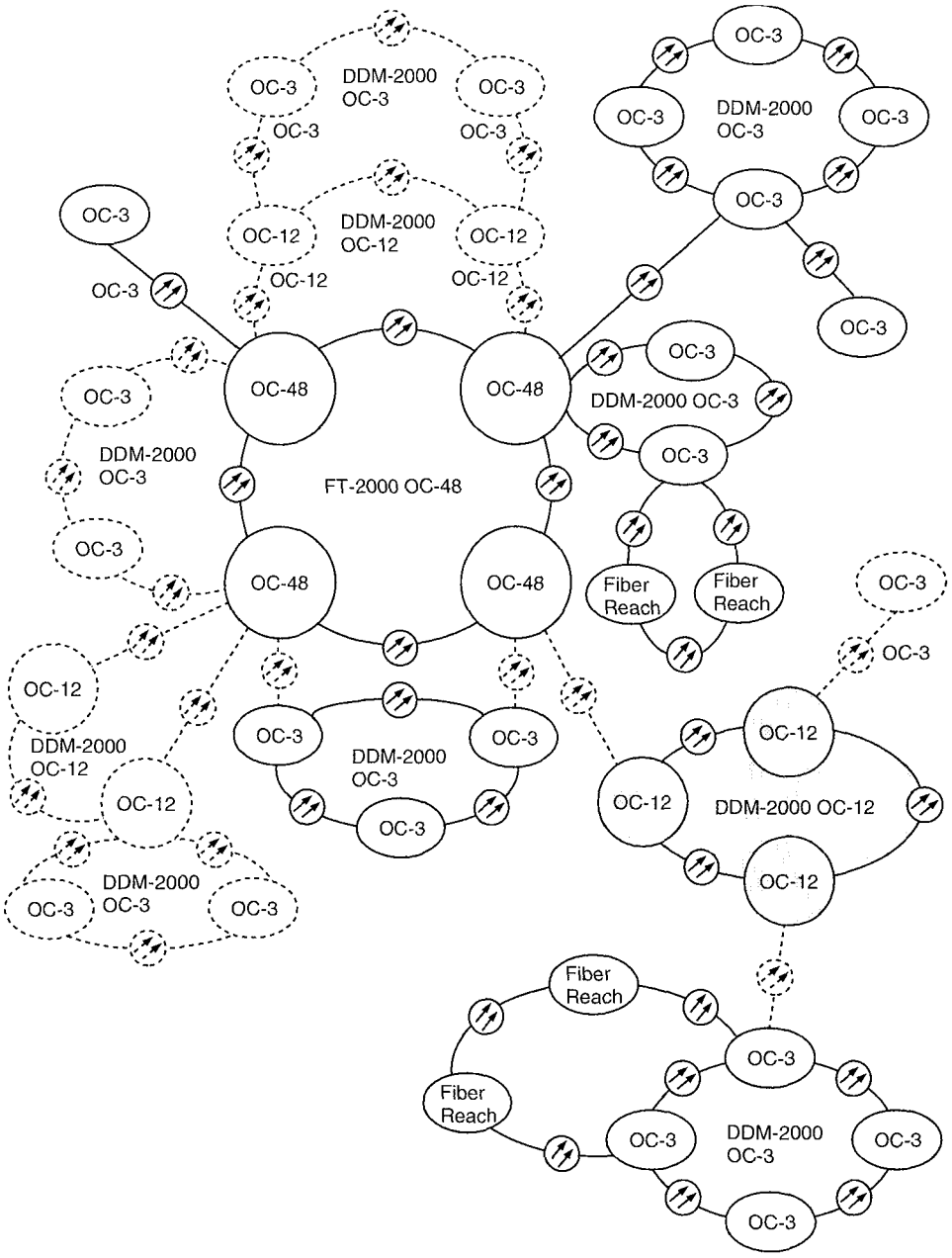


Figure 15. DDM-2000/FT-2000 Large Network Configurations — DDM-2000 OC-12 Path Switched Ring

Establish OC-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3
See Figure 17

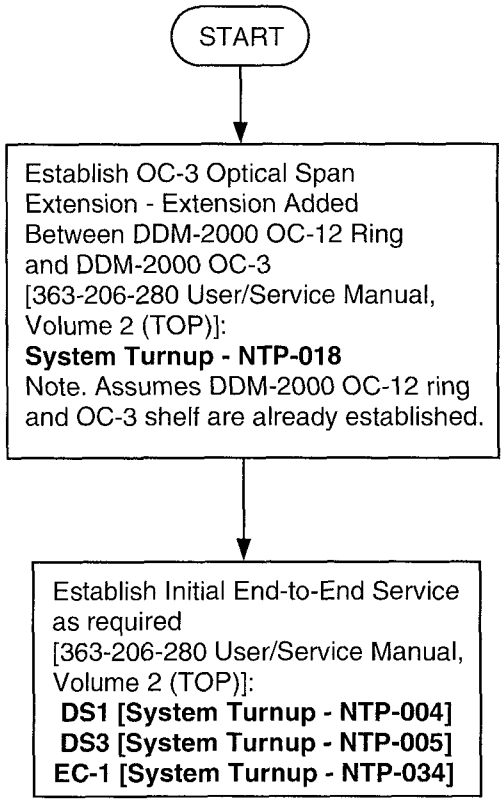


Figure 16. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3

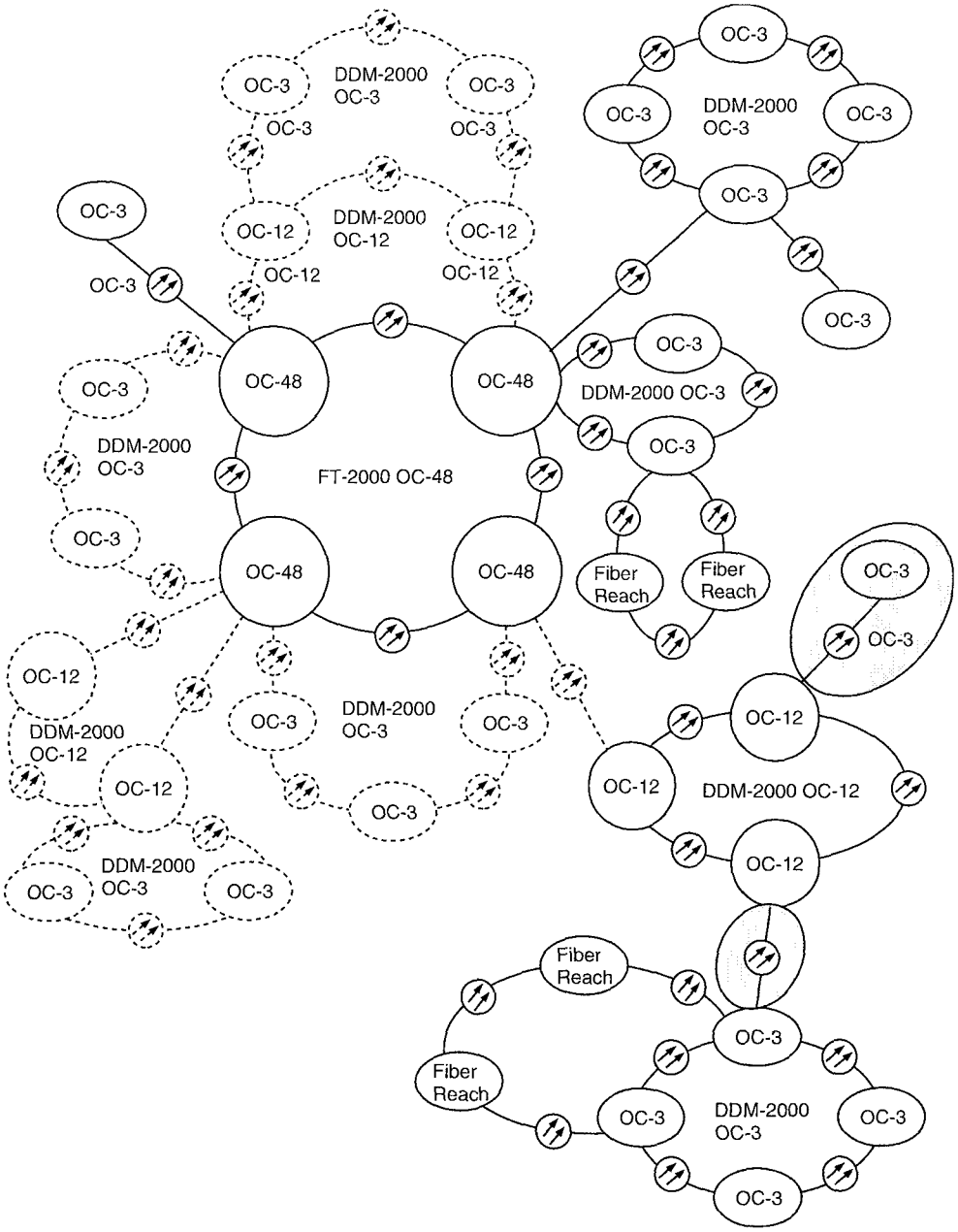


Figure 17. DDM-2000/FT-2000 Large Network Configurations — OC-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3

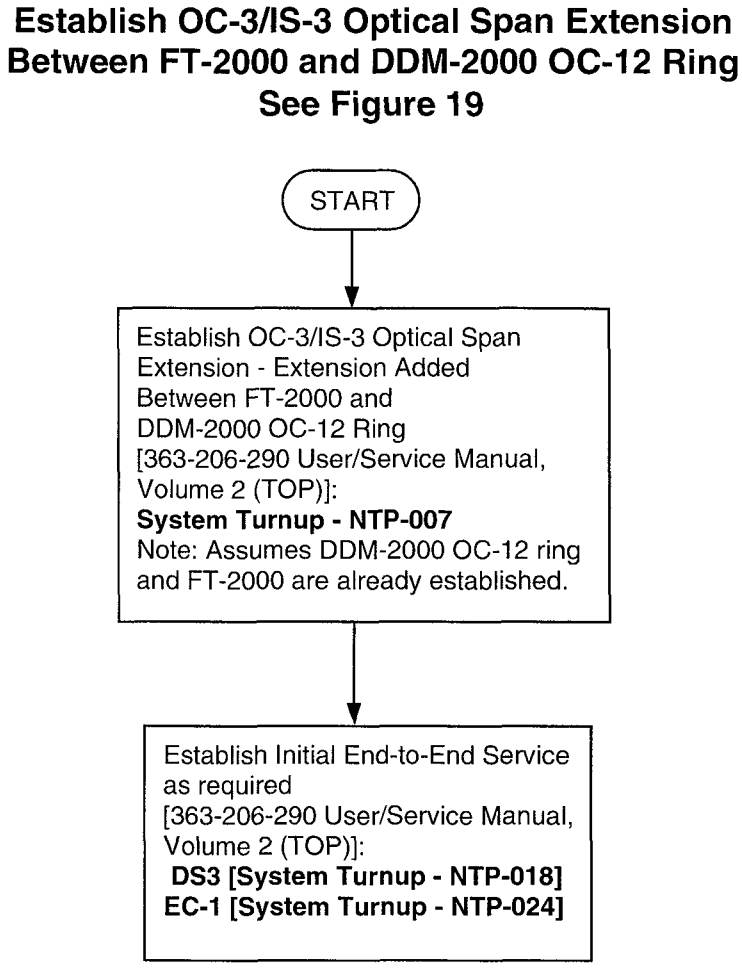


Figure 18. DDM-2000/FT-2000 Large Network Configurations — OC-3/IS-3 Optical Span Extension Between DDM-2000 OC-12 Ring and FT-2000 OC-48

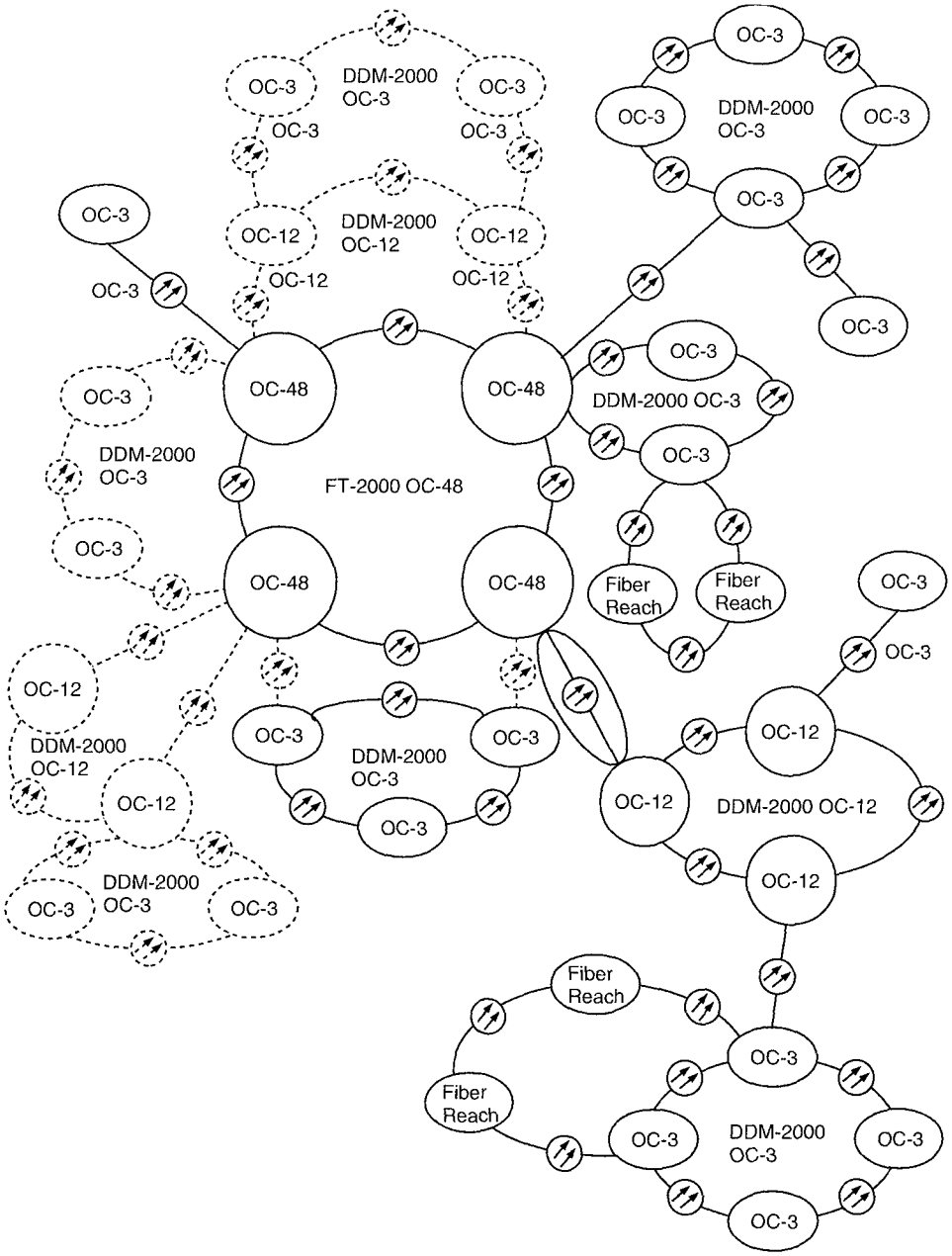


Figure 19. DDM-2000/FT-2000 Large Network Configurations — OC-3/IS-3 Optical Span Extension Between DDM-2000 OC-12 Ring and FT-2000 OC-48

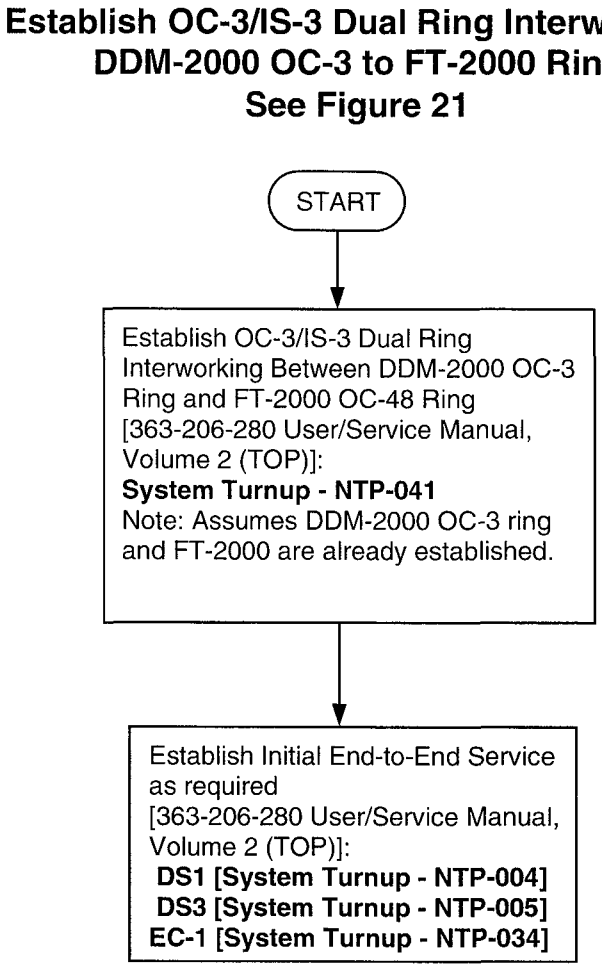


Figure 20. DDM-2000/FT-2000 Large Network Configurations — OC-3/IS-3 Dual Ring Interworking Between DDM-2000 OC-3 Ring and FT-2000 OC-48

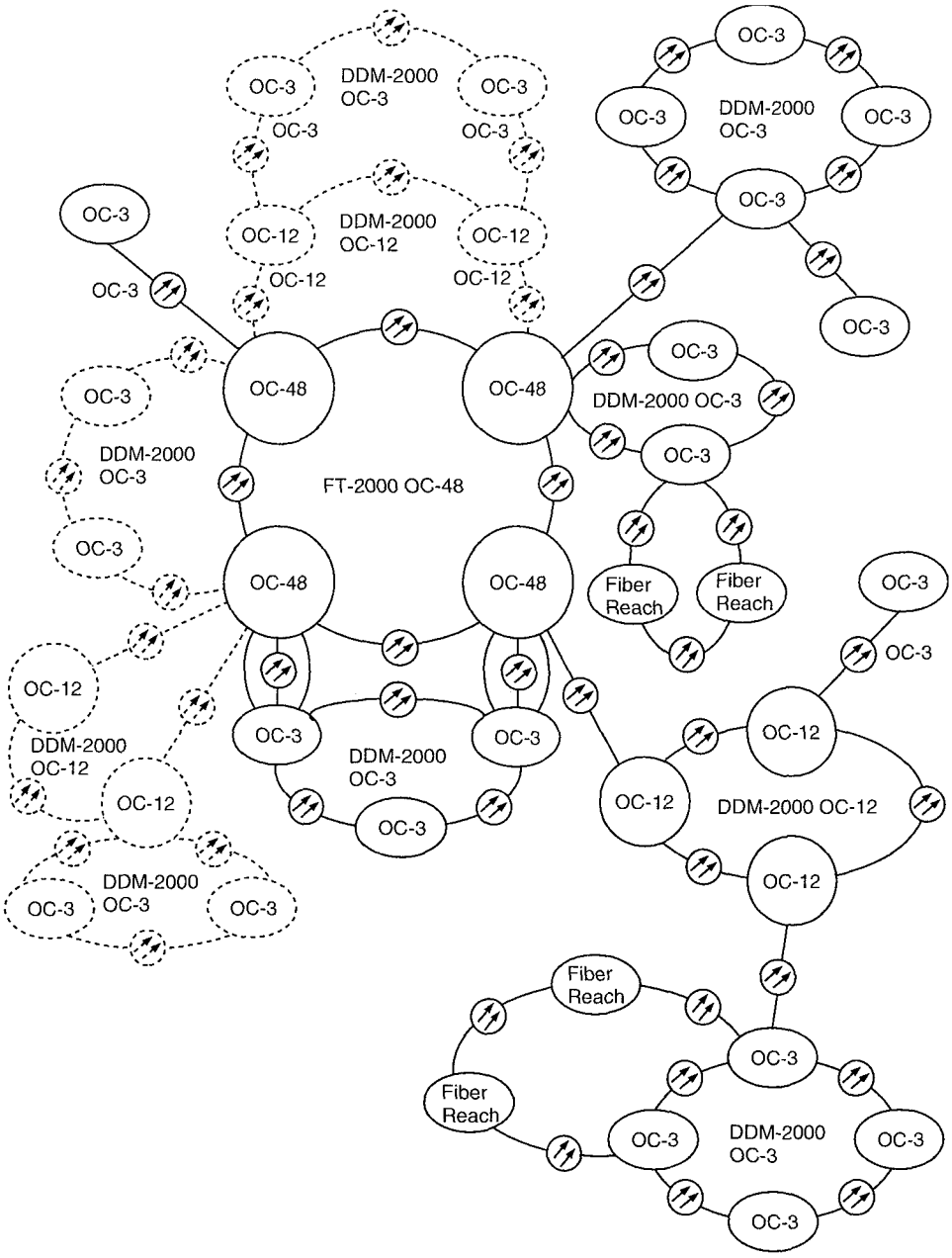


Figure 21. DDM-2000/FT-2000 Large Network Configurations — OC-3/IS-3 Dual Ring Interworking Between DDM-2000 OC-3 Ring and FT-2000 OC-48

Establish Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring See Figure 23

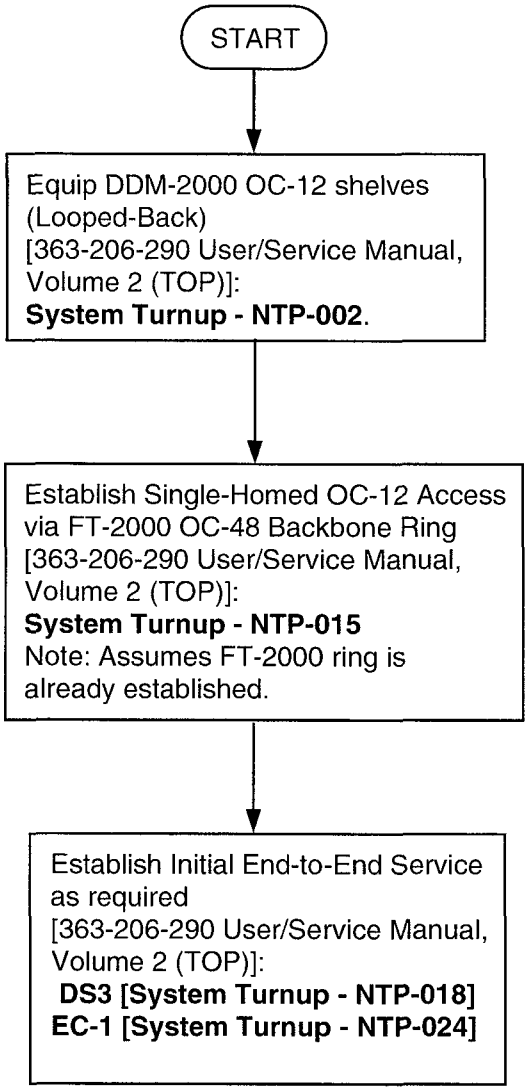


Figure 22. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

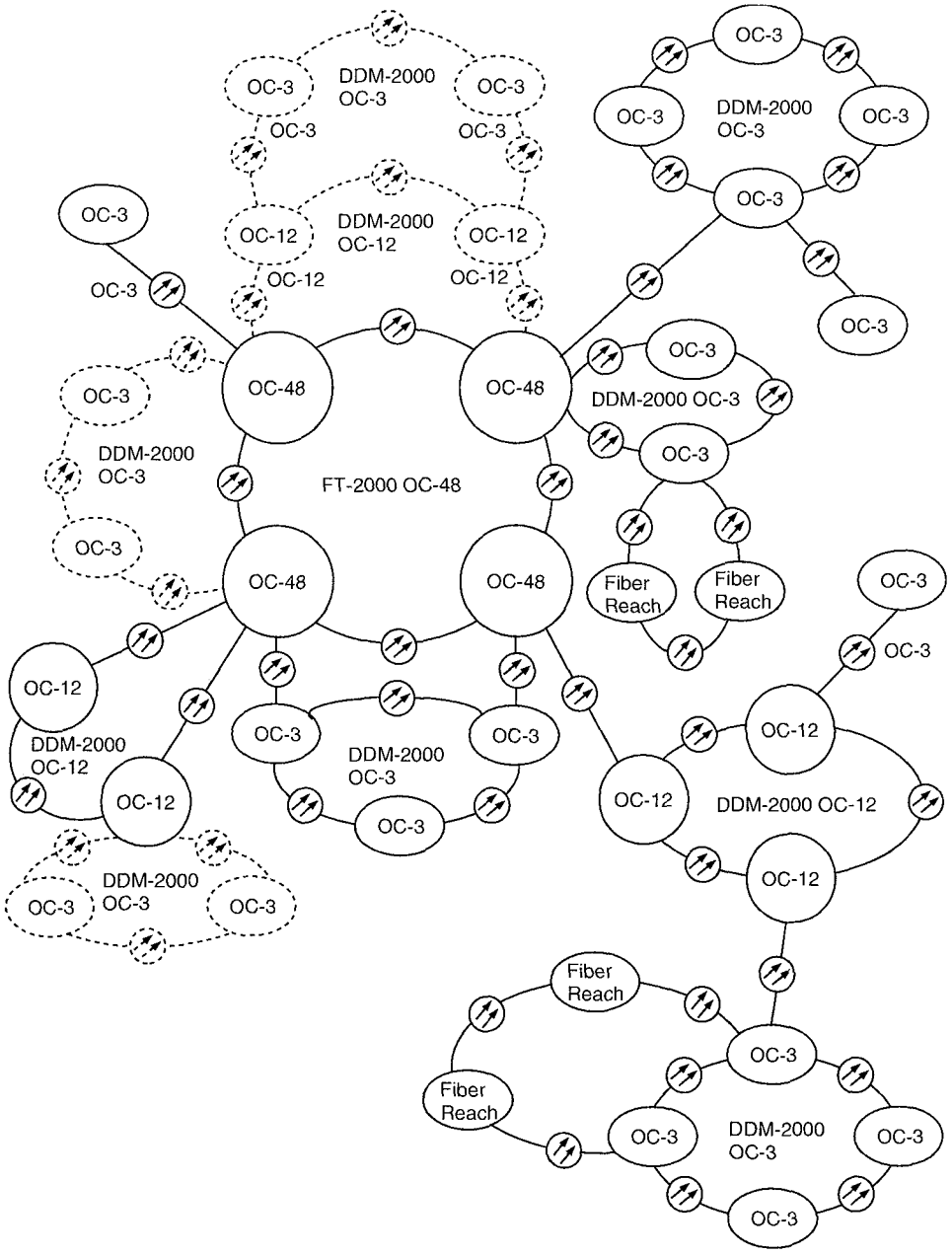


Figure 23. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

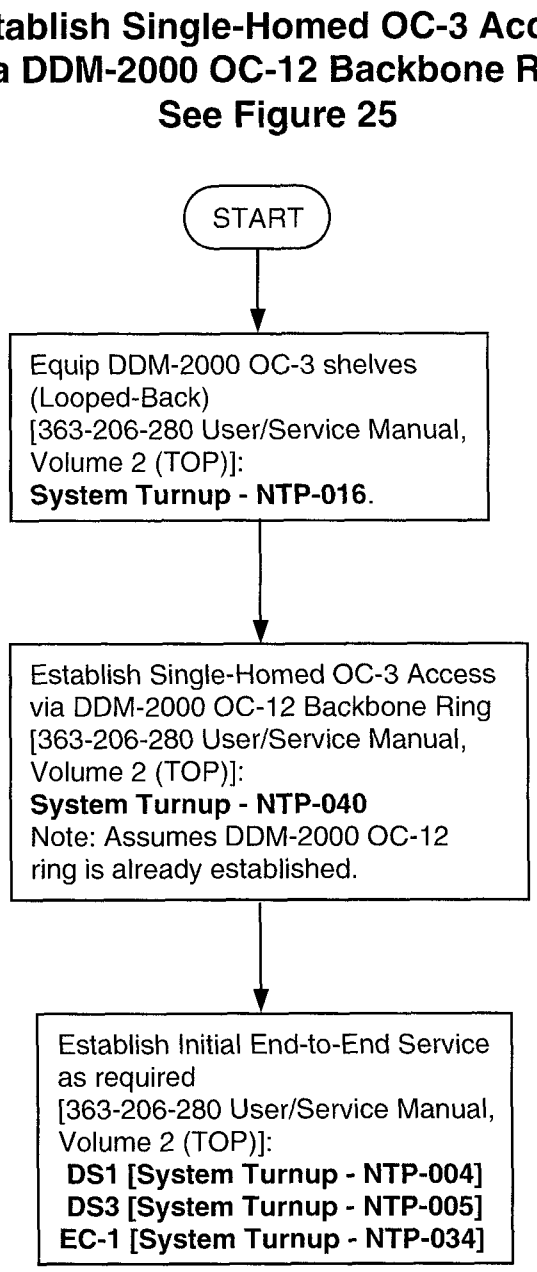


Figure 24. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

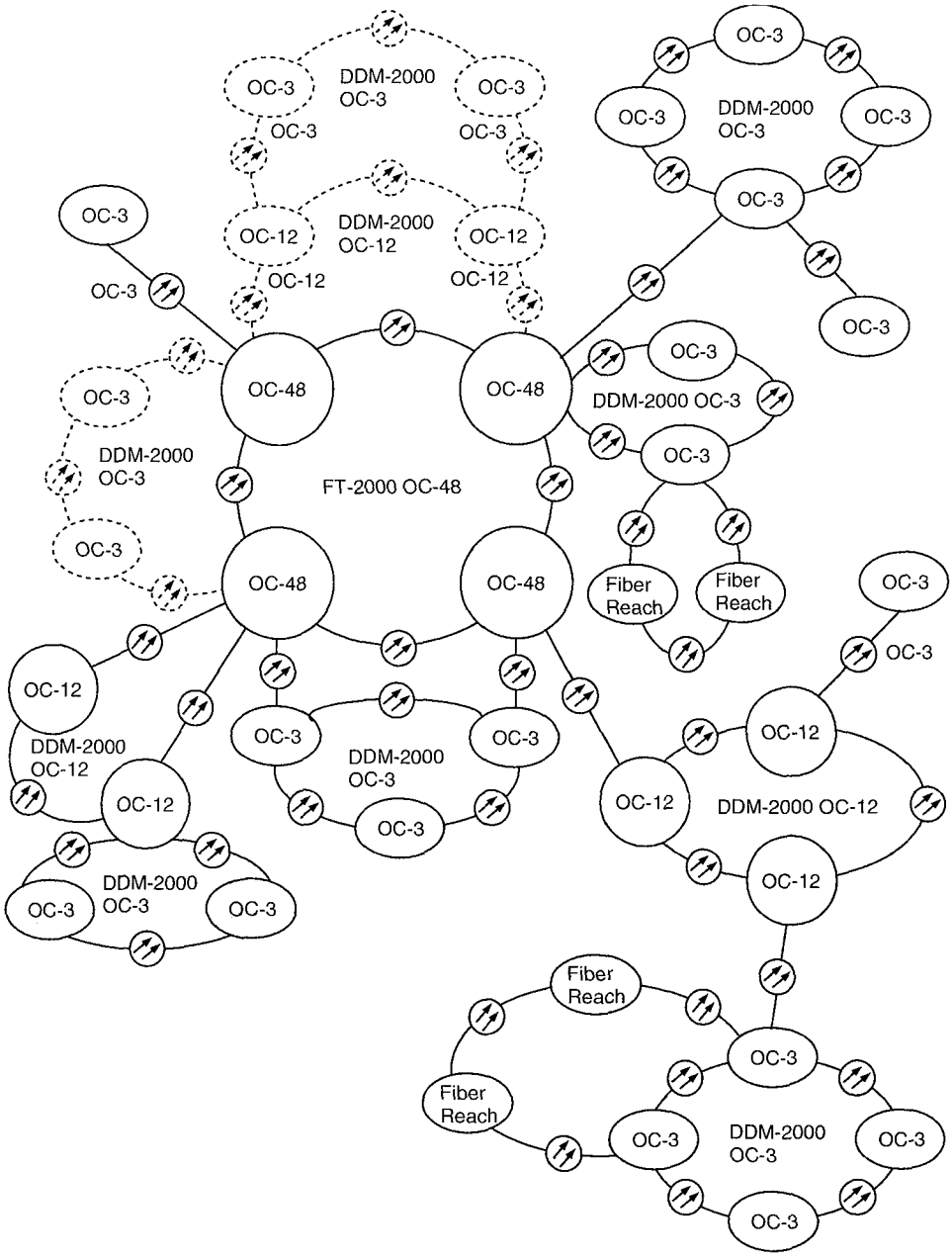


Figure 25. DDM-2000/FT-2000 Large Network Configurations — Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

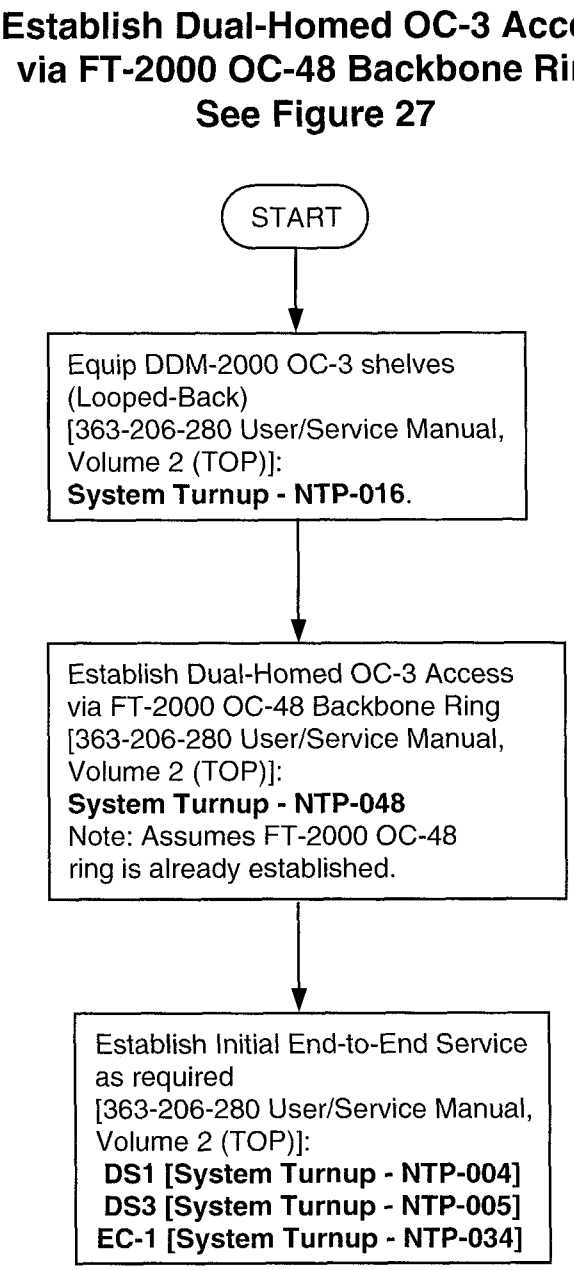


Figure 26. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring

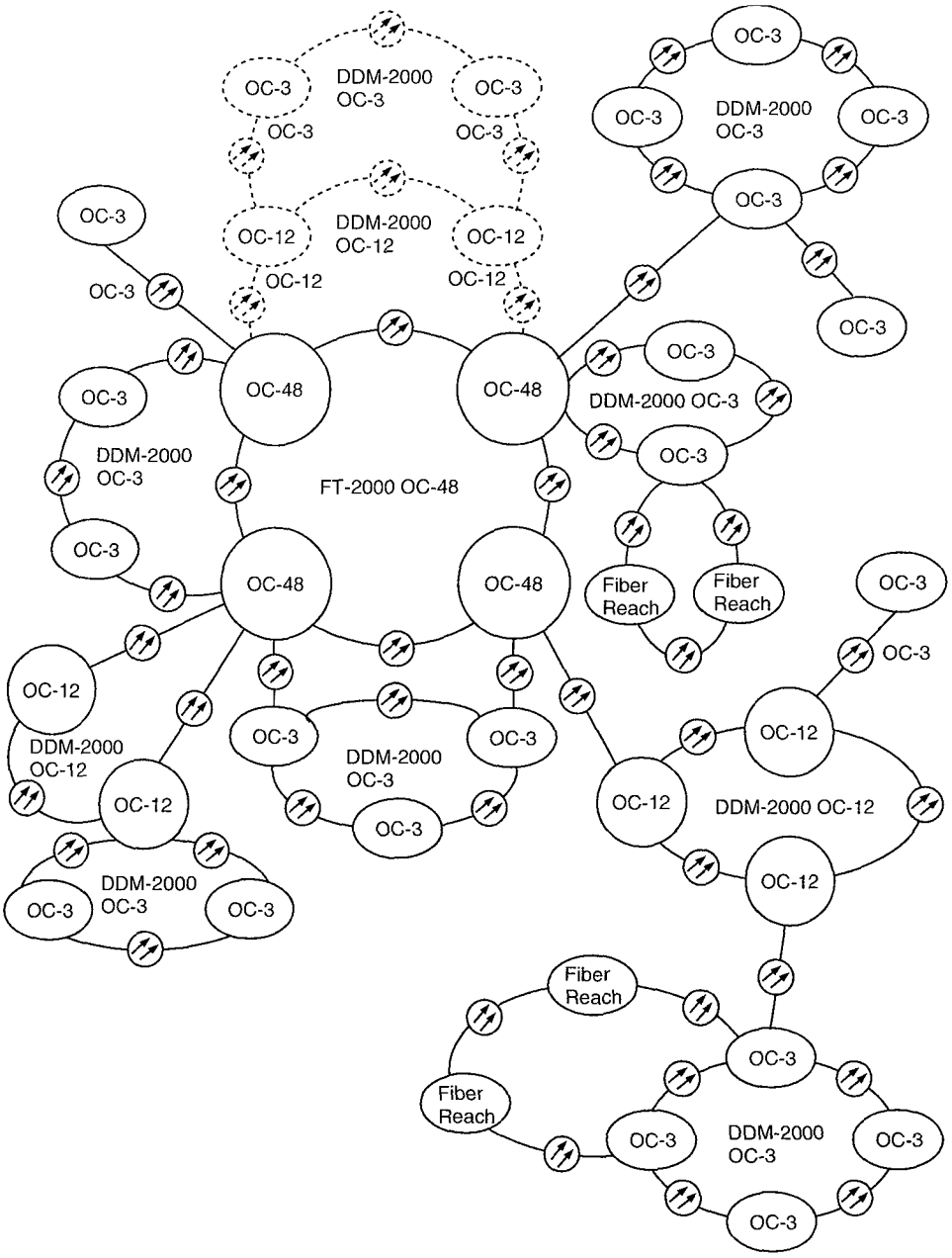


Figure 27. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via FT-2000 OC-48 Backbone Ring

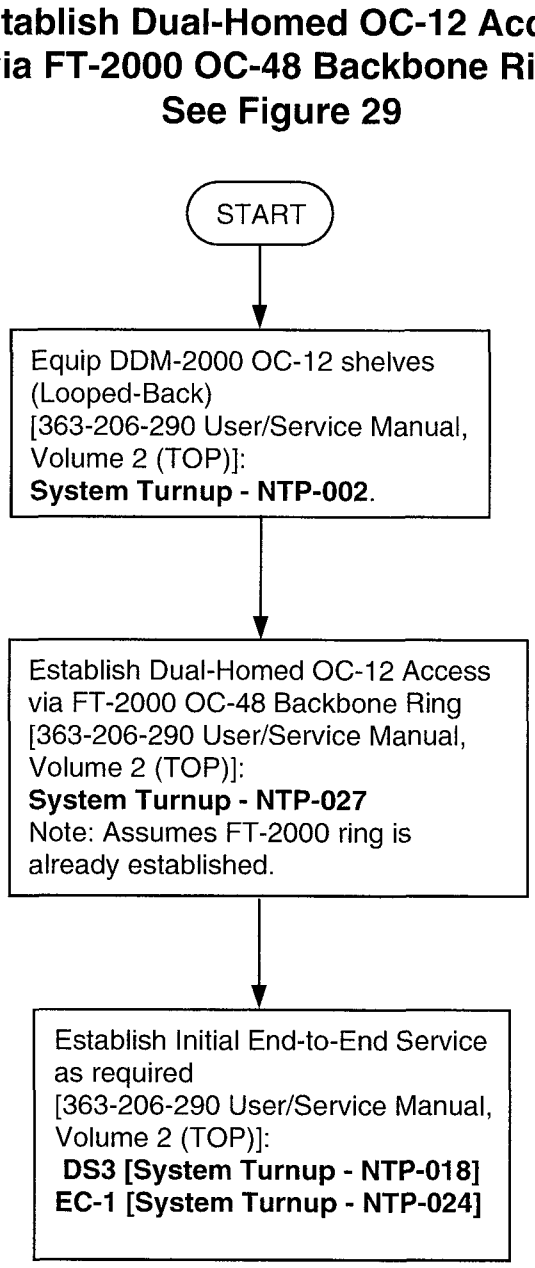


Figure 28. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

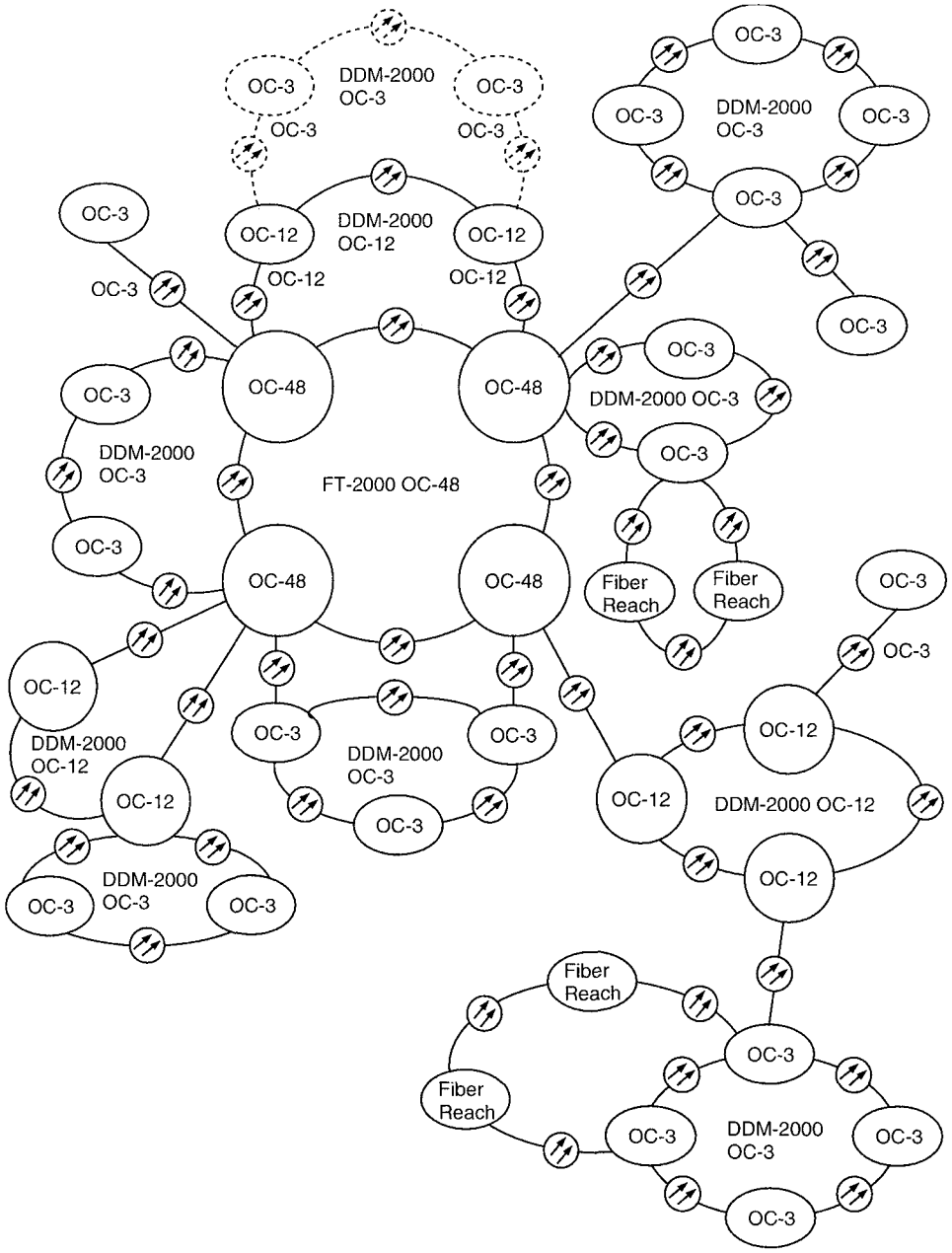


Figure 29. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

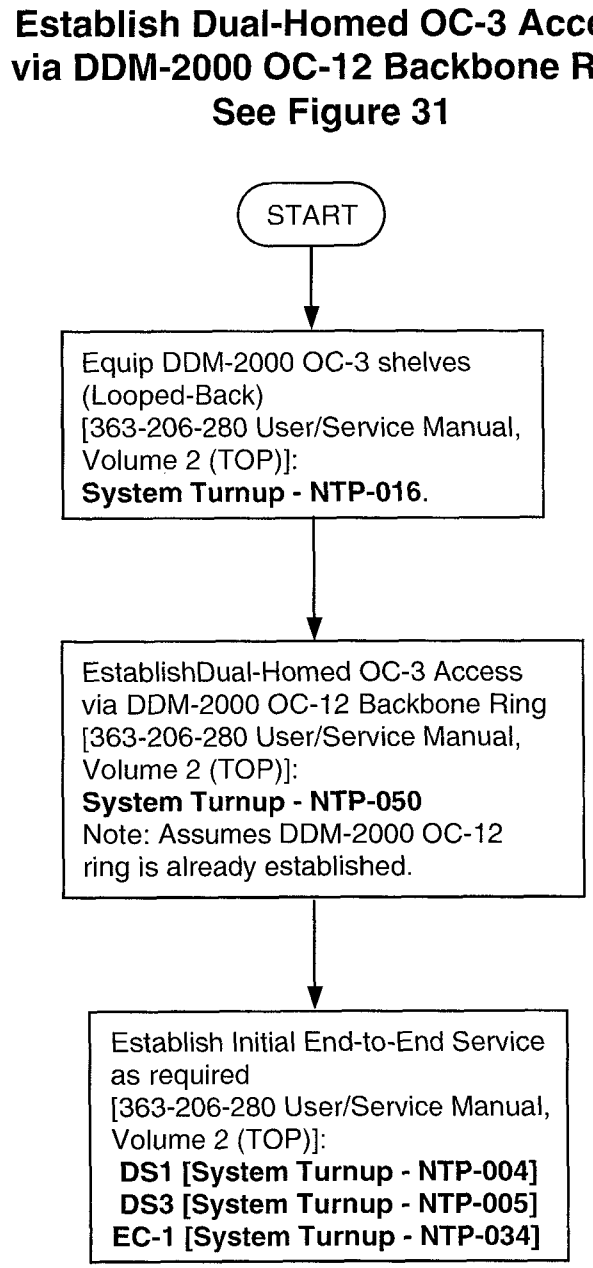


Figure 30. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

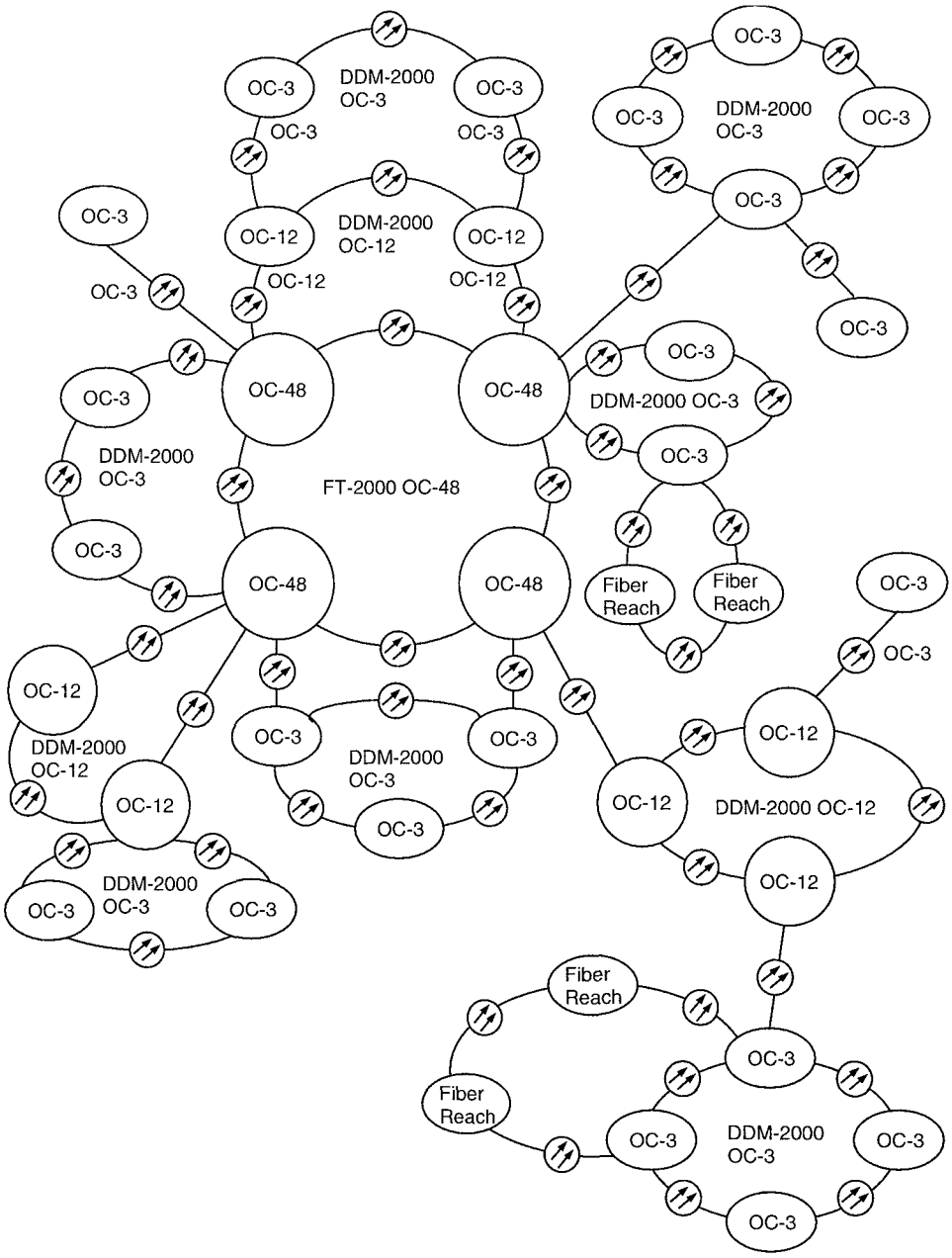


Figure 31. DDM-2000/FT-2000 Large Network Configurations — Dual-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring

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. 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:
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 A** and **B** LEDs lighted on User Panel).

NOTE 2:
Some of the circuit packs have 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. Install **BCP4 OHCTL** circuit pack.	**DLP-500**

3. ⇒ NOTE:
If system software has not been previously installed in the **OHCTL** and **SYSCTL**, it must be installed [**DLP-527**] after the **SYSCTL** is installed.

Install **BBG8 SYSCTL** circuit pack. **DLP-557**

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.
- Line timing mode is specified but the **OLIU**s will be optically looped back at the shelf.

When the DS1 external timing references become available or when the end-to-end system is established, the timing mode must be changed to the specified timing mode. If external timing is the specified timing mode and external timing is available to the shelf, the timing mode may be set for external timing.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Install **TGS** timing circuit packs.	**DLP-502**
5. Install **BCP3 TSI** circuit packs.	**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.	
8. Install **21G/21G-U OLIU** circuit packs (if required) with **HIGH/LOW POWER** switches set to **LOW**.	**DLP-503**
9. Install **21G2-U OLIU** circuit packs (if required).	**DLP-503**
10. Install **21D/21D-U OLIU** circuit packs (if required).	**DLP-503**

11. ⚠ CAUTION:
Before looping a shelf, verify/set DSNE parameter of the **`rtrv-ne:/set-ne:`** *command to* **no**. *This parameter will be set as required when the shelf is integrated into a network. Only one DSNE is allowed in a network.*

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 1:
If fecom is enabled, an `inconsistent DCC values` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the "Network Side/User Side" parameters at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address:`***`com=disable`** command to disable the DCC.

NOTE 2:
An `AGNE communication failure` alarm will also occur when the **OLIUs** are looped back. This alarm occurs because at least one shelf in the network must be set as an AGNE but the default for the shelf is AGNE=**no**. To clear the alarm during a fiber loopback, use the **`set-ne:tid:agne=`***`yes`* command.

NOTE 3:
Optical loops should be installed on **MAIN OLIU**s and then on **FUNCTION UNITS OLIU**s.

Install **MAIN** and **FUNCTION UNITS OLIU** optical loops.

A. **23G/23G-U** or **23H/23H-U OLIU**	**DLP-534**
B. **21G/21G-U/21G2-U** or **21D/21D-U OLIU**	**DLP-504**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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/BBG11B 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 and cross connections to their default values.*

⇒ NOTE 1:
An `inconsistent DCC values` alarm will occur when the **init-sys:all** command is executed because "fecom" becomes enabled again. To clear the alarm, use the **set-fecom:***address*:**com=disable** to disable the DCC.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
An `AGNE communication failure` alarm will also occur when the **`init-sys:all`** command is executed because the AGNE parameter of the **`set-ne:`** command is set to **`no`** again. To clear the alarm, use the **`set-ne:tid:agne=`***`yes`* command.

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 5.

Perform automatic local (looped back) DS3/EC1 transmission test. **DLP-508**

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 5.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Perform automatic local wiring cross-connect DS3/EC1 transmission test (looped back).	**DLP-508**
19. Perform DDM-2000 OC-12 receiver sensitivity test (if required). Optional test.	**DLP-544**
20. Check office alarm interface as required.	**DLP-512**
21. Check telemetry interface as required. A. Parallel telemetry B. Serial telemetry	 **DLP-513** **DLP-514**
22. Test protection switching function, if required.	**DLP-515**

23. ⚠ CAUTION:
The command **`init-sys:all`** *may affect service. It should never be used on an in-service system. It should be used only after a shelf has been equipped to reset all provisionable parameters and cross connections to their default values.*

⇒ NOTE 1:
An `inconsistent DCC values` alarm will occur when the **`init-sys:all`** command is executed. To clear the alarm, use the **`set-fecom:`***`address`***`:com=disable`** command to disable the DCC.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
An `AGNE communication failure` alarm will also occur when the **`init-sys:all`** command is executed because the AGNE parameter of the **`set-ne:`** command is set to **`no`** again. To clear the alarm, use the **`set-ne:tid:agne=`***`yes`* command.

Use the **`init-sys:all`** command to initialize all provisionable parameters to their original default values.

24. NOTE 1:
A craft interface terminal (CIT) is required to access optional features of the DDM-2000 OC-12 Multiplexer, such as system name (tid); site, ne, and shelf number; DSNE, alarm groups and AGNE; security and logins; date and time; far end communications (fecom); etc.

NOTE 2:
Alarm activity will result when optical fiber loops are removed for end-to-end system testing.

Activate optional features as required from work order or office records. **DLP-509**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

25. After all shelves in the network have been tested, you can establish the end-to-end DDM-2000 OC-12 subnetwork.

    A. DDM-2000 OC-12 Path Switched Rings [**NTP-020**]
    B. Single-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring [**NTP-003**]
    C. Dual-Homed OC-3 Access via DDM-2000 OC-12 Backbone Ring [**NTP-004**]
    D. OC-3/IS-3 Dual Ring Interworking — DDM-2000 OC-12 to OC-3 or FT-2000 Ring [**NTP-011**]
    E. EC-1 Dual Ring Interworking — DDM-2000 OC-12 to OC-3 or FT-2000 Ring [**NTP-014**]
    F. Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring [**NTP-015**]
    G. Dual-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring [**NTP-027**]

Establish Single-Homed OC-3/IS-3 Access via DDM-2000 OC-12 Backbone Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

---

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

NOTE 2:
It is assumed that all DDM-2000 OC-12 shelves in the system have passed the looped transmission test(s) (LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume II,* **System Turnup: NTP-002**) and the DDM-2000 OC-12 ring has been established (LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume II,* **System Turnup: NTP-020**). It is also assumed the DDM-2000 OC-3 shelves have been equipped and tested, **System Turnup: NTP-016**.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Determine the network configuration (for example, see Figures 1 and 2.)	
2. Verify that the host DDM-2000 OC-12 shelf is equipped with Release 5 or later ring software. If not equipped with Release 5 or later software, upgrade the DDM-2000 OC-12 host shelf with proper software. Verify that the DDM-2000 OC-3 shelf is equipped with Release 9 or later ring software.	**DLP-526**
3. Determine the optical loss of each optical span from office records or by making the required measurements.	
4. ⇒ NOTE: The **rtrv-eqpt:** command retrieves the Equipage and Version Report. This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.	
At OC-12 node, verify/install **21G/21G-U/21G2-U/21D/21D-U OLIU** circuit packs in **FUNCTION UNITS** slots (**FN A**, **FN B**, **FN C**, or **FN D**) being used for the new OC-3/IS-3 extension.	**DLP-503**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE 1:
If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops.

⇒ NOTE 2:
If fecom is enabled, an `inconsistent DCC values` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTL**s at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address`***`:com=disable`** command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIU**s just installed. **DLP-504**

6. ⇒ NOTE:
The Network Side (NS)/User Side (US) parameters of the **`set-fecom:`** command must be set opposite at each end of the optical spans. For example, see Figure 3.

Use the **`rtrv-fecom/set-fecom`** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

7. Use the **`rtrv-oc3/set-oc3`** command at the OC-12 shelf to verify/set application (*app*) parameter for the OC-12 **FUNCTION UNITS** slots being used for this single-homed configuration. For example, **`set-oc3:fn-a,app=`***`0X1`*.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-3 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. (OC-3 Reference: LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume II*, **DLP-513**). **DLP-510**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled for the OC-3 **MAIN-1** and **MAIN-2(P)** optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring and in the **FUNCTION UNITS** slots of the host OC-12 shelf.

NOTE 2:
The **rtrv-oc3:** command retrieves the OC-3 Line Provisioning Report. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume I* and LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume I* for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte/Sbyte parameter, as required.

10. NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed OC-3 node in a ring, it **must** be enabled at all line-timed OC-3 nodes of a ring.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume I*) and LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume I*) for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

11. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a duplicate TBOS display alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a duplicate site/ne address alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a duplicate TID alarm.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

12. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an `AGNE communication failure` alarm.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **set-ne:** command to designate ONE shelf in the network as the DSNE, if not already done.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

13. ⇒ NOTE:
This single-homed ring configuration requires that the **FN-( )-1 OLIU** on the OC-12 shelf connect to the **MAIN-1 OLIU** at the first OC-3 shelf from the OC-12 shelf. **MAIN-2(P) OLIU** at the OC-3 shelf (node) connects to the **MAIN-1 OLIU** at an adjacent OC-3 shelf (node). The **MAIN-2(P) OLIU** at the last OC-3 shelf on the OC-3 ring connects to **FN-( )-2(P) OLIU** on the host OC-12 shelf. See Figure 2. This procedure will establish the ring configuration starting from the OC-12 host node (near end) to the first OC-3 node, then continuing to the next node until the final connection is made from the last OC-3 node back to the host OC-12 node.

At the near end, remove the optical loop from the **21G/21G-U/21G2-U/21D/21D-U OLIU** (for example in Figure 2, OC-12 shelf **FN-A-1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated **OLIU** (for example, in Figure 2, OC-3 **MAIN-1 OLIU**).

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

14. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each shelf** to enable far end communications.

At each shelf, use the **`set-fecom:`***`address`***`:com=enabled`** command to ensure far end communications (fecom) is enabled.

15. Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-551**

16. ⇒ NOTE:
The **`rtrv-pm-line`** command in the following procedure displays performance monitoring data associated with the OC-3 lines terminated on the system.

Perform end-to-end OC-3 line test. **DLP-552**

17. Repeat this procedure from Step 13 for all OC-3 optical spans back to the host OC-12 shelf.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

18. ⇒ NOTE:
Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The single-homed DDM-2000 OC-3 access network is now ready for initial service to be established. For DS3, EC-1, STS-3c, and video terminations on a DDM-2000 OC-12 shelf, use the procedures in LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume II* to establish those services. For DS1, DS3, and/or EC-1 terminations on a DDM-2000 OC-3 shelf, use the procedures in this LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume II* to establish those services.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

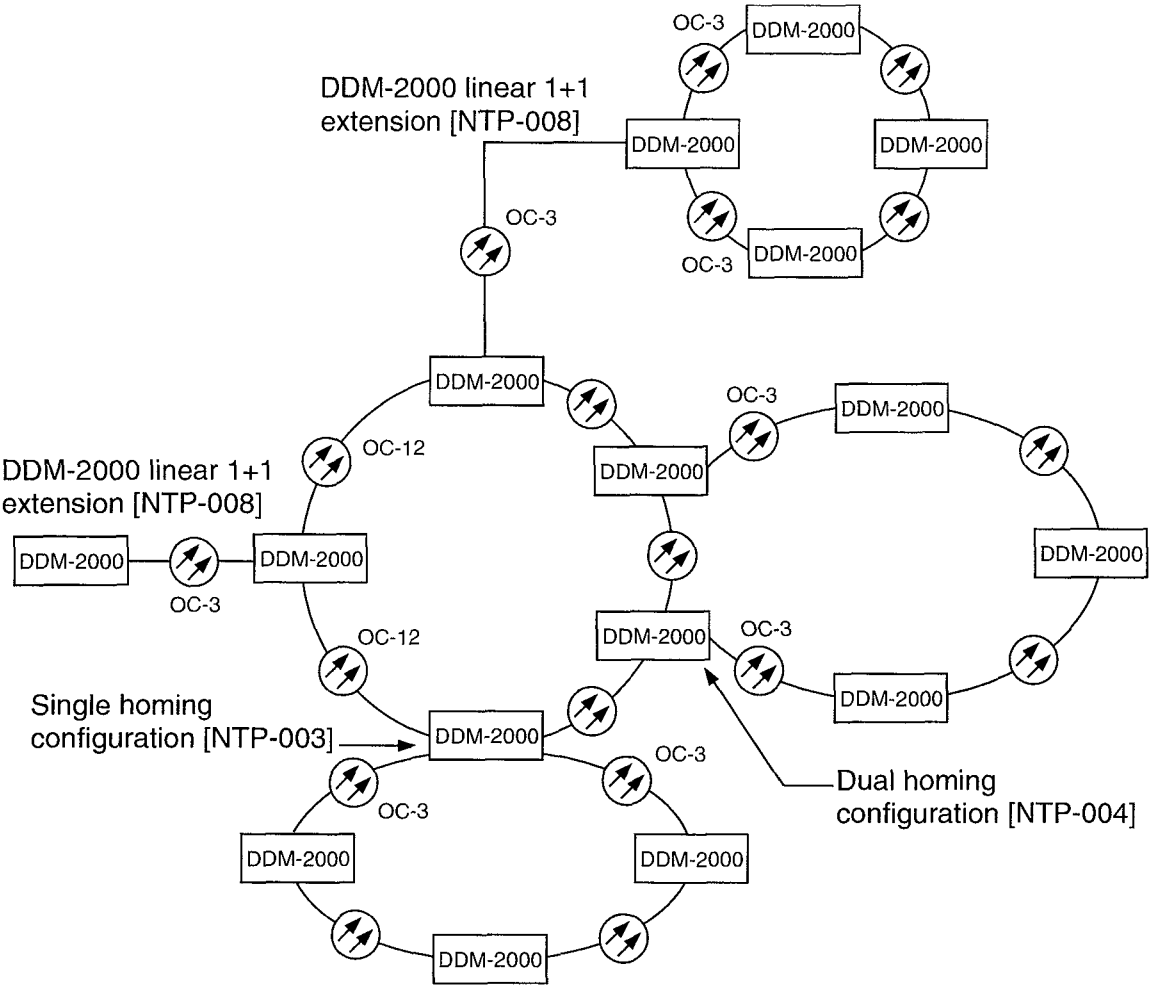


Figure 1. Example DDM-2000 OC-12/DDM-2000 OC-3 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

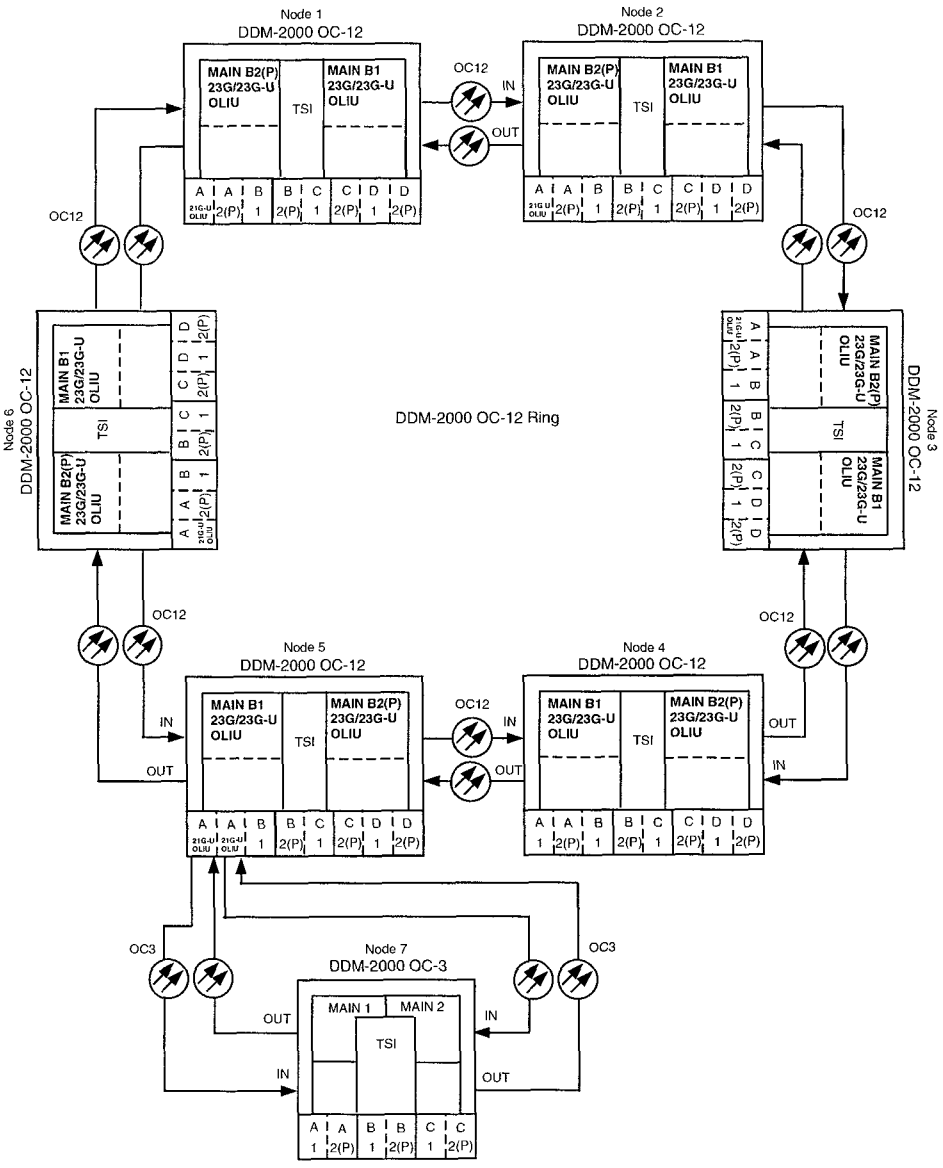
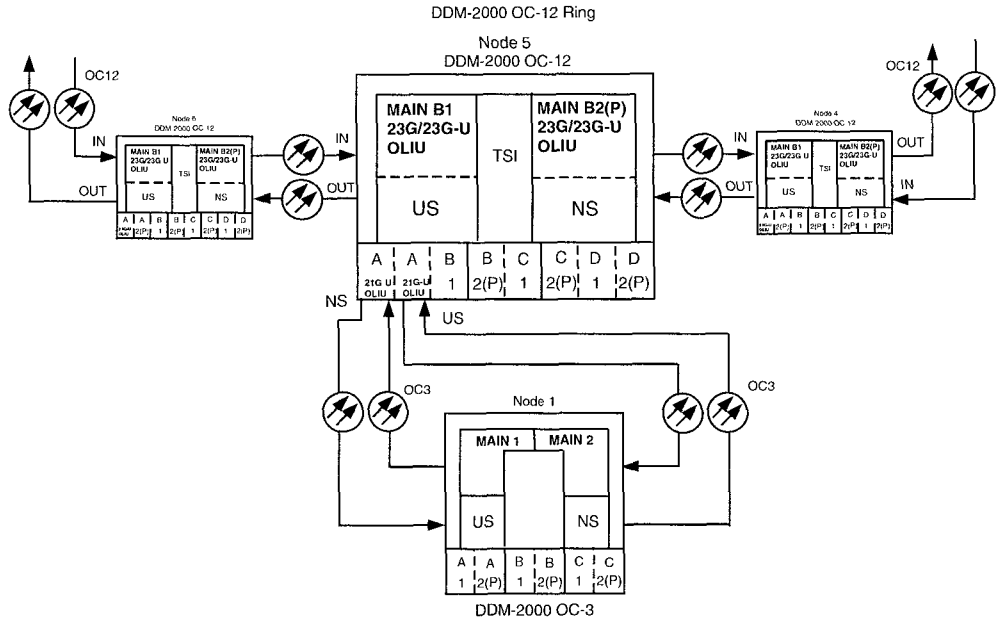


Figure 2. Example Single-Home Ring Configuration Connections

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
21-Type OLIUs (0X1 or video)	**FN-A-1** dcc-a1	**FN-A-2** dcc-a2	**FN-B-1** dcc-b1	**FN-B-2** dcc-b2	**FN-C-1** dcc-c1	**FN-C-2** dcc-c2	**FN-D-1** dcc-d1	**FN-D-2** dcc-d2
	NS	US	NS	US	NS	US	NS	US
23-Type OLIUs	**MAIN-B-1** dcc-mb1		**MAIN-B-2** dcc-mb2					
	US		NS					



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
22-Type OLIUs	**MAIN-1** dcc-m1	**MAIN-2** dcc-m2	**FN-A** dcc-a		**FN-B** dcc-b		**FN-C** dcc-c	
	US	NS	NS		NS		NS	
27-Type OLIUs	**MAIN-1** dcc-m1-1 dcc-m1-2	**MAIN-2** dcc-m2-1 dcc-m2-2	**FN-A-1** dcc-a1-1 dcc-a1-2	**FN-A-2** dcc-a2-1 dcc-a2-2	**FN-B-1** dcc-b1-1 dcc-b1-2	**FN-B-2** dcc-b2-1 dcc-b2-2	**FN-C-1** dcc-c1-1 dcc-c1-2	**FN-C-2** dcc-c2-1 dcc-c2-2
	US	NS	NS	US	NS	US	NS	US

Figure 3. Example of User Side/Network Side Value Settings

Establish Dual-Homed OC-3/IS-3 Access via DDM-2000 OC-12 Backbone Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

NOTE 2:
It is assumed that all DDM-2000 OC-12 shelves in the system have passed the looped transmission test(s) (LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume II,* **System Turnup: NTP-002**) and the host DDM-2000 OC-12 ring has been established (LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume II,* **System Turnup: NTP-020**) with software to support DDM-2000 OC-3 optical line access. It is also assumed the DDM-2000 OC-3 shelves have been equipped and tested, **System Turnup: NTP-016**.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Determine the network configuration (for example, see Figures 1, 2, and 3.)	
2. Verify the host DDM-2000 OC-12 shelves (for example, Figures 2 and 3, nodes 4 and 5) are equipped with Release 5 or later ring software. If not equipped with Release 5 or later software, upgrade the DDM-2000 OC-12 host shelves with proper software. Verify that the DDM-2000 OC-3 shelf is equipped with Release 9 or later software.	**DLP-526**
3. Determine the optical loss of each optical span from office records or by making the required measurements.	
4. ⇒ NOTE: The **rtrv-eqpt:** command retrieves the Equipage and Version Report. This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.	
At OC-12 node, verify/install **21G/21G-U/21G2-U/21D/21D-U OLIU** circuit packs in **FUNCTION UNITS** slots (**FN A**, **FN B**, **FN C**, or **FN D**) being used for the new OC-3/IS-3 extension.	**DLP-503**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE 1:
If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops.

⇒ NOTE 2:
If fecom is enabled, an `inconsistent DCC values` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTL**s at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address`***`:com=disable`** command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIU**s just installed. **DLP-504**

6. ⇒ NOTE:
The Network Side (NS)/User Side (US) parameters of the **`set-fecom:`** command must be set opposite at each end of the optical spans. For example, see Figures 4 and 5.

Use the **`rtrv-fecom/set-fecom`** command to verify/set "Network Side/User Side" parameters at each end of OC-3 optical span being established.

7. Use the **`rtrv-oc3/set-oc3`** command at the OC-12 shelf to verify/set application (*app*) parameter for the OC-12 function slots being used for this single homed configuration. For example, **`set-oc3:fn-a,app=`***`0X1`*.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-3 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records. (OC-3 Reference: LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume II,* **DLP-513**) **DLP-510**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled for the OC-3 **MAIN-1** and **MAIN-2(P)** optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring and in the **FUNCTION UNITS** slots of the host OC-12 shelf.

NOTE 2:
The **rtrv-oc3:** command retrieves the OC-3 Line Provisioning Report. This report displays the provisioned configuration of OC-3 lines. See the "Commands and Reports" section of LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume I* and LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume I* for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:** command to enable or disable the Kbyte/Sbyte parameter, as required.

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10. NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed OC-3 node in a ring, it **must** be enabled at all line-timed OC-3 nodes of a ring.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume I* and LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume I* for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

11. NOTE:
Two or more shelves in the same network with the same TBOS display number (set by the **set-ne** command) will cause a duplicate TBOS display alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a duplicate site/ne address alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a duplicate TID alarm. Two or more shelves in the same network designated as a DSNE (set by the **set-ne** command) will cause a duplicate DSNE alarm.

Verify no duplicate TBOS, site/ne, TID or DSNE settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the network **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an `AGNE communication failure` alarm.

Use the **set-ne:** command to designate ONE shelf as the DSNE.

Use the **set-ne:** command to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE 1:
In dual homing configurations, **OLIU** circuit packs must be installed in the correct **FUNCTION UNITS** slots in the host OC-12 nodes to support the direction of traffic required. For example, see Figures 2 and 3. In Figure 2, if a **21G-U/21G2-U/21D-U OLIU** is installed in Node 5, **FUNCTION UNITS** group **A**, slot **1**, traffic will be routed toward Node 6 when cross connections are made. The other end of the associated OC-3 ring must be connected to a **21G-U/21G2-U/21D-U OLIU** installed in slot **2(P)** of the **FUNCTION UNITS** group **( )** being used to terminate the OC-3 line (for example, Node 4 in Figure 2). Traffic from Node 4 will then be directed toward Node 3 when cross-connections are made. In Figure 3, note that all traffic from the OC-3 shelf will be directed to Node 8 because of the slot positions that terminate the OC-3 line.

⇒ NOTE 2:
A dual-homed ring configuration requires that the first OC-3 **MAIN-1 OLIU** connect to **FUNCTION UNITS ( ) 1 OLIU** on one host OC-12 shelf. The last OC-3 **MAIN-2(P) OLIU** connects to the **FN( ) 2(P) OLIU** on the other host OC-12 shelf. Intermediate OC-3 shelves on the same OC-3 ring connect from **MAIN-2(P) OLIU** at one OC-3 shelf to the **MAIN-1 OLIU** at an adjacent OC-3 shelf (node). For example, see Figure 3. This procedure will establish the ring configuration starting from one OC-12 host node (near end) and continuing to an adjacent OC-3 node, then to the next OC-3 node until the final connection is made from the last OC-3 node to the remaining OC-12 host node.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
Unused optical connectors on **OLIU**s should remain looped until optical line connections are made.

At the near end OC-12 host node, remove the optical loop from the **FUNCTION UNITS OC-3 OLIU** being used for the OC-3 ring configuration (for example, in Figure 3, OC-12 shelf Node 5, slot **FN-A-1**) At the other end of the optical span being established, remove the optical loop from the associated **OLIU** (for example, in Figure 3, OC-3 shelf Node 7 **MAIN-1 OLIU**.

14. NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each shelf** to enable far end communications.

At each shelf, use the **`set-fecom:`***`address`***`:com=enabled`** command to ensure far end communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
15. Perform optical fiber connections and verification of the integrity of the optical span being established.	**DLP-551**
16. ⇒ NOTE: The **`rtrv-pm-line`** command in the following procedure displays performance monitoring data associated with the OC-3 lines terminated on the system. Perform end-to-end OC-3 line test.	**DLP-552**
17. Repeat this procedure from Item 13 for all OC-3 optical spans being established in the DDM-2000 OC-12/OC-3 network. Ensure that the last optical span connected to the OC-12 host shelf is connected to an **OLIU** in the opposite slot as the one in the first host OC-12 (for example in Figure 3, slot **1** at one host node and slot **2(P)** at the other host node).	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

18. ⇒ NOTE:
Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The dual-homed DDM-2000 OC-3 access network is now ready for initial service to be established. For DS3, EC-1, STS-3c, and video terminations on a DDM-2000 OC-12 shelf, use the procedures LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, User/Service Manual—Volume II* to establish those services. For DS1, DS3, and/or EC-1 terminations on a DDM-2000 OC-3 shelf, use the procedures in this LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, User/Service Manual—Volume II* to establish those services.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

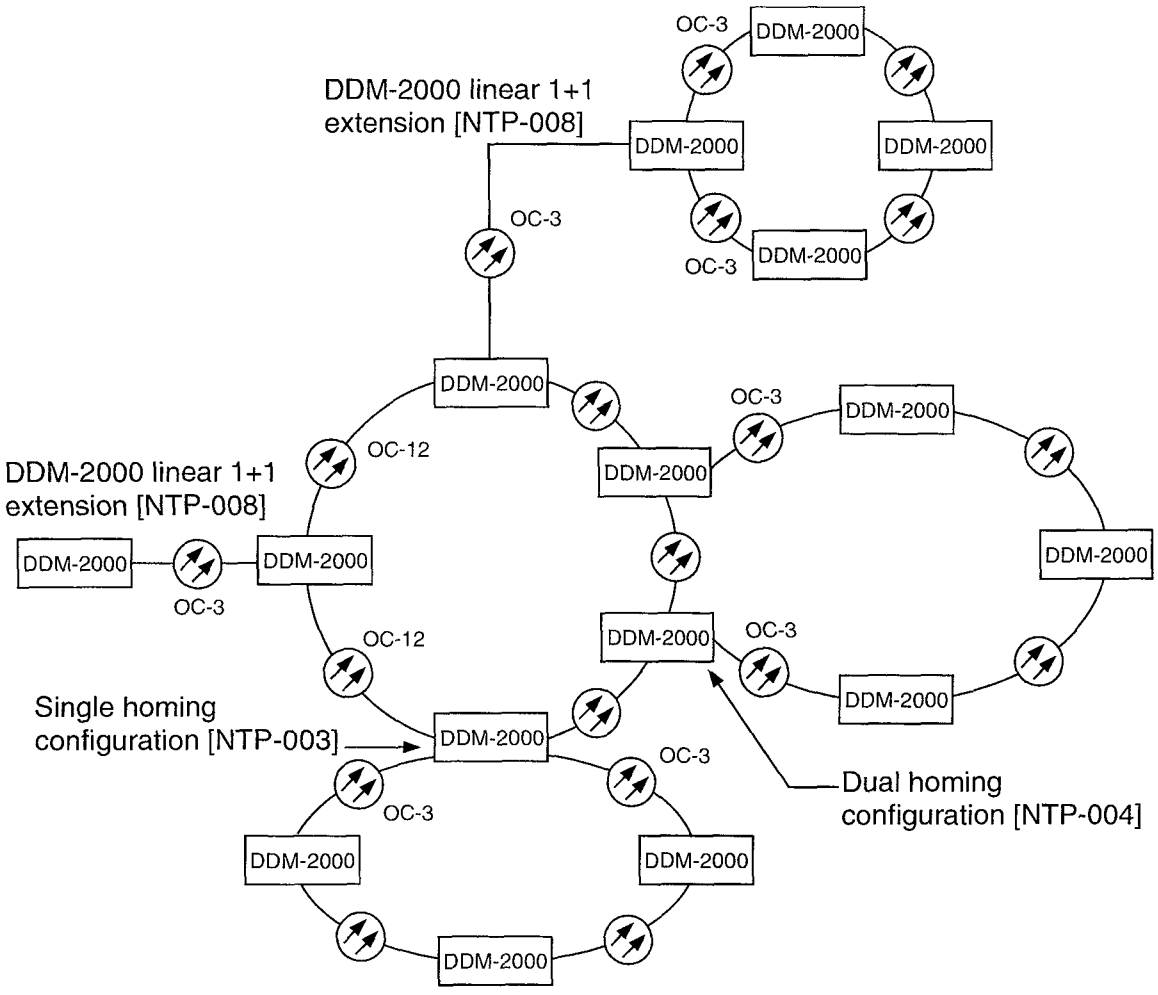


Figure 1. Example DDM-2000 OC-12/DDM-2000 OC-3 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

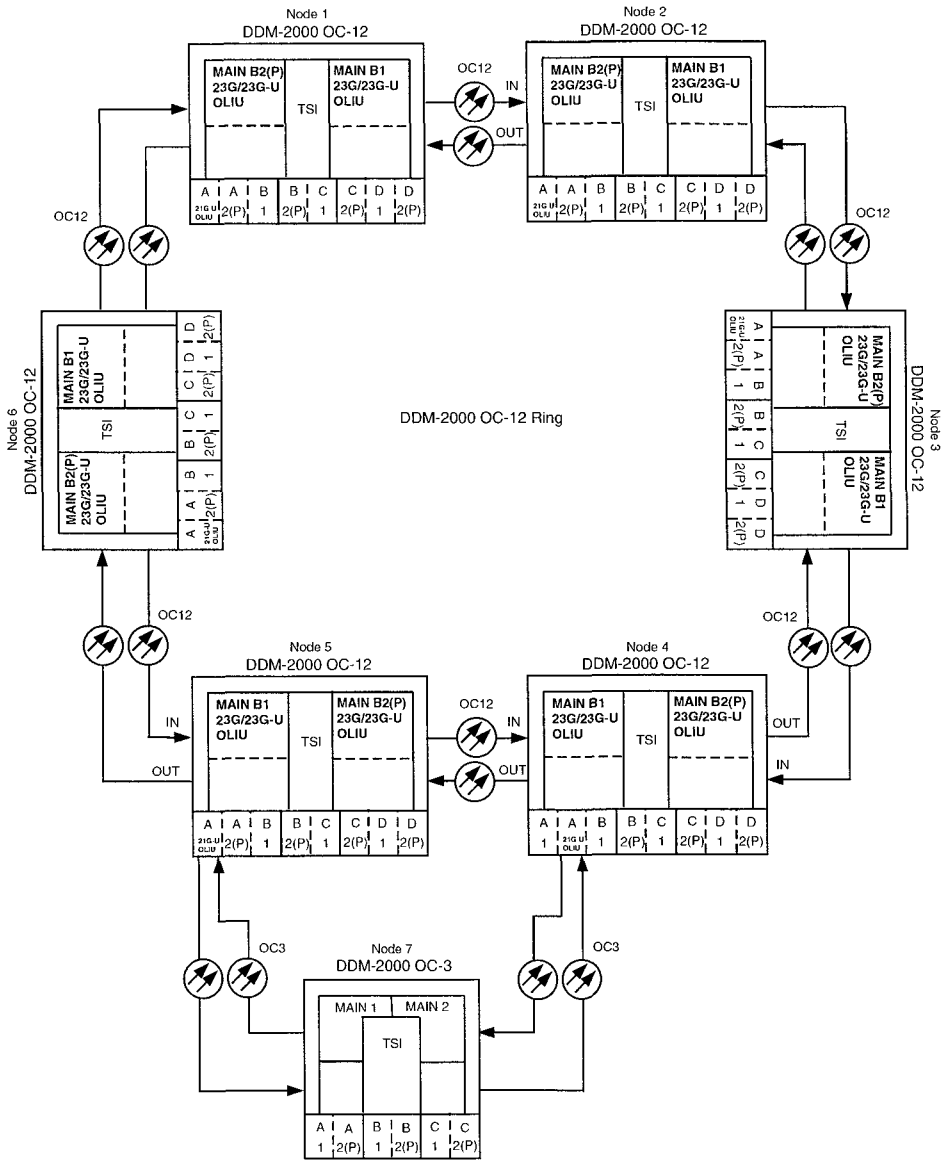


Figure 2. Example Dual-Homed OC-3/OC-12 Ring Configuration

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

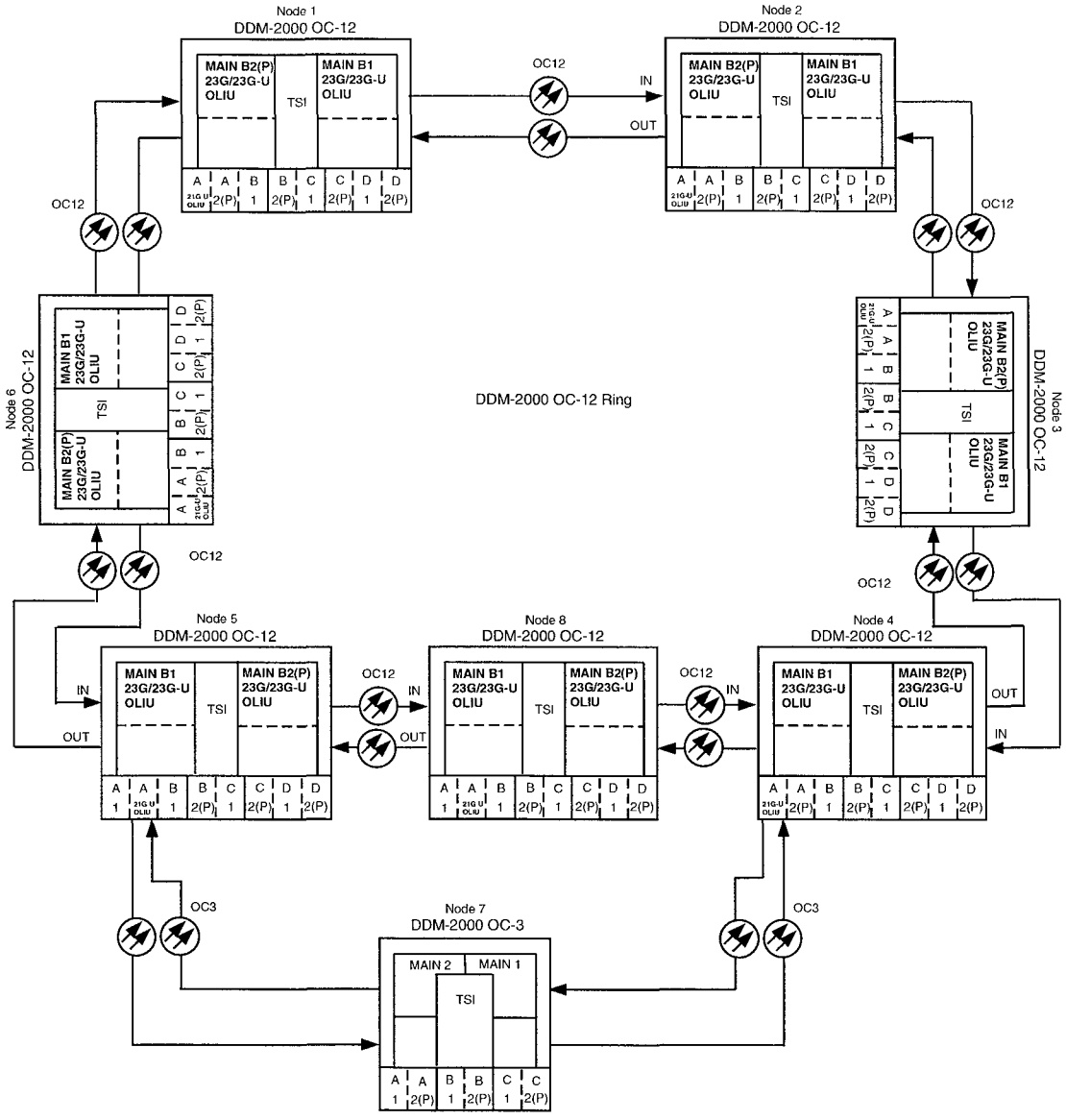
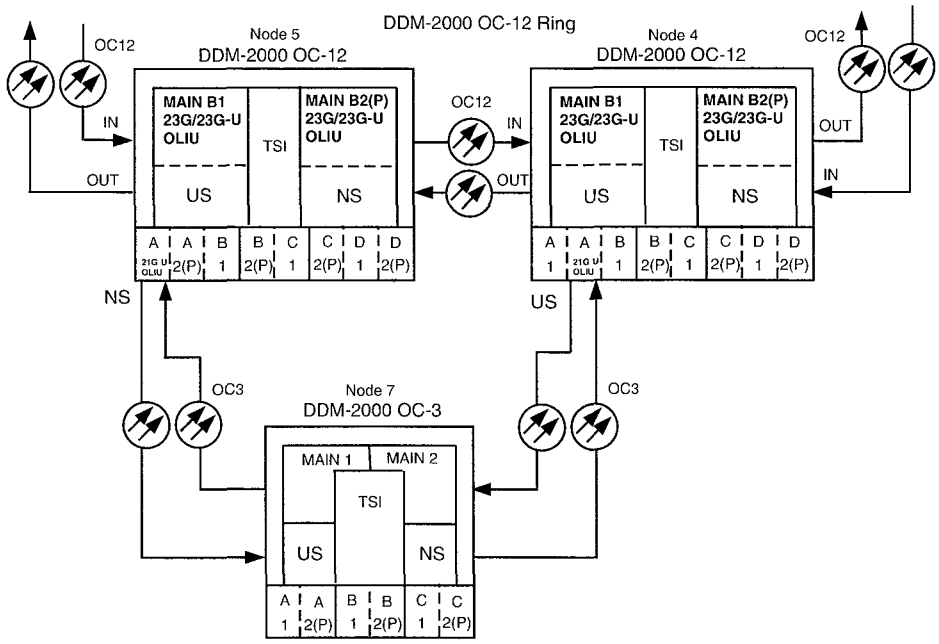


Figure 3. Example Dual-Homed OC-3/OC-12 Ring Configuration

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
21-Type OLIUs (0X1 or video)	**FN-A-1** dcc-a1	**FN-A-2** dcc-a2	**FN-B-1** dcc-b1	**FN-B-2** dcc-b2	**FN-C-1** dcc-c1	**FN-C-2** dcc-c2	**FN-D-1** dcc-d1	**FN-D-2** dcc-d2
	NS	US	NS	US	NS	US	NS	US
23-Type OLIUs	**MAIN-B-1** dcc-mb1		**MAIN-B-2** dcc-mb2					
	US		NS					

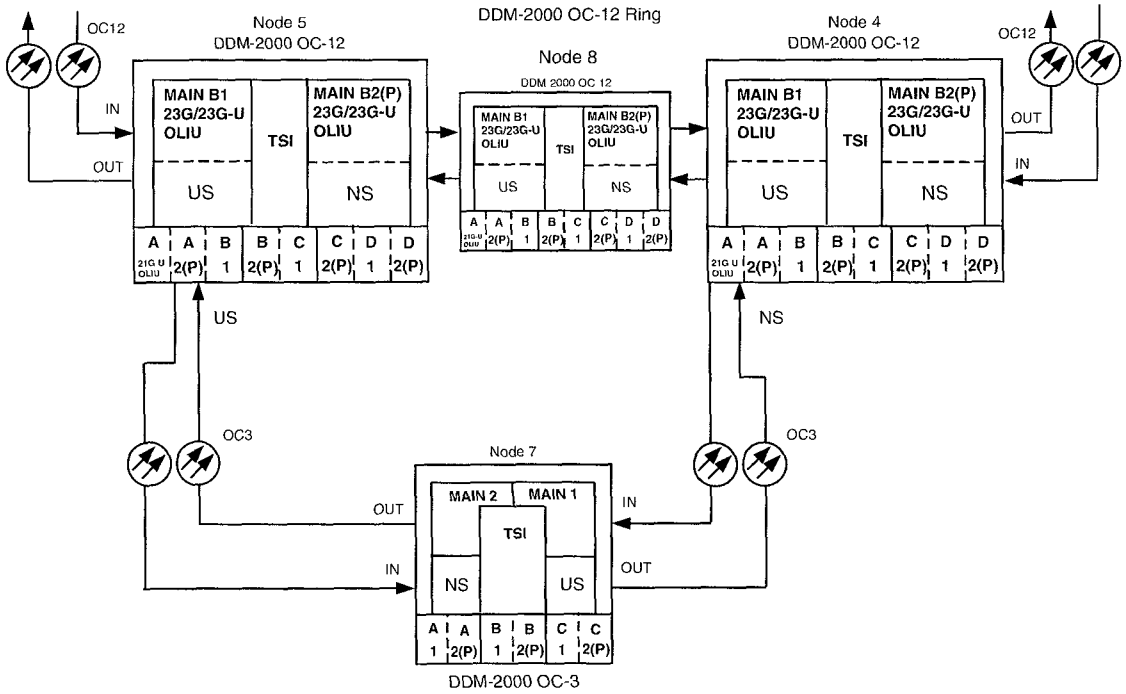


DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)					
22-Type OLIUs	**MAIN-1** dcc-m1	**MAIN-2** dcc-m2	**FN-A** dcc-a	**FN-B** dcc-b	**FN-C** dcc-c
	US	NS	NS	NS	NS

Figure 4. Example of User Side/Network Side Value Settings

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)								
21-Type OLIUs (0X1 or video)	**FN-A-1** dcc-a1	**FN-A-2** dcc-a2	**FN-B-1** dcc-b1	**FN-B-2** dcc-b2	**FN-C-1** dcc-c1	**FN-C-2** dcc-c2	**FN-D-1** dcc-d1	**FN-D-2** dcc-d2
	NS	US	NS	US	NS	US	NS	US
23-Type OLIUs	**MAIN-B-1** dcc-mb1		**MAIN-B-2** dcc-mb2					
	US		NS					



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)					
22-Type OLIUs	**MAIN-1** dcc-m1	**MAIN-2** dcc-m2	**FN-A** dcc-a	**FN-B** dcc-b	**FN-C** dcc-c
	US	NS	NS	NS	NS

Figure 5. Example of User Side/Network Side Value Settings

Establish Video Broadcast Access via DDM-2000 OC-12 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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 ring 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 ring system.

   ⇒ NOTE 2:
   If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

   At the OC-3c video terminating node(s) (CO and RTs) of the circuit being established, determine which **FUNCTION UNITS** slots (**FN A**, **B**, **C**, or **D**) are being used for the service and what options are to be selected. For example, see Figure 1.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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.

Verify/install **21G/21G-U/21G2-U/21D/21D-U OLIU** circuit packs in **FUNCTION UNITS** slots (**FN A**, **FN B**, **FN C**, or **FN D**) being used for the video service. **DLP-503**

3. Connect optical loops for **FUNCTION UNITS OLIU**s just installed. **DLP-504**

4. ⇒ NOTE:
The **rtrv-oc3:** command retrieves the `OC-3 Line Provisioning Report`. This report lists information about each OC-3 line. This information includes attributes set by the **set-oc3:** command. The applications (*app*) parameter of the **set-oc3** command must be set to *video* at the CO and each terminating (drop) shelf. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3/set-oc3:** command to verify/set the applications parameter to *video* and verify/set other characteristics of the OC-3 line or line pairs. (For example, see Figure 1,
set-oc3:fn-{a,b,c,d,all},app=*video*)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. ⇒ NOTE: The STS-3c feature allows STS-3c service (concatenated signals) to be supported and must be licensed for use. Use the **set-feat:** command at each OC-12 shelf in the network to enable the OC-12 shelf for each STS-3c service licensed for use. (**set-feat:feat=***sts3c*,**act=***enabled*)	
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. Determine the optical loss of each optical span from office records or by making the required measurements.	
8. Perform optical fiber connections and verification of the integrity of the OC-3c optical spans being established.	**DLP-551**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE 1:
Release 5 supports manual STS-1/STS-3c cross-connections in OC-12 ring applications. Manual STS-3c cross-connections have to be made at each shelf to configure the transmission path for the video circuit being established. Cross-connections are made at the CO (source input), at each pass-through node, and at each of the terminating (drop) RT nodes.

⇒ NOTE 2:
The **ent-crs-sts3c**, **dlt-crs-sts3c** and **rtrv-crs-sts3c** commands may be used to enter, delete and retrieve STS-3c cross-connections in a path protected ring network. See the "Commands and Reports" section of this manual for a description of commands.

Determine the necessary STS-3c cross-connections for the CO, each terminating RT node, and each pass-through node from the work order or circuit order.

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10. Enter or change the necessary STS-3c cross-connections for each node in the network. **DLP-523**

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11. Use the **set-state-oc3:address:ps=***nmon* command at each terminating (drop) RT node to silence alarms created by the loss of signal to the **FUNCTION UNITS OLIU**s.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. Perform STS-3c end-to-end transmission test for each circuit being put into service (optional).	DLP-543
13. Use the **rtrv-state-sts3c:** command to determine the channel state of the STS-3c channel being established.	
14. ⇒ NOTE: If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-sts3c:** 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-sts3c:** command to set the channel state of the STS-3c channel being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

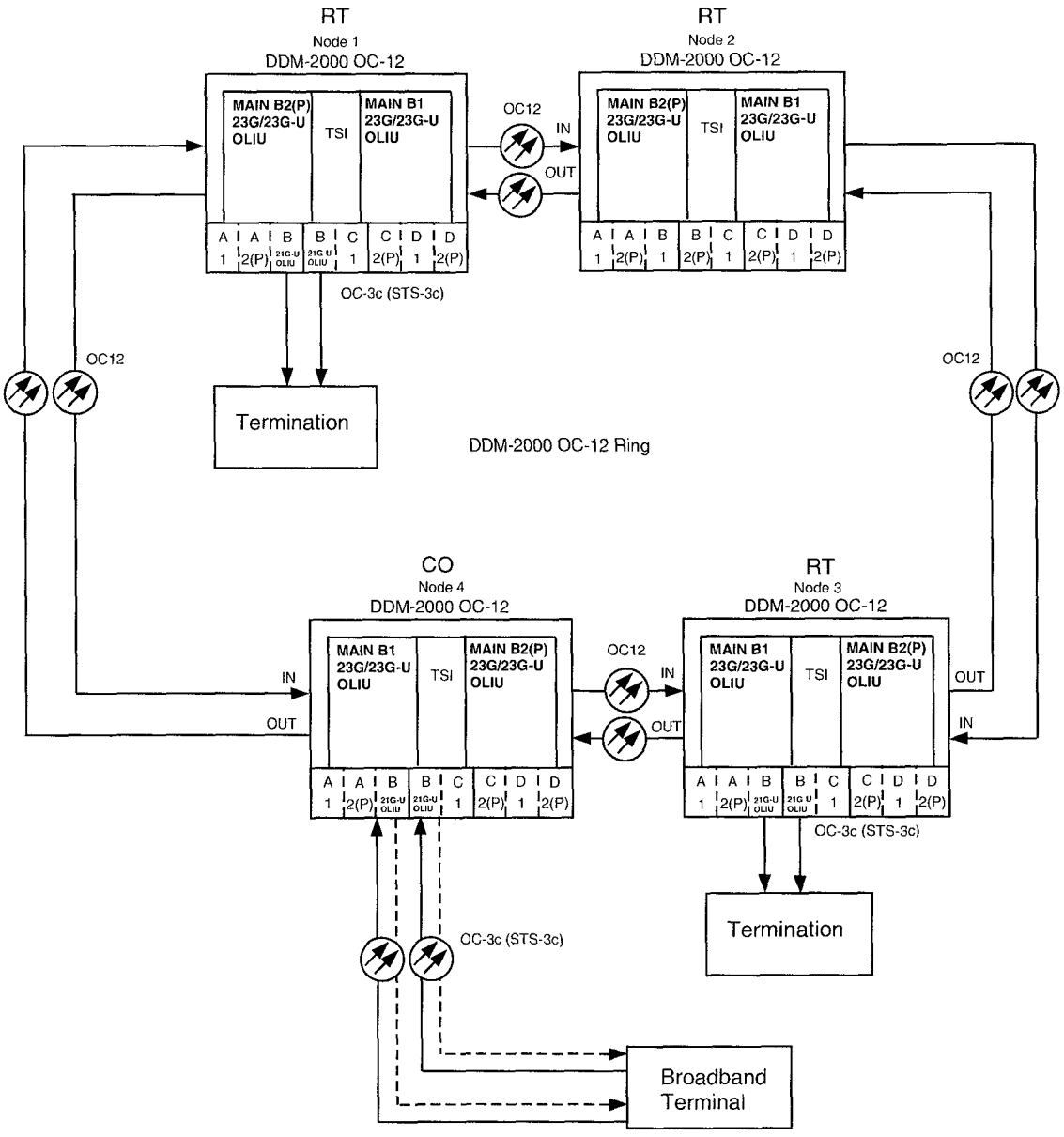


Figure 1. Sample Video Broadcast Network Schematic

Establish STS-3c Transport Access via DDM-2000 OC-12 Backbone Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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 ring 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 ring system.

   ⇒ NOTE 2:
   If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

   At the OC-3c terminating node of the circuit being established, determine which **FUNCTION UNITS** slots (**FN A**, **B**, **C**, or **D**) are being used for the service and what options are to be selected. For example, see Figure 1.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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.

Verify/install **21G/21G-U/21G2-U/21D/21D-U OLIU** circuit packs in **FUNCTION UNITS** slots (**FN A**, **FN B**, **FN C**, or **FN D**) being used for the STS-3c channel. **DLP-503**

3. Connect optical loops for **FUNCTION UNITS OLIU**s just installed. **DLP-504**

4. ⇒ NOTE:
The **rtrv-oc3:** command retrieves the OC-3 Line Provisioning Report. This report lists information about each OC-3 line. This information includes attributes set by the **set-oc3:** command. See the "Commands and Reports" section of this manual for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3/set-oc3:** command to verify/set the applications parameter to *1+1* and verify/set other characteristics of the OC-3 line or line pairs. (For example, see Figure 1,
set-oc3:fn-{a,b,c,d,all},app=*1+1*)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

5. ⇒ NOTE:
The STS-3c feature allows STS-3c service (concatenated signals) to be supported and must be licensed for use.

Use the **set-feat:** command at each OC-12 shelf in the network to enable the OC-12 shelf for STS-3c service licensed for use.
(**set-feat:feat=***sts3c*,**act=***enabled*)

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. Determine the optical loss of each OC-3 optical span from office records or by making the required measurements.

8. Perform optical fiber connections and verification of the integrity of the OC-3 optical spans being established. **DLP-551**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE 1:
Release 5 supports manual STS-1/STS-3c cross-connections in OC-12 ring applications. Manual STS-3c cross-connections have to be made at each shelf to configure the transmission path for the STS-3c circuit being established. Cross-connections are made at each pass-through node, and at each of the terminating nodes.

⇒ NOTE 2:
The **`ent-crs-sts3c`**, **`dlt-crs-sts3c`** and **`rtrv-crs-sts3c`** commands may be used to enter, delete and retrieve STS-3c cross-connections in a path protected ring network. See the "Commands and Reports" section of this manual for a description of commands.

Determine the necessary STS-3c cross-connections for each terminating node and each pass-through node from the work order or circuit order.

10. Enter or change the necessary STS-3c cross-connections for each node in the network. **DLP-524**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Perform STS-3c end-to-end transmission test for each circuit being put into service (optional).	DLP-543
12. Use the **rtrv-state-sts3c:** command to determine the channel state of the STS-3c channel 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-sts3c:** 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-sts3c:** command to set the channel state of the STS-3c channel being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

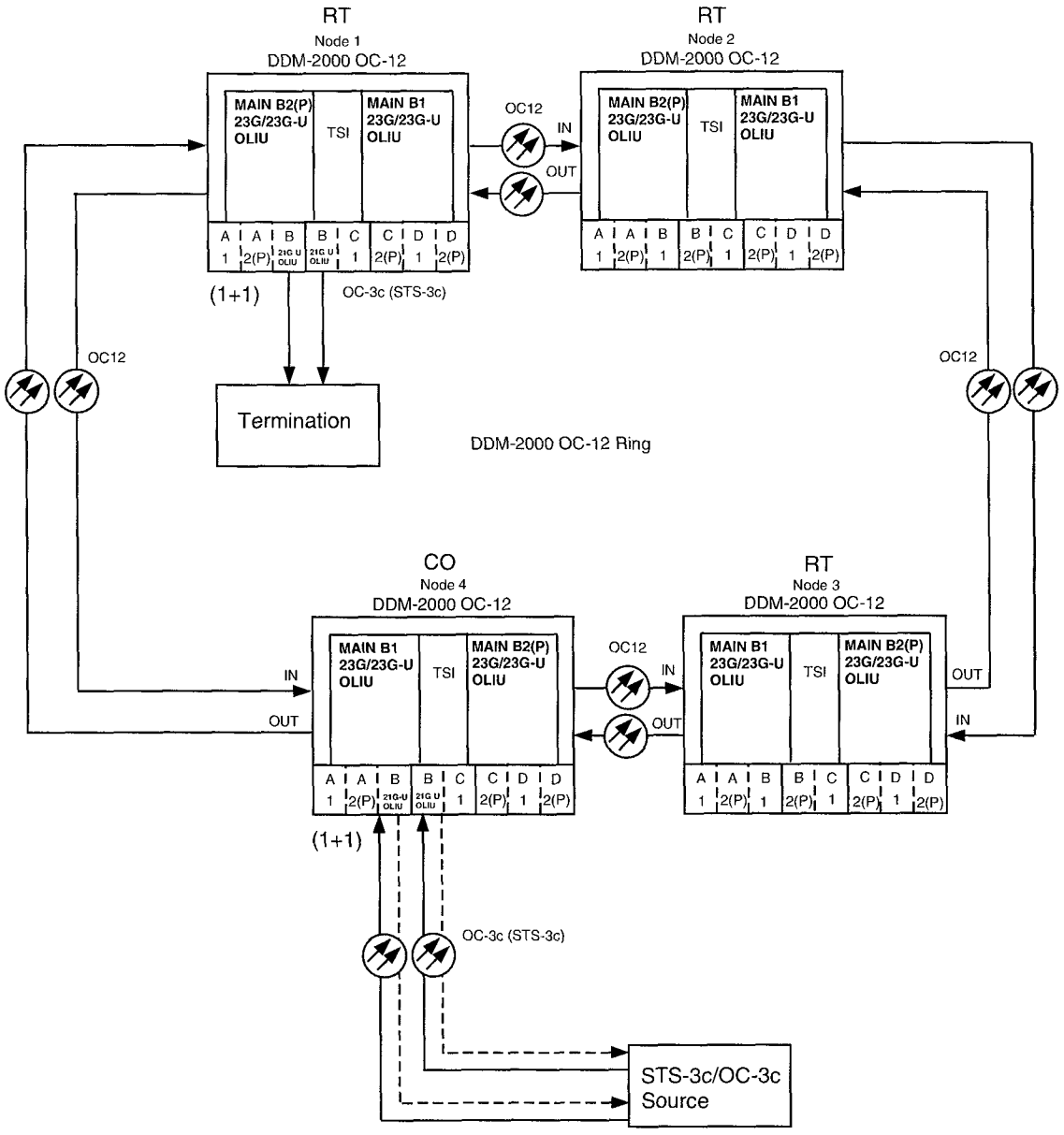


Figure 1. Sample STS-3C Transport Network Schematic

Establish OC-3/IS-3 Optical Span Extension Between FT-2000 and DDM-2000 OC-12 Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
This procedure assumes that the DDM-2000 OC-12 ring is in service and a new OC-3/IS-3 optical span is being added between this OC-12 ring and FT-2000. See Figures 1 and 2.

NOTE 2:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use **`rtrv-alm`** command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

3. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

⇒ NOTE:
The **rtrv-eqpt:** command retrieves the Equipage and Version Report. This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

At OC-12 node, verify/install **21G/21G-U/21G2-U/21D/21D-U OLIU** circuit packs in **FUNCTION UNITS** slots (**FN A**, **FN B**, **FN C**, or **FN D**) being used for the new OC-3/IS-3 extension. **DLP-503**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE 1:
If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops.

⇒ NOTE 2:
If fecom is enabled, an `inconsistent DCC values` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTL**s at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address`***`:com=disable`** command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIU**s just installed.

5. ⇒ NOTE:
The **`rtrv-oc3:`** command retrieves the `OC-3 Line Provisioning Report`. This report lists information about each OC-3/IS-3 line. This information includes attributes set by the **`set-oc3:`** command. The applications (*app*) parameter of the **`set-oc3`** command must be set to *1+1* for the **FUNCTION UNITS** slots being used in the OC-12 shelf. See the "Commands and Reports" section of this manual for a description of the **`rtrv-oc3:`** command format.

Use the **`rtrv-oc3/set-oc3:`** command to verify/set the applications parameter to *1+1* and verify/set other characteristics of the OC-3/IS-3 line or line pairs. (For example, see Figure 1,
`set-oc3:fn-{a,b,c,d,all},app=`*1+1*)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. Determine the optical loss of the optical facility from office records or by making the required measurements.

7. ⇒ NOTE:
The Network Side/User Side parameters of the OC-3 **`set-fecom:`** command and the FT-2000 DCC orientation must be set opposite at each end of the OC-3/IS-3 optical spans. For example, see Figure 2.

Use the **`rtrv-fecom/set-fecom`** command at the DDM-2000 or the **`CONFIGURATION-Enter-Assignment-DCC`** command at the FT-2000 to verify/set "Network Side/User Side" parameters at each end of optical span being established.

8. If **21G/21G-U OLIU**s are used, set option switch on each **21G/21G-U OLIU** to agree with the loss of the optical facility. **DLP-510**

9. ⇒ NOTE:
If option switch setting is changed, an update must be performed by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is reinstalled.

Reinstall **OLIU**s (if removed) and momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **UPD** command.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
10. Use procedures in the FT-2000 User/Service Manual to Verify/"Add OC-3 Low Speed Slots" at the host FT-2000 shelf. (LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**). (Verify/Provision the FT-2000 low speed OC-3/IS-3 slots Protection Mode (from OC-3) Parameter to *1+1* if both slots are used for the extension or to *0X1* if only one slot is used.)	
11. At DDM-2000 shelf, use the **set-fecom:***address***:com=enabled** command to ensure far end DCC communications (fecom) is enabled on the new OC-3/IS-3 optical extension. At FT-2000 shelf, use the **SECURITY-Set-Far End Communications:** command to ensure far end DCC communications (fecom) is enabled on the new OC-3/IS-3 optical extension.	
12. Perform OC-3/IS-3 optical fiber connections and verification of the optical facility.	**DLP-551**
13. At each DDM-2000 OC-12 node, use the **set-oc3:***address***:kbyte=***enabled* or **set-oc3:***address***:syncmsg=***Kbyte/Sbyte* command to enable sync messaging between the DDM-2000 **FUNCTION UNITS** group used for the new OC-3/IS-3 optical extension.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur and one of the DSNEs must be disabled. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
It may take 6 minutes or more for the network to stabilize after one of the DSNEs is discontinued. The remaining DSNE must record and map all the new network elements in the network.

⇒ NOTE 3:
It is recommended that a DDM-2000 OC-12 shelf be assigned as the DSNE.

Discontinue the DSNE on the FT-2000 OC-48 ring. Use the **reset** command at DDM-2000 OC-12 DSNE to reset the node, if a DSNE was established on the DDM-2000 OC-12 ring. Use the **set-ne:TID=tid:dsne=yes** command to establish the DSNE on the DDM-2000 OC-12 ring, if no DSNE was established on the DDM-2000 OC-12 ring.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

15. ⇒ NOTE:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

16. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a `duplicate TID` alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

17. Perform automatic end-to-end OC-3 line test on new OC-3/IS-3 optical extension. **DLP-552**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

18. ⇒ NOTE:
Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

The network is ready for service to be established. For service terminations on a FT-2000 shelf, use the procedures in the FT-2000 User/Service Manual to establish those services. For DS3 and/or EC-1 terminations on a DDM-2000 OC-12 shelf, use the procedures in this User/Service manual to establish those services.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

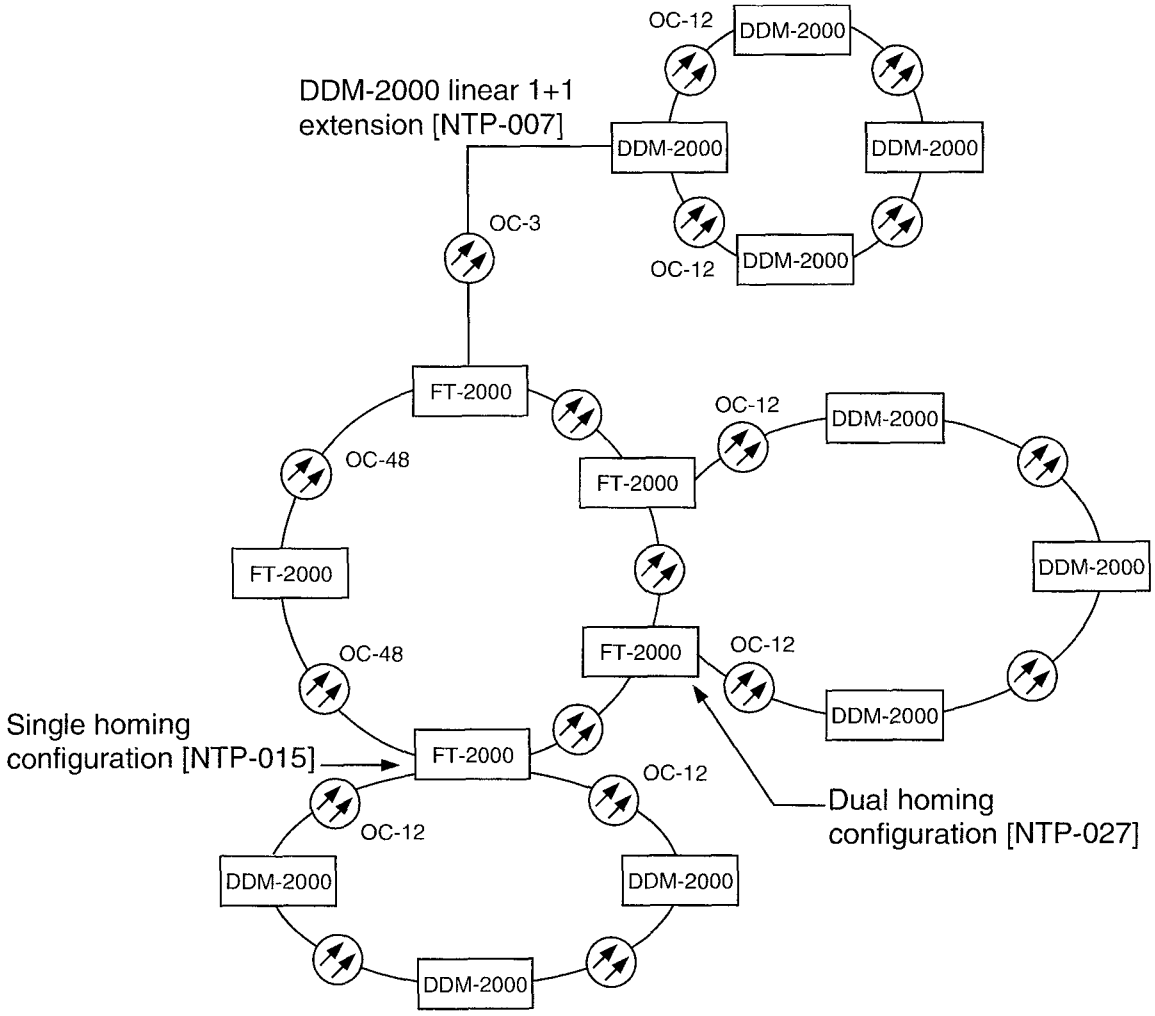


Figure 1. Example FT-2000 OC-48/DDM-2000 OC-12 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)				
21-Type OLIUs (1+1)	**FN-A** dcc-a	**FN-B** dcc-b	**FN-C** dcc-c	**FN-D** dcc-d
	NS	NS	NS	NS

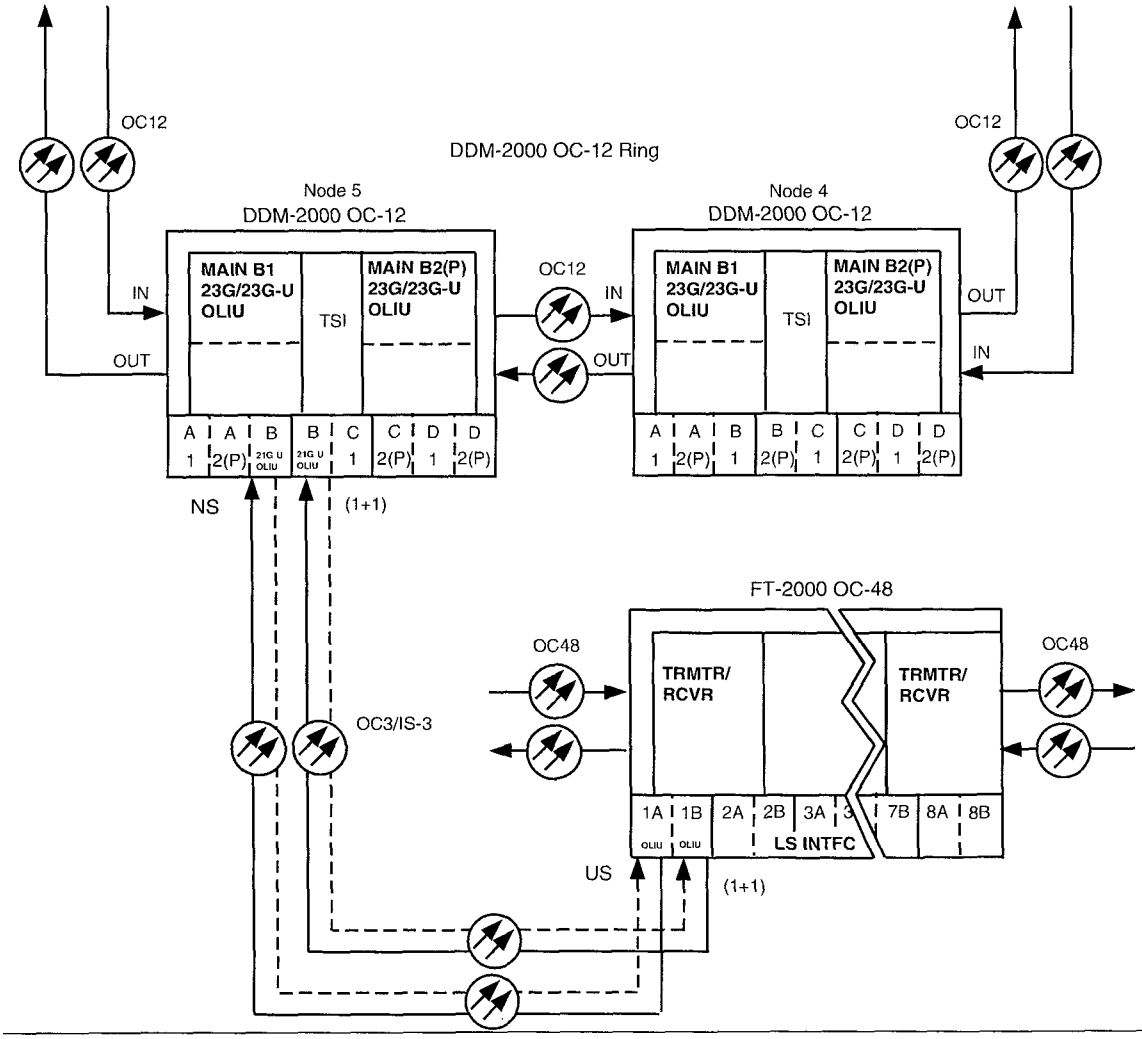


Figure 2. Adding New OC-3/IS-3 Optical Span Extension to OC-12 Ring

Establish OC-3/IS-3 Optical Span Extension Between DDM-2000 OC-12 Ring and DDM-2000 OC-3

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
This procedure assumes that the DDM-2000 OC-12 ring is in service and an OC-3 1+1 optical span is being added between this OC-12 ring and an OC-3 system. See Figures 1 through 4.

NOTE 2:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

Use **`rtrv-alm`** command to verify that no alarms, locks, loops, or switches are present.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. Notify maintenance center that alarms will be generated.

3. ⇒ NOTE:
The **rtrv-eqpt:** command retrieves the Equipage and Version Report. This report lists the circuit pack type and version information for one or more slots. See the "Commands and Reports" section of this manual for a description of the **rtrv-eqpt:** command format.

At OC-12 node, verify/install **21G/21G-U/21G2-U/21D/21D-U OLIU** circuit packs in **FUNCTION UNITS** slots (**FN A**, **FN B**, **FN C**, or **FN D**) being used for the new OC-3/IS-3 extension. **DLP-503**

4. ⇒ NOTE 1:
If **21G/21G-U OLIU** circuit packs are used, the **HIGH/LOW POWER** switch must be set to **LOW** before connecting the optical loops.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 2:
If fecom is enabled, an `inconsistent DCC values` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTL**s at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address:`***`com=disable`** command to disable the DCC.

Connect optical loops for **FUNCTION UNITS OLIU**s just installed. **DLP-504**

5. ⇒ NOTE:
The **`rtrv-oc3:`** command retrieves the `OC-3 Line Provisioning Report`. This report lists information about each OC-3/IS-3 line. This information includes attributes set by the OC-12 **`set-oc3:`** command. The applications (*app*) parameter of the **`set-oc3`** command must be set to *1+1* for the **FUNCTION UNITS** slots being used for the OC-3/IS-3 extension in the OC-12 shelf. See the "Commands and Reports" section of LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* for a description of the **`rtrv-oc3:`** command format.

Use the **`rtrv-oc3/set-oc3:`** command at the OC-12 shelf to verify/set the applications parameter to *1+1*.
(For example,
`set-oc3:fn-{a,b,c,d,all},app=`*`1+1`*)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⇒ NOTE:
DDM-2000 OC-3 shelves must be connected through the **MAIN** or **FUNCTION UNITS C** slots if the shelf or network is deriving timing from the OC-3/IS-3 optical links to the OC-12 network. See description of the **`src`** parameter in **`set-sync:`** command in LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume I.*

Ensure the DDM-2000 OC-3 subnetwork and/or shelf has been properly equipped with **OLIU**s to accept the new OC-3/IS-3 optical extension. Use LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume II,* **System Turnup: NTP-016** to equip a new DDM-2000 OC-3 shelf. If the new extension to be established is an OC-3c/IS-3c extension use LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume II,* **System Turnup: NTP-002** or procedure in LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume II,* **System Turnup: NTP-006**) to establish OC-3c/IS-3c (STS-3c) service.

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7. Determine the optical loss of the optical facility from office records or by making the required measurements.

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8. ⇒ NOTE:
The Network Side (NS)/User Side (US) parameters of the **`set-fecom:`** command must be set opposite at each end of the optical spans.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established. See Figure 5.	
9. If **21G/21G-U OLIU**s are used, set option switch on each **21G/21G-U OLIU** to agree with the loss of the optical facility.	**DLP-510**
10. ⇒ NOTE: If option switch setting is changed, an update must be performed by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **OLIU** is reinstalled. Reinstall **OLIU**s (if removed) and momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **UPD** command.	
11. Use **set-fecom:address:com=enabled** command to enable DCC communications on the new OC-3/IS-3 optical extension.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. Perform OC-3/IS-3 optical fiber connections and verification of the optical facility.	**DLP-551**

13. ⇒ NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled for the OC-3/IS-3 optical interfaces at any node in the OC-3 ring, it **must** be enabled at all nodes in the OC-3 ring and in the **FUNCTION UNITS** slots of the host OC-12 shelf.

⇒ NOTE 2:
The **rtrv-oc3:** command retrieves the OC-3 Line Provisioning Report. This report displays the provisioned configuration of OC-3/IS-3 lines. See the "Commands and Reports" section of LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume I* and LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* for a description of the **rtrv-oc3:** command format.

Use the **rtrv-oc3:** command to obtain the OC-3 Line Provisioning Report and verify if Kbyte/Sbyte is enabled or disabled. Use the **set-oc3:***address*:**kbyte=***enabled* or **set-oc3:***address*:**syncmsg=***Kbyte/Sbyte* command to enable sync messaging between the DDM-2000 **FUNCTION UNITS** group used for the new OC-3/IS-3 optical extension.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed OC-3 node in a ring, it **must** be enabled at all line-timed OC-3 nodes of a ring.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the `Synchronization Report`. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume I* and LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume I* for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the `Synchronization Report` and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

15. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur and one of the DSNEs must be disabled. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
It may take 6 minutes or more for the network to stabilize after one of the DSNEs is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Use the **set-ne:TID=tid:dsne=no** command to discontinue one of DSNEs, if not already done. Use the **reset** command at the remaining DSNE to reset the node.

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16. ⇒ NOTE:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

17. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a `duplicate TID` alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

18. Perform automatic end-to-end OC-3 line test on new OC-3/IS-3 optical extension. **DLP-552**

19. Perform end-to-end DS1 transmission test for each low speed group, if required. Use LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume II,* **Detailed Level Procedures: DLP-510**.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
20. Perform end-to-end DS3 transmission test for each low speed group, if required.	**DLP-508**
21. The network is ready for service to be established. Use procedures from both LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume II* and LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume II* to establish and test the required cross-connections for type of service being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

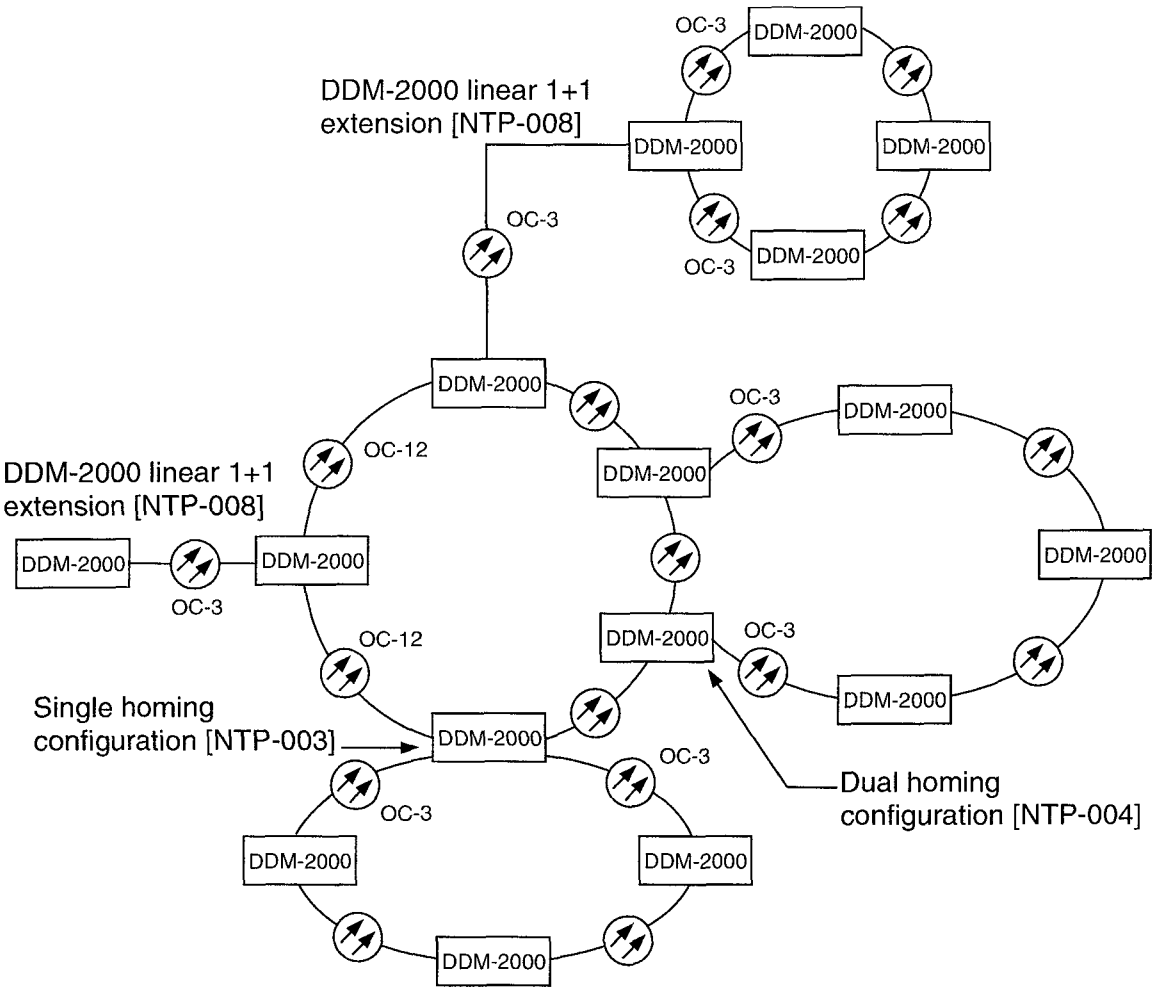


Figure 1. Example DDM-2000 OC-12/DDM-2000 OC-3 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

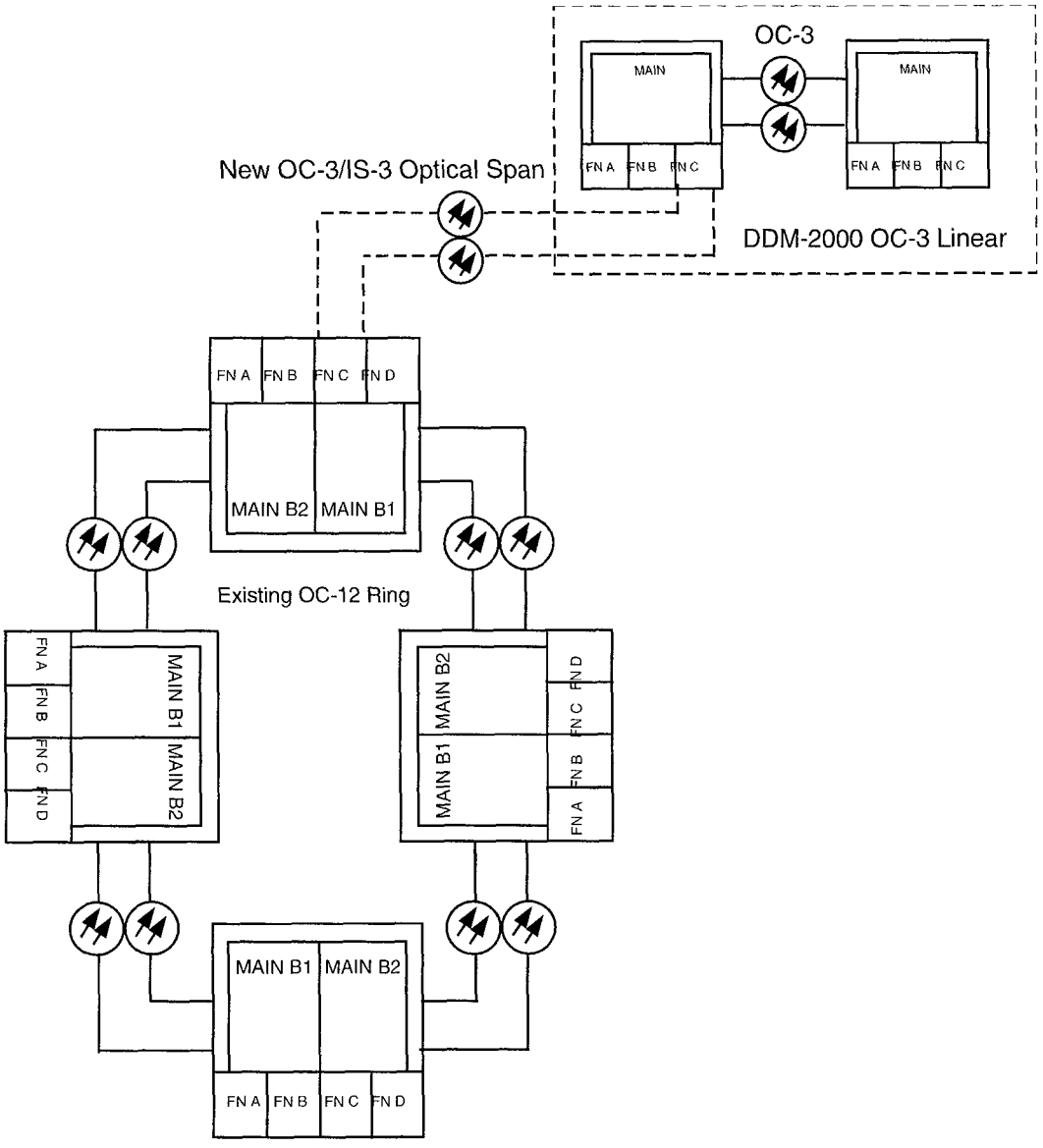


Figure 2. Adding New OC-3 Optical Span Extension — Linear OC-3 Network to OC-12 Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

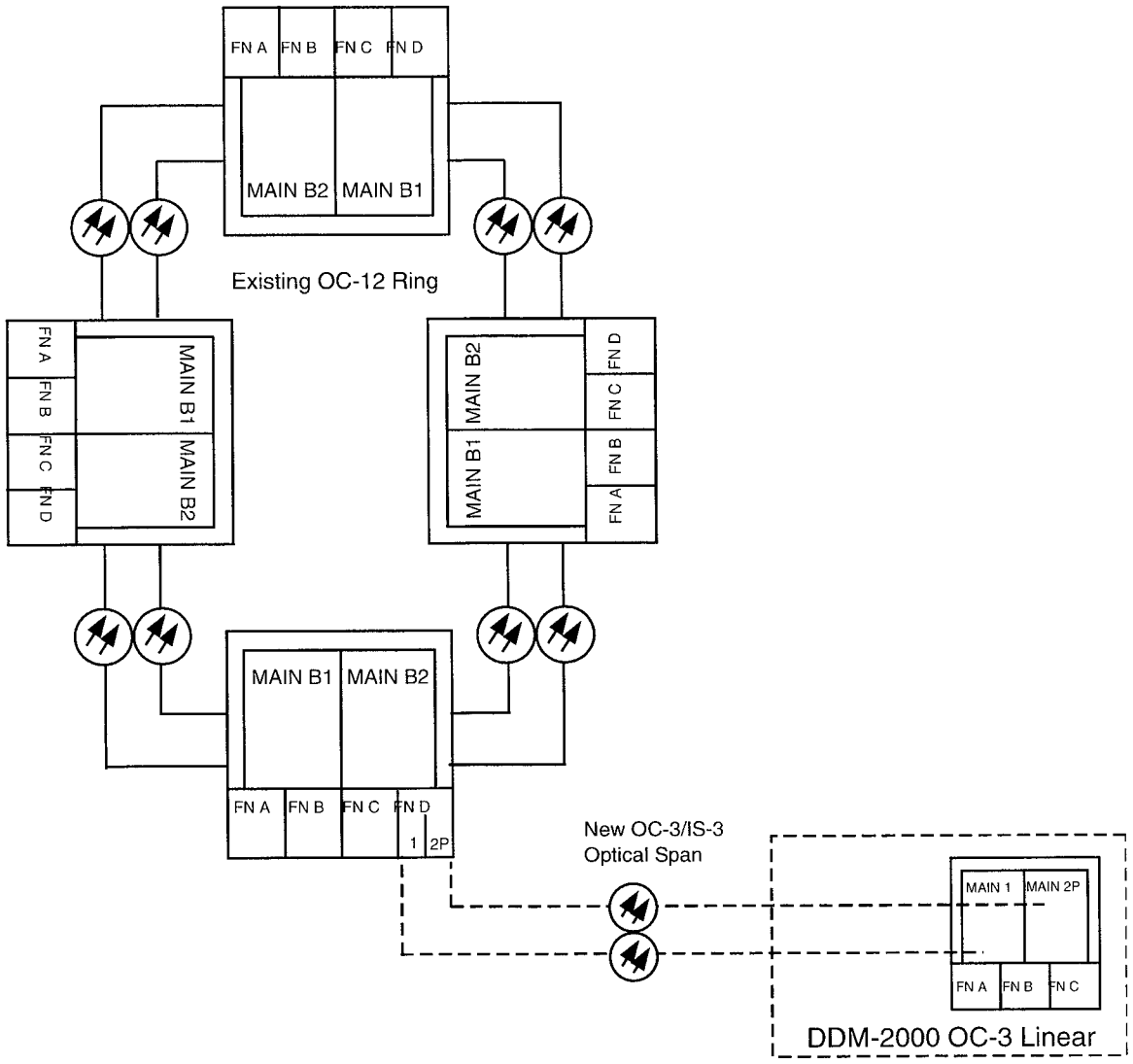


Figure 3. Adding New OC-3 Optical Span Extension — Linear OC-3 Shelf to OC-12 Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

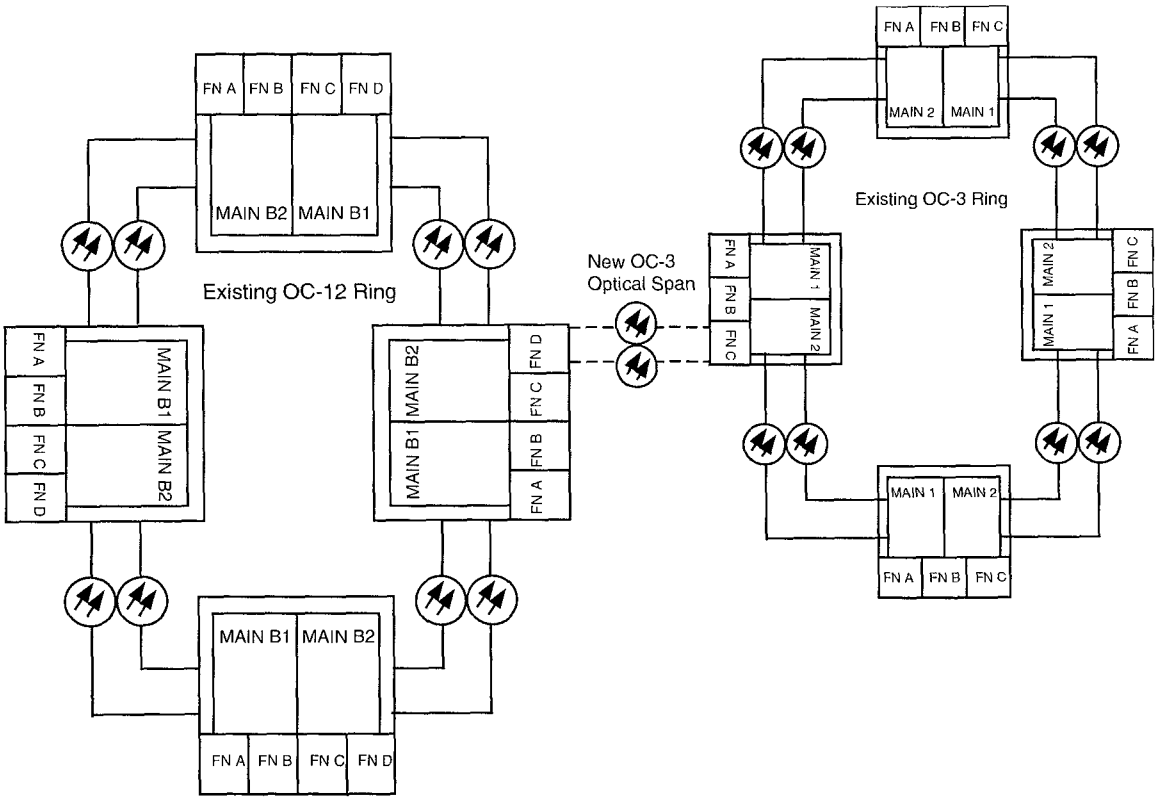
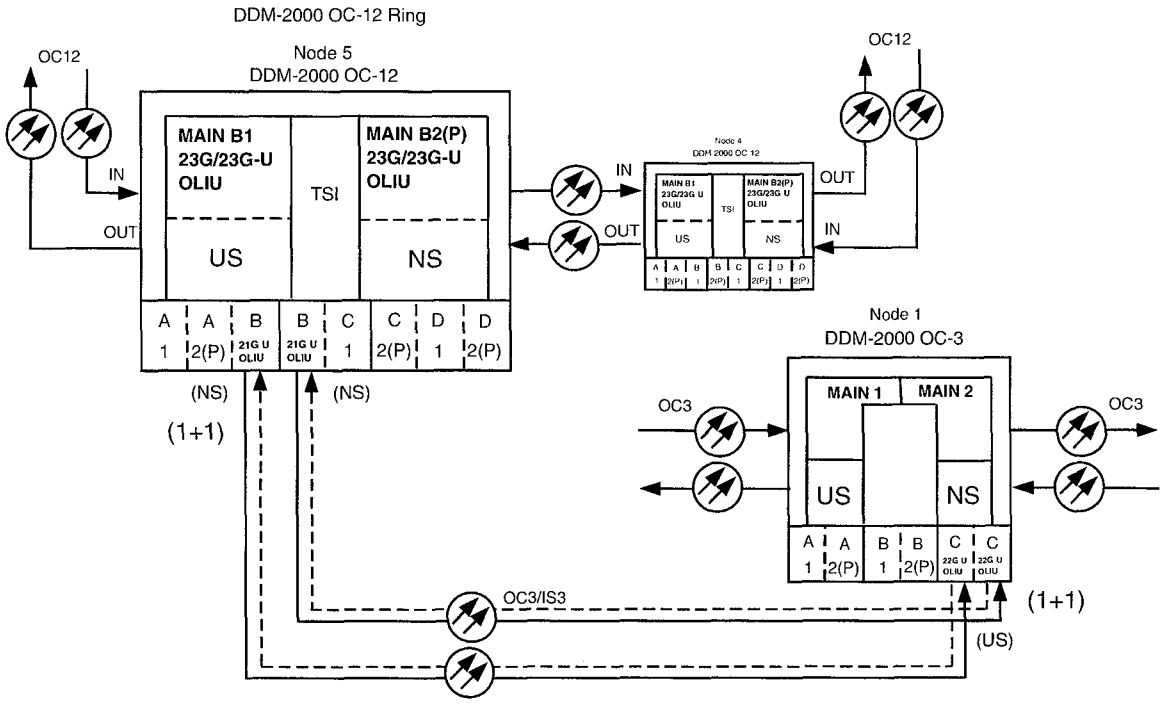


Figure 4. Adding New OC-3 Optical Span Extension — OC-3 Ring to OC-12 Ring

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)				
21-Type OLIUs (1+1)	**FN-A** dcc-a	**FN-B** dcc-b	**FN-C** dcc-c	**FN-D** dcc-d
	NS	NS	NS	NS



DDM-2000 OC-3 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)					
22-Type OLIUs	**MAIN-1** dcc-m1	**MAIN-2** dcc-m2	**FN-A** dcc-a	**FN-B** dcc-b	**FN-C** dcc-c
	US	NS	NS	NS	NS

Figure 5. Adding New OC-3 Optical Span Extension to OC-12 Ring

Discontinue OC-3/IS-3 Optical Span Extension

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE:
   The craft interface terminal (CIT) **`rtrv-map-network:`** command may be used to retrieve a map of the SONET network, including a list of the systems in the network and how they are connected. The **`rtrv-crs-( ):`** command may be used to retrieve STS-1 cross-connections within the DDM-2000 OC-12 system.

   Determine which optical span(s) is being discontinued.

2. Ensure service (signals) has been removed from the DS3/EC-1 groups in the span(s) being discontinued in the DDM-2000 OC-12 syatem using LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume II* [**NTP-019** (DS3), and/or **NTP-025** (EC-1)].

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⇒ NOTE 1:
The **set-ne:** command also designates a shelf as an alarm gateway network element (AGNE). Shelves may be assigned an alarm group number (default alarm group number is 255). At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

⇒ NOTE 2:
It may take several minutes for the network to stabilize after the AGNE has been changed.

If a shelf being discontinued is an AGNE, use the **set-ne:TID=tid:agne=yes** command to establish the AGNE on another shelf, if required. Use the **set-ne:TID=tid:agne=no** command to disable the AGNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur and one of the DSNEs must be disabled.

⇒ NOTE 2:
It is recommended that a DDM-2000 OC-12 shelf be assigned as the DSNE.

⇒ NOTE 3:
It may take 6 minutes or more for the network to stabilize after the DSNE has been discontinued.

If the DSNE is being discontinued and another DDM-2000 OC-12 shelf is going to be designated as the DSNE, use the **set-ne:TID=tid:dsne=yes** command to establish the DSNE on another DDM-2000 OC-12 shelf. Use the **set-ne:TID=tid:dsne=no** command to disable the DSNE at the shelf being removed.

If the DSNE is being discontinued and a FT-2000 node is going to be designated as the DSNE, use the **SECURITY-Set-Network Element-DSNE:yes** command at the FT-2000 to designate the DSNE, Use the **set-ne:TID=tid:dsne=no** command to disable the DSNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⚠ 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:
Removal of wrong fiber connections will result in a service interruption. Ensure you remove only the fiber connections for the optical span being discontinued.

⇒ NOTE:
The following operations will activate office alarms. The audible alarm may be suppressed by depressing the **ACO** button.

Remove optical fiber connections from all **OLIU**s associated with optical span(s) being discontinued.

6. Remove **OLIU**(s) associated with optical span being discontinued, if required.

7. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen to operate it.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

If **OLIU** circuit pack(s) was removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.

If **OLIU** circuit pack(s) was *not* removed, connect optical fiber loops to **OLIU**(s). **DLP-504**

8. NOTE 1:
When a shelf is removed from a DDM-2000 network and one of the other DDM-2000 nodes is designated as a DSNE, the **dlt-tadrmap:tid=***tid* command must be used to delete the TID of the removed shelf from the directory services data base. This prevents that TID from appearing in **rtrv-map-network** or **rtrv-map-neighbor** reports and will retire the communication failure alarms at all shelves in the network.

NOTE 2:
The **dlt-tadrmap:tid=***tid* command is valid only at a DDM-2000 DSNE. The **rtrv-map-network** command may be used to determine which shelf is the DSNE.

NOTE 3:
If the DSNE is other than a DDM-2000 shelf, the DSNE will automatically delete the node(s) from its inventory. Wait at least 6 minutes for alarms to settle.

If the DSNE is a DDM-2000 node, wait at least one minute then use the **dlt-tadrmap:tid=***tid* command at the DSNE to delete the TID of the removed shelf from the directory services data base.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
9. Verify that all alarms go off.	

Discontinue OC-3c/IS-3c (STS-3c) Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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.**

Determine which OC-3c/IS-3c circuits are to be discontinued and verify no alarms exist on system.

2. ⇒ NOTE:
The following operation will activate office critical, major, or minor, alarms. The audible alarm may be suppressed by depressing the **ACO** pushbutton.

Remove service (signal) from **21G/21G-U/21G2-U** or **21D/21D-U OLIU**s at terminating nodes for OC-3c/IS-3c circuit being discontinued. (**FAULT** LED flashes on **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit packs with signal removed).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. Momentarily depress **UPD/INIT** pushbutton on **SYSCTL** or use craft interface terminal (CIT) **upd** command to update DDM-2000 OC-12 terminating nodes.

4. Use **set-state-oc3:** command to disable alarm monitoring of the specified OC-3/IS-3 line pair or loop the OC-3/IS-3 **OLIU**s.

5. From the work order or **rtrv-crs-sts3c** command, determine the cross-connections for circuit being discontinued. Use the **rtrv-crs-sts3c** command at each node in the ring network to obtain the `STS-3c Cross Connect Report`.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⚠ CAUTION:
Removal of the wrong cross-connection may interrupt service.

NOTE 1:
Slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. Remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the nonterminating nodes, if required. A Critical alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

NOTE 2:
The following commands may be used to delete, enter, and retrieve STS-3c cross-connections: **`dlt-crs-sts3c`**, **`ent-crs-sts3c`**, and **`rtrv-crs-sts3c`**. 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.

At the terminating nodes, use the **`dlt-crs-sts3c:`** command to delete the STS-3c cross-connections for the function unit group/service being discontinued.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. Use the **dlt-crs-sts3c:** command to delete the pass-through STS-3c cross-connections at each nonterminating node for the service being removed.

8. Use **set-oc3:** command at each terminating node to set the application parameter (**app**) to default `0 X 1` for the specified OC-3/IS-3 line pair.

9. ⚠ CAUTION:
   Do not use the **set-feat:** command to disable the OC-3c feature if more than one pair of **FUNCTION UNITS** slots is equipped for the **sts3c** feature.

   If necessary, use the **set-feat:** command at each node in the path of the STS-3c service being discontinued to disable the **sts3c** feature.

10. Verify that all alarms go off. If optical spans are being discontinued and **OLIU**s are being removed, use the proper procedures in this manual to "Discontinue Optical Span".

Establish OC-3/IS-3 Dual Ring Interworking DDM-2000 OC-12 to OC-3 or FT-2000 Ring Configurations OC-3/IS-3 Optical Fiber Spans

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001** in the appropriate DDM-2000/FT-2000 documentation.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
It is assumed that the DDM-2000 or FT-2000 systems have been established in required individual ring configurations. Ring Release 7.2 or later software is required in each DDM-2000 OC-3 shelf. Ring Release 5 or later software is required in each DDM-2000 OC-12 shelf. Ring Release 6 or later software is required in each FT-2000 shelf. If **OLIU**s have already been installed in the function unit slots and the systems established in a DRI configuration using OC-3/IS-3 connections, go to Step 13 to establish new service. Otherwise, continue with this procedure to establish the initial DRI configuration.

NOTE 3:
If the OC-3 ring is to be line timed (no external timing available) from another system or ring, **BBF2B TGS** timing circuit packs must be installed in the node connected to the other system and the **FUNCTION UNITS C** slot must be equipped first to provide a source of synchronization. See the **`set-sync:`** command in the Commands and Reports section of this manual.

Consult office records or work/circuit orders to determine the **OLIU** function slots in each DRI node that will be used to connect the two systems together in a DRI configuration. See Figure 1.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE:
   If work order or office records do not specify OC-3/OC-12 **OLIU** types, refer to the system Applications, Planning, and Ordering Guide (LTP 363-206-200, OC-3 and OC-12) and/or Volume 1 of this User/Service manual for a description of **OLIU** circuit packs and applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

   At the DDM-2000 OC-12 dual ring interworking nodes, install **OLIU** circuit packs in selected **FUNCTION UNITS** slots. **DLP-503**

3. If FT-2000 shelves are the dual ring interworking nodes, use FT-2000 procedures in (LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**. If DDM-2000 OC-3 shelves are the dual ring interworking nodes, use procedures in LTP 363-206-280, *DDM-2000 OC-3 Multiplexer, Release 8 and Higher, User/Service Manual—Volume II*, to **Install OLIU Circuit Packs, DLP-504**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⇒ NOTE:
If fecom is enabled, an `inconsistent DCC values` alarm will occur when the **OLIU**s are looped back. Normally, the alarm occurs when the user/network parameters on the **OHCTL**s at both ends of the DCC are set the same. To clear the alarm during a fiber loopback, use the **`set-fecom:`***`address`***`:com=disable`** command to disable the DCC.

At DDM-2000 nodes, install **OLIU** optical loops.

A. DDM-2000 OC-3 **DLP-505**
B. DDM-2000 OC-12 User/Service Manual **DLP-504**

5. Determine the optical loss of each OC-3/IS-3 optical span from office records or by making the required measurements.

6. Remove optical loops from **OLIU**s in the OC-3/IS-3 optical span being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. ⇒ NOTE 1:
The network elements that terminate on each end of the optical span must have their "Network Side"/"User Side" parameters set to opposite values to avoid an `inconsistent DCC values` alarm. Network Side/User Side parameters [**`set-fecom`** command] must be properly set at each end of OC-3 optical spans. One end is provisioned as "Network" and the other end is provisioned as "User". Both ends of the OC-3 line cannot be the same and it makes no difference which end is "Network".

⇒ NOTE 2:
The section data communication channel (DCC), used for far-end communications, must be enabled at each network element (shelf) for communication and to allowe the end-to-end line tests to work when the optical span is established. Default condition in DDM-2000 is "enabled" for the DCC channel. If it has been disabled, use the **`set-fecom:`** command **at the DDM-2000 shelf** to enable far-end communications.

At the DDM-2000 shelf, use the
`set-fecom:`*`address`***`:com=`***`enabled`***`,nsus=`***`ns/us`**
command to enable far-end communications (fecom) and set Network Side (ns)/User Side (us) parameters.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
8. At each DDM-2000 OC-3/OC-12 node, use the **set-oc3/oc12:***address*:**kbyte=***enabled* or **set-oc3/oc12:***address*:**syncmsg=***Kbyte/Sbyte* command to enable sync messaging between the DDM-2000 **FUNCTION UNITS OLIU**s connecting to the other ring DRI nodes.	
9. At each DDM-2000 OC-3/OC-12 DRI node, use the **set-oc3/oc12:***address*:**kbyte=***disabled* command or **set-oc3/oc12:***address*:**syncmsg=***disabled* to disable sync messaging between the DDM-2000 **MAIN OLIU**s connecting the adjacent DRI nodes of the DDM-2000 OC-3/OC-12 ring. For example in the top DDM-2000 OC-3 ring in Figure 1, disable kbyte between CO 2 **MAIN-1** and CO 4 **MAIN-2**.	
10. At FT-2000 DRI nodes, if only one **OLIU** is used for the DRI connection, use **CONFIGURATION-Set-OC3** command to set the protection mode to **0 X 1** for the OC-3/IS-3 slot used for DRI connections. If two **OLIU**s are used for the DRI connection, use **CONFIGURATION-Set-OC3** command to set the protection mode to **1 + 1** for the OC-3/IS-3 slot used for DRI connections.	
11. At FT-2000 DRI nodes, use **CONFIGURATION-Enter-Assignment-DCC** command to assign a DCC channel to slot(s) used for DRI connections.	
12. Perform optical fiber connections and verification of the	**DLP-551**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
optical facility.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur. In mixed DDM-2000 and FT-2000 networks, it is recommended that the DSNE be provisioned in a DDM-2000. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

⇒ NOTE 3:
It may take 6 minutes or more for the network to stabilize after a DSNE is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Discontinue one of the duplicate DSNEs, if present (DDM-2000, **set-ne:dsne=***no*). Use the **reset** command at the remaining DSNE to reset the DSNE node. Use the **set-ne:** command to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
14. Perform end-to-end OC-3 line test at DRI nodes.	**DLP-552**
15. The network is now ready for initial DS3 or EC-1 service to be established. [**System Turnup: NTP-017**] (DS3) [**System Turnup: NTP-023**] (EC-1)	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

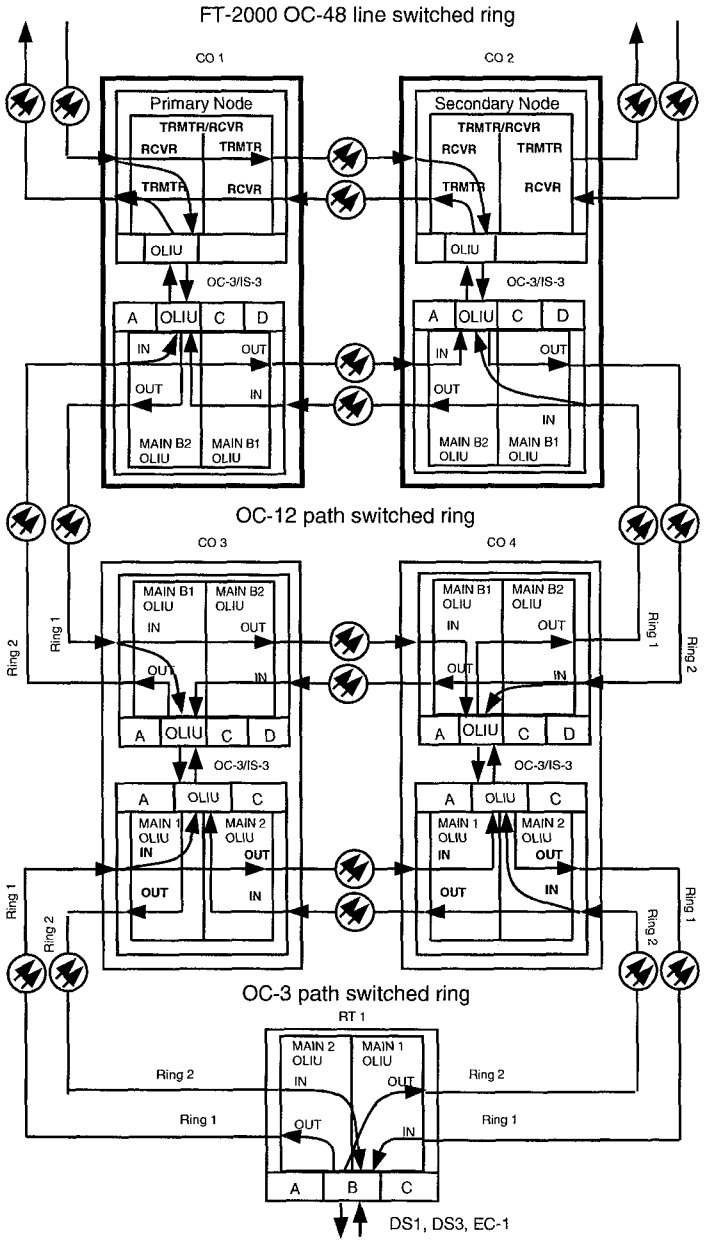


Figure 1. Example of DDM-2000 OC-3/OC-12/FT-2000 OC-48 Dual Ring Interworking Network

Upgrade DDM-2000 OC-12/FT-2000 Dual Ring Interworking Network from EC-1 to OC-3/IS-3 In Service

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.

   NOTE 1:
   This procedure will require **LAA10 OC3** or **LAA5 IS3** circuit packs in the Low Speed slots of the FT-2000 OC-48 shelves and **21G/21G-U/21G2-U OLIU**s (OC-3) or **21D/21D-U OLIU**s (IS-3) circuit packs in the **FUNCTION UNITS** slots of DDM-2000 OC-12 shelves. Existing **LAA4 STS1E** and **BBG12 3STS1E** circuit packs will be replaced in this procedure with **OLIU** circuit packs to support OC-3/IS-3 applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

   NOTE 2:
   This procedure assumes that the DDM-2000 and FT-2000 systems are in service and ring Release 5 or later software is used in each DDM-2000 OC-12 shelf. Ring Release 6 or later software is required in each FT-2000 shelf.

   NOTE 3:
   All shelves in the same network must have the same or compatible software releases.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the **`rtrv-alm:`** command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. Upgrade software in each FT-2000 OC-48 and DDM-2000 OC-12 shelf with a release that supports OC-3/IS-3 interfaces (Ring Release 6 or later (OC-48), Ring Release 5 or later (OC-12), if not already performed.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⚠ CAUTION 1:
Ensure traffic is being carried through the FT-2000 **primary** *node to prevent unnecessary service hits (for example, node B in Figure 1).*
(FT-2000 command **`CONFIGURATION-Retrieve-Crossconnection-STS3`**)

⚠ CAUTION 2:
Removal of the wrong cross-connections may cause service interruption.

NOTE 1:
When signals or circuit packs are removed, alarms will be generated until update procedures are performed.

NOTE 2:
STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs.

NOTE 3:
If the OC-3/IS-3 circuit pack is going to be using the same cross-connects as the EC-1 circuit pack that is to be removed, then the only cross-connects that need to be deleted are those at the node where the circuit pack is being replaced. The pass-through cross-connections can remain.

Discontinue the EC-1 interface cross-connections at the OC-12 node associated with the FT-2000 **secondary** node. **Note that only cross-connections at the DRI node are being discontinued when using the procedures of NTP-025.** **NTP-025**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. At the OC-12 node associated with the FT-2000 **secondary** dual ring interworking node, remove **3STS1E** circuit pack(s) from **FUNCTION UNITS** slot(s) being upgraded to **OLIU**s (for example, node D in Figure 1).	
6. Momentarily depress **UPD** button on **SYSCTL** or use the **`update`** command from the CIT.	
7. At the FT-2000 **secondary** dual ring interworking node (for example, node A in Figure 1), use FT-2000 procedures in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Delete DS3 and/or EC-1 Low Speed Port(s), NTP-003**.	
8. At the FT-2000 **secondary** dual ring interworking node, use FT-2000 procedures in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**.	
9. Install **21G/21G-U/21G2-U OLIU**(s) (OC-3) or **21D/21D-U OLIU**(s) (IS-3) in the OC-12 node associated with the FT-2000 secondary node (for example, node D in Figure 1).	**DLP-503**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. NOTE 1:
The network elements that terminate on each end of the optical span must have their "Network Side"/"User Side" parameters set to opposite values to avoid an `inconsistent DCC values` alarm. Network Side/User Side parameters [**`set-fecom`** command] must be properly set at each end of OC-3/IS-3 optical spans. One end is provisioned as "Network" and the other end is provisioned as "User". Both ends of the OC-3/IS-3 line cannot be the same and it makes no difference which end is "Network".

NOTE 2:
The section data communication channel (DCC), used for far-end communications, must be enabled at each network element (shelf) for communication and to allowe the end-to-end line tests to work when the optical span is established. Default condition in DDM-2000 is "enabled" for the DCC channel. If it has been disabled, use the **`set-fecom:`** command **at the DDM-2000 shelf** to enable far-end communications.

At the DDM-2000 shelf, use the
`set-fecom:`*`address`***`:com=`***`enabled`***`,nsus=`***`ns/us`**
command to enable far-end communications (fecom) and set Network Side (ns)/User Side (us) parameters.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. At the FT-2000 shelf, use **CONFIGURATION-Set-OC3** command to set the protection mode to **0 X 1** for the OC-3/IS-3 slot used for DRI connections, if only one **OLIU** is used for the DRI connection. If two **OLIU**s are used for the DRI connection, use **CONFIGURATION-Set-OC3** command to set the protection mode to **1 + 1** for the OC-3/IS-3 slot used for DRI connections.	
12. At the FT-2000 shelf, use **CONFIGURATION-Enter-Assignment-DCC** command to assign a DCC channel to slot(s) used for DRI connections, if required.	
13. Perform optical fiber connections and verification of the optical facility.	**DLP-551**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur. In mixed DDM-2000 and FT-2000 networks, it is recommended that the DSNE be provisioned in a DDM-2000. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

⇒ NOTE 3:
It may take 6 minutes or more for the network to stabilize after the DSNE is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Discontinue one of the duplicate DSNEs, if required. Use the **reset** command at the remaining DSNE to reset the DSNE node. Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
15. Perform end-to-end OC-3/IS-3 line test at DRI nodes associated with the FT-2000 secondary node (for example, between nodes A and D in Figure 1).	**DLP-552**
16. At the OC-3/IS-3 DRI node, use the **`ent-crs-sts1`** or **`ent-crs-vt1`** commands to make proper "drop and continue" cross-connections.	**DLP-549**
17. At the FT-2000 **primary** node, use the **`FAULT-Switch-Path-STS3-Line-Manual`** command to switch the designated tributary from primary node to secondary node. (Switch traffic to secondary node.) See Figure 2.	
18. ⇒ NOTE: If the OC-3/IS-3 circuit pack is going to be using the same cross-connects as the EC-1 circuit pack that is to be removed, then the only cross-connects that need to be deleted are those at the node where the circuit pack is being replaced. The pass-through cross-connections can remain. Discontinue the EC-1 interface cross-connections at the OC-12 node associated with the FT-2000 **primary** node. **Note that only cross-connections at the DRI node are being discontinued when using the procedures of NTP-025.**	**NTP-025**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
19. At the OC-12 node associated with the FT-2000 **primary** dual ring interworking node, remove both **3STS1E** circuit packs from function unit slots being upgraded to **OLIU**s (for example, node C in Figure 2).	
20. Momentarily depress **UPD** button on **SYSCTL** or use the **`update`** command from the CIT.	
21. At the FT-2000 **primary** dual ring interworking node (for example, node B in Figure 2), use FT-2000 procedures in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Delete DS3 and/or EC-1 Low Speed Port(s), NTP-003**.	
22. At the FT-2000 **primary** dual ring interworking node, use FT-2000 procedures in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Add OC-3/IS-3 Low Speed Slot(s), NTP-010**.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
23. Install **21G/21G-U/21G2-U** (OC-3) or **21D/21D-U OLIU**(s) (IS-3) in the OC-12 node.	**DLP-503**
24. At the DDM-2000 end of optical span between the FT-2000 primary node and DDM-2000, use the **set-fecom:***address***:com=***enabled***,nsus=***ns/us* command to enable far-end communications (fecom) and set Network Side (ns)/User Side (us) parameters.	
25. At the FT-2000 shelf, use **CONFIGURATION-Set-OC3** command to set the protection mode to **0 X 1** for the OC-3/IS-3 slot used for DRI connections, if only one **OLIU** is used for the DRI connection. If two **OLIU**s are used for the DRI connection, use **CONFIGURATION-Set-OC3** command to set the protection mode to **1 + 1** for the OC-3/IS-3 slot used for DRI connections.	
26. At the FT-2000 shelf, use **CONFIGURATION-Enter-Assignment-DCC** command to assign a DCC channel to slot(s) used for DRI connections.	
27. Perform optical fiber connections and verification of the optical facility.	**DLP-551**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
28. Perform end-to-end OC-3/IS-3 line test at DRI nodes associated with the FT-2000 primary node (for example, nodes B and C in Figure 2).	**DLP-552**
29. At the OC-3/IS-3 DRI node, use the **`ent-crs-sts1`** or **`ent-crs-vt1`** commands to make proper "drop and continue" cross-connections.	**DLP-549**
30. At FT-2000 primary node, use the **`FAULT-Switch-Path-STS3-Line-Reset`** command to switch the designated tributary from secondary node to primary node. (Switch traffic to primary node.)	
31. Remove all EC-1/DS3 connections between the nodes with **LAA4 STS1E/BBG12 3STS1E** circuit packs removed, if required.	
32. The upgrade is now complete.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

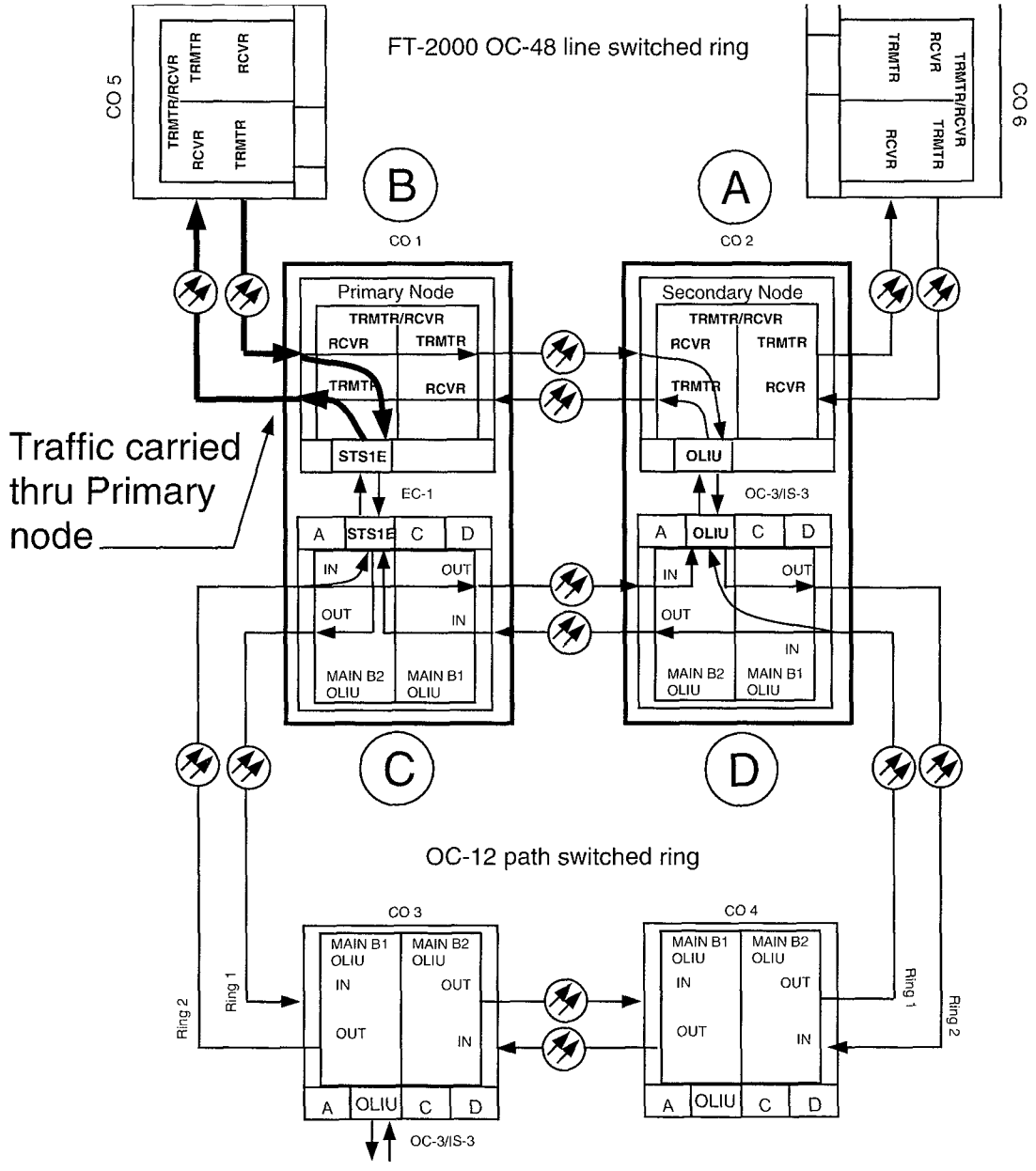


Figure 1. OC-12/OC-48 DRI Interworking

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

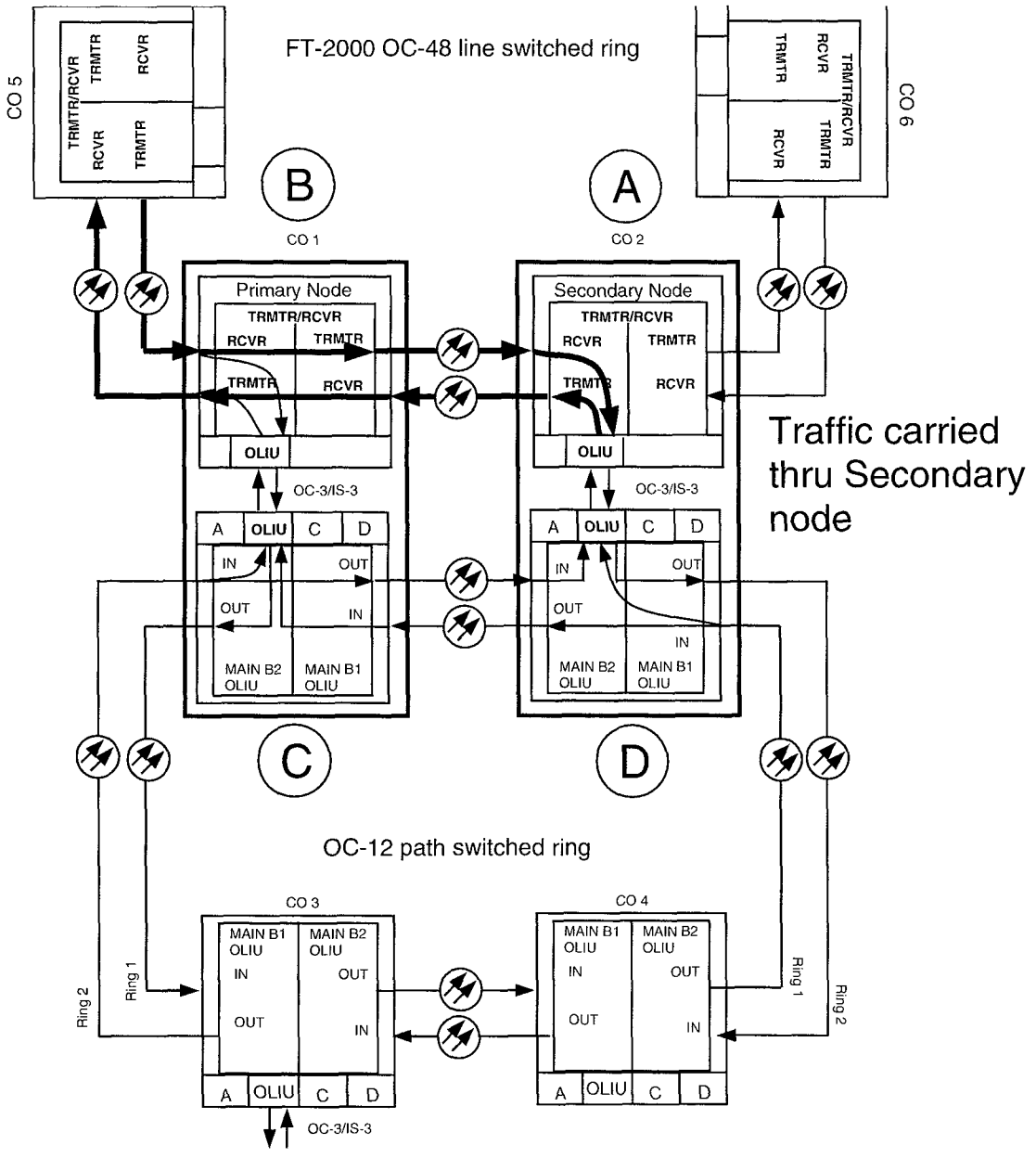


Figure 2. OC-12/OC-48 DRI Interworking

Upgrade DDM-2000 OC-3/OC-12 Dual Ring Interworking Network from EC-1 to OC-3/IS-3 In Service

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100**.

   ⇒ NOTE 1:
   If work order or office records do not specify **OLIU** types, refer to the system Applications, Planning, and Ordering Guide (LTP 363-206-200, OC-3 and OC-12) and/or Volume 1 of this User/Service manual for a description of **OLIU** circuit packs and applications. Existing **BBG12 3STS1E** and **BBG6 STS1E** circuit packs will be replaced in this procedure with **OLIU** circuit packs to support OC-3/IS-3 applications. Optical line power measurements and/or office records must be used to verify that the span length can be supported.

   ⇒ NOTE 2:
   This procedure assumes that the DDM-2000 systems are in service. Ring Release 5 or later software is required in each DDM-2000 OC-12 shelf. Ring Release 7.2 or later software is required in each DDM-2000 OC-3 shelf.

   ⇒ NOTE 3:
   All shelves in the same network must have the same or compatible software releases.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 4:
You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the **`rtrv-alm:`** command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. Upgrade software in each DDM-2000 OC-3/OC-12 shelf with a release that supports OC-3/IS-3 interfaces (Ring Release 5 (OC-12), Ring Release 7.2 or later (OC-3), if not already performed. **DLP-527**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. ⚠ CAUTION:
Removal of the wrong cross-connections may cause service interruption.

NOTE 1:
When signals or circuit packs are removed, alarms will be generated until update procedures are performed.

NOTE 2:
STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs.

NOTE 3:
If the OC-3 circuit pack is going to be using the same cross-connects as the EC-1 circuit pack that is to be removed, then the only cross-connects that need to be deleted are those at the node where the circuit pack is being replaced. The pass throughs can remain.

At the first set of dual ring interworking nodes having circuit packs replaced, discontinue the EC-1 interface cross-connections at the OC-3 node [**NTP-036**]/OC-12 node [**NTP-025**]. **Note that only cross-connections at the DRI node are being discontinued using NTP-036** or **NTP-025**. **NTP-025**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. At the first set of dual ring interworking nodes having circuit packs replaced, remove both **3STS1E** circuit packs from the OC-12 node and both **STS1E** circuit packs from the OC-3 node. (For example, see Figure 1. Remove the **3STS1E** circuit packs from the OC-12 at node D and the **STS1E** circuit packs from the OC-3 at node G.)	
6. At both OC-12 and OC-3 nodes, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.	
7. Remove all EC-1/DS3 connections between the OC-3 and OC-12 nodes with **3STS1E/STS1E** circuit packs removed.	
8. If **21G/21G-U OLIU**s are installed in OC-12 node, set the option switch on the **21G/21G-U OLIU**s to agree with the loss of the optical facility.	**DLP-510**
9. Install both **OLIU**s (OC-3/IS-3) in the OC-12 node and both **OLIU**s (OC-3/IS-3) in the OC-3 node.	**DLP-503**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⇒ NOTE 1:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) for the end-to-end line tests to work when the optical span is being established. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each DDM-2000 shelf** to enable far end communications.

⇒ NOTE 2:
The network elements that terminate on each end of the optical span must have their "Network Side/User Side" parameters set to opposite values to avoid an `inconsistent DCC values` alarm. One end is provisioned as "Network Side" and the other end is provisioned as "User Side". Both ends of the OC-3 line cannot be the same and it makes no difference which end is "Network Side".

At each DDM-2000 shelf, use the **`set-fecom:`***`address`***`:com=`***`enabled`***`,nsus=`***`ns/us`** command to enable far-end communications (fecom) and set User Side (us)/Network Side (ns) parameters.

11. Perform optical fiber connections and verification of the optical facility. **DLP-551**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

12. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur and one of the DSNEs must be disabled. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
It may take 5 minutes or more for the network to stabilize after one of the DSNEs is discontinued. The remaining DSNE must record and map all the new network elements in the network.

Use the **set-ne:TID=tid:dsne=no** command to discontinue one of DSNEs, if not already done. Use the **reset** command at the remaining DSNE to reset the DSNE node.

13.	Perform end-to-end OC-3/IS-3 line test at DRI nodes (For example, between nodes D and G in Figure 1).	**DLP-552**
14.	At the upgraded DRI nodes, use the **ent-crs-sts1** or **ent-crs-vt1** commands to make proper "drop and continue" cross-connections.	**DLP-549**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
15. At the next set of dual ring interworking nodes having circuit packs replaced, discontinue the EC-1 interface cross-connections at the OC-3 node [**NTP-036**]/OC-12 node [**NTP-025**]. **Note that only cross-connections at the DRI node are being discontinued using NTP-036** or **NTP-025**.	**NTP-025**
16. At the dual ring interworking nodes having circuit packs replaced, remove both **3STS1E** circuit packs from the OC-12 node and both **STS1E** circuit packs from the OC-3 node. (For example, see Figure 1. Remove the **3STS1E** circuit packs from the OC-12 at node C and the **STS1E** circuit packs from the OC-3 at node H.)	
17. At both OC-12 and OC-3 nodes, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.	
18. Remove all EC-1/DS3 connections between the OC-3 and OC-12 nodes with **3STS1E/STS1E** circuit packs removed.	
19. If **21G/21G-U OLIU**s are installed in OC-12 node, set the option switch on the **21G/21G-U OLIU**s to agree with the loss of the optical facility.	**DLP-510**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
20. Install both **OLIU**s (OC-3/IS-3) in the OC-12 node and both **OLIU**s (OC-3/IS-3) in the OC-3 node.	**DLP-503**
21. At each DDM-2000 shelf, use the **set-fecom:***address***:com=***enabled***,nsus=***ns/us* command to enable far-end communications (fecom) and set Network Side (ns)/User Side (us) parameters.	
22. Perform optical fiber connections and verification of the optical facility.	**DLP-551**
23. Perform end-to-end OC-3/IS-3 line test at DRI nodes (For example, between nodes C and H in Figure 1).	**DLP-552**
24. At the upgraded DRI nodes, use the **ent-crs-sts1** or **ent-crs-vt1** commands to make proper "drop and continue" cross-connections.	**DLP-549**
25. The upgrade is now complete.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

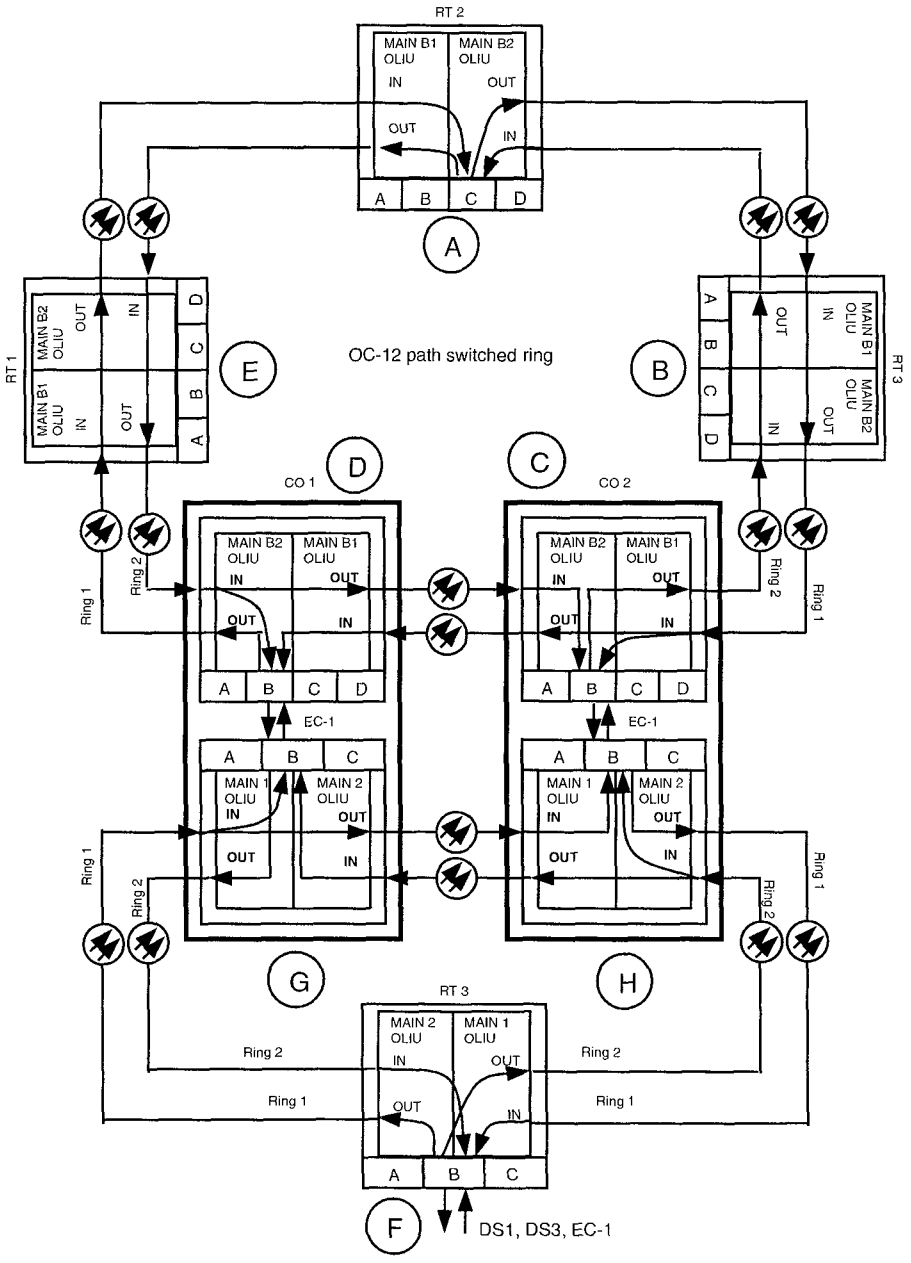


Figure 1. OC-3/OC-12 DRI Interworking

Establish EC-1 Dual Ring Interworking DDM-2000 OC-12 to OC-3 or FT-2000 OC-3/IS-3 Optical Fiber Spans

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE:
   This procedure treats the DRI EC-1 configuration as separate components which use the cross-connections to integrate the components into the DRI configuration. The EC-1 Dual Ring Interworking (DRI) configuration is established by first equipping the proper nodes with the EC-1 interfaces and then establishing DS3 service through the network. The procedures for establishing service reference the proper cross-connection procedure (DLP-549) for making the necessary cross-connections.

   Establish Initial Low Speed EC-1 Interface **NTP-023**

2. Establish Initial End-to-End DS3 Service, if required. **NTP-017**

Establish Single-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

⇒ NOTE 2:
It is assumed that FT-2000 shelves in the system have passed local tests and the FT-2000 ring has been established. It is also assumed the DDM-2000 OC-12 shelves have been equipped and tested (LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual (TOP)—Volume II,* **System Turnup: NTP-002**).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 3:
This procedure is used to establish a single-homed DDM-2000 OC-12 ring connection to an FT-2000 ring (See Figure 1). Other configurations may have to be established to obtain your final configuration. See **NTP-027** for dual-homed configurations from the FT-2000 low speed interface (**LS INTFC**) ports.

Determine the network configuration (for example, see Figure 1.)

2. Verify that the host FT-2000 OC-48 shelf is equipped with Release 6 or later ring software. If not equipped with Release 6 or later software, upgrade the FT-2000 OC-48 host shelf with proper software. Verify that the DDM-2000 OC-12 shelves are equipped with Release 5.0 or later ring software.

3. ⇒ NOTE:
FAULT LEDs will not go off until fibers are connected to the DDM.

Verify/"Add OC-12 Low Speed Slots" at the host FT-2000 shelves. (LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Add OC-12 Low Speed Slot(s), NTP-012**).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. At FT-2000, verify/provision the FT-2000 low speed OC-12 slots Protection Mode (from OC-12) Parameter to "*0X1*" (See **CONFIGURATION-Set-OC12** command in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Provision Low Speed Slot and Port Parameters, DLP-517**.)

5. At FT-2000 shelf, verify/assign DCC channels to FT-2000 low speed OC-12 slots. (See **CONFIGURATION-Enter-Assignment-DCC** command in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Provision Low Speed Slot and Port Parameters, DLP-517**.)

6. Determine the optical loss of each optical span from office records or by making the required measurements.

7. ⇒ NOTE 1:
   This procedure will establish the OC-12 ring configuration starting from the FT-2000 host node (far end) to the first OC-12 node (near end), then continuing to the next OC-12 node until the final connection is made from the last OC-12 node back to the host FT-2000 node.

   ⇒ NOTE 2:
   The Network Side (NS)/User Side (US) parameters of the OC-12 **set-fecom:** command and the FT-2000 DCC orientation must be set opposite at each end of the optical spans. For example, see Figure 2.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Use the **rtrv-fecom/set-fecom** command at the DDM-2000 or the **CONFIGURATION-Enter-Assignment-DCC** command at the FT-2000 to verify/set "Network Side/User Side" parameters at each end of all optical spans being established.

8. ⇒ NOTE 1:
If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-12 shelf turnup, the **TGS** option switches are probably set for *free running*. Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **rtrv-sync** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on DDM-2000 **TGS** circuit packs to the timing mode specified in work order or office records. **DLP-510**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled for the OC-12 **MAIN-B-1** and **MAIN-B-2(P)** optical interfaces at any node in the OC-12 ring, it **must** be enabled at all nodes in the OC-12 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. Use the **set-oc12:** command to enable the Kbyte/Sbyte parameter, if required.

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10. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed OC-12 node in a ring, it **must** be enabled at all line-timed OC-12 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 Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

11. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a duplicate TBOS display alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a duplicate site/ne address alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a duplicate TID alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. ⇒ NOTE 1:
The DDM-2000 **set-ne:** command designates a DDM-2000 shelf as the directory service network element (DSNE). **One**, and only one, shelf in the DDM-2000/FT-2000 network **must** be provisioned as a DSNE. It is recommended that a DDM-2000 shelf be provisioned as the DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an `AGNE communication failure` alarm.

⇒ NOTE 3:
It is recommended that the DSNE be changed from an FT-2000 node to a DDM-2000 node, discontinue the FT-2000 DSNE and use the **reset** command to reset the DDM-2000 DSNE node.

Use the **set-ne:** command to designate ONE shelf in the DDM-2000 network as the DSNE, if the DSNE is going to be a DDM-2000 shelf.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE:
If auto reconfiguration is enabled, the DDM-2000 shelf that will connect to the FT-2000 via the **MAIN-B-1** should be the first of the DDM-2000 ring to connect to the FT-2000. If the DDM-2000 shelf connecting to FT-2000 via **MAIN-B-2(P)** is connected first, the DDM-2000 shelf will remain in holdover as will all othe subsequent DDM-2000 shelves in the ring until the shelf connecting to the FT-2000 via **MAIN-B-1** is connected.

At the near end, remove the optical loop from the **MAIN OLIU** (for example in Figure 2, OC-12 node 2 **MAIN-B-1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated **T939A OC12** circuit pack (for example, in Figure 2, FT-2000 **LS INTFC 1A** slot).

14. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each shelf** to enable far end communications.

At each DDM-2000 shelf, use the **`set-fecom:`***`address`***`:com=enabled`** command to ensure far end DCC communications (fecom) is enabled.

At each FT-2000 shelf, use the **`SECURITY-Set-Far End Communications:`** command to ensure far end DCC communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
15. Perform optical fiber connections and verification of the integrity of the optical span being established.	DLP-511
16. ⇒ 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.	DLP-548
17. Repeat this procedure for all OC-12 optical spans until the OC-12 ring is complete back to the host FT-2000 shelf.	
18. ⇒ NOTE: Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.	
The single-homed DDM-2000 OC-12 access network is now ready for initial service to be established. For service terminations on a FT-2000 shelf, use the procedures in the FT-2000 User/Service Manual to establish those services. For DS3 and/or EC-1 terminations on a DDM-2000 OC-12 shelf, use the procedures in this User/Service manual to establish those services.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

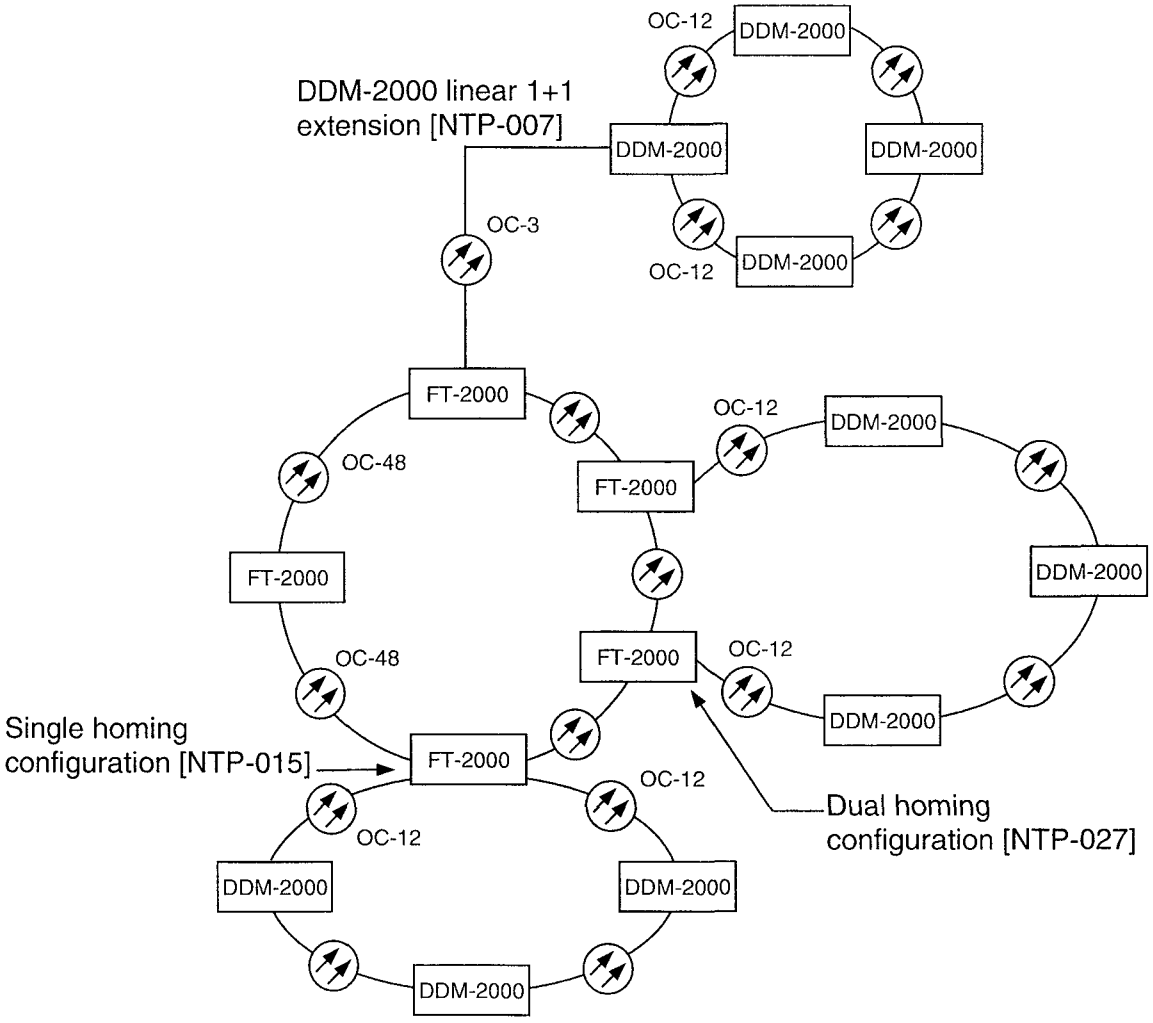
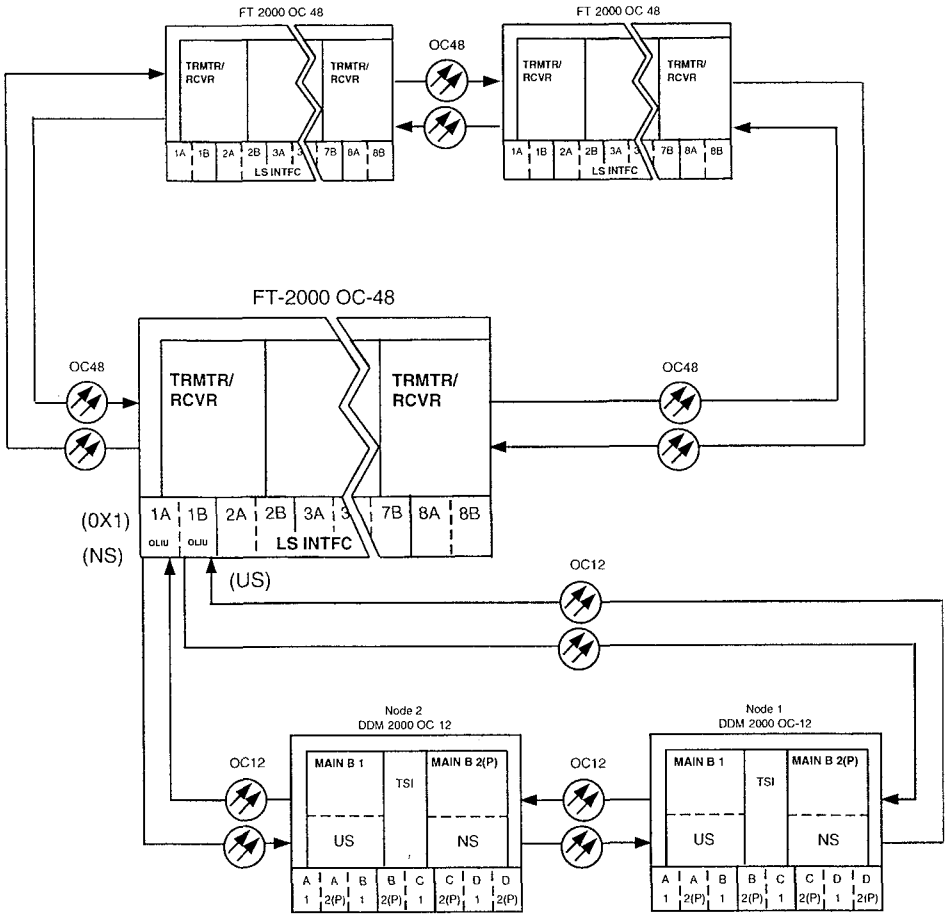


Figure 1. Example FT-2000 OC-48/DDM-2000 OC-12 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO



DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)							
23-Type OLIUs (Rings Application)	MAIN-B-1 dcc-m1	MAIN-B-2 dcc-m2	21-Type OLIUs (1+1)	FN-A dcc-a	FN-B dcc-a	FN-C dcc-c	FN-D dcc d
	US	NS		NS	NS	NS	NS

Figure 2. Example of Single Homed User Side/Network Side Value Settings

Upgrade DDM-2000 OC-12 Release 3 to Release 5 System In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure assumes that the DDM-2000 is in service and is being upgraded from Release 3 software to Release 5. Release 5 software requires that a new **BBG8 SYSCTL** and a **BCP4 OHCTL** be installed in the shelf. This procedure must be performed locally at all shelves in the same control network.

   ⇒ NOTE 2:
   If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

   Use `rtrv-alm` command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⚠ CAUTION:
Transmission configuration information for in-service systems is stored on the **TGS** *circuit pack in* **TIMING** *slot* **1**. *Both* **TGS** *circuit packs must be installed before performing this procedure. During this procedure, downloading Release 3.x software to a shelf running OC-12 Releases 5.x requires you to remove the* **TGS** *circuit pack in* **TIMING** *slot* **1** *in order to "force" the system to run the new software. If both* **TGS** *circuit packs are not installed, removal of the only* **TGS** *circuit pack will cause service interruption.*

NOTE 1:
When upgrading from a Release 3 system to a Release 5 system, after the first shelf is upgraded, single ended operations will not be available and major alarms (section DCC channel failed) will exist until all shelves are upgraded.

NOTE 2:
This procedure will not affect transmission when properly performed.

NOTE 3:
If you are **sure** you are installing new **BBG8 SYSCTL** and **BCP4 OHCTL** controllers that contain the proper software or you are **sure** you will load the proper software from the PC, you may elect to remove the **TGS** circuit pack in **TIMING** slot **1** and allow the software to run without having to "force" the system to run the software.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Before performing this procedure on an in-service system, ensure that both **TGS** circuit packs are installed in the shelf and use the **`switch-sync:s=circuitpack,pri=manual`** command to switch to the protection **TGS-2** circuit pack if not already **ACTIVE**. Use **`rtrv-sync:`** command to verify that the **TGS-2** circuit pack is **ACTIVE**.	
4. From system records, work orders, or the retrieve [RTRV-( )] commands, retrieve all parameters that might have been set using the SET commands [**DLP-509**]. See the "Commands and Reports" section of this manual for a description of the **`rtrv-( )`** commands. Note all the parameters that are set using the **`set-ne`** and **`set-fecom`** commands. These parameters may have to be reset when the controllers are replaced and the new software is installed.	
5. When upgrading from Release 3 to Release 5, use the **`set-ne:gne=no`** command to discontinue the GNE shelf in the R3 ring.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⚠ CAUTION:
Removing the **BBG5 SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display (see* **Note***) may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

⇒ NOTE:
Before removing the **SYSCTL**, you must momentarily depress the **ACO** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown on the **FE ID** display (9, 8, 7, etc.). During this countdown, the **SYSCTL** may be safely removed. If the **SYSCTL** is failed, the countdown may not occur.

Remove **BBG5 SYSCTL** circuit pack.

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7. Remove **BCP1 OHCTL** circuit pack.

---

8. Install **BCP4 OHCTL**. **DLP-500**

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9. ⇒ NOTE 1:
When upgrading from Release 3 to Release 5 (all shelves), after the software download is successfully completed, the **FAULT** LED on the **OHCTL** will flash and the **MJ** LED will be lighted until the other end is upgraded.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
The default *privileged user* logins for Releases 5.0, 5.1, or later are LUC01 (uppercase LUC-zero-one), LUC02 (uppercase LUC-zero-two), and LUC03 (uppercase LUC-zero-three). The default password is DDM-2000.

Install new **BBG8 SYSCTL**. **DLP-501**

10. CAUTION:
Do not designate any shelf as the DSNE (Step 12) until all shelves in the network have been upgraded to the new software. Designating the DSNE first will prevent the other nodes from completing the **`set-ne`** *command.*

NOTE:
Parameters that were previously set by switches on the **BCP1 OHCTL** and **BBG5 SYSCTL** are set by software commands on the new **BCP4 OHCTL** and **BBG8 SYSCTL** controllers: **`TID, Site, NE, Shelf, PMN, TBOS, CO/RT, Network Side/User Side (NS/US) parameters`**.

Use the **`set-ne`** and **`set-fecom`** commands to set these parameters on the new controllers: **`TID, Site, NE, Shelf, PMN, TBOS, CO/RT, Network Side/User Side (NS/US)`**. If other parameters have to be reset from default during this upgrade, use the Commands and Reports section of this manual for a description of the **`set-`** commands.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Repeat this procedure from Step 2 for all shelves being upgraded, if not already performed.	
12. After all shelves have been upgraded to new software, use the **`set-ne:dsne=yes`** command to designate one shelf as the DSNE.	
13. After all shelves have been upgraded to new software, use the **`set-ne:agne=yes`** command to designate one shelf as the AGNE.	

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 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 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 an EC-1 interface to support DS3 services being established, establish initial EC-1 low speed interface.	**NTP-023**
8. ⇒ NOTE 1: Ring releases support only manual STS-1 cross-connections. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 3:
The following commands may be used to delete, enter, and retrieve STS-1 cross-connections in a path protected ring network: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of this manual for a description of commands.

Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

9. Make necessary STS-1 cross-connections for each node in the network.

A. Single OC-12 Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**
C. Single/Dual Homing OC-12/OC-48 Configuration	**DLP-556**
D. Single/Dual Homing OC-12/OC-3 Configuration	**DLP-554**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⇒ NOTE:
For a DS3 circuit in a path protected ring network, the **sw-path-sts1:***address* command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path(s).

Perform DS3 end-to-end transmission test for each circuit being put into service (optional).

A. Single OC-12 Ring Configuration	**DLP-508**
B. Dual Ring Interworking (DRI) Configuration	**DLP-553**
C. Single/Dual Homing Ring Configuration	**DLP-508**

11. Use the **set-t3:** command to set the characteristics of the DS3 port of the circuit being established.

12. Use the **rtrv-state:** command to determine the port state of the DS3 port of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-t3:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-t3:** command to set the port state of the DS3 port of the circuit being established.

Add New DS3 Group for DS3 Service
System In Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

---

1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure assumes that the DDM-2000 is in service and that a new group is being equipped with **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. Set line build out (LBO) option jumpers and install **3DS3** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, **C**, or **D**) being equipped.	**DLP-506**
4. Make the appropriate backplane 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(s) being added.	
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: Ring releases support only manual STS-1 cross-connections. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve STS-1 cross-connections: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary STS-1 cross-connections for each node from the work order or circuit order.

7. Make necessary STS-1 cross-connections for each node in the network.

A. OC-12 Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**
C. Single/Dual Homing OC-12/OC-48 Configuration	**DLP-556**
D. Single/Dual Homing OC-12/OC-3 Configuration	**DLP-554**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE:
For a DS3 circuit in a path protected ring network, the **sw-path-sts1:***address* command must be used at the terminating nodes [and dual ring interworking (DRI) nodes in a DRI ring network] to switch the active STS-1 (DS3) path to repeat this test on the other path.

Perform DS3 end-to-end transmission test for each circuit being put into service (optional).

A. Single OC-12 Ring Configuration	**DLP-508**
B. Dual Ring Interworking (DRI) Configuration	**DLP-553**
C. Single/Dual Homing Ring Configuration	**DLP-508**

9. Use the **set-t3:** command to set the characteristics of the DS3 port.

10. Use the **rtrv-state:** command to determine the port state of the DS3 port(s) of the circuit being established.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-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.

Discontinue End-to-End DS3 Service

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   Determine which DS3 group is to be discontinued and verify no alarms exist on the system.

---

2. ⇒ NOTE 1:
   The following operation may activate the office critical, major, or minor alarm. The audible alarm may be suppressed by depressing the **ACO** button (`opr-aco` command).

   ⇒ NOTE 2:
   One of the terminating (drop) nodes for the DS3 service may be equipped with **3STS1E** circuit packs to provide an EC-1 interface for the DS3 service.

   At the DSX-3/STSX cable cross-connect point at the terminating (drop) nodes, remove the DS3/EC-1 service (signal) from the DS3 group being discontinued. (**FAULT** LED flashes on **3DS3/3STS1E** circuit packs with signal removed.)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ball-point pen to operate it.

At the terminating (drop) nodes, momentarily depress the **UPD/INIT** button on the **SYSCTL** circuit pack or use the **upd** command to update the equipment list. (Flashing **FAULT** LEDs go off.)

4. If a craft interface terminal (CIT) is available, use the **rtrv-state-eqpt** command to verify that the right port has been changed from *in-service* (i) to *auto* (a) state at the terminating nodes.

5. From the work order or **rtrv-crs-sts1** command, determine the cross-connections for circuit being discontinued. Use the **rtrv-crs-sts1** command at each node in the ring network to obtain the STS-1 Cross Connect Report.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⚠ CAUTION:
Removal of the wrong cross-connect may interrupt service.

NOTE 1:
DS3 slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. In ring configurations, remove the cross-connections from the terminating (drop) nodes first, then remove the pass-through cross-connections at the non-terminating nodes, if required. A Critical alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

NOTE 2:
In ring configurations, the following rules are used in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 3:
The following commands may be used to delete, enter, and retrieve STS-1 cross-connections: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
At the terminating (drop) nodes, use the **dlt-crs-sts1:** command to delete the STS-1 cross-connections for the DS3 service being discontinued, if required.	
7. Use the **dlt-crs-sts1:** command to delete the pass-through STS-1 cross-connections at each non-terminating node for the DS3 service being removed, if required.	
8. Remove the **3DS3/3STS1E** circuit packs associated with the group(s) being discontinued, if required.	
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.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
If circuit pack(s) was removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the `upd` command to update the DDM-2000 internal equipment list. If circuit pack(s) was *not* removed, use `set-state-t3` command to set state of **3DS3/3STS1E** circuit pack to "not monitored" (nmon).	
10. Verify that all alarms go off.	

Establish End-to-End DDM-2000 OC-12 System
OC-12 Optical Fiber Spans
Path Switched Ring 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. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

⇒ NOTE 2:
It is assumed that all DDM-2000s in the system have been equipped and passed the looped transmission test(s) [**System Turnup: NTP-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

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2. ⇒ NOTE:
The Network Side/User Side parameters of the **`set-fecom:`** command must be set opposite at each end of the optical spans. For example, see Figure 1.

Use the **`rtrv-fecom/set-fecom`** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

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3. ⇒ NOTE 1:
If line timing mode is specified or external timing mode is specified but the timing reference was not available at shelf turnup, the **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Set timing mode on **TGS** circuit packs to the timing mode specified in work order or office records.	**DLP-510**

4. ⇒ NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled for the **MAIN-B-1** and **MAIN-B-2(P)** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the 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/Sbyte is enabled or disabled. Use the **set-oc12:** command to enable or disable the Kbyte/Sbyte parameter, as required.

5. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed node in a ring, it **must** be enabled at all line-timed nodes of a ring.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter and to set sync source, as required.

6. NOTE:
Two or more shelves in the same network with the same TBOS display number (set by the **set-ne** command) will cause a duplicate TBOS display alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a duplicate site/ne address alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a duplicate TID alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate ONE shelf as the DSNE. Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE:
An OC-12 ring configuration requires that the **MAIN-B-1 OLIU** at one shelf (node) connect to the **MAIN-B-2(P) OLIU** at an adjacent OC-12 shelf (node). See Figure 1. It is suggested that this procedure establish the OC-12 ring configuration starting from the DSNE node (near end) and continuing to an adjacent node, then to the next node until the final connection is made from the last node back to the first node.

At the near end, remove the optical loop from ONE **OLIU** (for example, **MAIN-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.

9. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each shelf** to enable far end communications.

At each shelf, use the **`set-fecom:`***`address`***`:com=enabled`** command to ensure far end communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

10. ⇒ NOTE:
One ring node must be designated as the DSNE for proper DCC communications and in order to verify that the proper nodes have been interconnected using the **`rtrv-map-network`** command. You should start ring node interconnections at the node designated as the DSNE.

Perform optical fiber connections and verification of the integrity of the optical span being established. **DLP-511**

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. **DLP-548**

12. Repeat this procedure from Item 2 for each optical span being established in the DDM-2000 OC-12 network.

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**]
Initial OC-3c/STS-3c Interface [**System Turnup: NTP-006**]
Initial Video Interface [**System Turnup: NTP-005**]

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO



DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)													
23-Type OLIUs (Rings Application)	**MAIN-B-1** dcc-m1	**MAIN-B-2** dcc-m2	**21-Type OLIUs (1+1)**	**FN-A** dcc-a		**FN-B** dcc-a		**FN-C** dcc-c		**FN-D** dcc-d	
	US	NS		NS		NS		NS		NS	
			21-Type OLIUs (0X1)	**FN-A-1** dcc-a1	**FN-A-2** dcc-a2	**FN-B-1** dcc-b1	**FN-B-2** dcc-b2	**FN-C-1** dcc-c1	**FN-C-2** dcc-c2	**FN-D-1** dcc-d1	**FN-D-2** dcc-d2
				NS	US	NS	US	NS	US	NS	US

Figure 1. Example Ring Configuration Connections

Add New DDM-2000 OC-12 Node (Shelf) To DDM-2000 OC-12 Path Switched Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE 1:
   This procedure assumes that the DDM-2000 is in service and a new RT node (shelf) is being added to the Path Switched OC-12 Ring configuration. (See Figure 1.)

   ⇒ NOTE 2:
   It is assumed that optical loops are installed on the new shelf, that the new shelf has been tested in a looped-back configuration, and that the proper release of software 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

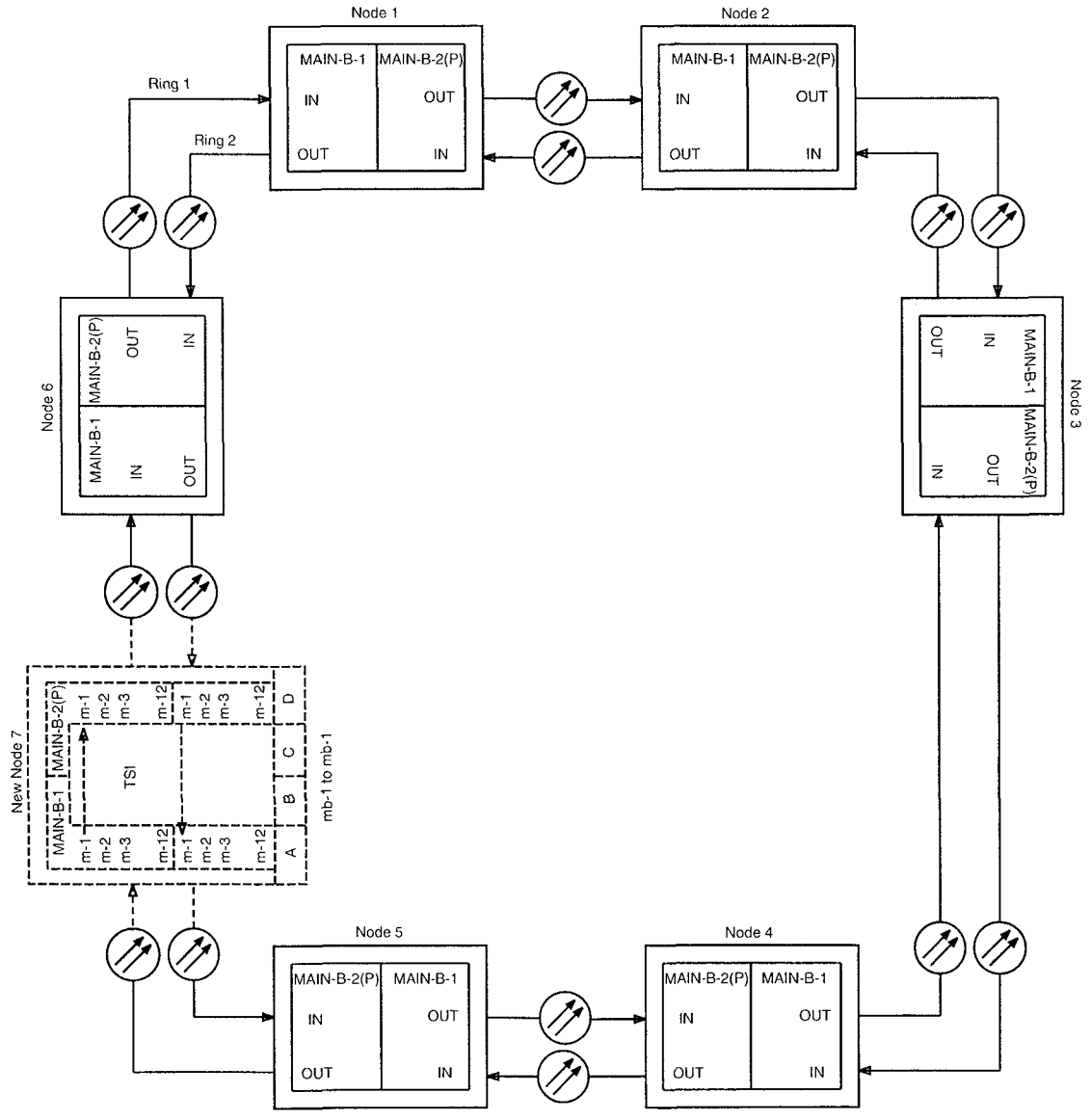


Figure 1. Adding an RT (Node) to an Existing OC-12 Ring Network

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:
It may be helpful to make a sketch of the network to visualize the cross-connections required.

Use **rtrv-map-network:** and **rtrv-map-neighbor:** commands to determine systems (sites) in the network and how they are connected to each other.

4. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a duplicate DSNE alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

NOTE 3:
Two or more shelves in the same network with the same TBOS display number will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID will cause a `duplicate TID` alarm.

Use the **`rtrv-ne`** command at each site to verify no duplicate DSNE, TBOS, site/ne, or TID settings exist. If duplicates exist, determine new settings and use **`set-ne`** command to make new settings.

Use the **`set-ne:`** command to set the alarm group number for this shelf, if required. (Default alarm group number is 255.) If the shelf is an AGNE, use the **`set-ne:`** command to designate the shelf as an AGNE. One primary AGNE and one backup per alarm group is recommended.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. From office records or by using the **`rtrv-crs-sts1:all`** command at any site, determine the existing cross-connections.

6. ⚠ CAUTION:
Critical or Major alarms will be generated if pass-through cross-connections are not made on the new shelf before splicing it into the network.

NOTE 1:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

NOTE 2:
Up to 12 DS3/EC-1s, 4 OC-3s, or 8 STS-3cs may be terminated in a ring network. Once a DS3/EC-1/OC-3/STS-3c is terminated, that timeslot must be reserved in both directions around the ring to the far end. Therefore, if a DS3/EC-1/OC-3/STS-3c is terminated (cross-connected) to a function 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 or **ent-crs-sts1:** command at the new shelf to make all required *pass-through* cross-connections (for example, **ent-crs-sts1:m-1,m-1**). Pass-through cross-connections must be made at the new shelf to correspond to each terminating cross-connection present on every shelf in the ring network. (See Figure 1.)

7. ⇒ NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled for the **MAIN-B-1** and **MAIN-B-2(P)** optical interfaces at any node in a ring, it **must** be enabled at all nodes of the 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/Sbyte is enabled or disabled. Use the **set-oc12:** command to enable or disable the Kbyte/Sbyte parameter, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed node in a ring, it **must** be enabled at all line-timed nodes of a ring.

⇒ NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

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9. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⚠ CAUTION:
An automatic protection switch service hit may occur when the correct optical fibers are cut. Cutting the wrong fiber lines will cause a service interruption.

At the point where the new DDM-2000 shelf will be added, use local procedures to cut the two fiber lines connecting existing shelves and condition the fiber for connection to the new shelf.

10. ⇒ NOTE:
Cutting the main sync source will cause the line-timed node to go into *holdover*.

Verify that only `minor nsa OC-12 LOS` and `nsa inc. STS1 AIS` alarms are present at each end of the fiber cut.

11. ⇒ NOTE 1:
If line timing mode is specified or external timing mode is specified but the timing reference was not available at new shelf turnup, the new shelf **TGS** option switches are probably set for *free running*. Before the end-to-end system is established, the specified timing mode must be set on the **TGS** circuit pack.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected.

Set timing mode on new shelf **TGS** to the timing mode specified in work order or office records. **DLP-510**

12. ⇒ NOTE:
The Network Side/User Side parameters of the **`set-fecom:`** command must be set opposite at each end of the optical spans.

Use the **`rtrv-fecom/set-fecom`** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

13. At new shelf, remove **OLIU** optical loops.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
14. Determine the optical loss of the optical facility from office records or by making the required measurements.	
15. Connect one pair of optical fibers from an adjacent shelf (site) to new shelf **MAIN-B-1 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**
16. ⇒ NOTE: If the report in this step indicates wrong fiber connections or no connection, verify that *fecom* is ON (**`rtrv-fecom:`**) and check fiber integrity. Use **`rtrv-map-neighbor:`** command to verify proper fiber connections have been made to the adjacent node.	
17. 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**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
18. ⇒ NOTE: If the report in this step indicates wrong fiber connections or no connection, verify that *fecom* is ON (**rtrv-fecom:**) and check fiber integrity. Use **rtrv-map-neighbor:** command to verify proper fiber connections have been made to the adjacent node.	
19. Verify that all alarm and status conditions clear. If `nsa inc. 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.	
20. Perform end-to-end OC-12 optical line test on optical spans being established.	**DLP-548**
21. ⇒ 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 **sw-path-( ):** command at both ends to test the other ring path.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Perform appropriate end-to-end transmission test for the circuits being added, as required.	
A. Single OC-3 ring DS3 test	**DLP-508**
B. Dual Ring Interworking (DRI) DS3 test	**DLP-553**

22. The system is ready for service to be established.
    Initial DS3 Service [**System Turnup: NTP-017**]
    Initial EC-1 Service [**System Turnup: NTP-023**]
    Initial OC-3c/STS-3c Service [**System Turnup: NTP-005**]
    Initial Video Service [**System Turnup: NTP-007**]

Discontinue DDM-2000 OC-12 Node (Shelf) From DDM-2000 OC-12 Path Switched Ring Network

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ⚠ CAUTION:
   DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

   ⇒ NOTE:
   The craft interface terminal (CIT) **`rtrv-map-network:`** and **`rtrv-map-neighbor:`** commands may be used to retrieve a map of the SONET network, including a list of the systems in the network and how they are connected. The **`rtrv-crs-sts1:`** command may be used to retrieve STS-1 cross-connections within the DDM-2000 OC-12 system.

   Use **`rtrv-alm`** command to verify no alarms, locks, loops, or switches are present.

2. Determine which DDM-2000 node (shelf) is being discontinued.

3. Verify that optical line loss budget will not be exceeded by removing this node.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

4. At the shelf being discontinued and all associated terminating shelves and extensions, ensure service (signals) has been removed from the function groups being discontinued.
   Discontinue DS3 Service [**System Turnup: NTP-019**]
   Discontinue EC-1 Interface [**System Turnup: NTP-025**]
   Discontinue OC-3c/STS-3c Service [**Circuit Order: NTP-010**]
   Discontinue Video Service [**Circuit Order: NTP-010**]

5. ⇒ NOTE 1:
   The **set-ne:** command designates a shelf as an alarm gateway network element (AGNE). Shelves may be assigned an alarm group number (default alarm group number is 255). At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

   ⇒ NOTE 2:
   It may take several minutes for the network to stabilize after the AGNE has been changed.

   If a shelf being discontinued is an AGNE, use the **set-ne:TID=tid:agne=yes** command to establish the AGNE on another shelf, if required. Use the **set-ne:TID=tid:agne=no** command to disable the AGNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⇒ NOTE 1:
The **set-ne:** command also designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur and one of the DSNEs must be disabled.

⇒ NOTE 2:
It is recommended that a DDM-2000 OC-12 shelf be assigned as the DSNE.

⇒ NOTE 3:
It may take 6 minutes or more for the network to stabilize after the DSNE has been discontinued.

If the DSNE is being discontinued and another DDM-2000 OC-12 shelf is going to be designated as the DSNE, use the **set-ne:TID=tid:dsne=yes** command to establish the DSNE on another DDM-2000 OC-12 shelf. Use the **set-ne:TID=tid:dsne=no** command to disable the DSNE at the shelf being removed.

If the DSNE is being discontinued and a FT-2000 node is going to be designated as the DSNE, use the **SECURITY-Set-Network Element-DSNE:yes** command at the FT-2000 to designate the DSNE, Use the **set-ne:TID=tid:dsne=no** command to disable the DSNE at the shelf being removed.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. ⚠ CAUTION: *Removal of wrong fiber connections will result in a service interruption. Ensure you remove only the fiber connections for the optical span being discontinued.* ⇒ NOTE: The following operations will activate office alarms. The audible alarm may be suppressed by depressing the **ACO** button. Remove optical fiber connections from **MAIN OLIU**s in node (shelf) being discontinued.	
8. Reconnect the optical fibers, bypassing the node just removed. Ensure all alarms in the ring configuration are off. If alarms are present, verify fiber connections and integrity.	
9. If the removed shelf is not to be left powered, power down the shelf per local procedures then continue with Step 12. Otherwise, continue with Step 10.	
10. If **OLIU** circuit packs are *not* removed, connect optical fiber loops to **OLIU**s.	**DLP-534**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

11. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen to operate it.

If any circuit packs were removed, momentarily depress the **UPD/INIT** button on the **SYSCTL** or use the **upd** command to update the DDM-2000 internal equipment list.

12. ⇒ NOTE 1:
When a shelf is removed from a DDM-2000 network and one of the DDM-2000 nodes is designated as a DSNE, 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-map-network** and **rtrv-map-neighbor** 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 DDM-2000 DSNE. The **rtrv-map-network** command may be used to determine which shelf is the DSNE.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
If the DSNE is other than a DDM-2000 shelf, the DSNE will automatically delete the node(s) from its inventory. Wait at least 6 minutes for alarms to settle.

Wait at least one minute, then at the DDM-2000 DSNE, use the **`dlt-tadrmap:tid=`***`tid`* command to delete the TID of the removed shelf from the directory services data base, if required.

13. Verify that all alarms go off.

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

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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, optioned for low speed, have been installed during the initial shelf turnup at the EC-1 terminating end(s) of the circuit. The other terminating end(s) may be equipped with **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 (drop) 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 and parameters set by switches on the circuit pack. See the "Commands and Reports" section of this manual for a description of the **rtrv-ec1:** command format.

Use the **rtrv-ec1:** command to obtain the EC1 Port Provisioning Report and verify the hardware and software option settings.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. Verify/set line build out (LBO) option jumpers on **3STS1E** circuit pack(s), as required.	**DLP-510**
5. ⇒ NOTE: If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** circuit pack after the **3STS1E** circuit pack is reinstalled. If necessary, set the **3STS1E** circuit pack option switch to LOW SPEED and reinstall the **3STS1E** circuit pack(s).	**DLP-510**
6. Use the **`set-ec1:`** command to set the characteristics of the EC-1 port at the EC-1 terminating node(s) of the circuit being established.	
7. 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

8. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.

9. If both terminating nodes are equipped with **3STS1E** circuit packs to terminate the EC-1, continue with Step 10. Otherwise, refer to **System Turnup/Circuit Order: IXL-001** for procedures to establish initial end-to-end DS3 service.

10. ⇒ NOTE 1:
Ring releases support only manual STS-1 cross-connections. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **dlt-crs-sts1**, **ent-crs-sts1**, and **rtrv-crs-sts1**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or office records.

11. Make necessary VT1.5/STS-1 cross-connections for each node.

A. OC-12 Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**
C. Single/Dual Homing OC-12/OC-48 Configuration	**DLP-556**
D. Single/Dual Homing OC-12/OC-3 Configuration	**DLP-554**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. Perform the appropriate end-to-end transmission test for circuit(s) being put into service. For a circuit in a path-protected single OC-12 ring network, use the **sw-path-( ):***address* command at both terminating nodes to switch the active path and repeat this test on the other path.

A. DS3 Single OC-12 Ring Test	**DLP-508**
B. DS3 Dual Ring (DRI) Test	**DLP-553**
C. DS3 Single/Dual Homing Ring Test	**DLP-508**

13. Use the **rtrv-state:** command to determine the port state of the EC-1 port of the circuit being established.

14. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-ec1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-ec1:** command to set the port state of the EC-1 port of the circuit being established.

Add New 3STS1E Low Speed Group for EC-1 Interface
Path Switched Ring
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. Set line build out (LBO) option jumpers and then install **3STS1E** circuit packs into proper slots of **FUNCTION UNITS** group (**A**, **B**, **C**, or **D**) being equipped.	**DLP-547**
4. Use the **`set-ec1:`** command to set the characteristics of the EC-1 port.	
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**.	
7. If both terminating nodes are equipped with **3STS1E** circuit packs to terminate the EC-1, continue with Step 8. Otherwise, refer to **System Turnup/Circuit Order: IXL-001** for procedures to add DS3 service.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
Ring releases support only manual STS-1 cross-connections. Manual STS-1 cross-connections have to be made at each shelf to configure the transmission path for each DS3 circuit being established. Either terminating (drop) cross-connections or "drop and continue" cross-connections are made at terminating nodes and pass-through cross-connections are made at intermediate nodes.

⇒ NOTE 2:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

⇒ NOTE 3:
The following commands may be used to convert, delete, enter, and retrieve cross-connections: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of this manual for a description of commands. See "Cross-Connection Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connection provisioning.

Determine the necessary cross-connections for each node from the work order or office records.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
9. Make necessary STS1 cross-connections for each node.	
A. Single Ring Configuration	**DLP-546**
B. Dual Ring Configuration	**DLP-549**
C. Single/Dual Homing OC-12/OC-48 Configuration	**DLP-556**
D. Single/Dual Homing OC-12/OC-3 Configuration	**DLP-554**
10. Perform the appropriate end-to-end transmission test for circuit being put into service. For a circuit in a path protected ring network, use the **sw-path-( ):***address* command at both terminating nodes to switch the active path and repeat this test on the other path.	
A DS3 Single OC-12 Ring Test	**DLP-508**
B. DS3 Dual Ring Interworking (DRI) Test	**DLP-553**
C. DS3 Single/Dual Homing Test	**DLP-508**
11. Use the **rtrv-state:** command to determine the port state of the EC-1 port(s) of the circuit being established.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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-ec1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

Use the **set-state-ec1:** command to set the port state of the EC-1 port(s) of the circuit being established.

Discontinue EC-1 Interface
Path Switched Ring

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:
   This procedure assumes that **3STS1E** circuit packs are installed at one terminating node in the circuit and either **3STS1E** or **3DS3** circuit packs are installed at the other terminating node(s) of the circuit. It further assumes that the EC-1 interface is being discontinued, not just an individual DS3. If DS3 service is being discontinued, see **System Turnup/Circuit Order: IXL-001** for procedures to discontinue DS3 service.

   At the EC-1 terminating node, determine which EC-1 port is to be discontinued, verify service has been removed, and verify no alarms exist on the system.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

2. ⇒ NOTE:
The following operation may activate the office major or minor alarm. The audible alarm may be suppressed by depressing the **ACO** button.

At the EC-1 cable cross-connect panel at the terminating nodes, remove the EC-1 signal(s) associated with the port(s) being discontinued. (**FAULT** LEDs begin flashing on **3STS1E** circuit pack with signals removed.)

3. ⇒ NOTE:
The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object, such as a ball-point pen, to operate it.

At the terminating nodes, momentarily depress the **UPD/INIT** button on the **SYSCTL** circuit pack or use the **`upd`** command to update the equipment list. (Flashing **FAULT** LEDs go off.)

4. If a craft interface terminal (CIT) is available, use the **`rtrv-state-eqpt:`** command to verify that the right port(s) has been changed from *in-service* (`i`) to *auto* (`a`) state at the terminating nodes.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE:
If the other terminating node for the EC-1 interface is equipped with **3DS3** circuit packs, then STS1 cross-connections will be present. The **rtrv-crs-sts1:** command retrieves the STS-1 Cross Connect Report.

From the work order or **rtrv-crs-sts1** command, determine the cross-connections for circuit being discontinued. Use the **rtrv-crs-sts1** command at each node in the ring network to obtain the STS-1 Cross Connect Report.

6. ⚠ CAUTION:
Deleting wrong cross-connections may interrupt service.

⇒ NOTE 1:
3STS1E slots cannot be unequipped without an alarm until all cross-connections are removed. The cross-connections must be removed first before removing circuit packs. Remove the cross-connections from the terminating nodes first, then remove the pass-through cross-connections at the nonterminating nodes. A Critical or Major alarm may occur when the first cross-connection at the terminating node is deleted and clear when the other terminating cross-connection is deleted.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 2:
The following commands may be used to delete, enter, and retrieve 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-Connect Provisioning" in the "Administration and Provisioning" section of this manual for more information on cross-connects.

Use the **dlt-crs-sts1:** command to delete the terminating node cross-connections for all service being removed, if required.

7. Use the **dlt-crs-sts1:** command to delete the pass-through cross-connections at each nonterminating node for all service being discontinued, if required.

8. ⇒ NOTE:
Install **177B** apparatus blanks (**APPBLK**) in all unused function unit slots to ensure adequate cooling by controlling air flow through the shelf.

If **3STS1E** circuit packs are at the other terminating node, remove the service and protection **3STS1E** circuit packs, if required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. Use **rtrv-state:** command to determine the port state of the EC-1 port(s) of the circuit being discontinued.

10. ⇒ NOTE:
If a port is in the *nmon* (*n*) state, the signal is not monitored or alarmed. The port will not automatically go to the *in service* (*i*) state when a signal is detected as it will in the *auto* (*a*) state. In the *nmon* state, the port must be returned to the *auto* state, using the **set-state-ec1:** command, to turn on monitoring of signal failures and before any circuit packs associated with that port can be removed from the equipment list by the **upd** command.

If 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 circuit pack(s) was *not* removed, use **set-state-ec1** command to set state of **3STS1E** circuit pack to *auto* or *nmon*, as required.

11. If the other terminating node(s) is equipped with **3DS3** circuit packs, discontinue the DS3 service at those nodes as required. [**NTP-019**]

12. Verify all alarms are off.

Convert DS3 Group Service to EC-1 Group Service Path Switched Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
This procedure assumes that the DDM-2000 is in service and 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.

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:
   Ring releases support 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:
3DS3 FUNCTION UNITS 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-547**
11. Use the **`set-ec1:`** command to set the characteristics of the EC-1 port(s) of the circuit being converted.	
12. 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
13. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **Trouble Clearing: IXL-001** and follow the appropriate trouble-clearing procedure.	
14. If both terminating nodes are equipped with **3STS1E** circuit packs to terminate EC-1 service, continue with Step 15. Otherwise, refer to **System Turnup/Circuit Order: NTP-018** for procedures to add DS3 service.	
15. Determine the necessary cross-connections for each terminating and pass-through node from the work order or office records.	
16. Enter or change the necessary STS-1 cross-connections for each node.	
A. Single OC-12 Ring Configuration	**DLP-546**
B. Dual Ring Interworking (DRI) Configuration	**DLP-549**
C. Single/Dual Homing OC-12/OC-48 Configuration	**DLP-556**
D. Single/Dual Homing OC-12/OC-3 Configuration	**DLP-554**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

17. ⇒ 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).

A. DS3 Single OC-12 Ring Test	**DLP-508**
B. DS3 Dual Ring Interworking (DRI) Test	**DLP-553**
C. DS3 Single/Dual Homing Test	**DLP-508**

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-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 converted.

Establish Dual-Homed OC-12 Access via FT-2000 OC-48 Backbone Ring

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DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

⇒ NOTE 1:
If the DDM-2000 fails to respond in the indicated manner, refer to **Trouble Clearing: IXL-001**.

⇒ NOTE 2:
It is assumed that FT-2000 shelves in the system have passed local tests and the FT-2000 ring has been established. It is also assumed the DDM-2000 OC-12 shelves have been equipped and tested (LTP 363-206-290, *DDM-2000 OC-12 Multiplexer, Release 5 and Higher, User/Service Manual—Volume II,* **System Turnup: NTP-002**).

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 3:
This procedure is used to establish a dual-homed DDM-2000 OC-12 ring connection to an FT-2000 ring (See Figure 1). Other configurations may have to be established to obtain your final configuration. See **NTP-015** for single-homed configurations from the FT-2000 low speed interface (**LS INTFC**) ports.

Determine the network configuration (for example, see Figure 1.)

2. Verify that the host FT-2000 OC-48 shelves are equipped with Release 6 or later ring software. If not equipped with Release 6 or later software, upgrade the FT-2000 OC-48 host shelves with proper software. Verify that the DDM-2000 OC-12 shelves are equipped with Release 5.0 or later ring software.

3. ⇒ NOTE:
FAULT LEDs will not go off until fibers are connected to the DDM.

Verify/"Add OC-12 Low Speed Slots" at the host FT-2000 shelves. (See LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Add OC-12 Low Speed Slot(s), NTP-012**).

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. At FT-2000, verify/provision the FT-2000 low speed OC-12 slots Protection Mode (from OC-12) Parameter to "*0X1*". (See **CONFIGURATION-Set-OC12** command in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Provision Low Speed Slot and Port Parameters**, **DLP-517**.)	
5. At FT-2000 shelf, verify/assign DCC channels to FT-2000 low speed OC-12 slots. (See **CONFIGURATION-Enter-Assignment-DCC** command in LTP 365-575-102, *FT-2000 OC-48 Lightwave System, Releases 1 Through 7.1, User/Service Manual, Issue 7.1*, **Provision Low Speed Slot and Port Parameters DLP-517**.)	
6. 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

7. ⇒ NOTE 1:
This procedure will establish the OC-12 ring configuration starting from one FT-2000 host node (far end) to the first OC-12 node (near end), then continuing to the next OC-12 node until the final connection is made from the last OC-12 node to the other host FT-2000 node.

⇒ NOTE 2:
The Network Side (NS)/User Side (US) parameters of the DDM-2000 OC-12 **set-fecom:** command and the FT-2000 DCC orientation must be set opposite at each end of the optical spans. For example, see Figure 2.

Use the **rtrv-fecom** command at the DDM-2000 to retrieve DCC parameters. Use **set-fecom:nsus=***NS/US* command at the DDM-2000 to set "Network Side (NS)/User Side (US)" parameters at each end of all optical spans being established. Use the **CONFIGURATION-Enter-Assignment-DCC** command at the FT-2000 to assign DCC channels.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. ⇒ NOTE 1:
If line timing mode is specified or external timing mode is specified but the timing reference was not available at the OC-12 shelf turnup, the **TGS** option switches are probably set for *free running.* Before this configuration is established, the specified timing mode must be set on the **TGS** circuit packs.

⇒ NOTE 2:
If the option switch setting is changed, an update must be done by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the **TGS** circuit packs are reinstalled.

⇒ NOTE 3:
If external timing is selected and the **NE ACTY** LED remains lighted after the **TGS** circuit pack is reinserted, use the CIT and the **`rtrv-sync`** command to check the operational mode of the system. If the mode is `Holdover` instead of `External`, check that the incoming timing references are connected. Also check `Mode Switching` (revertive or nonrevertive) and the external `DS1 Line Code/Format` switch settings.

Set timing mode on DDM-2000 **TGS** circuit packs to the timing mode specified in work order or office records. **DLP-510**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. ⇒ NOTE 1:
If Kbyte/Sbyte (sync messaging) is enabled for the OC-12 **MAIN-B-1** and **MAIN-B-2(P)** optical interfaces at any node in the OC-12 ring, it **must** be enabled at all nodes in the OC-12 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. Use the **set-oc12:** command to enable the Kbyte/Sbyte parameter, if required.

10. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte must also be enabled.

⇒ NOTE 2:
If Sync Autoreconfiguration is enabled at any line-timed OC-12 node in a ring, it **must** be enabled at all line-timed OC-12 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 Autoreconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoreconfiguration parameter, as required.

11. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a duplicate TBOS display alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a duplicate site/ne address alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a duplicate TID alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

12. ⇒ NOTE 1:
The DDM-2000 **set-ne:** command designates a DDM-2000 shelf as the directory service network element (DSNE). **One**, and only one, shelf in the DDM-2000/FT-2000 network **must** be provisioned as a DSNE. It is recommended that a DDM-2000 shelf be provisioned as the DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as a DSNE, a duplicate DSNE alarm will occur. Multiple GNEs are allowed. A shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes. The AGNE parameter of the **set-ne:** command may have been set to **yes** on each new shelf during shelf turnup procedures to suppress an `AGNE communication failure` alarm.

⇒ NOTE 3:
It is recommended that the DSNE be changed from an FT-2000 node to a DDM-2000 node, discontinue the FT-2000 DSNE and use the `reset` command to reset the DDM-2000 DSNE node.

Use the **set-ne:** command to designate ONE shelf in the DDM-2000 network as the DSNE, if the DSNE is going to be a DDM-2000 shelf.

Use the **set-ne:** command to designate the AGNE(s) and alarm group numbers, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

13. ⇒ NOTE 1:
If auto reconfiguration is enabled, the DDM-2000 shelf that will connect to the FT-2000 via the **MAIN-B-1** ahould be the first of the DDM-2000 ring to connect to the FT-2000. If the DDM-2000 shelf connecting to FT-2000 via **MAIN-B-2(P)** is connected first, the DDM-2000 shelf will remain in holdover as will all othe subsequent DDM-2000 shelves in the ring until the shelf connecting to the FT-2000 via **MAIN-B-1** is connected.

At the near end, remove the optical loop from the **MAIN OLIU** (for example in Figure 1, OC-12 node 1 **MAIN-B-1**) associated with the optical span being established. At the other end of the optical span, remove the optical loop from the associated **T939A OC12** circuit pack (for example, in Figure 2, FT-2000 **LS INTFC 1A** slot).

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14. ⇒ NOTE:
The section data communication channel (DCC), used for far end communications, must be enabled at each network element (shelf) optical interface being tested in order for the end-to-end line tests to work. Default condition for the DCC channel is "enabled". If it has been disabled, use the **`set-fecom:`** command **at each shelf** to enable far end communications.

At each DDM-2000 shelf, use the **`set-fecom:`***`address`***`:com=enabled`** command to ensure far end DCC communications (fecom) is enabled.

At each FT-2000 shelf, use the **`SECURITY-Set-Far End Communications:`** command to ensure far end DCC communications (fecom) is enabled.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
15. Perform optical fiber connections and verification of the integrity of the optical span being established.	**DLP-511**
16. ⇒ 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.	**DLP-548**
17. Repeat this procedure for all OC-12 optical spans until the OC-12 ring is complete to the other host FT-2000 shelf.	
18. ⇒ NOTE: Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.	
The dual-homed DDM-2000 OC-12 access network is now ready for initial service to be established. For service terminations on a FT-2000 shelf, use the procedures in the FT-2000 User/Service Manual to establish those services. For DS3 and/or EC-1 terminations on a DDM-2000 OC-12 shelf, use the procedures in this User/Service manual to establish those services.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

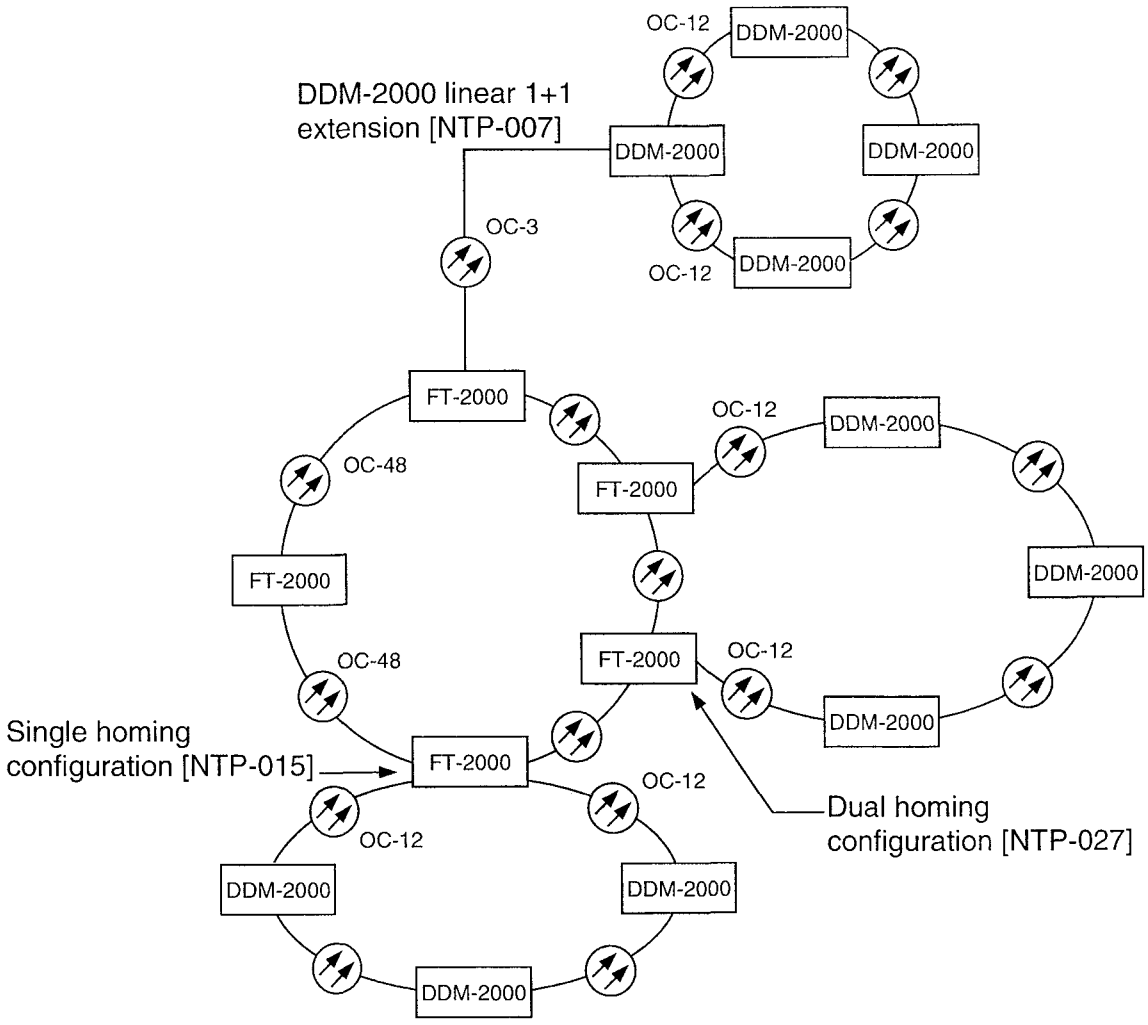
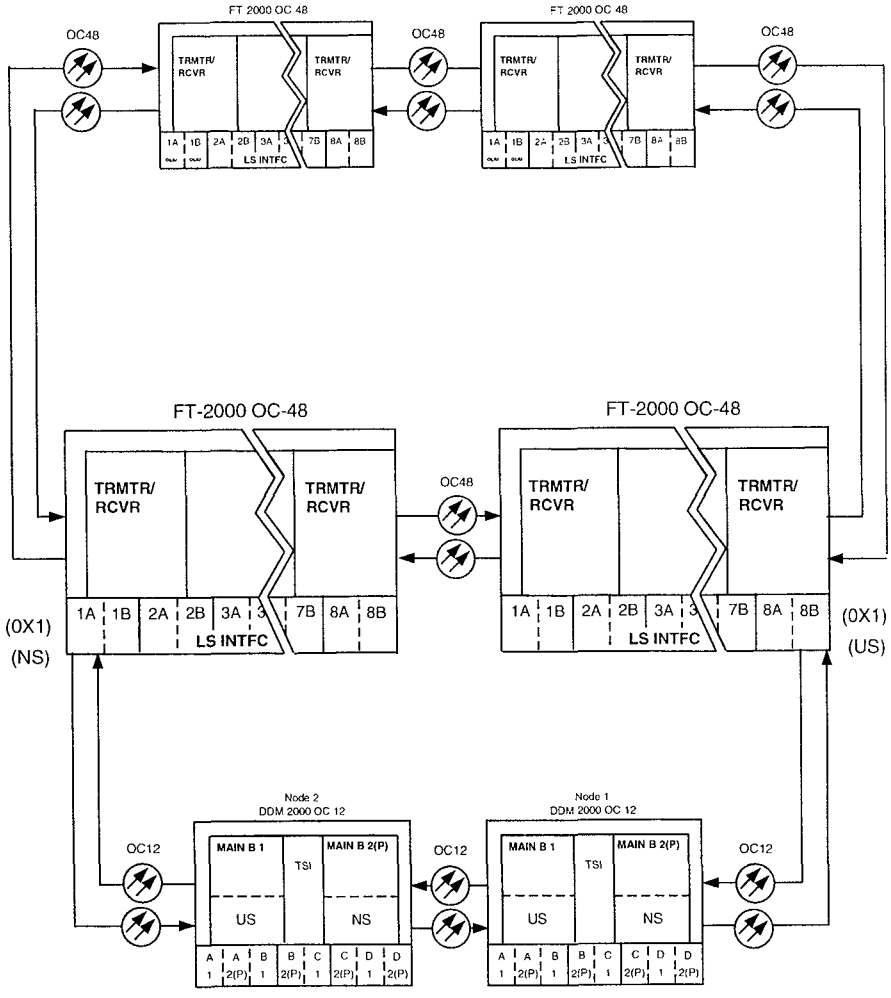


Figure 1. Example FT-2000 OC-48/DDM-2000 OC-12 Configurations

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO



DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)							
23-Type OLIUs (Rings Application)	**MAIN-B-1** dcc-m1	**MAIN-B-2** dcc-m2	**21-Type OLIUs (1+1)**	**FN-A** dcc-a	**FN-B** dcc-a	**FN-C** dcc-c	**FN-D** dcc-d
	US	NS		NS	NS	NS	NS

Figure 2. Example of Dual Homed User Side/Network Side Value Settings

Unused

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Unused

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Unused

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Upgrade DDM-2000 OC-12 Point-to-Point Network to Path Switched Ring Out of Service

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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 1:
This procedure requires that the system be taken out of service long enough to change **OLIU** optical fiber connections to the ring configuration. Release 5 or later software is required for all shelves in the ring configuration.

⇒ NOTE 2:
All shelves in the same network must have the same software release.

⇒ NOTE 3:
You may also contact Lucent Technologies to provide an in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
Use the **`rtrv-alm:`** command to verify that no alarms, locks, loops, or switches are present.	
2. Notify maintenance center that alarms will be generated.	
3. ⇒ NOTE: 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 with **BCP4 OHCTL** circuit pack.	**DLP-518**
4. Replace **BBG5 SYSCTL** circuit pack with **BBG8 SYSCTL** circuit pack.	**DLP-518**
5. Upgrade software in each DDM-2000 OC-12 shelf with Release 5 or later that supports the path switched ring configuration. (Software upgrades must be made locally at each shelf.)	**DLP-527**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. ⇒ NOTE:
In Release 5 or later, the **BCP3 TSI** circuit pack is required for manual internal STS-1 cross-connections in path switched ring applications.

Replace **BCP2 TSI**s in each shelf with **BCP3 TSI**s. **DLP-518**
(Protection **BCP3 TSI**s are required.)

7. ⇒ NOTE:
The Network Side/User Side parameters of the **`set-fecom:`** command must be set opposite at each end of the optical spans.

Use the **`rtrv-fecom/set-fecom`** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

8. ⇒ NOTE:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.
2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

At **each** shelf, use **`ent-crs-sts1:`** and/or **`ent-crs-sts3c:`** command(s) to make all required STS-1 cross-connections.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

9. Use **`rtrv-sync:`** command to check timing mode and parameters for proper provisioning. If necessary, use **`set-sync:`** command to change timing provisioning.

10. Use **`set-fecom:dcc-mb1`** or **`mb2:com=disabled`** command to disable far-end communications (fecom) at the near end shelf.

11. ⚠ 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.

12. ⚠ CAUTION:
This step will interrupt service until the optical lines have been properly reconnected. Notify maintenance center and other required personnel that service will be interrupted.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE:
In the ring configuration, optical fibers from **MAIN-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.

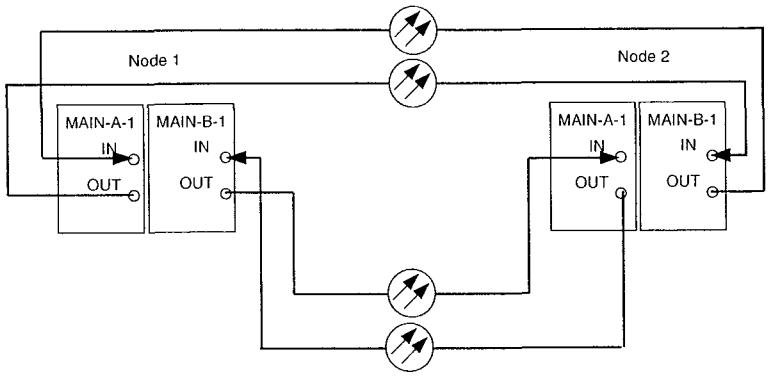


Figure 1. DDM-2000 OC-12 Point-to-Point to Ring Upgrade

13. NOTE 1:
The **`set-ne:`** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate ONE shelf as the DSNE, if required. Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

14. Use **set-fecom:dcc-all:com=enabled** command at both ends to enable far-end communications (fecom).

15. ⇒ NOTE 1:
If Kbyte/Sbyte (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/Sbyte is enabled or disabled. Use the **set-oc12:** command to enable or disable the Kbyte/Sbyte parameter, as required.

16. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte 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.

17. 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

---

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:
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 5 or later software is required for the final ring configuration.

NOTE 4:
All shelves in the same network must have the same or compatible software releases.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

⇒ NOTE 5:
You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the **rtrv-alm:** command to verify that no alarms, locks, loops, or switches are present.

2. Notify maintenance center that alarms will be generated.

3. ⇒ NOTE:
The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

4. 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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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-eqpt:main-b-all`** command to check switch state (`main-b-2 OLIU active`). (See Figure 1.)

7. At Node 1 and Node 2, use **`set-fecom:dcc-mb:com=disabled`** command to disable far-end communications (fecom).

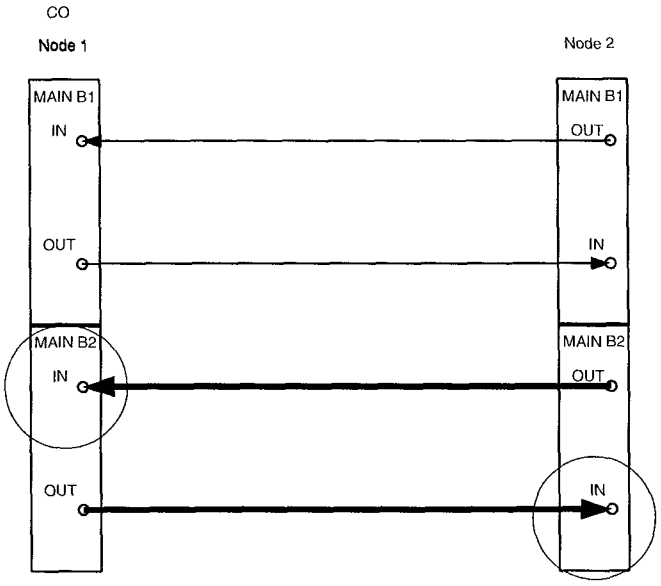


Figure 1. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.

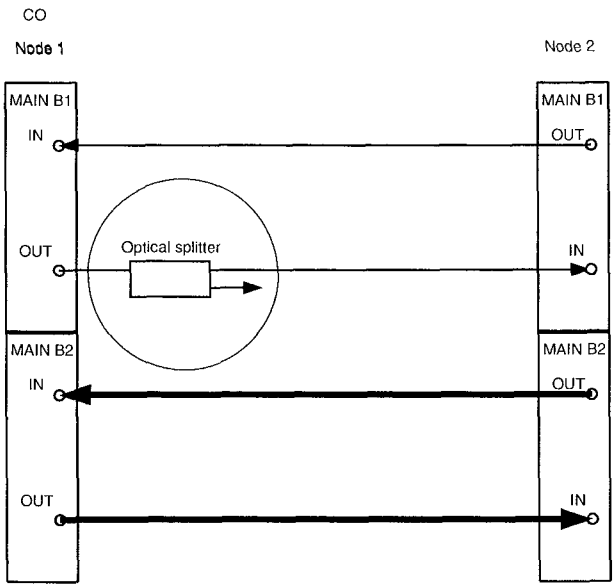


Figure 2. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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 line (`main-b-1 OLIU active`). (See Figure 3.)

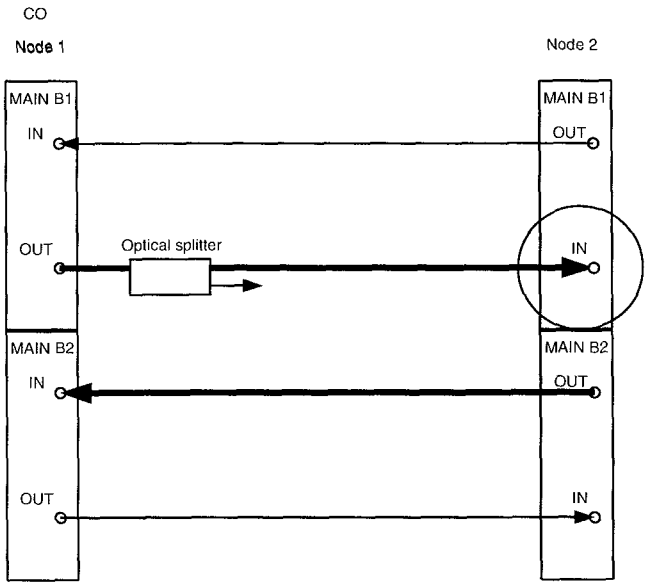


Figure 3. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

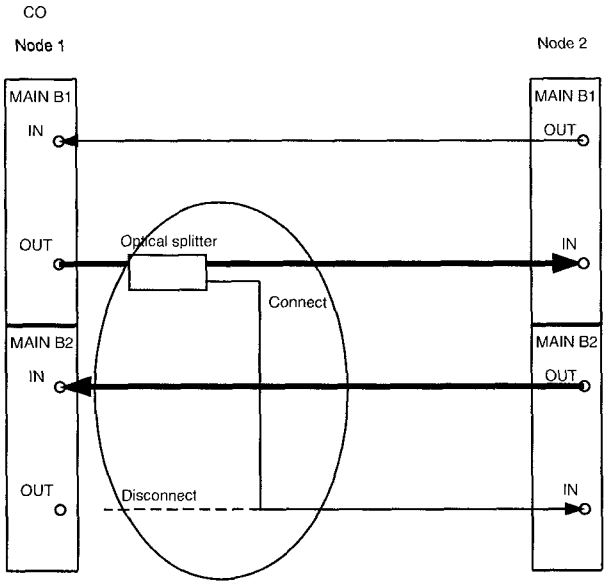


Figure 4. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

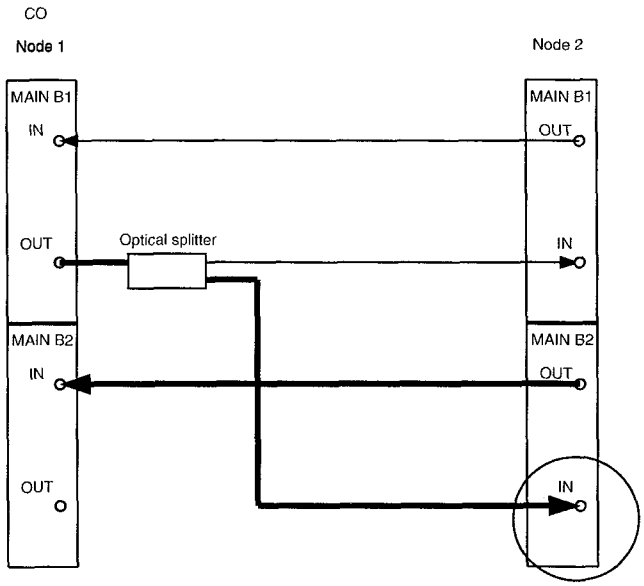


Figure 5. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

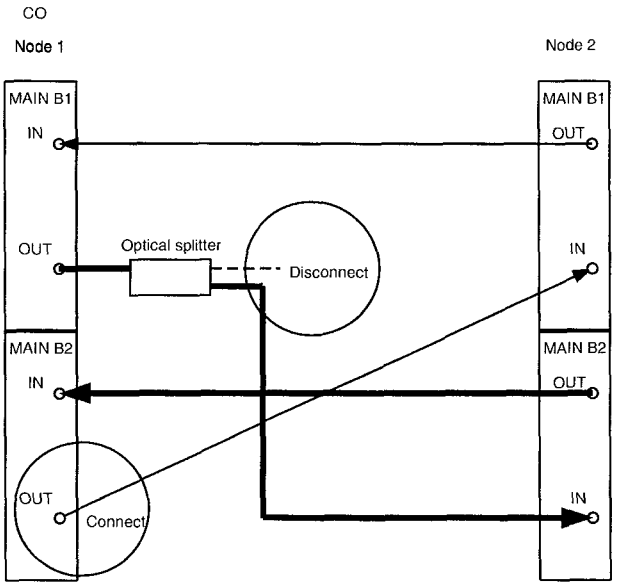


Figure 6. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

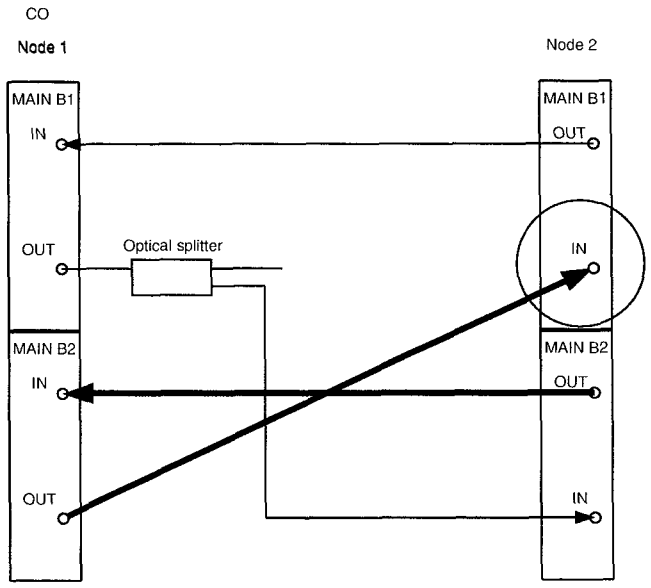


Figure 7. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

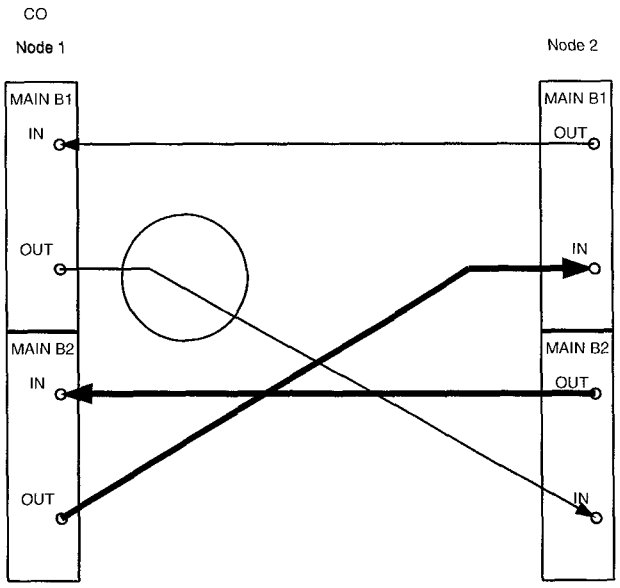


Figure 8. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.

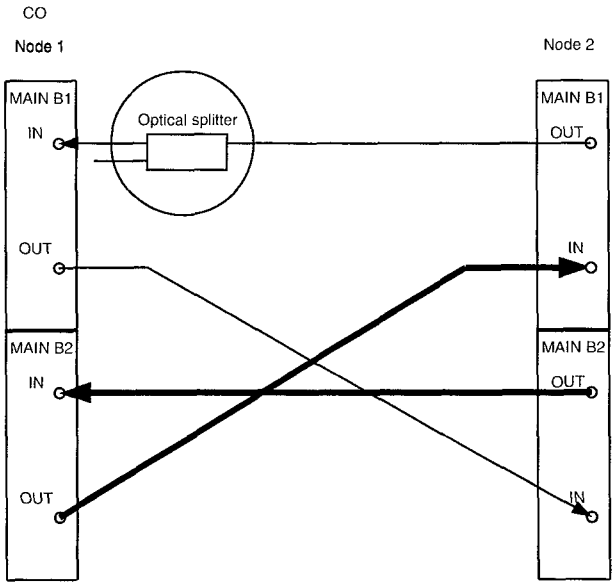


Figure 9. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

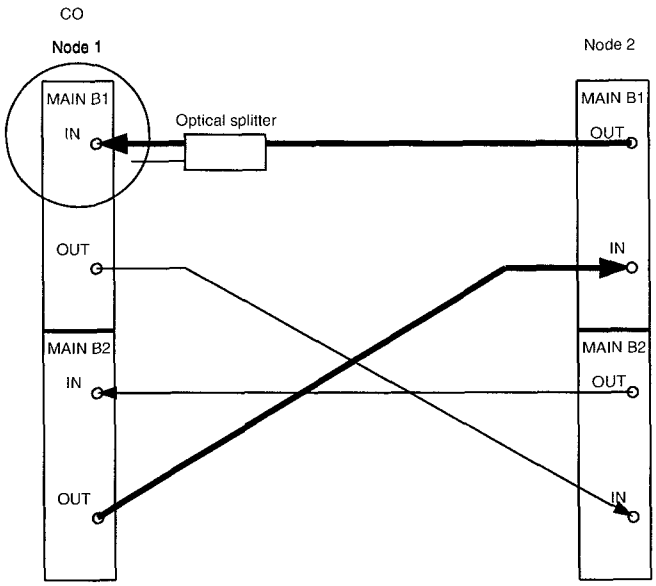


Figure 10. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

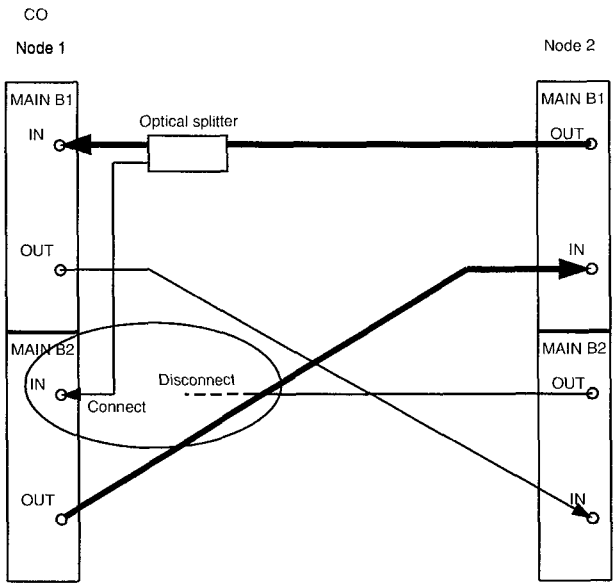


Figure 11. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

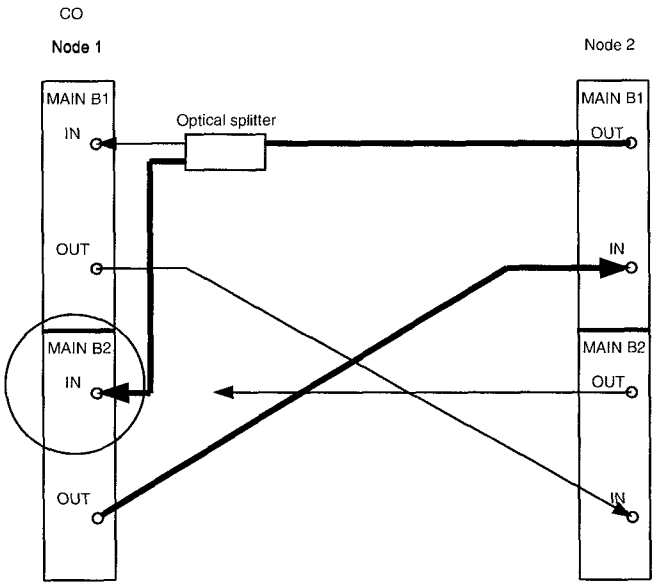


Figure 12. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

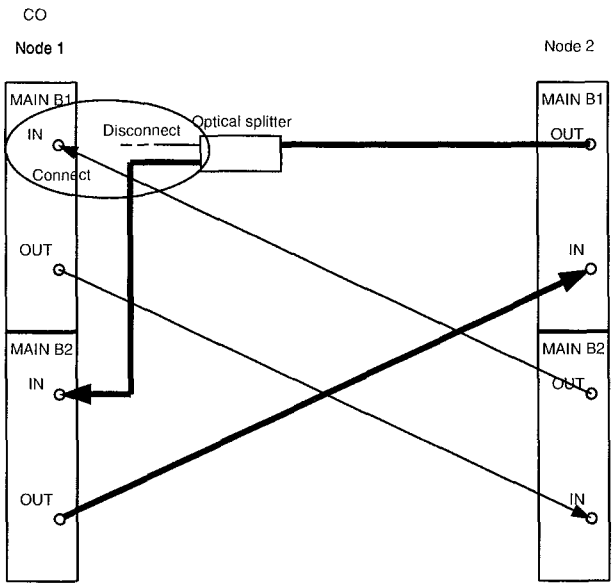


Figure 13. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

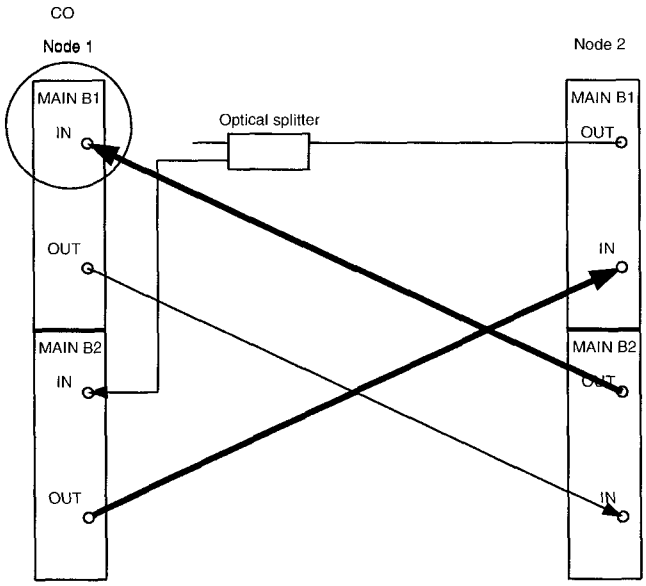


Figure 14. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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.)

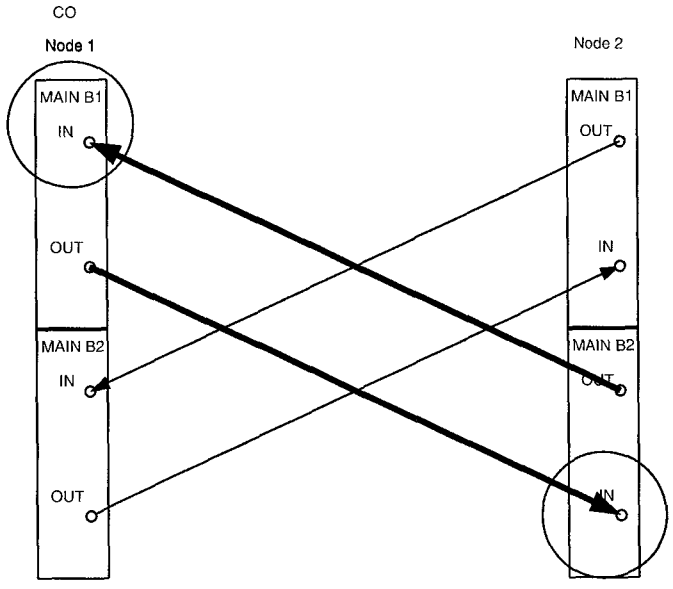


Figure 15. DDM-2000 OC-12 Point-to-Point Network to Ring Upgrade

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:
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 with **BCP4 OHCTL** circuit pack. **DLP-518**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
28. Replace **BBG5 SYSCTL** circuit pack with **BBG8 SYSCTL** circuit pack.	**DLP-518**
29. Upgrade Node 2 (shelf) with Release 5 or later software. (Software upgrades must be made locally at each shelf.)	**DLP-527**

30. ⇒ 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.

31. At Node 2, reseat **MAIN-B-1 OLIU**.

32. At Node 2, reseat **TGS** circuit pack in the **TGS-1** slot.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

33. ⇒ NOTE:
Two unidirectional transmission hits will result when the **MAIN-B-2 OLIU** is removed.

At Node 2, remove **MAIN-B-2 OLIU**.

34. At Node 2, remove **BCP2 TSI** circuit pack from **TSI-2** slot.

35. At Node 2, seat new **BCP3 TSI** circuit pack into **TSI-2** slot.

36. At Node 2, reseat **MAIN-B-2 OLIU**.

37. ⇒ 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
38. At Node 1, unseat **MAIN-B-1 OLIU**.	
39. At Node 1, remove **BCP2 TSI** circuit pack in the **TSI-1** slot.	
40. At Node 1, unseat **TGS** circuit pack in the **TGS-1** slot.	
41. ⇒ NOTE: 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 with **BCP4 OHCTL** circuit pack.	**DLP-518**
42. Replace **BBG5 SYSCTL** circuit pack with **BBG8 SYSCTL** circuit pack.	**DLP-518**
43. Upgrade Node 1 (shelf) with Release 5 software. (Software upgrades must be made locally at each shelf.)	**DLP-527**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

44. ⇒ 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.

---

45. At Node 1, reseat **MAIN-B-1 OLIU**.

---

46. At Node 1, reseat **TGS** circuit pack in the **TGS-1** slot.

---

47. ⇒ NOTE:
Two unidirectional transmission hits will result when the **MAIN-B-2 OLIU** is removed.

At Node 1, remove **MAIN-B-2 OLIU**.

---

48. At Node 1, remove **BCP2 TSI** circuit pack from **TSI-2** slot.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

49. At Node 1, seat new **BCP3 TSI** circuit pack into **TSI-2** slot.

50. At Node 1, reseat **MAIN-B-2 OLIU**.

51. Use **`set-fecom:dcc-mb1`** or **`mb2:com=enabled`** command at Node 1 and Node 2 to enable far-end communications (fecom).

52. ⇒ NOTE 1:
The **`set-ne:`** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **`set-ne:`** command to designate ONE shelf as the DSNE, if required. Use the **`set-ne:`** to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

53. ⇒ NOTE 1:
If Kbyte/Sbyte (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/Sbyte is enabled or disabled. Use the **set-oc12:** command to enable or disable the Kbyte/Sbyte parameter, as required.

---

54. ⇒ NOTE 1:
If Sync Autoreconfiguration is enabled, Kbyte/Sbyte 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.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

NOTE 3:
The **rtrv-sync:** command retrieves the Synchronization Report. This report displays the provisioning and operational information on the synchronization attributes of the DDM-2000. See the "Commands and Reports" section of this manual for a description of the **rtrv-sync:** command format.

Use the **rtrv-sync:** command to obtain the Synchronization Report and verify if Sync Autoconfiguration is enabled or disabled. Use the **set-sync:** command to enable or disable the Sync Autoconfiguration parameter, as required.

55. The ring configuration is now complete and new nodes may be added as required [**NTP-021**].

Unused

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

Upgrade DDM-2000 OC-3 Ring Network to OC-12 Ring Network In Service

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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

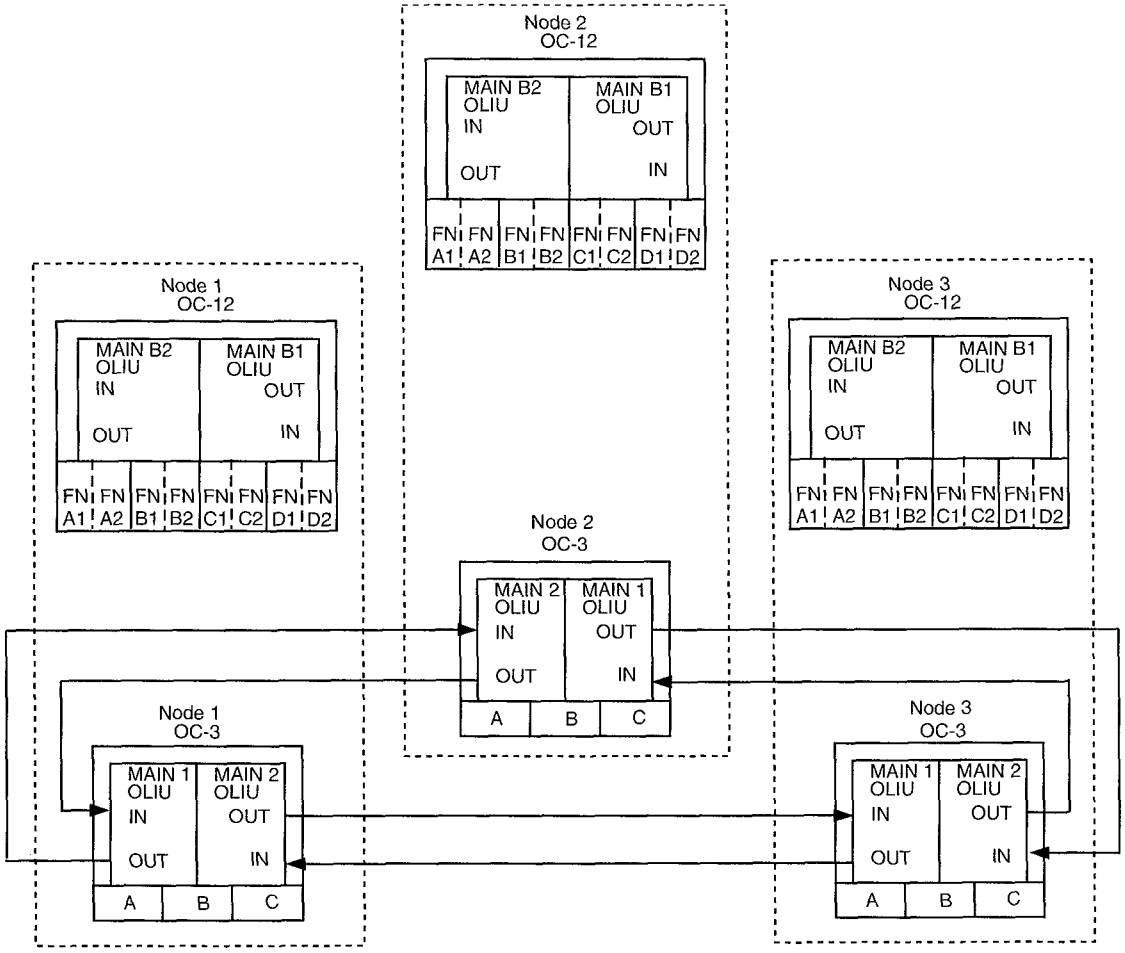


Figure 1. Example of OC-3 to OC-12 Ring Upgrade (1 of 7)

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 5 or later, software must be installed in the OC-12 shelves. Release 7.2 or Release 9 or later, software must be installed in the OC-3 shelves.

NOTE 6:
You may also contact Lucent Technologies to provide this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Use the **`rtrv-alm:`** command at the OC-3 ring to verify that no alarms, locks, or switches are present.

2. Notify maintenance center that alarms will be generated.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

3. ⇒ NOTE:
The Network Side/User Side parameters of the **set-fecom:** command must be set opposite at each end of the optical spans.

Use the **rtrv-fecom/set-fecom** command to verify/set "Network Side/User Side" parameters at each end of optical span being established.

4. ⇒ NOTE:
Two or more shelves in the same network with the same TBOS display number (set using the **set-ne** command) will cause a `duplicate TBOS display` alarm. Two or more shelves in the same network with the same site/ne address (set by the **set-ne** command) will cause a `duplicate site/ne address` alarm. Two or more shelves in the same network with the same system name or TID (set by the **set-ne** command) will cause a `duplicate TID` alarm.

Verify no duplicate TBOS, site/ne, or TID settings exist. The **rtrv-ne:** command may be used at each shelf in the network to display settings. If duplicates exist, determine new settings and use the **set-ne** command to make new settings.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ⇒ NOTE 1:
The **set-ne:** command designates a shelf as the directory service network element (DSNE). **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. If there is no DSNE in the network, all DCC communication can become disabled. If more than one shelf is provisioned as DSNE, a `duplicate DSNE` alarm will occur. Multiple GNEs are allowed and a shelf is automatically provisioned as a GNE when connected to an active X.25 interface.

⇒ NOTE 2:
Shelves may be designated as an alarm gateway network element (AGNE) and assigned an alarm group number. (Default alarm group number is 255.) At least one AGNE is required per alarm group. One primary AGNE and one backup per alarm group is recommended. For a network greater than 16 nodes, the AGNE and TL1 GNE should be on separate nodes.

Use the **set-ne:** command to designate ONE shelf as the DSNE, if required.

Use the **set-ne:** to designate the AGNE(s) and alarm group number, as required.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

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 single-homed 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 single-homed 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},{a,b,c,d}-{1-3}` 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 DSNE, use the **`set-ne:tid=`***`tid`***`;dsne=no`** command to set the DSNE 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 DSNE 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 DSNE, disconnect the fiber pair between the associated OC-3 shelf and a neighboring OC-3 shelf. For example in Figure 2, if the DSNE 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

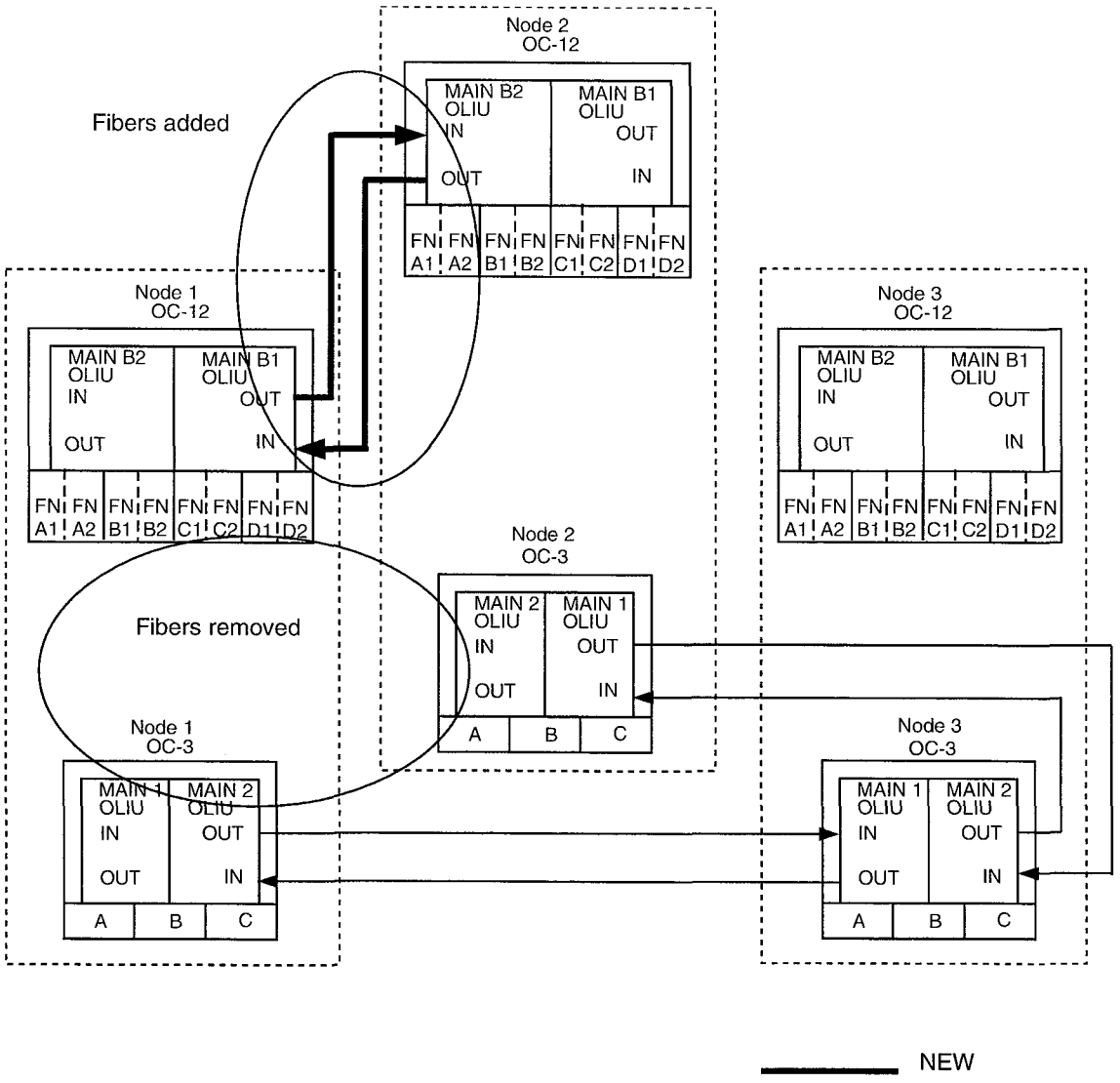


Figure 2. Example of OC-3 to OC-12 Ring Upgrade (2 of 7)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

12. At OC-12 Nodes 1 and 2, use the **`rtrv-oc3`**/**`set-oc3`** command to verify/set application (*app*) parameter for **FUNCTION UNITS** slots being used for this single-homed configuration. For example, **`set-oc3:fn-a,app=0X1`**.

13. ⇒ NOTE:
The remainder of this procedure is based on the 3-node example in the figures and the assumption that the DSNE is at Node 1.

At Node 1, remove **22F/22F-U/22F2-U OLIU** from OC-3 **MAIN 1** slot. At Node 2, remove **22F/22F-U/22F2-U 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-map-network`** and **`rtrv-map-neighbor`** commands 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 single-homed connection. In single-homed 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-map-network`** and **`rtrv-map-neighbor`** commands 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

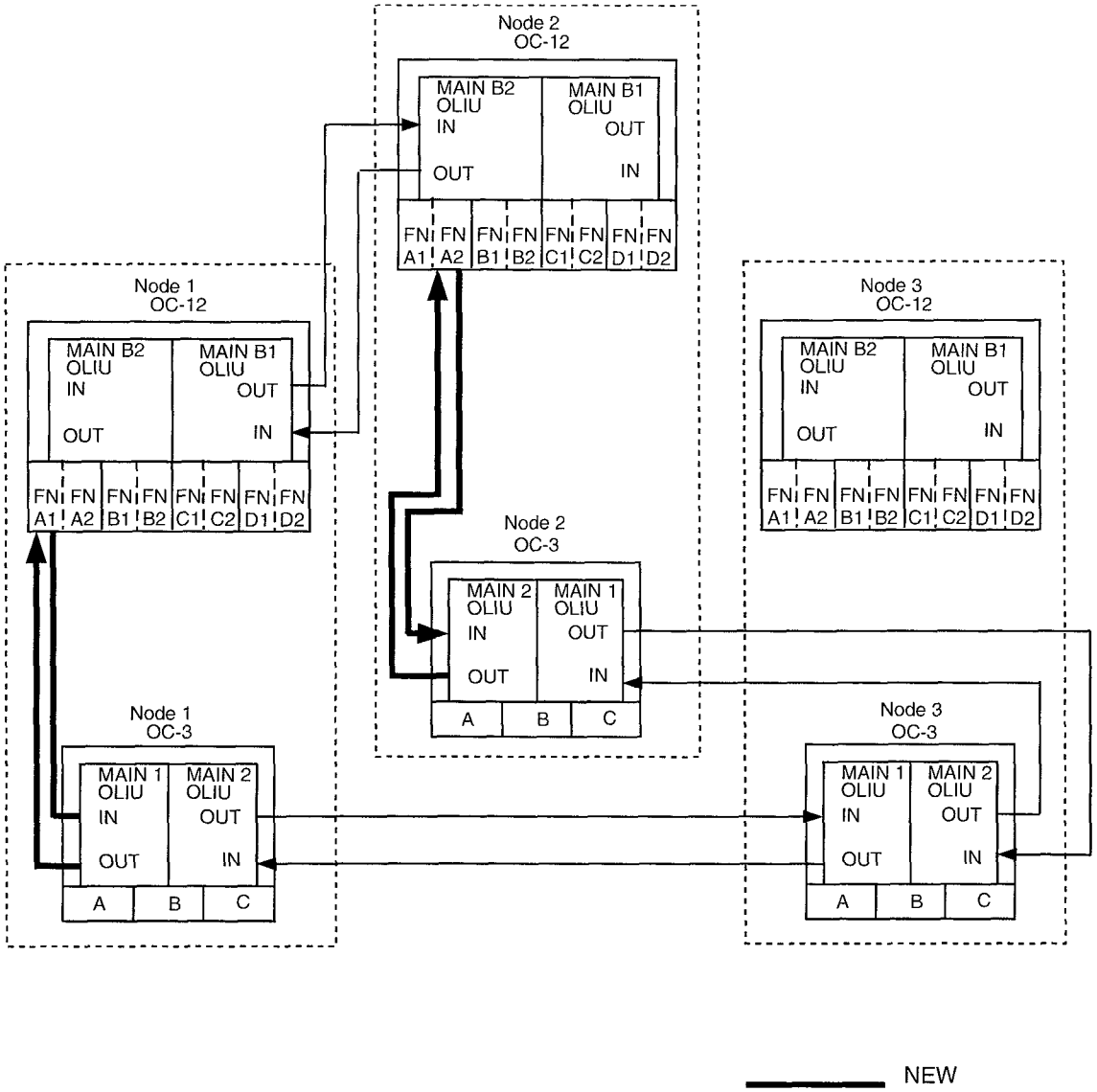


Figure 3. Example of OC-3 to OC-12 Ring Upgrade (3 of 7)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
17. At OC-12 Nodes 1 and 2, use the **`rtrv-oc3`**/**`set-oc3`** command to verify/set application (*app*) parameter for **FUNCTION UNITS** slots being used for this single-homed configuration. For example, **`set-oc3:fn-a,app=0X1`**.	
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/22F-U/22F2-U OLIU** from OC-3 **MAIN 1** slot. At Node 3, remove **22F/22F-U/22F2-U 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

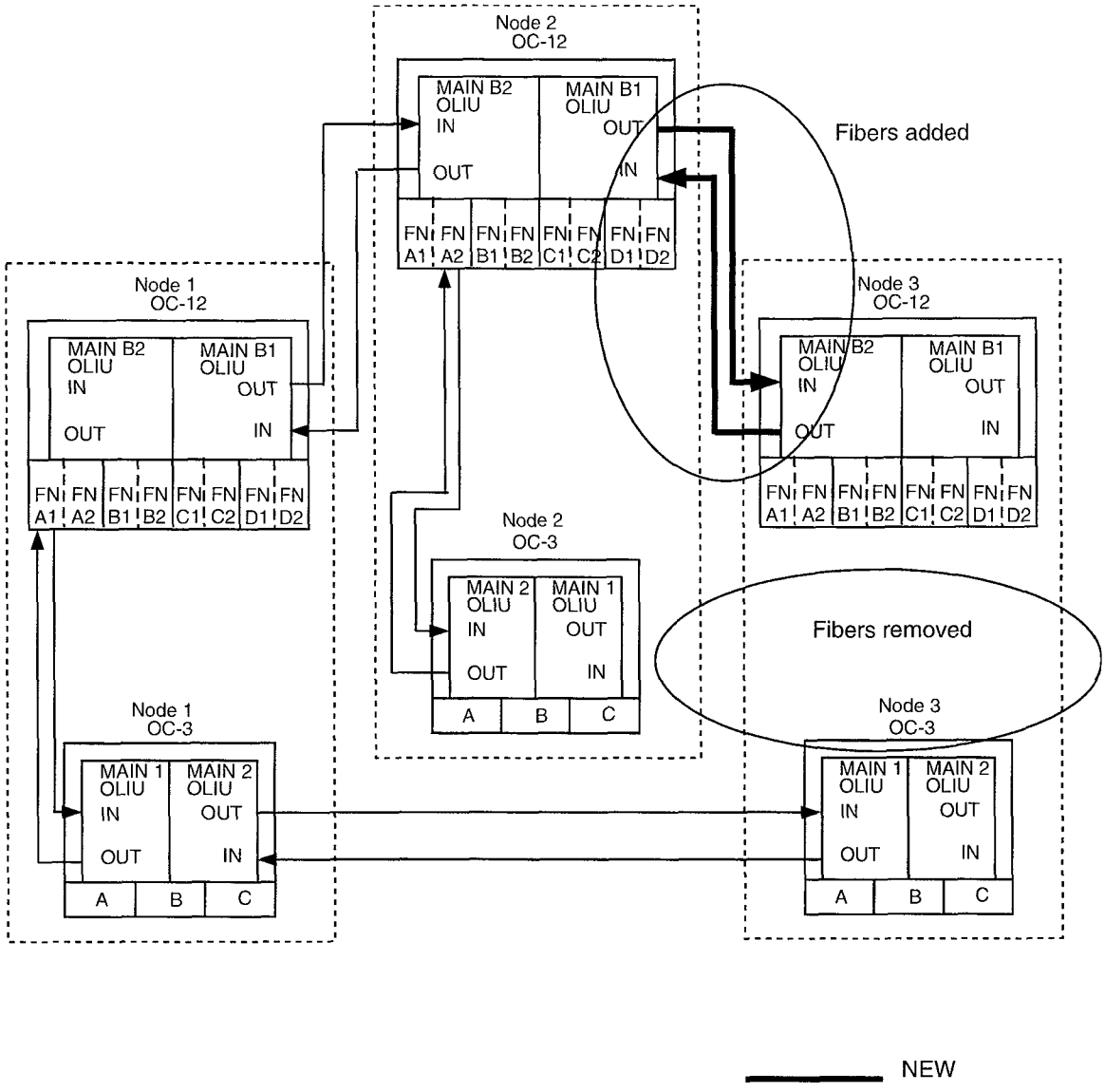


Figure 4. Example of OC-3 to OC-12 Ring Upgrade (4 of 7)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

21. ⇒ NOTE:
Due to multiple DCC channels during portions of this upgrade, the **`rtrv-map-network`** and **`rtrv-map-neighbor`** commands 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-map-network`** and **`rtrv-map-neighbor`** commands 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

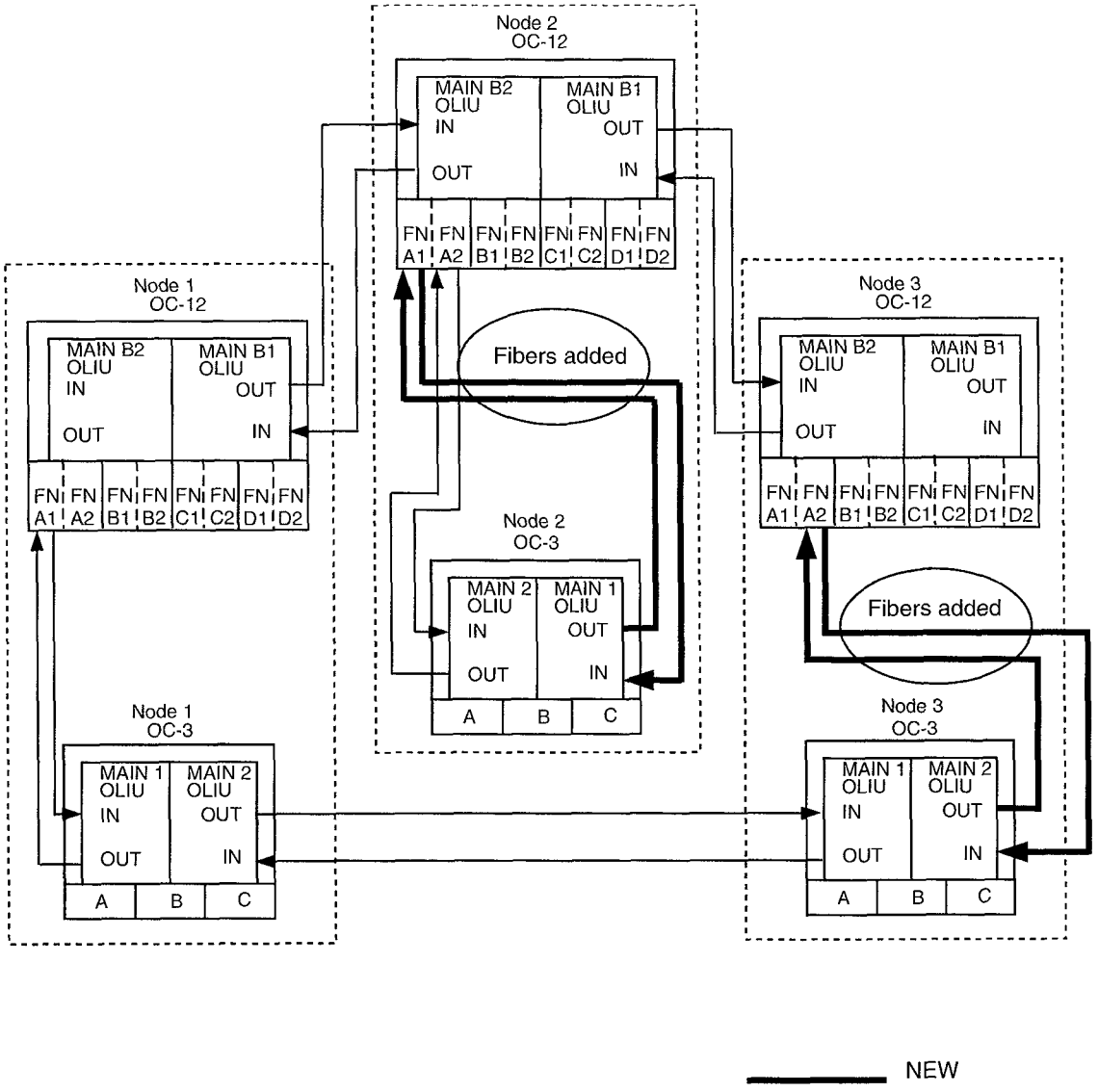


Figure 5. Example of OC-3 to OC-12 Ring Upgrade (5 of 7)

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/22F-U/22F2-U OLIU** from OC-3 **MAIN 1** slot. At Node 1, remove **22F/22F-U/22F2-U 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

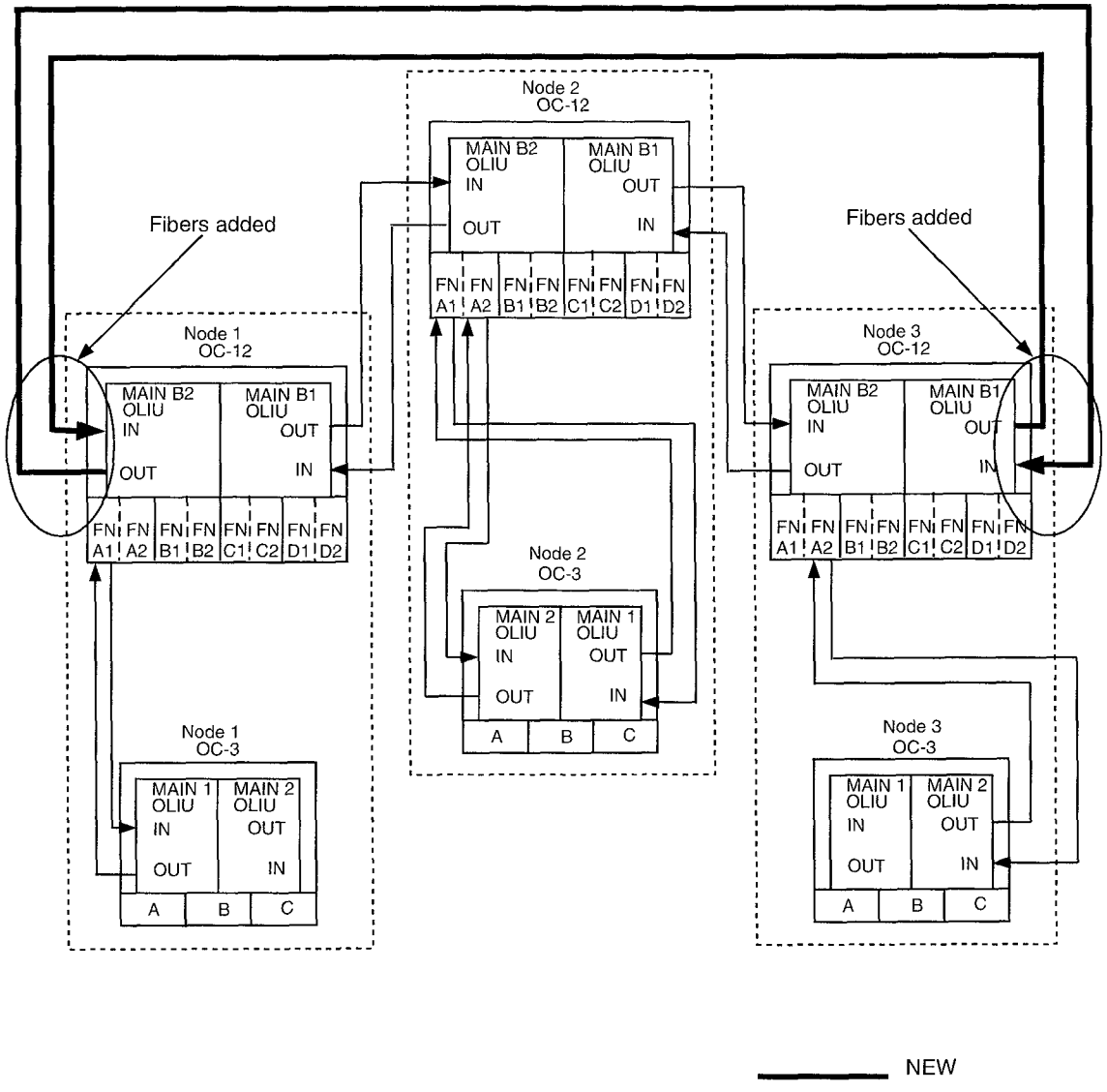


Figure 6. Example of OC-3 to OC-12 Ring Upgrade (6 of 7)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

26. ⇒ NOTE:
Due to multiple DCC channels during portions of this upgrade, the **`rtrv-map-network`** and **`rtrv-map-neighbor`** commands 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-map-network`** and **`rtrv-map-neighbor`** commands 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

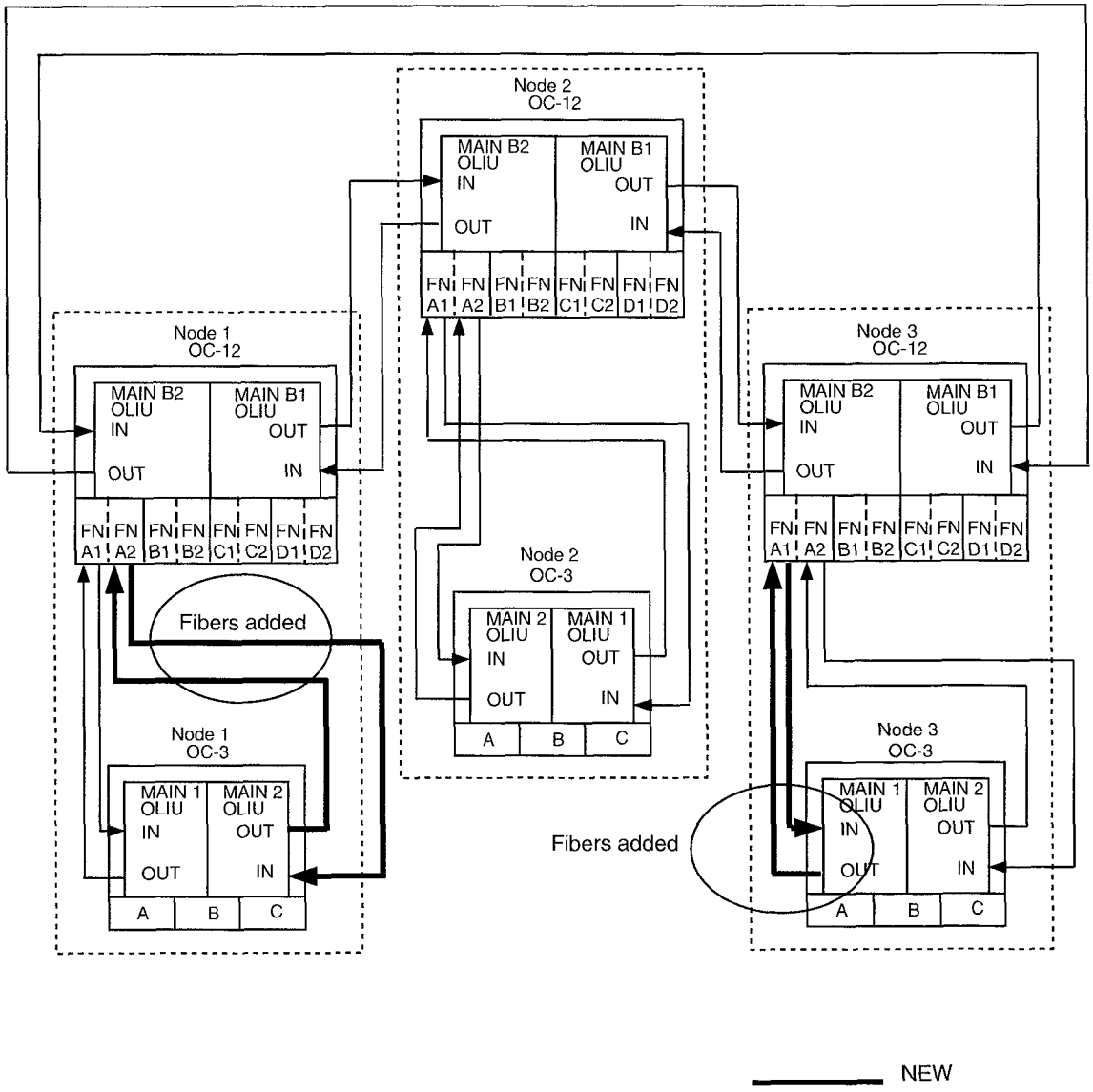


Figure 7. Example of OC-3 to OC-12 Ring Upgrade (7 of 7)

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 DSNE 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-map-network:** 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 DSNE. If necessary, use **set-ne:** command to change the shelf designated as the DSNE if specified on the work order.

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Alarm - NE ACTY/FE ACTY Only - Clear TAP-117

Alarm - Power Minor (PMN) - Clear TAP-104

ED-8C733-30, G8 Fan Shelf Alarm - Clear TAP-118

Trouble Report - Clear TAP-105

Trouble During Program Upgrade - Clear TAP-116

Maintenance Philosophy

Overview

The maintenance philosophy is built on gathering system information at two levels. One maintenance level is a local visual inspection of the user panel and the circuit pack LEDs. The user panel LEDs show a composite of near end and far end alarms. By using the **FE SEL** button on the **SYSCTL**, the alarm conditions at any site may be displayed. Most problems can be corrected at this level. A second maintenance level requires a craft interface terminal (CIT) for detailed information on the local and/or remote DDM-2000 OC-12 terminals. The CIT retrieves detailed reports about performance monitoring, alarms and status, and system configuration for near and far end terminals.

Trouble Analysis Procedures

The trouble analysis procedures in this document involve replacing faulty circuit packs and obtaining performance reports and/or alarm and status reports for analysis to determine proper system operation and/or trouble. If the trouble cannot be corrected or identified, the procedures direct the technician to obtain assistance because no more step-action procedural data is known for the specific trouble.

RTAC Assistance

The technician must make the decision regarding trouble analysis, corrective action, and obtaining assistance. The technician or local technical support staff may choose to continue trouble analysis based on their knowledge or experience on the DDM-2000 system, or may elect to obtain assistance by calling the Regional Technical Assistance Center **1-800-225-RTAC**.

COACH Assistance

Various customer computer-support tools are on-line and available via COACH. A login identification and password must be obtained to gain access to the COACH tools. Contact your regional DDM-2000 coordinator for information on obtaining a COACH login.

Diagnostic Dictionary	The Diagnostic Dictionary tool gives the user access to previously detected symptoms, problems, temporary fixes, cautions, and solutions. These may be usable in diagnosing, correcting, or avoiding a system problem.
Compatibility Data	The Compatibility Data tool gives the user access to hardware configuration data that is compatible to a user-specified software generic.
News and Bulletin	The News and Bulletin tool allows the user to process News and Bulletin information. News consists of messages which may be of general interest to the user. Bulletins contain information of a more urgent nature.

Circuit Pack Failures

Circuit pack failures are identified by LEDs and reported by system alarms and/or by manual or automatic diagnostic reports. When this occurs, a determination must be made as to why a circuit pack has failed. One recommendation as a first step for determining the cause of a failure is to unseat and then reseat the suspected circuit pack. For example, if a **3DS3** circuit pack is reported faulty, that circuit pack should be unseated and then reseated before being returned as defective. This will cause an automatic recovery and diagnostic operation to be performed on that **3DS3** circuit pack. If there is a contact problem such as dirt, oil, or lack of total contact connection, then this may be corrected by reseating and thus avoiding the return of a good unit for repair. Use caution when unseating circuit packs. For example, ensure protection switching is available for circuit pack being removed.

When circuit packs are replaced in some sequence to clear a trouble, they should be replaced one at at time by installing the original circuit packs if they were found to be operational.

Electrostatic Discharge (ESD) Considerations

Any integrated circuit on a circuit pack can be damaged by static electricity that builds up within a work area, particularly in areas with low relative humidity. This static buildup on work surfaces and on personnel and their clothing is produced by the various charging effects of even simple movements and by contact between various objects.

As a rule, the greatest potential for electrostatic damage occurs in areas with the lowest relative humidity. But, because such damage can occur anywhere, all personnel handling circuit packs should take the following precautions:

1. Since materials such as food wrappers, plastics, and Styrofoam containers tend to generate static electricity, keep them away from all circuit packs.
2. Be sure to read all warning labels on bags and cartons before opening any packaging.
3. If possible, open all circuit packs at a static-safe work position using properly grounded wrist straps and table mats that can dissipate static electricity.
4. Whenever possible, wait to remove circuit packs from their protective antistatic packaging until it is time to insert them into a bay.
5. Never touch a circuit pack's components, conductors, or connector pins. Handle all circuit packs only by the faceplate or latch or by the top and bottom outermost edges.
6. When opening and handling circuit packs or when working on backplanes, always wear a grounded wrist strap or wear a heel strap and stand on a grounded floor mat that can dissipate static electricity.
7. Always store and transport circuit packs in static-safe packages. (Shielding is not required unless specified.)
8. Whenever you remove circuit packs from a shelf, immediately put them into static-safe packages.
9. Try to keep relative humidity above 20 percent.
10. DDM-2000 shelves are equipped with grounding jacks for connecting static ground wrist straps. The jacks are located on the bottoms of the user panels.

Clear Critical (CR) Alarm

1. ⇒ NOTE:
   Critical alarms are failures that cause loss of service to 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. Using a Craft Interface Terminal (CIT) aids in troubleshooting multi-shelf DDM-2000 networks.

Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system.

Reference: **DLP-516**

11. ⇒ NOTE 1:
The **`rtrv-alm`** command can be used to display a report of active DDM-2000 OC-12 alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

⇒ NOTE 2:
The `Active Alarm and Status Report` is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the `Source Address` and `Description` columns for the top entry/entries above the first single dashed line (for example, "CRITICAL ... inc.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. **NOTE:**
    Far-end alarm or status conditions are listed in this report with a `Source Address` of `farend`. Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

    Does the `Source Address` of any top entry in the alarm report indicate local slot, channel, port or operations interface for the `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)	inc. OC12 LOS inc. OC12 LOF inc. OC12 sig failed (BER) inc. OC12 sig degrade (BER)	Failure of **OLIU** at near or far end, or failure of receive fiber.	TAP-120 (ring,0X1)
	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-120 (ring,0X1)
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).	inc. OC3 LOS inc. OC3 LOF inc. OC3 sig failed (BER) inc. OC3 sig degrade (BER)	Failure of **OLIU** at near or far end, or failure of receive fiber.	TAP-121 (linear,1+1) or TAP-120 (ring,0X1)
	inc. STS1 LOP OC3 *slotaid*	If failure on both OC-3 lines unprotected removal or failure of **MXRVO** or **DS3** CP at far end.	LTP 363-206-280 TAP-101
		If failure on only one OC-3 line Failure of **OLIU** at near or far end.	TAP-121 (linear,1+1) or TAP-120 (ring,0X1)
CRITICAL. **CR** LED lighted	inc. OC3 line AIS*	Failure of **OLIU** at the far end	Step 37
CRITICAL. **CR** LED lighted **FAULT** LED flashing on **3DS3**.	inc. (from DSX) DS3 LOS* inc. (from DSX) DS3 sig fail*	Equipment failed or removed at DSX-3	Step 17

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 **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-119
	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-121 (linear,1+1) or TAP-120 (ring,0X1)
	inc. STS1 unequipped	STS-1/STS-3c 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.
CRITICAL. **CR** LED lighted **FAULT** LED may be lighted on failed circuit packs.	Both TGS CP failed Both TSI CP failed Both OLIU CP failed Both 3DS3 CP failed Both 3STS1E CP failed	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 CP removed Both TSI CP removed Both OLIU CP removed Both 3DS3 CP removed Both 3STS1E CP 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 at RT	Use **rtrv-attr-env** command at RT to determine cause. Clear trouble using local procedures.
	ExternalMinor*	External minor alarm (environmental alarm input 15) is active at RT. DC power or cooling fan in RT has failed.	Use **rtrv-attr-env** command at RT to determine cause Clear trouble using local procedures
	illegal CP type	An illegal or unknown circuit pack type has been inserted into the shelf	Remove CP and install correct CP
	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 lighted on circuit pack.	unexpected CP type	Circuit pack inserted into slot provisioned for different circuit pack.	Step 21

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-120**.
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 update (**`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. OC12 line AIS` or `inc. OC3 line AIS` alarm message.

    Reference: **DLP-518**

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Major (MJ) Alarm

1. ⇒ NOTE 1:
   Major alarms are failures that cause loss of service to at least 1 DS3. Table A lists conditions which may cause a major alarm.

   Is a CIT available?

   If **NO**, then continue with **Step 2**.
   If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-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. Using a Craft Interface Terminal (CIT) aids in troubleshooting multi-shelf DDM-2000 networks.

Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system.

Reference: **DLP-516**

11. ⇒ NOTE 1:
The **`rtrv-alm`** command can be used to display a report of active DDM-2000 OC-12 alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

⇒ NOTE 2:
The `Active Alarm and Status Report` is output automatically following CIT log in. The report shown in Figure 1 is an example that shows several entries. There may be only one entry in the actual report.

Note the information in the `Source Address` and `Description` columns for the top entry/entries above the first single dashed line (for example, "MAJOR ... inc.STS1 LOP EC1" in Figure 1) in the `Active Alarm and Status Report`.

```
/* Active Alarms and Status Report
================================================================
 Alarm       Source    Date   Time      Srv   Description
 Level       Address     Detected
================================================================
 MAJOR       fn-a-1    MM-DD HH:MM:SS   SA    inc. STS1 LOP EC1
----------------------------------------------------------------
 ne-acty     fn-d-1    MM-DD HH:MM:SS   nsa   inc. STS1 AIS
*/
```

Figure 1. Example of Active Alarms and Status Report

12. ⇒ **NOTE:**
    Far-end alarm or status conditions are listed in this report with a `Source Address` of `farend`. Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

    Does the `Source Address` of any top entry in the alarm report indicate local slot, channel, port or operations interface for the `MAJOR` alarm?

    If **NO**, then do **TAP-107**.
    If **YES**, then continue with **Step 13**.

13. Use **`opr-aco`** command to silence active audible office alarms, if required.

14. Note the trouble indication in the `Description` column of the `Active Alarm and Status Report`, starting with the highest alarm level (Major) listed in the `Alarm Level` column.

15. See Table A for trouble description for the highest alarm level and go to the indicated step or procedure.

Table A. Major (MJ) Alarm Conditions

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR **MJ** LED lighted	AGNE communication failure	The AGNE has not been assigned in an alarm group The AGNE and NEs are assigned different alarm group numbers The AGNE has failed (Unless there are 2 or 3 AGNEs)	Use the **rtrv-ne** command to check AGNE assignment and alarm group number assignment. Use **set-ne** command to change AGNE assignment and alarm group assignment.
	CP removed	Circuit packs removed without doing **upd** command to remove circuit packs from equipment list	Step 56
	DSNE not reachable	No network element has been provisioned as a directory service network element (DSNE).	See the **set-ne** and **rtrv-ne** commands for DSNE provisioning information. Use the **set-ne** command to provision one (and only one) shelf as the DSNE
MAJOR. **MJ** LED lighted. **FAULT** LED lit on **SYSCTL** and **OHCTL** CP	duplicate site/ne address	Two or more shelves in the network have the same site address and the same network element address (determined by **set-ne** command).	Use **rtrv-ne** command to check site and network element assignments at each shelf Use **set-ne** command to change site and network element assignments.
MAJOR. **MJ** LED lighted	duplicate DSNE	A shelf has been provisioned as a DSNE in a network that already has a DSNE. Only one network element in the network may be provisioned as the DSNE.	Use **rtrv-map-network** command to check DSNE assignments. Delete duplicate DSNE using **set-ne** command
	duplicate TBOS display	Two or more shelves in the alarm group have the same TBOS display address (determined by **set-ne** command)	Use **rtrv-ne** command to check TBOS display address at each shelf Use **set-ne** command to change TBOS display address

See notes and footnotes at end of table

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR **MJ** LED lighted	duplicate TID	Two or more shelves in the network have the same system name or TID set by the **set-ne** command.	Use **set-ne** to change TID of improperly named shelves.
	ExternalMinor*	External minor alarm (environmental alarm input 15) is active at RT. DC power or cooling fan in RT has failed.	Use **rtrv-attr-env** command at RT to determine trouble. Clear trouble using local procedures
	environment***n****	An environmental alarm point (miscellaneous discrete input) is active at RT.	Use **rtrv-attr-env** command at RT to determine trouble. Clear trouble using local procedures.
	excessive holdover	System has been in holdover mode for more than 4 hours because of timing ref. fail or manual switch	Check timing ref., check state of eqpt (**rtrv-state-eqpt**)
	frequency error	The DS1 external timing reference or the timing from a remote shelf has a frequency offset greater than 20 hertz.	Check the DS1 external timing source or the timing obtained from a remote shelf.
MAJOR. **MJ** LED lighted. **FAULT** LED flashing on **TGS**.	inc. DS1 sync. ref. LOS inc. DS1 sync. ref LOF inc. DS1 sync. ref BER inc. DS1 sync. ref AIS inc. DS1 sync. ref OOL inc. DS1 sync. ref EOOF	Failure of **TGS** at near or far end, or failure of upstream timing supply, timing eqpt., system set for SF and received DS1 is ESF.	Step 21
MAJOR. **MJ** LED lighted. **FAULT** LED flashing on **3DS3**.	inc. (from DSX) DS3 LOS* inc. (from DSX) DS3 sig fail*	Equipment failed or DSX-3 signal removed	Step 19

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR. **MJ** LED lighted **FAULT** LED flashing on **3STS1E**	inc. EC1 LOF* inc. EC1 LOS* inc. EC1 sig failed (BER)* inc. EC1 sig degrade (BER)*	Failure of the **3STS1E** or equivalent circuit pack at other end of EC-1, failure of the incoming cable, failure of the **3STS1E** circuit pack at the near end, cross talk in office wiring, or a cable disconnect at the EC-1 STSX cross-connect point or shelf connector.	Step 19
	inc. EC1 line AIS*	Failure of **3STS1E** circuit pack or equivalent at other end of EC-1 line	Step 19
	inc. STS1 LOP EC1*	Failure of the far end **3STS1E** circuit pack or failure of the **3STS1E** circuit pack at the near end.	Step 19
MAJOR **MJ** LED lighted.	inc. OC12 line AIS*	Failure of OC-12 **OLIU** CP at far end	Step 63
	inc. OC3 line AIS*	Failure of OC-3 **OLIU** CP at far end	Step 63
	inc. STS1 AIS*	Incomplete or incorrect cross-connect provisioning in an end-to-end network; unprotected removal or failure of a **3DS3** or **OLIU** circuit pack at far end.	TAP-119
	inconsistent DCC values	The Network Side/User Side parameters are set the same at both ends of the DCC (optical span).	Use **rtrv-fecom** command to check Network Side/User Side parameters at each shelf in the network. Use **set-fecom** command to change Network Side/User Side parameters at one end of optical span.
MAJOR. **MJ** LED lighted **FAULT** LED lighted on circuit pack.	OHCTL CP failed	Internal circuit pack failure	Step 48
	SYSCTL CP failed	Internal circuit pack failure	Step 40

See notes and footnotes at end of table.

Table A. Major (MJ) Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MAJOR **MJ** LED lighted Flashing **FAULT** LED on **OHCTL**	section DCC channel failed	**SYSCTL** failure, reset, or initialization at far end. **SYSCTL** removed from a site Program installation in progress or failed at far end **SYSCTL** or **OHCTL** failed at near end. Both **OLIU** transmitters or transmit fibers failed (no communication with other end)	Step 23
MAJOR. **MJ** LED lighted	TID address map full	Network elements have been removed from the network but not from the DSNE database.	Use **dlt-tadrmap** command to delete removed NEs from database.
	unexpected CP switches	Switch settings invalid, different from other circuit pack, or different than they were before circuit pack was removed or replaced Circuit pack inserted into slot provisioned for different pack	Step 56
	X.25 communication failure	X 25 communication eqpt failed; failure at the OS.	Issue trouble report to OS.

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:
If a program installation is being performed to a **SYSCTL** at the far end, it is normal for the **FAULT** LED on the near-end **OHCTL** to flash and the **MJ** and **NE ACTY** LEDs to light on the User Panel. If there is a **MJ** alarm at the end receiving the program, trouble is indicated. You should check if a program installation is being done.

Was new software generic being downloaded (program upgrade) to the **SYSCTL** at this end when alarm occurred?

If **YES**, then do **TAP-116**.
If **NO**, then continue with **Step 17**.

17. Is the **FAULT** LED on the faceplate of one or more circuit packs flashing?

If **YES**, then continue with **Step 18**.
If **NO**, then proceed to **Step 39**.

18. Find the circuit pack(s) with a flashing LED in Table B below and go to the indicated step or procedure.

Table B. Circuit Pack(s) With Flashing LED

Circuit Pack	Go To
3DS3/3STS1E (SRV or PROTN)	Step 19
TGS	Step 21
OHCTL	Step 31
OLIU (Release 5)	TAP-120

19. 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**].

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. 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**

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. ⇒ NOTE:
    If a program installation is being performed to a **SYSCTL** at the far end, it is normal for the **FAULT** LED on the near-end **OHCTL** to flash and the **MJ** and **NE ACTY** LEDs to light on the User Panel. If there is a **MJ** alarm at the end receiving the program, trouble is indicated. You should check if a program installation is being done.

    Is new software generic being downloaded (program upgrade) to the **SYSCTL** at the far end terminal?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 24**.

24. In alarm report, is there any indication of **OLIU** or fiber trouble at near end or far end such as `inc. OC12 FERF` alarm message?

    If **YES**, then continue with **Step 25**.
    If **NO**, then proceed to **Step 27**.

25. ⇒ NOTE:
If there is a DCC failure, a remote login to the shelf connected through the `Source Address` cannot be done. The **`rtrv-alm`**, **`rtrv-map-network`**, and **`rtrv-map-neighbor`** command can be used to check for `dcc failure` for main (and function units A, B, C, or D). Also, use **`rtrv-fecom`** command to see if fecom has been disabled.

Note `Source Address` of DCC channel failure. Check optical fibers connected through the `Source Address` per local procedures. If no trouble found, replace near-end **OLIU** first then far-end **OLIU**.

Reference: **DLP-518**

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

27. Use CIT and **`reset`** command to reset **SYSCTL** at the near end or unplug and reseat the **SYSCTL**.

28. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (`section DCC channel failed`)?

If **YES**, then continue with **Step 29**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. If possible, use CIT and **`rlgn`** command to log in to the far-end terminal (**DLP-517**) and use the **`reset`** command to reset **SYSCTL** at the far end.

30. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (`section DCC channel failed`)?

If **YES**, then proceed to **Step 35**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. ⇒ NOTE:
Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

32. Is the **FAULT** LED on the affected circuit pack still flashing?

    If **YES**, then continue with **Step 33**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

33. Obtain a CIT and repeat this procedure.

34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

35. Refer to **DLP-501** and replace **SYSCTL** at near-end terminal.

36. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing?

    If **YES**, then continue with **Step 37**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

37. At far-end terminal, reset **SYSCTL** by unseating and reseating **SYSCTL** or by using a CIT and the `reset` command, if not already performed. If **FAULT** LED is still flashing after a reset, refer to **DLP-501** and replace **SYSCTL** at far-end terminal. If an **OHCTL** is present and the **FAULT** LED is still flashing after the **SYSCTL** is replaced, replace the **OHCTL** [**DLP-518**] first at one end and then the other, if trouble still exists.

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

39. Is the **FAULT** LED lighted on the **SYSCTL**?

    If **YES**, then continue with **Step 40**.
    If **NO**, then proceed to **Step 47**.

40. Remove **SYSCTL** and check switch settings.

    Reference: **DLP-510**

41. Are switch settings correct?

    If **YES**, then proceed to **Step 43**.
    If **NO**, then continue with **Step 42**.

42. Set switches to correct settings.

    Reference: **DLP-510**

43. Reinstall the **SYSCTL**. Is the **FAULT** LED still lighted?

    If **YES**, then continue with **Step 44**.
    If **NO**, then proceed to **Step 46**.

44. Use CIT and **`rtrv-ne`** command to check provisioning of site ID and network element number. Two or more shelves cannot have the same site ID and/or network element number. If provisioning is not correct, use CIT and **`set-ne`** command to set site ID and/or network element number. If provisioning is correct, refer to **DLP-501** and replace **SYSCTL** circuit pack.

45. Is the **FAULT** LED still lighted on the **SYSCTL**?

    If **YES**, then proceed to **Step 51**.
    If **NO**, then continue with **Step 46**.

46. Is the **MJ** alarm LED still lighted?

    If **YES**, then continue with **Step 47**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

47. Is the **FAULT** LED on **OHCTL** lighted?

    If **YES**, then continue with **Step 48**.
    If **NO**, then proceed to **Step 53**.

48. Use CIT and **`rtrv-ne`** command to check provisioning of site ID and network element number. Two or more shelves cannot have the same site ID and/or network element number. If provisioning is not correct, use CIT and **`set-ne`** command to set site ID and/or network element number. If provisioning is correct, refer to **DLP-518** and replace **OHCTL** circuit pack.

49. Is the **FAULT** LED on **OHCTL** still lighted?

    If **YES**, then proceed to **Step 51**.
    If **NO**, then continue with **Step 50**.

50. Is the **MJ** alarm LED still lighted?

    If **YES**, then proceed to **Step 53**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

51. The problem appears to be in the backplane of the DDM-2000 or another circuit pack in the shelf is causing the **FAULT** LED on the **SYSCTL** to light. Remove service from one function group (A, B, C, or D) and unseat all circuit packs associated with that group. If the trouble clears, it means that one or more of the circuit packs removed is defective. If the trouble does not clear, reinsert the removed circuit packs and repeat the above for another function group. If the trouble cannot be isolated by removing circuit packs, seek technical assistance and/or replace the shelf. Notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

52. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

53. ⇒ NOTE:
    A major alarm may also be caused by a wrong circuit pack inserted into the **AUXCTL** slot, switch settings that are different from what they were before a **TGS** circuit pack was replaced, excessive holdover due to loss of synchronization reference, or a manual switch to holdover in effect too long.

    Is any circuit pack except an **OHCTL** installed in the **AUXCTL** slot?

    If **YES**, then continue with **Step 54**.
    If **NO**, then proceed to **Step 56**.

54. Remove wrong circuit pack from **AUXCTL** slot and install correct **OHCTL** circuit pack [**DLP-518**].

55. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

56. 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 59**.
If **NO**, then continue with **Step 57**.

57. Remove circuit packs from wrong slots, check option switches (**DLP-510**) and reinstall circuit packs into the correct slots.

58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

59. CAUTION:
When removing circuit packs ensure that protection switching is available. Also, remove the circuit pack without the lighted **ACTIVE** *LED first.*

Check switch settings on the circuit packs for correct settings. If the circuit pack has been replaced, check if settings are the same as they were before the circuit pack was replaced. Also check if the switches are set the same as the companion circuit pack.

Reference: **DLP-510**

60. Are switch settings correct?

If **YES**, then do **TAP-103**.
If **NO**, then continue with **Step 61**.

61. Change switch settings to the correct settings. (Use **sw-( )** command to switch to other circuit pack before removing pack.) If switch settings are to be changed from what they were previously, update the equipment list by momentarily depressing the **UPD/INIT** button on the **SYSCTL** after the circuit pack is reinstalled.

62. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

63. Replace **OLIU**s at far end that are associated with the `Source Address` of the `inc. OC12 line AIS` or `inc. OC3 line AIS` alarm message.

    Reference: **DLP-518**

64. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Multiple Failure

1. ⚠ CAUTION:
Although the **FAULT** *LEDs may be lighted or flashing on an* **OLIU**, *service may be interrupted if the* **OLIU** *is removed. The* **OLIU**s *may be in unidirectional switching mode and transmitting on one* **OLIU** *while receiving on the other. The state of the switch mode must be analyzed before removing an* **OLIU**.

NOTE:
A multiple failure condition exists when a service circuit pack and its associated protection circuit pack have failed, or when the switch mode is inhibited or locked and a failure occurs on a service circuit pack.

Is the **FAULT** LED on an **OLIU** lighted (`OLIU CP failed`) or flashing (`inc. OC12 LOS`, etc.)?

If **YES**, then do **TAP-120**.
If **NO**, then continue with **Step 2**.

2. Are the **FAULT** LEDs on both a service and protection circuit pack of the same type lighted (not flashing) (`(  ) CP failed`)?

If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 7**.

3. ⚠ CAUTION:
Replacement circuit pack may have option switches which must be properly set before the circuit pack is installed.

Replace the service circuit pack with the lighted **FAULT** LED.

Reference: **DLP-518**

4. Is the **FAULT** LED on the circuit pack just replaced off?

   If **YES**, then continue with **Step 5**.
   If **NO**, then do **TAP-106**.

5. Replace the protection circuit pack with the lighted **FAULT** LED.

   Reference: **DLP-518**

6. Is the **FAULT** LED on the circuit pack just replaced off?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then do **TAP-106**.

7. Use CIT and the **`rtrv-( )`** commands (**`rtrv-state-eqpt`**, etc.) to check switching mode for inhibits, locks, etc.

8. Was any trouble found?

   If **YES**, then continue with **Step 9**.
   If **NO**, then do **TAP-108**.

9. Determine reason for locks, inhibits, etc. to be in place. See the "Commands and Reports" section of this manual for a description of the **`switch-( )`** commands and the **`rtrv-alm`** command report descriptions. Use the **`switch-( )`** commands to reset switching mode or priority.

   If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Power Minor (PMN) Alarm

1. ⚠ CAUTION:
   There is an AC power failure at the remote DDM-2000 terminal. This will result in a service interruption if it is not restored.

   Are you at remote terminal site?

   If **YES**, then proceed to **Step 6**.
   If **NO**, then continue with **Step 2**.

2. Momentarily depress **ACO/TST** pushbutton on DDM-2000 User Panel.

   Response: Audible alarm is silenced.

3. Issue a trouble report of an AC power failure at remote terminal.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. What type of RT configuration do you have?

   If **Bulk Power**, then continue with **Step 6.**
   If **Distributed Power**, then proceed to **Step 8.**

6. Use documentation for your bulk power plant to clear trouble. Check AC circuit breakers and verify AC power is present at RT enclosure.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Using digital multimeter (DMM), measure incoming AC voltage (use **AC** and **GND** jacks on **LDU** faceplate in J1C182BA Power Shelf).

9. Is measured AC voltage between 105 and 129 volts?

   If **YES,** then continue with **Step 10.**
   If **NO,** then proceed to **Step 19.**

10. Is power shelf a J1C182BA Power Shelf?

    If **YES**, then continue with **Step 11**.
    If **NO**, then proceed to **Step 27**.

11. Is **FAIL** LED lighted on any **336A RECTIFIER**s at RT?

    If **YES,** then continue with **Step 12.**
    If **NO,** then proceed to **Step 14.**

12. Replace **336A RECTIFIER**s that have **FAIL** LED lighted.

13. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 27.**

14. Is **BAT DISCHG** LED lighted on any **337A BATTERY CHARGER**(s)?

    If **YES,** then continue with **Step 15.**
    If **NO,** then proceed to **Step 27.**

15. Replace one **336A RECTIFIER**.

16. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 17.**

17. Replace another **336A RECTIFIER**.

18. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 27.**

19. Is fuse blown or circuit breaker tripped at RT main AC circuit breaker box?

    If **YES,** then continue with **Step 20.**
    If **NO,** then proceed to **Step 23.**

20. Replace blown fuse or reset circuit breaker.

21. Does fuse blow or circuit breaker trip again?

    If **YES,** then proceed to **Step 27.**
    If **NO,** then continue with **Step 22.**

22. Did alarm clear within 20 seconds?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 27.**

23. Contact local power company if loss of AC power has occurred or if there is overvoltage or undervoltage condition.

24. Does local power company verify abnormal power condition?

    If **YES,** then continue with **Step 25.**
    If **NO,** then proceed to **Step 27.**

25. Estimate restoration time for AC power. If necessary, equip RT with fully charged batteries or other power source to maintain power until AC power is restored.

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

27. ⇒ NOTE:
    If alarms remain, multiple troubles exist and trouble analysis must be repeated.

    If you have a J1C182BA Power Shelf, use SD-7C117 and SD-7C118 to locate trouble. If another power shelf or powering arrangement is used, use appropriate documentation and wiring diagrams to locate power trouble. If you need technical assistance, call your regional technical support group or Lucent Technologies RTAC number listed in front of this manual.

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

Clear Trouble Report

1. Is **CR** alarm LED lighted on User Panel?

   If **YES**, then do **TAP-101**.
   If **NO**, then continue with **Step 2**.

2. Is **MJ** alarm LED lighted on User Panel?

   If **YES**, then do **TAP-102**.
   If **NO**, then continue with **Step 3**.

3. Is **MN** alarm LED lighted on User Panel?

   If **YES**, then do **TAP-112**.
   If **NO**, then continue with **Step 4**.

4. Is **FAULT** LED on faceplate of **3DS3** or **3STS1E** circuit pack flashing [`inc. ( ) LOS`]?

   If **YES**, then continue to **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. There appears to be an incoming DS3 or EC-1 signal failure. Refer to **TAP-110** and clear failure condition.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Is **FAULT** LED on faceplate of any circuit pack in DDM-2000 lighted (not flashing) [`( ) CP failed`]?

   If **YES**, then continue with **Step 8**.
   If **NO**, then proceed to **Step 10**.

8. ⇒ NOTE:
   There is an inconsistent combination of alarms and diagnostic indications.

   Refer to **TAP-108** and determine true status of system.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Perform LED test by depressing **ACO/TST** button or using `test-led` command.

    Reference: **DLP-507**

11. Did all circuit packs pass LED test?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 14**.

12. ⇒ NOTE:
    DDM-2000 appears to be operating correctly with no failures present.

    Return report of NO TROUBLE FOUND.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Replace circuit pack that failed the LED test.

    Reference: **DLP-518**

15. Repeat the LED test.

16. Did all circuit packs pass the LED test?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 17**.

17. ⇒ NOTE:
    Failure is not in the circuit pack just replaced.

    Refer to **TAP-106** to isolate and clear failure.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Isolate and Clear Failure

1. ⇒ NOTE:
   It is assumed that the **FAULT** LED on a circuit pack is lighted and replacing the circuit pack does not clear the problem.

   Is circuit pack with lighted LED a **3DS3** , **3STS1E**, or **OLIU**?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 12**.

2. Unplug and reseat standby circuit pack (without lighted **ACTIVE** LED) in the same group as the affected circuit pack with the lighted LED.

3. Is CIT available?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 6**.

4. Use CIT and `reset` command to reset **SYSCTL**.

5. Is **FAULT** LED on affected circuit pack still lighted?

   If **YES**, then proceed to **Step 8**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. ⇒ NOTE:
   Unseating and reseating **SYSCTL** performs a *reset* procedure which restarts software program.

   Unplug and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

7. Is **FAULT** LED on affected circuit pack still lighted?

   If **YES**, then continue with **Step 8**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Have both circuit packs been unplugged and reseated?

   If **YES**, then proceed to **Step 10**.
   If **NO**, then continue with **Step 9**.

9. Unplug and reseat active circuit pack in the same group as the affected circuit pack with the lighted LED. Repeat this procedure from Step 3.

10. Replace the standby circuit pack (without lighted **ACTIVE** LED) in the same group as the affected circuit pack with the lighted LED. If **FAULT** LED on affected circuit pack is still lighted, replace the active circuit pack in the same group as the affected circuit pack with the lighted LED.

    Reference: **DLP-518**

11. Is **FAULT** LED on affected circuit pack still lighted?

    If **YES**, then continue with **Step 17**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. Is CIT available?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 15**.

13. Use CIT and **`reset`** command to reset **SYSCTL**.

14. Is **FAULT** LED on affected circuit pack still lighted?

    If **YES**, then proceed to **Step 17**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. ⇒ NOTE:
    Unseating and reseating **SYSCTL** performs a *reset* procedure which restarts software program.

    Unplug and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

16. Is **FAULT** LED on affected circuit pack still lighted?

    If **YES**, then continue with **Step 17**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. ⚠ CAUTION:
    Replacing **SYSCTL** *involves updating internal memory on circuit pack.*

    Refer to **DLP-501** and replace **SYSCTL**.

18. Is **FAULT** LED on affected circuit pack still lighted?

    If **YES**, then continue with **Step 19**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. ⇒ NOTE:
    The problem appears to be in backplane wiring of DDM-2000. One way to verify this is to swap **SYSCTL** and any circuit pack with inconsistent diagnostic indication with corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more circuit packs is defective. If the problem stays with the original DDM-2000, the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

    Check for bent or broken pins, shorted pins, etc. If you need technical assistance, call your regional technical support group or Lucent Technologies RTAC number listed in front of this manual.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Far End Alarm Using Craft Interface Terminal (CIT)

1. ⇒ NOTE:
   It is assumed that a CIT is available and that there is a failure at a far end 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. 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 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. ⇒ 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 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-map-network`** command to get a network map report.

7. ⇒ NOTE 1:
   The TID of the far-end system is the TID listed in the "`Description`" column of the near-end "`Active Alarm and Status Report`" obtained using the **`rtrv-alm`** command.

NOTE 2:
In a path protection switched ring network, FAILED Communication Status most likely indicates a total node failure (power failure, failure of both **OLIU**s or both fiber pairs). In a linear or hub configuration, it most likely indicates a failure of both service and protection paths between the last shelf without communication failure and the first shelf with a communication failure.

NOTE 3:
If any systems have a Communications Status of `FAILED`, you may have to log in to the system nearest to the system with a `FAILED` communications status or issue a trouble report on the system you cannot log into.

NOTE 4:
The farend alarms refer to alarms in the same alarm group as the local network element. For systems you cannot log into (FT-2000), issue a trouble report on the system indicated in the alarm and status report.

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 B for a detailed description of the messages in the alarm and status report. For systems other than DDM-2000 OC-12, (FT-2000 OC-48, DDM-2000 FiberReach, DDM-2000 OC-3, and *SLC*®-2000, etc.),use the User/Service Manual for that system for trouble clearing procedures.

9. Repeat this procedure from Step 3 for the DDM-2000 OC-12 shelf you are now logged into. Remember that when the procedures refer to local it is now the shelf from which you are getting the Alarm and Status Report.

Table B. RTRV-ALM Message Descriptions

Description	Alarm Level	Meaning
`-48V power/fuse FA|FB failed`	MN	-48 volt power feeder or fuse on user panel has failed. (**FA** or **FB** identifies failure if **BBG8** controller is used.)
`3DS3 CP failed`	CR or MN	Internal equipment failure of specified **3DS3** CP.
`3STS1E CP failed`	CR or MN	Internal equipment failure of specified **3STS1E** 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.)
`AGNE communication failure`	MJ	A network element cannot establish communication with the alarm gateway network element (AGNE), or the AGNE cannot establish communication with a network element in the same alarm group. Use the **`rtrv-map-network`** command to determine if both network elements are in the same alarm group.
`APS channel failed`	MN	SONET automatic protection switching (APS) channel on protection OC-3 or OC-12 line has failed. **Likely causes**. Failure of **OLIU** CP on protection line at far end; failure of **OLIU** CP on protection line at near end.
`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-map-network`** 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
`control`**n**	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.

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
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.
dormant/executing code mismatch	Status	The network element detects that dormant software exists on the network element with a release number that does not match the release number of the executing software
DS3 loopback (to Fiber)	ABN	A loopback (toward optical fiber) is active on specified T3 port (See **opr-lpbk-t3** and **rls-lpbk-t3** commands.)
DS3 loopback (to DSX)	ABN	A loopback (toward DSX) 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 not reachable	MJ	No network element is designated a directory service network element (DSNE). Node(NE) can no longer reach the DSNE. **Likely causes**: DCC failure between local NE and the DSNE, OC-n line failure in the subnetwork, a controller failure or pull or reset or initialization of the DSNE.
duplicate DSNE	MJ	Shelf has been provisioned as a DSNE in a network that already has a DSNE. Only one NE in the network may be provisioned as the DSNE. See **set-ne** and **rtrv-ne** commands for DSNE provisioning information.
duplicate site/ne address	MJ	Two or more shelves in network have same site address and same network element address (determined by **set-ne** command)
duplicate TBOS display	MJ	Two or more shelves in network have same TBOS display number (determined by **set-ne** command).
duplicate TID	MJ	Two or more shelves in network have same system name or TID (set by **set-ne** command).
EC1 loopback (to Fiber)	ABN	A loopback (toward the optical fiber) is active on the specified EC1 port. See **opr-lpbk-ec1** and **rls-lpbk-ec1** commands
EC1 loopback (to DSX)	ABN	A loopback (toward DSX) is active on the specified EC1 port. See **opr-lpbk-ec1** and **rls-lpbk-ec1** commands.

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
environment**n**	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 B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
forced switch	ABN	When associated with OC-3 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 line switching is unidirectional Because of this, specified OC-3 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 UNITS** 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** command
frequency error	MJ	This alarm condition indicates that the timing of a terminated DS3 signal has an unacceptable 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
holdover mode active	NE ACTY	System is in holdover synchronization mode. **Likely causes**: System was manually switched to holdover mode (with **switch-sync** command or in a central office system, with TBOS control point 54) and switch has not been reset; or the system automatically switched to holdover mode due to failure of timing references, and either (1) the reference failures have not cleared, or (2) the system is provisioned for nonrevertive synchronization mode switching, or (3) the system is provisioned for External timing and no external timing references are available, or (4) the system is provisioned for loop-timed operation and the optical line or OLIU circuit pack has failed, or a message indicating an upstream clock problem has been received on the sync message bits of the optical line (**rtrv-sync** command) or (5) the system is provisioned for sync message signaling, but the upstream system from which it loop-times has not been provisioned for sync message signaling The condition can be cleared by provisioning both systems the same (**set-sync** and **rtrv-sync** commands). Condition can be cleared by repairing at least one of timing references (if both are failed) and resetting synchronization mode protection switch with command **switch-sync:s=mode,pri=reset**. In a central office system, the synchronization mode can also be reset with a TBOS control point.

Table B. 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.
`inc. EC1 FERF`	NE ACTY	System has detected the EC-1 far end receive failure (FERF) signal in the incoming EC-1 signal **Likely causes:** Failure of the **3STS1E** CP at near end, or failure of **3STS1E** CP at far end, or the transmit fiber on the specified line.
`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

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`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 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 failed (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
`inc. (from DSX) 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 fail`	CR, MJ, MN or None	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.
`inc. (from OC3) DS3 AIS` `inc. (from fiber) DS3 AIS`	NE ACTY	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. **Likely causes:** The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`inc. (from OC3) DS3 OOF` `inc. (from fiber) DS3 OOF`	NE ACTY	The system has detected a DS3 out-of-frame (OOF) condition in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal This condition is reported only if the DS3 interface is provisioned in VM or VMR mode (See the **`set-t3`** and **`rtrv-t3`** commands) **Likely causes:** An out-of-frame DS3 signal incoming to the DSX-3 at the far end, failure of the **DS3** CP at the far end or near end, the DS3 signal is looped at both ends.
`inc. (from OC12) DS3 AIS` `inc. (from fiber) DS3 AIS`	NE ACTY	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. **Likely causes:** The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end
`inc. (from OC12) DS3 OOF` `inc. (from fiber) DS3 OOF`	NE ACTY	The system has detected a DS3 out-of-frame (OOF) condition in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal This condition is reported only if the DS3 interface is provisioned in VM or VMR mode. (See the **`set-t3`** and **`rtrv-t3`** commands) **Likely causes:** An out-of-frame DS3 signal incoming to the DSX-3 at the far end; failure of the **3DS3** CP at the far end or near end; the DS3 signal is looped at both ends
`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 line AIS`	CR, MJ, MN, or None	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 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

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
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, MJ, MN, or None	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
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.

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`inc. STS1 AIS`	CR, MJ, MN, or None	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:** Incomplete or incorrect cross connect provisioning in an end-to-end network, unprotected removal or failure of **3DS3** or **OLIU** CP at far end
`inc. STS1 LOP EC1`	CR, MJ, MN, or None	The system has detected a loss-of-pointer (LOP) condition A valid STS-1 pointer could not be found for eight consecutive frames in the identified STS-1 signal **Likely cause:** Failure of the far end **STS1E** or **3STS1E** CP or failure of the **STS1E** or **3STS1E** CP at the near end
`inc. STS1 LOP OC3 slotaid`	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.
`inc. STS1 LOP OC12 slotaid`	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. STS1 sig degrade (BER)`	CR or MN	For STS-1 path ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the user-provisioned signal degrade threshold. **Likely causes:** Failure at a fiber or failure of an **OLIU** CP at some point in the STS-1 path.
`inc. STS1 sig failed (BER)`	CR or MN	For ring applications, the bit error ratio (BER) of the specified STS-1 signal exceeds the signal fail threshold (10^{-6}) **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.

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
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 values	MJ	The Network Side/User Side parameters are set the same at both ends of a DCC optical span (Set by the **set-fecom** command.)
inhibit switch	ABN	When associated with OC-3 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 line switching is unidirectional. Because of this, specified OC-3 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 UNITS** 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** 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 This message is cleared by enabling autonomous message reporting with the TL1 **ALW-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.
lockout of protection	ABN	When associated with OC-3 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 line switching is unidirectional. Because of this, specified OC-3 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.

Table B. RTRV-ALM Message Descriptions (Contd)

Description	Alarm Level	Meaning
`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.)
`OHCTL CP failed`	MJ	Internal equipment failure of **OHCTL** CP.
`OHCTL standby boot failed`	MN	**OHCTL** CP failed during local or remote software download
`OLIU CP failed`	CR or MN	Internal equipment failure of specified **OLIU** CP
`program installation IP`	Status	This system is being used to install software into another system. If this procedure is interrupted prior to completion, the remote systems' control circuit packs will likely become inoperable until another install program attempt is successful This condition can also appear if the NE determines that it is time to install a new software generic by initiating the **`apply`** command
`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
`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.
`SYSCTL standby boot failed`	MN	**SYSCTL** CP failed during local or remote software download
`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.
`TID address map full`	MJ	The size of the directory service-network element (DSNE) database has been exceeded. **Likely causes:** Network elements have been removed from the network, but not from the DSNE database. See the **`dlt-tadrmap`** command
`TSI CP failed`	CR or MN	Internal equipment failure of specified **TSI** CP

Table B. 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/21G-U OLIU** CP is different from what it was before the **21G/21G-U 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** or **3STS1E** CP, or a **3DS3** or **3STS1E** 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 Obscure Failure Condition

1. ⇒ NOTE:
   It is assumed that a set of alarms or conditions exists which are inconsistent or may not have associated LED indications.

   Perform LED test by depressing **ACO/TST** pushbutton or using CIT command `test-led`.

   Reference: **DLP-507**

2. Did any LED fail LED test?

   If **YES**, then do **TAP-115**.
   If **NO**, then continue with **Step 3**.

3. Is CIT available?

   If **YES**, then proceed to **Step 7**.
   If **NO**, then continue with **Step 4**.

4. Is trouble associated with LED indications (for example, no **NE ACTY** or **FE ACTY** LED lighted; no **CR, MJ, MN, PMN**, etc., LED lighted when alarm is present, etc.)?

   If **YES**, then proceed to **Step 11**.
   If **NO**, then continue with **Step 5**.

5. ⇒ NOTE:
   Unseating and reseating **SYSCTL** performs *reset* procedure which restarts software program.

   Unplug and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** pushbutton.

6. Is trouble still present?

   If **YES**, then proceed to **Step 9**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Use CIT and `reset` command to reset **SYSCTL**.

8. Is trouble still present?

   If **YES**, then continue with **Step 9**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. ⚠ CAUTION:
   Replacing **SYSCTL** *involves updating internal memory on circuit pack.*

   Replace **SYSCTL**.

   Reference: **DLP-501**

10. Is trouble still present?

    If **YES**, then continue with **Step 11**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. ⇒ NOTE 1:
    The problem may be in backplane wiring of DDM-2000 OC-12 Multiplexer. One way to verify this is to swap **SYSCTL** and any circuit pack with inconsistent diagnostic indication with corresponding circuit packs in another DDM-2000 OC-12 Multiplexer. If the problem moves with the circuit packs, it means that one or more circuit packs is defective. If the problem stays with the original DDM-2000 OC-12 Multiplexer the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 OC-12 Multiplexer has a printed backplane and cannot be repaired in the field.

NOTE 2:
A CIT and system **rtrv-( )** commands may be helpful in determining condition of system.

Use CIT and **rtrv-alm** command to get an alarm and status report. See Commands and Reports section of this manual under **RTRV-ALM** for description of each message retrieved with **rtrv-alm** command.

If you need technical assistance, call your regional technical support group or Lucent Technologies RTAC number listed in front of this manual.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Abnormal (ABN) Indication

1. ⇒ NOTE:
   The **ABN** LED indicates a manually caused abnormal condition. Table A lists the conditions which may cause an **ABN** alarm. These conditions may have been initiated locally, from another DDM-2000 at the other end of the facility, or through telemetry.

   Is the **CR**, **MJ**, **MN**, or **PMN** LED on the User Panel lighted?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 4**.

2. ⇒ NOTE 1:
   It is better to clear the higher priority alarms (**CR**, **MJ**, etc.) first, although in most cases this will not clear an **ABN** alarm. If the higher priority alarm is cleared first, you can then use this procedure to clear the **ABN** alarm.

   ⇒ NOTE 2:
   In some cases, clearing an **ABN** alarm will result in a higher priority alarm being cleared. For example, clearing the abnormal condition `manual sync. mode switch` may cause an `excessive holdover` **MJ** alarm to clear.

   Refer to Task Index **IXL-001** for procedure to clear the indicated alarm.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. Is a CIT available?

   If **NO**, then continue with **Step 5**.
   If **YES**, then proceed to **Step 12**.

5. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote alarm and status conditions [**DLP-525**].

   Use **FE SEL** button to display alarm conditions for local shelf (**L.** displayed in **FE ID** display).

6. Was **NE ACTY** LED lighted on the User Panel when local shelf alarm conditions are displayed (**L.** displayed in **FE ID** display)?

   If **YES**, then proceed to **Step 27**.
   If **NO**, then continue with **Step 7**.

7. Use **FE SEL** button to display alarm conditions for other sites/shelves in the network (observe site address in **FE ID** display).

8. Was **NE ACTY** LED lighted on User Panel when alarms were displayed for any selected site?

   If **YES**, then continue with **Step 9**.
   If **NO**, then do **TAP-108**.

9. Refer to **DLP-525** and use **FE SEL** pushbutton on **SYSCTL** to display far-end alarm conditions for other sites/shelves in the network.

10. Issue a trouble report of abnormal (**ABN**) alarm condition at the far-end DDM-2000 terminal.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. ⇒ NOTE:
    For all network configurations except point-to-point, there will be multiple far-end `farend` terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

    Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system, if not already performed.

    Reference: **DLP-516**

13. **NOTE 1:**
The **rtrv-alm** command can be used to display a report of active alarm and status conditions. The Commands and Reports section of this manual gives a description of the command.

NOTE 2:
The `Active Alarm and Status Report` is output automatically following CIT log in. 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 only one entry. There may be several 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 (for example, "abnormal ... DS1 loopback" 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
=============================================================
 abnormal    fn-a-1    MM-DD HH:MM:SS   nsa   DS3 loopback
-------------------------------------------------------------
*/
```

Figure 1. Example of Active Alarms and Status Report

14. ⇒ NOTE:
Far-end alarm or status conditions are listed in this report with a `Source Address` of `farend`. Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

Does the `Source Address` of any top entry in the alarm report indicate local slot, channel, port or operations interface for the `abnormal` alarm?

If **NO**, then do **TAP-107**.
If **YES**, then continue with **Step 15**.

15. Use **`opr-aco`** command to silence active audible office alarms, if required.

16. Note the trouble indication in the `Description` column of the `Active Alarm and Status Report`, starting with the highest alarm level (`abnormal`) listed in the `Alarm Level` column.

17. Find the trouble description in Table A for the highest alarm level and not the related commands.

Table A. Abnormal (ABN) Alarm and Status Conditions

Description	Related Commands
forced switch inhibit switch	**switch-line** **switch-fn** **switch-sync**
inhibit auto. os messages	**INH-MSG** **ALW-MSG**
lockout of protection	**switch-line** **switch-fn**
manual sync. mode switch	**switch-sync**
DS3 loopback (to Fiber) DS3 loopback (to DSX)	**opr-lpbk-t3** **rls-lpbk-t3**
EC1 loopback (to Fiber) EC1 loopback (to DSX)	**opr-lpbk-ec1** **rls-lpbk-ec1**
DS3 trmsn test IP	**test-trmsn-t3**

18. ⚠ CAUTION:
You must determine the reason for the **ABN** *indication before attempting to clear it.*

Use the command **rtrv-state** to see if you can determine the condition associated with the **ABN** indication.

19. Contact the appropriate personnel at your location, at the far-end location, and at any central maintenance location to determine the reason for the **ABN** indication before clearing it.

20. Have you determined that it is appropriate for you to clear the condition causing the **ABN** indication?

    If **YES**, then proceed to **Step 23**.
    If **NO**, then continue with **Step 21**.

21. There is nothing more to be done until the reason for the **ABN** condition is known.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. Use the appropriate command to clear the abnormal condition. The command will be **rls-lpbk-( )** or **switch-( )**.

24. Is the **ABN** indicator still lighted?

    If **YES**, then continue with **Step 25**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. Use the **rtrv-alm** command to determine if there are other conditions causing the **ABN** alarm. See Table A.

26. See Table A. Does the **rtrv-alm** command report any other abnormal conditions.

    If **NO**, then do **TAP-108**.
    If **YES**, then repeat this procedure from **Step 16**.

27. Unseat and reseat the **SYSCTL** to perform a reset.

28. Is the **ABN** LED still lighted?

    If **YES**, then continue with **Step 29**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. Obtain CIT and repeat this procedure from **Step 12**.

Clear Flashing FAULT LED Indication

1. Is **MN** LED lighted on User Panel?

   If **YES**, then do **TAP-112.**
   If NO, then continue with **Step 2**.

2. Is **MJ** LED lighted on User Panel?

   If **YES**, then do **TAP-102.**
   If NO, then continue with **Step 3**.

3. Is **CR** LED lighted on User Panel?

   If **YES**, then do **TAP-101.**
   If NO, then continue with **Step 4**.

4. Is **FAULT** LED flashing on faceplate of one or more **3DS3/3STS1E** circuit packs?

   If **YES**, then continue with **Step 5**.
   If **NO**, then do **TAP-108**.

5. ⇒ NOTE:
   There is an incoming DS3/EC-1 signal failure. This failure can be further isolated using a CIT.

   Is CIT available?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 8**.

6. Connect CIT to connector on User Panel and establish session.

   Reference: **DLP-516**

7. Refer to Commands and Reports section of this manual under **RTRV-( )** and use **`rtrv-( )`** to further isolate the particular incoming DS3 signal failure.

8. 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**]. With a CIT, use the command **`rtrv-alm`** to verify the alarm.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

Clear Brownout Condition
Flashing L in FE ID Display

1. Is fuse **FA** or **FB** blown?

   If **YES**, then do **DLP-555**.
   If **NO**, then proceed to **Step 2**.

2. Condition DMM (digital multimeter) to measure voltage.

3. ⚠ CAUTION:
   If fuse on User Panel is not blown, trouble may be a failure of **one** *of the –48V DC power feeders. Removing the wrong fuse or disconnecting the wrong feeder for power measurement will cause service interruption.*

   Measure voltage at fuse holder **FA** or **FB**.

4. Does voltage measure less than -40 volts DC?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. ⚠ CAUTION:
   During brownout conditions the **SYSCTL** *will suspend normal operations. No alarms will be generated and CIT commands will* **not** *work. Local and remote logins will* **not** *work.*

   Trouble in power feeder(s). Check office battery distribution panel for low-voltage condition.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. NOTE:
   Unseating and reseating **SYSCTL** circuit pack performs a **reset** procedure which restarts the software program.

   Unseat and reseat **SYSCTL** circuit pack or use `reset` command. Do not press **UPD/INIT** pushbutton.

8. Is trouble cleared?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then proceed to **Step 9**.

9. CAUTION:
   Replacing the **SYSCTL** *involves updating the internal memory on the circuit pack.*

   Replace the **SYSCTL** (**DLP-501**).

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Minor (MN) Alarm

1. ⇒ NOTE:
   Table A lists some possible causes and indications of minor alarms.

   Is a CIT available?

   If **NO**, then continue with **Step 2**.
   If **YES**, then proceed to **Step 10**.

2. On the User Panel, momentarily depress **ACO** button to silence active audible office alarms.

3. ⇒ NOTE:
   The **FE SEL** button on the **SYSCTL** is used to display local and remote (farend) alarm and status conditions [**DLP-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. ⇒ NOTE:
    Far-end alarm or status conditions are listed in this report with a `Source Address` of `farend`. Local alarm or status conditions have a `Source Address` of the local slot, line, port, channel, path, cross-connection, or operations interface (DCC, X.25, TBOS, etc.) where the event occurred. (See *Addresses* in the Commands and Reports section of this manual.) Use the **`rtrv-alm`** command to get another report, if necessary.

    Does the `Source Address` of any top entry in the alarm report indicate local slot, channel, port or operations interface for the `MINOR` alarm?

    If **NO**, then do **TAP-107**.
    If **YES**, then continue with **Step 13**.

13. Use **`opr-aco`** command to silence active audible office alarms, if required.

14. Note the trouble indication in the `Description` column of the `Active Alarm and Status Report`, starting with the highest alarm level (Minor) listed in the `Alarm Level` column.

15. 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 FA|FB failed`	-48V power feeder or fuse on User Panel failed.	Replace fuse
MN LED lighted **FAULT** LED lighted on circuit pack	`3DS3 CP fail` `3STS1E CP fail`	Internal failure of circuit pack with lighted LED	Step 16
MN LED lighted.	`CP removed`	Circuit packs removed without doing **upd** command to remove circuit packs from equipment list.	Step 27
	`APS channel failed`	Failure of near-end or far-end protection OC-3 or OC-12 **OLIU** CP or failure of receive fiber on the protection line at near end	TAP-121 or LTP 363-206-280 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
	`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**).
	`environment`***n****	An environmental alarm point (misc. discrete input) is active at RT	Use **rtrv-attr-env** command at RT to determine trouble. Clear trouble using local procedures.
	`ExternalMinor`*	The external minor alarm input (environmental alarm input 15) is active at RT. DC power or the cooling fan in RT has failed.	Use **rtrv-attr-env** command at RT to determine trouble Clear trouble using local procedures

See Notes/footnotes at the end of this table.

Table A. Minor Alarm Conditions (Continued)

Alarm Level or LED Indication	Trouble Description (Note)	Likely causes	Step or Procedure
MN LED lighted **FAULT** LED lighted on **SYSCTL**	`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	`inc. DS1 sync. ref. AIS`
	`inc. DS1 sync. ref. BER`
	`inc. DS1 sync. ref. EOOF`
	`inc. DS1 sync. ref. LOF`
	`inc. DS1 sync. ref. LOS`
	`inc. DS1 sync. ref. OOL`
		Failure of incoming sync ref signal **TGS** provisioned for wrong frame format (SF or ESF).	Step 25

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	`inc. OC12 line AIS`*	Failure of OC-12 **OLIU** CP at far end.	Step 66

MN LED lighted. **FAULT** LED flashing on **OLIU**	`inc. OC12 LOF`
	`inc. OC12 LOS`
	`inc. OC12 sig degrade (BER)`
	`inc. OC12 sig failed (BER)`
		Failure of **OLIU** at near or far end, or failure of receive fiber.	TAP-120

MN LED lighted **FAULT** LED flashing on **3STS1E**	`inc. EC1 line AIS`* `inc. EC1 LOF`* `inc. EC1 LOS`* `inc. EC1 sig degrade (BER)`* `inc. EC1 sig failed (BER)`*	Failure of **3STS1E** at near or far end, or failure of receive fiber.	Step 23

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. OC3 line AIS`*	Failure of OC-3 **OLIU** CP at far end	Step 66

MN LED lighted **FAULT** LED flashing on **OLIU**	`inc. OC3 LOF`
	`inc. OC3 LOS`
	`inc. OC3 sig degrade (BER)`
	`inc. OC3 sig failed (BER)`
		Failure of OC-3 **OLIU** at near or far end, or failure of receive fiber	TAP-121 (linear,1+1) or TAP-120 (ring,0X1)

MN LED lighted	`inc. STS1 line AIS`*	Incomplete or incorrect cross-connection provisioning in an end-to-end network, unprotected removal of failure of a **3DS3** or **OLIU** circuit pack at far end	TAP-119
MN LED lighted. **FAULT** LED flashing on **3STS1E**	`inc. STS1 LOP EC1`*	Failure of **3STS1E** at near or far end, or failure of receive fiber	Step 23
MN LED lighted **FAULT** LED flashing on **OLIU**	`inc. STS1 LOP OC3` *slotaid*	If failure on both OC-3 lines. unprotected removal or failure of **MXRVO** or **DS3** CP at far end	LTP 363-206-280 TAP-112
		If failure on only one OC-3 line. Failure of **OLIU** at near or far end.	TAP-121 (linear,1+1) or TAP-120 (ring,0X1)
	`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-120 (ring,0X1)
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-121 (linear,1+1) or TAP-120 (ring,0X1)
	`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.

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	`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	`OLIU CP fail`
	`TGS CP fail`
	`TSI CP fail`
		Internal failure of circuit pack with lighted LED	Step 16

MN LED lighted	`OLIU CP removed`
	`TGS CP removed`
	`TSI CP removed`
		Circuit packs removed without doing **upd** command to remove circuit packs from equipment list	Step 27

MN LED lighted **FAULT** LED flashing on **OHCTL**	`section DCC channel failed`	**SYSCTL** failure, reset, or initialization at far end. **SYSCTL** removed from a site. Program installation in progress or failed at far end. **SYSCTL** or **OHCTL** failed at near end Both **OLIU** transmitters or transmit fibers failed (no communication with other end)	Step 50
MN LED lighted **FAULT** LED lighted on circuit pack.	`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
	`OHCTL standby boot failed`	**OHCTL** circuit pack hardware failure.	Replace **OHCTL** (DLP-518) and repeat local or remote software download.
	`SYSCTL standby boot failed`	**SYSCTL** circuit pack hardware failure.	Replace **SYSCTL** (DLP-501) and repeat local or remote software download

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. 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:
Removal of an unprotected circuit pack may cause service interruption.

⇒ NOTE:
The –48V power feeders/fuses on the User Panel supply power to DC-to-DC converters on the **TGS**, **OLIU**, **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.**

50. ⇒ NOTE:
    If a program installation is being performed to a **SYSCTL** at the far end, it is normal for the **FAULT** LED on the near-end **OHCTL** to flash and the **MJ** and **NE ACTY** LEDs to light on the User Panel. If there is a **MJ** alarm at the end receiving the program, trouble is indicated. You should check if a program installation is being done.

    Is new software generic being downloaded (program upgrade) to the **SYSCTL** at the far end terminal?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 51**.

51. In alarm report, is there any indication of **OLIU** or fiber trouble at near end or far end such as `inc. OC12 FERF` alarm message?

    If **YES**, then continue with **Step 52**.
    If **NO**, then proceed to **Step 54**.

52. ⇒ NOTE:
    If there is a DCC failure, a remote login to the shelf connected through the `Source Address` cannot be done. The **`rtrv-alm`**, **`rtrv-map-network`**, and **`rtrv-map-neighbor`** command can be used to check for `dcc failure` for main (and function units A, B, C, or D). Also, use **`rtrv-fecom`** command to see if fecom has been disabled.

Note `Source Address` of DCC channel failure. Check optical fibers connected through the `Source Address` per local procedures. If no trouble found, replace near-end **OLIU** first then far-end **OLIU**.

Reference: **DLP-518**

53. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

54. Use CIT and **`reset`** command to reset **SYSCTL** at the near end or unplug and reseat the **SYSCTL**.

55. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (`section DCC channel failed`)?

    If **YES**, then continue with **Step 56**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

56. If possible, use CIT and **`rlgn`** command to log in to the far-end terminal (**DLP-517**) and use the **`reset`** command to reset **SYSCTL** at the far end.

57. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing (`section DCC channel failed`)?

    If **YES**, then proceed to **Step 62**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

58. ⇒ NOTE:
    Unseating and reseating the **SYSCTL** performs a *reset* procedure which restarts the software program.

    Unseat and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

59. Is the **FAULT** LED on the affected circuit pack still flashing?

    If **YES**, then continue with **Step 60**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

60. Obtain a CIT and repeat this procedure.

61. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

62. Refer to **DLP-501** and replace **SYSCTL** at near-end terminal.

63. Is the **FAULT** LED on the **OHCTL** circuit pack still flashing?

    If **YES**, then continue with **Step 64**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

64. At far-end terminal, reset **SYSCTL** by unseating and reseating **SYSCTL** or by using a CIT and the **`reset`** command, if not already performed. If **FAULT** LED is still flashing after a reset, refer to **DLP-501** and replace **SYSCTL** at far-end terminal. If an **OHCTL** is present and the **FAULT** LED is still flashing after the **SYSCTL** is replaced, replace the **OHCTL** [**DLP-518**] first at one end and then the other, if trouble still exists.

65. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

66. Replace **OLIU**s at far end that are associated with the `Source Address` of the `inc. OC12 line AIS` or `inc. OC3 line AIS` alarm message.

    Reference: **DLP-518**

67. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Obscure Minor (MN) Alarm

1. Perform LED test by depressing **ACO/TST** pushbutton or using `test-led` command from CIT.

   Reference: **DLP-507**

2. Did any circuit pack fail LED test?

   If **YES**, then do **TAP-115**.
   If **NO**, then continue with **Step 3**.

3. Is this site a remote terminal location with separate J1C182BA Power Shelf and/or fan unit?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 5**.

4. Look for blown fuses and/or lighted LEDs on battery shelf, battery charger, or fan assembly. Is there any indication of trouble?

   If **YES**, then do **TAP-114**.
   If **NO**, then continue with **Step 5**.

5. Is CIT available?

   If **YES**, then proceed to **Step 11**.
   If **NO**, then continue with **Step 6**.

6. NOTE:
   Unseating and reseating **SYSCTL** performs *reset* procedure which restarts software program.

   Unplug and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

7. Is **MN** alarm LED still lighted, after about 1 minute?

   If **YES**, then continue with **Step 8**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. ⚠ CAUTION:
   Replacing **SYSCTL** *involves updating internal memory on circuit pack.*

   Replace **SYSCTL** (**DLP-501**).

9. Is **MN** alarm LED still lighted?

   If **YES**, then continue with **Step 10**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. ⇒ NOTE:
    Without CIT it is difficult to determine cause of minor alarm. Table A lists some remaining possible causes of minor alarm.

    Obtain CIT and establish session with DDM-2000 system.

    Reference: **DLP-516**

11. Use CIT and **`rtrv-alm`** command to get an alarm and status report. See Commands and Reports section of this manual under **RTRV-ALM** for description of each message retrieved with **`rtrv-alm`** command.

12. Refer to Table A. Are any of the conditions listed in Description column reported in Alarm and Status Report?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 23**.

13. Refer to Table A. Note suspected trouble and go to indicated step or procedure.

Table A. Obscure Minor Alarm Conditions

Description	Meaning	Step
`APS channel failed`	APS channel on protection OC-3 line has failed	Step 14
`externalMinor`	DC power or fan failure at remote terminal far end.	TAP-114
`environment`*n*	Miscellaneous discrete input is active. This message may be changed using **`set-attr-env`** command Description may be alphanumeric string up to 26 characters long (for example, Fire, Open Door, etc.).	Step 16
protected `CP removed`	Circuit pack previously installed in system is removed. Pack should be replaced or an update (**`upd`**) should be done to remove it from equipment list.	Step 18
`unexpected CP switches` `unexpected CP type`	Circuit pack is installed in slot provisioned for different circuit pack, or switch settings have been changed from what they were before pack was removed	Step 20

14. ⇒ NOTE:
Indications are that **OLIU** circuit pack on protection line (slot**2(P)**) has failed at near end or far end, or receive fiber on protection line at near end has failed.

Go to **TAP-121** and isolate trouble on **OLIU**s.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. Use local procedures to clear condition(s) that caused environmental alarm.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. Locate source address of removed circuit pack from alarm and status report, then determine reason circuit pack was removed. If same circuit pack is to be reinserted and no switch settings are changed, reinstall circuit pack. If circuit pack was removed and switch settings changed, reinstall circuit pack and momentarily depress **UPD/INIT** button on **SYSCTL**. If circuit pack is not to be reinserted, momentarily depress **UPD/INIT** button on **SYSCTL** to remove circuit pack from equipment inventory.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

20. ⇒ NOTE:
    Indications are that circuit pack has been installed in wrong slot; switch settings are invalid or different from a companion circuit pack; or switches are set differently from what they were before circuit pack was replaced.

    Determine source address from alarm and status report. Refer to Commands and Reports section of this manual under **RTRV-ALM** for more detailed description of report meaning.

21. If circuit pack(s) is installed in wrong slot, remove circuit pack. Determine correct position of circuit pack and install circuit pack into correct slot.

    Check circuit pack switch settings for valid settings or wrong settings (**DLP-510**). If switch settings are to be changed from what they were previously, update equipment list by momentarily depressing **UPD/INIT** button on **SYSCTL** after circuit pack is reinstalled.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. Has **SYSCTL** been replaced?

    If **YES**, then proceed to **Step 28**.
    If **NO**, then continue with **Step 24**.

24. Use CIT and **`reset`** command to reset **SYSCTL**.

25. Is **MN** alarm LED still lighted after about 1 minute?

    If **YES**, then continue with **Step 26**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. ⇒ NOTE:
    Replacing **SYSCTL** involves updating internal memory on circuit pack.

    Replace **SYSCTL** (**DLP-501**).

27. Is **MN** alarm LED still lighted?

    If **YES**, then continue with **Step 28**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

28. ⇒ NOTE:
    The problem appears to be in backplane wiring of DDM-2000. One way to verify this is to swap **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more circuit packs is defective. If the problem stays with the original DDM-2000, the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

    Check for broken or bent pins, shorted pins, etc. If you need technical assistance, call your regional technical support group or Lucent Technologies RTAC number listed in front of this manual.

29. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear External Minor Alarm at RT

1. Are there any blown fuses on battery shelf or **BFU** (for bulk powering)?

   If **YES,** then continue with **Step 2.**
   If **NO,** then proceed to **Step 4.**

2. Replace blown fuse(s).

3. Does alarm clear?

   If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO,** then continue with **Step 4.**

4. Is bulk power (J1C182BB bulk power shelf) being used?

   If **YES,** then proceed to **Step 25.**
   If **NO,** then continue with **Step 5.**

5. Is **OPEN BATT** LED on **337A BATTERY CHARGER** lighted at RT battery shelf?

   If **YES,** then continue with **Step 6.**
   If **NO,** then proceed to **Step 25.**

6. Condition DMM (digital multimeter) to measure voltage.

7. Measure voltage at **–48B** and **GND** and **–48L** and **GND** jacks on **LDU** faceplate.

8. Does voltage measure between –42 and –58 volts?

   If **YES,** then continue with **Step 9.**
   If **NO,** then proceed to **Step 18.**

9. Use SD-7C119 to check wiring between **337A BATTERY CHARGER** and batteries.

10. Was a problem found in wiring?

    If **YES,** then continue with **Step 11.**
    If **NO,** then proceed to **Step 12.**

11. Correct wiring problem and proceed to **Step 17.**

12. Is fuse blown on **337A BATTERY CHARGER**?

    If **YES,** then proceed to **Step 16.**
    If **NO,** then continue with **Step 13.**

13. Is **BAT DISCHG** LED on **337A BATTERY CHARGER** lighted?

    If **YES,** then continue with **Step 14.**
    If **NO,** then proceed to **Step 16.**

14. Depress and hold **HIGH RATE CHG ACTIVATE** pushbutton on **337A BATTERY CHARGER**. Is **BAT DISCHG** LED lighted?

    If **YES,** then continue with **Step 15.**
    If **NO,** then proceed to **Step 16.**

15. ⇒ NOTE:
    HIGH RATE CHG ON LED will remain lighted until batteries reach approximately –58 volts. If batteries are completely discharged, it may take approximately 1 day for **HIGH RATE CHG ON** LED to go out.

    Release **HIGH RATE CHG ACTIVATE** pushbutton. Does **BAT DISCHG** LED go off and is **HIGH RATE CHG ON** LED lighted?

    If **YES,** then proceed to **Step 17.**
    If **NO,** then continue with **Step 16.**

16. Replace **337A BATTERY CHARGER** and proceed to **Step 17.**

17. Did alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then proceed to **Step 23.**

18. Use DMM to measure voltage at battery shelf jacks **J5** (**+BAT**) and **J6** (**–BAT**).

19. Does voltage measure between –42 and –58 volts?

    If **YES,** then proceed to **Step 37.**
    If **NO,** then continue with **Step 20.**

20. Is **197A BATTERY LOAD TEST SET** available for use in testing batteries?

    If **YES,** then continue with **Step 21.**
    If **NO,** then proceed to **Step 23.**

21. Test batteries using **197A** test set.

    Reference: **DLP-531**

22. Replace any failed battery pack(s) and reconnect battery leads to battery shelf and proceed to **Step 24.**

23. Replace battery packs one at a time until –48 volts is present at output jacks on battery shelf.

24. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 25.**

25. Is **FAN ALARM** LED lighted on fan assembly?

    If **YES,** then continue with **Step 26.**
    If **NO,** then proceed to **Step 37.**

26. Remove **FAN H** and **FAN L** fuses on corresponding **BFU** on power shelf. Are fuses blown?

    If **YES,** then continue with **Step 27.**
    If **NO,** then proceed to **Step 30.**

27. Replace **FAN H** and **FAN L** fuses on corresponding **BFU**.

28. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 29.**

29. Is **FAN ALARM** LED lighted on fan assembly?

    If **YES,** then continue with **Step 30.**
    If **NO,** then proceed to **Step 37.**

30. ⚠ WARNING:
    To avoid possible damage, do not overextend fan assembly power cable.

    Remove fan assembly from bay.

31. Examine fan assembly for anything that will prevent fan from operating properly.

32. Remove any blockages and reinstall fan assembly and fuses.

33. Is fan assembly **FAN ALARM** LED off?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 34.**

34. Remove **FAN H** and **FAN L** fuses on corresponding **BFU**.

35. Replace fan assembly with new fan assembly and install fuses.

36. Is fan assembly **FAN ALARM** LED off?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 37.**

37. Replace one of the **336 RECTIFIER**s.

38. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 39.**

39. Reinstall original **336A RECTIFIER**.

40. Replace second **336A RECTIFIER**.

41. Does alarm clear?

    If **YES,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO,** then continue with **Step 42.**

42. Reinstall original **336A RECTIFIER**.

43. For technical assistance, call your regional technical support group or Lucent Technologies RTAC number listed in front of this manual.

44. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear LED Test Trouble

1. Did all LEDs on the **DDM-2000** fail to light?

   If **YES**, then proceed to **Step 4**.
   If **NO**, then continue with **Step 2**.

2. ⚠ CAUTION:
   Replacement circuit packs may have option switches which must be properly set before circuit pack is installed.

   Refer to **DLP-518** and replace circuit pack that failed LED test. Repeat LED test.

3. Did same LED fail test again?

   If **YES**, then continue with **Step 4**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. ⇒ NOTE:
   Using CIT and **`reset`** command or unseating and reseating **SYSCTL** restarts software program.

   Enter **`reset`** command or unplug and reseat **SYSCTL** circuit pack. Do not depress **UPD/INIT** button.

5. Repeat LED test.

6. Did same LED(s) fail test again?

   If **YES**, then continue with **Step 7**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. ⚠ CAUTION:
Replacing **SYSCTL** *involves updating internal memory on circuit pack.*

Replace **SYSCTL** (**DLP-501**) and repeat LED test.

8. Did LED test fail again?

If **YES**, then continue with **Step 9**.
If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. ⇒ NOTE:
The problem appears to be in backplane wiring of DDM-2000. One way to verify this is to swap **SYSCTL** and any circuit pack with an inconsistent diagnostic indication with corresponding circuit packs in another DDM-2000. If the problem moves with the circuit packs, it means that one or more circuit packs is defective. If the problem stays with the original DDM-2000, the entire assembly, but not the circuit packs, should be replaced. The DDM-2000 has a printed backplane and cannot be repaired in the field.

If you need technical assistance, call your regional technical support group or Lucent Technologies RTAC number listed in front of this manual.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble During Program Upgrade

1. ⇒ NOTE:
   Program installation may fail due to failure of communication link between PC and DDM-2000, failure of the floppy disk on the PC, failure or loss of power in the PC, or failure of the **SYSCTL** (or **OHCTL**).

   Was the following prompt printed indicating communication was established with near-end shelf:

   ```
   /*Enter a shelf number from 1 to 8*/
   shelf [default] =
   ```

   If **YES**, then proceed to **Step 4**.
   If **NO**, then continue with **Step 2**.

2. Check PC to CIT port connections. Make sure the cable is connected between the PC **COM1** port and the CIT port on the DDM-2000. If the rear CIT port is being used on the DDM-2000, make sure a null modem is installed on the port. Check baud rate settings on **SYSCTL** and CTRM terminal emulator. Check if CIT bay mult cabling is connected to this shelf but not terminated at another shelf.

   If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

4. Was the following message received?

   ```
   /* Status, execution stopped. */
   /* Communication link could not be established.
   Please connect PC with DDM-2000 upgrade program and
   start again. */
   ```

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. ⇒ NOTE:
   Indications are that the PC is not functioning properly, you are using a CIT instead of a PC, the disk drive is inoperable, the diskette has been removed, or the program has previously been erased from the **SYSCTL**. A program upgrade to the near-end DDM-2000 cannot be performed with a CIT. Ensure you are using a PC to upgrade the program. Check that the PC is operating properly and the diskette has not been removed.

   Has program installation procedure been tried more than once?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 14**.

6. Was the following message received?

```
ins-prog:tid DENY
  SSTP
  /* Status, execution stopped. */
  /* Far end not responding.
```

   If **YES**, then continue with **Step 7**.
   If **NO**, then proceed to **Step 10**.

7. Is **SYSCTL** (and **OHCTL**) circuit pack installed at far end?

   If **YES**, then proceed to **Step 10**.
   If **NO**, then continue with **Step 8**.

8. Determine reason **SYSCTL** (and **OHCTL**) is not installed. The **SYSCTL** (and **OHCTL**) must be installed to upgrade program. Reinstall the **SYSCTL** (and **OHCTL**) and repeat the program installation procedure.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Did **SYSCTL** (or **OHCTL**) fail, indicated by the following or similar SYSCTL CP failed message?

```
ins-prog:tid DENY
  SSTP
  /*Status, execution stopped.*/
  /*Installation cannot be done because of SYSCTL test
  failure. */
```

    If **YES**, then proceed to **Step 17**.
    If **NO**, then continue with **Step 11**.

11. Did **FAULT** LED on **SYSCTL** light and did the **SYSCTL FE ID** display go off?

    If **YES**, then proceed to **Step 19**.
    If **NO**, then continue with **Step 12**.

12. ⇒ NOTE:
    It is assumed that the program installation failed in one of two ways: before the old program was erased or after the old program was erased. If the program installation failed after 1 minute, the DDM-2000 may have erased its old program and will be unable to report alarms or do protection switches. If program installation failed within 1 minute, the old program may not have been erased and the DDM-2000 may have automatically reset and restarted its old program. A new attempt must be made to install the program.

    Check PC COM( ) port to CIT connection. Check PC disk drive and floppy diskette.

13. Has program installation procedure been tried more than once?

    If **NO**, then continue with **Step 14**.
    If **YES**, then proceed to **Step 15**.

14. ⇒ NOTE:
The new program installation may have failed because of faulty diskettes.

Disconnect PC and repeat program installation procedure. Use your *backup diskettes* containing new generic program, if available.

15. If new program installation cannot be completed and the old program has been erased, one the following procedures may be used to restore the old program or install a different version program.
    a. Go to the far-end shelf and establish session with a CIT. Enter the **ins-prog:** *tid* command where the *tid* is the *tid* (shelf name) for the failed shelf where you want to install the old program.
    b. Replace the **SYSCTL** (and **OHCTL**) with one that has compatible software.

       Reference: **DLP-518**
    c. If a **C** was displayed in the **FE ID** display during a software upgrade, indications are that the software being loaded will not support the current system transmission configuration. This indicates a problem with the version of software you are trying to install, or you are trying to install an older version of software that does not support the system configuration that you have. To load another version of software, unplug and then reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display. Release buttons and install program using the procedures of **DLP-527**.

    If you need technical assistance, contact your local or regional maintenance group. The telephone number for Lucent Technologies RTAC is listed in the front of this manual.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Unplug and reseat **SYSCTL** to perform reset.

18. Is alarm still present?

    If **YES**, then continue with **Step 19**.
    If **NO**, then proceed to **Step 21**.

19. Has **SYSCTL** or **OHCTL** been replaced?

    If **NO**, then continue with **Step 20**.
    If **YES**, then proceed to **Step 23**.

20. ⚠ CAUTION:
    Replacing the **SYSCTL** *involves updating the internal memory on the circuit pack.*

    Replace the **SYSCTL** or **OHCTL**.

    Reference: **DLP-518**

21. Repeat program installation procedure.

    Reference: **DLP-527**

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. If you need technical assistance, contact your local or regional maintenance group. The telephone number for Lucent Technologies RTAC is listed in the front of this manual.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear NE ACTY/FE ACTY Alarm Only

1. Is a CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 8**.

2. ⇒ NOTE:
   For all network configurations except point-to-point, there will be multiple far-end "farend" terminals. Troubleshooting multi-shelf DDM-2000 networks is facilitated by use of a Craft Interface Terminal (CIT).

   Connect the CIT to the **CIT** connector on the near-end User Panel and log in to the near-end system.

   Reference: **DLP-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-1    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**: System was manually switched to holdover mode (with **switch-sync** command or in a central office system, with TBOS control point 54) and switch has not been reset; or the system automatically switched to holdover mode due to failure of timing references, and either (1) the reference failures have not cleared, or (2) the system is provisioned for nonrevertive synchronization mode switching, or (3) the system is provisioned for External timing and no external timing references are available, or (4) the system is provisioned for loop-timed operation and the optical line or OLIU circuit pack has failed, or a message indicating an upstream clock problem has been received on the sync message bits of the optical line (**rtrv-sync** command) or (5) the system is provisioned for sync message signaling, but the upstream system from which it loop-times has not been provisioned for sync message signaling. The condition can be cleared by provisioning both systems the same (**set-sync** and **rtrv-sync** commands). Condition can be cleared by repairing at least one of timing references (if both are failed) and resetting synchronization mode protection switch with command **switch-sync:s=mode,pri=reset**. In a central office system, the synchronization mode can also be reset with a TBOS control point.
inc. (from OC3) DS3 AIS inc. (from fiber) DS3 AIS	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (coming from the fiber) for the specified DS3 signal. **Likely causes:** The incoming DS3 signal at the far end is failed, DS3 AIS is received from the DSX-3 at the far end, incomplete or missing STS1 (DS3) cross connections at a far end terminal. [TAP-119]
inc. (from OC12) DS3 AIS inc. (from fiber) DS3 AIS	The system has detected DS3 alarm indication signal (AIS) in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. **Likely causes:** The incoming DS3 signal at the far end is failed, or DS3 AIS is received from the DSX-3 at the far end. [TAP-119]
inc. (from OC3) DS3 OOF inc. (from fiber) DS3 OOF	The system has detected a DS3 out-of-frame (OOF) condition in the DEMUX direction (coming from the fiber) for the specified DS3 signal. **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. [DLP-518 or LTP 363-206-280, DLP-523]

Table A. Alarm and Status - NE ACTY (Contd)

Activity	Meaning
inc. (from OC12) DS3 OOF inc. (from fiber) DS3 OOF	The system has detected a DS3 out-of-frame (OOF) condition in the DEMUX direction (that is, coming from the fiber) for the specified DS3 signal. This condition is reported only if the DS3 interface is provisioned in VM or VMR mode. (See the **set-t3** and **rtrv-t3** commands.) **Likely causes:** An out-of-frame DS3 signal incoming to the DSX-3 at the far end; failure of the **3DS3** CP at the far end or near end; the DS3 signal is looped at both ends. [DLP-518]
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. [DLP-518]
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. [TAP-121 or LTP 363-206-280, TAP-111 or TAP-119]
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. [TAP-120]
inc. STS1 yellow	The system has detected an incoming STS-1 yellow signal inserted by the far end path terminating equipment. **Likely causes:** Incomplete or incorrect cross-connect provisioning in the end-to-end network [TAP-119], unprotected failure of a **3DS3** CP at the far end or near end, or fiber failure at some point in the end-to-end path.

Clear Fan Shelf Alarm

NOTE:
POWER ON LED not lighted indicates power failure. **POWER FAULT** LED lighted indicates single power feeder failure. **CONTROL FAULT** LED lighted indicates fan shelf assembly failure. **FILTER REPLACE** LED lighted indicates fan filter needs replacing. **FAN FAULT 1, 2, 3,** or **4** LED lighted indicates single fan failure. Execute **ALARM RESET** after failure is cleared.

1. Is **POWER ON** LED lighted on fan shelf?

   If **NO**, then continue with **Step 2.**
   If **YES**, then proceed to **Step 9.**

2. Are **POWER RESET A** and **B** circuit breakers tripped (pins extended)?

   If **YES**, then continue with **Step 3.**
   If **NO**, then proceed to **Step 7.**

3. Reset circuit breakers (depress pins).

4. Did circuit breakers trip again?

   If **YES**, then continue with **Step 5.**
   If **NO**, then proceed to **Step 35.**

5. Trouble in fan shelf. Remove front cover, disconnect cables to all four fan packs, and reset circuit breakers. If circuit breakers trip again, replace fan shelf. If circuit breakers do not trip, reconnect fan units one at a time and replace fan unit that causes breaker to trip. Fan shelf must be repaired within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Trouble in power feeder(s). Check office battery distribution fuse panel for blown fuses. Check power feeders to fan shelf. Power must be restored within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if power is not restored and fan made operational.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Is **POWER FAULT** LED lighted on fan shelf?

   If **YES**, then continue with **Step 10.**
   If **NO**, then proceed to **Step 17.**

10. Is circuit breaker tripped?

    If **NO**, then continue with **Step 11.**
    If **YES**, then proceed to **Step 13.**

11. Trouble in one of power feeders. Check office battery distribution fuse panel for blown fuses. Check power feeders to fan shelf.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. Reset circuit breaker (depress pin).

14. Did circuit breaker trip again?

    If **YES**, then continue with **Step 15.**
    If **NO**, then proceed to **Step 35.**

15. Trouble in fan shelf. Replace fan shelf.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Is **CONTROL FAULT** LED lighted on fan shelf?

    If **YES**, then continue with **Step 18.**
    If **NO**, then proceed to **Step 20.**

18. Trouble in fan shelf. Replace fan shelf within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

20. Is **FILTER REPLACE** LED lighted on fan shelf?

    If **YES**, then continue with **Step 21.**
    If **NO**, then proceed to **Step 33.**

21. NOTE:
    The fan filter is located on the bottom of DDM-2000 OC-12 shelf that is installed immediately below the DDM-2000 fan shelf. It is held in place by a spring-loaded mechanism. To remove filter, simply pull it out. To install a filter, insert filter, with spring-loaded mechanism facing up, into the bottom cavity of the shelf.

    Replace fan filter. Momentarily depress **ALARM RESET** button.

    Reference: **DLP-537**

22. Is **FILTER REPLACE** LED lighted on fan shelf?

    If **YES**, then continue with **Step 23.**
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. CAUTION:
    If the air flow sensor element is disturbed during cleaning, it may cause the fan shelf to go out of calibration and cause the DDM-2000 equipment to overheat. If experienced personnel are not available to clean the air flow sensor element, it is recommended you replace the fan shelf.

    NOTE:
    Trouble in fan shelf or air flow sensor. Replace fan shelf or clean air flow sensor within 4 hours of minor alarm indication. Service interruption and/or circuit pack failure may occur if fan shelf is not replaced.

    Are you going to clean the air flow sensor or replace the fan shelf?

    If **REPLACE FAN SHELF**, then continue with **Step 24.**
    If **CLEAN SENSOR**, then proceed to **Step 26.**

24. Replace fan shelf.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. ⇒ NOTE:
The air flow sensor could get contaminated with dust in environments where excessive dust is present and/or in situations where the fan filter was not installed. The air flow sensor is located in the area where fan pack #2 is located. When fan pack #2 is removed, it is still difficult to see if the air flow sensor has accumulated dust. If dust is suspected and a replacement fan shelf is not available, then personnel experienced in the air flow sensor cleaning procedures may clean the sensor element.

27. Remove fan shelf front cover.

28. ⇒ NOTE:
Fan packs are numbered from left to right as viewed from the front of the fan shelf. To remove fan pack, disconnect fan cable from fan pack. Remove 2 screws holding fan in place. Slide out fan pack.

Remove fan pack #2. See Figure 2.

29. Locate air flow sensor (Figure 2) and direct a gentle blast of clean dry air toward the center of the vertical sensor orifice.

30. Reinsert fan pack #2. Reinstall screws and connect fan cable.

31. Reinstall front cover and momentarily depress the **ALARM RESET** button.

32. Is **FILTER REPLACE** LED lighted on fan shelf?

    If **YES**, then proceed to **Step 15.**
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

33. Is **FAN FAULT 1, 2, 3,** or **4** LED lighted on fan shelf?

    If **YES**, then continue with **Step 34.**
    If **NO**, then proceed to **Step 35.**

34. NOTE:
    Fan packs are numbered from left to right as viewed from the front of the fan shelf. To replace fan pack, remove front cover and disconnect fan cable from failed fan pack. Remove 2 screws holding fan in place. Slide out old fan and install new one. Reinstall screws and connect fan cable.

    Trouble is in fan pack associated with lighted LED. Replace ED-8C733-30, G6 fan pack.

    Reference: **DLP-545**

35. Momentarily depress the **ALARM RESET** button to reset alarms.

36. Verify that all fan shelf alarm LEDs are extinguished and no circuit breakers are tripped.

37. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

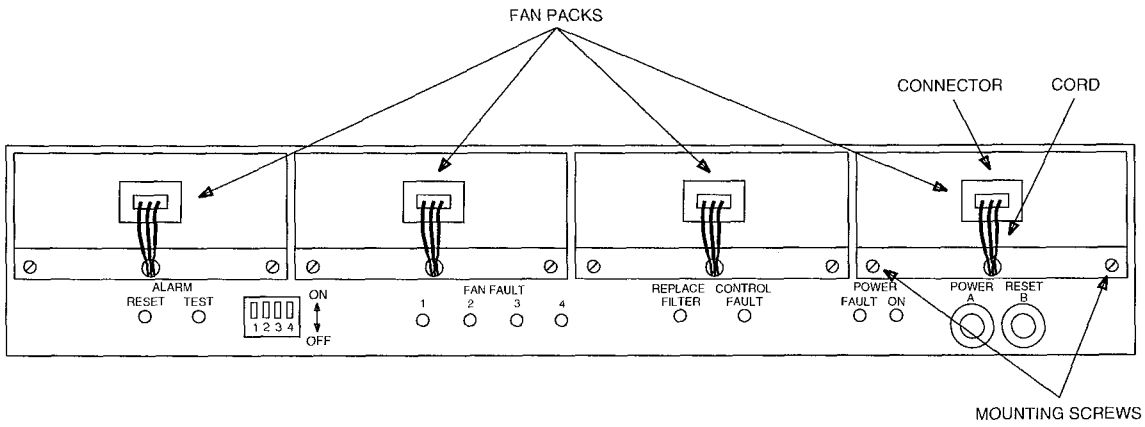


Figure 1. DDM-2000 Fan Shelf — Front Cover Removed

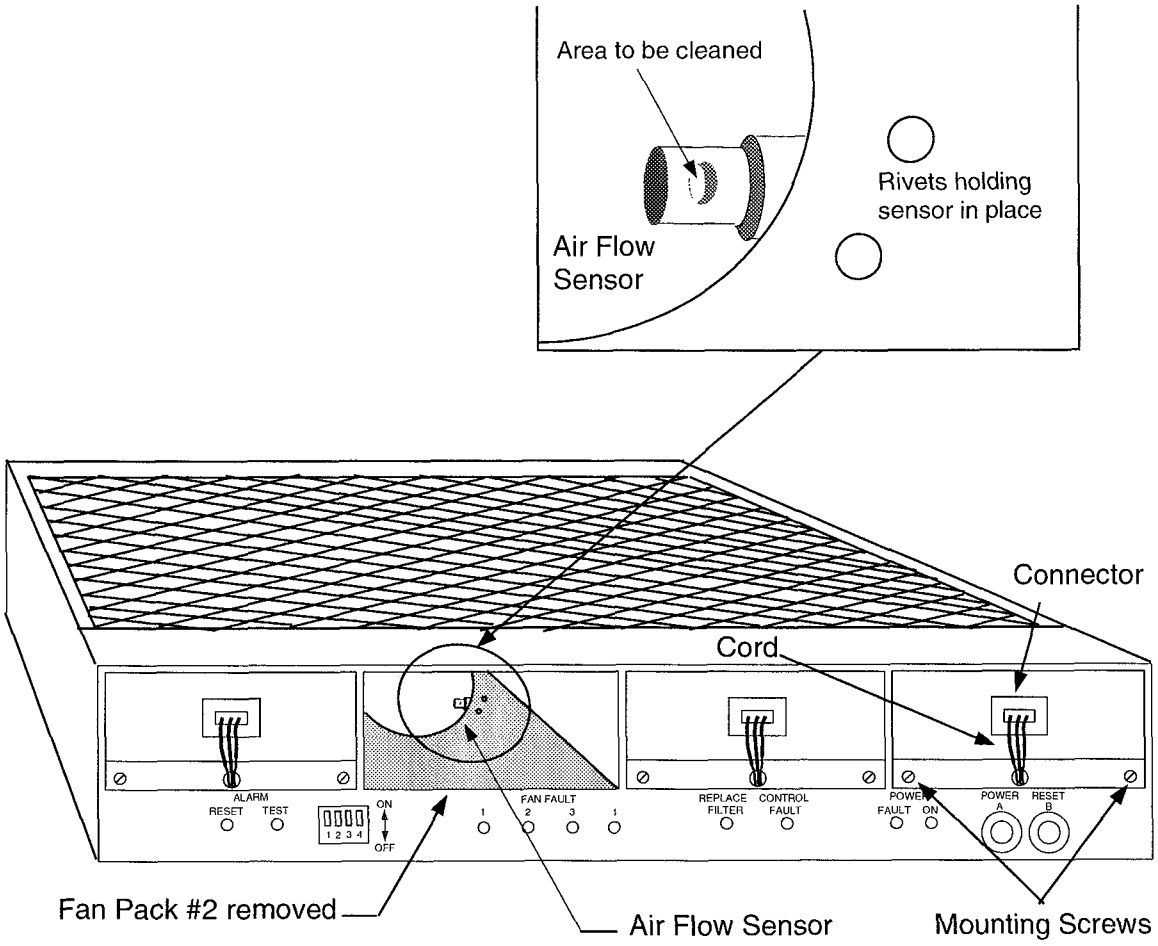


Figure 2. DDM-2000 Fan Shelf — Air Flow Sensor Location

Clear STS AIS Alarm Conditions

1. NOTE 1:
   Incoming STS1 AIS often indicates missing or incorrect cross-connects. In ring configurations they may have an alarm level of "ne-acty", MJ or CR. Incoming STS1 AIS may also indicate an unprotected failure or removal of a **3DS3**, **3STS1E**, or **OLIU** at the far end associated with the Source Address of the alarm message.

   NOTE 2:
   STS1 AIS conditions are only reported at service termination (drop) points. Incoming STS AIS reported as "ne-acty" at a shelf where the service is cross-connected to a DS3 or EC1 drop can be caused by missing or incorrect cross-connections at the other terminal shelf or at any shelves where the service should be pass-through cross-connected.

   Note the Source Address of the STS1 AIS condition reported in the alarm and status report (e.g. a-1). Based on the circuit layout or other office records, determine the other shelf where that time slot is supposed to be terminated (cross-connected to a DS3 or EC-1 termination).

2. Use the '**rlgn**' command to login to the other terminating shelf, then use the **rtrv-crs-sts1** command to determine if the time slot identified in Step 2 is cross-connected as specified in circuit layout or other office records.

3. Were there incomplete or incorrect cross-connects?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 6**.

4. Use the commands **ent-crs-sts1** and **dlt-crs-sts1**, as necessary, to correct the provisioning.

5. Have all indications of STS1 AIS cleared?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 6.**

6. ⇒ NOTE:
   If the service is STS1 cross-connected at either terminating shelf, both terminating shelves must be properly equipped to terminate the entire STS1. For example, if DS3 service is being provided, both ends must be equipped with **3DS3** circuit packs in the groups that are STS1 cross-connected.

   Use the **`rtrv-eqpt`** command at both shelves to verify that the shelves are properly equipped for the service being provided. If the shelves are not properly equipped, install circuit packs as required.

7. Have all indications of STS1 AIS cleared?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 8.**

8. Using the **`rlgn`** command, login to every shelf where the service should be pass-through cross-connected (e.g. mb-1 to mb-1) and use the **`rtrv-crs-sts1`** command to determine if the time slot identified in Step 2 is cross-connected as specified in circuit layout or other office records. If service is cross-connected through other maintenance subnetworks, such as dual ring interworking (DRI), look for missing cross-connections in the other subnetworks.

9. At any shelves with missing cross-connects use the **`ent-crs-sts1`** command to provision the pass-through cross-connect (e.g. mb-1 to mb-1).

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear OLIU or Fiber Trouble
Path Protected Ring

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
When removing **OLIU** *circuit packs or replacing fiber, ensure that all STS paths are active on the* **OLIU** *and fiber that is* **NOT** *being removed or replaced. When available, use a CIT and the* **`switch-path-( ):all:pri=manual`** *command to switch all STS paths to the* **OLIU** *and fiber that are not being removed or replaced. It is also recommended to login to the far end of the* **OLIU** *and use the* **`switch-path-( ):all:pri=manual`** *command to switch all STS paths to the* **OLIU** *and fiber that are not being removed or replaced.*

⚠ CAUTION 2:
If timing source has been previously set to optical line (main-b-1 or main-b-2) that has failed, use the **`set-sync:src=main-b-1`** *or* **`main-b-2`** *command to select timing source from good optical line.*

NOTE:
A lighted **FAULT** LED on the **OLIU** indicates that either the receiver, the transmitter, or both has failed. A flashing **FAULT** LED on the **OLIU** indicates that either the near-end receiver, far-end transmitter, or incoming (receive) fiber has failed. In a Path Protected Ring network, both **OLIU**s are normally **ACTIVE**. One **OLIU** carries service on one path of the ring and the other **OLIU** carries service on the other path. If possible, log into shelf associated with source address (for example, main-b-2) of `inc. OC12 LOS`, etc. to see if circuit pack is removed or failed.

Was **OLIU**(s) removed or being replaced or installed when alarm occurred?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 8**.

2. ⇒ NOTE:
An alarm will occur if a circuit pack is removed without performing an update by momentarily depressing the **UPD/INIT** button or using the **upd** command.

Is any previously installed **OLIU**(s) removed from the shelf?

If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 5**.

3. Determine the reason the circuit pack was removed. If the same circuit pack is to be reinserted, reinstall the circuit pack. If the circuit pack was removed and is not to be reinserted, momentarily depress the **UPD/INIT** button on the **SYSCTL** to remove the circuit pack from equipment inventory.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Is **OLIU**(s) installed in correct slot(s) (**rtrv-eqpt**)?

If **NO**, then continue with **Step 6**.
If **YES**, then proceed to **Step 8**.

6. Remove optical fibers from circuit packs, if connected, then remove circuit pack(s) from wrong slot(s). Install circuit pack(s) into correct slot(s). Reconnect optical fibers (**DLP-511**).

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Is **FAULT** LED lighted (`OLIU CP failed`) on **OLIU** at any location associated with source address?

If **YES**, then continue with **Step 9**.
If **NO**, then proceed to **Step 11**.

9. Replace **OLIU** with lighted **FAULT** LED.

   Reference: **DLP-518**

10. Is **FAULT** LED still lighted (`OLIU CP failed`) on **OLIU**?

    If **YES**, then do **TAP-106**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Is **FAULT** LED flashing (`inc. OC3 LOS` or `inc. OC12 LOS`) on **OLIU**s?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 14**.

12. ⇒ NOTE:
    Indications are that the incoming (receive) optical fiber line has failed or near-end or far-end **OLIU**s have failed.

    Check optical fiber lines per local procedures, repair if necessary. If no trouble is found in the optical fibers, replace **OLIU**(s) at near end first (**DLP-518**). If trouble still exists, replace **OLIU**(s) at far end. If trouble still exists, trouble is in receive optical fiber associated with **OLIU** with flashing LED. Clear trouble in optical fiber per local procedures.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. For technical assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear OLIU or Fiber Trouble
Linear Extensions

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
When removing circuit packs, ensure that protection switching is available. When available, use a CIT and the **`switch-line`** *command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a* **`switch-line`** *at near end and far end to switch both transmit and receive to same line.*

⚠ CAUTION 2:
When removing circuit packs, always remove one without a lighted **ACTIVE** *LED first.*

NOTE 1:
A lighted **FAULT** LED on the **OLIU** indicates that either the receiver, the transmitter, or both has failed. A flashing **FAULT** LED on the **OLIU** indicates that either the near-end receiver, far-end transmitter, or incoming (receive) fiber has failed. A lighted **ACTIVE** LED indicates that the **OLIU** is carrying service (transmitting, receiving, or both).

NOTE 2:
Because OC-3 line protection switching request is unidirectional, it is possible to have lighted **FAULT** LEDs on both service and protection **OLIU**s and still be in service. When troubleshooting **OLIU** problems, you must first fully analyze trouble indications. This may be done by noting LED indications at both ends of system or using a CIT to log in to far-end terminal and using `rtrv-alm` and `rtrv-state` commands to check far-end status.

NOTE 3:
This procedure can be used to clear some troubles, but knowledge of **OLIU** protection switching arrangement and use of CIT commands are necessary to clear other troubles where a service interruption might occur.

Was **OLIU**(s) being replaced, installed, or having switch setting changed when alarm occurred?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 11**.

2. NOTE:
An alarm will occur if a circuit pack is removed without performing update by momentarily depressing **UPD/INIT** button or using `upd` command.

Is any previously installed **OLIU**(s) removed from shelf?

If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 5**.

3. Determine reason circuit pack(s) was removed. If same circuit pack is to be reinserted and switch setting is not changed, reinstall circuit pack. If circuit pack was removed and switch setting changed, reinstall circuit pack (**DLP-518**) and momentarily depress **UPD/INIT** button on **SYSCTL**. If circuit pack is not to be reinserted, momentarily depress **UPD/INIT** button on **SYSCTL** to remove circuit pack from equipment inventory.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Is **OLIU**(s) installed in correct slot(s) (`rtrv-eqpt`)?

   If **NO**, then continue with **Step 6**.
   If **YES**, then proceed to **Step 8**.

6. Remove optical fibers from circuit packs, if connected, then remove circuit pack(s) from wrong slot(s). Check option switch setting (**DLP-510**), and install circuit pack(s) into correct slot(s). Reconnect optical fibers (**DLP-551**).

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Was circuit pack installed with switch setting(s) changed from what it was previously (`rtrv-oc3`)?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 11**.

9. Ensure switch setting on **OLIU** circuit pack(s) is correct (**DLP-510**). If **OLIU** circuit pack(s) was replaced or installed with switch setting changed from what it was previously, momentarily depress **UPD/INIT** button on **SYSCTL**.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Are **FAULT** LEDs flashing on both service and protection **OLIU**s (`inc. OC3 LOS, LOF, sig. failed`, etc.)?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 14**.

12. ⇒ NOTE:
    Indications are that both incoming (receive) optical fiber lines have failed or both near- or far-end service and protection **OLIU**s have failed, or both **TGS**, **MXRVO**, or **DS3** circuit packs in the DDM-2000 OC-3 shelf have failed or been removed.

    Check for failed or removed **TGS**, **MXRVO**, or **DS3** circuit packs in the DDM-2000 OC-3 shelf. Replace failed circuit packs [**LTP 363-206-280**, **DLP-523**]. Use local procedures to check optical fiber connections and transmission. If no trouble is found on the optical fibers, replace **OLIU**s at near end first (**DLP-518**). If trouble still exists, replace **OLIU**s at far end [**LTP 363-206-280**, **DLP-523**]. If alarm still exists, trouble is in optical fibers.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Is **FAULT** LED lighted (`OLIU CP fail, unexpected CP type/switches`, etc.) or flashing (`inc. OC3 LOS, LOF, sig. failed`, etc.) on only one **OLIU** at either near end or far end?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed to **Step 24**.

15. Is **ACTIVE** LED lighted on both service and protection **OLIU**s (**`rtrv-state`**)?

    If **YES**, then proceed to **Step 18**.
    If **NO**, then continue with **Step 16**.

16. Is alarm Critical or Minor?

    If **MINOR**, then proceed to **Step 19**.
    If **CRITICAL**, then continue with **Step 17**.

17. ⇒ NOTE:
    Indications are that near- or far-end **OLIU** or incoming fiber line has failed and protection switching has been inhibited or locked at one or both ends. Also, if the protection line fails, the **ACTIVE** LEDs on both **OLIU**s will be lighted because of the uncertain state of the far end. If the **`rtrv-state`** report indicates `active-?` for the protection line (slot **2(P)**), indications are that the protection line is failed. If the service line (slot**1**, indicates `active-rx` at both ends of the system, the service line is carrying all service.

    Use CIT and **`rtrv-state`** command to check switch status at BOTH ends of system.

18. Use CIT and **`switch-line`** command to reset switch and switch both near- and far-end lines to **OLIU** pair without lighted **FAULT** LED.

19. Replace **OLIU** with lighted or flashing **FAULT** LED.

    Reference: **DLP-518** or **LTP 363-206-280**, **DLP-523**

20. Did trouble clear?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 21**.

21. Is **FAULT** LED lighted or flashing?

    If **FLASHING**, then continue with **Step 22**.
    If **LIGHTED**, then do **TAP-106**.

22. Replace **OLIU** at far-end (**LTP 363-206-280**, **DLP-523**). If trouble does not clear, trouble is in incoming optical fiber.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

24. ⇒ NOTE:
    Remember that OC-3 line protection switching request is unidirectional. It is possible to have a lighted **FAULT** LED on an **OLIU** and still have that **OLIU** active (for example, if transmitter failed, receiver could still be receiving). It is necessary to analyze lighted or flashing **OLIU** LEDs before replacing an **OLIU**. If **ACTIVE** LED is lighted on an **OLIU**, it is in service (ACTIVE) either transmitting or receiving or both. It may be necessary to perform a **`switch-line`** at near end and at far end to switch both transmit and receive to same line.

    Is **FAULT** LED lighted or flashing only on service **OLIU**s or only on protection **OLIU**s?

    If **YES**, then continue with **Step 25**.
    If **NO**, then proceed to **Step 32**.

25. Is **ACTIVE** LED lighted on **OLIU**s with lighted **FAULT** LEDs?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 27**.

26. Use CIT and **`rtrv-state`** command to check switch status at both ends of system. Use CIT and **`switch-line`** command to reset switch and switch both near- and far-end lines to **OLIU**s without lighted **FAULT** LED.

27. NOTE:
    Local procedures may require you to check optical fibers before replacing **OLIU**s.

    Replace **OLIU**s with lighted **FAULT** LEDs.

    Reference: **DLP-518** or **LTP 363-206-280**, **DLP-523**

28. Did trouble clear?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 29**.

29. Is **FAULT** LED(s) lighted or flashing?

    If **FLASHING**, then continue with **Step 30**.
    If **LIGHTED**, then do **TAP-106**.

30. Trouble is in optical fiber. Clear trouble using local procedures.

31. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

32. Multiple troubles exist which are beyond scope of this manual. Without knowing exact LED indications, alarm and status indications (obtained with **`rtrv-alm`** command), or state of protection switch (using **`rtrv-state`** command), this procedure cannot go any further.

    Use LED indications and **`rtrv-alm`** and **`rtrv-state`** commands to analyze trouble. Look for protection switch locks or inhibits. If system is found to be completely out of service, replace circuit packs with lighted **FAULT** LEDs. If system is still in service and a protection switch can place all service on either protection or service **OLIU**s, perform switch; then replace circuit packs with lighted **FAULT** LEDs.

    If you need technical assistance, call your regional technical support group or Lucent Technologoies RTAC number listed in front of this manual.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install BCP4 OHCTL Circuit Pack
New Shelf

1. ⇒ NOTE 1:
For Release 5 or later, the **OHCTL** must be a **BCP4 OHCTL**. This procedure is used to install the **OHCTL** for the first time in a new shelf. To replace an **OHCTL** in an in-service system, refer to **DLP-518**.

⇒ NOTE 2:
A **BCP4 OHCTL** must have software installed and it must be compatible with the software in the **BBG8 SYSCTL**. If no software is installed or if the software is not compatible, you must find circuit packs with compatible software or install new software in both the **OHCTL** and **SYSCTL** when the **SYSCTL** is installed. The shelf must be equipped with both **OHCTL** and **SYSCTL** [**DLP-557**] circuit packs before new software can be installed [**DLP-520**].

⇒ NOTE 3:
When the **OHCTL** is installed, the **FAULT** LED will light and remain lighted until the **SYSCTL** is installed.

Install **OHCTL** into **AUXCTL** slot.

Response: **FAULT** LED lights.

2. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace BBG8/BBG5 SYSCTL In-Service

This procedure is used for replacing a **BBG8/BBG5 SYSCTL** in an in-service shelf. For procedures to install the **SYSCTL** in a new shelf (initial installation), refer to **DLP-557**.

1. ⚠ 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 some upgrades, system tests, or training classes), if the system is in service and a* **SYSCTL** *and* **OHCTL** *are being installed that contain a version of software 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 currently in the* **SYSCTL**. *If both* **TGS** *circuit packs are not installed, removal of the only* **TGS** *circuit pack will cause service interruption.*

   NOTE:
   If the system is in service and both the **SYSCTL** and **OHCTL** controllers are being replaced, the following step is highly recommended to protect against a loss of service because of installing controllers with software not compatible with current shelf software. But, if you are **sure** that you want to install controllers with incompatible software, you may elect to remove the **TGS** in **TIMING** slot **1** and allow the software to run without having to force the system to run the software.

Before performing this procedure on an in-service system, 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**.

Are you replacing a **BBG8 SYSCTL** with another **BBG8 SYSCTL** or replacing a **BBG5 SYSCTL** with a **BBG8 SYSCTL**?

If **REPLACING BBG8**, then continue with **Step 2**.
If **REPLACING BBG5**, then proceed to **Step 3**.

2. Remove and inspect circuit pack being replaced for proper option switch settings. Set option switches on the replacement **BBG8 SYSCTL** the same as the original.

   Proceed to **Step 7.**

3. ⚠ CAUTION:
   Removing the **BBG5 SYSCTL** *without performing a 10-second countdown sequence on the* **FE ID** *display may result in unexpected and undesirable protection switches, incorrect circuit pack fault indications, or incoming signal failure indications.*

   Momentarily depress the **ACO/TST** pushbutton on the User Panel and the **FE SEL** pushbutton on the **SYSCTL** at the same time to start a 10-second countdown (9, 8, 7, etc.) on the **FE ID** display. During this countdown, remove the **SYSCTL**. If the **SYSCTL** is failed, the countdown may not occur.

4. Set **SYSCTL** switch **S1** sections **S1-1**, **S1-2**, and **S1-3** to **OFF**, **OFF**, **OFF**, respectively, to set the product (shelf) type. See Figure 1.

5. Set TBOS termination switch **S2** per Table A.

6. Set all **SYSCTL** switch **S2** sections **S2-2**,**S2-3**, **S2-4**, **S2-5**, **S2-6**, **S2-7**, and **S2-8** to **OFF**.

Table A. SYSCTL Switch 2 (S2)
TBOS Link Terminator

Shelf Position	Switch S2-1
Last	ON
Not Last	OFF

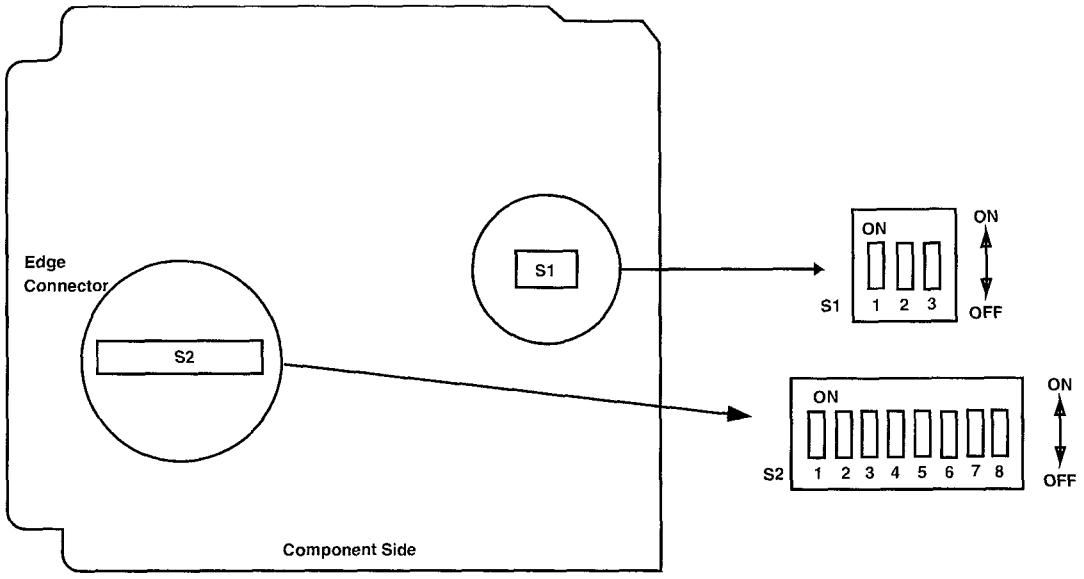


Figure 1. SYSCTL Option Settings

7. NOTE:
   Steps 8 and 9 must be performed without unnecessary delays. Familiarize yourself with these steps before continuing with the procedure.

   Read Steps 8 and 9 before proceeding.

8. CAUTION 1:
   Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **SYSCTL**.

   CAUTION 2:
   Initializing the **SYSCTL** *in the following steps will momentarily interrupt service if protection switches are activated.*

   NOTE:
   The **UPD/INIT** pushbutton on the **SYSCTL** is recessed to prevent its accidental operation. You will need a small pointed object such as a ballpoint pen to operate it.

Read the remainder of Steps 8 and 9 before installing the SYSCTL, then seat the **SYSCTL**.

If the following responses do not occur, proceed to **Step 10**.

Response: **FAULT** LED on **BBG8 SYSCTL** lights and **ABN** LED on the User Panel lights after approximately 5 seconds. **MJ** and **NE** LEDs may light or flash briefly. **FAULT** LED on the **SYSCTL** goes off after approximately 5 seconds. **ABN** LED goes off after approximately 15 seconds. Approximately 1 minute and 30 seconds after the **ABN** LED goes off, the **FAULT** LED on the **OHCTL** goes off and the **CR** LED on the User Panel begins to flash.

9. Momentarily depress the **UPD/INIT** button on the **SYSCTL** while the **CR** LED is flashing (**you have 10 SECONDS** to do this).

   If the following responses do not occur, continue with **Step 10**.

   Response: **CR** LED on the User Panel stops flashing when the **UPD/INIT** button is pressed.

   FAULT LED on **BBG9 OHCTL** and **ABN** LED on the User Panel are lighted after approximately 15 seconds. **ABN** LED goes off after approximately 30 seconds. Approximately 1 minute and 45 seconds after the **ABN** LED goes off, the **CR** LED on the User Panel flashs again. **DO NOT** depress **UPD/INIT** pushbutton again when the **CR** LED flashes.

   All red LEDs on all circuit packs in the **DDM-2000** should be off. Any red LEDs remaining on or flashing represent a failure condition.

   Initialization may take 2-3 minutes.

10. ⇒ NOTE:
Compatible software must be installed in both the **BBG9 OHCTL** and the **BBG8 SYSCTL**. When the new **SYSCTL** is installed, if software is not installed in the **SYSCTL**, or the software is not compatible with the software in the **OHCTL**, or the software in the **SYSCTL** and **OHCTL** is not compatible with the transmission configuration of the shelf, the letter **P**, **d**, or **C** will be displayed in the **FE ID** display. Displayed letters or conditions indicate 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**. If the **P** is followed by a period (**P.**), it means that a previous download attempt has failed and a new software download will have to be attempted either locally or remotely using the **`ins-prog:tid`** or **`cpy-prog:tid`** command. If there is no period (**P**) the software can only be downloaded locally.

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 **U** displayed in the **FE ID** display indicates that **SYSCTL** Switch **S1** is not set properly for the type of shelf being equipped. Remove **SYSCTL**, check switch settings, then repeat this procedure.

f. The letter **E** displayed in the **FE ID** display indicates that the **SYSCTL** must be replaced. Replace **SYSCTL** and repeat this procedure.

g. The letter **F** displayed in the **FE ID** display indicates that the **SYSCTL** faceplace latch is not fully latched. Latch the faceplate. (A reset occurs after the faceplate is latched.)

Did the letter "**P**", "**P.**", or "**d**" appear in the **FE ID** display?

If **YES**, then continue with **Step 11**.
If **NO**, then proceed to **Step 13**.

11. Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-527**.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. Did the letter "**C**" appear in the **FE ID** display?

    If **YES**, then continue with **Step 14**.
    If **NO**, then proceed to **Step 18**.

14. ⚠ CAUTION:
    If the system is in service and is forced to run the current software in the **SYSCTL** *that is displaying a* **C**, *service interruption may result.*

    NOTE:
    Indications are that the software in the **SYSCTL** and **OHCTL** you have installed will not support the system transmission configuration that you have. If this occurs, you must reload the original version of software, load another version of software, or *force* the system to run the current software that is in the **SYSCTL**

    You must decide if you want the system to run this current version of software or if you want to download another version (original version or new version) of software.

    Do you want to run the current version of software that is in the **SYSCTL**?

    If **NO**, then continue with **Step 15**.
    If **YES**, then proceed to **Step 17**.

15. Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-527**.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. 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.
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.**

Install TGS Circuit Packs

1. ⚠ CAUTION:
The timing mode of all nodes should be checked before a node is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).

NOTE 1:
The timing mode may be provisioned as Free Running, DS1 External, or Line Timed. In free-running mode, the **TGS** gets timing from an oscillator on the **TGS**. In DS1 external timing mode, the **TGS** gets timing from an external DS1 reference input. In line-timed mode, the **TGS** gets timing from a reference clock recovered from a received OC-12 line rate signal. In Releases 5 or later, line timing from the **MAIN B** OC-12 line is the factory default.

NOTE 2:
In addition to the same options as the **BBF2 TGS**, the **BBF2B TGS** may be provisioned to provide a DS1 output for intershelf timing distribution (mult mode) or for network timing distribution (sync mode). When in *sync out* mode, the DS1 output signal derives its timing from the incoming OC-12 line signal from the **MAIN OLIU**s.

NOTE 3:
Tables A and B depict all the possible timing topologies for the **BBF2 TGS** and **BBF2B TGS** which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for line timing or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table A. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available
Free Running	External - Mult	This timing topology is not supported The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.

Table A. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Loop Timing with the proper source using the **set-sync** command If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop

Table B. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	Line Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS. In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging. In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Free Running	External - Sync Out	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	Line Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located. The NE provisioned for Line Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Line Timing	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop NE 1 will attempt to break the timing loop by inserting DS1 AIS on its DS1 output port NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Line Timing - Sync Out	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1 If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the timing loop by inserting DS1 AIS on its DS1 output port NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously Note DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS
External - Mult	External - Sync Out	This topology is used to distribute network timing to a target location from a location with access to a synchronization reference. The NE provisioned for External - Mult, is providing timing to the NE provisioned for External - Sync Out, which in turn generates a DS1 output reference regenerated from the optical interface shared by both NE's. This DS1 output is used to provide a synchronization reference to a BITS.

Table B. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop. If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal.
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not. supported The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult If the reference available is an optical reference provision to Loop Timing with the proper source using the **set-sync** command If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop

NOTE 4:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

NOTE 5:
If an invalid switch setting is selected, the **TGS FAULT** LED lights and an alarm is generated.

Refer to Table C and Figure 1 (**BBF2**) or Table D and Figure 2 (**BBF2B**). Set the timing mode as required for the **TGS** circuit pack being installed.

Table C. BBF2 TGS Timing Mode Switch Setting

	Switch S1 Settings	
Timing Mode	**S1-3**	**S1-4**
Free Running	ON	ON
DS1 External (MULT Mode)	OFF	ON
Line Timed	OFF	OFF
Invalid	ON	OFF

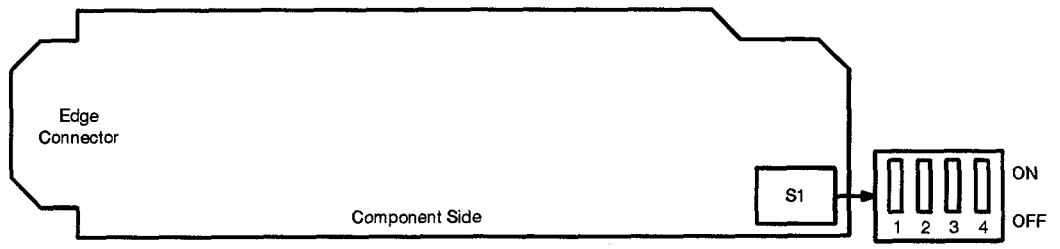


Figure 1. BBF2 TGS Option Switch

Table D. BBF2B TGS Timing Mode Switch Settings

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

*Factory default.
† **MAIN-B OLIU** is default.

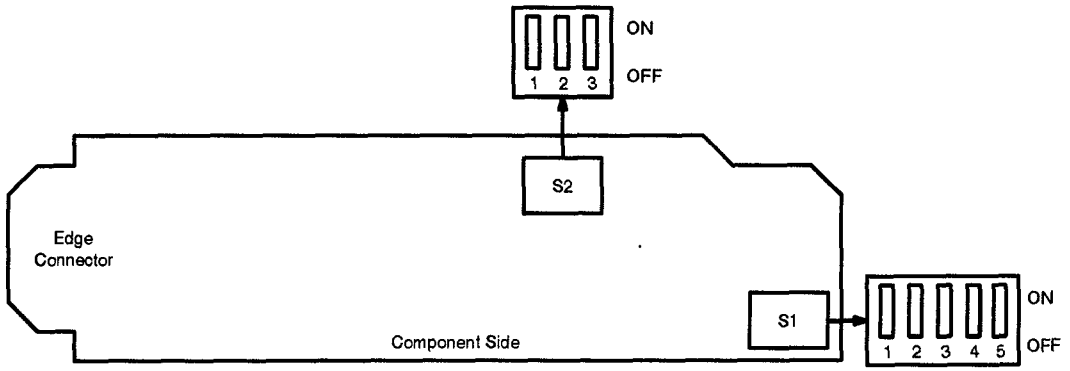


Figure 2. BBF2B TGS Option Switches

2. If the **BBF2B TGS** circuit pack is being installed and is provisioned for either *sync out* mode, refer to Table E and set the equalizer switches for proper cable length.

Table E. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid	OFF	OFF	OFF
Invalid	OFF	OFF	ON
Invalid	ON	ON	ON

3. ⇒ NOTE:
Switches **S1-1** and **S1-2** are ignored by the system unless the timing mode is set to *DS1 External* or *Loop Timed sync out mode*.

Is timing mode set to either *DS1 External* or *Line Timed sync out mode*?

If **YES**, then continue with **Step 4.**
If **NO**, then proceed to **Step 5.**

4. Refer to Table F and set the DS1 line coding and frame format as required for the **TGS** circuit pack. See Figures 1 and 2.

Table F. TGS DS1 Line Coding and Frame Format Switch Settings

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

5. ⚠ CAUTION:
Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **TGS**.

NOTE 1:
If external timing mode is used and other installed shelves above this shelf are connected together with bay mult cables for DS1 timing, installing a **TGS** circuit pack causes a momentary loss of an incoming DS1 timing reference. This may result in an `inc. DS1 sync. ref. LOS` alarm on all shelves above this shelf that are connected to the same bay mult cabling. This momentary loss of timing reference does not affect transmission.

NOTE 2:
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS** circuit pack. If the information is incompatible with the controller software information, an alarm is generated.

NOTE 3:
If a signal has previously been applied to the original **BBF2B TGS** circuit pack, the **FAULT** lamp will flash when the new **BBF2B TGS** is installed until the signal tests good.

NOTE 4:
If the response is not correct in the following procedures, check option switches and replace the **TGS**. When a circuit pack is inserted, the **FAULT** LED lights immediately and remains lighted until the circuit pack tests good. The green **ACTIVE** LED lights on the first **TGS** circuit pack installed. After the **TGS** tests good, the **FAULT** LED goes off.

Install first **TGS** in **TIMING** slot **1**.

Response: **FAULT** LED on the **TGS** lights. **ACTIVE** LED lights. **FAULT** LED goes off after about 15 seconds.

6. ⇒ NOTE:
   If the timing mode option switches are not set the same on the two **TGS** circuit packs, the **FAULT** LED will remain lighted on the second circuit pack installed.

   Install second (protection) **TGS** in **TIMING** slot **2**.

   Response: **FAULT** LED on **TGS** lights for about 15 seconds then goes off. **ACTIVE** LED remains off.

7. Is timing mode set to external DS1?

   If **YES**, then continue with **Step 8.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. If the **NE ACTY** LED on the User Panel remains on, use the CIT command **`rtrv-sync`** to verify that the operational mode of the system is *`External`*. If the operational mode is *`Holdover`*, check the DS1 timing references.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install FUNCTION UNITS OLIU Circuit Packs

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
The **HIGH/LOW POWER** *option switch on a* **21G/21G-U OLIU** *must be set to the* **LOW POWER** *position when the* **21G/21G-U OLIU** *is looped on itself. There are no option switches on the other type OLIUs.*

⚠ CAUTION 2:
Before installing **OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned* **[DLP-522]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

⇒ NOTE:
21G/21G-U/21G2-U and **21D/21D-U OLIU**s can only be installed in **FUNCTION UNITS** slots.

Are **21G/21G-U OLIU**s being installed?

If **YES**, then continue with **Step 2.**
If **NO**, then proceed to **Step 3.**

2. ⇒ NOTE:
It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

Refer to Table A and Figure 1 and set the **HIGH/LOW POWER** option switch to proper setting.

Table A. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

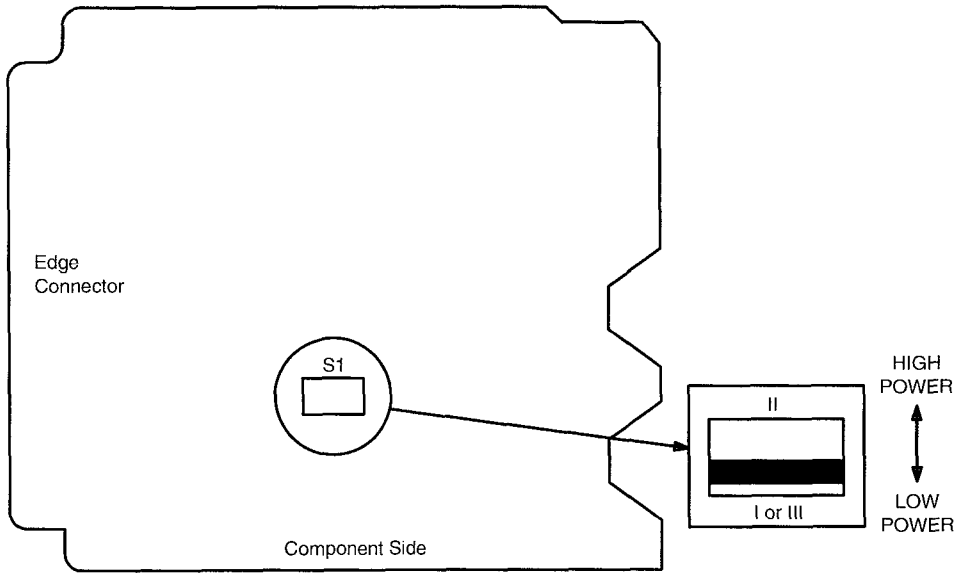


Figure 1. 21G/21G-U OLIU Option Switch

3. ⚠ CAUTION:
If optical fiber cables are routed beneath the **OLIU***s, be careful not to pinch or crush the fibers when the* **OLIU***s are inserted.*

NOTE 1:
The red **FAULT** LED flashes when no signal is present to the **OLIU**s.

NOTE 2:
When using the following procedures to install the **OLIU**s, if the responses are not correct, check option switches and connections. If switches and connections are correct, replace the **OLIU** that has the wrong response.

NOTE 3:
The single-homed ring configuration requires that the **FN-( )-1 OLIU** on the OC-12 host shelf connect to the **MAIN 1 OLIU** at the first OC-3 shelf from the OC-12 host shelf. **MAIN 2(P) OLIU** at an adjacent OC-3 shelf (node) connects to the **MAIN 1 OLIU** at an adjacent OC-3 shelf (node). The **MAIN 2(P) OLIU** at the last OC-3 shelf on the OC-3 ring connects to **FN-( )-2(P) OLIU** on the OC-12 host shelf. This procedure will establish the ring configuration starting from the OC-12 host node (near end) to the first OC-3 node, then continuing to the next node until the final connection is made from the last OC-3 node back to the host OC-12 shelf.

NOTE 4:
A dual-homed ring configuration requires that the first OC-3 **MAIN 1 OLIU** connect to **FN-( )-1 OLIU** on one host OC-12 shelf. The last OC-3 **MAIN 2(P) OLIU** connects to the **FN-( )-2(P) OLIU** on the other OC-12 host shelf. Intermediate OC-3 shelves on the same OC-3 ring connect from **MAIN 2(P) OLIU** at one OC-3 shelf to the **MAIN 1 OLIU** at an adjacent OC-3 shelf (node). This procedure will establish the ring configuration starting from one OC-12 host node (near end) and continuing to an adjacent OC-3 node, then to the next OC-3 node until the final connection is made from the last OC-3 node to the remaining OC-12 host node.

Install **OLIU** into required **FN-( )-1** slot.

Response: **FAULT** LED and **ACTIVE** LED lights. **FAULT** LED begins flashing after about 10 seconds.
[**OHCTL FAULT** LED may begin flashing if far-end communications (fecom) is enabled.]

Comment: Critical, major or minor alarm LEDs light depending on the version of software installed. Generally the **MJ** (fecom enabled) or **MN** (fecom disabled) LED will light for ring releases.

4. Install second **OLIU** (if required) into **FN-( )-2(P)** slot.

   Response: **FAULT** LED and **ACTIVE** LED lights. **FAULT** LED begins to flash after about 10 seconds. (The **FAULT** LED may go off for a few seconds before starting to flash.)

5. Have all required **OLIU**s been installed?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then repeat this procedure for all **OLIU**s being installed.

Connect Optical Loop for FUNCTION UNITS OLIUs

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **OLIU.**

⚠ CAUTION 2:
The level control on the **21G/21G-U OLIU** *must be set to* **LOW POWER** *when the* **21G/21G-U OLIU** *is looped on itself. Other* **OLIU***s have no switch settings.*

⚠ CAUTION 3:
Avoid excessive bending of the optical jumper used to loop the **OLIU** *on itself.*

⚠ CAUTION 4:
All optical fiber connectors and couplings should be properly cleaned **[DLP-522]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

Which **OLIU**s are being looped?

If **21G/21G-U**, then continue with **Step 2.**
If **21D/21D-U** or **21G2-U**, then proceed to **Step 3.**

2. Refer to Figure 1 and set the option switch on the **21G/21G-U OLIU** to the **LOW POWER** position, if not already performed.

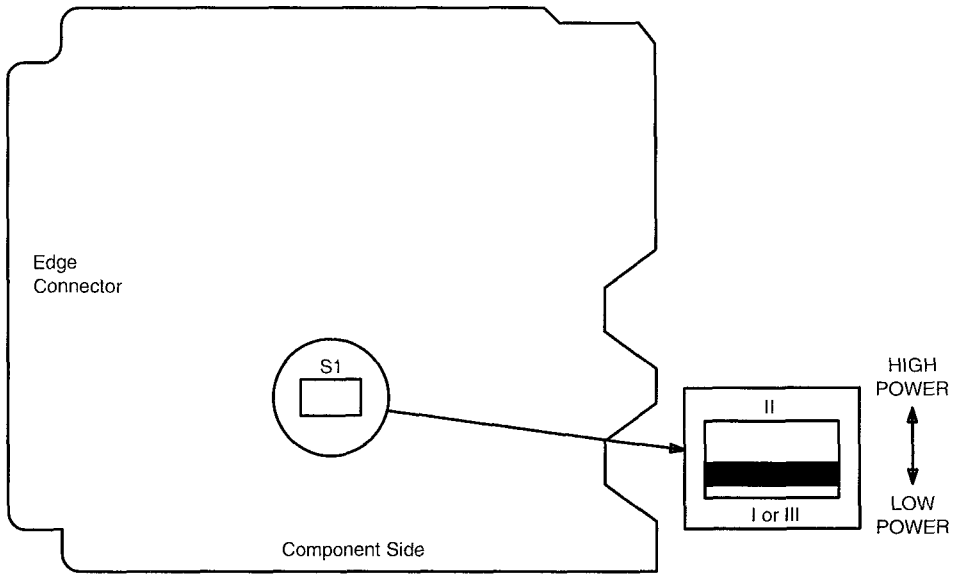


Figure 1. 21G/21G-U OLIU Option Settings

3. NOTE 1:
It may take from 15 seconds to 3 minutes and 25 seconds for the **FAULT** LEDs to stop flashing, depending on the setting of the signal degrade threshold (–5 to –9).

NOTE 2:
The lightguide jumpers used to loop the **OLIU**s must be equipped with *ST*®, FC/PC, or SC connectors at both ends, depending on the type of **OLIU** connector. See Figures 2, 3, and 4.

NOTE 3:
The **21G** and **21D OLIU**s are equipped with *ST*-type connectors.

NOTE 4:
The **21G-U/21G2-U** and **21D-U OLIU**s are shipped with a 0 dB *ST*-type universal LBO installed (code - **A3070**, comcode - **106795354**). If an SC or FC/PC connector is required; the universal 0 dB LBOs can be ordered separately. See Table A.

NOTE 5:
The **21G/21G-U/21G2-U OLIU**s require single-mode lightguide jumpers (Table B). The **21D/21D-U OLIU**s require multimode lightguide jumpers (Table C).

Replace the 0 dB LBO on the **21G-U/21G2-U** and/or **21D-U OLIU**s with a 0 dB LBO with a SC or FC/PC connector on the **FN-( )-1 OLIU**s, if required. See Table A.

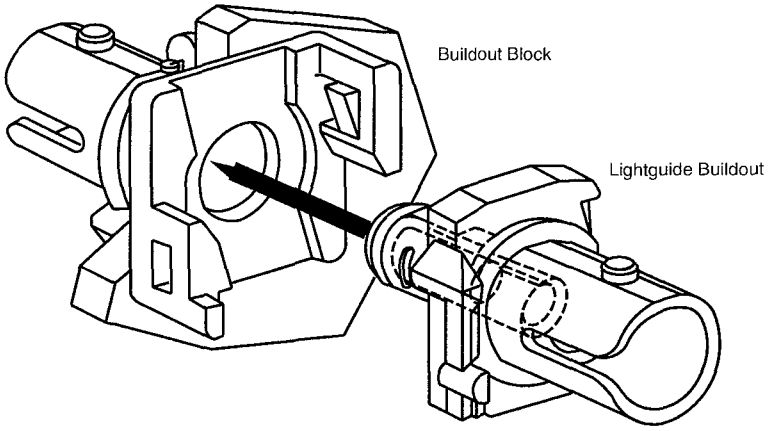


Figure 2. *ST*-Type Universal Buildout

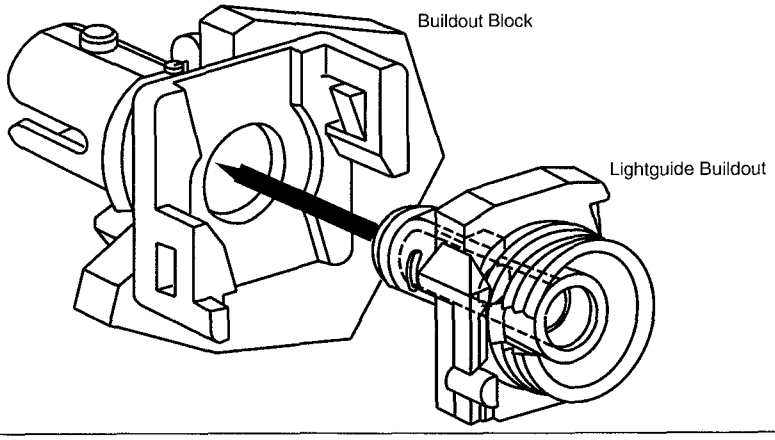


Figure 3. FC/PC-Type Universal Buildout

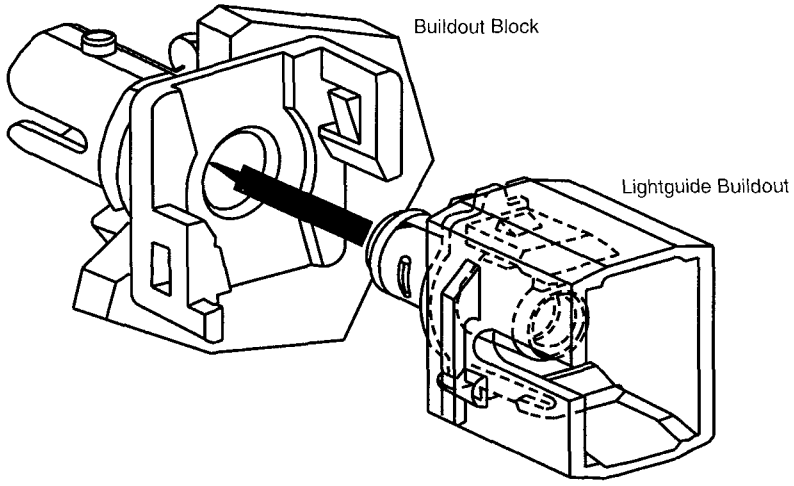


Figure 4. SC-Type Universal Buildout

Table A. Universal 0 dB Lightguide Buildouts

Code	Comcode	Connector Type	Fiber Connection	Label Color
A3060	106708951	SC	SM-SM & MM-MM	None
A3070	106795354	*ST*	SM-SM & MM-MM	None
A3080	106795404	FC/PC	SM-SM & MM-MM	None

Table B. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1E-E-2	105357727	2	ST-ST
LS1SC-SC-2	106908247	2	SC-SC
LS1FP-FP-10	106593825	10	FC/PC-FC/PC

Table C. Multimode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FL1E-E-2	105351795	2	ST-ST
LL1SC-SC-2	106908668	2	SC-SC
LL1FC-FC-10	107095549	10	FC-FC

4. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **FN-( )-1 OLIU**(s). See Table B or C.

   Response: **FAULT** LED stops flashing.
   ACTIVE LED remains on.
   If flashing, **FAULT** LED on **OHCTL** goes off after all number one **OLIU**s are looped. The lighted major (**MJ**) or minor (**MN**) LED remains lighted.
   If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 4.
   If responses are still not correct, replace **OLIU**.

   Comment: The lighted major (**MJ**) or minor (**MN**) LED remains lighted.
   It may take 1 minute or more for LEDs and alarms to stabilize after the **OLIU**(s) are looped.

5. Replace the 0 dB LBO on the **21G-U/21G2-U** and/or **21D-U OLIU**s with a 0 dB LBO with a SC or FC/PC connector on the **FN-( )-2(P) OLIU**s, if required. See Table A.

6. Use lightguide jumpers to loop the **IN** and **OUT** connectors of the **FN-( )-2(P) OLIU**(s). See Table B or C.

   Response: **FAULT** LED stops flashing.
   ACTIVE LED remains on.
   Major/Minor (**MJ/MN**) alarm goes off.
   If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 6.
   If responses are still not correct, replace **OLIU**. It may take 1 minute or more for LEDs and alarms to stabliize after the **OLIU**(s) are looped.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install BCP3 TSI Circuit Packs

1. ⇒ NOTE 1:
   If response is not correct in the following procedures, replace the **TSI**.

   ⇒ NOTE 2:
   TSI circuit packs may be installed in TSI slot **TSI-( )**.

   ⇒ NOTE 3:
   The **BCP3 TSI** circuit pack is required for manual internal STS-1 cross-connections in path switched ring applications.

   Seat **TSI** circuit pack into slot **TSI-1**.

   Response: **FAULT** LED on **TSI** lights for about 20 seconds then goes off. **ACTIVE** LED lights on first **TSI** installed.

2. If required, seat a second **TSI** into slot **TSI-2**.

   Response: **FAULT** LED on protection **TSI** lights for about 13 seconds then goes off. **ACTIVE** LED remains off.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install BBG11/BBG11B 3DS3 Circuit Packs

1. ⚠ CAUTION:
   Take care to avoid damaging LEDs that protrude through opening in faceplate of **3DS3** *circuit pack.*

   ⇒ NOTE:
   3DS3 circuit packs may be installed in function unit group slots, **FN A**, **FN B**, **FN C**, or **FN D**. Main **3DS3** circuit packs are installed in slots labeled **FN ( )-1**. Protection **3DS3** circuit packs are installed in slots labeled **FN ( )-2(P)**.

   Determine which function unit group slots (**FN A**, **FN B**, **FN C**, or **FN D**) are to be equipped with **3DS3** circuit packs.

2. Determine from office records the length of DS3 cabling between DDM-2000 OC-12 Multiplexer and DSX-3 cross-connect point.

3. ⇒ NOTE:
   The only option settings on the **3DS3** circuit pack are the LBO settings shown in Figure 1. If there are other jumpers on the circuit pack similar to the LBO jumpers, they are factory test points and should be ignored.

   Refer to Table A and Figure 1. Install DS3 option jumpers per Table A.

Table A. DS3 LBO Settings

Cable Length (Ft)			
734A	Mini-Coax KS-19224	735A 1735006A	LBO Setting
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

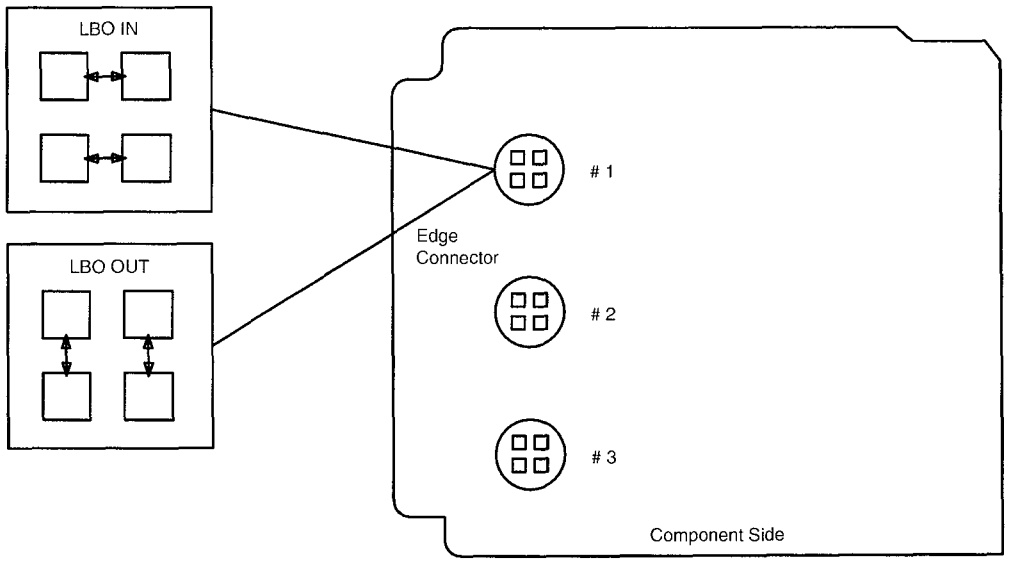


Figure 1. 3DS3 Option Settings

4. **NOTE:**
If response is not correct in the following procedures, replace **3DS3** circuit pack.

Seat a **3DS3** circuit pack in function unit group slot **FN A-1**, **FN B-1**, **FN C-1**, or **FN D-1**.

Response: **FAULT** LED on **3DS3** lights for about 20 seconds then goes off. **ACTIVE** LED lights on first **3DS3** circuit pack of pair installed.

5. If required, seat a second (protection) **3DS3** circuit pack in function unit group slot **FN A-2(P)**, **FN B-2(P)**, **FN C-2(P)**, or **FN D-2(P)** of same function unit group.

   Response: **FAULT** LED on **3DS3** lights for about 20 seconds then goes off. **ACTIVE** LED remains off.

6. Repeat this procedure from Step 1 for each pair of **3DS3** circuit packs to be installed.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform LED Test

1. ⚠ CAUTION:
   Take care to avoid damaging LEDs that protrude through openings in faceplates of circuit packs.

   Is CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 5**.

2. Connect CIT to User Panel.

   Reference: **DLP-516**

3. Use **`test-led:`***`address`***`:r=( )`** command to test LEDs.

   Where address = address identifier of system, slot, or User Panel that contains LEDs to be tested. Default is *`all`*.

   r = number of times (1-10) test is repeated.

   Response: All LEDs for specified address identifier light. For **SYSCTL** LED test, all segments of **SYSCTL FE ID** display (including the period) light. After 10 seconds, all LEDs go off. After another 10 seconds, a completion message is printed and all LEDs are updated to show current status of system.

4. Did LED test pass?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then proceed to **Step 7**.

5. ⇒ NOTE:
   When **ACO/TST** pushbutton is depressed, all LEDs and 7-segment **FE ID** display on **SYSCTL** light. If **ACO/TST** pushbutton is released within 2 seconds, LED test completes and 7-segment display and all LEDs will revert to normal operation. If **ACO/TST** pushbutton is depressed longer than 2 seconds, 7-segment display goes blank for 2 seconds, and then each digit of generic software version code is scrolled through display. LEDs remain lighted while code is being displayed. When **ACO/TST** pushbutton is released, LEDs remain lighted until full software version code is displayed. If **ACO/TST** pushbutton is still depressed when software version code has completed cycling, display goes blank for 2 seconds and starts cycling through software version code again. This continues as long as **ACO/TST** button is depressed.

   Depress **ACO/TST** pushbutton on User Panel.

   Response: All LEDs and **SYSCTL** 7-segment display light.

6. Was response correct?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 7**.

7. Were you sent here by another procedure to perform LED test?

   If **YES**, then continue with **Step 8**.
   If **NO**, then do **Trouble Clearing: TAP-115**.

8. Record circuit pack(s) (LEDs) that failed LED test and return to procedure that sent you here.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3 Transmission Test

1. NOTE 1:
This procedure may be used to perform DS3 transmission tests in the mux (toward the fiber) or demux (toward the DSX) direction. When this procedure is being used to perform end-to-end DS3 tests, it is assumed that the complete end-to-end system has already been tested and that only a particular DS3 channel is being tested at this time. Transmission tests in the *mux* direction may be local or end-to-end tests (See Figure 1). Transmission tests in the *demux* direction are local cross-connect tests (See Figure 2). The Commands and Reports section of this manual, under TEST-TRMSN-T3, gives an explanation of commands.

NOTE 2:
This test can be performed either with a CIT and the automated test command **`test-trmsn-t3`** or with a DS3 test set.

NOTE 3:
When this procedure is used to do end-to-end tests, one DDM-2000 shelf will be referred to as the near end and the other shelf as the far end. These designations are arbitrary; either shelf can be the near-end or the far-end shelf.

NOTE 4:
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3 circuit being tested. Release 5 has no default cross-connections and supports only manual STS-1 cross-connections. See the description of the following commands in the Commands and Reports section of this manual: **`cnvt-crs`**, **`dlt-crs-sts1`**, **`dlt-crs-sts3c`**, **`ent-crs-sts1`**, **`ent-crs-sts3c`**, **`rtrv-crs-sts1`**, **`rtrv-crs-sts3c`**, **`set-ne`**, and **`rtrv-ne`**. See *Cross-Connection Provisioning* in the Administration and Provisioning section of this manual for more information on cross-connection provisioning.

NOTE 5:
A CIT is required for this test if manual cross-connections have to be made at any shelf.

Is a CIT available?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 3**.

2. NOTE 1:
If one terminating end is equipped with **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, either DS1 or 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-521**

3. ⇒ NOTE:
   Work orders, office records, or CIT **ent-crs-sts1** or **rtrv-crs-sts1** commands may be used to make or verify STS-1 cross-connections.

   At each shelf in the network, make/verify that proper STS-1 cross-connections have been made for each DS3 channel being tested.

4. Are you using CIT and **test-trmsn-t3** command to perform this test?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 21**.

5. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLIU** must be in place. If end-to-end tests are being performed, do ONE of the following:

   (a) ⇒ NOTE:
   When an end-to-end DS3 test is run in the mux direction and an external loopback is established at the far end, provision the far end DS3 for CC mode with no AIS (**set-t3:***address*:**mode=cc,ais=no**). Otherwise, if the VMR mode is used, then only errors in the receive direction will be monitored and the system may not recognize that a loopback is up.

   Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-3 or STSX cross-connect point associated with the DS3 channel to be tested.

   (b) Use the **rlgn** command to log in to the far-end shelf and use the **opr-lpbk-t3:***address* or **opr-lpbk-ec1:***address* command to loop back the DS3 or EC-1 port(s) at the far end. Use **logout** or **toggle** (crtl t) command to return control of CIT to near end.

6. Are you doing this test in the mux or demux direction?

   If **MUX** direction, then continue with **Step 7**.
   If **DEMUX** direction, then proceed to **Step 9**.

7. At the near end, use the following command to perform a test of the DS3 loop in the fiber direction:

   `test-trmsn-t3:`*`address`***`:dirn=mux:dur=( );`**

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If **`dirn=mux`**, direction is toward fiber.

dur = duration of the test in minutes (1-120), default is 1.

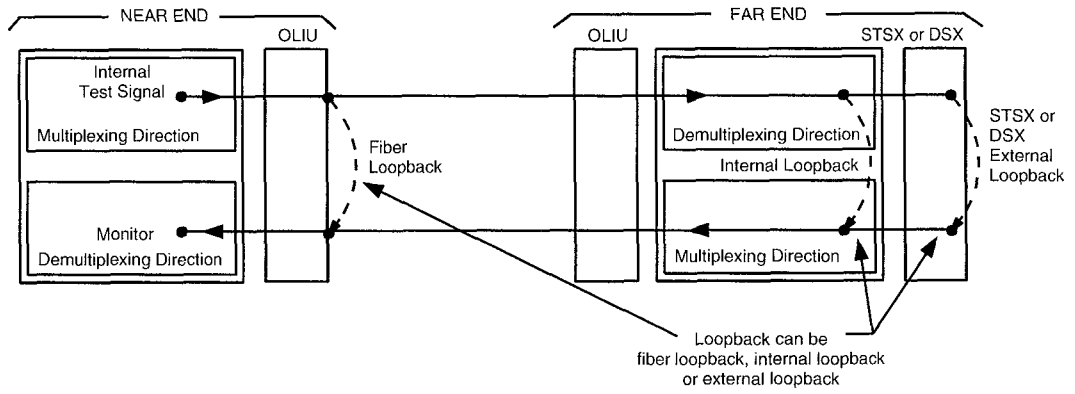


Figure 1. Transmission Test of DS3 Signal in MUX Direction

8. Was the test successful (error free)?

   If **YES**, then proceed to **Step 12**.
   If **NO**, then proceed to **Step 34**.

9. See Figure 2. At the near-end DSX-3 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.

10. Use the following command to perform a DS3 transmission test in the demux direction to test the DS3 loop in the DSX direction:
`test-trmsn-t3:`*`address`***`:dirn=demux:dur=( );`**

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If **`dirn=demux`**, direction is toward DSX.

dur = duration of the test in minutes (1-120), default is 1.

11. Was the test successful (error free)?

If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 34**.

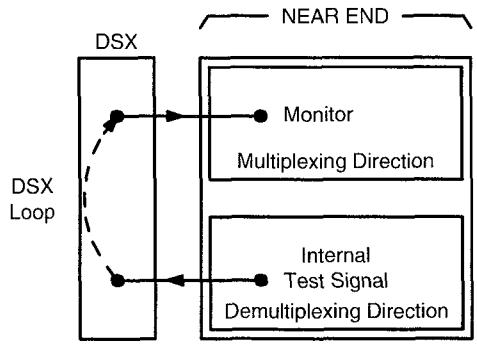


Figure 2. Transmission Test of DS3 Signal in DEMUX Direction

12. Is this the first service being placed on the group and is a protection DS3 circuit pack installed?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:
    switch-fn:*address***:pri=manual;**.

    Response: The green **ACTIVE** LED lights on the protection circuit pack.

14. ⇒ NOTE:
    If this is a single-ring configuration and the transmission test is being performed in the **mux** direction, the **switch-path** command should be used to switch the path to the other ring and then repeat this test.

    Repeat the transmission test in the mux (or demux) direction using the following command:
    test-trmsn-t3:*address***:dirn=mux (or demux):dur=( );**.

15. Was the test successful (error free)?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 34**.

16. Use the following command to clear active switch requests:
    switch-fn:*address***:pri=reset;**.

17. The DS3 circuit under test has passed the DS3 transmission test. Remove the looping patch cords from the cross-connect point. Use the **rls-lpbk-t3** command to release loopback(s) at the far end, if required.

18. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the "update" command) on the **SYSCTL** to update the **SYSCTL**.

19. If violation monitor removal mode was set differently than the original mode in Step 5, reprovision the mode to the original or required setting using the **set-t3** command. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. See Figure 1. If local tests are being performed, the fiber loopback at the near-end **OLIU** must be in place. If end-to-end tests are being performed, at the far-end DSX-3 or STSX cross-connect point associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.

22. At the cross-connection associated with the near-end DDM-2000, connect the DS3 test set to the **IN** and **OUT** jacks associated with the circuit under test.

23. Use the DS3 test set to test for error-free transmission.

24. Was the test successful (error free)?

    If **YES**, then continue with **Step 25**.
    If **NO**, then proceed to **Step 34**.

25. Is this the first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 30**.

26. Unseat the service **3DS3** circuit pack associated with the circuit under test.

27. Repeat the DS3 transmission test with the DS3 test set.

28. Was the test successful (error free)?

    If **YES**, then continue with **Step 29**.
    If **NO**, then proceed to **Step 34**.

29. Reseat the **3DS3** circuit pack associated with the circuit under test.

30. The DS3 circuit under test has passed the DS3 transmission test. Remove the looping patch cords from the cross-connections.

31. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.

32. Repeat this procedure from Step 21 for any additional DS3 circuits to be tested.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. Has the **3DS3** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 37**.
    If **NO**, then continue with **Step 35**.

35. Replace the **3DS3** circuit pack that failed the test.

    Reference: **DLP-518**

36. Repeat this procedure for the **3DS3** circuit pack that failed.

37. Trouble may be in the DSX cross-connect wiring, STS1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the rtrv-crs-sts1 command to ensure proper STS1 cross-connections have been made at each shelf in the ring for the DS3 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, **`rtrv-alm`**, **`rtrv-hsty`**, etc.) to check for other trouble indications.

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Activate Optional System Features Using CIT

1. Connect CIT to **CIT** connector on User Panel and establish session.

   Reference: **DLP-521**

2. Refer to the Commands and Reports section of this user/service manual for the descriptions and syntax of the various optional features and parameters of the DDM-2000 that may be set using the CIT (see Tables A and B). These optional features and parameters can be found under numerous listings.

   The following lists optional features which may be lost if the **SYSCTL** is replaced:

ent-tl1msgmap	Maps the DDM-2000 TL1 message types to the operations systems (OS) for this network element in the subnetwork. Users may change the default mapping by using this command. Users may check the current provisioning by using the **rtrv-tl1msgmap** command.
ent-osacgmap	Creates entries in the X.25 subnetwork application context map. This map lists the permanent virtual circuits (PVCs) and switched virtual circuit (SVC) available in the X.25 channel and maps them to operation systems (OS) application contexts. Command is available to privileged users only for all CIT or DCC ports on the shelf.
ent-ulsdcc	Provisions the user-settable fields of the network service access point (NSAP) address. Command parameters should **not** be changed from default values except by users who intend to provision the SONET subnetwork and partition DCC communications.
set-attr-alm	Sets alarm delay and clear delay.
set-attr-env	Names and sets alarm level of miscellaneous discrete input points at RT only.
set-attr-cont	Names miscellaneous discrete control output points at RT only.

set-date	Sets date and time.
set-fecom	Enables or disables far end communication over the data communication channel and sets Network Side/User Side parameters.
set-lgn	Enters, edits, and deletes logins and passwords. Privileged users can change other users' passwords by using this command.
set-link	Sets length of page output on the CIT.
set-ne	In Release 5, it sets the name [Target Identifier (TID)] of the network element. It designates the shelf as a directory services network element (DSNE) for OSI protocol. **One**, and only one, shelf in the subnetwork **must** be provisioned as a DSNE. It designates a shelf as an alarm gateway network element (AGNE) and sets alarm group numbers and sets cross-connect mode to default or manual. It designates the Site, Network Element, and Shelf numbers and designates the Central Office/Remote Terminal parameter. It sets the TBOS display address, link function, and remote reporting status. It sets the Idle Channel Signal parameter.
set-passwd	Sets or changes a users' password. All users can change their own passwords.
set-pmthres-line	Sets the thresholds of the line performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-sect	Sets the thresholds of the section performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.
set-pmthres-t3	Sets the thresholds of the DS3 performance parameters. Also enables or disables the processing of the threshold crossings for these performance parameters.

set-pmthres-sts1	Sets the STS-1 path performance parameter thresholds.
set-secu	Sets security on each CIT port and DCC interface. Enabling security requires users to enter login and password to access the system.
set-sync	Sets synchronization mode switching to revertive or nonrevertive. After the end-to-end system is established, sets synchronization source to select the line from which shelf loop-timing and/or the DS1 sync output will be derived. Sets output mode to select the source of the DS1 sync output.

Other optional features are set from the CIT but are not lost if the **SYSCTL** is replaced.

⚠ CAUTION:
Execution of these commands may be service affecting.

These features may be found under the following listings:

ent-crs-sts1	Specifies STS-1 cross-connect routing. Used in establishing service and/or performing transmission tests.
ent-crs-sts3c	Specifies STS-3c cross-connect routing. Used in establishing service and/or performing transmission tests.
set-ec1	Sets the characteristics of an EC-1 port.
set-feat	Enables feature options that are licensed for use: sts3c, vtpm, ds1pm.
set-oc12	Sets the characteristics of an OC-12 line pair. Sets the signal degrade threshold of the OC-12 line as a bit error rate (BER). Specifies if sync message signaling (Kbyte/Sbyte) is enabled or disabled.

set-oc3	Sets the characteristics of an OC-3 line pair. Sets the signal degrade threshold of the OC-3 line as a bit error rate (BER). Specifies if sync message signaling (Kbyte/Sbyte) is enabled or disabled. Specifies if the application mode (app) of the OC-3 line is to be 0x1, 1+1, or video.
set-state-ec1	Sets the state of a low-speed EC-1 port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-state-t3	Sets the state of a DS3 port to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-state-sts1	Sets the state of a STS-1 channel to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-state-sts3c	Sets the state of a STS-3c channel to be automatically monitored (AUTO) for a good signal or not monitored (NMON).
set-sts1	Sets the signal degrade characteristics of an STS-1 channel.
set-sts3c	Sets the signal degrade characteristics of an STS-3c channel.
set-t3	Sets the characteristics of a DS3 port.
set-x25	Sets the packet size of X.25 link to either 128 or 256.

3. Determine options required from office records.
4. Set options using the syntax of the Commands and Reports section in this manual.
5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. DDM-2000 OC-12 Parameters Provisionable Via the CIT

Parameter	Range	Default (Note 1)	Command (Note 2)
Date	current value	70-01-01	**set-date**
Time	current value	00:00:00	**set-date**
Target ID (system name)	20 characters	Site#NE#	**set-ne**
Site number	1-64	64	**set-ne**
Network element #	1-5	5	**set-ne**
Shelf number	1-8	1	**set-ne**
CO/RT select	CO, RT	RT	**set-ne**
TBOS address	1-8	1	**set-ne**
TBOS link	primary, secondary, normal, no TBOS	no TBOS	**set-ne**
TBOS remote	enabled, disabled	disabled	**set-ne**
DSNE **	yes, no	no	**set-ne**
AGNE	yes, no	no	**set-ne**
Alarm group number	1-255	255	**set-ne**
STS Uneqpd./AIS insert	Uneqpd., AIS	AIS	**set-ne**
CIT page length	0 (pager off), 3-150 rows	24	**set-link**
PM thresholds	See PM Table	-	**set-pmthres**
Alarm holdoff delay	0-30 sec	2	**set-attr-alm**
Alarm clear delay	0-30 sec	15	**set-attr-alm**
Power minor almn. level	MN, MJ	MN	**set-attr-alm**
OC-3 degrade threshold	10^{-5}—10^{-9}	10^{-6}	**set-oc3**
OC-3 interface applications	1+1, 0x1, video	0x1	**set-oc3**
Sync messaging	K byte, S byte, disabled	K byte	**set-oc3/set-oc12**
AIS alm. level of NSA OC-3 Line AIS	CR, MJ, MN, NA	NA	**set-oc3**
OC-3 line state	IS, NMON	IS	**set-state-oc3**
STS-1 signal degrade	10^{-5}—10^{-9}	10^{-6}	**set-sts1**
NSA STS-1 path AIS alarm level	MN, NR	MN	**set-sts1**
SA STS-1 path AIS alarm level	CR, MN, NA, NR	MN	**set-sts1**
STS-1 channel state	NMON, AUTO †	AUTO †	**set-state-sts1**

See notes and footnotes at end of table.

Table A. DDM-2000 OC-12 Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
STS-3c signal degrade threshold	10^{-5} to 10^{-9}	10^{-6}	`set-sts3c`
NSA STS-3c path AIS alarm level	MN, NR	MN	`set-sts3c`
SA STS-3c path AIS alarm level	CR, NA	CR	`set-sts3c`
STS-3c channel state	AUTO, NMON	AUTO †	`set-state-sts3c`
OC-12 degrade threshold	10^{-5}—10^{-9}	10^{-6}	`set-oc12`
AIS almn. level of NSA OC-12 line AIS	CR, MJ, MN, NA	NA	`set-oc12`
DS3 VMR mode	VMR, VM, clear channel	VMR	`set-t3`
Clear channel DS3 AIS insertion	yes, no	no	`set-t3`
DS3 signal failure alarm level	CR, MJ, MN, NA	NA	`set-t3`
DS3 failure threshold	10^{-3},10^{-6} BER	10^{-3}	`set-t3`
DS3 PM mode	off,on	on	`set-t3`
DS3 PM frame	m13,cbit	m13	`set-t3`
DS3 PM format	pbit,fmbit,cbit	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 BER 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, NA	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 description	26 characters	control #	`set-attr-cont`
Far end communication over DCC	enabled, disabled	enabled	`set-fecom`
DCC identity for OSI ntwks.	userside, networkside	see command pgs.	`set-fecom`
Set Security	enabled, disabled, lockout	disabled	`set-secu`
CIT security	enabled, disabled, lockout	disabled	`set-secu`
CIT timeout (minutes)	0-120	15	`set-secu`
DCC security	enabled, disabled, lockout	disabled	`set-secu`
DCC timeout (minutes)	0-120	15	`set-secu`

See notes and footnotes at end of table.

Table A. DDM-2000 OC-12 Parameters Provisionable Via the CIT (Contd)

Parameter	Range	Default (Note 1)	Command (Note 2)
SYNC mode switching	revertive, nonrevertive	revertive	**set-sync**
Sync Timing Source¶	main-b-1, main-b-2	main-b-1	**set-sync**
AIS Threshold	level 5, level 4, level 3 level 2	level 5	**set-sync**
Auto. Synch. Reconfig.	enabled, disabled	disabled	**set-sync**
Feature Package ‡ OC-3c (STS-3c)	enabled, disabled	disabled	**set-feat**
X.25 packet size	128, 256	256	**set-x25**
NSAP			
OrganizationID (Operator ID)	6 hex digits	000000	**ent-ulsdcc**
Reserved (Reserved)	4 hex digits	0000	**ent-ulsdcc**
Routing Data (Domain/Area)	8 hex digits	00000000	**ent-ulsdcc**
VC ckt. type X.25 attach.	PVC, SVC	PVC	**ent-osacmap**
SNPA: LCN for PVCs	LCN, DTE	LCN1 (PVC) LCN2 (PVC) LCN3 (PVC)	
or DTE address for SVC	see command pgs.		**ent-osacmap**
OS type (ACID)	see command pgs.		**ent-osacmap**
ACID (OS type or funct.)	see command pgs.		**ent-tl1msgmap**
TL1 message type	see command pgs.		**ent-tl1msgmap**
Action to assoc. message type to OS	enabled, disabled	enabled	**ent-tl1msgmap**
Cross-connection type	twoway,dc	twoway	**ent-crs-sts1**
Ring ID for drop&continue	mb1, mb2	see command pgs.	**ent-crs-sts1**
Cross-connection type	twoway,dc,cov,rtv	twoway	**ent-crs-sts3c**
Ring ID for drop&continue	mb1, mb2	see command pgs.	**ent-crs-sts3c**
Outgoing STS-1 path trace message	62 characters	see command pgs	**set-trace-sts1**
Expected STS-1 path trace message	62 characters	see command pgs	**set-trace-sts1**

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-.

† 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 subnetwork must be set to "yes" for proper DCC communications.

Table B. OC-12 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 B. Performance Monitoring Parameters Provisionable via the CIT (Contd)

Parameter Definition		Threshold Range [Default]		Command
Facility	Measure	Current Quarter Hour	Current Day	`set-pmthres`
DS3 Path for P-Bit, F&M Bit, and C-Bit from Fiber and DSX	CV-P Coding Violations	1-16383[40]	1-1048575[3820]	`t3`
	ES-P Errored Seconds	1-900[25]	1-65535[250]	`t3`
	SES-P Severely Errored Seconds	1-63[4]	1-4095[40]	`t3`
	UAS-P Unavailable Seconds	1-63[10]	1-4095[10]	`t3`
	SEFS	1-63[2]	1-4095[8]	`t3`
DS3 Line	CV-L Coding Violations	1-16383[40]	1-1048575[3865]	`t3`
	Errored Seconds, Line (ES-L)	1-900[25]	1-65535[250]	`t3`
	Severely Errored Seconds, Line (SES-L)	1-63[4]	1-4095[40]	`t3`

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

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
BBG8 SYSCTL	Step 2
BCP4 OHCTL*	—
BBF2 TGS	Step 7
BBF2B TGS	Step 11
BCP3 TSI*	—
21G/21G-U OLIU	Step 16
BBG11/BBG11B 3DS3	Step 18
BBG12 3STS1E	Step 21
21D/21D-U OLIU*	—
21G2-U OLIU*	—
23G/23G-U OLIU*	—
23H/23H-U OLIU*	—

* There are no option switches on these circuit packs.

SYSCTL

2. ⇒ NOTE:
The **BBG8 SYSCTL** is required for Release 5 or later.

Determine the desired **SYSCTL** option switch settings from office records and see Figure 1.

3. ⇒ NOTE:
To set switch to **ON**, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to **OFF**, depress rocker or slide switch toward side labeled **OFF** in the figure.

If **SYSCTL** is being installed in shelf for the first time (initial shelf turnup, only **OHCTL** installed at this time) and switches have not been set, set TBOS termination switch **S2** per Table B. See Figure 1.

Table B. SYSCTL Switch 2 (S2)
TBOS Link Terminator

Shelf Position	Switch
	S2-1
Last	ON
Not Last	OFF

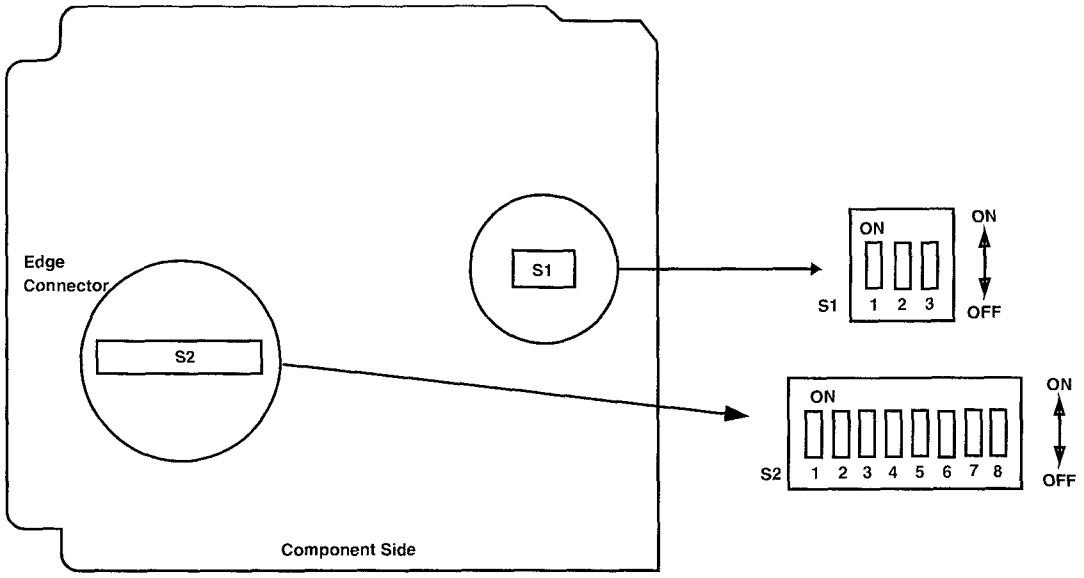


Figure 1. SYSCTL Option Settings

4. Set **SYSCTL** switch **S2** sections **S2-2**, **S2-3**, **S2-4**, **S2-5**, **S2-6**, **S2-7**, and **S2-8** to **OFF**, to enable the DCC channel.

5. Set **SYSCTL** switch **S1** sections **S1-1**, **S1-2**, and **S1-3** to **OFF**, to set the product (shelf) type.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2 TGS

7. NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).

NOTE 2:
The **BBF2 TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Line Timed*. In free-running mode, the **BBF2 TGS** gets timing from an oscillator on the **BBF2 TGS**. In external timing, the **BBF2 TGS** gets timing from an external DS1 reference input. In line-timed mode, the **BBF2 TGS** gets timing from an **OLIU** from a reference clock recovered from the received OC-3 line rate signal.

NOTE 3:
Table C depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application.

Table C. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported Both systems are operating asynchronously from each other
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS. The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS.

Table C. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Line Timing with the proper source using the `set-sync` command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

NOTE 4:
To set switch to ON, depress rocker or slide switch toward side labeled **ON** in the figure. To set switch to OFF, depress rocker or slide switch toward side labeled **OFF** in the figure.

Determine the timing mode from work order or office records. Refer to Table D and Figure 2 and set the timing mode as required for the **TGS** circuit pack(s).

Table D. BBF2 TGS Timing Mode Switch Setting

	Switch S1 Settings	
Timing Mode	S1-3	S1-4
Free Running	ON	ON
DS1 External (MULT Mode)	OFF	ON
Line Timed	OFF	OFF
Invalid*	ON	OFF

* If an invalid setting is selected, **FAULT** LED is lighted and an alarm is generated (`unexpected CP type/switches` or `unexpected CP switches`)

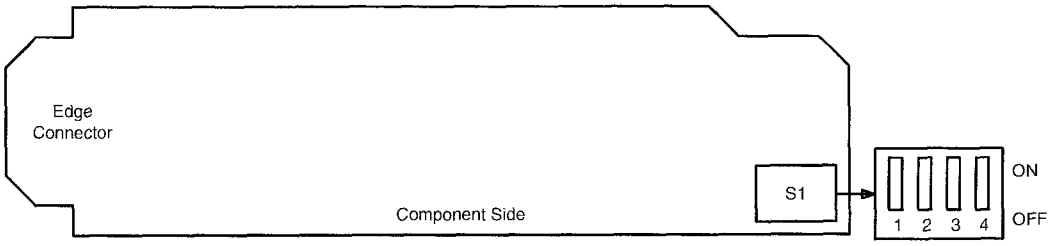


Figure 2. BBF2 TGS Option Switch

8. NOTE:
Switches **S1-1** and **S1-2** are ignored by the system the first time the **TGS** is installed unless the timing mode is set to *DS1 External.* Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update (**upd**) command must be performed.

Is timing mode set to *DS1 External*?

If **YES**, then continue with **Step 10.**
If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Refer to Table E and Figure 2 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table E. BBF2 TGS DS1 Line Coding and Frame Format Switch Settings

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

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

11. NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line-timed mode).

NOTE 2:
The **BBF2B TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Line Timed*. In free-running mode, **BBF2B TGS** gets timing from oscillator on **BBF2B TGS**. In external timing mode, **BBF2B TGS** gets timing from external DS1 reference input. In line-timed mode, **BBF2B TGS** gets timing from a reference clock recovered from received OC-12 line rate signal. Line timing from the **MAIN-B-1 OLIU** OC-12 line is the factory default.

NOTE 3:
Table F depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for line timing or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table F. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported Both systems are operating asynchronously from each other
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	Line Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network The DS1 timing output is normally used to synchronize other NE's to a PRS In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported The two network elements will be operating asynchronously from each other.
Free Running	External - Sync Out	This timing topology is not supported The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS

Table F. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Mult	Line Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located The NE provisioned for Line Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Line Timing	Caution! This topology might create a timing loop In this topology the NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop

Table F. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Line Timing - Sync Out	Caution! This topology might create a timing loop In this topology the NE provisioned for Line Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously Note: DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves 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 F. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's. In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop. The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop. If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not. supported The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult If the reference available is an optical reference provision to Line Timing with the proper source using the **set-sync** command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop

NOTE 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 G and Figure 3 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table G. BBF2B TGS Timing Mode Switch Settings

	Switch S1 Settings		
Timing Mode	**S1-3**	**S1-4**	**S1-5**
Free Running	ON	ON	OFF
DS1 External, MULT Mode*	OFF	ON	OFF
Line Timing, MAIN	OFF	OFF	OFF
Line 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

* Factory default.

† **MAIN-B-1** OLIU is factory default; **MAIN-B-2(P)** set by **`set-sync command.`**

‡ **`If an invalid setting is selected,`** **FAULT** LED is lighted and an `unexpected CP switches` alarm is generated.

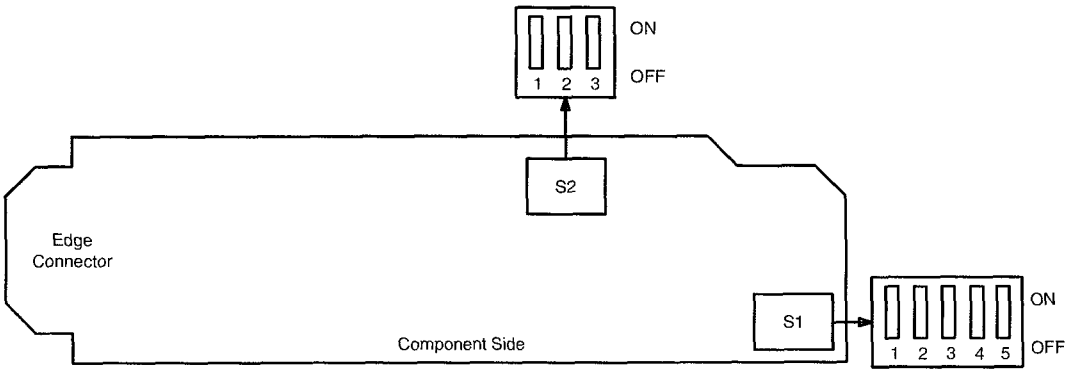


Figure 3. BBF2B TGS Option Switch

12. If the **BBF2B TGS** is provisioned for *Sync Out mode*, refer to Table H and Figure 3 and set equalizer switches for the proper cable length.

Table H. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid*	OFF	OFF	OFF
Invalid*	OFF	OFF	ON
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP switches` alarm is generated.

13. ⇒ NOTE:
Switches **S1-1** and **S1-2** are ignored by the system the first time the **TGS** is installed unless the timing mode is set to *DS1 External* or *Line Timing sync out* mode. 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 *Line Timed sync out*?

If **YES**, continue with **Step 10.**
If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Refer to Table I and Figure 3 and set DS1 line coding and frame format as required for **BBF2B TGS** circuit pack.

Table I. 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

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21G/21G-U OLIU

16. ⚠ 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 J and Figure 4 and set **HIGH/LOW POWER** option switch to proper setting.

Table J. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LOW Power
Greater than 6 dB	HIGH Power

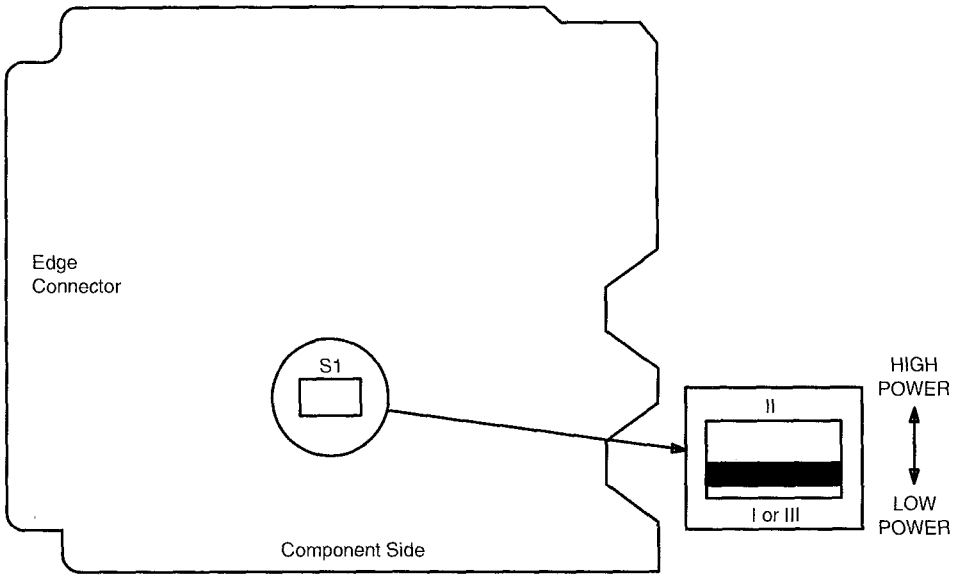


Figure 4. 21G/21G-U OLIU Option Switch

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG11/BBG11B 3DS3

18. Determine from office records the length of DS3 cabling between DDM-2000 OC-12 Multiplexer and DSX-3 cross-connect point.

19. Install **3DS3** option jumpers per Table K and Figure 5.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table K. 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

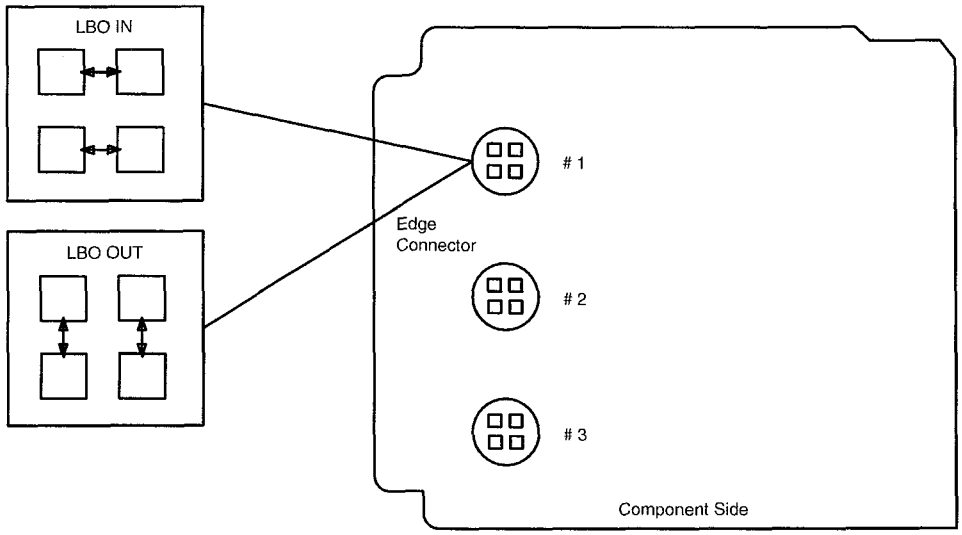


Figure 5. BBG11/BBG11B 3DS3 Option Settings

BBG12 3STS1E

21. Determine from office records the length of EC-1 cabling between DDM-2000 OC-12 Multiplexer and STSX cross-connect point.

22. Install **3STS1E** option jumpers per Table L and Figure 6.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table L. 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

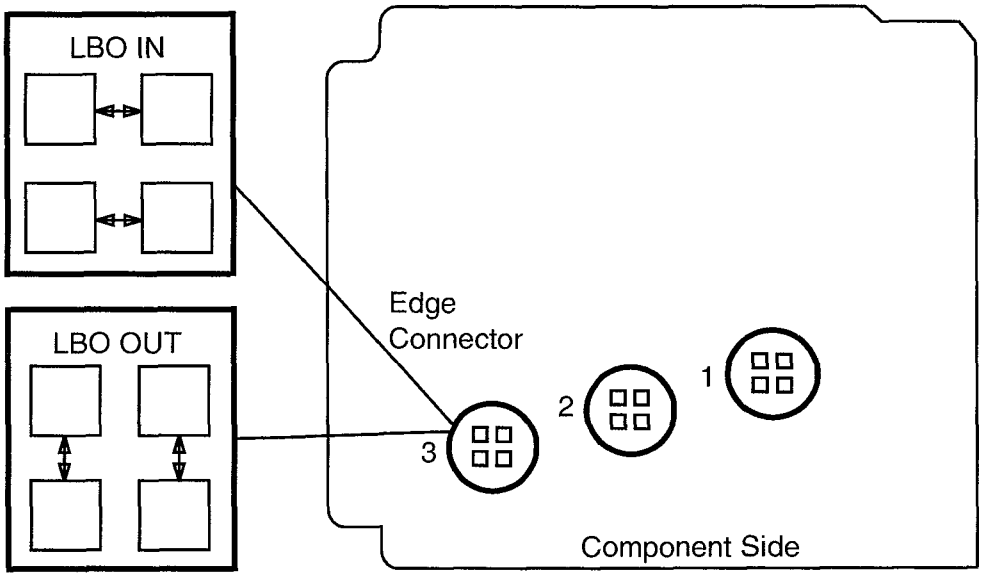


Figure 6. BBG12 3STS1E Option Settings

Perform Optical Fiber Connections and Verification of Optical Facility for MAIN OLIUs

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam. 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 DDM-2000 OC-12 network consisting of OC-12 Multiplexers only and/or an DDM-2000 OC-12 network consisting of OC-12 Multiplexers and FT-2000 OC-48 Terminals with an OC-12 interface. For each span, determine the loss of each optical fiber and install the proper LBO. Then connect the fibers to the associated **IN** and **OUT** connectors of each DDM-2000 **OLIU** or FT-2000 Optical Interface at the end of the span.

NOTE 2:
It is assumed that the optical jumpers used to connect the DDM-2000 OC-12 Multiplexer to an optical interconnection point are equipped with *ST*®, FC/PC, or SC lightguide cable connectors.

If the optical cables have not been placed into the cable tray at bottom front of the shelf, loosen three screws holding the front cover of the cable tray and slide out the front cover of the tray.

2. Route the optical jumpers up through the slotted hole(s) at the bottom left-front corner of the shelf and up to the **OLIU**s. See Table A.

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

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 **23G/23G-U** and **23H/23H-U OLIU**s, the recommended optical fiber is single mode, but multimode can be used. For the FT-2000 **T939A OC12** Optical Interface, the recommended optical fiber for the **IN** connector is single mode or multimode and for the **OUT** connector is single mode.

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-12 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. Replace the 0 dB LBO with the correct LBO to attenuate the optical power.

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.

7. ⇒ NOTE:
   For OC-12 ring configurations, optical fibers extend in two different directions to make up the ring. At each shelf (node) in the ring, the **MAIN-B-1 OLIU** will connect to the **MAIN-B-2(P) OLIU** in another node, and the **MAIN-B-2(P) OLIU** will connect to the **MAIN-B-1 OLIU** in a separate node. In single-homed OC-12/OC-48 configurations, the OC-12 **MAIN-B-1 OLIU** will connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1A**, or **2A**, or **3A**, or **4A**, or **5A**, or **6A**, or **7A**, or **8A** and the OC-12 **MAIN-B-2(P) OLIU** will connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1B**, or **2B**, or **3B**, or **4B**, or **5B**, or **6B**, or **7B**, or **8B**, or **8B** which is the companion to the **A** slot in the same FT-2000 ring node. In dual-homed OC-12/OC-48 configurations, the OC-12 **MAIN-B-1 OLIU** will connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1A**, or **2A**, or **3A**, or **4A**, or **5A**, or **6A**, or **7A**, or **8A** in one FT-2000 node and the OC-12 **MAIN-B-2(P) OLIU** will connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1B**, or **2B**, or **3B**, or **4B**, or **5B**, or **6B**, or **7B**, or **8B**, or **8B** which is the companion to the **A** slot in another FT-2000 ring node.

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 assemblies with the correct buildout assemblies per Figure 1 and Tables B, C, D, E, and/or F [**DLP-538**].

   Reconnect the optical fiber transmit cables at both ends.

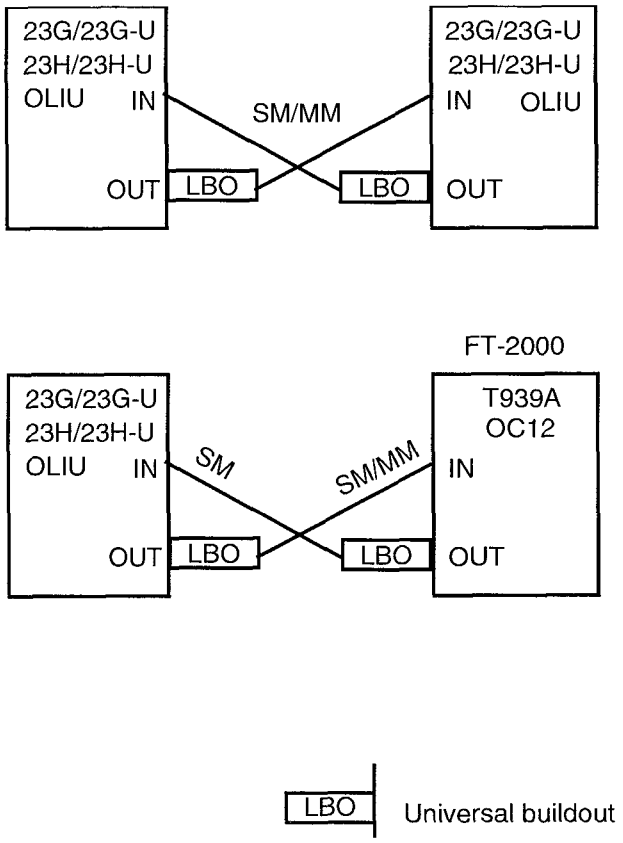


Figure 1. DDM-2000 OC-12 - FT-2000 OC-12 Fiber Optic Connections and Line Buildouts

Table B. DDM-2000 OC-12/FT-2000 Measured Optical Power and Required LBO

	Receiver					
	T939A OC12 (FT-2000)		23G/23G-U OLIU		23H/23H-U OLIU	
Transmitter	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)	Received Power(dBm)	LBO (dB)
T939A OC12 (FT-2000)					2 0 to –3 0	20
			2 0 to 1 0	15	–3 0 to –8 0	15
			1 0 to –4 0	10	–8 0 to –13.0	10
			–4 0 to –9 0	5	–13 0 to –18 0	5
			–9 0 to –31 0	0	–18 0 to –34 0	0
23G/23G-U OLIU					2 0 to –3 0	20
	2 0 to 1 0	15	2 0 to 1 0	15	–3 0 to –8 0	15
	1 0 to –4 0	10	1 0 to –4 0	10	–8 0 to –13 0	10
	–4 0 to –9 0	5	–4 0 to –9 0	5	–13.0 to –18 0	5
	–9 0 to –30 5	0	–9 0 to –31 0	0	–18 0 to –34 0	0
23H/23H-U OLIU					2 0 to –3 0	20
	2 0 to 1 0	15	2 0 to 1.0	15	–3 0 to –8 0	15
	1 0 to –4 0	10	1 0 to –4 0	10	–8 0 to –13 0	10
	–4 0 to –9 0	5	–4 0 to –9.0	5	–13 0 to –18 0	5
	–9 0 to –30 5	0	–9 0 to –31 0	0	–18 0 to –34 0	0

Notes:

1 Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU

2 The minimum measured received power allows for optical path penalty and unallocated margin Connector loss is not allotted for; it should already be accounted for in the optical power measurement

3 The margin for falling within the max rx power is 1 0 dB

Table C. *ST* Single-Mode Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3010	106312523	*ST*	SM-SM	None
5 dB	A3010B	106312556	*ST*	SM-SM	Blue
10 dB	A3010D	106312572	*ST*	SM-SM	Black
15 dB	A3010F	106312598	*ST*	SM-SM	Green

Table D. Universal Single-Mode (SM) *ST* Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3070	106795354	*ST*	SM-SM & MM-MM	None
5 dB	A3070B1	107406183	*ST*	SM-SM	Blue
10 dB	A3070D1	107406191	*ST*	SM-SM	Black
15 dB	A3070F1	107406209	*ST*	SM-SM	Green

Table E. Universal FC/PC Single-Mode Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3080	106795404	FC/PC	SM-SM	None
5 dB	A3080B1	107406225	FC/PC	SM-SM	Blue
10 dB	A3080D1	107406233	FC/PC	SM-SM	Black
15 dB	A3080F1	107406241	FC/PC	SM-SM	Green

Table F. Universal SC Single-Mode Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3060	106708951	SC	SM-SM	None
5 dB	A3060B1	107406142	SC	SM-SM	Blue
10 dB	A3060D1	107406159	SC	SM-SM	Black
15 dB	A3060F1	107406167	SC	SM-SM	Green

Fiber Connection

10. ⇒ NOTE:
In Release 5 or later, **one** shelf in the network **must** be designated as a directory services network element (DSNE) using the **`set-ne`** command. This allows you to use the **`rtrv-map-network`** command to retrieve a listing of all active nodes in the network. Therefore, for Release 5 or later, it is suggested that optical fiber connections begin at the node designated as the DSNE.

At far end, connect the input optical fiber to the proper **OLIU IN** (receive) connector.

11. Did **FAULT** LED go off on the far-end **OLIU**?

If **NO**, then continue with **Step 12**.
If **YES**, then proceed to **Step 13**.

12. Check optical fiber connections. Verify integrity of fiber connections by ensuring correct output at one end is connected to correct input at the other end. Replace **OLIU** with flashing LED. Continue with this procedure when trouble is cleared.

13. At near end, connect the input optical fiber(s) to the corresponding **OLIU IN** (receive) connector.

14. Did **FAULT** LED go off on the near-end **OLIU**?

If **NO**, then continue with **Step 15**.
If **YES**, then proceed to **Step 16**.

15. Check optical fiber connections at both ends of the fiber. Verify the integrity of the fiber connections by ensuring **OLIU** output at one end is connected to the correct **OLIU** input at the other end. Verify proper systems have been connected by using the **rtrv-map-neighbor** command (Figure 3).

Fiber Verification

16. Disconnect the fiber cable from the **OUT** connector on the **OLIU** at one end of the span. At the other end, verify that the associated **FAULT** LED is flashing, indicating a loss of signal. Reconnect the fiber and repeat the process for the other direction of transmission.

17. Verify proper systems have been connected by using the **rtrv-map-network** and **rtrv-map-neighbor** command to retrieve a map of the network (Figures 2 and 3).

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-network:  COMPLD
 /* Network Map for Site6NE1
   ==========================================================================
    System Name           Comm.   Product              NE          Alarm
      (TID)               Status  Type                 Type        Group
   ==========================================================================
   Site6NE1                       DDM-2000 OC-12                     3
   Site7NE1                       FT-2000              DSNE          3
   Site3NE1                       DDM-2000 OC-3                      3
   Site4NE1              FAILED   DACS IV-2000                       3
   Site5NE1                       FT-2000              DSNE          201
   Site8NE1                       DDM-2000 OC-12                     201
   Site9NE1                       FiberReach                         250
   Site10NE1                      FiberReach                         250
   Site11NE1                      FiberReach                         250

 */
```

Figure 2. Sample Report From **rtrv-map-network** Command

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Site6NE1
   ================================================================================
                                      Link
    System Name            Connected  Comm.            Product
      (TID)                Through    Status           Type
   ================================================================================
   Site6NE1                                           DDM-2000 OC-12
   Site7NE1                main-b-1   FAILED           DDM-2000 OC-12
   Site5NE1                main-b-2                    FT-2000

 */
```

Figure 3. Sample Report From `rtrv-map-neighbor` Command

18. After all connections and tests have been made, verify optical fiber cables are placed correctly in fiber tray/rings and properly routed in bay framework. Reinstall front cover and tighten three screws.

19. Repeat this procedure for each fiber span to be connected until the end-to-end system is established.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Local Office Alarms

1. ⚠ CAUTION:
This test will interrupt service if it is done without a CIT. If done with a CIT, this test can be done on an in-service system.

NOTE:
It is assumed that you were sent here by another procedure to test DDM-2000 OC-12 local office alarms.

Is CIT available?

If **YES**, then continue with **Step 2**.
If **NO**, then proceed to **Step 5**.

2. Connect CIT to **CIT** connector on User Panel.

3. NOTE:
Commands and Reports section of this user manual under **TEST-ALM** gives description of **`test-alm`** command.

Use **`test-alm`** command to perform alarm tests. Note the audible and visual alarm indications during the test.

4. Did DDM-2000 OC-12 Multiplexer pass alarm tests?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then proceed to **Step 14**.

5. NOTE:
It is assumed that DDM-2000 OC-12 Multiplexer is powered and running with loops at low speed cross-connections and that high-speed terminations are either looped on themselves or connected in an end-to-end looped configuration. It is also assumed that protection circuit packs are installed and that no alarms or other diagnostic indications are activated.

Unseat function unit in **FUNCTION UNIT (FN)** group slot **FN A-1**, **FN B-1**, **FN C-1**, or **FN D-1**.

6. Wait 30 seconds.

7. Is minor (**MN**) alarm activated?

   If **YES**, then continue with **Step 8**.
   If **NO**, then proceed to **Step 13**.

8. Leave function unit unseated and unseat protection function unit circuit pack in slot **FN A-2(P)**, **FN B-2(P)**, **FN C-2(P)**, or **FN D-2(P)**.

9. Wait 30 seconds.

10. ⇒ NOTE:
    In some offices the critical and major alarms may be wired together if a separate critical alarm is not available. The following step will activate a critical (**CR**) alarm on the User Panel.

    Is major (**MJ**) or critical (**CR**) alarm activated?

    If **YES**, then continue with **Step 11**.
    If **NO**, then proceed to **Step 13**.

11. Reseat both circuit packs. Take care to avoid damaging LEDs protruding through openings in faceplates of circuit packs.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. Reseat circuit pack(s). Take care to avoid damaging LEDs protruding through openings in faceplates.

14. DDM-2000 OC-12 has failed alarm test. The most likely source of trouble is in the alarm wiring. Check that alarms are connected correctly. If wiring is correct and failure persists, refer to **Trouble Clearing: TAP-108** to clear failure.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Parallel Telemetry

1. ⚠ CAUTION:
   This test will interrupt service if it is done without a CIT. If done with a CIT, this test can be done on an in-service system.

   ⇒ NOTE:
   It is assumed that you were sent here by another procedure to test DDM-2000 OC-12 parallel telemetry.

   Is CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 6**.

2. Connect CIT to **CIT** connector on User Panel.

3. Refer to Commands and Reports section of this user manual under **TEST-TLM-PAR** for description of tests.

4. Contact monitoring location and use **`test-tlm-par`** command to perform parallel telemetry tests as described in Commands and Reports section of this manual.

5. Did DDM-2000 OC-12 Multiplexer pass parallel telemetry tests?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then proceed to **Step 18**.

6. ⇒ NOTE 1:
   It is assumed that DDM-2000 OC-12 Multiplexer is powered and running with loops at low speed cross-connect bay and that high speed terminations are either looped on themselves or connected in end-to-end looped configuration. It is also assumed that the system is equipped with protection circuit packs and that no alarms or other diagnostic indications are activated.

   ⇒ NOTE 2:
   It is assumed that DDM-2000 OC-12 Multiplexer is connected to telemetry system and that state of telemetry inputs and outputs to that system can be determined.

Unseat function unit in **FUNCTION UNIT (FN)** group slot **FN A-1**, **FN B-1**, **FN C-1**, or **FN D-1**.

7. Wait 30 seconds.

8. Is minor (**MN**) alarm telemetry point activated?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 17**.

9. Leave circuit pack unseated and unseat associated protection function unit circuit pack in group slot **FN A-2(P)**, **FN B-2(P)**, **FN C-2(P)**, or **FN D-2(P)**.

10. Wait 30 seconds.

11. Is critical (**CR**) alarm telemetry point activated?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 17**.

12. Reseat both circuit packs. Take care to avoid damaging the LEDs protruding through openings in faceplates.

13. Unseat the protection **3DS3**, **3STS1E**, or **OLIU** and a service **3DS3**, **3STS1E**, or **OLIU** circuit pack in the same group.

14. Is the major (**MJ**) alarm activated?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed with **Step 17**.

15. The remaining telemetry points can be tested in same manner. For example, to check **INC** telemetry point, disconnect one or more of the incoming DS3, EC-1, IS-3, or OC-3 signals. To test the **CLF** point, disconnect one of the receive optical fibers.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Reseat both circuit packs. Take care to avoid damaging LEDs protruding through openings in faceplates.

18. DDM-2000 OC-12 has failed parallel telemetry alarm test. The most likely source of the trouble is in the telemetry wiring. Check that telemetry is connected correctly. If wiring is correct and failure persists, refer to **Trouble Clearing: TAP-108** to clear failure.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check TBOS Serial Telemetry

1. ⇒ NOTE 1:
   It is assumed that the DDM-2000 OC-12 under test is powered and running and that no alarms or other diagnostic indicators are activated.

   ⇒ NOTE 2:
   It is assumed that the DDM-2000 OC-12 under test is connected to serial telemetry system and that access to central telemetry equipment is available.

   Is CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 7**.

2. Connect CIT to **CIT** connector on User Panel.

3. Refer to Commands and Reports section of this user manual under **TEST-TLM-SER** for description of tests.

4. Contact monitoring location and use `test-tlm-ser` command to perform serial telemetry tests as described in the Commands and Reports section of this manual.

5. Did DDM-2000 OC-12 Multiplexer pass serial telemetry tests?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 15**.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. At the central telemetry equipment, send message to the DDM-2000 OC-12 Multiplexer to Lockout Switching - **MAIN-B** (control point **32**).

8. Is scan point **58** (Valid Command Received) raised?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 15**.

9. Is scan point **54** and **57** (Manual Forced/Inhibit/Lockout OC12 Line Protection Switching and Abnormal Condition) raised?

   If **YES**, then continue with **Step 10**.
   If **NO**, then proceed to **Step 15**.

10. At the central telemetry equipment, send message to DDM-2000 OC-12 Multiplexer to Reset Switching - **MAIN-B** (control point **34**).

11. Is scan point **58** (Valid Command Received) raised?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 15**.

12. Is scan point **54** and **57** (Manual Forced/Inhibit/Lockout OC12 Line Protection Switching and Abnormal Condition) retired?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 15**.

13. The DDM-2000 OC-12 Multiplexer has passed serial telemetry test.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. The DDM-2000 OC-12 has failed serial telemetry test. The most likely source of trouble is in the telemetry wiring. Check connections. If wiring is correct and trouble persists, refer to **Trouble Clearing: TAP-108** to clear failure condition.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Test Protection Switching Function

1. Is CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 7**.

2. To test for a switch to protection using CIT, connect CIT to **CIT** connector on user panel. Enter command **`rtrv-state`**. Terminal will display current protection status.

3. Use one of the switch commands (for example, **`switch-line:`***`address`***`:pri=manual`**, **`switch-sync:s=circuitpack:pri=manual`**, or **`switch-fn:`***`address`***`:pri=manual`**) to perform a manual switch.

4. Enter command **`rtrv-state`** to verify the switch was done.

5. Use **`switch-( ):`***`address`***`:pri=reset`** command to reset switch.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. ⇒ NOTE:
   The alarm delay is provisionable from 0 to 30 seconds. This procedure assumes the alarm delay is set for the default of 2 seconds.

   To test **FUNCTION UNITS** switch to protection, unplug a **3DS3**, **3STS1E**, or **OLIU** circuit pack that has **ACTIVE** LED lighted.

   Response: **NE ACTY** LED on user panel lights immediately and, after approximately 2 seconds, **MN** LED on user panel lights and **ACTIVE** LED lights on protection **3DS3**, **3STS1E**, or **OLIU** circuit pack.

8. Reseat circuit pack that was removed.

   Response: All LEDs go OFF after approximately 2 seconds.

9. Repeat Step 7 for each equipped **FUNCTION UNITS** slot.

10. To test high-speed switch to protect, unplug one of active **TSI** circuit packs.

    Response: **NE ACTY** LED on user panel lights immediately, and after approximately 2 seconds, **MN** LED on user panel lights and **ACTIVE** LED lights on companion **TSI** circuit pack.

11. Reseat **TSI** circuit pack that was removed.

    Response: After approximately 2 seconds, all LEDs go OFF.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

Connect CIT and Establish Session

1. ⚠ CAUTION:
You must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly whenever working with the DDM-2000.

NOTE 1:
If all shelves in a bay are connected together with CIT bay mult cabling, the CIT may be connected to any shelf front or rear **CIT** connector and gain access to any other shelf by entering a shelf address. If the CIT is connected to the rear **CIT** connector, it must be connected through a null modem.

NOTE 2:
If shelves are connected together with bay mult cabling and ANY shelf in the chain becomes unpowered with the **SYSCTL** inserted, CIT communications will be lost to all shelves. Once the shelf is repowered, CIT communications are restored without established login sessions being dropped. If shelves are not powered, the **SYSCTL** should not be inserted.

NOTE 3:
With a CIT baud rate of 19200, CIT communication to a shelf may fail if the CIT bay mult cabling is connected to the shelf but not terminated on the next shelf. This condition is only present at baud rates greater than 9600 and does not affect communication at lower baud rates.

Connect CIT to the RS-232C **CIT** connector on the DDM-2000 User Panel or rear **CIT** connector.

2. Turn on CIT and set terminal parameters as follows (consult your terminal's manual for setup procedures):
   - Full duplex.
   - 8 data bits.
   - 1 start bit.
   - 1 stop bit.
   - No flow control.
   - Baud rate setting is automatically set by DDM-2000 when connection is made.

3. ⇒ NOTE:
   To set baud rate automatically, enter two carriage returns (**<cr>**), two lower case "a"s (**aa**), or two upper case "A"s (**AA**). All other characters are ignored.

   Enter two carriage returns.

   Response: CIT prompts with:

   ```
   /* Enter a shelf number from 1 to 8 */
   shelf [default] =
   ```

4. ⇒ NOTE:
   Entering just a carriage RETURN at the shelf prompt will connect you to the default shelf physically connected to the CIT.

   Enter the shelf number and/or carriage RETURN for the shelf being accessed.

   Response: CIT prompts with `login <`

5. NOTE 1:
Security is available to protect against unauthorized access to the system. System security requires the defaults for the privileged user logins/password to be changed and CIT and/or DCC port security to be enabled. If security is enabled on a port, users must enter a valid login and password to access the system through that port.

NOTE 2:
The system always has three privileged user logins to minimize the chance that both users will forget their passwords at the same time. You must be logged into the system as a *privileged user* to set security; add, change, or delete logins; and to execute some commands. The default *privileged user* logins for Release 5.1 and later are LUC01 (uppercase LUC-zero-one), LUC02 (uppercase LUC-zero-two), and LUC03 (uppercase LUC-zero-three). The default *privileged user* logins for Release 5.0 and earlier are ATT01 (uppercase ATT-zero-one), ATT02 (uppercase ATT-zero-two), and ATT03 (uppercase ATT-zero-three). The default *privileged user* password is DDM-2000. The login banner for Release 5.0 and earlier reads: `AT&T, DDM-2000 OC-12 Multiplexer, Release a.b.c.`

Were you sent here from **DLP-541** to connect CIT?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 6**.

6. If security has been enabled, enter your login, and then enter your password when prompted.

   If security has not been enabled, enter a carriage RETURN.

   Response: CIT prints the following message followed by an alarm and status report:

```
/***********************************
*                                  *
*        Lucent Technologies       *
*       Bell Labs Innovations      *
*     DDM-2000 OC-12 Multiplexer   *
*                                  *
*          Release a.b.c           *
*                                  *
***********************************/

                  .
                  .
                  .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

7. ⇒ **NOTE 1:**
   The system prompt may be something other than `<` if there is an alarm condition (for example, if there is an MJ alarm condition on the system, the prompt will be `MJ <`).

   ⇒ **NOTE 2:**
   After the prompt (<), the system will respond to commands entered. The command **`set-link:pg=( )`** may be used to set the vertical size of the displayed page on the CIT. Page (**pg**) length may be set from 3 to 150 lines with a default length of 24 lines. The page length is set to default each time a new CIT session is started.

   See the "Commands and Reports" section of this manual for a description of the command formats.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Establish Remote Login

1. Connect CIT and establish session with near-end DDM-2000.

   Reference: **DLP-516**

2. NOTE 1:
   The command **toggle** (CTRL T) may be used to toggle back and forth between the remote terminal and near-end terminal. If no remote session is in progress, the toggle command will be rejected.

   NOTE 2:
   A remote login within a remote login or a remote login entered to the near end while a remote session is suspended by the toggle command is not allowed. (A remote session is suspended when a remote session is under way and **toggle** (CTRL T) is entered to toggle control to the near end.) A remote login will also be denied if one is already in progress at the remote site.

   NOTE 3:
   If security has been enabled on the DCC port being accessed, a login and password are required to do the remote login.

   NOTE 4:
   Far end communications (fecom) must be enabled in the far-end shelf in order to remote login to that shelf. The command **rtrv-fecom** can be used at the far-end shelf to determine if fecom is enabled or disabled. The command **set-fecom** can be used at the far-end shelf to enable fecom. If security is enabled, the **set-fecom** command can be executed by privileged users only.

   NOTE 5:
   One shelf in the network must be set as a DSNE using the **set-ne** command to allow far-end communications. Remote login to FT-2000 OC-48 systems is not allowed from the DDM-2000 OC-12 system.

NOTE 6:
A remote login session may be terminated in some cases due to events in distant shelves and may not be noticeable until you begin typing in the rlgn session. Events such as disabling fecom, failure of the DCC, **`init-sys`** or **`reset`**, removing **OLIU**s, etc. may abruptly terminate a remote login session. This is normal because all the network elements must relearn the network after one of these events.

Enter command **`rlgn:tid`**

Where tid = equals the target identifier (shelf or site/shelf name) of the remote terminal.

Response: **CIT** prompts with: `login <`

3. If security has been enabled, enter your login and password when you are prompted.

   If security has not been enabled, enter a carriage RETURN.

   Response: System responds with:

```
/************************************
*                                   *
*        Lucent Technologies        *
*       Bell Labs Innovations       *
*     DDM-2000 OC-12 Multiplexer    *
*                                   *
*          Release a.b.c            *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm: all COMPLD
   /* Active Alarms and Status Report
```

4. ⇒ NOTE:
   After the prompt, the remote system will respond normally to any commands entered just as if you were physically connected to the remote terminal.

   See the Commands and Reports section of this manual for a description of the commands formats.

5. ⇒ NOTE:
   A logout entered to the remote terminal will end the remote session and return control to the near-end CIT. A logout entered to the near-end terminal will terminate the local and remote sessions.

   Use the command **`logout`** to log out of the remote terminal session and return control to the near-end terminal.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Circuit Pack

1. ⚠ CAUTION 1:
Circuit packs must not be installed or replaced if **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
BBG8 SYSCTL	Step 2
BCP3 TSI	Step 4
BCP4 OHCTL	Step 6
BBF2 TGS	Step 8
BBF2B TGS	Step 13
21G/21G-U OLIU	Step 19
21D/21D-U OLIU	Step 23
21G2-U OLIU	Step 23
BBG11/BBG11B 3DS3	Step 27
BBG12 3STS1E	Step 31
23G/23G-U OLIU	Step 35
23H/23H-U OLIU	Step 35

BBG8 SYSCTL

2. Refer to **DLP-501** to replace **SYSCTL**.
3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BCP3 TSI

4. ⇒ NOTE:
   In Release 5 or later, 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.**

BCP4 OHCTL

6. NOTE 1:
For Release 5 or later, the **OHCTL** must be a **BCP4 OHCTL**.

NOTE 2:
A **BCP4 OHCTL** must have software installed and it must be compatible with the software in the **BBG8 SYSCTL**. If no software is installed or if the software is not compatible, the letter **C**, **P**, or **d** will be displayed in the **FE ID** display on the **SYSCTL** when installed. If this occurs, you must find circuit packs with compatible software or install new software in both the **OHCTL** and **SYSCTL**. The shelf must be equipped with both **OHCTL** and **SYSCTL** [**DLP-501**] circuit packs before new software can be installed [**DLP-527**].

NOTE 3:
When the **OHCTL** is installed, the **FAULT** LED will light and remain lighted until the **SYSCTL** is installed.

Install **OHCTL** into **AUXCTL** slot.

Response: **FAULT** LED lights, if **SYSCTL** is not installed.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2 TGS

8. ⚠ CAUTION:
BBF2 TGS *and* **BBF2B TGS** *timing mode switch settings are not set the same. Check switch settings carefully.*

NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line timed mode).

NOTE 2:
The **BBF2 TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Line Timed*. In free-running mode, the **BBF2 TGS** gets timing from an oscillator on the **BBF2 TGS**. In external timing, the **BBF2 TGS** gets timing from an external DS1 reference input. In line timing, the **BBF2 TGS** gets timing from an **OLIU** from a reference clock recovered from the received OC-12 line rate signal. Line timing from the **MAIN-B OLIU** OC-12 line is the factory default.

NOTE 3:
Table B depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application.

Table B. BBF2 TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported. Both systems are operating asynchronously from each other.
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported The two network elements will be operating asynchronously from each other.
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note· DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves colocated in the same bay to conserve ports on the BITS

Table B. BBF2 TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not. supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Line Timing with the proper source using the `set-sync` command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop.

Refer to Table C and Figure 1 and set the timing mode as required for the new **BBF2 TGS** circuit pack(s).

Table C. BBF2 TGS Timing Mode Switch Setting

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

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP type` or `unexpected CP switches` alarm is generated.

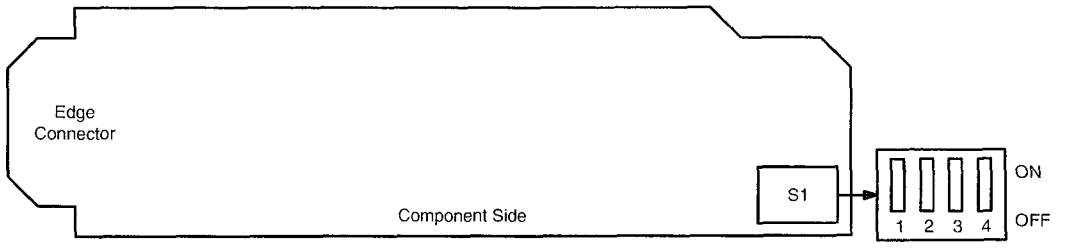


Figure 1. BBF2 TGS Option Switch

9. NOTE:
Switches **S1-1** and **S1-2** were ignored by the system the first time the **TGS** was installed unless the timing mode was set to *DS1 External*. Subsequent removal or replacement of the **TGS** requires that switches **S1-1** and **S1-2** be set the same as the original settings or an update (**upd**) must be performed.

Is timing mode set to *DS1 External*?

If **YES**, then continue with **Step 10.**
If **NO**, then proceed to **Step 11.**

10. Refer to Table D and Figure 1 and set the DS1 line coding and frame format as required for the **TGS** circuit pack.

Table D. TGS DS1 Line Coding and Frame Format Switch Settings

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

11. ⚠ CAUTION:
When all OC-12 shelves in a bay are timed from a common external timing supply, removal of the bottom shelf **TGS** *circuit pack will cause a momentary transmission hit on all shelves in the bay.*

⇒ NOTE 1:
A **TGS** circuit pack is required in **TIMING** slot **1** to protect against accidentally downloading wrong software and interrupting transmission. Transmission configuration information is stored in the **TGS** circuit pack in **TIMING** slot **1**. During software download procedures the software checks the information stored in the **TGS 1** circuit pack. If the information is incompatible with the controller software information, an alarm is generated.

⇒ NOTE 2:
If a signal has previously been applied to the original **TGS** circuit pack, the **FAULT** lamp will flash when the new **TGS** is installed until the signal tests good.

Remove old **TGS** and install replacement **TGS**.

Response: **FAULT** LED on the **TGS** lights (flashes) for about 15 seconds and then goes off.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBF2B TGS

13. NOTE 1:
The timing mode of all nodes should be checked before the system is placed in service. Improper timing modes may cause the system to act unpredictably or cause a service interruption (for example, if all nodes are set to line-timed mode).

NOTE 2:
The **BBF2B TGS** timing mode may be provisioned as *Free Running*, *DS1 External*, or *Line Timed*. In free-running mode, **BBF2B TGS** gets timing from oscillator on **BBF2B TGS**. In external timing mode, **BBF2B TGS** gets timing from external DS1 reference input. In line-timed mode, **BBF2B TGS** gets timing from main **OLIU** from a reference clock recovered from received OC-12 line rate signal. Line timing from the **MAIN-B OLIU** OC-12 line is the factory default.

NOTE 3:
Table E depicts all the possible timing topologies which can be encountered on adjacent network elements (NE) with some comments or cautionary notes on their application. When the NE is provisioned for line timing or with the DS1 output in SYNC OUT mode, the assumption is that the NE is deriving its timing from the optical interface shared between the two NE's.

Table E. BBF2B TGS Synchronization Provisioning Topologies

NE 1	NE 2	Application Comments
Free Running	Free Running	This topology is not supported Both systems are operating asynchronously from each other
Free Running	Line Timing	This topology is allowed but results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to a PRS on the network. If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to another better quality line timing source, if available.
Free Running	Line Timing - Sync Out	This topology, although not recommended, results in having a SONET subnetwork operating asynchronously with respect to other NE's in the network. The NE's deriving timing off the NE provisioned for Free Running will be synchronized to it but not to the rest of the network. The DS1 timing output is normally used to synchronize other NE's to a PRS In this topology the timing of the Free Running NE is being distributed by the use of the DS1 output timing reference in the absence of Synchronization Messaging. In the presence of Synchronization Messaging, the DS1 output will carry DS1 AIS If automatic synchronization reconfiguration is supported and enabled in a system, the NE 2 system will attempt to switch to a better quality line timing source, if available.
Free Running	External - Mult	This timing topology is not supported. The two network elements will be operating asynchronously from each other.
Free Running	External - Sync Out	This timing topology is not supported. The two network elements will be operating asynchronously from each other
External - Mult	Line Timing	This topology is used when one of the NE's does not have access to an external synchronous reference and needs to be synchronized to an NE whose timing is traceable to a PRS The NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS

Table E. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Mult	Line Timing - Sync Out	This topology is used when one of the NE's does not have access to an external synchronous reference, needs to be synchronized to an NE whose timing is traceable to a PRS, and timing is needed to be distributed where NE 2 is located. The NE provisioned for Line Timing - Sync Out will derive its timing from the NE provisioned for External - Mult timing thus operating synchronously with that respective NE. Its DS1 output could serve as a reference to distribute timing to a BITS in that CO The NE provisioned for External - Mult timing could use its DS1 output to distribute its incoming DS1 timing reference to other shelves in the bay to conserve ports on the BITS.
External - Sync Out	Line Timing	Caution! This topology might create a timing loop. In this topology the NE provisioned for Line Timing will derive its timing from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the potential timing loop existing in the actual provisioning. If Synchronization Messaging is enabled on both NE's, the DS1 output reference of the NE provisioned for External - Sync out will carry an unframed all ones DS1 signal (DS1 AIS) in the present topology. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop.

Table E. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	Line Timing - Sync Out	Caution! This topology might create a timing loop In this topology the NE provisioned for Line Timing will derive its timing and that of the DS1 output reference from the NE provisioned for External - Sync Out timing thus operating synchronously with that respective NE. The NE provisioned for External - Sync Out should be reprovisioned for External - Mult to prevent the timing loop existing in the actual provisioning If Synchronization Messaging is enabled on both NE's, the DS1 output reference on NE 1 will carry DS1 AIS and NE 2 will derive its timing and that of the DS1 output port from NE 1 If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to break the potential timing loop. NE 1 will attempt to break the loop by inserting DS1 AIS on its DS1 output port. NE 2 will attempt to switch to another line timing source, if available, to prevent the timing loop
External - Mult	External - Mult	This topology is used when both NE's have access to and are receiving its timing from BITS clocks. The recommendation is to have these BITS synchronized to references which are traceable to the same PRS. If these guidelines are followed the subnetwork created by these two NE's would be operating synchronously. Note. DDM-2000 systems are designed to operate in pleisiochronous timing topologies. The DS1 output generated by each NE is regenerated from the input DS1 timing reference and could be used to distribute this reference to other shelves 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 E. BBF2B TGS Synchronization Provisioning Topologies (Contd)

NE 1	NE 2	Application Comments
External - Sync Out	External - Sync Out	Caution! This topology can potentially create a timing loop if synchronization messaging is not enabled on both NE's In this topology both NE's will derive the DS1 output reference from each other thus creating a timing loop The NE with access to a BITS, which has an input reference traceable to a PRS, and is sourced from an element other than this NE, should be reprovisioned for External - Mult to prevent the timing loop If Synchronization Messaging is enabled on both NE's, the DS1 output reference in one of the NE's will carry DS1 AIS and the other NE will generate a DS1 output carrying a framed DS1 all ones signal
Line Timing	Line Timing	Caution! This topology creates a timing loop and it is not supported. The NE with access to an external timing reference traceable to a PRS, if available, should be provisioned for External - Mult. If the reference available is an optical reference provision to Line Timing with the proper source using the **set-sync** command. If automatic synchronization reconfiguration is supported and enabled in a system, both NEs will attempt to switch to another line timing source, if available, to prevent a timing loop

NOTE 4:
To set switch to **ON**, depress rocker or slide switch toward side labeled **ON** in figure. To set switch to **OFF**, depress rocker or slide switch toward side labeled **OFF** in figure.

Determine timing mode from work order or office records. Refer to Table F and Figure 2 and set timing mode as required for **BBF2B TGS** circuit pack(s).

Table F. BBF2B TGS Timing Mode Switch Settings

	Switch S1 Settings		
Timing Mode	**S1-3**	**S1-4**	**S1-5**
Free Running	ON	ON	OFF
DS1 External, MULT Mode*	OFF	ON	OFF
Line Timing MAIN†	OFF	OFF	OFF
Line 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

* Factory default.

† **MAIN-B-1** OLIU is factory default; **MAIN-B-2(P)** set by **`set-sync`** command

‡ If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP switches` alarm is generated.

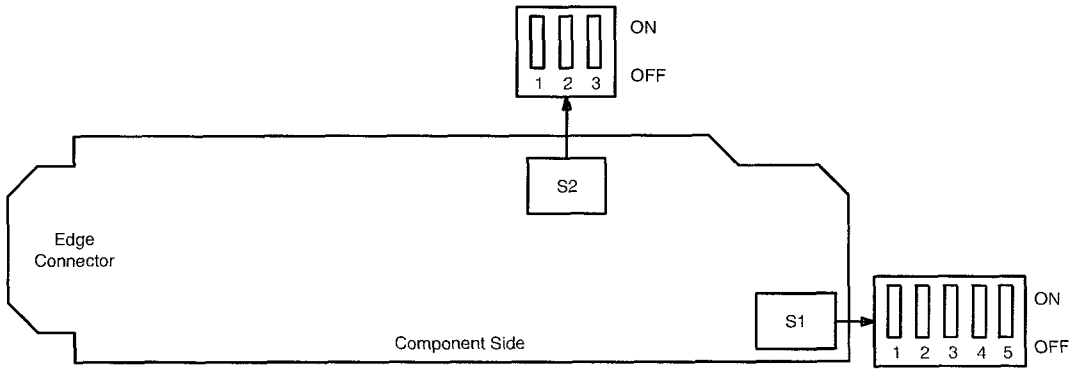


Figure 2. BBF2B TGS Option Switch

14. If the **BBF2B TGS** is provisioned for *sync out mode*, refer to Table G and Figure 2 and set equalizer switches for the proper cable length.

Table G. Equalizer Switch Settings

Equalization	S2-1	S2-2	S2-3
0' to 131'	ON	ON	OFF
>131' to 262'	ON	OFF	ON
>262' to 393'	ON	OFF	OFF
>393' to 524'	OFF	ON	ON
>524' to 655'	OFF	ON	OFF
Invalid*	OFF	OFF	OFF
Invalid*	OFF	OFF	ON
Invalid*	ON	ON	ON

* If an invalid setting is selected, **FAULT** LED is lighted and an `unexpected CP switches` alarm is generated.

15. ⇒ 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 *Line 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 *Line Timed sync out*?

If **YES**, continue with **Step 16.**
If **NO**, proceed to **Step 17.**

16. Refer to Table H and Figure 2 and set DS1 line coding and frame format as required for **BBF2B TGS** circuit pack.

Table H. 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

17. ⇒ 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.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21G/21G-U OLIU

19. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use 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 I and Figure 3 and set **HIGH/LOW POWER** option switch on replacement **21G/21G-U OLIU** to proper setting.

Table I. 21G/21G-U OLIU Option Switch

Facility Loss	Transmitter Switch
0 - 6 dB	LO Power
Greater than 6 dB	HI Power

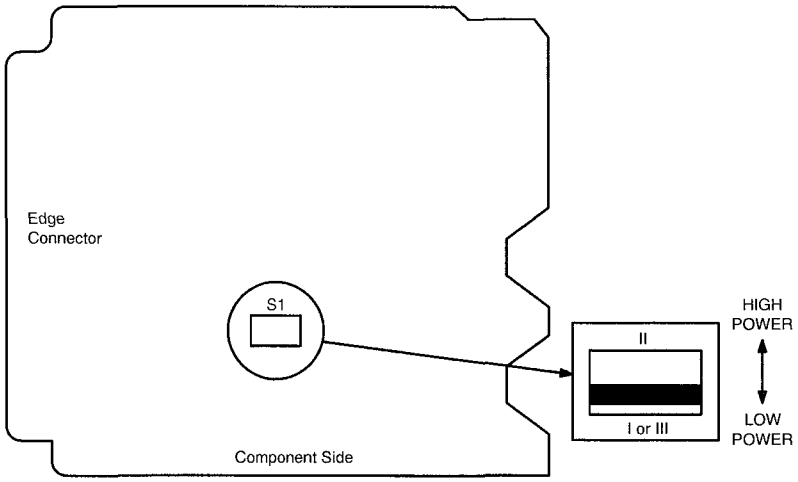


Figure 3. 21G/21G-U OLIU Option Switch

20. Remove old **21G/21G-U OLIU** and install replacement **21G/21G-U OLIU**.

    Response: **FAULT** LED on **21G/21G-U OLIU** flashes.

21. ⇒ 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.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21D/21D-U or **21G2-U OLIU**

23. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use 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** or **21G2-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** or **21G2-U** OLIU to be replaced.

24. Remove old **21D/21D-U** or **21G2-U OLIU** and install replacement **21D/21D-U** or **21G2-U OLIU**.

    Response: **FAULT** LED on **21D/21D-U** or **21G2-U OLIU** flashes.

25. ⇒ NOTE:
    FAULT LED on **21D/21D-U** or **21G2-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** or **21G2-U OLIU**.

    Response: **FAULT** LED on **21D/21D-U** or **21G2-U OLIU** goes off.

26. **STOP: YOU HAVE COMPLETED THIS PROCEDURE.**

BBG11/BBG11B 3DS3

27. Determine from office records length of DS3 cabling between DDM-2000 OC-12 Multiplexer and DSX-3 cross-connect point.

28. Refer to Table J and Figure 4. Install DS3 option jumpers per Table J.

Table J. BBG11/BBG11B 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

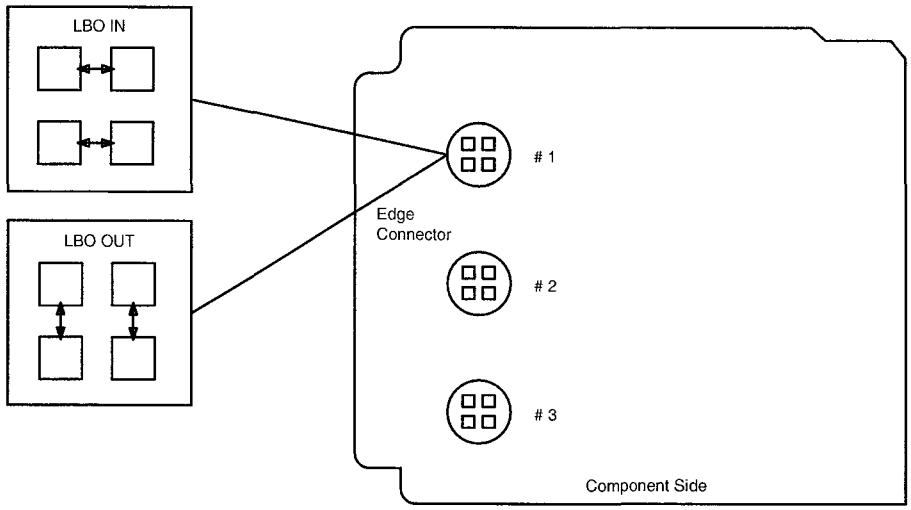


Figure 4. BBG11/BBG11B 3DS3 Option Settings

29. ⇒ 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.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

BBG12 3STS1E

31. Determine from office records length of EC-1 cabling between DDM-2000 OC-12 Multiplexer and STSX cross-connect point.

32. Refer to Table K and Figure 5. Install STS-1 option jumpers per Table K.

Table K. BBG12 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

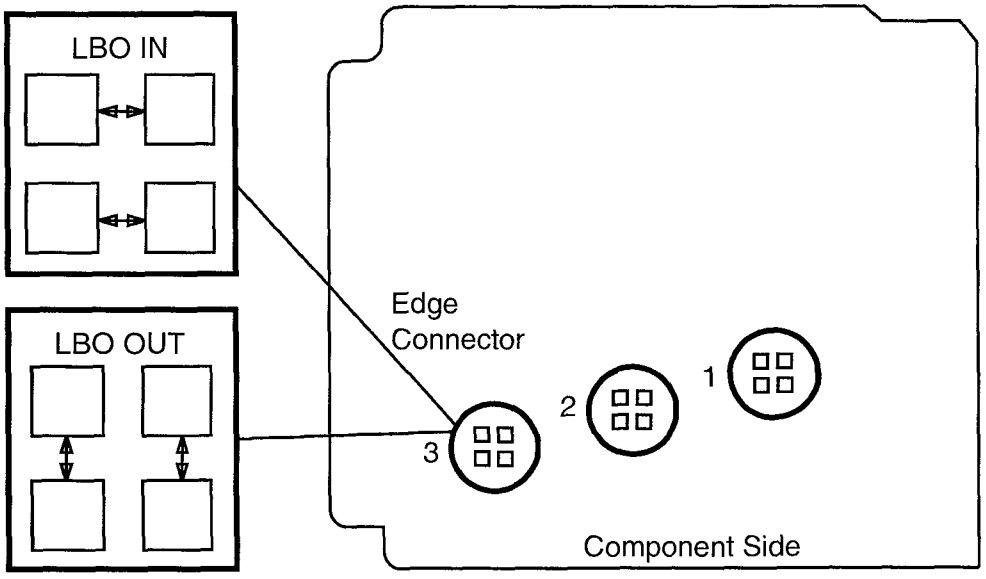


Figure 5. BBG12 3STS1E Option Settings

33. ⇒ 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.

34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23G/23G-U or **23H/23H-U OLIU**

35. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Ensure that protection switching is available (protection line good and no locks, inhibits, or forced switches in effect). When available, use 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.

36. Determine from old **23G/23G-U** or **23H/23H-U OLIU** if lightguide buildout (LBO) is required.

37. Remove LBO (if installed) [**DLP-538**] and optical cables from **23G/23G-U** or **23H/23H-U OLIU** to be replaced.

38. Remove old **23G/23G-U** or **23H/23H-U OLIU** and install replacement **23G/23G-U** or **23H/23H-U OLIU**.

39. ⇒ 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.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check –48 V DC Office Battery

1. Obtain multimeter capable of measuring DC voltage in 40 to 60 volt range.

2. ⚠ WARNING:
–48 V DC is present in the fuse holders and –**48VA** and –**48VB** terminal strip power connections at rear of User Panel.

   ⚠ CAUTION:
   If system is in service, service interruption will occur if both fuses are removed or both power feeders are disconnected.

   Are fuses installed in User Panel?

   If **YES**, then continue with **Step 3**.
   If **NO**, then proceed to **Step 4**.

3. Remove ONE of the –48 V fuses at the top of User Panel.

   Reference: **DLP-555**

4. ⚠ CAUTION:
Exercise care not to short meter probe across fuse contacts in fuse holder.

   Use multimeter to measure DC voltage at front of fuse holder(s). Place negative probe on front fuse contact (G4 shelves) and the other probe to a solid chassis ground.

   Requirement: Voltage must be between –40.00 V and –60.0 V DC

5. Was requirement met?

   If **YES**, then proceed to **Step 8**.
   If **NO**, then continue with **Step 6**.

6. Trouble in User Panel, power feeder(s) or office battery distribution. Refer trouble to organization that installed shelf.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Have both fuse holders been checked?

   If **YES**, then proceed to **Step 10**.
   If **NO**, then continue with **Step 9**.

9. Reinstall fuse if removed. Remove other fuse if installed and repeat this procedure from **Step 4** for other fuse holder.

10. Are fuses installed?

    If **YES**, then proceed to **Step 12**.
    If **NO**, then continue with **Step 11**.

11. ⇒ NOTE:
    Fuses on the G4 shelf User Panel are 10 amp fuses, COMCODE 406203190.

    Install –48 V DC fuses in User Panel fuse holders.

12. Is any fuse blown?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Replace blown fuse.

    Reference: **DLP-555**

14. Did fuse blow again?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed to **Step 17**.

15. Trouble in User Panel or backplane terminal strip. Refer trouble to organization that installed shelf.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Are **PWR ON A** and **B** LEDs lighted?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 18**.

18. Trouble in User Panel. Refer trouble to organization that installed shelf.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install Software Generic Program
New Shelf Installation
Only BBG8 SYSCTL and BCP4 OHCTL Installed

1. ⇒ NOTE 1:
This procedure is used to install a software program in a new DDM-2000 OC-3 shelf equipped only with the **BBG8 SYSCTL** and **BCP4 OHCTL** controller circuit packs. The circuit packs may be new from the factory or circuit packs used previously that may be loaded with software. For procedures to download software locally to a fully equipped in-service shelf, see **DLP-527**. For procedures to download software remotely to a fully equipped in-service shelf, see **DLP-530**.

⇒ NOTE 2:
It is assumed that the **BCP4 OHCTL** and **BBG8 SYSCTL** circuit packs have been installed per **DLP-500** and **DLP-557**.

Obtain the following equipment:

(1) IBM* compatible personal computer (PC) running an *MS-DOS*† computer program operating system, Release 2.1 or later.

(2) RS-232 cable to connect PC **COM** port to User panel **CIT** port.

⇒ NOTE:
The PC may be connected to either the front or rear CIT port, or remotely through a dial-up modem. If connected to the rear **CIT** port, a null modem is required between the RS-232 cable and the rear **CIT** port.

(3) Working copies of the new system generic program diskette(s).

(4) Software Release Description for software being installed.

---

* Registered Trademark of International Business Machines Corporation

† Registered Trademark of Microsoft Corporation

2. Before beginning this procedure, the following is strongly suggested:
   a. Become familiar with the characteristics and operating procedures of your PC and the *MS-DOS* operating system.

      Reference: **DLP-528**

   b. Operate laptop PCs on AC power during download procedures.

   c. Follow proper procedures in handling the diskette(s) (floppies).

      Reference: **DLP-528**

   d. Make working copies and backup copies of the original new generic program diskettes.

      Reference: **DLP-529**

   e. **Read the Software Release Description for software being installed.**

3. Before beginning the software installation, refer to the Software Release Description for the software being installed for a description of any special considerations required when installing this version of the software.

4. ⇒ NOTE:
   Software download procedure must be initiated from *MS-DOS* environment. It should not be initiated from a windows environment.

   Start *MS-DOS* operating system on the PC [**DLP-529**].

   Response: PC displays the prompt (for example, `C>`, `C:/DOS>`) determined by the PC.

5. If you are going to use the PC hard disk to load software to the shelf, **copy** all files on the source diskettes(s) (floppies) to a directory on the hard disk (for example, GEN_511 for generic version 5.1.1).

6. If you are going to load the software from the hard disk, use the **cd** command to change to the appropriate hard drive directory containing the software.

   If you are going to load the software from the floppies, use the appropriate *MS-DOS* command (for example, **a:** or **b:**) to go to the drive where the floppy disk will be installed.

   Response: PC displays the appropriate prompt (A>, B>, C>, C:/DOS>, etc.) determined by the PC.

   Comment: If you are using floppies and get a disk error message, verify the drive latch is locked and that you have the proper diskette installed in the drive.

7. ⇒ **NOTE:**
   The new generic program may be on many floppy disks. If you are using the floppy disks, the PC will prompt you to insert disks as needed after the first disk is installed.

   If you are using the floppy disks, insert the first (number 1) floppy disk into the PC drive.

8. ⇒ NOTE:
The **checkpgm** command may take up to 25 minutes to complete.

Execute the command **checkpgm** to check the version number of the program you are installing. If using floppy disks, insert each diskette when prompted.

approx. 15 min. if using hard drive **approx. 25 min. if using floppy drive**

Response: `PC has DDM-2000 program version a.b.c`

9. ⇒ NOTE 1:
The shelf rear access CIT port is configured for a modem. A null modem is required to use this port with the PC.

⇒ NOTE 2:
The cable from the **CIT** port on the DDM-2000 must be connected to the **COM** (**COM1 or COM2**) RS-232 port of the PC. If a "**P**" or "**d**" is displayed in the **FE ID** display, the PC must be connected to the front **CIT** port.

Connect PC to **CIT** port by connecting one end of an RS-232 cable to the **COM( )** port of the PC and the other end of the cable to the front or rear DDM-2000 **CIT** port.

10. ⇒ NOTE:
The **FE ID** display on the **SYSCTL** will show one of the following preceding software installation:

a. The letter **P** displayed in the **FE ID** display indicates that no software is installed in the **SYSCTL**. If the **P** is followed by a period (**P.**), it means that a previous download attempt has failed and a new software download will have to be attempted either locally or remotely using the **`ins-prog:tid`** or **`cpy-prog:tid`** command. If there is no period (**P**) the software can only be downloaded locally.

b. Nothing displayed in the **FE ID** display indicates that compatible software is installed in the **OHCTL** and **SYSCTL**.

c. The letter **d** displayed in the **FE ID** display indicates the **OHCTL** has no software or that the software in the **OHCTL** and **SYSCTL** is incompatible.

d. The letter **U** displayed in the **FE ID** display indicates that **SYSCTL** Switch **S2** is not set properly for the type of shelf being equipped. Set circuit pack option switch [**DLP-510**].

e. The letter **E** displayed in the **FE ID** display indicates that the **SYSCTL** must be replaced. Replace the **SYSCTL** [**DLP-557**] and repeat this procedure.

f. The letter **F** displayed in the **FE ID** display indicates that the **SYSCTL** faceplate latch is not fully latched. Latch the faceplate. (A reset occurs after the faceplate is latched.)

g. A flashing letter **L** displayed in the **FE ID** display indicates a low voltage condition (brownout) on the shelf. Clear trouble using **TAP-111**.

Does the **FE ID** display on the **SYSCTL** display a "**P**"?

If **YES**, then continue with **Step 11**.
If **NO**, then proceed to **Step 15**.

Letter "P" in FE ID Display

11. ⇒ NOTE:
If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

Enter **term** or **term COM***n* command, where *n* = 1 or 2. If **term** is entered without the **COM***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", disregard it.

approx. 15-45 min.

Response: Two brief messages are printed and you are instructed to `Press any key to continue . . .` after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows within 2 minutes:

```
CTRM ready. (Type Alt-h for help.)
Communications established.

p

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress . . . .
```

The dots continue to print until program installation is complete. If using floppies, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog:TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

12. Was response correct?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 13**.

13. If the download does not start, as indicated by the `In progress` message and rows of dots, within 2 minutes after pressing any key, try the following:

    a. Ensure first (number 1) disk of program being installed is inserted, if using floppies.

    b. Ensure diskette is inserted in correct drive.

    c. Ensure the proper command was used to go to the drive with the diskette or to the proper directory containing the software.

    d. Check for invalid COM port. Exit TERM (Alt-F2), then restart TERM using **term COM1** or **term COM2**.

    e. If the download still does not start, exit CTRM, restart TERM and change the CTRM baud rate as follows: if the baud rate is currently set to 9600, change it to 4800 or if the baud rate is currently set to 4800, change it to 9600. The baud rate is changed by momentarily depressing the "Alt C" keys, using the RETURN key to move to the "Speed" field, pressing the "Space" bar until the desired rate appears, and then momentarily depressing the "Escape/Esc" key to activate the new baud rate.

    If the download starts and fails during its progress, refer to **Trouble Clearing: TAP-116**.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Is the **FE ID** display on the **SYSCTL** display blank?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 27**.

FE ID Display Blank

16. ⇒ NOTE:
Ensure PC is connected to the front CIT (CIT-1). If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

Enter **term** or **term COM***n* command, where *n* = 1 or 2. If **term** is entered without the **COM***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", disregard it.

approx. 15-45 min.

Response: Two brief messages are printed and you are instructed to `Press any key to continue . . .` after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows:

```
CTRM ready. (Type Alt-h for help.)
Communications established.
```

17. ⇒ NOTE:
The default shelf is the shelf physically connected to the PC. To set baud rate automatically, enter two carriage returns (**<cr>**), two lower case "a"s (**aa**), or two upper case "A"s (**AA**). All other characters are ignored.

Enter two carriage returns.

Response: PC prompts with:

```
/* Enter a shelf number from 1 to 8 */
shelf [default] =
```

18. Was response correct?

    If **YES**, then proceed to **Step 20**.
    If **NO**, then continue with **Step 19**.

19. Check PC to **CIT** port connections. Make sure the cable is connected between the PC **COM( )** port and the **CIT** port on the DDM-2000. If the rear **CIT** port is being used on the DDM-2000, make sure a null modem is installed on the port. Check CTRM setup and make sure the **comm** port selected matches the port (**COM( )**) on the PC that is connected to the **CIT** port on the shelf. Check if CIT bay mult cabling is connected to this shelf but not terminated at another shelf.

    Repeat this procedure from Step 16.

20. Enter the shelf number for the shelf being used for new program download.

    Response: PC responds with:

```
login<
password<

    /************************************
    *                                   *
    *         Lucent Technologies       *
    *        Bell Labs Innovations      *
    *      DDM-2000 OC-12 Multiplexer   *
    *                                   *
    *           Release a.b.c           *
    *                                   *
    ************************************/

                      .
                      .
                      .

    TID date time
 M  rtrv-alm: all COMPLD
    /* Active Alarms and Status Report
```

21. ⇒ **NOTE:**
After the system prompt (<), the system will respond normally to commands entered. The Commands and Reports section of this manual gives a description of the commands.

Use **rtrv-ne** command to retrieve the name (*tid*) of the shelf having new program installed or see TID in response above.

22. If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

23. Enter the command **ins-prog:***tid*

Where tid = the target identifier (shelf name) for the DDM-2000 shelf having the new program installed.

Response: `/* Testing For Program Installation... */`

After several seconds, the PC prints a `Caution!` message followed by the prompt:

`Execute? y/n =.`

24. Was response correct?

    If **YES**, then continue with **Step 25**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

25. Enter a *y* or *yes* and a carriage return to execute the program.

    approx. 15-45 min.

    Response: **ABN** LED lights on User Panel and a **P** is displayed in **SYSCTL FE ID** display in the shelf receiving the program. PC starts download and prints the following message:

    ```
    p

    Searching for optimal transfer rate.
    Handshake established at <baudrate> baud.

    In progress . . . .
    ```

    The dots continue to print until program installation is complete. If floppy disks are being used, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

    ```
    ins-prog:TID COMPLD
    /* Generic a.b.c is installed */
    ```

    The **SYSCTL** resets, and the terminal is logged off the system. The LEDs go off on the User Panel and **SYSCTL**.

26. Was response correct?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then do **Trouble Clearing: TAP-116**.

Letter "d" in FE ID Display

27. ⇒ NOTE:
Ensure PC is connected to the front CIT (CIT-1). If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

Enter **term** or **term COM***n* command, where *n* = 1 or 2. If **term** is entered without the **COM***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", disregard it.

approx. 15-45 min.

Response: Two brief messages are printed and you are instructed to `Press any key to continue . . .` after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows:

```
CTRM ready. (Type Alt-h for help.)
Communications established.
```

28. Unplug and reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display (approximately 15 seconds).

approx. 15-45 min.

Response: PC starts download and prints the following message:

```
p

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress . . . .
```

The dots continue to print until program installation is complete. If using the floppy disks, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog:TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

29. Was response correct?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then continue with **Step 30**.

30. Check that the DDM-2000 is connected to the PC through the **COM** port. If it is not, reconnect the PC to DDM-2000 using the **COM** port and repeat the procedure.

    If the download still does not start, as indicated by the `In progress` message and rows of dots, within 2 minutes after the **P** appears in the **FE ID** display, change the CTRM baud rate as follows and repeat this procedure: if the baud rate is currently set to 9600, change it to 4800 or if the baud rate is currently set to 4800, change it to 9600. The baud rate is changed by:

    1. Momentarily depress the "Alt C" keys.
    2. Use the RETURN key to move to the "Speed" field.
    3. Press the "Space" bar until the desired rate appears.
    4. Momentarily depress the "Escape/Esc" key to activate the new baud rate.

    If the download starts and fails during its progress, refer to **Trouble Clearing: TAP-116**.

Condition and Connect Modems to Establish Communication From Remote CIT Location

1. ⚠ CAUTION:
DDM-2000 circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in **Trouble Clearing: TAD-100.**

NOTE 1:
This procedure may be used to connect modems and a craft interface terminal (CIT) to the DDM-2000 OC-12 Multiplexer system for use in provisioning the system from a remote location.

NOTE 2:
This procedure must be performed at both the DDM-2000 location and remote CIT location to set the parameters of modems and terminal.

NOTE 3:
Modems supporting a large set of options and error detection capabilities may require other options to be set before using the modems to download generic software. Refer to manufacturer's manuals for instructions on setting modem parameters.

Verify the generic parameters of the modem are set to the following:

- 300, 1200, 2400, 4800, 9600, or 19,200 baud

  The Lucent Technologies 4024 and 2224 CEO modems support 1200 and 2400 baud rates. The Lucent Technologies 2296 modem supports 4800 or 9600 baud rates.
- Full duplex
- 8 data bits
- No parity bits
- 1 start bit
- 1 stop bit
- No flow control
- Transparent data mode - ON (Required for software download on some modems.)
- Direct operating mode - ON (Required for software download on some modems.).

2. Are you at the DDM-2000 location or remote CIT location?

   If **DDM-2000 LOCATION**, continue with **Step 3**.
   If **REMOTE CIT LOCATION**, proceed to **Step 7**.

3. Set the modem to answer incoming calls. For example, if you are using an Lucent Technologies 2224 CEO modem, do the following to program the modem:

   a. NOTE:
      It is assumed the PC and modem ("AT" command compatible) are powered and the PC is loaded with communications software.

      Set all front panel switches to DOWN (factory default) for AT command mode.

   b. Connect PC serial port to the modem RS-232C port using modem cable or using a null modem adapter.

   c. Establish communications between the PC and modem using the communications software set for the generic parameters in Step 2.

   d. At the prompt, enter the following "AT" commands.

PC	Response	Comment
ATH	OK	#hang-up (on-hook)
AT&F	OK	#resets to factory defaults
AT&C1	OK	#data carrier is present when on
ATS0=2	OK	answer on 2 rings
AT&W	OK	wait for second dial tone

4. Remove the connector at the PC serial port and plug into the front (requires null modem) or rear access port on the DDM-2000 shelf. Dialup access to the network element via the modem is now ready. Tables A and B show the EIA-232-D pins required for use with the DDM-2000.

Table A. Pin Connections for Modem Using DB-25 Cable

EIA-232-D Pin	Front Access CIT (DCE)	Rear Access CIT (DTE) Modem Port
Pin 2 - Circuit BA Transmitted Data	Carries data from terminal or modem to DDM-2000	Carries data from DDM-2000 to modem or terminal
Pin 3 - Circuit BB Received Data	Carries data from DDM-2000 to terminal or modem	Carries data from modem or terminal to DDM-2000
Pin 7 - Circuit AB Signal Ground	Signal ground	Signal ground
Pin 8 - Circuit CF Received Line Signal Detector	Not used	Indicates to DDM-2000 that Modem or terminal is connected
Pin 20 - Circuit CD DTE Ready	Indicates to DDM-2000 that modem or terminal is connected	Indicates to modem or terminal that DDM-2000 is connected (always ON when **SYSCTL** is powered)

Table B. Pin Connections for Modem Using DB-9 Cable

PC DB-9 Connector	CIT
Pin 1 - Carrier Detect	This modem detects carrier from the remote modem.
Pin 2 - Receive Data	Receives data from modem
Pin 3 - Transmit Data	Transmits data to the modem
Pin 4 - Data Terminal Ready	CIT notifies the modem that they are connected
Pin 5 - Signal ground	Signal ground
Pin 6 - Data Set Ready	Modem notifies the CIT that the modem is connected and ready to receive data.
Pin 7 - Request to Send	CIT is requesting clearance from the modem so it can send data.
Pin 8 - Clear to Send	Modem notifies the CIT that it is clear to send.
Pin 9 - Ring indicator	Modem notifies the CIT that ring signal is present when the modem is in an auto-answer mode.

5. Verify the telephone line is plugged into the modem.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Remote CIT Location

7. At the remote CIT location, set the terminal parameters to match those set at the DDM-2000 location. Refer to manufacturer's manual for instructions on setting modem parameters.

8. Connect the remote modem to the CIT terminal using the appropriate modem cable. Tables B and C list the pins for the DB-25 connector and DB-9 connector, respectively.

9. Verify the telephone line is plugged into the modem.

10. **NOTE 1:**
    Characters other than a question mark (?), carriage return (<cr>), semicolon (;), dollar sign ($), or the numbers 1 through 8 are ignored. Typing a carriage return more than twice by mistake will cause the system to start a session with the default shelf. The default shelf is the shelf that is physically connected to the CIT.

    NOTE 2:
    Security is available to protect against unauthorized access to the system. If security is enabled, users must enter a valid login and password to access the system.

    Dial into the DDM-2000 system by entering the correct telephone number. When the modem at the DDM-2000 end answers, establish a login session by pressing RETURN (<cr>) until the system answers. CIT should return with the following prompt:

    ```
    /* Enter a shelf number from 1 to 8 */
    shelf [default] =
    ```

11. **NOTE:**
    Entering just a carriage RETURN at the shelf prompt will connect you to the shelf physically connected to the CIT.

    Enter the shelf number and/or carriage RETURN for the shelf being accessed.

    Response: CIT prompts with `login <`

12. ⇒ **NOTE:**
Systems with security always have three privileged user logins to minimize the chance that both users will forget their passwords at the same time. You must be logged into the system as a *privileged user* to set security; add, change, or delete logins; and to execute some commands. The default *privileged user* logins for Releases 5.1 and later are LUC01 (uppercase LUC-zero-one), LUC02 (uppercase LUC-zero-two), and LUC03 (uppercase LUC-zero-three). The default *privileged user* logins for Release 5.0 and earlier are ATT01 (uppercase ATT-zero-one), ATT02 (uppercase ATT-zero-two), and ATT03 (uppercase ATT-zero-three). The default *privileged user* password is DDM-2000. The login banner for Release 5.0 and earlier reads: `AT&T, DDM-2000 OC-12 Multiplexer, Release a.b.c.`

If security has been enabled, enter your login, and then enter your password when prompted.

If security has not been enabled, enter a carriage RETURN.

Response: CIT prints the following message followed by a proprietary system message and an alarm and status report:

```
/************************************
*                                   *
*         Lucent Technologies       *
*        Bell Labs Innovations      *
*      DDM-2000 OC-12 Multiplexer   *
*                                   *
*           Release a.b.c           *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

13. NOTE 1:
The system prompt may be something other than < if there is an alarm condition (for example, if there is an MJ alarm condition on the system, the prompt will be MJ <).

NOTE 2:
After the prompt (<), the system will respond to commands entered. The command **set-link:pg=( )** may be used to set the vertical size of the displayed page on the CIT. Page (**pg**) length may be set from 3 to 150 lines with a default length of 24 lines. The page length is set to default each time a new CIT session is started.

See the Commands and Reports section of this manual for a description of the command formats.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clean Optical Fibers, Connectors, and Lightguide Buildouts (LBOs)

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

NOTE:
All optical fiber connectors (*ST*®, FC/PC, and SC types), lightguide buildouts, and buildout blocks or equivalent should be cleaned before making initial connections or reconnections per the following instructions. Only the components being assembled at this particular time should be cleaned.

Keep all dust caps and plugs in place until time to make connections.

Clean optical fibers and connectors on **OLIU** or LBOs.

If **21D/21G OLIU**, go to **Step 2**.
If **23G/23H OLIU** using *ST* connectors, go to **Step 7**.
If **21D-U/21G-U/21G2-U/23G-U/23H-U OLIU** using universal LBOs, go to **Step 12**.
If in-line **LBO**s, go to **Step 20**.
If **lightguide fibers**, go to **Step 26**.

2. On printed wiring board side of **OLIU** faceplate, disconnect one of *ST* connectors from faceplate coupling.

3. Clean end and sides of connector tips with lint-free, optical quality tissue moistened with isopropyl alcohol.

4. Carefully wipe connector end again with clean, dry, lint-free optical quality tissue.

5. Blow any lint or dust from connector using canned air at least 3 inches (8 cm) from face of connector.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Remove **LBO** from **OUT** connector on **23G/23H OLIU**, if necessary.

   Reference: **DLP-538**

8. Clean couplings on faceplate of **23G/23H OLIU** or by rotating a pipe cleaner, moistened with isopropyl alcohol, inside coupling.

9. Blow any lint or dust from inside coupling, using canned air at least 3 inches (8 cm) from coupling.

10. Install *ST* connectors onto coupling by aligning mark on rim of connector body with slot in coupling. Push connector onto coupling with clockwise twist-locking motion.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. Remove lightguide connector from buildout (if necessary).

13. Remove lightguide buildout from buildout block by unlocking tab and pushing in and turning in counter-clockwise direction (if necessary).

    Reference: **DLP-538**

14. Clean the end and the sides of the connectors, buildouts, and blocks with a lint-free, optical quality tissue dampened with isopropyl alcohol.

15. Carefully wipe the connector, buildouts, and blocks again with a clean, dry, lint-free optical quality tissue.

16. Blow any lint or dust from the connectors, buildouts, and blocks using canned air held at least 3 inches (8 cm) away.

17. Clean the inside of the block using a pipe cleaner moistened with isopropyl alcohol.

18. Blow any lint or dust from inside the block, using canned air at least 3 inches (8 cm) away.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

20. Is LBO 0 dB or attenuated?

    If **0 dB LBO**, go to **Step 21**.
    If **attenuated LBO**, go to **Step 24**.

21. Clean LBO by placing a pipe cleaner, moistened with isopropyl alcohol, inside LBO and rotating the pipe cleaner.

22. Blow any lint or dust from inside the LBO, using canned air at least 3 inches (8 cm) from LBO.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

24. ⚠ CAUTION:
    Attenuated LBO has lens. Do not use pipe cleaner.

    Clean LBO by canned air only. Blow any lint or dust from inside LBO, using canned air at least 3 inches (8 cm) from LBO.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. Clean fiber-end face and sides of connector with lint-free, optical quality tissue moistened with isopropyl alcohol.

27. Carefully wipe fiber-end face and sides of connector again with clean, dry, lint-free optical quality tissue.

28. Blow any lint or dust from fiber-end face and sides of connector using canned air at least 3 inches (8 cm) from connector.

29. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make Cross-Connections Using CIT
Video Broadcast via OC-12 Backbone Ring

1. ⇒ NOTE 1:
   If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual: **`ent-crs-sts3c`**, **`rtrv-crs-sts3c`**, and **`dlt-crs-sts3c`**.

   ⇒ NOTE 2:
   You will have to login to more than one node in each ring to get a complete map of the network using the **`rtrv-map-network`** and **`rtrv-map-neighbor`** commands. If a drawing of the network is not provided with the work order or circuit order, it is recommended that you draw a simple schematic of the network before making cross-connections.

   Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

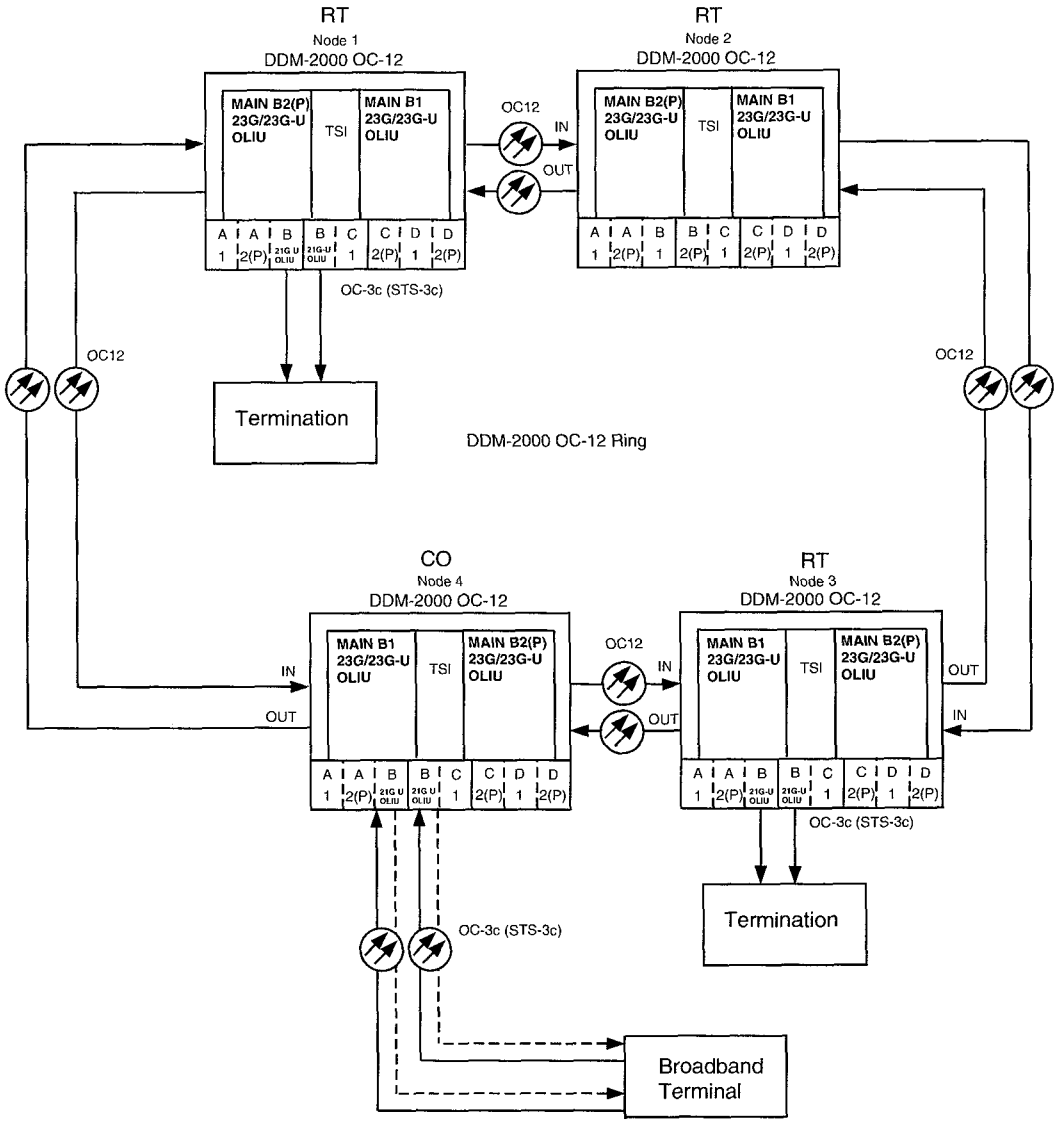


Figure 1. Sample Video Broadcast Network Schematic

Log in to any node in the network and use the **rtrv-map-network** and/or **rtrv-map-neighbor** command to retrieve a map of the network which lists all the nodes and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
    Node4 95-12-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-network:  COMPLD
 /* Network Map for Node4
   ================================================================================
    System Name            Comm.   Product                NE          Alarm
      (TID)                Status  Type                   Type        Group
   ================================================================================
   Node4                           DDM-2000 OC-12         DSNE          3
   Node3                           DDM-2000 OC-12         AGNE          3
   Node2                           DDM-2000 OC-12                       3
   Node1                           DDM-2000 OC-12                       3
 */
```

Figure 2. Sample Report From rtrv-map-network Command

```
    Node4 95-12-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Node7
   ================================================================================
                                       Link
    System Name            Connected   Comm.              Product
      (TID)                Through     Status             Type
   ================================================================================
   Node4                                                  DDM-2000 OC-12
   Node3                   main-b-2                       DDM-2000 OC-12
   Node1                   main-b-1                       DDM-2000 OC-12

 */
```

Figure 3. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is the same as specified on work order or circuit order.

3. ⇒ NOTE:
   Cross-connections consist of "drop and continue (rtv, not dc)" cross-connections at RT nodes, pass-through connections at non-terminating nodes, and CO cross-connections (cov). For example in Figure 4, drop and continue connections are made at Nodes 1 and 3. Pass-through cross-connections are made at Node 2. And CO cross-connections are made at Node 4. STS-3c circuits continuing through other networks require cross-connections be made in all interconnected networks, including other DDM-2000 OC-12 rings and FT-2000 OC-48 rings, as required.

   From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. From work order or circuit order, determine the OC-12 CO node that connects to the OC-3c source.

6. Use the **`rtrv-eqpt:`** command at each node in the network to verify that each shelf is properly equipped for the service being established. Ensure that **OLIU** circuit packs are installed in the correct slots in the OC-12 nodes.

7. From work order or circuit order, determine the STS-3c cross-connections to be made at each node.

8. Starting at the CO terminating node, use the **rtrv-crs-sts3c:** 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 STS-1 channels in the **OLIU**s in **FUNCTION UNITS B** group are to be connected to the second group of internal STS-1 channels (mb-4) in the **MAIN OLIU**s and the **rtrv-crs-sts3c** command shows that the cross-connection is already established, you should determine from office records if this channel 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-sts3c** command.

9. At all nonterminating pass-through nodes in the network, use the **ent-crs-sts3c:** command to provision pass-through connections. (For example in Figure 4, to make the STS-3c pass-through cross-connection at Node 2, use the **ent-crs-sts3c:mb-4,mb-4:cct=twoway** command.)

10. At the CO node of the circuit being established, use the **ent-crs-sts3c:address:cct=cov** command to make the terminating cross-connections (For example at Node 4 in Figure 4, use the **ent-crs-sts3c:mb-4,b-1:cct=cov** command to make cross-connections.)

11. At the RT terminating node site(s), use the **ent-crs-sts3c:address:cct=rtv** command to make proper cross-connections. (For example, in Figure 4 at Nodes 1 and 3, use the **ent-crs-sts3c:mb-4,b-1:cct=rtv** command to make cross-connections.)

12. Use the **rtrv-crs-sts3c:** command to verify that the proper connections have been made. If an improper cross-connection is made, use the **dlt-crs-sts3c:** command to delete the improper cross-connection and reenter the cross-connection.

13. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

14. If `ne-acty`, `inc. VT AIS`, `inc. STS1 AIS`, `inc. VT unequipped`, or `inc. STS1 unequipped` alarms are present, look for missing or improperly made cross-connections. Use **TAP-119** to locate missing cross-connections, if required.

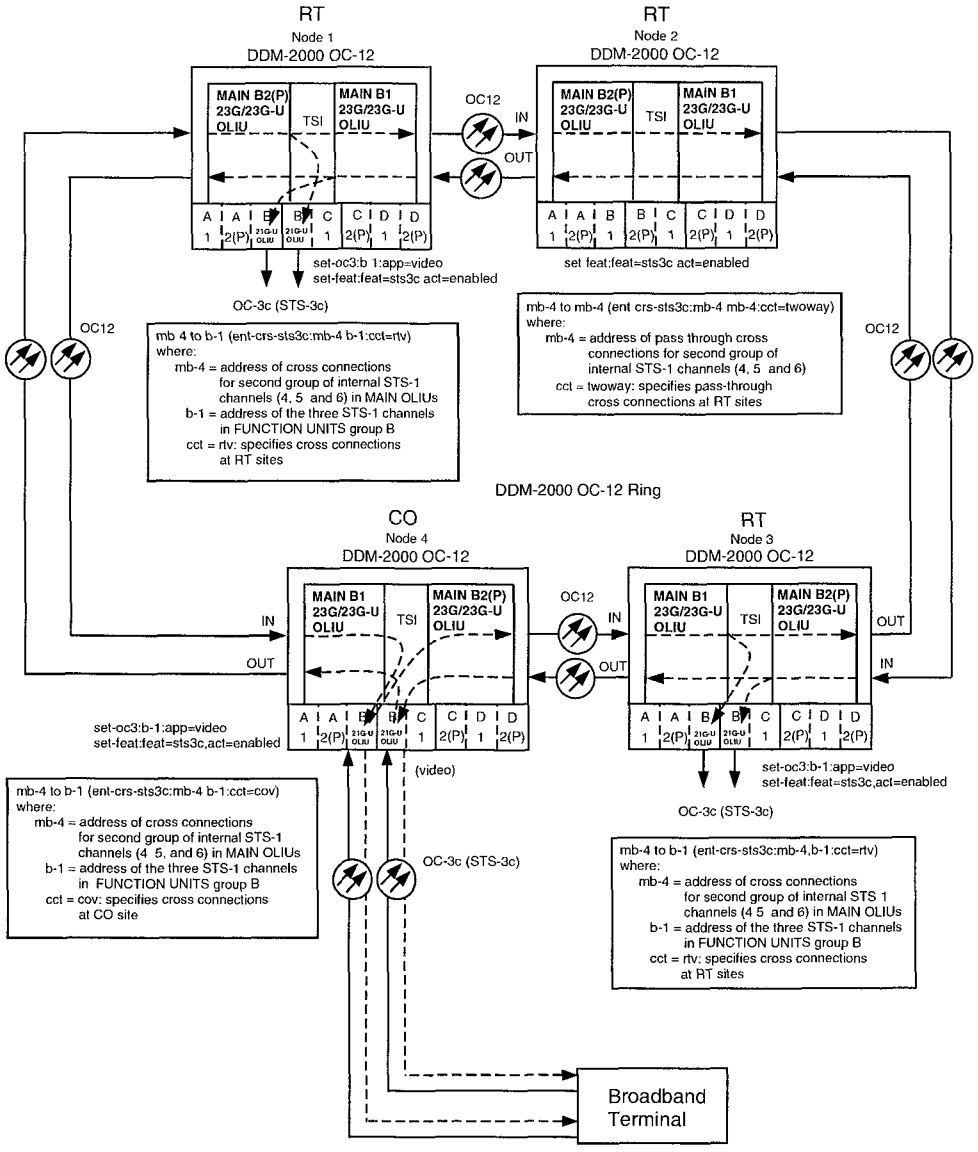


Figure 4. Example of Cross-connections for Video Broadcast Access via OC-12

Make Cross-Connections Using CIT
STS-3c Transport via OC-12 Backbone Ring

1. ⇒ NOTE 1:
   If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual: **`ent-crs-sts3c`**, **`rtrv-crs-sts3c`**, and **`dlt-crs-sts3c`**.

   ⇒ NOTE 2:
   You will have to login to more than one node in each ring to get a complete map of the network using the **`rtrv-map-network`** and **`rtrv-map-neighbor`** commands. If a drawing of the network is not provided with the work order or circuit order, it is recommended that you draw a simple schematic of the network before making cross-connections.

   Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

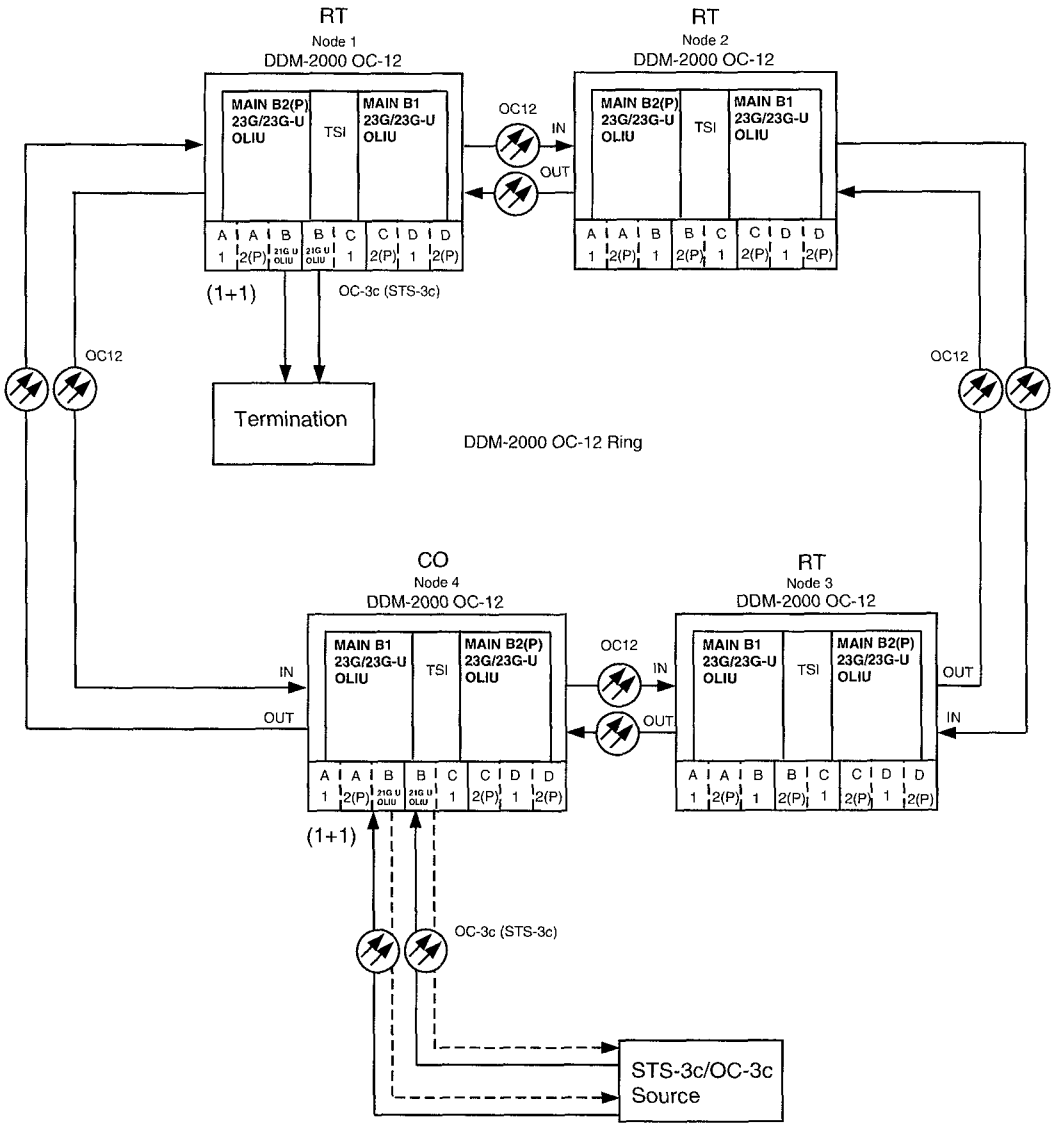


Figure 1. Sample STS-3c Transport Network Schematic

Log in to any node in the network and use the **rtrv-map-network** and/or **rtrv-map-neighbor** command to retrieve a map of the network which lists all the nodes and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
    Node4 95-12-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-network:  COMPLD
 /* Network Map for Node4
   ==========================================================================
    System Name           Comm.   Product              NE          Alarm
      (TID)               Status  Type                 Type        Group
   ==========================================================================
   Node4                          DDM-2000 OC-12       DSNE          3
   Node3                          DDM-2000 OC-12       AGNE          3
   Node2                          DDM-2000 OC-12                     3
   Node1                          DDM-2000 OC-12                     3
 */
```

Figure 2. Sample Report From rtrv-map-network Command

```
    Node4 95-12-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Node7
   ==========================================================================
                                 Link
    System Name           Connected    Comm.            Product
      (TID)               Through      Status           Type
   ==========================================================================
   Node4                                               DDM-2000 OC-12
   Node3                  main-b-2                     DDM-2000 OC-12
   Node1                  main-b-1                     DDM-2000 OC-12

 */
```

Figure 3. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is the same as specified on work order or circuit order.

3. ⇒ NOTE:
   Cross-connections consist of pass-through connections at non-terminating nodes and add/drop cross-connections at terminating nodes. For example in Figure 4, add/drop connections are made at Nodes 1 and 4. Pass-through cross-connections are made at Nodes 2 and 3. STS-3c circuits continuing through other subnetworks require cross-connections be made in all interconnected subnetworks, including other DDM-2000 OC-12 rings and FT-2000 OC-48 rings, as required.

   From work order or circuit order, determine the terminating nodes for the service being established.

4. From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the **`rtrv-eqpt:`** command at each node in the network to verify that each shelf is properly equipped for the service being established. Ensure that **OLIU** circuit packs are installed in the correct slots in the OC-12 nodes.

6. From work order or circuit order, determine the STS-3c cross-connections to be made at each node.

7. Starting at the CO terminating node, use the **rtrv-crs-sts3c:** 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 STS-1 channels in the **OLIU**s in **FUNCTION UNITS B** group are to be connected to the second group of internal STS-1 channels (mb-4) in the **MAIN OLIU**s and the **rtrv-crs-sts3c** command shows that the cross-connection is already established, you should determine from office records if this channel 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-sts3c** command.

8. At all nonterminating pass-through nodes in the network, use the **ent-crs-sts3c:** command to provision pass-through connections. (For example in Figure 4, to make the STS-3c pass-through cross-connection at Node 2, use the **ent-crs-sts3c:mb-4,mb-4:cct=twoway** command.)

9. At the CO node of the circuit being established, use the **ent-crs-sts3c:address:cct=twoway** command to make the terminating cross-connections (For example at Node 4 in Figure 4, use the **ent-crs-sts3c:mb-4,b-1:cct=twoway** command to make cross-connections.)

10. At the RT terminating node site, use the **ent-crs-sts3c:address:cct=twoway** command to make proper cross-connections. (For example, in Figure 4 at Node 1, use the **ent-crs-sts3c:mb-4,b-1:cct=twoway** command to make cross-connections.)

11. Use the **rtrv-crs-sts3c:** command to verify that the proper connections have been made. If an improper cross-connection is made, use the **dlt-crs-sts3c:** command to delete the improper cross-connection and reenter the cross-connection.

12. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

13. If `ne-acty, inc. VT AIS, inc. STS1 AIS, inc. VT unequipped,` or `inc. STS1 unequipped` alarms are present, look for missing or improperly made cross-connections. Use **TAP-119** to locate missing cross-connections, if required.

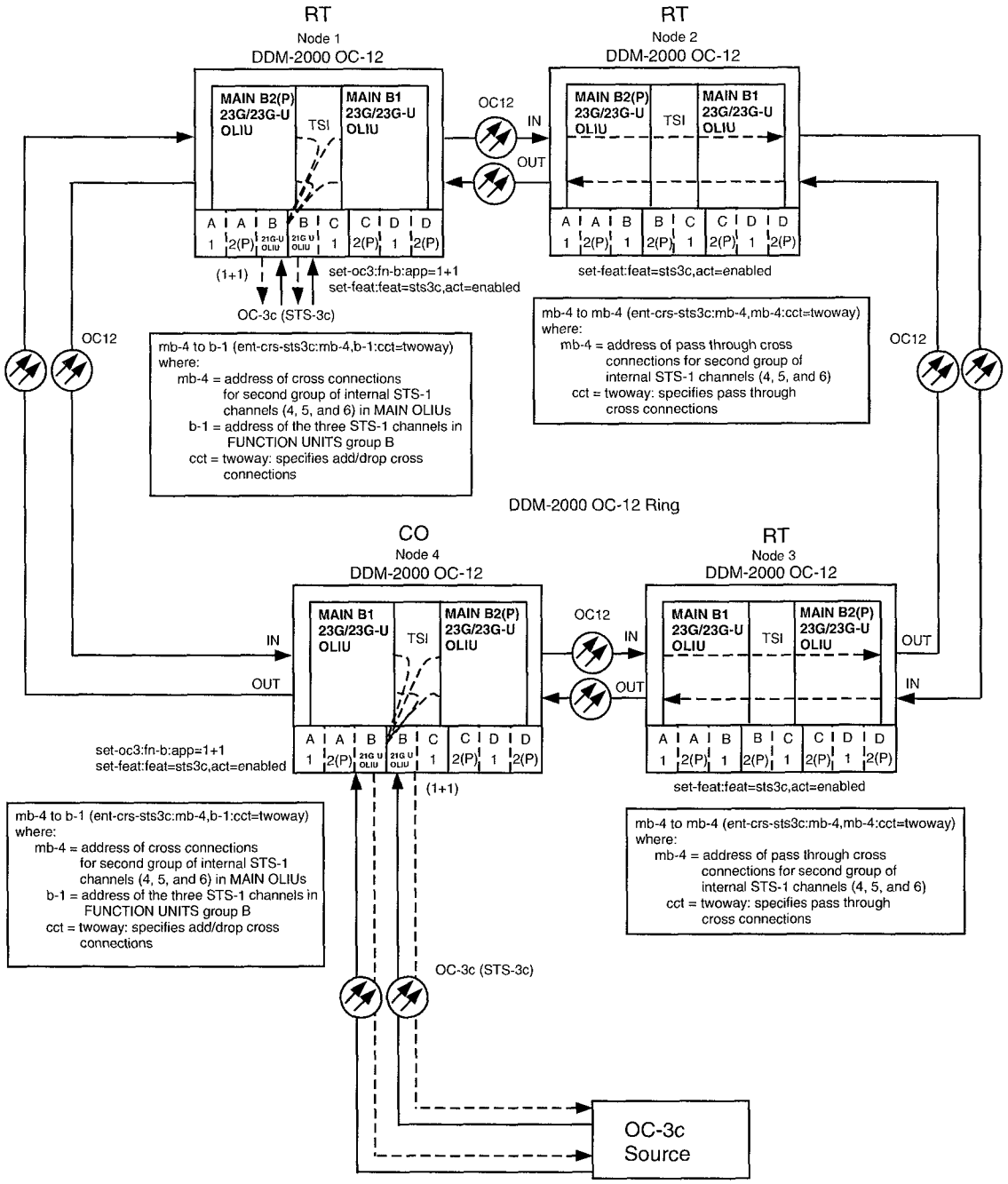


Figure 4. Example of Cross-connections for STS-3c Transport Access via OC-12

Operate FE SEL Pushbutton on SYSCTL

1. NOTE 1:
The **FE SEL** pushbutton on the **SYSCTL** can be used to display the near-end and far-end alarm/status condition. The 7-segment **FE ID** display indicates which site/shelf conditions are currently being displayed on the local User Panel. When the 7-segment display is blank, a composite of the local and far-end alarm and status conditions is displayed on the User Panel.

NOTE 2:
When the **FE SEL** pushbutton is pushed for the first time, the **FE ID** display shows **L.** and the User Panel LEDs show the conditions of the local shelf only.

If the **FE SEL** pushbutton is pushed again within 15 seconds, the **FE ID** display shows the local shelf SITE address (with the decimal point), and the User Panel LEDs show the alarm and status condition of all shelves at this site. In OC-3 applications, there will be only one shelf at each site and the set of LEDs lighted will be the same for the first and second button pushes. In OC-3/OC-12 applications, there may be up to five shelves at one site. The first button push allows isolation of a fault to a single shelf at the local site, and subsequent button pushes allow isolation of a fault to the local site or one of the remote sites.

In OC-3/OC-12 applications, each time the **FE SEL** button is pushed again within 15 seconds, the **FE ID** display and User Panel increment to display the next highest SITE address in the network and the alarm or status condition of the shelves at that site. If the local DDM-2000 OC-12 Multiplexer cannot communicate with another site due to a failure, all LEDs on the User Panel will be lighted when the FE ID display shows that site number. In OC-3 applications, each time the **FE SEL** button is pushed again within 15 seconds, the **FE ID** display increments to display the next highest SITE address in the network and the User Panel LEDs show the composite alarm and status condition of the shelves in the network at that site. If the local DDM-2000 OC-3 Multiplexer cannot communicate with another site due to a failure, then all LEDs on the User Panel will be lighted when the **FE ID** display shows that site number.

If there are more than eight sites, a dash will appear in the **FE ID** display for each site greater than eight. After cycling through the sites, **L.** and the conditions of the local shelf are again displayed.

When the **FE SEL** is released and not pushed again for 15 seconds, or if the **ACO/TST** pushbutton is pushed, the **FE ID** display will go blank and the User Panel will return to the composite display.

Momentarily depress and release the **FE SEL** pushbutton until the required SITE address and conditions are displayed.

2. Note the alarm LEDs displayed on the local User Panel. You have **15 seconds** to observe the alarm indications.

3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Retrieve Generic Software Version ID

1. Is CIT available?

   If **YES**, then continue with **Step 2**.
   If **NO**, then proceed to **Step 5**.

2. Connect CIT to User Panel and establish session.

   Reference: **DLP-516**

3. Use **`rtrv-eqpt:sysctl`** command to retrieve generic software version number.

   Response: System outputs an `Equipage and Version Report` which contains program version presently loaded into system.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. ⇒ NOTE:
When the **ACO/TST** pushbutton is depressed, all LEDs and 7-segment display on the **SYSCTL** light. If the **ACO/TST** pushbutton is released within 2 seconds, LED test completes and 7-segment display and all LEDs will revert to normal operation. If the **ACO/TST** pushbutton is depressed longer than 2 seconds, 7-segment display goes blank for 2 seconds and then each digit of the generic software version code is scrolled through the display. The LEDs remain lighted while the code is being displayed. When the **ACO/TST** pushbutton is released, the LEDs remain lighted until the full software version code is displayed. If the **ACO/TST** pushbutton is still depressed when the software version code has completed cycling, the display goes blank for 2 seconds and starts cycling through the software version code again. This continues as long as the **ACO/TST** pushbutton is depressed. When the **ACO/TST** pushbutton is released, the cycle will complete and the display and all LEDs go to normal operation.

Depress and hold (for longer than 2 seconds) the **ACO/TST** pushbutton on the User Panel.

Response: All LEDs and the 7-segment display light. Display goes blank for 2 seconds and then scrolls through the full software version code.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install New Software Generic Program
In-Service System
Local Shelf Download

1. NOTE 1:
This procedure is used to install a new software program in a local in-service DDM-2000 OC-12 shelf. For procedures to download software in a new shelf (initial installation), see **DLP-520**. For procedures to download software to a remote shelf (using `ins-prog` or `cpy-prog` command), see **DLP-530**.

Verify that no DCC failures or transmission failures (OC-12 LOS, flashing **OLIU FAULT** LEDs, etc.) are present on the network element or system receiving the program.

2. 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 some upgrades, system tests, or training classes), if the system is in service and a version of software is being installed that is not compatible with the current transmission configuration, it may be necessary to remove the* **TGS** *circuit pack in* **TIMING** *slot* **1** *to force the system to run the software you are trying to download. If both* **TGS** *circuit packs are not installed, removal of the only* **TGS** *circuit pack will cause service interruption.*

NOTE 1:
When upgrading from releases without synchronization messaging to releases with this feature, it is suggested to upgrade first the shelves which are provisioned for "external timed" or "external mult" timed. This is to prevent timing "holdover" conditions at nodes that derive timing from the OC-12 line.

NOTE 2:
If a shelf is in the STS3c mode (**sts3c** mode enabled by the **set-feat** command) and a different software generic that does not have the STS3c feature is loaded, the **OLIU**s will stay in the **sts3c** mode until they are removed and reseated.

NOTE 3:
The following step is recommended to protect against a loss of service because of inadvertently loading incompatible software. But, if you are **sure** that you want to load incompatible software, 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**.

3. Obtain the following equipment:
   (1) IBM* compatible personal computer (PC) running an *MS-DOS*† computer program operating system, Release 2.1 or later.

   (2) RS-232 cable to connect PC **COM** port to User panel **CIT** port.

   NOTE:
   The PC may be connected to either the front or rear CIT port, or remotely through a dial-up modem. If connected to the rear **CIT** port, a null modem is required between the RS-232 cable and the rear **CIT** port.

   (3) Working copies of the new system generic program diskette(s).

   (4) Software Release Description for software being installed.

---

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† Registered Trademark of Microsoft Corporation

4. Before beginning this procedure, the following is strongly suggested:
   a. Become familiar with the characteristics and operating procedures of your PC and the *MS-DOS* operating system.

      Reference: **DLP-528**

   b. Operate laptop PCs on AC power during download procedures.

   c. Follow proper procedures in handling the diskette(s) (floppies).

      Reference: **DLP-528**

   d. Make working copies and backup copies of the original new generic program diskettes.

      Reference: **DLP-529**

   e. **Read the Software Release Description for software being installed.**

5. Before beginning the software installation, refer to the Software Release Description for the software being installed for a description of any special considerations required when installing this version of the software.

6. ⇒ NOTE:
   Software download procedure must be initiated from *MS-DOS* environment. It should not be initiated from a windows environment.

   Start *MS-DOS* operating system on the PC [**DLP-529**].

   Response: PC displays the prompt (for example, `C>`, `C:/DOS>`) determined by the PC.

7. If you are going to use the PC hard disk to load software to the shelf, **copy** all files on the source diskettes(s) (floppies) to a directory on the hard disk (for example, GEN_511 for generic version 5.1.1).

8. If you are going to load the software from the hard disk, use the **cd** command to change to the appropriate hard drive directory containing the software.

   If you are going to load the software from the floppies, use the appropriate *MS-DOS* command (for example, **a:** or **b:**) to go to the drive where the floppy disk will be installed.

   Response: PC displays the appropriate prompt (`A>`, `B>`, `C>`, `C:/DOS>`, etc.) determined by the PC.

   Comment: If you are using floppies and get a disk error message, verify the drive latch is locked and that you have the proper diskette installed in the drive.

9. ⇒ **NOTE:**
   The new generic program may be on many floppy disks. If you are using the floppy disks, the PC will prompt you to insert disks as needed after the first disk is installed.

   If you are using the floppy disks, insert the first (number 1) floppy disk into the PC drive.

10. ⇒ NOTE:
The **checkpgm** command may take up to 25 minutes to complete.

Execute the command **checkpgm** to check the version number of the program you are installing. If using floppy disks, insert each diskette when prompted.

approx. 15 min. if using hard drive approx. 25 min. if using floppy drive

Response: `PC has DDM-2000 program version a.b.c`

11. ⇒ NOTE 1:
The shelf rear access CIT port is configured for a modem. A null modem is required to use this port with the PC.

⇒ NOTE 2:
The cable from the **CIT** port on the DDM-2000 must be connected to the **COM** (**COM1 or COM2**) RS-232 port of the PC. If a "**P**" or "**d**" is displayed in the **FE ID** display, the PC must be connected to the front **CIT** port.

Connect PC to **CIT** port by connecting one end of an RS-232 cable to the **COM( )** port of the PC and the other end of the cable to the front or rear DDM-2000 **CIT** port.

12. ⇒ NOTE:
The **FE ID** display on the **SYSCTL** will show one of the following preceding software installation:

a. The letter **P** displayed in the **FE ID** display indicates that no software is installed in the **SYSCTL**. If the **P** is followed by a period (**P.**), it means that a previous download attempt has failed and a new software download will have to be attempted either locally or remotely using the **`ins-prog:tid`** or **`cpy-prog:tid`** command. If there is no period (**P**) the software can only be downloaded locally.

b. Nothing displayed in the **FE ID** display indicates that compatible software is installed in the **OHCTL** and **SYSCTL**.

c. The letter **d** displayed in the **FE ID** display indicates the **OHCTL** has no software or that the software in the **OHCTL** and **SYSCTL** is incompatible.

d. 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.

e. The letter **U** displayed in the **FE ID** display indicates that **SYSCTL** Switch **S2** is not set properly for the type of shelf being equipped. Set circuit pack option switch [**DLP-510**].

f. The letter **E** displayed in the **FE ID** display indicates that the **SYSCTL** must be replaced. Replace the **SYSCTL** [**DLP-501**] and repeat this procedure.

g. The letter **F** displayed in the **FE ID** display indicates that the **SYSCTL** faceplace latch is not fully latched. Latch the faceplate. (A reset occurs after the faceplate is latched.)

h. A flashing letter **L** displayed in the **FE ID** display indicates a low voltage condition (brownout) on the shelf. Clear trouble using **TAP-111**.

Does the **FE ID** display on the **SYSCTL** display a "**P**" or "**P.**"?

If **YES**, then continue with **Step 13**.
If **NO**, then proceed to **Step 18**.

Letter "P" in FE ID Display

13. NOTE 1:
If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

NOTE 2:
If a "**P.**" was displayed in the **FE ID** display, unseat and then reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a "**P**" appears in the **FE ID** display.

Enter **term** or **term COM***n* command, where *n* = 1 or 2. If **term** is entered without the **COM***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", disregard it.

approx. 15-45 min.

Response: Two brief messages are printed and you are instructed to `Press any key to continue . . .` after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows within 2 minutes:

```
Interface ready. (Type Alt-h for help.)
Communications established.

p

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress . . . .
```

The dots continue to print until program installation is complete. If using floppies, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog:TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

14. Was response correct?

    If **YES**, then continue with **Step 15**.
    If **NO**, then proceed to **Step 16**.

15. Did the letter "**C**" appear in the **FE ID** display?

    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **YES**, then proceed to **Step 36**.

16. If the download does not start, as indicated by the `In progress` message and rows of dots, within 2 minutes after pressing any key, try the following:

    a. Ensure first (number 1) disk of program being installed is inserted, if using floppies.

    b. Ensure diskette is inserted in correct drive.

    c. Ensure the proper command was used to go to the drive with the diskette or to the proper directory containing the software.

    d. Check for invalid COM port. Exit TERM (Alt-F2), then restart TERM using **term COM1** or **term COM2**.

    e. If the download still does not start, exit CTRM, restart TERM and change the CTRM baud rate as follows: if the baud rate is currently set to 9600, change it to 4800 or if the baud rate is currently set to 4800, change it to 9600. The baud rate is changed by momentarily depressing the "Alt C" keys, using the RETURN key to move to the "Speed" field, pressing the "Space" bar until the desired rate appears, and then momentarily depressing the "Escape/Esc" key to activate the new baud rate.

    If the download starts and fails during its progress, refer to **Trouble Clearing: TAP-116**.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. Is the **FE ID** display on the **SYSCTL** display blank?

    If **YES**, then continue with **Step 19**.
    If **NO**, then proceed to **Step 31**.

FE ID Display Blank

19. ⇒ NOTE:
Ensure PC is connected to the front CIT (CIT-1). If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

Enter **term** or **term COM***n* command, where *n* = 1 or 2. If **term** is entered without the **COM***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", disregard it.

approx. 15-45 min.

Response: Two brief messages are printed and you are instructed to `Press any key to continue . . .` after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows:

```
Interface ready. (Type Alt-h for help.)
Communications established.
```

20. ⇒ NOTE:
The default shelf is the shelf physically connected to the PC. To set baud rate automatically, enter two carriage returns (**<cr>**), two lower case "a"s (**aa**), or two upper case "A"s (**AA**). All other characters are ignored.

Enter two carriage returns.

Response: PC prompts with:

```
/* Enter a shelf number from 1 to 8 */
shelf [default] =
```

21. Was response correct?

If **YES**, then proceed to **Step 23**.
If **NO**, then continue with **Step 22**.

22. Check PC to **CIT** port connections. Make sure the cable is connected between the PC **COM( )** port and the **CIT** port on the DDM-2000. If the rear **CIT** port is being used on the DDM-2000, make sure a null modem is installed on the port. Check CTRM setup and make sure the **comm** port selected matches the port (**COM( )**) on the PC that is connected to the **CIT** port on the shelf. Check if CIT bay mult cabling is connected to this shelf but not terminated at another shelf.

Repeat this procedure from Step 19.

23. Enter the shelf number for the shelf being used for new program download.

    Response: PC responds with:

```
login<
password<

    /************************************
    *                                   *
    *         Lucent Technologies       *
    *        Bell Labs Innovations      *
    *      DDM-2000 OC-12 Multiplexer   *
    *                                   *
    *           Release a.b.c           *
    *                                   *
    ************************************/

                      .
                      .
                      .

    TID date time
 M  rtrv-alm: all COMPLD
    /* Active Alarms and Status Report
```

24. ⇒ **NOTE:**
    After the system prompt (<), the system will respond normally to commands entered. The Commands and Reports section of this manual gives a description of the commands.

    Use **rtrv-ne** command to retrieve the name (*tid*) of the shelf having new program installed or see TID in response above.

25. If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

26. Enter the command **ins-prog:** *tid*

    Where tid = the target identifier (shelf name) for the DDM-2000 shelf having the new program installed.

    Response: `/* Testing For Program Installation... */`

    After several seconds, the PC prints a `Caution!` message followed by the prompt:

    `Execute? y/n =.`

27. Was response correct?

    If **YES**, then continue with **Step 28**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

28. Enter a *y* or *yes* and a carriage return to execute the program.

    approx. 15-45 min.

    Response: **ABN** LED lights on User Panel and a **P** is displayed in **SYSCTL FE ID** display in the shelf receiving the program. PC starts download and prints the following message:

    ```
    p

    Searching for optimal transfer rate.
    Handshake established at <baudrate> baud.

    In progress . . . .
    ```

    The dots continue to print until program installation is complete. If floppy disks are being used, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

    ```
    ins-prog:TID COMPLD
    /* Generic a.b.c is installed */
    ```

    The **SYSCTL** resets, and the terminal is logged off the system. The LEDs go off on the User Panel and **SYSCTL**.

29. Was response correct?

    If **YES**, then continue with **Step 30**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

30. Did the letter "**C**" appear in the **FE ID** display?

    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **YES**, then proceed to **Step 36**.

Letter "d" in FE ID Display

31. ⇒ NOTE:
    Ensure PC is connected to the front CIT (CIT-1). If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

Enter **`term`** or **`term COM`***n* command, where *n* = 1 or 2. If **`term`** is entered without the **`COM`***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", disregard it.

approx. 15-45 min.

Response: Two brief messages are printed and you are instructed to `Press any key to continue . . .` after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows:

```
Interface ready. (Type Alt-h for help.)
Communications established.
```

32. Unplug and reseat the **SYSCTL** and immediately push and hold the **FE SEL** and **UPD/INIT** buttons at the same time until a **P** appears in the **FE ID** display (approximately 15 seconds).

approx. 15-45 min.

Response: PC starts download and prints the following message:

```
p

Searching for optimal transfer rate.
Handshake established at <baudrate> baud.

In progress . . . .
```

The dots continue to print until program installation is complete. If using the floppy disks, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

```
ins-prog:TID COMPLD
/* Generic a.b.c is installed */
```

The **SYSCTL** resets and the terminal is logged off the system.

33. Was response correct?

If **YES**, then continue with **Step 34**.
If **NO**, then proceed to **Step 35**.

34. Did the letter "**C**" appear in the **FE ID** display?

If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **YES**, then proceed to **Step 36**.

35. Check that the DDM-2000 is connected to the PC through the **COM** port. If it is not, reconnect the PC to DDM-2000 using the **COM** port and repeat the procedure.

    If the download still does not start, as indicated by the `In progress` message and rows of dots, within 2 minutes after the **P** appears in the **FE ID** display, change the CTRM baud rate as follows and repeat this procedure: if the baud rate is currently set to 9600, change it to 4800 or if the baud rate is currently set to 4800, change it to 9600. The baud rate is changed by:

    1. Momentarily depress the "Alt C" keys.
    2. Use the RETURN key to move to the "Speed" field.
    3. Press the "Space" bar until the desired rate appears.
    4. Momentarily depress the "Escape/Esc" key to activate the new baud rate.

    If the download starts and fails during its progress, refer to **Trouble Clearing: TAP-116**.

Letter "C" in FE ID display

36. ⚠ CAUTION:
If the system is in service and is forced to run the current software that is displaying a **C***, service interruption may result.*

NOTE:
Indications are that there may be a problem with the version of software you are installing or you are trying to install a version of software that will not support the system transmission configuration that you have. Under normal upgrade procedures, this indication should not occur. But, if you are downloading an older version of software or upgrading to a new version of software which has major changes or is incompatible with the version that you have, this indication will occur. You can *force* the system to run the current software or back out of this procedure by loading another version of software.

You must decide if you want the system to run this current version of software that has been loaded or if you want to download another version (original version or new version) of software.

Do you want to run the current version of software in the **SYSCTL**?

If **NO**, then continue with **Step 37**.
If **YES**, then proceed to **Step 38**.

37. Exit CTRM (Alt-F2). Find new version of software and repeat this procedure from Step 31.

38. To *force* the system to run the current software, perform the following:
    a. Ensure that a **TGS** circuit pack is installed in the **TGS-2** slot.
    b. Remove the **TGS-1** circuit pack, if not already removed.
    c. Reset (unplug and reseat) the **SYSCTL** to force it to run the current software.
    d. After the current software is up and running (no alarm LEDs lighted or you can log into the shelf), reinstall the **TGS-1** circuit pack.

39. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Introduction to the PC

General

This DLP provides a brief introduction to the PC. It includes proper handling and storage of diskettes and some of the important procedures you should follow when working with your PC. This DLP is a brief review of PC concepts. Refer to your PC user's guide for a complete description.

Anatomy of a PC

PCs vary in physical appearance and size, most *IBM** compatible PCs consist of three basic parts — a main unit, a monitor, and a keyboard. Note that some PCs, particularly portables, integrate the keyboard, monitor, and main unit into a briefcase-size package. The DDM-2000 generic program may be installed with either a desktop PC or a portable PC. The diskettes may be either 3-½ inch floppy disks or 5-¼ inch floppy disks.

Main Unit

The main unit of the PC contains the CPU (central processing unit), disk drive(s), and memory, among other things. All main units have some common features which include:

- ON/OFF Switch — This switch is used to switch the PC **ON** or **OFF**. It is usually located on the back of the PC, near where the AC power cord plugs in to the PC.
- Serial Port — This is the port which the PC uses to communicate with the customer equipment. When using the PC to install a new generic program to DDM-2000, the COM1 port must be used. Refer to your PC documentation to determine which port is the COM1 port. There are two types of serial port connectors:
  - — 25-pin RS-232 connector (male)
  - — 9-pin connector (male).

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If your PC has the 9-pin connector, you will need a serial port adapter which converts the 9-pin connector to a 25-pin connector. This is a cable which has a 9-pin connector on one end and a 25-pin male connector on the other end.

- Parallel Port — This port is used to connect to some printers.
- Disk Drives — PCs come in several basic types, some of which are as follows:
  - — Single floppy disk, no hard disk — This type PC is the most basic configuration. The PC has a single floppy disk drive, with no hard (fixed) disk. The floppy drive is referred to as drive **A**.
  - — Dual floppy disk, no hard disk — This type PC is identified by the two floppy disk drives installed. One floppy drive is referred to as drive **A**. The second is referred to as drive **B**.
  - — Single floppy disk with hard disk — This type PC has a single floppy disk drive and a hard disk, which can typically store 10 or more megabytes of data. The single floppy disk drive is referred to as drive **A**, and the hard disk is usually referred to as drive **C** .

Other combinations of floppy and hard drives are possible but all that is required is a single floppy drive as a minimum. The procedures in this manual for installing a new generic program indicate using drive **A**.

Monitor

The monitor, sometimes called a display screen, may be either monochrome or color.

Keyboard

The keyboard is used to enter commands. This section reviews some of the features of the keyboard and points out some of the special keys.

The keyboard is divided into two different sections:

- *Typewriter section* — This area has the alphanumeric keys that resemble the layout of a typewriter. In particular, you should locate the **ENTER** key (sometimes referred to as **RETURN**). This key is located on the right side of the typewriter section. It usually has the word **ENTER** or **RETURN** printed on the key. When you are asked to select **<ENTER>** or **RETURN**, you should momentarily depress that key, or equivalent.
- *Special Keys* — The keyboard has many special keys which are interpreted differently by various software packages. Locate the **CANCEL** or **DELETE** key. This key may be used to abort a command.

Rebooting the PC

Occasionally, you may have to reboot the PC. There are three ways to accomplish this:

- Power **ON/OFF** switch — If the PC is **OFF**, you should set the **ON/OFF** switch to the **ON** position. If the PC is already **ON**, it is preferable to reset it using one of the following two methods:
- **RESET** button — Not all PCs have a **RESET** button, but if yours does, it provides an easy way to reset the PC. Alternatively, the following method may work.
- Hold down the **CTRL**, **ALT**, and **DELETE** keys all at the same time.

If **RESET** or **CTRL**, **ALT**, and **DEL** keys are not effective, turn **OFF** the PC, wait a few seconds, and turn it back **ON**. Rebooting the PC clears all data you had in memory. If the time of day clock is not indicating the current time and date, set the time of day clock.

Diskettes — Care and Handling

Diskettes are sometimes called floppy disks, or floppies for short. Diskettes are similar to cassette tapes—magnetically encoded information is stored on the diskette for later retrieval. By adhering to the following guidelines you will increase the useful life of your diskettes:

DO:

— Keep the diskette in a protective envelope when not in use.

— Keep the diskette in a dry place.

— Keep the diskettes away from magnetic fields or objects (for example, magnetic screwdriver.)

DO NOT:

— Touch any of the exposed surfaces of the diskette itself; handle it by the edge of the jacket. Very tiny scratches, fingerprints, or dust can ruin a diskette.

— Bend a diskette.

— Write on a diskette label with a ballpoint pen or pencil. Use a felt-tipped pen instead. Write the label before applying it to the diskette if possible.

— Erase the diskette label with a pencil eraser. The dust may destroy the diskette. Instead, place a new label over the old one.

Inserting Diskettes

You should ***never*** remove or insert a diskette while the disk drive indicator light is on. (The computer turns the indicator light on to let you know that it is reading or writing from the disk.) Always wait for the indicator light to go off before opening the disk drive door. Failure to do this may result in damaging the diskette or loss of data on the diskette. Insert a diskette into a disk drive as follows:

1. Open the diskette drive door.
2. Gently insert the diskette with the label facing up and the notch on the left, if provided.
3. Slide the diskette in as far as it will go, but do not force it. You may hear a click when the diskette is all the way in.

   ⚠ CAUTION:
   Do not attempt to force the diskette into the drive.

   If resistance is felt or it does not slide in easily, remove the diskette and insert it again.
4. Close (latch) the disk drive door.

When you are instructed to insert a diskette into a drive, it is implied that you should open the door, slide the diskette in all the way, and close (latch) the door.

Removing Diskettes

Wait for the indicator light on the disk drive to go off. Open the disk drive door. The diskette may pop out for easy removal. (Opening up a disk drive door is similar to ejecting a cassette from a cassette recorder.) After the diskette has been removed, place it into its protective envelope or storage facility.

Copy Diskettes and Make Backups

General

If you are using new generic program diskettes for the first time, there are two things that you should do:

1. Create a working copy.
2. Make backup copies.

Before installing the program, it is a good idea to make backup copies of the working copy. If the working copy is ever lost or damaged, you will have a backup copy and will not have to create a new working copy from the original.

Create a Working Copy

The diskette(s) sent to you contains the new generic program software. However, before you can install this new program, you have to load the *MS-DOS** operating system software. (If you are not sure how to do this, instructions are given in the "Starting *MS-DOS* Software" section.) The new generic program software requires *MS-DOS* software (Release 2.1 or later).

To load the version of *MS-DOS* software, you can copy the *MS-DOS* onto the first diskette, and then copy the new generic program software to that diskette also. Once you have done that, simply insert that diskette into the drive and reboot the PC. The new diskette(s) that you create will be your working copy of the new generic program. The original diskette(s) that you received should be stored in a clean, dry place.

You will need the following to create a working copy:

- The *MS-DOS* software disk with Release 2.1 or later.
- A blank diskette(s) (this will become the working copy).
- The original diskette(s) containing the new generic program.

---

* Registered trademark of Microsoft Corporation

There are three steps required to create a working copy:

1. Start *MS-DOS* software.
2. Format a new diskette(s).
3. Copy the original diskette(s) that you received with your package to the working diskette(s).

Starting *MS-DOS* Software

Insert your copy of the *MS-DOS* diskette into drive **A**, close the door, and reboot or turn on the PC. The disk drive indicator light will come on, and the PC may print out diagnostic results on the monitor. In addition, the memory size may be printed out as the memory tests are run. Typical memory sizes are 256K, 512K, and 640K. When *MS-DOS* software is ready, a prompt (for example, **A>**) appears on the display screen. This is how *MS-DOS* software lets you know it is ready for you to type a command. You are now ready to format the blank disk(s).

Formatting a New Diskette

You will need a blank diskette(s). It is a good practice to label diskettes so that you can keep track of them. You should prepare a label for the diskette(s) marked as Lucent Technologies DDM-2000 OC-12 Release a.b.c - working copy. The a.b.c is the release version that you are copying.

⚠ **WARNING:**
Do not write on diskette label using a ballpoint pen or pencil.

When the prompt **A>** appears, type the following command, and then press **<ENTER>**. (If you make a mistake while entering this command, you can press the **BACKSPACE** key, or equivalent, which will erase one character at a time.)

```
format a:/s <ENTER>
```

You will see a message similar to the following (the exact wording of the message may vary depending on which PC you are using):

```
Insert new diskette for drive A:
and strike any key when ready
```

Now open the drive door and remove the *MS-DOS* diskette. Place the *MS-DOS* diskette in its envelope, and set it aside for the time being.

Next, insert the blank diskette into the drive and close the door. Depress any key on the keyboard to begin formatting. After you depress a key, a message similar to the following will appear:

```
Formatting...
```

You will see the disk drive indicator light come on. The formatting process takes several minutes. When the formatting is complete, a message appears to tell you that the format is complete. In addition, you will see several lines of messages about total disk space available. Finally, you will be prompted to format another disk with the following message:

```
Format another (Y/N)?
```

If you do not need to format another disk, type **n** and **<ENTER>**. The system will respond with a prompt **A>** display.

Remove the diskette from the disk drive and place it in a protective envelope or storage location. If you have not already done so, label the diskette(s) as Lucent Technologies DDM-2000 OC-12 Release a.b.c - working copy. You are now ready to copy the files from the original diskette(s) to the working copy diskette(s).

Copying Files — General

The process of copying files from one diskette to another varies slightly depending on whether you have one or two floppy disk drives.

If you have a dual floppy PC, *MS-DOS* software refers to one disk drive as drive **A** and the other disk drive as drive **B**. If you have a single floppy PC (one floppy drive, with or without a hard disk), *MS-DOS* software treats the floppy disk drive as both drive **A** and drive **B**. The hard disk is usually referred to as drive **C**.

To do the new generic program installation using floppy diskettes, all the following files must be on a single diskette:

CHECKPGM.EXE	CRTM.EXE	CTRM.INI	CTRM.SCR	GENERIC.0
PCLOAD.EXE	README	TERM.BAT	STAGE_1.0	STAGE_10.0

The remaining files similar to the following can be on the same diskette or on another diskette:

GENERIC.1	GENERIC.2	GENERIC.3	GENERIC.4	GENERIC.5 ...
GENERICO.0	GENERICO.1	GENERICO.2 ...		

To do the new generic program installation using the PC hard disk, all the files listed in the README file must be on the hard disk in the directory from which you will do the installation.

To read the contents of the README file, use the **`more < README`** command. To list the files on the hard disk or floppy diskette, use the **`dir/p`** command.

Copying Files — Hard Disk System

Set up your hard disk so that when you turn on your computer, it starts up using the hard disk instead of the *MS-DOS* system diskette. When prompt **C:>** appears, type the following commands:

```
mkdir ngp <ENTER>
cd ngp <ENTER>
```

Insert the original generic program diskette in drive **A**, and close the door. Type the following command:

```
copy a:*.* <ENTER>
```

This command tells *MS-DOS* software to copy all of the files from the **A** drive to the **C** drive (hard disk). Open the drive door, and remove the original diskette from the drive. Repeat this procedure for all diskettes.

Copying Files — Single Floppy System

If you have a single floppy system (with or without a hard disk), insert the original new generic program diskette into drive **A**, and close the door. Type the following command after the prompt:

copy a:*.* b: <ENTER>

This command tells *MS-DOS* software to copy all of the files from drive **A** to drive **B**. Since there is no drive **B** physically installed, *MS-DOS* software will pretend that there is one. It does this by copying a file from drive **A** (as much as it can fit) into the PC's memory. It then displays the following message:

```
Insert diskette for drive B:
Strike any key when ready...
```

Open the drive door, and remove the original diskette from the drive. Insert the working copy diskette into the drive, and close the door. Depress any key. The *MS-DOS* software now copies the file from the PC memory to the working copy diskette which you inserted into drive **A**. When the copy is complete, it will display the following message:

```
Insert diskette for drive A:
Strike any key when ready...
```

Open the drive door, and remove the working copy diskette from the drive. Insert the original diskette into the drive, and close the door. Depress any key. The *MS-DOS* software now begins where it left off. This process repeats until the entire diskette has been copied. In summary:

- When you are prompted to insert diskette for drive **A**, insert the original diskette into the floppy drive.
- When you are prompted to insert diskette for drive **B**, insert the working copy diskette into the floppy drive.
- Repeat until the prompt **A>** appears on the display screen.

When the process is complete, the prompt **A>** will be displayed on the screen. Repeat this procedure for all original diskettes. Before using the diskette(s) to install the new program, it is a good idea to make backup copies of the working copy. If the working copy is ever lost or damaged, you will have a backup copy and will not have to create a new working copy from the original(s).

Making Backups — Single Floppy System

Insert the *MS-DOS* diskette into drive **A**. Type:

diskcopy a: b: <ENTER>

A message similar to the following appears:

```
Insert SOURCE diskette in drive A:
    Strike any key when ready
```

Wait for the disk drive indicator light to go off. Remove the *MS-DOS* disk from drive **A** and insert the working copy diskette (the source) into the drive. Press any key. The disk drive indicator light will come on to indicate that the copying is in progress. The *MS-DOS* software copies as much of the diskette as it can into the PC's memory and then displays the following message:

```
Insert TARGET diskette in drive A:
    Strike any key when ready
```

Remove the working copy (source) diskette, insert the new (target) diskette, and press any key. It is not necessary to preformat the new diskette; the diskcopy command will do this for you. Depending on the amount of memory in your computer, you may be prompted to repeat this several times. When the copy is complete, the following message will appear:

```
Copying complete

Copy another (Y/N)?
```

If you wish to make additional backups, type **y** and follow the same instructions. If you are done, type an **n** and **<ENTER>**. When the prompt **A>** appears, wait for the disk drive indicator light to go OFF and remove floppy. Label the backup floppy with an appropriate label (for example, Lucent Technologies DDM-2000 OC-12 Release a.b.c - working copy backup).

Copying Files — Dual Floppy System

Insert the first original new generic program diskette into drive **A** and close the door. Insert the formatted copy diskette into drive **B** and close the door. Type the following command:

copy a:*.* b: <ENTER>

The files from the original diskette will be copied to the working diskette one at a time. When the process is complete, the prompt **A>** will be displayed on the screen. Repeat the procedure for all remaining original diskettes. Label all diskettes.

Making Backups — Dual Floppy System

Insert the *MS-DOS* diskette into drive **A**. Type in the following command:

diskcopy a: b: <ENTER>

A message similar to the following is displayed:

```
Insert SOURCE diskette in drive A:
Insert TARGET diskette in drive B:
     Strike any key when ready
```

Wait for the disk drive indicator light to go off. Remove the *MS-DOS* disk from drive **A** and insert the working copy diskette (the source). Insert a new diskette into drive **B** (the target). It is not necessary to preformat the new diskette; the disk copy command will do this for you. Press any key when ready.

The disk drive indicators on both the **A** and **B** drives will light, indicating that the copying is in progress. Do not open a drive door while the disk drive indicator light is on. When copying is complete, a message similar to the following appears:

```
Copying complete

Copy another (Y/N)?
```

If you wish to make additional backups, type **y** and follow the same instructions. If you are done, type **n** and **<ENTER>**. When the prompt **A>** appears, wait for the disk drive indicator light to go OFF and remove both floppies. Label the backup floppy with an appropriate label (for example, Lucent Technologies DDM-2000 OC-12 Release a.b.c - working copy backup).

Install New Software Generic Program
In-Service System
Remote Shelf Download

1. NOTE 1:
   This procedure uses the **cpy-prog** or **ins-prog** commands to install a new software program in a remote in-service DDM-2000 OC-12 shelf. It is assumed that the local shelf has already been upgraded and the software is running normally. For procedures to download software in a new shelf (initial installation), see **DLP-520**. For procedures to download software locally to a shelf, see **DLP-527**.

   Verify that no DCC failures or transmission failures (OC-12 LOS, flashing **OLIU FAULT** LEDs, etc.) are present on the network element or system receiving the program.

2. Use `rtrv-fecom/set-fecom` command to verify/enable far-end communications (fecom).

3. 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 some upgrades, system tests, or training classes), if the system is in service and a version of software is being installed that is not compatible with the current transmission configuration, it may be necessary to remove the* **TGS** *circuit pack in* **TIMING** *slot* **1** *to force the system to run the software you are trying to download. If both* **TGS** *circuit packs are not installed, removal of the only* **TGS** *circuit pack will cause service interruption.*

⇒ NOTE 1:
If a shelf is in the STS3c mode (**`sts3c`** mode enabled by the **`set-feat`** command) and a different software generic that does not have the STS3c feature is loaded, the **OLIU**s will stay in the **`sts3c`** mode until they are removed and reseated.

⇒ NOTE 2:
The following step is recommended to protect against a loss of service because of inadvertently loading incompatible software. But, if you are **sure** that you want to load incompatible software, 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 receiving the program 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**.

4. Obtain the following equipment:
   (1) IBM* compatible personal computer (PC) running an *MS-DOS*† computer program operating system, Release 2.1 or later, if the **ins-prog** command is being used,

   (2) RS-232 cable to connect PC **COM** port to User panel **CIT** port, if the **ins-prog** command is being used,

   ⇒ NOTE:
   The PC or CIT may be connected to either the front or rear CIT port, or remotely through a dial-up modem. If connected to the rear **CIT** port, a null modem is required between the RS-232 cable and the rear **CIT** port.

   (3) Working copies of the new system generic program diskette(s).

   (4) Software Release Description for software being installed.

---

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† Registered Trademark of Microsoft Corporation

5. Before beginning this procedure, the following is strongly suggested:
   a. Become familiar with the characteristics and operating procedures of your PC and the *MS-DOS* operating system.

      Reference: **DLP-528**

   b. Operate laptop PCs on AC power during download procedures.

   c. Follow proper procedures in handling the diskette(s) (floppies).

      Reference: **DLP-528**

   d. Make working copies and backup copies of the original new generic program diskettes.

      Reference: **DLP-529**

   e. **Read the Software Release Description for software being installed.**

6. NOTE 1:
   If you want to load new software to a remote shelf (if allowed) directly **from a PC**, use the **`ins-prog:`***`tid`* command where the TID entered is that of the remote shelf where you want to install the new software. Only one **`ins-prog:`** per CTRM session is permitted. After using the **`ins-prog:`***`tid`* command to download software to one shelf, you must exit CTRM (Alt F2) and re-execute CTRM before starting a second **`ins-prog:`** command. If CTRM is not exited, it will stop running if a second **`ins-prog:`** is started within the same CTRM session. The PC will not respond or return any message and the **`ins-prog:`** will not progress.

   NOTE 2:
   If remote software downloading is allowed and you want to load new software to a remote site via the DCC **from a local shelf** which already contains the new software, log in (either physically or remotely) to the shelf containing the new software, and then enter the **`cpy-prog:`***`tid`* command (where *`tid`* = the tid of the shelf in which you want to install the software). [The tid is the name given to a shelf (network element) using the **`set-ne:`** command.] The **`cpy-prog:`***`tid`* command will only copy software from a local controller to a remote controller; it is not used to download software from a PC.

NOTE 3:
The download time will be longer (even without excessive DCC traffic) when there are additional spans between the source and target network elements. To minimize the download time and reduce DCC traffic, it is recommended that multi-span software downloading be avoided by remotely logging into the nearest shelf of the same type and remotely downloading the new program from that shelf.

NOTE 4:
When upgrading from releases without synchronization messaging to releases with this feature, it is suggested to upgrade first the shelves which are provisioned for "external timed" or "external mult" timed. This is to prevent timing "holdover" conditions at nodes that derive timing from the OC-3 line.

NOTE 5:
The software to be copied may be a non-executing, dormant copy of a software generic. When executing the **`cpy-prog`** command, the local network element will internally check whether the current executing software or a dormant software should be copied into the memory of the target network element, where it may reside as a dormant copy also.

The **`apply`** command is used later to overwrite the currently executing generic with a copy of the generic included in the dormant software.

Before beginning the software installation, refer to the Software Release Description for the software being installed for a description of any special considerations required when installing this version of the software.

7. Are you using **ins-prog** or **cpy-prog** command to download software to far-end shelf?

   If **CPY-PROG**, then continue with **Step 8**.
   If **INS-PROG**, then proceed to **Step 14**.

8. ⚠ CAUTION:
   Only one **cpy-prog** *procedure at a time should be performed in the same maintenance subnetwork. Multiple simultaneous procedures in the same network may cause the software copying procedure to fail.*

   Connect and establish session with local shelf being used for new program download.

   Reference: **DLP-516**

9. ⇒ NOTE:
   In order to accomplish the same results obtained in previous releases through the **cpy-prog** command, after the new task of **cpy-prog** is accomplished successfully (the dormant software generic in the source network element is copied into the target network element's flash memory as a dormant software generic), a new command called **apply** is to be used. This new command has the same effect as the **cpy-prog** did in previous releases.

   Enter the command **cpy-prog:***tid*

   Where tid = the target identifier (shelf name) for the DDM-2000 shelf having the new program installed.

   Response: `/* Testing For Program Installation... */`

   After several seconds, the PC prints a `Caution!` message followed by the prompt:

   `Execute? y/n =.`

10. Was response correct?

    If **YES**, then continue with **Step 11**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

11. Enter a *y* or *yes* and a carriage return to execute the program.

    approx. 15-45 min.

    Response: **ABN** LED lights on User Panel and a "**P.**" is displayed in **SYSCTL FE ID** display in the far-end shelf receiving the program. At DDM-2000 shelves connected directly to the shelf receiving the program, **MJ** and **NE ACTY** LEDs light on User Panel and **FAULT** LED flashes on **OHCTL**. At other shelves in the same control system, **MJ** and **FE ACTY** LEDs light on User Panel. Download begins and the following message is displayed:

    ```
    In progress . . . .
    ```

    The dots continue to print until program installation is complete. After installation is completed, the PC prints the following completion message:

    ```
    ins-prog:TID COMPLD
    /* Generic a.b.c is installed */
    ```

    The **SYSCTL** resets. The LEDs go off on the User Panel and **SYSCTL**.

12. Was response correct?

    If **YES**, then continue with **Step 13**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

13. Did the letter "**C**" appear in the **FE ID** display?

    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **YES**, then proceed to **Step 32**.

14. ⇒ NOTE:
Software download procedure must be initiated from *MS-DOS* environment. It should not be initiated from a windows environment.

Start *MS-DOS* operating system on the PC [**DLP-529**].

Response: PC displays the prompt (for example, `C>`, `C:/DOS>`) determined by the PC.

15. If you are going to use the PC hard disk to load software to the shelf, **`copy`** all files on the source diskettes(s) (floppies) to a directory on the hard disk (for example, GEN_511 for generic version 5.1.1).

16. If you are going to load the software from the hard disk, use the **`cd`** command to change to the appropriate hard drive directory containing the software.

If you are going to load the software from the floppies, use the appropriate *MS-DOS* command (for example, **`a:`** or **`b:`**) to go to the drive where the floppy disk will be installed.

Response: PC displays the appropriate prompt (`A>`, `B>`, `C>`, `C:/DOS>`, etc.) determined by the PC.

Comment: If you are using floppies and get a disk error message, verify the drive latch is locked and that you have the proper diskette installed in the drive.

17. ⇒ NOTE:
The new generic program may be on many floppy disks. If you are using the floppy disks, the PC will prompt you to insert disks as needed after the first disk is installed.

If you are using the floppy disks, insert the first (number 1) floppy disk into the PC drive.

18. ⇒ NOTE:
The **checkpgm** command may take up to 25 minutes to complete.

Execute the command **checkpgm** to check the version number of the program you are installing. If using floppy disks, insert each diskette when prompted.

approx. 15 min. if using hard drive **approx. 25 min. if using floppy drive**

Response: `PC has DDM-2000 program version a.b.c`

19. ⇒ NOTE 1:
The shelf rear access CIT port is configured for a modem. A null modem is required to use this port with the PC.

⇒ NOTE 2:
The cable from the **CIT** port on the DDM-2000 must be connected to the **COM** (**COM1 or COM2**) RS-232 port of the PC.

Connect PC to **CIT** port by connecting one end of an RS-232 cable to the **COM( )** port of the PC and the other end of the cable to the front or rear local DDM-2000 **CIT** port.

20. ⇒ NOTE 1:
The **FE ID** display on the remote **SYSCTL** must show one of the following preceding software installation. Other conditions represent failure conditions or conditions that will not allow a remote software download.

A. The letter (**P.**) displayed in the **FE ID** display indicates that a previous software download has failed and you may be able to download software from another shelf, or locally. If there is no period after the (**P**), the software can only be downloaded locally.

B. Nothing displayed in the **FE ID** display indicates that compatible software is installed in the **OHCTL** and **SYSCTL** and you may download software remotely if remote software downloading is permitted for this release.

⇒ NOTE 2:
Ensure PC is connected to the front CIT (CIT-1). If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

Enter **`term`** or **`term COM`***n* command, where *n* = 1 or 2. If **`term`** is entered without the **`COM`***n* option, then **COM1** will be selected by default. If after starting the terminal emulator you see the message "`Can't find script <init>`", disregard it.

approx. 15-45 min.

Response: Two brief messages are printed and you are instructed to `Press any key to continue . . .` after the second message. After you press any key, the terminal emulator is loaded and the terminal responds as follows:

```
CTRM ready. (Type Alt-h for help.)
Communications established.
```

21. ⇒ NOTE:
The default shelf is the shelf physically connected to the PC. To set baud rate automatically, enter two carriage returns (**<cr>**), two lower case "a"s (**aa**), or two upper case "A"s (**AA**). All other characters are ignored.

Enter two carriage returns.

Response: PC prompts with:

```
/* Enter a shelf number from 1 to 8 */
shelf [default] =
```

22. Was response correct?

If **YES**, then proceed to **Step 24**.
If **NO**, then continue with **Step 23**.

23. Check PC to **CIT** port connections. Make sure the cable is connected between the PC **COM( )** port and the **CIT** port on the DDM-2000. If the rear **CIT** port is being used on the DDM-2000, make sure a null modem is installed on the port. Check CTRM setup and make sure the **comm** port selected matches the port (**COM( )**) on the PC that is connected to the **CIT** port on the shelf. Check if CIT bay mult cabling is connected to this shelf but not terminated at another shelf.

Exit CTRM (Alt-F2) and repeat this procedure from Step 20.

24. Enter the shelf number for the shelf being used for new program download.

    Response: PC responds with:

```
login<
password<

    /************************************
    *                                   *
    *         Lucent Technologies       *
    *        Bell Labs Innovations      *
    *      DDM-2000 OC-12 Multiplexer   *
    *                                   *
    *           Release a.b.c           *
    *                                   *
    ************************************/

                      .
                      .
                      .

    TID date time
 M  rtrv-alm: all COMPLD
    /* Active Alarms and Status Report
```

25. ⇒ **NOTE:**
    After the system prompt (<), the system will respond normally to commands entered. The Commands and Reports section of this manual gives a description of the commands.

    Use **`rtrv-ne`** command to retrieve the name (*tid*) of the shelf having new program installed.

26. If floppies are being used, ensure the first (number 1) diskette is installed in floppy drive. If hard drive is being used, ensure you are in the correct directory.

27. Enter the command **`ins-prog:`***`tid`*

    Where tid = the target identifier (shelf name) for the far-end DDM-2000 shelf having the new program installed.

    Response: `/* Testing For Program Installation... */`

    After several seconds, the PC prints a `Caution!` message followed by the prompt:

    `Execute? y/n =.`

28. Was response correct?

    If **YES**, then continue with **Step 29**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

29. Enter a *y* or *yes* and a carriage return to execute the program.

    approx. 15-45 min.

    Response: **ABN** LED lights on User Panel and a **P** is displayed in **SYSCTL FE ID** display in the shelf receiving the program. PC starts download and prints the following message:

    ```
    p

    Searching for optimal transfer rate.
    Handshake established at <baudrate> baud.

    In progress . . . .
    ```

    The dots continue to print until program installation is complete. If floppy disks are being used, insert each diskette when prompted. After installation is completed, the PC prints the following completion message:

    ```
    ins-prog:TID COMPLD
    /* Generic a.b.c is installed */
    ```

    The **SYSCTL** resets, and the terminal is logged off the system. The LEDs go off on the User Panel and **SYSCTL**.

30. Was response correct?

    If **YES**, then continue with **Step 31**.
    If **NO**, then do **Trouble Clearing: TAP-116**.

31. Did the letter "**C**" appear in the **FE ID** display?

    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **YES**, then continue with **Step 32**.

Letter "C" in FE ID display

32. ⚠ CAUTION:
If the system is in service and is forced to run the current software that is displaying a **C***, service interruption may result.*

⇒ NOTE:
Indications are that there may be a problem with the version of software you are installing or you are trying to install a version of software that will not support the system transmission configuration that you have. Under normal upgrade procedures, this indication should not occur. But, if you are downloading an older version of software or upgrading to a new version of software which has major changes or is incompatible with the version that you have, this indication will occur. You can *force* the system to run the current software or back out of this procedure by loading another version of software.

You must decide if you want the system to run this current version of software that has been loaded or if you want to download another version (original version or new version) of software.

Do you want to run the current version of software in the **SYSCTL**?

If **NO**, then continue with **Step 33**.
If **YES**, then proceed to **Step 35**.

33. Exit CTRM (Alt-F2). Load new version of software locally using procedures of **DLP-527**.

34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

35. To *force* the system to run the current software, perform the following:
    a. Ensure that a **TGS** circuit pack is installed in the **TGS-2** slot.
    b. Remove the **TGS-1** circuit pack, if not already removed.
    c. Reset (unplug and reseat) the **SYSCTL** to force it to run the current software.
    d. After the current software is up and running (no alarm LEDs lighted or you can log into the shelf), reinstall the **TGS-1** circuit pack.
36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Test of RT Batteries Using 197A BATTERY LOAD TEST SET

1. ⚠ CAUTION:
   Service interruption will occur if batteries are disconnected and AC power is not available.

   Obtain **197A BATTERY LOAD TEST SET (197A)** and place near batteries to be tested (Figure 1).

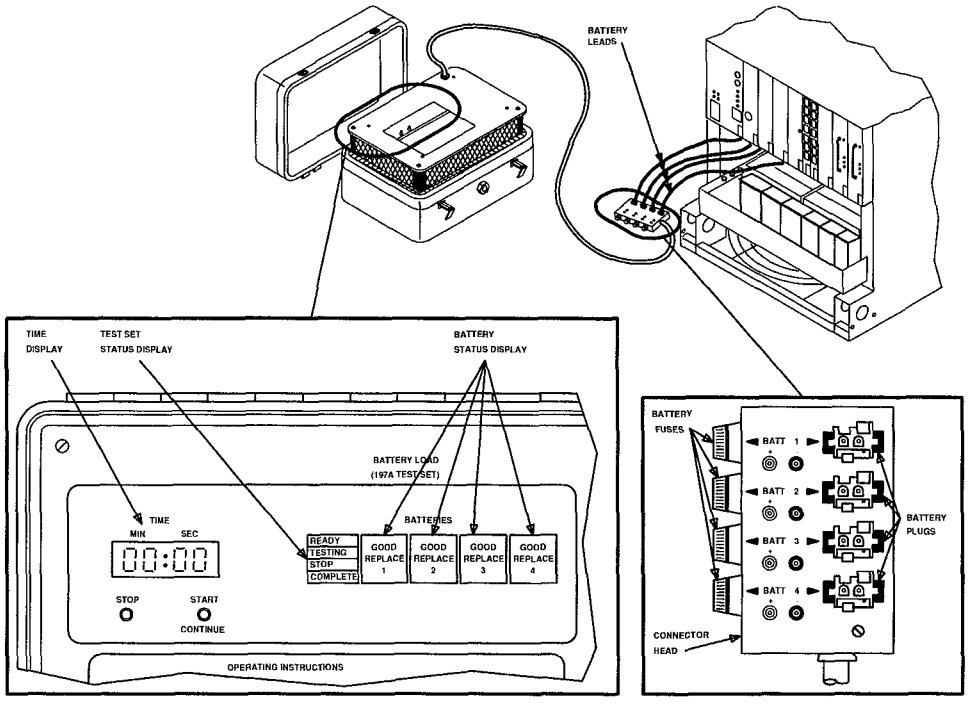


Figure 1. 197A Battery Load Test Set Test Connections

2. ⇒ NOTE:
   The **197A** test set is intended to test batteries that are fully charged. A minimum of two days must be allowed between the time the batteries (new or replacement) are put on high rate charge and this test is made. After testing is completed, the batteries must be put on high rate charge using the **337A BATTERY CHARGER**.

   Remove cover from **197A** test set.

3. Check **197A** test set for proper operation (if not already performed).

   Reference: **DLP-532**

4. Ensure that system(s) associated with batteries to be tested has AC power available (**PMN** or **P/M** indicator on **BCU** circuit pack not lighted).

5. On **337A BATTERY CHARGER** associated with batteries to be tested, is **HIGH RATE CHG/ON** indicator lighted?

   If **YES,** then continue with **Step 6.**
   If **NO,** then proceed to **Step 7.**

6. Batteries are on high charge and may require up to 24 hours to charge. Do not perform this procedure until **HIGH RATE CHG/ON** indicator on **BATTERY CHARGER** goes off.

7. ⚠ CAUTION:
   Service interruption will occur if batteries are disconnected and AC power is not available.

   Disconnect battery leads of batteries to be tested from battery shelf.

8. ⇒ NOTE:
   Under normal conditions, when the first battery is connected, the following occurs: (a) The test set **TIME** display indicates **00 MIN:00 SEC**; (b) the status display indicates which test set **BATT** plug the battery is connected to, status of the battery (**GOOD** or **REPLACE**), and the **READY** indicator lights; (c) test set fan operates.

At test set connector head (Figure 1), connect battery leads (up to four) to **BATT 1, 2, 3,** and **4** plugs.

9. ⇒ NOTE:
If status display does not indicate battery number of battery status, **BATT** fuse may be blown, connector head or test set may be defective, or battery pack is defective.

Does test set display indicate **REPLACE** for all batteries being tested?

If **YES,** then continue with **Step 10.**
If **NO,** then proceed to **Step 12.**

10. Replace all batteries and connect good batteries to battery shelf.

11. Place batteries on high charge by depressing **HIGH RATE CHG/ACTIVATE** pushbutton on **BATTERY CHARGER** and repeat from Step 6.

12. ⚠ DANGER:
A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

⇒ NOTE:
This test must run for a full 15 minutes to be valid or until all batteries indicate **REPLACE**. The **STOP** button should only be used if a problem occurs during the test, if the test is to be terminated early because of loss of AC power, or all batteries indicate **REPLACE**. The **START/CONTINUE** button is used to continue the test if no problem is found.

Depress **197A** test set **START/CONTINUE** button.

Response: At **197A** test set, **TESTING** indicator is lighted, **READY** indicator is off, and **TIME** display is counting time.

13. ⇒ NOTE:
If one, two, or three, but not all, batteries show **REPLACE** during the test period, the remaining batteries still must be tested for the full 15 minutes.

Does test set show **REPLACE** for all batteries within the 15-minute test period shown on **TIME** display?

If **YES,** then continue with **Step 14.**
If **NO,** then proceed to **Step 15.**

14. ⚠ DANGER:
A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

Depress test set **STOP** button. Proceed to **Step 17.**

Response: **STOP** indicator on test set lights

15. After 15 minutes, the test set **COMPLETE** indicator lights.

16. Is any **REPLACE** indicator on test set lighted?

If **YES,** then continue with **Step 17.**
If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Unplug and set aside all defective batteries.

18. Install and connect replacement batteries to battery shelf. Reconnect any remaining good batteries to battery shelf.

19. Place batteries on high charge by depressing **HIGH RATE CHG ACTIVATE** pushbutton on **BATTERY CHARGER** and repeat from Step 6.

Check 197A BATTERY LOAD TEST SET

1. Obtain **197A BATTERY LOAD TEST SET**. See Figure 1.

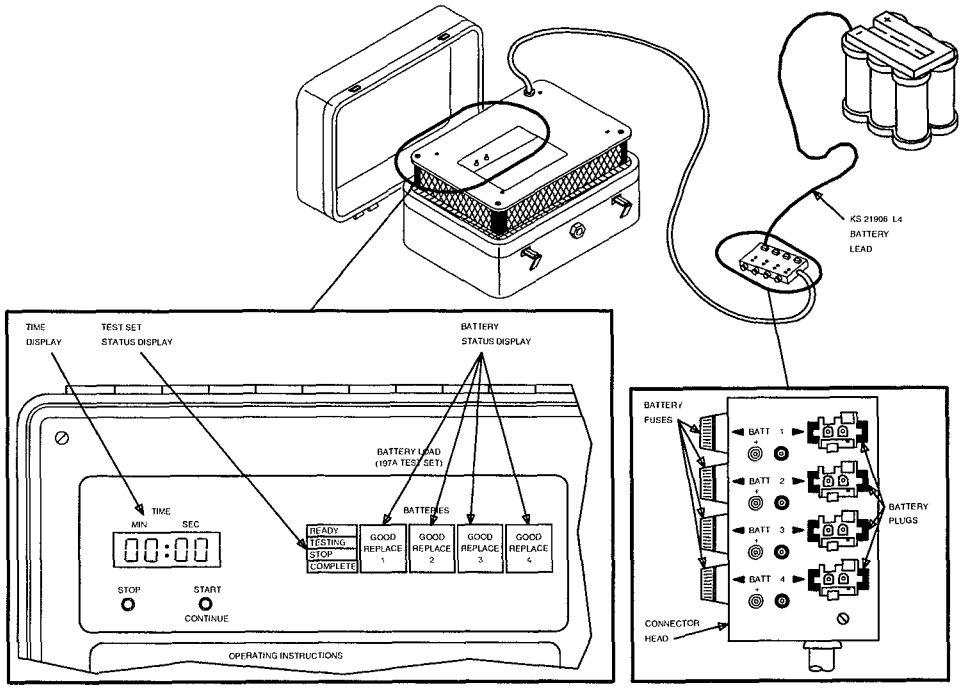


Figure 1. 197A Battery Load Test Set Arrangement

2. Remove cover from test set.
3. At test connector head, verify battery fuse holders each contain a 20 Amp fast-blow fuse.
4. Obtain one KS-21906, L4 battery.

5. NOTE:
   Under normal conditions, when the first battery is connected, the following occurs: (a) Test set **TIME** display indicates **00 MIN: 00 SEC**; (b) status display indicates which test set **BATT** plug that battery is connected to, status of the battery (**GOOD** or **REPLACE**), and the **READY** indicator lights; (c) test set fan operates.

   At test set connector head, connect battery lead to **BATT 1, 2, 3**, or **4** plug being tested.

6. WARNING:
   Damage will occur if test set is operated without fan operating.

   Does test set fan operate?

   If **YES,** then proceed to **Step 15.**
   If **NO,** then continue with **Step 7.**

7. Connect battery lead to remaining **BATT** plugs, one at a time, and note if fan operates.

8. Did test set fan operate for any **BATT** plug connection?

   If **YES,** then proceed to **Step 11.**
   If **NO,** then continue with **Step 9.**

9. NOTE:
   The test set is intended to test fully charged batteries. Before new batteries or replacement batteries are tested, a minimum of two days must have passed between the time the batteries were put on high rate charge and this test is made.

   Disconnect lead. Using a different battery pack, connect battery lead to any **BATT** plug.

10. Does test set fan operate?

    If **YES,** then proceed to **Step 15.**
    If **NO,** then proceed to **Step 35.**

11. On test set connector head, remove battery lead and check for blown fuse(s).

12. Is fuse(s) blown?

    If **YES,** then continue with **Step 13.**
    If **NO,** then proceed to **Step 14.**

13. Replace fuse(s) and repeat from Step 5.

14. NOTE:
    Test set may be used for testing using one, two, three, or all four **BATT** plug positions.

    There is a defective test set or connector head. Note defective **BATT** plug position(s). Continue with test procedures using remaining **BATT** plugs.

15. Does test set **TIME** display indicate **00 MIN:00 SEC** without blinking?

    If **YES,** then continue with **Step 16.**
    If **NO,** then proceed to **Step 35.**

16. Does status display indicate which battery was connected, status (**GOOD** or **REPLACE**) of the battery, and is **READY** indicator lighted?

    If **YES,** then continue with **Step 17.**
    If **NO,** then proceed to **Step 35.**

17. Does status display indicate **GOOD** or **REPLACE**?

    If **YES,** then proceed to **Step 19.**
    If **NO,** then continue with **Step 18.**

18. DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Battery pack is defective. Ensure that **TESTING** indicator is not lighted (**READY** indicator lighted), unplug and set aside defective battery pack, and repeat from Step 5.

19. Have **TIME** display and **STATUS** indicators been tested for each good **BATT** plug position?

    If **YES,** then proceed to **Step 21.**
    If **NO,** then continue with **Step 20.**

20. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Ensure that **TESTING** indicator is not lighted. (**READY** indicator lighted). Unplug battery pack and repeat from Step 5.

21. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Depress test set **START/CONTINUE** button.

22. Does test set **TESTING** indicator light, **READY** indicator go off, and **TIME** display start counting time?

    If **YES,** then proceed to **Step 24.**
    If **NO,** then continue with **Step 23.**

23. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    There is a defective test set. Depress **STOP** button, unplug battery, and return test set for repair.

24. Depress test set **STOP** button.

25. Does test set **STOP** indicator light and **TIME** display stop counting time?

    If **YES,** then proceed to **Step 27.**
    If **NO,** then continue with **Step 26.**

26. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    There is a defective test set. Allow test to run for 15 minutes as shown on **TIME** display. When **COMPLETE** indicator lights, unplug battery, and return test set for repair.

27. ⚠ DANGER:
    A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Depress test set **START/CONTINUE** button.

28. Does test set **TESTING** indicator light, **STOP** indicator go off, and **TIME** display start counting time?

    If **YES,** then continue with **Step 29.**
    If **NO,** then proceed to **Step 34.**

29. Allow test set to run for 15 minutes as shown on **TIME** display.

30. During 15-minute test period, does test set show **REPLACE**?

    If **YES,** then continue with **Step 31.**
    If **NO,** then proceed to **Step 32.**

31. Note that battery being used is defective.

32. After 15 minutes, does **COMPLETE** indicator light?

    If **YES,** then continue with **Step 33.**
    If **NO,** then proceed to **Step 34.**

33. Unplug battery. Store connector head in test set cover. Reinstall cover.

STOP. YOU HAVE COMPLETED THIS PROCEDURE

34. ⚠ DANGER:
A high discharge current is present at connector head if **TESTING** *indicator is lighted. Batteries must not be connected or disconnected when* **TESTING** *indicator is lighted.*

    Defective test set. Depress **STOP** button, unplug battery, and return test set for repair.

35. There is a defective test set. Return for repair.

Upgrade TBOS/Parallel Telemetry to TL1/X.25

1. ⇒ NOTE:
   The Technical Specifications section of this manual, under TL1/X.25 Telemetry, describes the parameters and connections for the TL1/X.25 telemetry interface.

   At central office operations interface shelf, connect the TL1/X.25 cable to **J61** on the shelf backplane.

2. Connect CIT and establish session.

   Reference: **DLP-516**

3. Are you upgrading TBOS or parallel telemetry to TL1/X.25.

   If **PARALLEL**, continue with **Step 4**.
   If **TBOS**, proceed to **Step 6**.

4. Disconnect parallel telemetry and discrete cables from **P21**, **P22**, and **P67** on the shelf backplane.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. Use the **`set-ne:tblink=`***`noTBOS`* command to disable the TBOS link.

7. Disconnect TBOS cable from **J62** on shelf backplane, if required.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect Optical Loop for 23G/23G-U or 23H/23H-U OLIU

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Take care to avoid damaging LEDs that protrude through opening in faceplate of **OLIU**.

⚠ CAUTION 2:
An external buildout must be installed on **OUT** *connector when* **OLIU** *is looped on itself.*

⚠ CAUTION 3:
Avoid excessive bending of optical jumper used to loop **OLIU** *on itself.*

⚠ CAUTION 4:
*All optical fiber connectors, couplings, and buildouts should be properly cleaned [***DLP-522***]. Signal performance may be degraded if connectors, couplings, or buildouts are not cleaned properly.*

NOTE 1:
It may take from 15 seconds to 3 minutes and 25 seconds for **FAULT** LEDs to stop flashing, depending on setting of signal degrade threshold (–5 to –9).

NOTE 2:
The lightguide jumpers used to loop the **OLIU**s must be equipped with *ST*®, FC/PC, or SC connectors at both ends, depending on the type of **OLIU** connector. See Figures 1, 2, and 3.

Is optical loop being installed on **23G/23G-U OLIU** or **23H/23H-U OLIU**?

If **23G/23G-U OLIU**, then continue with **Step 2**.
If **23H/23H-U OLIU**, then proceed to **Step 5**.

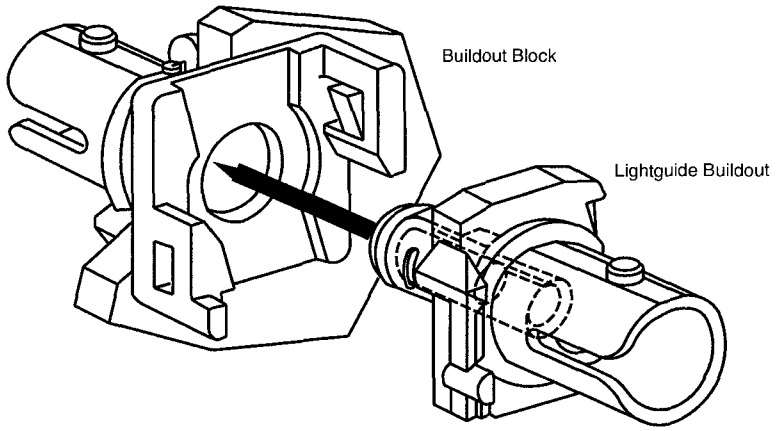


Figure 1. *ST*-**Type Universal Buildout**

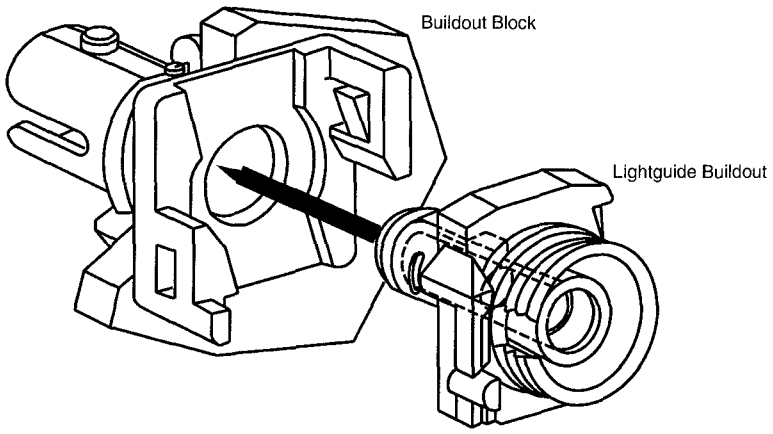


Figure 2. FC/PC-Type Universal Buildout

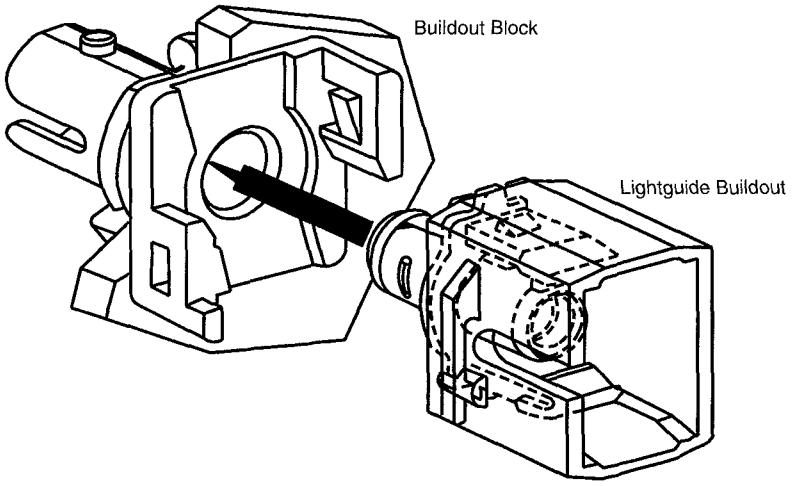


Figure 3. SC-Type Universal Buildout

2. Install lightguide buildout on **OUT** connector. See Table A. Use lightguide jumpers to loop **IN** and **OUT** connectors of **MAIN-B-1 OLIU**. See Table B.

   Response: **FAULT** LED stops flashing. **ACTIVE** LED remains on. (If flashing, **FAULT** LED on **OHCTL** goes off after all number one **OLIU**s are looped.)
   The lighted major (**MJ**) or minor (**MN**) LED remains lighted.
   If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 2.
   If responses are still not correct, replace **OLIU**.

   Comment: The lighted major (**MJ**) or minor (**MN**) LED remains lighted.
   It may take 1 minute or more for LEDs and alarms to stabilize after the **OLIU**(s) are looped.

Table A. Lightguide Buildouts

OLIU	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
23G	15 dB	A3010F	106312598	*ST*	SM-SM	Green
23G-U	15 dB	A3060F1	107406167	SC	SM-SM	Green
23G-U	15 dB	A3070F1	107406209	*ST*	SM-SM	Green
23G-U	15 dB	A3080F1	107406241	FC/PC	SM-SM	Green

Table B. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1E-E-2	105357727	2	ST-ST
LS1SC-SC-2	106908247	2	SC-SC
LS1FP-FP-10	106593825	10	FC/PC-FC/PC

3. Install lightguide buildout on **OUT** connector. See Table A. Use lightguide jumpers to loop **IN** and **OUT** connectors of **MAIN-B-2(P) OLIU**. See Table B.

Response: **FAULT** LED stops flashing. **ACTIVE** LED remains on.
Major/Minor (**MJ/MN**) alarm goes off.
If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 3.
If responses are still not correct, replace **OLIU**. It may take 1 minute or more for LEDs and alarms to stabliize after the **OLIU**(s) are looped.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Install lightguide buildout on **OUT** connector. See Table C. Use lightguide jumpers to loop **IN** and **OUT** connectors of **MAIN-B-1 OLIU**. See Table B.

   Response: **FAULT** LED stops flashing. **ACTIVE** LED remains on.
   (If flashing, **FAULT** LED on **OHCTL** goes off after all number one **OLIU**s are looped.)
   The lighted major (**MJ**) or minor (**MN**) LED remains lighted.
   If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 5.
   If responses are still not correct, replace **OLIU**.

   Comment: The lighted major (**MJ**) or minor (**MN**) LED remains lighted.
   It may take 1 minute or more for LEDs and alarms to stabilize after the **OLIU**(s) are looped.

Table C. Lightguide Buildouts

OLIU	Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
23H	20 dB	A3010H	106312630	*ST*	SM-SM	Red
23H-U	20 dB	A3060H	106708993	SC	SM-SM	Red
23H-U	20 dB	A3070H	106795396	*ST*	SM-SM	Red
23H-U	20 dB	A3080H	106795446	FC/PC	SM-SM	Red

6. Install lightguide buildout on **OUT** connector. See Table C. Use lightguide jumpers to loop **IN** and **OUT** connectors of **MAIN-B-2(P) OLIU**. See Table B.

Response: **FAULT** LED stops flashing. **ACTIVE** LED remains on. Major/Minor (**MJ/MN**) alarm goes off.
If responses are not correct, check connections and looping fibers. Clean connectors and repeat Step 6. If responses are still not correct, replace **OLIU**. It may take 1 minute or more for LEDs and alarms to stabliize after the **OLIU**(s) are looped.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install 23G/23G-U OLIU or 23H/23H-U OLIU

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Before installing the **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.*

⚠ CAUTION 2:
If optical fiber cables are in the tray beneath the **OLIU***s, be careful not to pinch or crush the fibers when the* **OLIU***s are inserted.*

NOTE 1:
The **FAULT** LED flashes because there is no signal present.

NOTE 2:
When using the following procedure to install the **OLIU**s, if responses are not correct, check circuit pack connections. If the connections are correct, replace the **OLIU** that has wrong response. A lighted, not flashing, **FAULT** LED indicates a failed circuit pack.

NOTE 3:
In a Stand-Alone DDM-2000 OC-12 ring application, **23G/23G-U OLIU**s or **23H/23H-U OLIU**s are installed in the **MAIN-B-1** and **MAIN-B-2(P)** slots.

NOTE 4:
The single-homed OC-12/OC-48 ring configuration requires that the FT-2000 OC-48 Low Speed Shelf **LS INTFC** slots **1A**, or **2A**, or **3A**, or **4A**, or **5A**, or **6A**, or **7A**, or **8A** on the OC-48 host shelf connect to the **MAIN-B-1 OLIU** at the first DDM-2000 OC-12 shelf from the OC-48 host shelf. **MAIN-B-2(P) OLIU** at an adjacent OC-12 shelf (node) connects to the **MAIN-B-1 OLIU** at an adjacent OC-12 shelf (node). The **MAIN-B-2(P) OLIU** at the last OC-12 shelf on the OC-12 ring connects to the FT-2000 Low Speed Shelf **LS INTFC** slots **1B**, or **2B**, or **3B**, or **4B**, or **5B**, or **6B**, or **7B**, or **8B**, or **8B** which is the companion to the **A** slot on the OC-48 host shelf. This procedure will establish the ring configuration starting from the OC-48 host node (near end) to the first OC-12 node, then continuing to the next node until the final connection is made from the last OC-12 node back to the host OC-48 shelf.

NOTE 5:
A dual-homed OC-12/OC-48 ring configuration requires that the first OC-12 **MAIN-B-1 OLIU** connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1A**, or **2A**, or **3A**, or **4A**, or **5A**, or **6A**, or **7A**, or **8A** on one host OC-48 shelf. The last OC-12 **MAIN-B-2(P) OLIU** connects to the the FT-2000 Low Speed Shelf **LS INTFC** slots **1B**, or **2B**, or **3B**, or **4B**, or **5B**, or **6B**, or **7B**, or **8B**, or **8B** on the other OC-48 host shelf. Intermediate OC-12 shelves on the same OC-12 ring connect from **MAIN-B-2(P) OLIU** at one OC-12 shelf to the **MAIN-B-1 OLIU** at an adjacent OC-12 shelf (node). This procedure will establish the ring configuration starting from one OC-48 host node (near end) and continuing to an adjacent OC-12 node, then to the next OC-12 node until the final connection is made from the last OC-12 node to the remaining OC-48 host node.

2. Install **OLIU** into required **MAIN-B-1** slot.

   Response: **FAULT** LED and **ACTIVE** LED lights. **FAULT** LED begins flashing after about 10 seconds.
   [**OHCTL FAULT** LED may begin flashing if far-end communications (fecom) is enabled.]

   Comment: Critical, major, or minor alarm LEDs light depending on the version of software installed. Generally, the **MJ** (fecom enabled) or **MN** (fecom disabled) LED will light for ring releases.

3. Install second **OLIU** (if required) into **MAIN-B-2(P)** slot.

   Response: **FAULT LED and ACTIVE** LED lights. **FAULT** LED begins to flash after 10 seconds. The (**FAULT** LED may go off for a few seconds before starting to flash.)

4. Have all required **OLIU**s been installed?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then repeat this procedure for all **OLIU**s being installed.

Test ED-8C733-30, G8 Fan Shelf

1. On fan shelf, verify that only green **POWER ON** LED is lighted. If other LEDs are lighted, refer trouble to organization that installed shelf.
2. Press and hold **ALARM TEST** button.

   Response: All LEDs, except **CONTROL FAULT**, light. All fans slow down during time pushbutton is depressed.
3. Release **ALARM TEST** button.
4. Momentarily depress **ALARM RESET** button to reset alarms.
5. Remove front cover of fan shelf.
6. Locate 4-part switch to left of center on front of fan shelf. See Figure 1.
7. Set switches as shown in Table A.

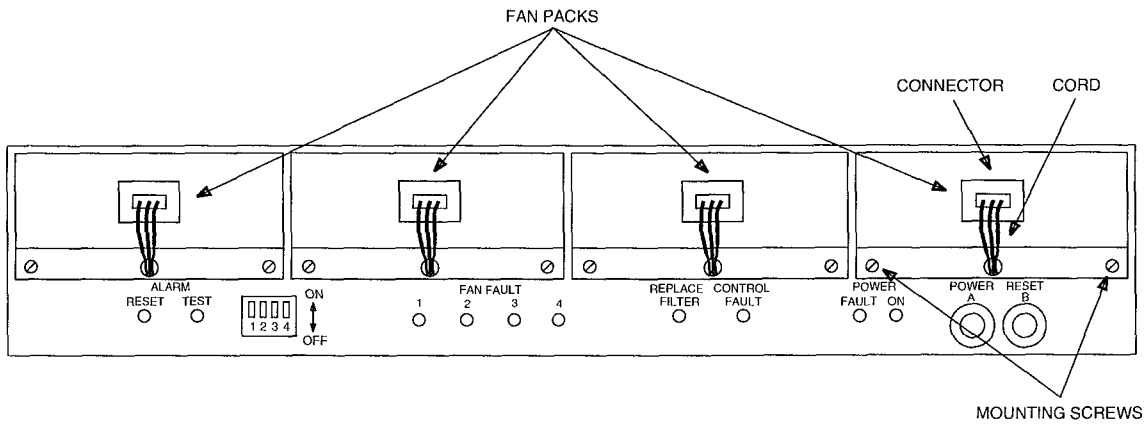


Figure 1. DDM-2000 Fan Shelf — Fan Switches — Front Cover Removed

Table A. DDM-2000 Fan Shelf Switch Settings

Cooling Arrangement	Set Point	Switch Settings			
		S1	S2	S3	S4
DDM-2000 OC-3	400 fpm	ON	OFF	ON	ON
DDM-2000 OC-12	400 fpm	ON	OFF	ON	ON

8. If switch settings are changed, depress and hold the **ALARM RESET** button on the fan shelf for 5 seconds to allow the fan shelf controller to recognize the change in switch setting.

9. ⇒ NOTE:
   Fan filter mounts to the bottom of DDM-2000 OC-12 shelf that is installed immediately below DDM-2000 fan shelf. It is held in place in bottom cavity of shelf with a spring-loaded mechanism.

   Verify that fan filter is properly installed.

10. Reinstall front cover of fan shelf.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace ED-8C733-30, G5 Fan Filter

1. NOTE:
   Fan filter is located on the bottom of the DDM-2000 OC-12 shelf that is installed immediately below the DDM-2000 fan shelf. A spring-loaded mechanism around perimeter of filter holds filter in place in the bottom cavity of the DDM-2000 OC-12 shelf.

   Remove fan filter by pulling it out.

2. Install new filter, with spring-loaded mechanism facing up, into the bottom cavity of the DDM-2000 OC-12 shelf.

3. Momentarily depress the **ALARM RESET** button to reset alarms, if required.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install/Remove Lightguide Buildout

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
Use static ground wrist strap whenever handling circuit packs or working on DDM-2000 terminal to prevent electrostatic discharge damage to sensitive components.

Is buildout being installed or removed?

If **Installing**, then continue with Step 2.
If **Removing**, then continue with Step 5.

2. Remove protector caps and plugs (if equipped) from buildout and buildout block.

3. Align lightguide buildout locking tab with slot in buildout block (unlocked position), push in, and rotate clockwise until locked into position. Refer to the appropriate figure for the specific buildout type.

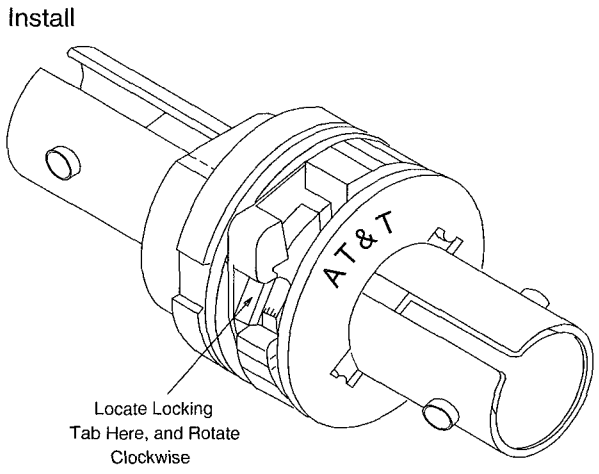


Figure 1. *ST*®**-Type Buildout (Old Version)**

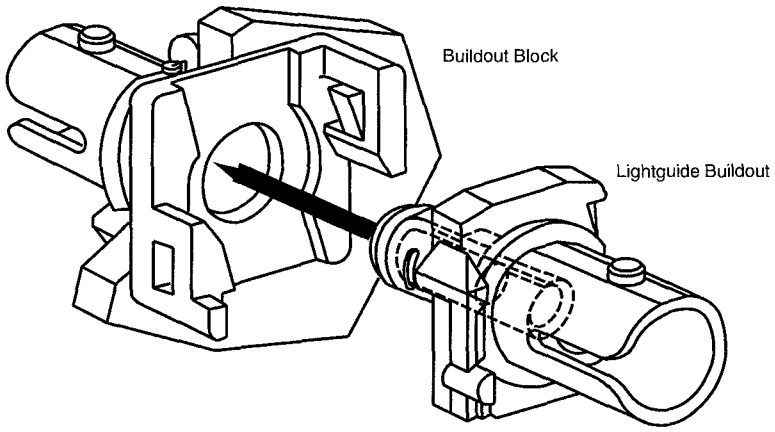


Figure 2. *ST*-**Type Buildout (New Version)**

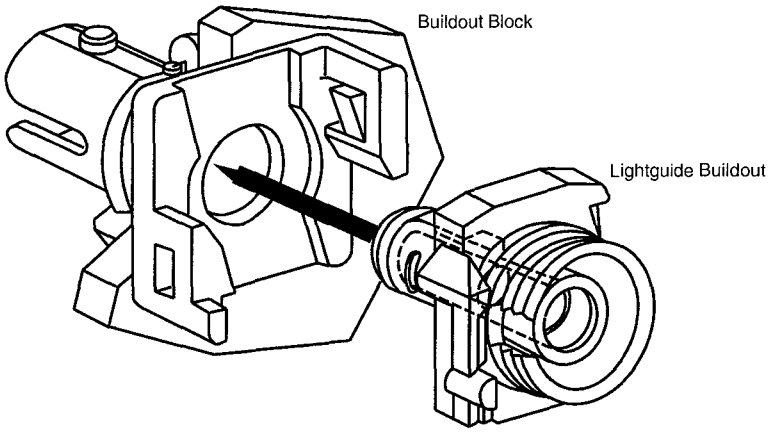


Figure 3. FC/PC-Type Buildout (New Version)

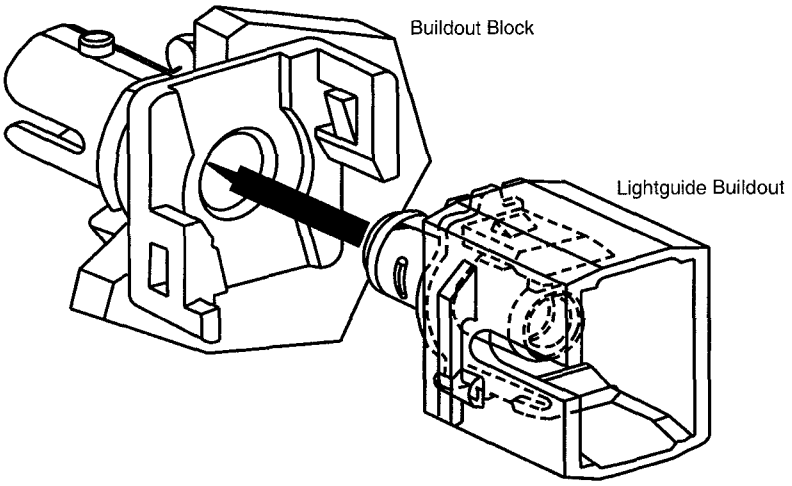


Figure 4. SC-Type Buildout (New Version)

4. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

5. Depress locking tab on the buildout until locking tab is free from the locked position, rotate the buildout counterclockwise to the stop position, and separate the buildout block by pulling it toward you. Only the old version of the *ST*-type buildout is shown. Refer to the appropiate figure in Step 3 for the specific buildout type.

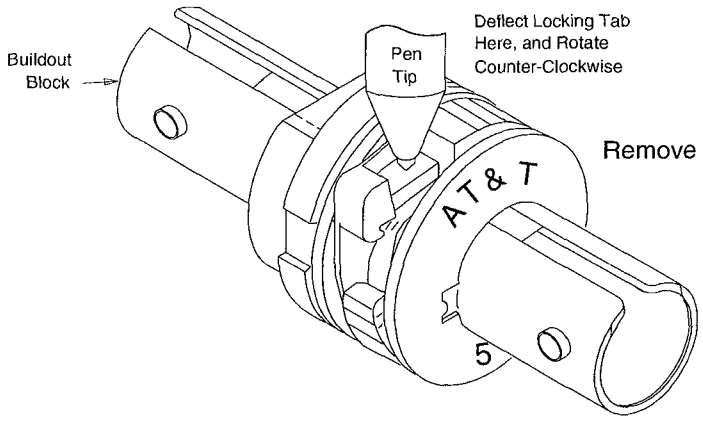


Figure 5. *ST*-**Type Buildout (Old Version)**

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Change Timing Mode on TGS Circuit Pack

1. ⚠ CAUTION:
If shelves in a bay are connected together with timing mult cabling, changing the timing mode on one system may affect the timing for other systems. Ensure that proper timing arrangements are made for all affected shelves.

   NOTE:
   This procedure may be used to change the timing mode on an installed **TGS** circuit pack. For example, you may want to change the timing mode on an installed **TGS** from Free Running to DS1 External, or you may want to provision the DS1 timing output on the **BBF2B** to *sync out mode*. The DS1 timing output on the **BBF2B** can be provisioned for *sync out mode* only when the timing mode is set to *DS1 External sync out* or *Line Timing sync out*. See the Transmission and Synchronization Interfaces section of this manual for a description of DS1 timing outputs.

   Verify that there are no alarms or protection switches present on the system.

2. Are you changing timing mode to *DS1 External*?

   If **YES**, then continue with **Step 3**.
   If **NO**, then proceed to **Step 5**.

3. Check external timing references to ensure they are good.

4. NOTE 1:
   ED-8C727-20, G151, G152, or G153 cables are used to connect timing references to shelf 1 in a bay. ED-8C727-20, G154 or G155 (rear access) or ED-8C727-21, G210, G211, G212, and G213 (front access) cables are used to multiple timing references to subsequent shelves in the bay (for example, from shelf 1 to shelf 2, shelf 2 to shelf 3, etc.). The cable from the timing reference source to shelf 1 is connected to jack **J66** on the shelf backplane (or **J266** of the front access cable). The cable from shelf 1 (or lower shelf) to the next higher shelf is connected from jack **J65** (**P265**) of the lower shelf to jack **J66** (**J266**) of the next higher shelf.

NOTE 2:
If **BBF2B TGS** circuit packs are installed and the timing mode is set to DS1 External sync out mode, an ED-8C724-20, G394 cable must be connected to jack **J66** on the shelf backplane (or **J266** of the front access cable). This cable has a relay to disconnect the external timing supply if the **TGS** circuit pack is removed.

Make DS1 external timing reference connections as shown in Table A.

Table A. DS1 Timing Reference Source Connections

Name	Desig.	Conn.	Term.	Color
Receive from Primary DS1 Reference	T R	P66	6 1	BK O
Receive from Secondary DS1 Reference	T R		7 2	R G

5. Make synchronization DS1 timing output connections as shown in Table B, if required.

Table B. DS1 Timing Output Connections

Name	Desig.	Conn.	Term.	Color
Transmit Primary DS1 Reference	T R	P65	6 1	BK O
Transmit Secondary DS1 Reference	T R		7 2	R G

6. CAUTION:
A momentary transmission hit will occur whenever the **TGS** *circuit pack is switched.*

Is a CIT available?

If **YES**, then continue with **Step 7**.
If **NO**, then proceed to **Step 8**.

7. Use the **`switch-sync:s=circuitpack,pri=manual`** command to switch timing to **TIMING** slot **2**, if not already active.

Response: **ACTIVE** LED lights on **TGS** circuit pack in **TIMING** slot **2**.

8. If Sync Autoreconfiguration has been enabled (**rtrv-sync**) on a line-timed shelf and you are changing timing to DS1 External or Free Running, use the (**set-sync**) command to disable Sync Autoreconfiguration.

9. Remove **TGS** circuit pack from **TIMING** slot **1** and set option switches to timing mode required.

   Reference: **DLP-510**

10. Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

11. Reinsert **TGS** circuit pack into **TIMING** slot **1**.

    Response: **FAULT** LED lights on **TGS** circuit pack in **TIMING** slot **1**.

12. ⇒ NOTE:
    The critical (**CR**) alarm LED may light for up to 15 seconds after the **UPD/INIT** button is depressed on the **SYSCTL**. This does not indicate a service interruption.

    Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

    Response: **FAULT** LED goes off on **TGS** circuit pack in **TIMING** slot **1** and lights on **TGS** circuit pack in **TIMING** slot **2**. **ACTIVE** LED goes off on **TGS** circuit pack in **TIMING** slot **2** and lights on **TGS** circuit pack in **TIMING** slot **1**.

13. Remove **TGS** circuit pack from **TIMING** slot **2** and set option switches to timing mode required.

    Reference: **DLP-510**

14. Reinsert **TGS** circuit pack into **TIMING** slot **2**.

    Response: **FAULT** LED on **TGS** circuit pack in **TIMING** slot **2** lights for about 15 seconds then goes off.

15. If a CIT is available, use the **rtrv-sync** command to display the provisioning and operational information of the synchronization interface.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Existing OLIU With Different Type OLIU

1. ⚠ WARNING:
Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Circuit packs must not be installed or replaced if the **SYSCTL** *is not installed and operating normally. If the* **SYSCTL** *is not installed and operating normally, unpredictable provisioning of the replaced/installed circuit pack can result.*

⚠ CAUTION 2:
*Ensure that protection switching is available (***OLIU** *installed in slot 2, protection line good, and no locks, inhibits, or forced switches in effect).*

⚠ CAUTION 3:
Before installing **OLIU***s, ensure all optical fiber connectors and couplings have been properly cleaned* **[DLP-522]**. *Signal performance may be degraded if the connectors and couplings are not cleaned properly.*

⚠ CAUTION 4:
Ensure that necessary optical power levels will be met with different type of **OLIU** *installed. Use optical line power measurements and check* **OLIU** *output specifications.*

NOTE 1:
This procedure may be used to replace existing **OLIU**s with **21D/21D-U OLIU**s to provide a cost effective interconnect for intraoffice applications such as OC-3 optical extensions from an OC-12 shelf.

NOTE 2:
If this procedure is being used to replace **OLIU**s with **21D/21D-U OLIU**s, note that the recommended optical fiber for the **21D/21D-U OLIU** is multimode optical fiber.

If new software is required to support the **OLIU** being installed, download the required new software to the system.

Reference: **DLP-527**

2. NOTE:
When available, use a CIT and the **`switch-line:`***`address`***`pri=manual`** (linear extensions) or **`switch-path-(sts1):`***`address`***`pri=manual`** (rings) command to do a protection switch. The line protection switching request is unidirectional. It may be necessary to perform a switch command at both the near end and far end to switch both transmit and receive to the same line.

Is a CIT available?

If **YES**, then continue with **Step 3.**
If **NO**, then proceed to **Step 5.**

3. NOTE:
   The **rtrv-state** command may be used to verify that only the protection line is active. In the `rtrv-state` report, the `Switch State` should show `active` only for the protection **OLIU**. Also, the green **ACTIVE** LEDs should be lighted only on protection **OLIU**s in slot **2(P)**.

   Use the **switch-line:** or **switch-path:** command to switch service to protection slot **2(P)**, if not already performed.

4. Use the **rtrv-state** command to ensure that service is switched to protection slot **2(P)**.

5. Disconnect optical fiber from **OLIU** in service slot **1** of **MAIN** or **FUNCTION UNIT** slots being equipped.

6. Remove service **OLIU** from slot **1**.

7. NOTE 1:
   The optical connector labeled **OUT** is the output from the **OLIU**. The connector labeled **IN** is the input to the **OLIU**.

   NOTE 2:
   Optical fibers connecting the system with the other end should not be connected to the **OLIU** until at least 45 seconds after an optical loopback is removed.

   Remove the protective covers from the new **OLIU** connectors. Clean the fibers and connectors with optical quality, lint-free tissue and a compressed air duster.

   Reference: **DLP-522**

8. ⇒ NOTE:
   When a different **OLIU** replaces an existing **OLIU**, the **FAULT** LED on the new **OLIU** will light until the **UPD/INIT** button is momentarily depressed in the following step.

   Install new **OLIU** into service slot **1** and connect optical fibers. Ensure **OLIU** output at one end is connected to the correct **OLIU** input at the other end.

   Reference: **DLP-511** or **DLP-551**

9. Momentarily depress the **UPD/INIT** button on the **SYSCTL**.

   Response: **FAULT** LED lights on **OLIU** in slot **2(P)**. **FAULT** LED goes off on **OLIU** in slot **1**.

10. Did **FAULT** LED go off on **OLIU** in service slot **1**?

    If **YES**, then continue with **Step 11**.
    If **NO**, then do **TAP-120** or **TAP-121**.

11. ⇒ NOTE:
    If existing cross-connections to the new circuit pack are not supported, the new circuit pack will be declared bad and the switch to the new circuit pack will not be completed. All cross-connections not supported by the new circuit pack have to be deleted before the switch will be successful.

    Ensure service has switched to **OLIU** in service slot **1**.

12. Disconnect optical fiber from **OLIU** in protection slot **2(P)** and remove the **OLIU**.

13. Remove the protective covers from the new **OLIU** connectors. Clean the fibers and connectors with optical quality, lint-free tissue and a compressed air duster.

    Reference: **DLP-522**

14. Install new **OLIU** into protection slot **2(P)** and connect optical fibers. Ensure **OLIU** output at one end is connected to the correct **OLIU** input at the other end.

    Reference: **DLP-511** or **DLP-551**

15. Did **FAULT** LED go off on **OLIU** in protection slot **2(P)**?

    If **YES**, then continue with **Step 16**.
    If **NO**, then do **TAP-120** or **TAP-121**.

16. Verify optical fiber cables are placed correctly in the fiber tray and are properly routed in the bay framework.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Enable or Disable System Security and/or Edit, Delete, or Enter User Login

1. ⚠ CAUTION:
You must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly whenever working with the DDM-2000.

⇒ NOTE:
If all shelves in a bay are connected together with CIT bay mult cabling, the CIT may be connected to any shelf front or rear **CIT** connector and gain access to any other shelf by entering a shelf address. If the CIT is connected to the rear **CIT** connector, it must be connected through a null modem.

Connect CIT and establish session.

Reference: **DLP-516**

2. Are you going to enable or disable system security or are you going to edit, delete, or enter a user's login?

If **Enable or Disable System Security**, continue with **Step 3**.
If **Edit, Delete, or Enter User Login**, proceed to **Step 15**.

3. ⇒ NOTE 1:
You must be logged into the system as one of the three privileged users to enable or disable system security. Initially, the defaults for the privileged user logins (Release 5.1 and later) are LUC01 (uppercase LUC-zero-one), LUC (uppercase LUC-zero-two), and LUC03 (uppercase ATT-zero-three); however, these defaults may have been changed. For Release 5.0 and earlier, the defaults for the privileged user logins are ATT01 (uppercase ATT-zero-one), ATT02 (uppercase ATT-zero-two), and ATT03 (uppercase ATT-zero-three). The login banner for Release 5.0 and earlier reads: `AT&T, DDM-2000 OC-12 Multiplexer, Release a.b.c.`

NOTE 2:
System security requires the defaults for the privileged user logins/password to be changed and CIT and/or DCC port security to be enabled.

At the `login<` prompt, enter a valid privileged user login (provided by your DDM-2000 administrator).

Response: `password<`

4. **NOTE 1:**
Initially, the default for the privileged user password is DDM-2000; however, this default may have been changed.

NOTE 2:
Passwords are not displayed on the CIT.

At the `password<` prompt, enter a valid privileged user password (provided by your DDM-2000 administrator).

Response: CIT prints the following message followed by an alarm and status report:

```
/************************************
*                                   *
*         Lucent Technologies       *
*        Bell Labs Innovations      *
*      DDM-2000 OC-12 Multiplexer   *
*                                   *
*           Release a.b.c           *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

5. ⇒ NOTE:
After the prompt (<), the system will respond to commands entered. The **set-link:pg=( )** command may be used to set the vertical size of the displayed page on the CIT. Page (**pg**) length may be set from 3 to 150 lines with a default length of 24 lines.

Did you use the default privileged user login (LUC01, LUC02, or LUC03) and password (DDM-2000) to log into the system?

If **YES**, continue with **Step 6**.

If **NO**, proceed to **Step 8**.

6. ⇒ NOTE:
The defaults for privileged user logins (LUC01, LUC02, and LUC03) and password (DDM-2000) must be changed for system security. There are always three privileged user logins. (Privileged user logins cannot be added or deleted.) See the "Commands and Reports" section of this manual for a description of the **set-lgn** command format.

Use the **set-lgn:** command to change the defaults for the privileged user logins (LUC01, LUC02, and LUC03) and password (DDM-2000).

7. ⇒ NOTE:
The **rtrv-lgn:** command retrieves the Login Provisioning Report. This report lists each user's login and authorization level (user type). The report does not contain passwords. See the "Commands and Reports" section of this manual for a description of the **rtrv-lgn:** command format.

Use the **rtrv-lgn:** command to obtain the Login Provisioning Report and verify that the privileged user logins have been changed.

8. ⇒ NOTE:
The **rtrv-secu:** command retrieves the `Port Security Configuration Report`. This report provides CIT and DCC port security and timeout information. See the "Commands and Reports" section of this manual for a description of the **rtrv-secu:** command format.

Use the **rtrv-secu:** command to obtain the `Port Security Configuration Report` and note the CIT/DCC port security and timeout information.

9. ⇒ NOTE 1:
The **set-secu:** command determines whether security is enabled or disabled or in lockout state on each CIT and DCC interface using one or more CIT and/or DCC port addresses [dcc-all or cit-{1,2,all}]. This command is also used to specify the timeout period for each port address. The timeout period is the time, in minutes, before an inactive session is automatically terminated. See the "Commands and Reports" section of this manual for a description of the command format. For example, **set-secu:cit-1:sec=enabled** enables security on the front CIT port.

⇒ NOTE 2:
When security is enabled for a CIT or DCC port address, a valid login and password must be entered to access the system through that port. When security is in lockout state, only a privileged user can access the system through the locked out CIT/DCC port.

⇒ NOTE 3:
For applications that have a remote terminal located on a customer premise site, you may want to disable security on the DCC interface at the remote terminal. This allows the user at the terminal in the central office to login remotely (via the DCC) to the remote terminal without a login/password. At the terminal in the central office, you may want to enable security on the DCC. This means that a user at the remote terminal must have a valid login/password to login remotely (via the DCC) to the terminal at the central office.

Use the **set-secu:** command to enable or disable security on each CIT and/or DCC port and specify the corresponding timeout period, as required.

10. Use the **rtrv-secu:** command to obtain the Port Security Configuration Report and verify the security and timeout information for the CIT and/or DCC ports.

11. ⇒ NOTE 1:
There are three types of users:

Privileged users may execute any command, including restricted commands.

General users may execute any commands that are not restricted to privileged users.

Maintenance users may execute commands that obtain nonprivileged system reports, perform protection switching, loopback activities, and perform some other maintenance activities.

Reports-only users may only execute commands that obtain nonprivileged system reports.

Refer to *Security* in the "Administration and Provisioning" section of this manual for more information about restricted commands.

⇒ NOTE 2:
Three privileged and up to 100 nonprivileged (general and/or reports-only) logins are supported. If a user attempts to enter another login when the maximum supported logins already exist, the command will be denied. See the "Commands and Reports" section of this manual for a description of the **set-lgn** command format.

Use the **set-lgn:** command to enter, edit, or delete nonprivileged (general and/or reports-only) logins/passwords and user types, as required.

12. Use the **rtrv-lgn:** command to obtain the Login Provisioning Report and verify the nonprivileged user logins and user types.

13. See the "Commands and Reports" section of this manual for descriptions of related security commands: **set-passwd**, **rtrv-lgn**, and **rtrv-secu**.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. ⇒ **NOTE:**
You must be logged into the system as one of the three privileged users to edit, delete, or enter a user's login. Initially, the defaults for the privileged user logins are LUC01 (upper case LUC-zero-one), LUC02 (upper case LUC-zero-two), and LUC03 (upper case ATT-zero-three); however, these defaults may have been changed.

At the `login<` prompt, enter a valid privileged user login (provided by your DDM-2000 administrator).

Response: `password<`

16. ⇒ **NOTE 1:**
Initially, the default for the privileged user password is DDM-2000; however, this default may have been changed.

⇒ **NOTE 2:**
Passwords are not displayed on the CIT.

At the `password<` prompt, enter a valid password (provided by your DDM-2000 administrator).

Response: CIT prints the following message followed by an alarm and status report:

```
/************************************
*                                   *
*         Lucent Technologies       *
*        Bell Labs Innovations      *
*      DDM-2000 OC-12 Multiplexer   *
*                                   *
*           Release a.b.c           *
*                                   *
************************************/

                    .
                    .
                    .

   TID date time
M  rtrv-alm:all COMPLD
   /* Active Alarms and Status Report
```

17. **NOTE 1:**
After the prompt (<), the system will respond to commands entered. The **set-link:pg=( )** command may be used to set the vertical size of the displayed page on the CIT. Page (**pg**) length may be set from 3 to 150 lines with a default length of 24 lines.

NOTE 2:
There are three types of users:

Privileged users may execute any command, including restricted commands.

General users may execute any commands that are not restricted to privileged users.

Maintenance users may execute commands that obtain nonprivileged system reports, perform protection switching, loopback activities, and perform some other maintenance activities.

Reports-only users may only execute commands that obtain nonprivileged system reports.

Refer to *Security* in the "Administration and Provisioning" section of this manual for more information about restricted commands.

NOTE 3:
Three privileged and up to 100 nonprivileged (general and/or reports-only) logins are supported. If a user attempts to enter another login when the maximum supported logins already exist, the command will be denied.

NOTE 4:
Both privileged user logins may be edited to change the login name and/or password, but privileged user logins cannot be added or deleted. See the "Commands and Reports" section of this manual for a description of the **set-lgn** command format.

Use the **set-lgn:** command to edit, delete, or enter logins/passwords and user types, as required.

18. ⇒ NOTE:
The **rtrv-lgn:** command retrieves the Login Provisioning Report. This report lists each user's login and authorization level (user type). The report does not contain passwords. See the "Commands and Reports" section of this manual for a description of the **rtrv-lgn:** command format.

Use the **rtrv-lgn:** command to obtain the Login Provisioning Report and verify the user logins and user types.

19. ⇒ NOTE:
Setting logins/passwords does not set system security. In addition to assigning valid logins/passwords, CIT and/or DCC port security must be enabled to secure a system.

Repeat this procedure to enable system security, if required.

20. See the "Commands and Reports" section of this manual for descriptions of related security commands: **set-passwd**, **rtrv-lgn**, and **rtrv-secu**.

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Upgrade BBF2 TGS To BBF2B TGS

1. ⚠ CAUTION:
If shelves in a bay are connected together with timing mult cabling, changing the timing mode on one system may affect the timing for other systems. Ensure that proper timing arrangements are made for all affected shelves.

⇒ NOTE:
This procedure may be used to replace existing **BBF2 TGS** circuit packs with **BBF2B TGS** circuit packs.

Verify that there are no alarms or protection switches present on the system.

2. Set new **BBF2B TGS** circuit pack option switches as required.

   Reference: **DLP-510**

3. Is timing mode DS1 External?

   If **YES**, then continue with **Step 4**.
   If **NO**, then proceed to **Step 6**.

4. Check external timing references to ensure they are good.

5. ⇒ NOTE 1:
ED-8C727-20, G151, G152, or G153 cables are used to connect timing references to shelf 1 in a bay. ED-8C727-20, G154 or G155 (rear access) or ED-8C727-21, G210, G211, G212, and G213 (front access) cables are used to multiple timing references to subsequent shelves in the bay (for example, from shelf 1 to shelf 2, from shelf 2 to shelf 3, etc.). The cable from the timing reference source to shelf 1 is connected to jack **J66** on the shelf backplane (or **J266** of the front access cable). The cable from shelf 1 (or lower shelf) to the next higher shelf is connected from jack **J65** (**P265**) of the lower shelf to jack **J66** (**J266**) of the next higher shelf.

NOTE 2:
If the **BBF2B TGS** timing mode is set to DS1 External sync out mode, an ED-8C724-20, G394 cable must be connected to jack **J66** on the shelf backplane (or **J266** of the front access cable). This cable has a relay to disconnect the incoming external timing supply if the **TGS** circuit pack is removed.

Make DS1 external timing reference connections as shown in Table A.

Table A. DS1 External Timing Reference Source Connections

Name	Desig.	Conn.	Term.	Color
Receive from Primary DS1 Reference	T	P66	6	BK
	R		1	O
Receive from Secondary DS1 Reference	T		7	R
	R		2	G

6. Make synchronization DS1 timing output connections as shown in Table B, if required.

Table B. DS1 Timing Output Connections

Name	Desig.	Conn.	Term.	Color
Transmit Primary DS1 Reference	T	P65	6	BK
	R		1	O
Transmit Secondary DS1 Reference	T		7	R
	R		2	G

7. CAUTION:
A momentary transmission hit (error) will occur when the **TGS** *circuit pack is switched.*

Is a CIT available?

If **YES**, then continue with **Step 8**.
If **NO**, then proceed to **Step 9**.

8. Use **`switch-sync:s=circuitpack,pri=manual`** command to switch timing to protection **TGS** in **TIMING** slot **2**, if not already active.

Response: **ACTIVE** LED lights on **TGS** circuit pack in **TIMING** slot **2**.

9. ⇒ NOTE:
If external timing mode is used and bay mult cables for DS1 timing references connect shelves in a bay, removing a **TGS** circuit pack causes a momentary loss of the associated incoming DS1 timing reference. This may result in a `inc. DS1 sync. ref. LOS` alarm on all shelves above this shelf that are connected to the same bay mult cabling. This momentary loss of timing reference does not affect transmission.

Remove old **TGS** circuit pack from **TIMING** slot **1**.

10. Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

11. Insert new **BBF2B TGS** circuit pack into **TIMING** slot **1**.

Response: **FAULT** LED lights on **TGS** circuit pack in slot **1**.

12. ⇒ NOTE:
The critical (**CR**) alarm LED may light for up to 15 seconds after the **UPD/INIT** button is depressed on the **SYSCTL**. This does not indicate a service interruption.

Momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL**.

Response: **FAULT** LED lights on **TGS** circuit pack in **TIMING** slot **2**. **FAULT** LED goes off on **TGS** circuit pack in **TIMING** slot **1** after about 15 seconds. **ACTIVE** LED goes off on **TGS** circuit pack in **TIMING** slot **2** and lights on **TGS** circuit pack in **TIMING** slot **1**.

13. Remove old **TGS** circuit pack from **TIMING** slot **2**.

14. Insert new **BBF2B TGS** circuit pack into **TIMING** slot **2**.

Response: Red **FAULT** LED on **TGS** circuit pack in slot **2** lights for about 15 seconds then goes off.

15. If a CIT is available, use the **`rtrv-sync`** command to display the provisioning and operational information of the synchronization interface.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform OC-3c (STS-3c) Transmission Test

1. NOTE 1:
   This procedure may be used to perform OC-3c transmission tests in the mux (toward the fiber) direction. When this procedure is being used to perform end-to-end OC-3c tests, it is assumed that the complete end-to-end system has already been tested and that only the OC-3c signal is being tested at this time. Transmission tests in the *mux* direction may be local or end-to-end tests (see Figure 1).

   NOTE 2:
   This test is performed with a SONET test set.

   NOTE 3:
   When this procedure is used to do end-to-end tests, one DDM-2000 OC-12 Multiplexer will be referred to as the near end and the other assembly as the far end. These designations are arbitrary; either assembly can be the near-end or the far-end assembly.

   Use the **`rtrv-feat:`** command at each node to verify OC-3c service has been set using the **`set-feat:feat=sts3c,act=enable`** command.

2. Use the **`rtrv-crs-sts3c:`** command at each node to verify proper cross-connections have been made.

3. If local tests are being performed, the fiber loopback at the near-end **23G-U MAIN OLIUs** must be in place (Figure 1.)

   If STS-3c transport service end-to-end tests are being performed, at the far-end LGX cross-connection associated with the DDM-2000 OC-12 Multiplexer being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the OC-3c signal to be tested. At the cross-connection associated with the near-end DDM-2000 OC-12 Multiplexer (CO), connect the SONET test set to the **IN** and **OUT** jacks associated with the circuit under test.

   If STS-3c broadcast video service end-to-end tests are being performed, SONET test sets must be connected at the CO and each RT node as shown in Figure 2. The drop signals at each RT and the return signal at the CO may be monitored.

4. Use the SONET test set to test for error-free transmission.

5. Was the test successful (error free)?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 16**.

6. Is video broadcast service being tested?

   If **YES**, then proceed to **Step 14**.
   If **NO**, then continue with **Step 7**.

7. Is protection **OLIU** circuit pack installed in function unit slot being tested?

   If **YES**, then continue with **Step 8**.
   If **NO**, then proceed to **Step 12**.

8. Unseat the service **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack associated with the circuit under test.

9. Repeat the OC-3c transmission test with the SONET test set.

10. Was the test successful (error free)?

    If **YES**, then continue with **Step 11**.
    If **NO**, then proceed to **Step 16**.

11. Reseat the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack associated with the circuit under test.

12. The **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack under test has passed the OC-3c transmission test. Remove the looping patch cords from the cross-connections.

13. At the near-end (and the far-end) DDM-2000 OC-12 Multiplexer, momentarily depress the **UPD/INIT** pushbutton on the **SYSCTL** (or use the **`upd`** command) to update the **SYSCTL**.

14. Repeat this procedure for any additional OC-3c circuits to be tested.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. Has the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 19**.
    If **NO**, then continue with **Step 17**.

17. Replace the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack that failed the test.

    Reference: **DLP-518**

18. Repeat this procedure for the **21G/21G-U/21G2-U** or **21D/21D-U OLIU** circuit pack that failed.

19. Trouble may be in the LGX cross-connections or the shelf backplane. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the **RETRIEVE** commands (for example, **`rtrv-alm`**, **`rtrv-hsty`**, etc.) to check for other trouble indications.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

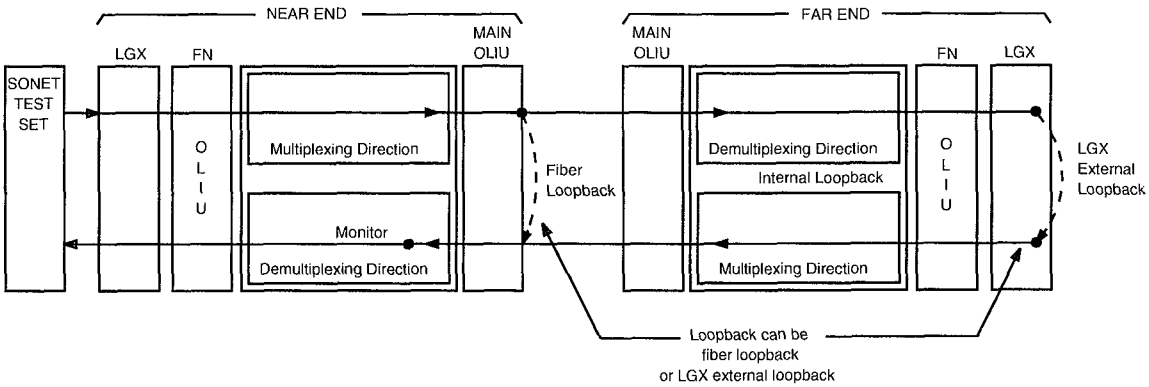


Figure 1. Transmission Test of OC-3c Signal in MUX Direction

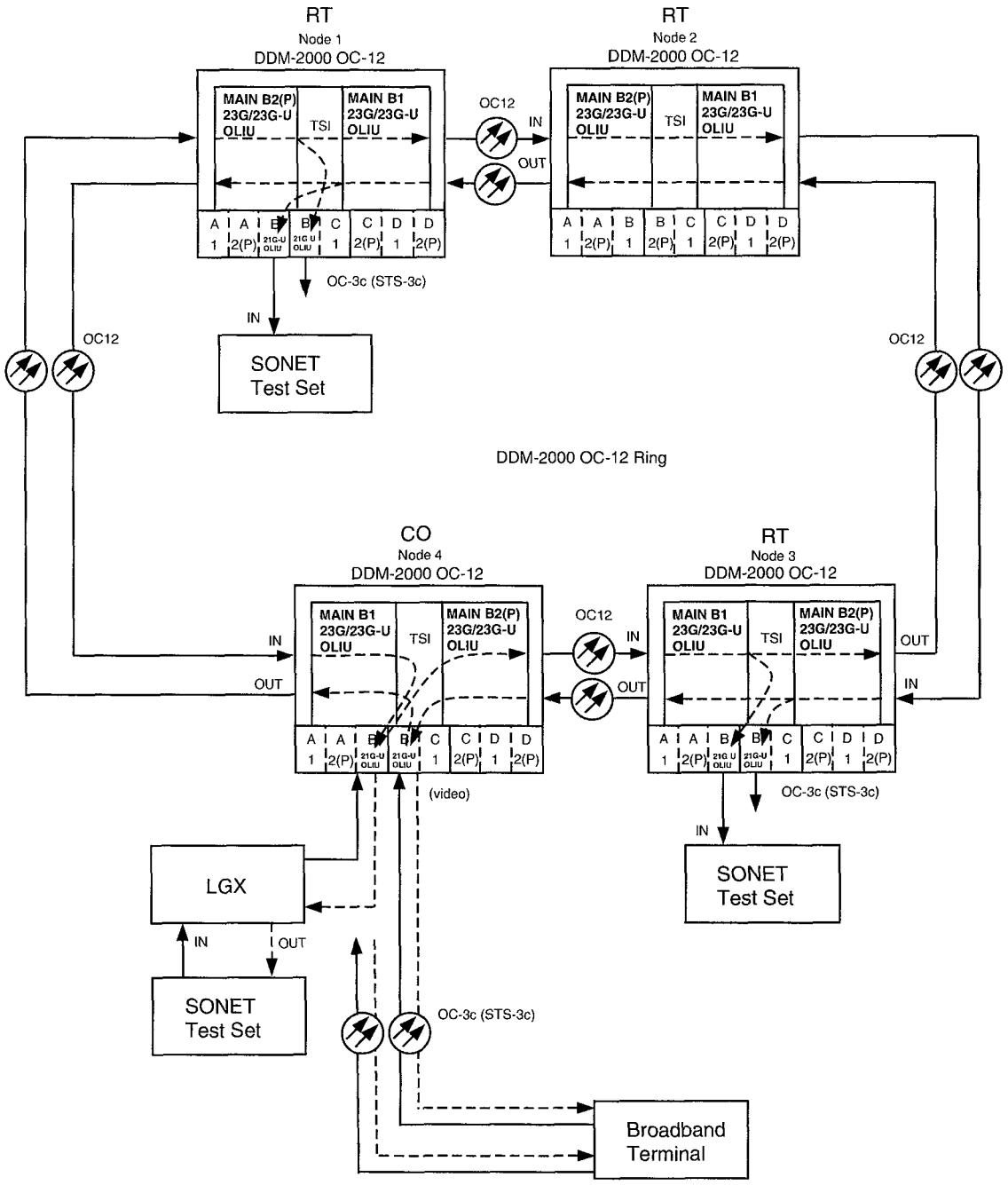


Figure 2. Transmission Test of Video Broadcast Network

DDM-2000 Receiver Sensitivity Test

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to beam. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION 1:
Take care to avoid damaging LEDs that protrude through opening in faceplate of **OLIU**.

⚠ CAUTION 2:
Avoid excessive bending of optical jumper and cables.

⚠ CAUTION 3:
*All optical fiber connectors, couplings, and buildouts should be properly cleaned [***DLP-522***]. Signal performance may be degraded if connectors, couplings, or buildouts are not cleaned properly.*

NOTE 1:
It may take from 15 seconds to 3 minutes and 25 seconds for **FAULT** LEDs to stop flashing, depending on setting of signal degrade threshold (–5 to –9).

NOTE 2:
This test may be accomplished with one shelf by simply using an optical loopback after the optical splitter.

Configure the DDM-2000 shelf and test equipment as shown in Figure 1.

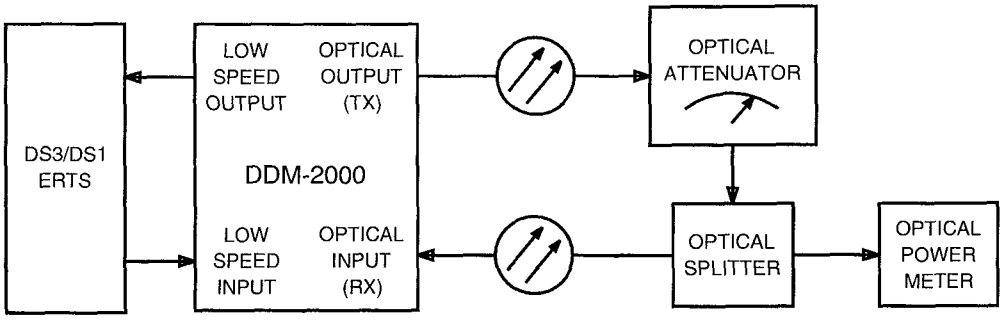


Figure 1. DDM-2000 Receiver Sensitivity Test Configuration

2. Set variable optical attenuator to obtain power level reading on optical power meter as required from Table A.

Table A. Variable Optical Power Settings for OC-12

OC-12 OLIU Power Levels	
OLIU	**Power Level (dBm)**
23H, 23H-U	–34
23G, 23G-U	–31
21G, 21G-U	–34
21D, 21D-U	–33.8(Cont. Env.) -31.8(Uncont. Env.)

3. Monitor the DS1/DS3 received signal with the DS1/DS3 Error Rate Test Set for 30 minutes and insure a bit error rate (BER) result of 10^{-10} or better.

4. Did **OLIU** pass BER test?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with **Step 5**.

5. Clean optical attenuators and connectors and repeat test. If test fails again, replace **OLIU**.

Procedure For Replacing Defective Fan Pack

1. **NOTE 1:**
   Fan packs are numbered from left to right as viewed from front of fan shelf.

   NOTE 2:
   This procedure is the same for both front and rear access arrangements.

   NOTE 3:
   Fan pack removal does not require the removal of the fan shelf.

   Remove fan shelf front cover by turning front latch assemblies according to the markings on the front cover.

2. Disconnect the fan pack cable and unscrew the two mounting screws holding the fan pack in place. See Figure 1.

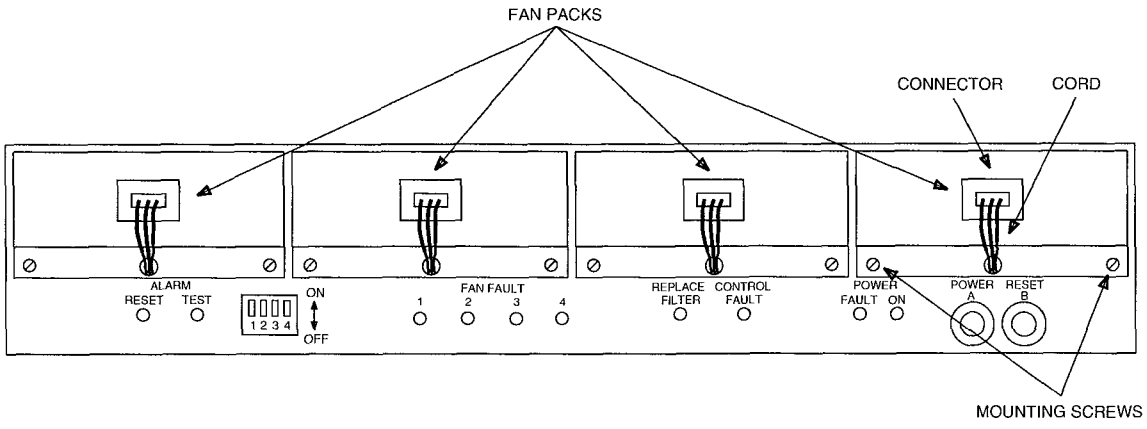


Figure 1. DDM-2000 Fan Shelf — Front Cover Removed

3. Slide out the defective fan pack and install the new one.
4. Reinstall fan pack screws and reconnect the fan cable.
5. Remount fan shelf front cover and tighten latch assemblies.
6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make STS1 (DS3) Cross-Connections Using CIT Path Switched Ring Configuration

1. NOTE 1:
   If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the Administration and Provisioning section of this manual. Also, read the description of the following commands in the Commands and Reports section of this manual: **`ent-crs-sts1`**, **`rtrv-crs-sts1`**, and **`dlt-crs-sts1`**.

   NOTE 2:
   You have to login to more than one node to get a complete map of the network using the **`rtrv-map-network`** and **`rtrv-map-neighbor`** commands. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

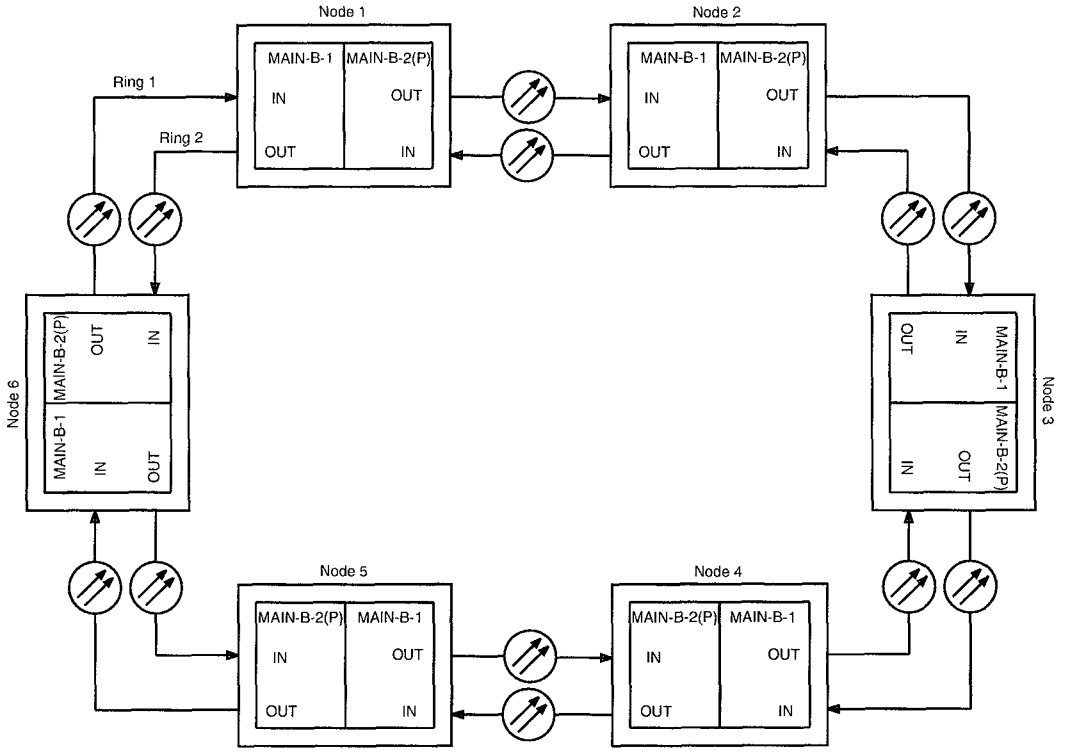


Figure 1. Sample OC-12 Network Schematic

Login to any node in each ring in the network and use the **`rtrv-map-network`** and **`rtrv-map-neighbor`** command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
    Node6 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-network:  COMPLD
 /* Network Map for Node6
   ==========================================================================
    System Name           Comm.   Product              NE          Alarm
      (TID)               Status  Type                 Type        Group
   ==========================================================================
   Node6                          DDM-2000 OC-12       DSNE          3
   Node5                          DDM-2000 OC-12       AGNE          3
   Node4                          DDM-2000 OC-12                     3
   Node3                          DDM-2000 OC-12                     3
   Node2                          DDM-2000 OC-12                     3
   Node1                          DDM-2000 OC-12                     3
 */
```

Figure 2. Sample Report From `rtrv-map-network` Command

```
    Node6 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Node6
   ==========================================================================
                                      Link
    System Name           Connected   Comm.            Product
      (TID)               Through     Status           Type
   ==========================================================================
   Node6                                               DDM-2000 OC-12
   Node5                  main-b-1                     DDM-2000 OC-12
   Node1                  main-b-2                     DDM-2000 OC-12

 */
```

Figure 3. Sample Report From `rtrv-map-neighbor` Command

2. Verify system configuration is same as specified on work order or circuit order.

3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. ⇒ NOTE 1:
   In ring configurations, cross-connections consist of pass-through cross-connections in addition to the terminating cross-connections. For example in Figure 1, if the terminating nodes are at Node1 and Node5, then pass-through cross-connections will have to be made at all other nodes (Nodes 2, 3, 4 and 6).

   ⇒ NOTE 2:
   In ring configurations, you should use the following rules in establishing cross-connections in each ring:

   1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.

   2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the **`rtrv-eqpt:`** command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **3DS3** circuit packs if DS3 service is being established?

6. NOTE 1:
Cross-connections supporting DS3 and EC-1 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. See Figures 2 and 3 for examples.

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** slot **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 5 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,a-1**)

10. 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.

11. At terminating nodes equipped with **BBG11/BBG11B 3DS3** circuit packs, use the **set-trace-sts1** command to verify the proper cross-connect path of a STS-1 cross-connected STS-1 signal.

    Reference: **DLP-558**

12. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

13. If `inc. STS1 AIS` alarms are present, look for missing or improperly made cross-connections. Use **TAP-119** to locate missing cross-connections, if required.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

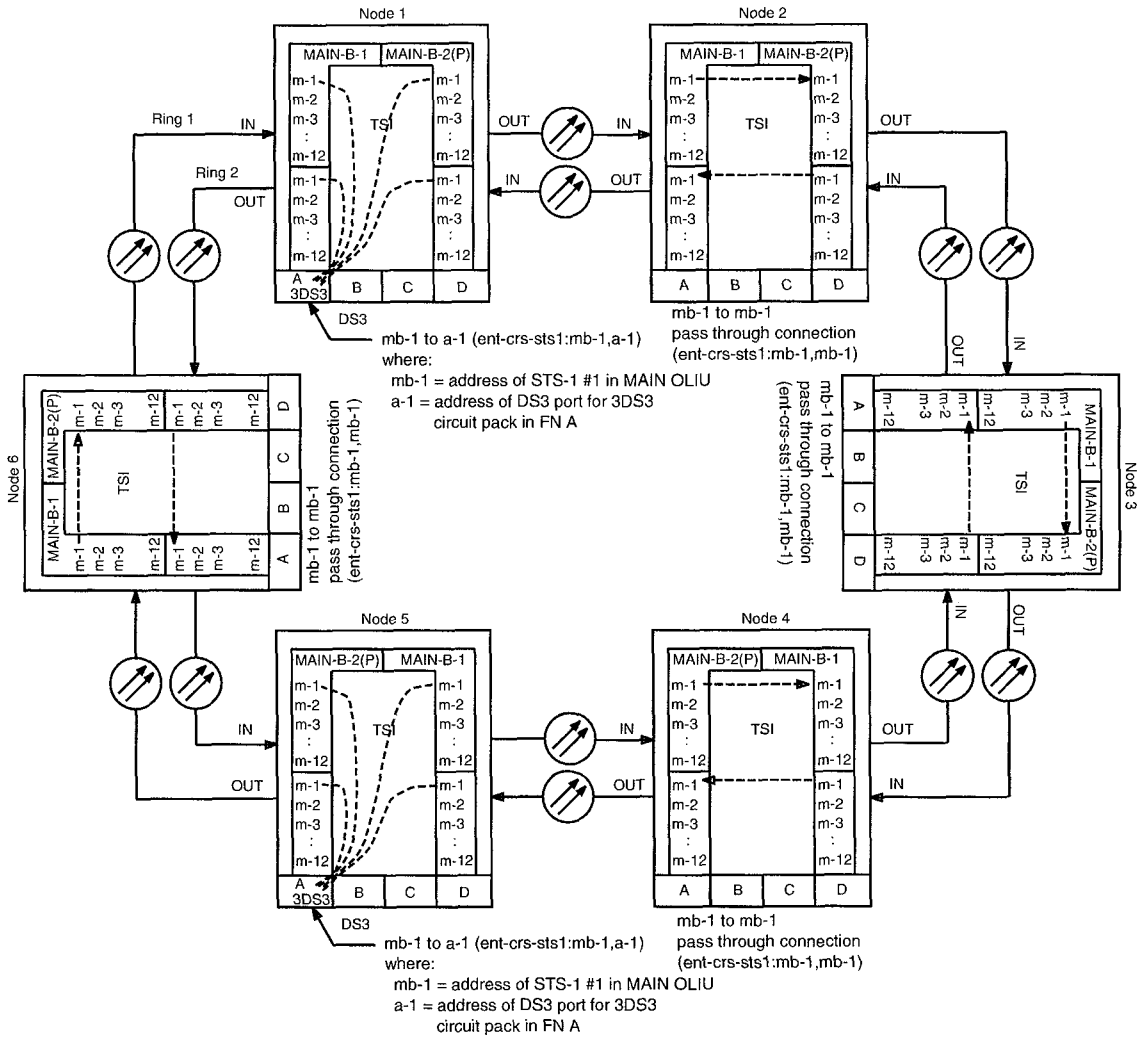


Figure 4. OC-12 Path Protected Ring Network (DS3 to DS3) with STS1 Cross-Connections

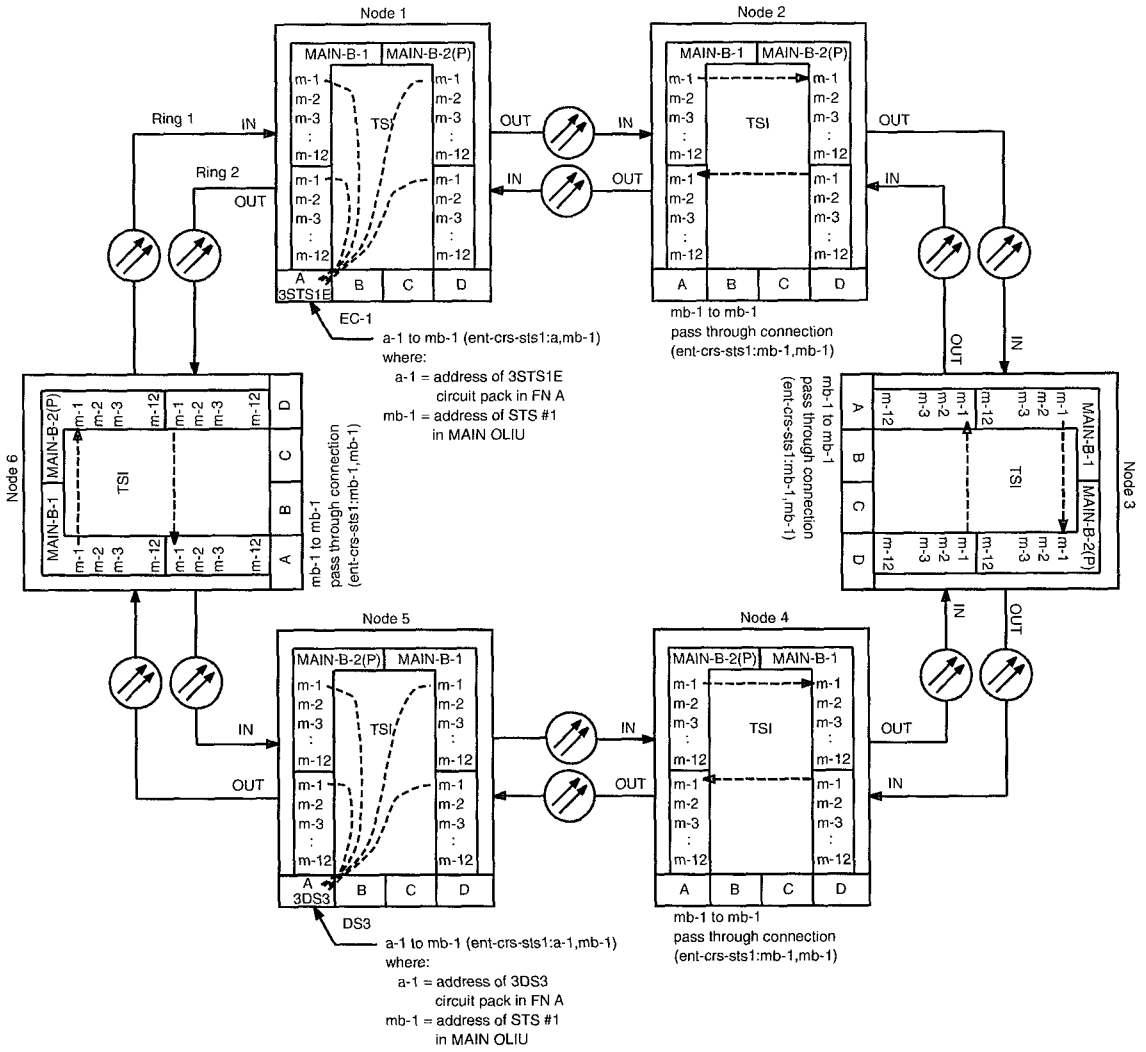


Figure 5. OC-12 Path Protected Ring Network (DS3 to EC-1) with STS1 Cross-Connections

Install 3STS1E Circuit Packs

1. ⚠ CAUTION:
   Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the **3STS1E**.

   ⇒ NOTE:
   3STS1E circuit packs may be installed in function unit group slots **FN A**, **FN B**, **FN C**, or **FN D**. Service **3STS1E** circuit packs are installed in slots labeled **FN ( ) 1**. Protection **3STS1E** circuit packs are installed in slots labeled **FN ( ) 2(P)**.

   Determine which function unit group slots (**FN A**, **FN B**, **FN C**, or **FN D**) are to be equipped with **3STS1E** circuit packs.

2. Determine from office records the length of the STS1E cabling between the DDM-2000 and the STSX cross-connect point.

3. Refer to Table A and Figure 1. Install the STS1E option jumpers per Table A.

4. ⇒ NOTE:
   The **3STS1E** circuit pack provides bidirectional transport of up to three EC-1 signals through the DDM-2000 OC-12 Multiplexer.

Table A. 3STS1E LBO Settings

Cable Length (Ft)			
734A Cable	Mini-Coax KS-19224	735A Cable	LBO Setting
0 to 225	0 to 75	0 to 125	LBO IN
>225 to 450	>75 to 150	>125 to 250	LBO OUT

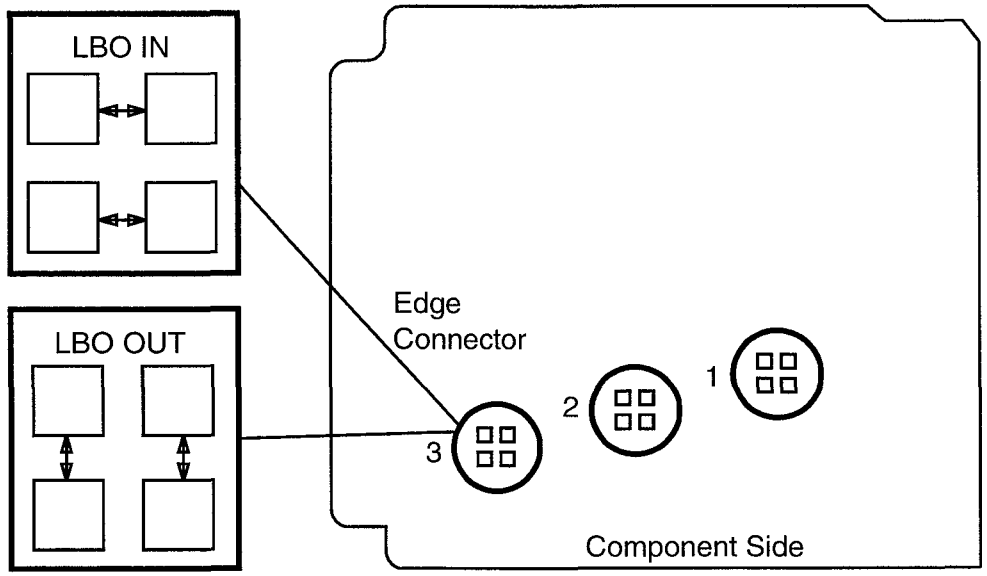


Figure 1. 3STS1E Option Settings

5. ⇒ NOTE:
   If the response is not correct in the following procedures, replace the **3STS1E** circuit pack.

   Seat a **3STS1E** circuit pack in function unit group slot **FN A-1**, **FN B-1**, **FN C-1**, or **FN D-1**.

   Response: **FAULT** LED on the **3STS1E** lights for about 20 seconds then goes off. **ACTIVE** LED lights on the first **3STS1E** circuit pack of the pair installed.

6. If required, seat a second (protection) **3STS1E** circuit pack in function unit group slot **FN A-2(P)**, **FN B-2(P)**, **FN C-2(P)**, or **FN D-2(P)** of the same function unit group.

   Response: **FAULT** LED on the **3STS1E** lights for about 20 seconds then goes off. **ACTIVE** LED remains off.

7. Repeat this procedure from Step 1 for each pair of **3STS1E** circuit packs to be installed.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform End-to-End OC-12 Optical Line Test

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

NOTE 1:
This test is used in ring Release 5 or later to verify the integrity of the OC-12 fiber lines (single span) between two DDM-2000 shelves and may be performed with the DDM-2000 in service or out of service.

NOTE 2:
It is assumed that each DDM-2000 has passed the local (looped) transmission tests and a CIT is available. If these tests have not been completed, refer to the appropriate procedure and perform the tests.

NOTE 3:
This test must be performed locally at each shelf location associated with the optical span(s) being tested. See Figure 1.

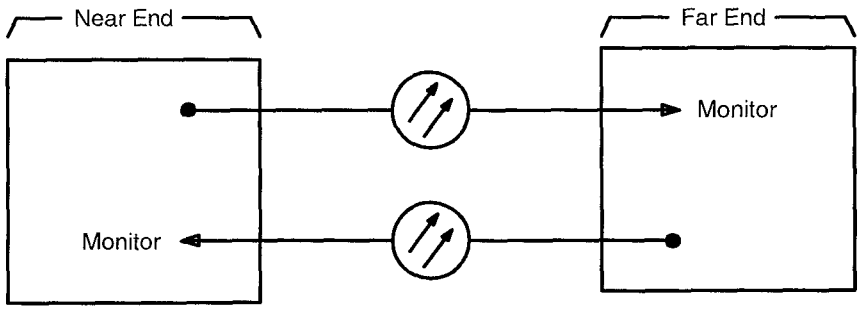


Figure 1. End-to-End Optical Line Test Monitoring

2. At near-end test location, connect CIT to User Panel **CIT** connector and establish session.

   Reference: **DLP-521**

3. ⚠ CAUTION:
   The **`init-pm:reg=all`** *command initializes (clears) all current day and/or all current quarter-hour performance-monitoring storage registers.*

   NOTE:
   If local procedures prohibit you from doing the **`init-pm:reg=all`** command, you may perform the following in Step 5. Use the **`rtrv-pm-line`** command to obtain the line performance monitoring status report, note the readings on the `Today` line in the report, wait 20 seconds and then obtain another report. There should be no change in readings from the first report.

   Enter the command **`init-pm:reg=all`**, if allowed.

4. Wait 20 seconds.

5. Enter one of the following commands:
   - **rtrv-pm-line:main-b-1** if service line is being tested.
   - **rtrv-pm-line:main-b-2** if protection line is being tested.
   - **rtrv-pm-line:main-b-all** if both lines are being tested.

   Response: The following CIT report will indicate the status of the equipment. The `Today` line should indicate that there are no errors. Other `Time` lines may exist with numbers greater than zero. (The Commands and Reports section of this manual under **RTRV-PM-LINE** describes this report.)

```
/* Line Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
================================================================================
Address      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
    .         .        .         .      .        .        .        .       .
    .         .        .         .      .        .        .        .       .
    .         .        .         .      .        .        .        .       .
*/
```

6. Has performance-monitoring report been obtained from all shelf locations associated with optical span(s) being tested?

   If **NO**, then continue with **Step 7**.
   If **YES**, then proceed to **Step 8**.

7. Repeat this procedure from Step 3 at other shelf locations.

8. Did report indicate errors?

   If **YES**, then continue with **Step 9**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Trouble may be in optical fiber and/or connections. Trouble may also be in **OLIU**s. If the report indicated trouble when the report was obtained from the near end of the span, trouble may be in the receive direction (see Figure 1). If the report indicated trouble when the report was obtained from the far end of the span, trouble may be in the transmit direction. Check optical fiber and connections. Clean optical fiber connections [**DLP-522**]. If no trouble found in the optical fibers, replace **OLIU**(s) [**DLP-518**] associated with the address indicated in the report.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Make STS1 (DS3) Cross-Connections Using CIT Dual Ring Interworking Configuration

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 in each ring to get a complete map of the network using the **`rtrv-map-network`** and **`rtrv-map-neighbor`** commands. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections. List the TID of each node and how they are connected to each other. Figure 1 shows an example of a simple schematic.

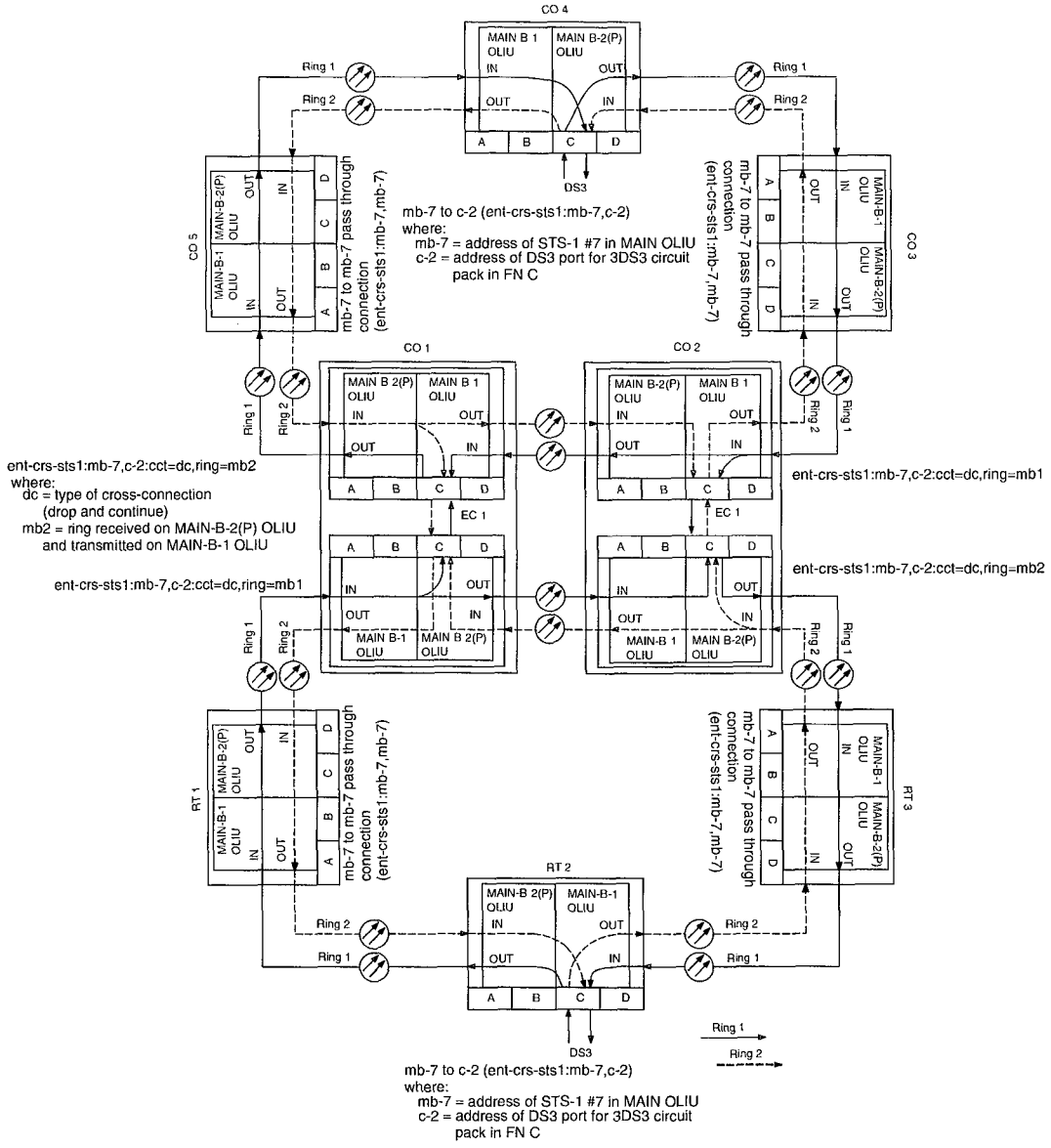


Figure 1. Example of Dual Ring Interworking Cross Connections

Login to any node in each ring in the network and use the **rtrv-map-network** and **rtrv-map-neighbor** command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
    Node6 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-network:  COMPLD
 /* Network Map for Node6
   ==========================================================================
    System Name           Comm.   Product              NE          Alarm
      (TID)               Status  Type                 Type        Group
   ==========================================================================
   Node6                          DDM-2000 OC-12       DSNE          3
   Node5                          DDM-2000 OC-12       AGNE          3
   Node4                          DDM-2000 OC-12                     3
   Node3                          DDM-2000 OC-12                     3
   Node2                          DDM-2000 OC-12                     3
   Node1                          DDM-2000 OC-12                     3
 */
```

Figure 2. Sample Report From rtrv-map-network Command

```
    Node6 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Node6
   ==========================================================================
                                    Link
    System Name           Connected Comm.            Product
      (TID)               Through   Status           Type
   ==========================================================================
   Node6                                             DDM-2000 OC-12
   Node5                  main-b-1                   DDM-2000 OC-12
   Node1                  main-b-2                   DDM-2000 OC-12

 */
```

Figure 3. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order.

3. From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. ⇒ NOTE 1:
   In dual ring configurations, cross-connections consist of drop and continue connections in addition to pass-through and terminating cross-connections. For example in Figure 1, drop and continue connections are made at the four nodes in CO1 and CO2 located between the two rings. Also. cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and FT-2000 OC-48 rings, as required.

   ⇒ NOTE 2:
   In ring configurations, you should use the following rules in establishing cross-connections in each ring:

   1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.

   2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. Use the **`rtrv-eqpt:`** command at each node to verify that each shelf is properly equipped for the service being established. For example, is the group or slot being used for service at the terminating ends equipped with the proper **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 5 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. If FT-2000 is a part of the DRI configuration, use LTP 365-575-102 User/Service Manual to make DRI cross-connections.

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. At terminating nodes equipped with **BBG11/BBG11B 3DS3** circuit packs, use the **set-trace-sts1** command to verify the proper cross-connect path of a STS-1 cross-connected STS-1 signal.

    Reference: **DLP-558**

17. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

18. If `inc. STS1 AIS` or `inc. STS1 unequipped` alarms are present, look for missing or improperly made cross-connections. Use **TAP-119** to locate missing cross-connections, if required.

Replace DDM-2000 OC-12 Shelf User Panel Out of Service

1. ⚠ CAUTION:
For an in-service shelf, it will be necessary to remove service prior to performing this procedure.

⇒ NOTE:
This procedure provides instructions for replacement of the User Panel in an **ED-8C727-30**, **G1** or **G4** DDM-2000 OC-12 Shelf.

Tools, Accessories, and Material

The following is required:

Table A. Tools, Accessories, and Material

Quantity	Description
1	ED-8C727-31, G1 or G2 User Panel
1	Screwdriver
1	Wrist Strap*

* A grounded wrist strap must be worn when handling circuit packs.

Preparation

2. If the shelf is in service:
    1. Verify that the shelf is free of alarms and that no protection switches are active.
    2. Remove the service from the shelf.

Modification Procedure

3. Remove the **OHCTL** and **SYSCTL** circuit packs from the shelf.
4. Disconnect the shelf power lead connectors **P1** and **P2** from the bay power riser connectors **J1** and **J2**. The green **PWR ON** LED on the front of the user panel should gradually extinguish.
5. Unseat the remaining circuit packs in the shelf.
6. Remove the screws at the top and bottom of the User Panel faceplate.
7. Slide the User Panel out and install the new User Panel.
8. Reconnect shelf power lead connector **P1** to the bay power riser connector **J1** and verify that the **PWR ON** LED on the User Panel lights.

Verification and Completion

9. Disconnect shelf power lead connector **P1**. Reconnect shelf power lead connector **P2** to bay power riser connector **J2** and verify that the **PWR ON** LED on the User Panel lights.
10. Reconnect power lead connector **P1** to bay power riser connector **J1**.
11. Install the **OHCTL** and **SYSCTL** circuit packs in the shelf.
12. Reseat the remaining circuit packs in the following order: **TGS**, **TSI**, **23G/23G-U** or **23H/23H-U OLIU**, **21G/21G-U/21G2-U** or **21D/21D-U OLIU**, and **3DS3/3STS1E**.
13. After 10 minutes the shelf should be free of alarm indications.
14. Depress the **ACO/TST** pushbutton on the User Panel and verify that all LEDs on the User Panel light. Continue to depress the **ACO/TST** pushbutton and the release number of the software installed in the shelf should be displayed in the **SYSCTL** window.

15. Use CIT and verify that you can log into the shelf. If you cannot establish a session, check cable connections.

    Reference: **DLP-516**

16. Service may now be restored to the shelf.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Optical Fiber Connections and Verification of Optical Facility for FUNCTION UNITS OLIUs

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

⚠ CAUTION:
When handling optical pigtails or jumpers, take care to keep bending radius as large as possible.

NOTE 1:
This procedure is used to connect the optical fiber spans in an OC-12 network consisting of DDM-2000 OC-3 and OC-12 Multiplexers only and/or an OC-12 network consisting of OC-12 Multiplexers and FT-2000 OC-48 Terminals with an OC-3/IS-3 interface. For each span, determine the loss of each optical fiber and install the proper LBO. Then connect the fibers to the associated **IN** and **OUT** connectors of each DDM-2000 **OLIU** or FT-2000 Optical Interface at the end of the span.

NOTE 2:
It is assumed that the optical jumpers used to connect the DDM-2000 OC-12 Multiplexer to an optical interconnection point are equipped with *ST*®, FC/PC, or SC lightguide cable connectors.

If the optical cables have not been placed into the cable tray at bottom front of the shelf, loosen three screws holding the front cover of the cable tray and slide out the front cover of the tray.

2. Route the optical jumpers up through the slotted hole(s) at the bottom left-front corner of the shelf and up to the **OLIU**s. See Tables A and B.

Table A. Single-Mode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FS1E-E-2	105357727	2	*ST-ST*
FS1E-E-10	105357768	10	*ST-ST*
FS1E-E-25	105357800	25	*ST-ST*
FS1E-E-50	105357859	50	*ST-ST*
FS1E-E-100	105357875	100	*ST-ST*
FS1E-A-2	105420905	2	*ST*-2016A Biconic
FS1E-A-10	105420947	10	*ST*-2016A Biconic
FS1E-A-25	105423958	25	*ST*-2016A Biconic
FS1E-A-50	105424006	50	*ST*-2016A Biconic
FS1E-A-100	105424022	100	*ST*-2016A Biconic
LS1SC-SC-2	106908247	2	SC-SC
LS1SC-SC-10	106908270	10	SC-SC
LS1SC-SC-25	106908304	25	SC-SC
LS1SC-SC-50	106908346	50	SC-SC
LS1SC-SC-100	106908395	100	SC-SC
LS1FP-FP-10	106593825	10	FCPC-FCPC
LS1FP-FP-25	106932908	25	FCPC-FCPC
LS1FP-FP-50	106932916	50	FCPC-FCPC
LS1FP-FP-100	106932924	100	FCPC-FCPC

Table B. Multimode Lightguide Jumpers

Code	Comcode	Length (Feet)	Connectors
FL1E-E-2	105351795	2	*ST*-ST
FL1E-E-10	105351837	10	*ST*-ST
FL1E-E-25	105351860	25	*ST-ST*
FL1E-E-50	105351910	50	*ST-ST*
FL1E-E-100	105351936	100	*ST-ST*
FL1E-A-2	105613954	2	*ST*-2016A Biconic
FL1E-A-10	105613988	10	*ST*-2016A Biconic
FL1E-A-25	105614010	25	*ST*-2016A Biconic
FL1E-A-50	105614051	50	*ST*-2016A Biconic
FL1E-A-100	105614119	100	*ST*-2016A Biconic
LL1SC-SC-2	106908668	2	SC-SC
LL1SC-SC-10	106908692	10	SC-SC
LL1SC-SC-25	106908734	25	SC-SC
LL1SC-SC-50	106908775	50	SC-SC
LL1SC-SC-100	10690879	100	SC-SC
LL1FC-FC-10	107095549	10	FC-FC
LL1FC-FC-25	107095556	25	FC-FC
LL1FC-FC-50	107095564	50	FC-FC
LL1FC-FC-100	107095572	100	FC-FC

3. Establish communication with technician at other end of the optical span.

4. NOTE 1:
   The optical connector labeled **OUT** is the output from the **OLIU**. The optical connector labeled **IN** is the input to the **OLIU**.

   NOTE 2:
   For **21G/21G-U/21G2-U OLIU**s, the recommended optical fiber is single mode, but multimode can be used. For **21D/21D-U OLIU**s and the FT-2000 **LAA5 IS3** Optical Interface requires multimode optical fiber. For the FT-2000 **LAA10 OC3** Optical Interface, the recommended optical fiber is single mode, but multimode can be used.

NOTE 3:
Optical fibers connecting this shelf with a far end shelf should not be connected to the **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 with 0 dB LBOs per Figures 1 and/or 2. Connect the optical fiber transmit cable to the **OLIU OUT** connection. Measure the optical power of the optical fiber receive cables at the other ends using an optical power meter.

6. At both ends of the optical span, replace the *ST*, FC/PC, or SC LBOs with 0 dB LBOs per Figures 1 and/or 2 [**DLP-538**].

7. ⇒ NOTE 1:
   For Ring configurations, optical fibers extend in two different directions to make up the ring. At each shelf (node) in the ring, the **MAIN-B-1 OLIU** will connect to the **MAIN-B-2(P) OLIU** in another node, and the **MAIN-B-2(P) OLIU** will connect to the **MAIN-B-1 OLIU** in a separate node. In single-homed configurations, the OC-3 **MAIN 1 OLIU** will connect to the OC-12 **FUNCTION UNITS ( ) 1 OLIU** and the OC-3 **MAIN 2(P) OLIU** will connect to the OC-12 **FUNCTION UNITS ( ) 2(P) OLIU** in the same OC-12 ring node. In dual-homed configurations, the OC-3 **MAIN 1 OLIU** will connect to the OC-12 **FN ( ) 1 OLIU** in one OC-12 ring node and the OC-3 **MAIN 2(P) OLIU** will connect to the OC-12 **FUNCTION UNITS ( ) 2(P) OLIU** in another OC-12 ring node.

   ⇒ NOTE 2:
   For DDM-2000 OC-12/FT-2000 configurations, the DDM-2000 OC-12 **FUNCTION UNITS ( ) 1 OLIU** and/or **FUNCTION UNITS ( ) 2(P) OLIU** will connect to the FT-2000 Low Speed Shelf **LS INTFC** slots **1A**, **1B**, **2A**, **2B**, **3A**, **3B**, **4A**, **4B**, **5A**, **5B**, **6A**, **6B**, **7A**, **7B**, **8A**, or **8B** depending on the application.

   At each end of the span, connect the optical fiber transmit cables to the **OLIU OUT** connections.

8. At each end of the span, measure the optical power of the optical fiber receive cables using an optical power meter.

9. Replace the lightguide buildout assemblies with the correct buildout assemblies per Figures 1 and/or 2 and Tables C, D, E, F, G, H, I, and/or J [**DLP-538**].

   Reconnect the optical fiber transmit cables at both ends.

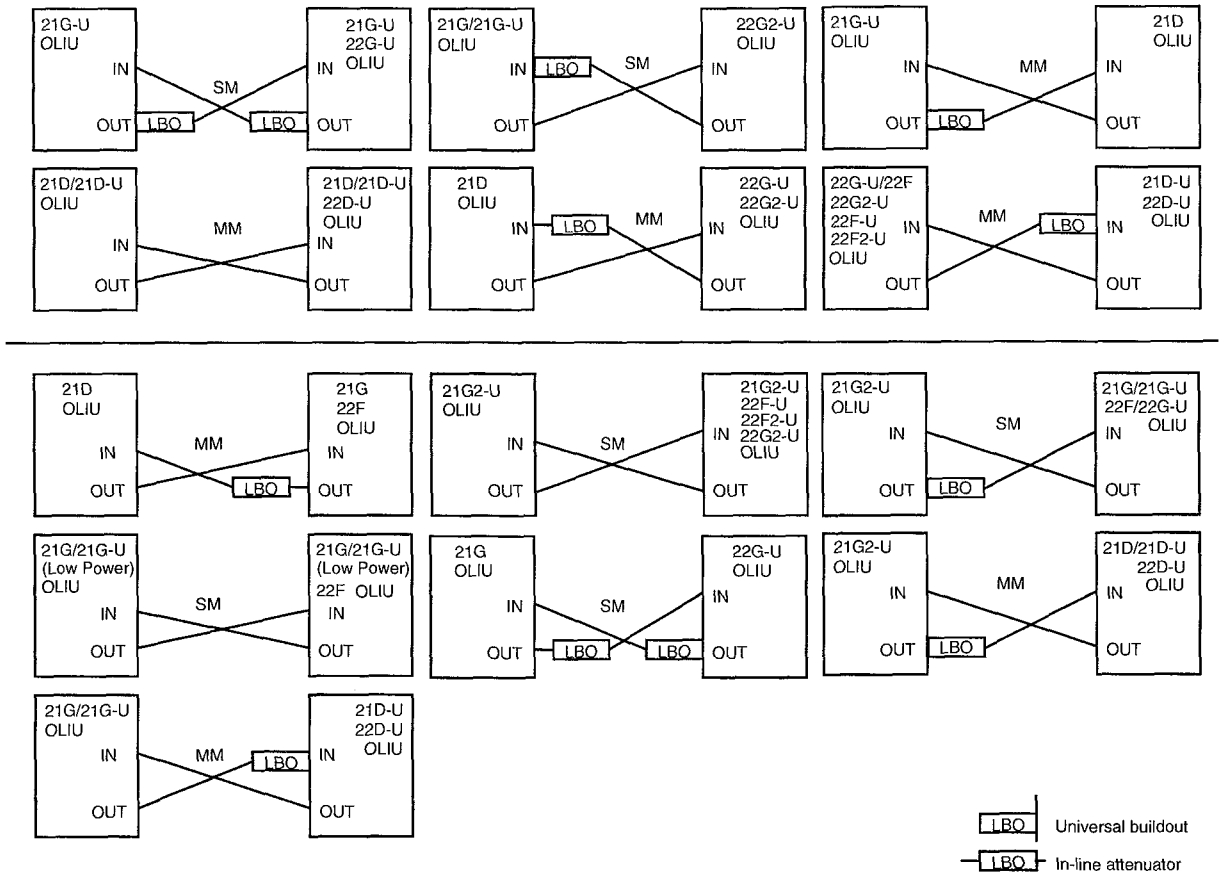


Figure 1. DDM-2000 OC-3/OC-12 OC-3/IS-3 Fiber Optic Connections and Line Buildouts

Table C. DDM-2000 OC-3/OC-12 Measured Optical Power and Required LBO

	Receiver							
	22F OLIU 22G-U OLIU 21G/21G-U OLIU (High/Low Power)		21G2-U OLIU 22F-U OLIU 22F2-U OLIU 22G2-U OLIU		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)
21G/21G-U OLIU					−2.5 to −5 0	15	−2 5 to −5 0	15
(High Power)	−2.5 to −3.0	10			−5.0 to −10.0	10	−5.0 to −10.0	10
	−3.0 to −8.0	5			−10.0 to −15.0	5	−10.0 to −15.0	5
	−8 0 to −34 0	0	−2.5 to −34.0	0	−15.0 to −33 8	0	−15.0 to −31.8	0
21G/21G-U OLIU					−7.5 to −10.0	10	−7.5 to −10.0	10
(Low Power)	−7.5 to −8 0	5			−10 0 to −15.0	5	−10.0 to −15.0	5
	−8.0 to −34.0	0	−7.5 to −34.0	0	−15.0 to −33.8	0	−15.0 to −31.8	0
21G2-U OLIU					0.0 to −5.0	15	0.0 to −5.0	15
	0.0 to −3.0	10			−5 0 to −10.0	10	−5 0 to −10.0	10
	−3.0 to −8.0	5			−10.0 to −15.0	5	−10 0 to −15.0	5
	−8 0 to −34.0	0	0.0 to −34.0	0	−15.0 to −33.8	0	−15 0 to −31.8	0
22F/22F-U/22F2-U OLIU					−8.0 to −10.0	10	−8.0 to −10.0	10
					−10.0 to −15.0	5	−10.0 to −15.0	5
	−8.0 to −34 0	0	−8 0 to −34 0	0	−15.0 to −33.8	0	−15.0 to −31.8	0
22G-U/22G2-U OLIU					0.0 to −5.0	15	0.0 to −5.0	15
	0 0 to −3.0	10			−5.0 to −10.0	10	−5.0 to −10.0	10
	−3.0 to −8.0	5			−10.0 to −15.0	5	−10.0 to −15.0	5
	−8.0 to −34 0	0	0 0 to −34 0	0	−15.0 to −33 8	0	−15.0 to −31.8	0
21D/21D-U/22D-U OLIU (Controlled & (Uncontrolled Env.)					−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	−15.0 to −33.8	0	−15.0 to −31.8	0

Notes:

1 Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU

2 The minimum measured received power allows for optical path penalty and unallocated margin Connector loss is not allotted for; it should already be accounted for in the optical power measurement

3 The margin for falling within the max rx power is 1 0 dB

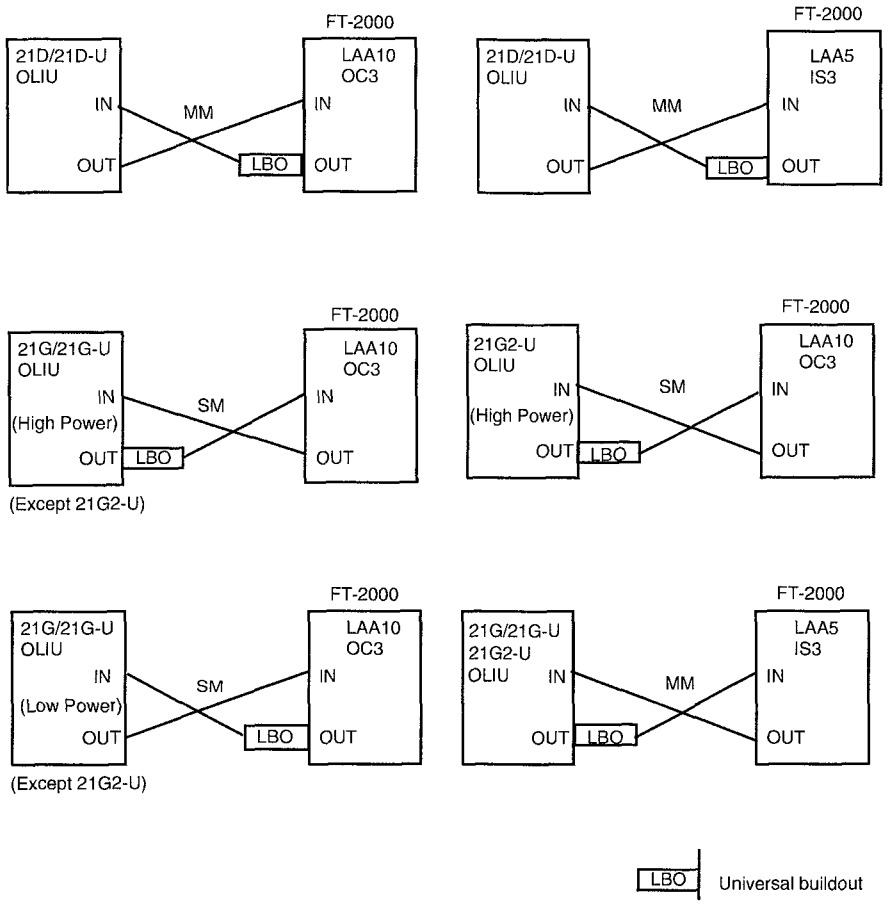


Figure 2. DDM-2000 OC-12/FT-2000 OC-3/IS-3 Fiber Optic Connections and Line Buildouts

Table D. DDM-2000 OC-12/FT-2000 Measured Optical Power and Required LBO

	Receiver									
	LAA10 OC3 (FT-2000)		LAA5 IS3 (FT-2000)		21D/21D-U OLIU (Controlled Env.)		21G/21G-U OLIU (High/Low Power)		21G2-U OLIU	
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)
LAA10 OC3 (FT-2000)					−7 0 to −10 0	10				
					−10.0 to −15.0	5	−7.0 to −8 0	5		
					−15.0 to −33 8	0	−8 0 to −34 0	0	−7.0 to −34 0	0
LAA5 IS3 (FT-2000)					−5 0 to −14 0	10				
					−14 0 to −15 0	5				
					−15.0 to −33 8	0	−14.0 to −34 0	0	−14.0 to −34 0	0
21D/21D-U OLIU			−14 0 to −15.0	5						
(Controlled Env.)	−14 0 to −34 0	0	−15 0 to −30 8	0						
21G/21G-U OLIU			−2.5 to −5 0	15						
(High Power)	−2 5 to −3 0	10	−5 0 to −10 0	10						
	−3 0 to −8 0	5	−10 0 to −15.0	5						
	−8.0 to −34.0	0	−15.0 to −30.8	0						
21G/21G-U OLIU			−7.5 to −9.0	10						
(Low Power)	−7.5 to −8 0	5	−9 0 to −14 0	5						
	−8.0 to −34.0	0	−14.0 to −30.8	0						
21G2-U OLIU			0.0 to −5.0	15						
	0 0 to −3.0	10	−5.0 to −10.0	10						
	−3 0 to −8 0	5	−10 0 to −15.0	5						
	−8 0 to −34 0	0	−15.0 to −30.8	0						

Notes:

1 Measured power is defined to be the measured power of the light emitted from receive fiber connector at OLIU

2 The minimum measured received power allows for optical path penalty and unallocated margin
Connector loss is not allotted for; it should already be accounted for in the optical power measurement

3 The margin for falling within the max rx power is 1 0 dB

Table E. In-Line Single-Mode (SM) and Multimode (MM) Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2000B	106597297	*ST*	MM-MM	Blue
10 dB	A2000D	106597446	*ST*	MM-MM	Black
5 dB	A3000B	106060718	*ST*	SM-SM	Blue
10 dB	A3000D	106060734	*ST*	SM-SM	Black

Table F. Universal Single-Mode (SM) *ST* Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3070	106795354	*ST*	SM-SM & MM-MM	None
5 dB	A3070B1	107406183	*ST*	SM-SM	Blue
10 dB	A3070D1	107406191	*ST*	SM-SM	Black
15 dB	A3070F1	107406209	*ST*	SM-SM	Green

Table G. Universal Single-Mode (SM) FC/PC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3080	106795404	FC/PC	SM-SM & MM-MM	None
5 dB	A3080B1	107406225	FC/PC	SM-SM	Blue
10 dB	A3080D1	107406233	FC/PC	SM-SM	Black
15 dB	A3080F1	107406241	FC/PC	SM-SM	Green

Table H. Universal Single-Mode (SM) SC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
0 dB	A3060	106708951	SC	SM-SM & MM-MM	None
5 dB	A3060B1	107406142	SC	SM-SM	Blue
10 dB	A3060D1	107406159	SC	SM-SM	Black
15 dB	A3060F1	107406167	SC	SM-SM	Green

Table I. Universal Multimode (MM) *ST* Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2070B	106795313	ST	MM-MM	Blue
10 dB	A2070D	106795321	ST	MM-MM	Black
15 dB	A2070F	106795339	ST	MM-MM	Green

Table J. Universal Multimode (MM) SC Lightguide Buildouts

Lightguide Buildout (LBO)	Code	Comcode	Connector Type	Fiber Connection	Label Color
5 dB	A2060B	106795271	SC	MM-MM	Blue
10 dB	A2060D	106795289	SC	MM-MM	Black
15 dB	A2060F	106795297	SC	MM-MM	Green

Fiber Connection

10. ⇒ NOTE:
In Release 5 or later, **one** shelf in the network **must** be designated as a directory services network element (DSNE) using the **`set-ne`** command. This allows you to use the **`rtrv-map-network`** command to retrieve a listing of all active nodes in the network. Therefore, for Release 5 or later, it is suggested that optical fiber connections begin at the node designated as the DSNE.

At far end, connect the input optical fiber to the proper **OLIU IN** (receive) connector.

11. Did **FAULT** LED go off on the far-end **OLIU**?

If **NO**, then continue with **Step 12**.
If **YES**, then proceed to **Step 13**.

12. Check optical fiber connections. Verify integrity of fiber connections by ensuring correct output at one end is connected to correct input at the other end. Replace **OLIU** with flashing LED. Continue with this procedure when trouble is cleared.

13. At near end, connect the input optical fiber(s) to the corresponding **OLIU IN** (receive) connector.

14. Did **FAULT** LED go off on the near-end **OLIU**?

If **NO**, then continue with **Step 15**.
If **YES**, then proceed to **Step 16**.

15. Check optical fiber connections at both ends of the fiber. Verify the integrity of the fiber connections by ensuring **OLIU** output at one end is connected to the correct **OLIU** input at the other end. Verify proper systems have been connected by using the **rtrv-map-neighbor** command (Figure 4).

Fiber Verification

16. Disconnect the fiber cable from the **OUT** connector on the **OLIU** at one end of the span. At the other end, verify that the associated **FAULT** LED is flashing, indicating a loss of signal. Reconnect the fiber and repeat the process for the other direction of transmission.

17. Verify proper systems have been connected by using the **rtrv-map-network** and **rtrv-map-neighbor** (R5) command to retrieve a map of the network (Figures 3 and 4).

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-network:  COMPLD
 /* Network Map for Site6NE1
   ==========================================================================
    System Name           Comm.   Product              NE          Alarm
      (TID)               Status  Type                 Type        Group
   ==========================================================================
   Site6NE1                       DDM-2000 OC-12       DSNE          3
   Site7NE1                       FT-2000              AGNE          3
   Site3NE1                       DDM-2000 OC-3                      3
   Site4NE1              FAILED   DACS IV-2000                       3
   Site5NE1                       FT-2000              AGNE        201
   Site8NE1                       DDM-2000 OC-12                    201
   Site9NE1                       FiberReach           AGNE        250
   Site10NE1                      FiberReach                       250
   Site11NE1                      FiberReach                       250

 */
```

Figure 3. Sample Report From **rtrv-map-network** Command

```
    Site6NE1 95-03-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Site6NE1
   ================================================================================
                                    Link
    System Name           Connected Comm.           Product
      (TID)               Through   Status          Type
   ================================================================================
   Site6NE1                                         DDM-2000 OC-12
   Site7NE1               main-b-1     FAILED       DDM-2000 OC-12
   Site5NE1               main-b-2                  FT-2000

 */
```

Figure 4. Sample Report From `rtrv-map-neighbor` Command

18. After all connections and tests have been made, verify optical fiber cables are placed correctly in fiber tray/rings and properly routed in bay framework. Reinstall front cover and tighten three screws.

19. Repeat this procedure for each fiber span to be connected until the end-to-end system is established.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform End-to-End OC-3 Optical Line Test

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

NOTE 1:
This test is used in ring Release 5 to verify the integrity of the OC-3 fiber lines between a DDM-2000 OC-12 shelf and a DDM-2000 OC-3 shelf and may be performed with the DDM-2000s in service or out of service.

NOTE 2:
It is assumed that each DDM-2000 has passed the local (looped) transmission tests and a CIT is available. If these tests have not been completed, refer to the appropriate procedure and perform the tests.

NOTE 3:
This test must be performed locally at each shelf location associated with the optical span(s) being tested. See Figure 1.

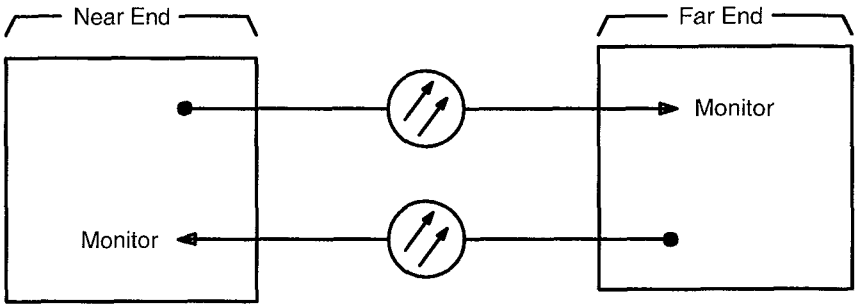


Figure 1. End-to-End Optical Line Test Monitoring

2. At test location, connect CIT to User Panel **CIT** connector and establish session.

   Reference: **DLP-516**

3. ⚠ CAUTION:
   The **`init-pm:reg=all`** *command initializes (clears) all current day and/or all current quarter-hour performance-monitoring storage registers.*

   NOTE:
   If local procedures prohibit you from doing the **`init-pm:reg=all`** command, you may perform the following in Step 5. Use the **`rtrv-pm-line`** command to obtain the line performance monitoring status report, note the readings on the `Today` line in the report, wait 20 seconds and then obtain another report. There should be no change in readings from the first report.

   Enter the command **`init-pm:reg=all`**, if allowed.

4. Wait 20 seconds.

5. The test is being performed on **OLIU**(s) installed in **FUNCTION UNITS** slot(s), enter one of the following commands:
   - **`rtrv-pm-line:fn-{a, b, c, or d}-1`** if service line is being tested.
   - **`rtrv-pm-line:fn-{a, b, c, or d}-2`** if protection line is being tested.
   - **`rtrv-pm-line:fn-{a, b, c, or d}-all`** if both lines are being tested.

   Response: The following CIT report will indicate the status of the equipment. The `Today` line should indicate that there are no errors. Other `Time` lines may exist with numbers greater than zero. (The Commands and Reports section of this manual under **RTRV-PM-LINE** describes this report.)

```
/* Line Performance Monitoring Status Report
   Last initialized:  day registers at yy-mm-dd hh:mm:ss
                      quarter hour registers at yy-mm-dd hh:mm:ss
================================================================
Address  End      B2 CV    B2 ES  B2 ES   B2 ES   B2 SES  B2 UAS
         Time                     Type A  Type B
================================================================
address  Today     0?       0?     0?      0?      0?      0?
         ----------------------------------------------------
         Time      0?       0?     0?      0?      0?      0?
================================================================
address  Today     0?       0?     0?      0?      0?      0?
         ----------------------------------------------------
         Time      0?       0?     0?      0?      0?      0?
*/
```

6. Has performance-monitoring report been obtained from all shelf locations associated with optical span(s) being tested?

   If **NO**, then continue with **Step 7**.
   If **YES**, then proceed to **Step 8**.

7. Repeat this procedure from Step 3 at other locations.

8. Did report indicate errors?

   If **YES**, then continue with **Step 9**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Trouble may be in optical fiber and/or connections. Trouble may also be in **OLIU**s. If the report indicated trouble when the report was obtained from the near end of the span, trouble may be in the receive direction (see Figure 1). If the report indicated trouble when the report was obtained from the far end of the span, trouble may be in the transmit direction. Check optical fiber and connections. Clean optical fiber connections [**DLP-522**]. If no trouble found in the optical fibers, replace **OLIU**(s) [**DLP-518**] associated with the address indicated in the report.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3 Transmission Test
Dual Ring Interconnection

Overview: This procedure is performed on one or more out-of-service circuits to test the dual ring interconnections (DRI) from a DDM-2000 ring network to another DDM-2000 ring network or to an FT-2000 ring network. Numerous configurations are possible when interconnecting DDM-2000 networks. Therefore, this procedure provides you with typical examples and explanations of some of the possible configurations and instructs you on the procedures used in testing these configurations.

1. **NOTE 1:**
   This procedure may be used to perform DS3 transmission tests for a Dual Ring Interconnection (DRI) between DDM-2000 networks and FT-2000 ring networks. When this procedure is being used to perform end-to-end DS3 tests, it is assumed that the complete end-to-end systems have already been tested and that only a particular DS3 channel is being tested at this time.

   NOTE 2:
   A CIT is required for this test to make/verify 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:
Proper cross-connections must be made at each shelf to establish the complete end-to-end path for the DS3 circuit being tested. Releases 5 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.

NOTE 6:
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 7:
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**

2. ⇒ NOTE:
Work orders, office records, or CIT **`ent-crs-sts1`** or **`rtrv-crs`** commands may be used to make or verify STS-1 cross-connections.

At each shelf in the network, make/verify that proper pass-through, terminating, and "drop and continue" STS-1 cross-connections have been made for each DS3 channel being tested.

3. Do one of the following:

(a) ⇒ NOTE:
When an end-to-end DS3 test is run in the mux direction and an **external** loopback is established at the far end, provision the far end DS3 for CC mode with no AIS (**`set-t3:`***`address`***`:mode=cc,ais=no`**). Otherwise, if the VMR mode is used, then only errors in the receive direction will be monitored and the system may not recognize that a loopback is up.

Connect a patch cord from the **OUT** jack to the **IN** jack at the far-end DSX-3 or STSX cross-connect point associated with the DS3 channel to be tested.

(b) Log into the far-end DDM-2000 terminal, either locally or by using the **`rlgn`** command, if possible, and use the **`opr-lpbk-t3:`***`address`* or **`opr-lpbk-ec1:`***`address`* command to loop back the DS3 or EC-1 port(s) at the far end. Use **`logout`** or **`toggle`** (crtl t) command to return control of CIT to near end.

4. ⚠ CAUTION:
Execution of switch commands may affect service. Check local procedures before performing switch commands.

NOTE 1:
If this transmission test is to be performed for each path in the end-to-end network, the **`switch-path-sts1`** command must be used at some of the DDM-2000 nodes to switch paths for each test. If FT-2000 is part of the network, the **`FAULT-Switch-Path-STS3`** command must be used at the FT-2000 Primary DRI node(s) if the FT-2000 secondary path and the DDM-2000 DRI connections to the FT-2000 secondary node are to be tested. Up to four tests may have to be performed for each DS3 circuit if all protection paths are required to be tested. See Figures 3-14.

NOTE 2:
For configurations not shown in the examples, local procedures should be developed to test the DS3 circuits being equipped. A sketch of the network may need to be made and the paths to be tested should be determined as shown in the examples in this procedure.

Use the necessary switch commands to set up the DS3 path being tested. [For example, if the configuration looks like Figure 3, use the **`switch-path-sts1`** command for test 1 to make Ring 1 active at both terminating nodes and all DDM-2000 DRI nodes. Other DS3 path tests for the same configuration would be set up as follows (Figures 3-6)]:

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

5. Are you using CIT and **`test-trmsn-t3`** command to perform this test?

   If **YES**, then continue with **Step 6**.
   If **NO**, then proceed to **Step 23**.

6. Are you doing this test in the mux or demux direction?

   If **MUX** direction, then continue with **Step 7**.
   If **DEMUX** direction, then proceed to **Step 9**.

7. See Figure 1. At the near end DDM-2000, use the following command to perform a test of the DS3 loop in the fiber direction:
   `test-trmsn-t3:`*`address`***`:dirn=mux:dur=( );`**

Where *address* = address identifier of the DS3 signal.

dirn = direction of the test. If **`dirn=mux`**, direction is toward fiber.

dur = duration of the test in minutes (1-120), default is 1.

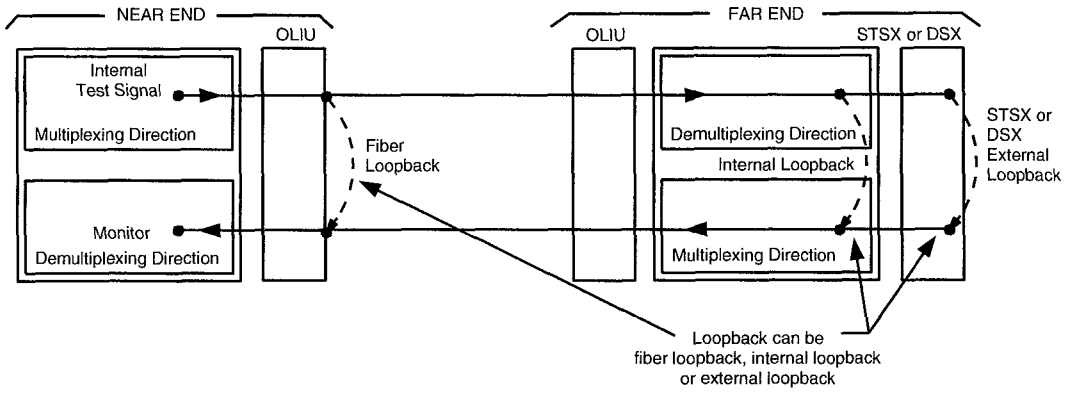


Figure 1. Transmission Test of DS3 Signal in MUX Direction

8. Was the test successful (error free)?

   If **YES**, then continue with **Step 9**.
   If **NO**, then proceed to **Step 37**.

9. See Figure 2. At the near-end DSX-3 cross-connection associated with the DDM-2000 being tested, connect a patch cord from the **OUT** jack to the **IN** jack for the DS3 channel to be tested.

10. Use the following command to perform a DS3 transmission test in the demux direction to test the DS3 loop in the DSX direction:
    `test-trmsn-t3:`*`address`***`:dirn=demux:dur=( );`**

    Where *address* = address identifier of the DS3 signal.

    dirn = direction of the test. If **`dirn=demux`**, direction is toward DSX.

    dur = duration of the test in minutes (1-120), default is 1.

11. Was the test successful (error free)?

    If **YES**, then continue with **Step 12**.
    If **NO**, then proceed to **Step 37**.

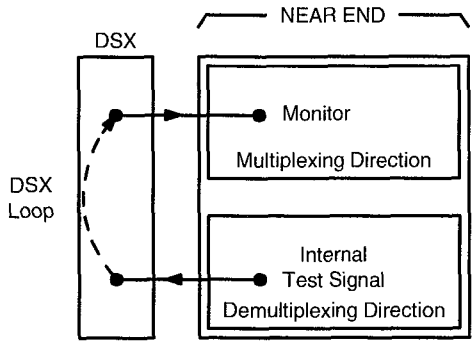


Figure 2. Transmission Test of DS3 Signal in DEMUX Direction

12. Is this the first service being placed on the group and is a protection circuit pack installed?

    If **YES**, then continue with **Step 13**.
    If **NO**, then proceed to **Step 17**.

13. Use the following command to switch from service to protection circuit pack:
switch-fn:*address*:pri=manual;.

    Response: The green **ACTIVE** LED lights on the protection circuit pack.

14. Repeat the transmission test in the mux (or demux) direction using the following command:
test-trmsn-t3:*address*:dirn=mux (or demux):dur=( );.

15. Was the test successful (error free)?

    If **YES**, then continue with **Step 16**.
    If **NO**, then proceed to **Step 37**.

16. Use the following command to clear active switch requests on the protection circuit pack:
switch-fn:*address*:pri=reset;.

17. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 18**.
    If **YES**, then proceed to **Step 19**.

18. Repeat this procedure from Step 4 for the next path to be tested.

19. Remove the looping patch cords from the cross-connect point. Use the **rls-lpbk-t3** or **rls-lpbk-ec1** command to release loopback(s) at the far end, if required.

20. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button (or use the "update" command) on the **SYSCTL** to update the **SYSCTL**.

21. If violation monitor removal mode was set differently than the original mode in Step 3, reprovision the mode to the original or required setting using the **set-t3** command. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. At the cross-connection associated with the near-end DDM-2000, connect the DS3 test set to the **IN** and **OUT** jacks associated with the circuit under test.

24. Use the DS3 test set to test for error-free transmission.

25. Was the test successful (error free)?

    If **YES**, then continue with **Step 26**.
    If **NO**, then proceed to **Step 37**.

26. Is this the first service being placed on the group and is protection circuit pack installed?

    If **YES**, then continue with **Step 27**.
    If **NO**, then proceed to **Step 31**.

27. Unseat the service **3DS3** circuit pack associated with the circuit under test.

28. Repeat the DS3 transmission test with the DS3 test set.

29. Was the test successful (error free)?

    If **YES**, then continue with **Step 30**.
    If **NO**, then proceed to **Step 37**.

30. Reseat the **3DS3** circuit pack associated with the circuit under test.

31. The **DS3** circuit path under test has passed the DS3 transmission test. Have all required paths been tested?

    If **NO**, then continue with **Step 32**.
    If **YES**, then proceed to **Step 33**.

32. Repeat this procedure from Step 4 for the next path to be tested.

33. Remove the looping patch cords from the cross-connections.

34. At the near-end (and the far-end) DDM-2000, momentarily depress the **UPD/INIT** button on the **SYSCTL** to update the **SYSCTL**.

35. Repeat this procedure from Step 2 for any additional DS3 circuits to be tested.

36. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

37. Has the **3DS3** circuit pack that failed been replaced?

    If **YES**, then proceed to **Step 40**.
    If **NO**, then continue with **Step 38**.

38. Replace the **3DS3** circuit pack that failed the test.

    Reference: **DLP-518**

39. Repeat this procedure for the **3DS3** circuit pack that failed.

40. Trouble may be in the DSX cross-connect wiring, STS1 cross-connections in the network (if ring configuration), or the shelf backplane. Use the **`rtrv-crs-sts1`** command to ensure proper STS1 cross-connections have been made at each shelf in the ring for the DS3 being tested. If no trouble found, check DSX cross-connect wiring and backplane connections. If other alarms or trouble indications are present, refer to **Trouble Clearing: IXL-001** to isolate the trouble. If no alarms or indications are present and a CIT is available, use the RETRIEVE commands (for example, **`rtrv-alm`**, **`rtrv-hsty`**, etc.) to check for other trouble indications.

41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

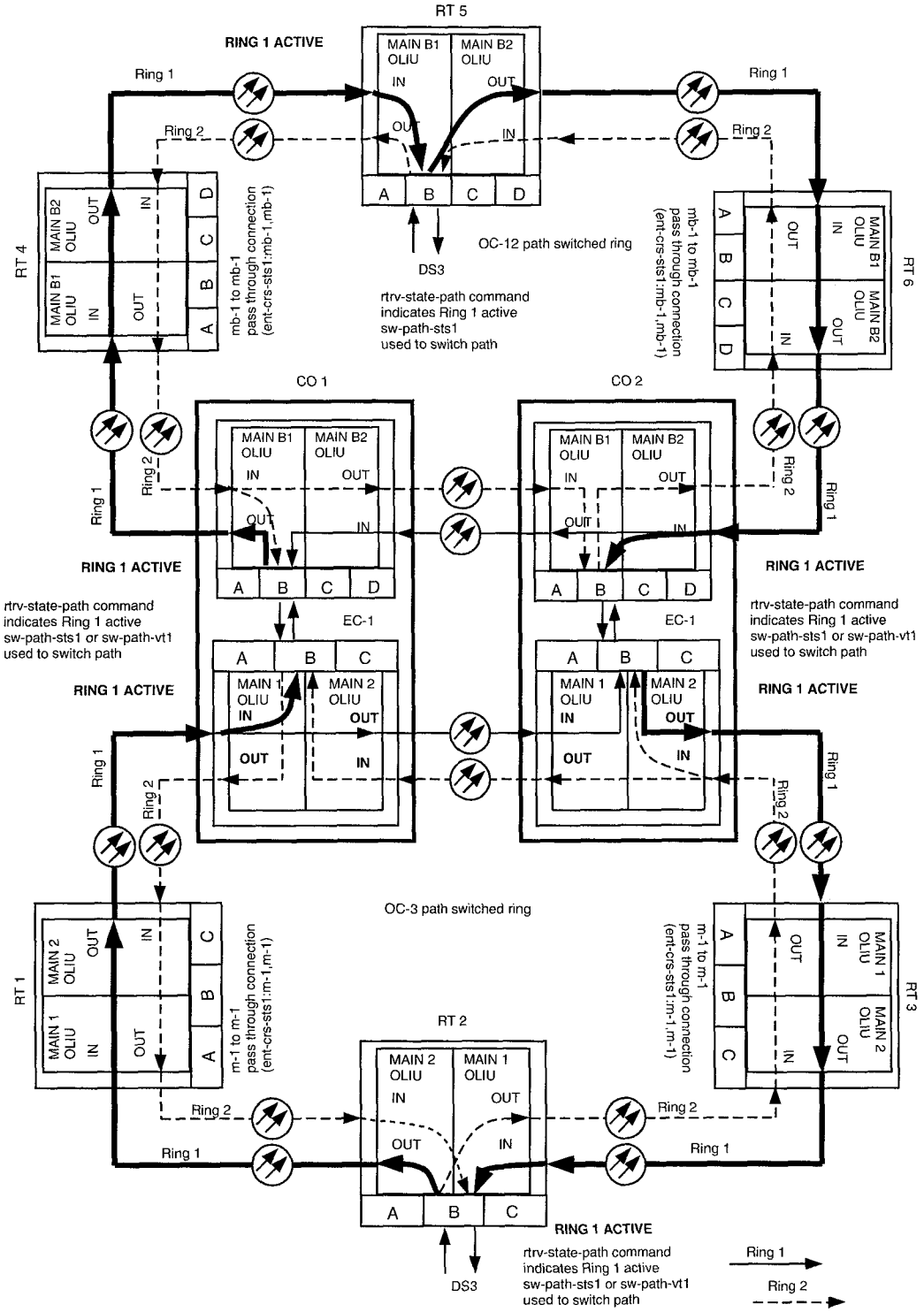


Figure 3. Example of DS3 Transmission Test in Dual Ring Interworking Network

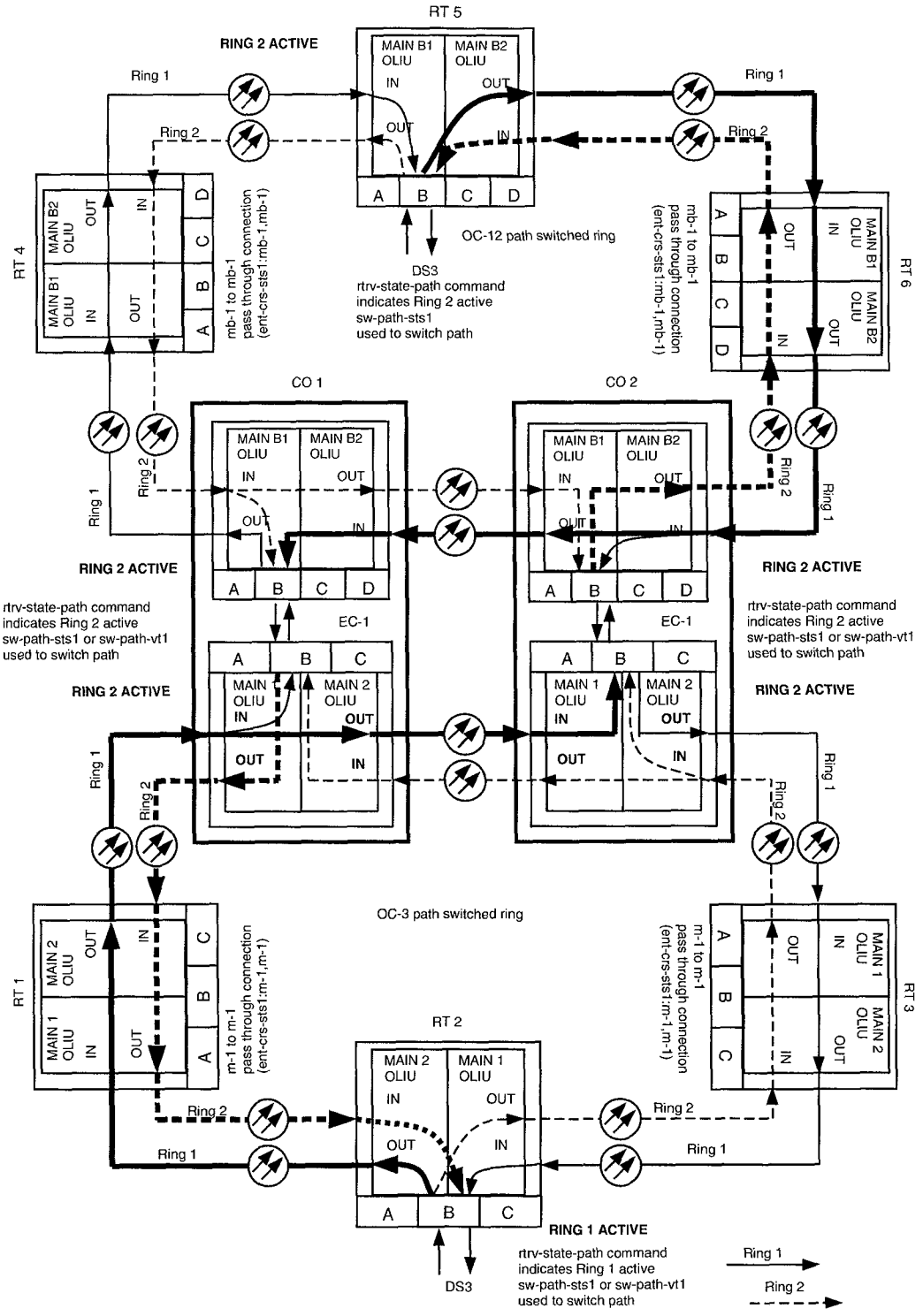


Figure 4. Example of DS3 Transmission Test in Dual Ring Interworking Network

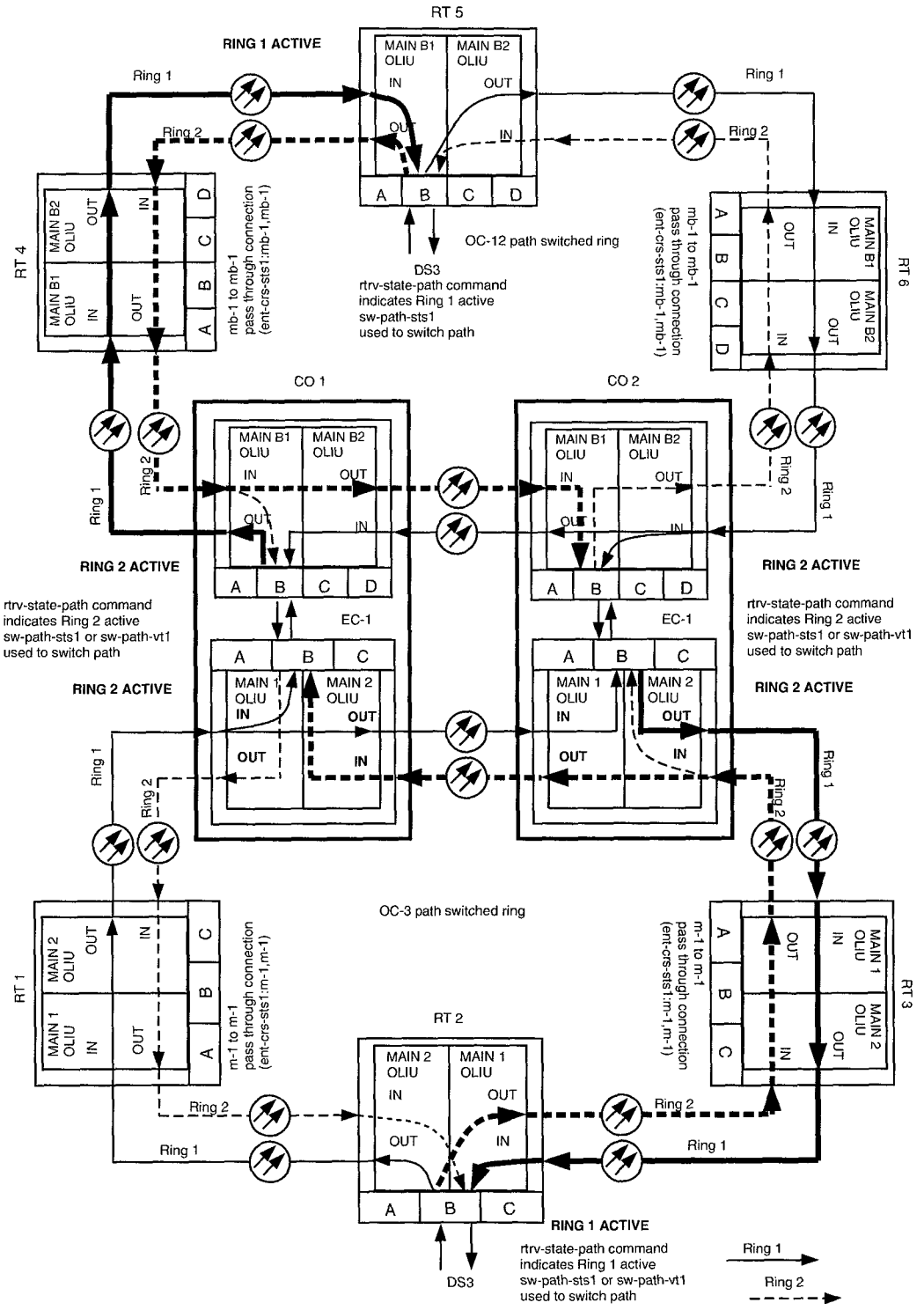


Figure 5. Example of DS3 Transmission Test in Dual Ring Interworking Network

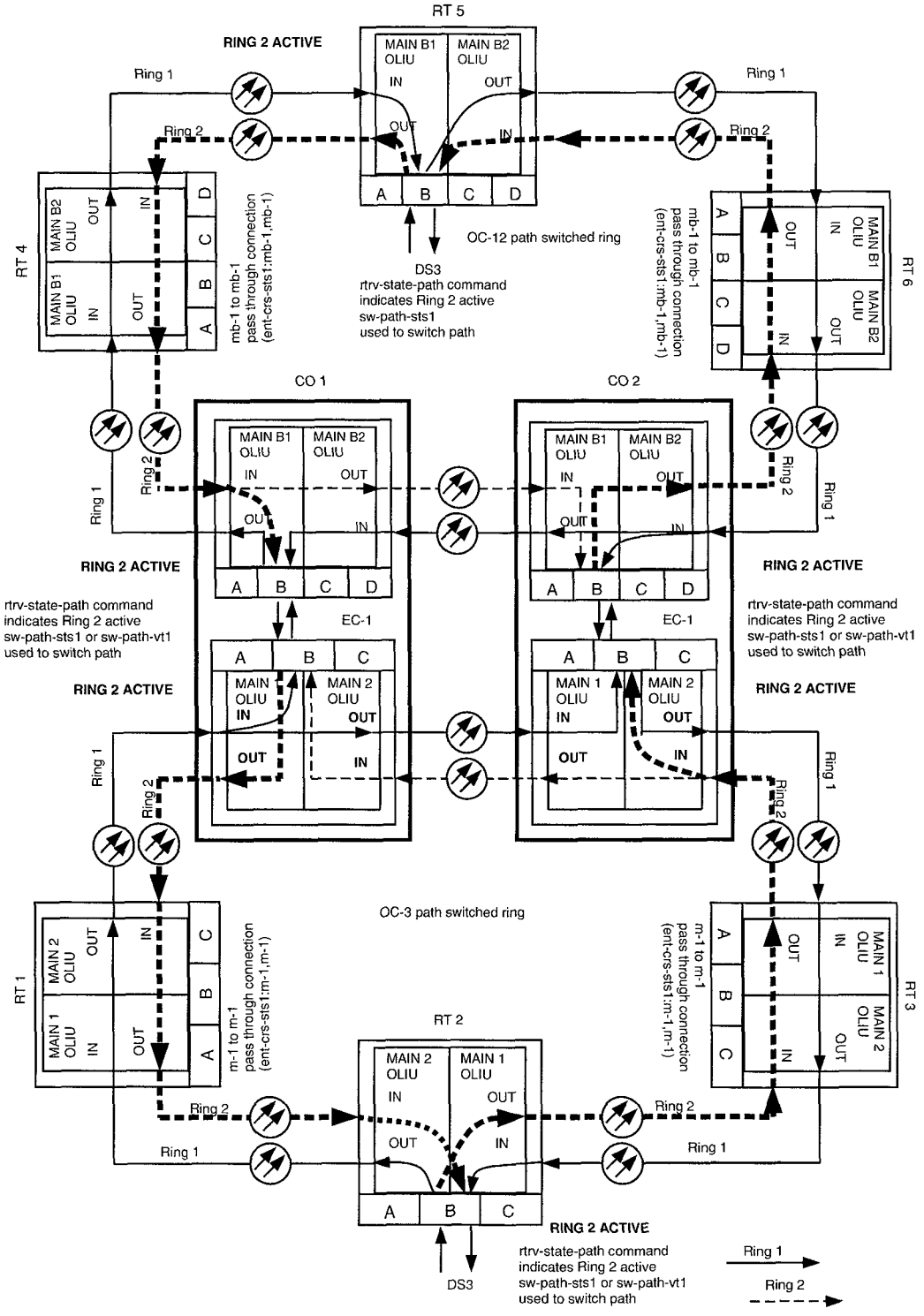


Figure 6. Example of DS3 Transmission Test in Dual Ring Interworking Network

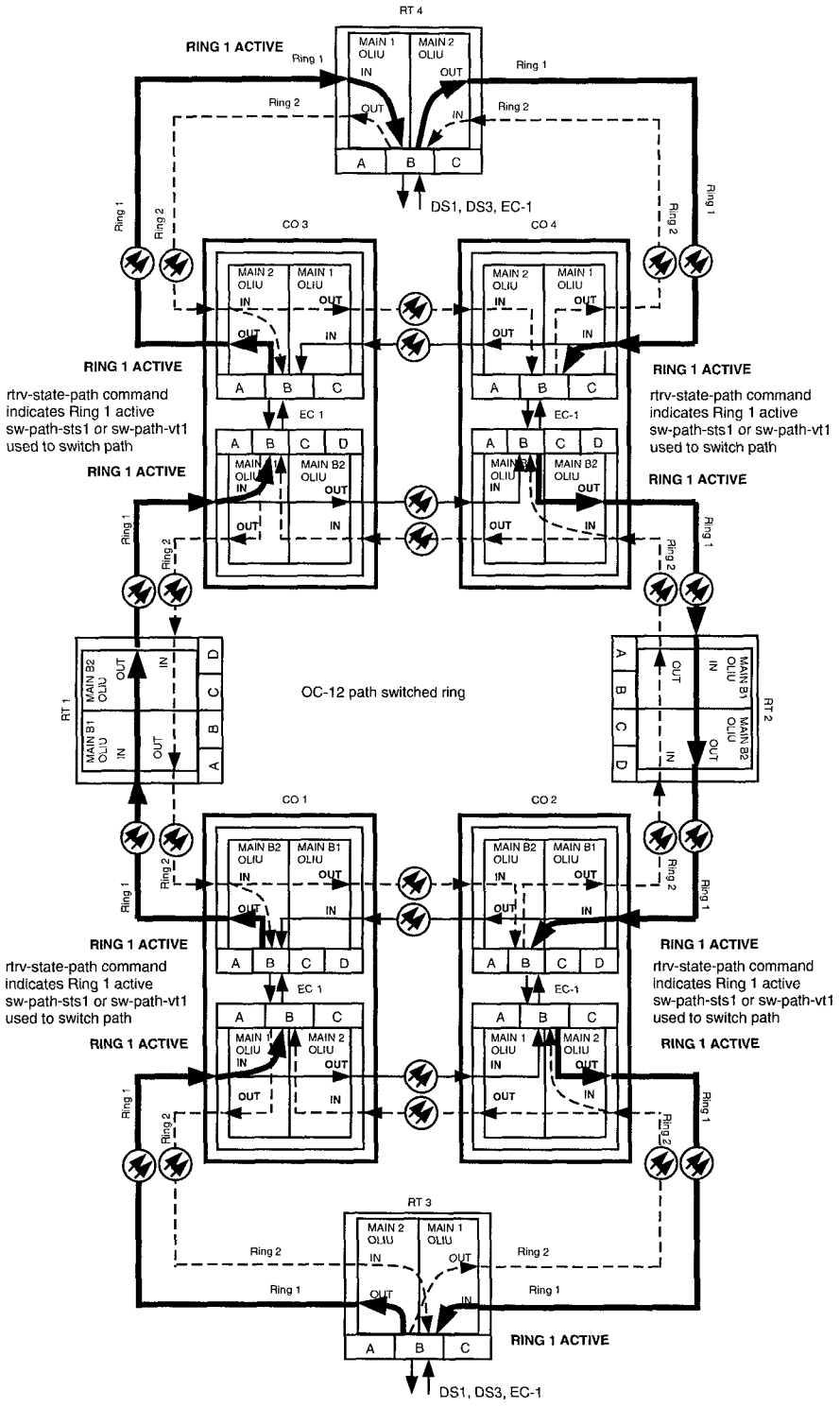


Figure 7. Example of DS3 Transmission Test in Dual Ring Interworking Network

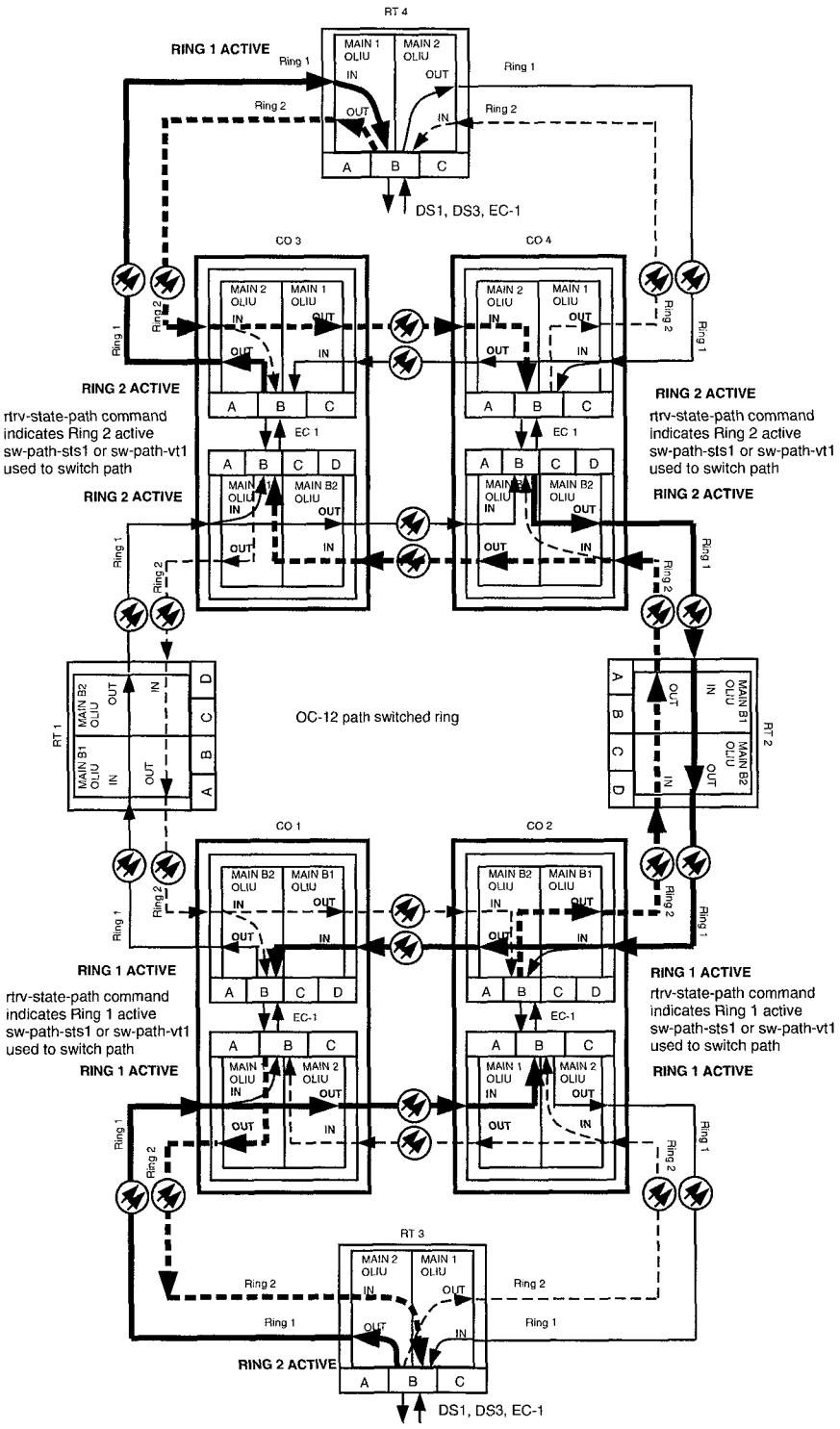


Figure 8. Example of DS3 Transmission Test in Dual Ring Interworking Network

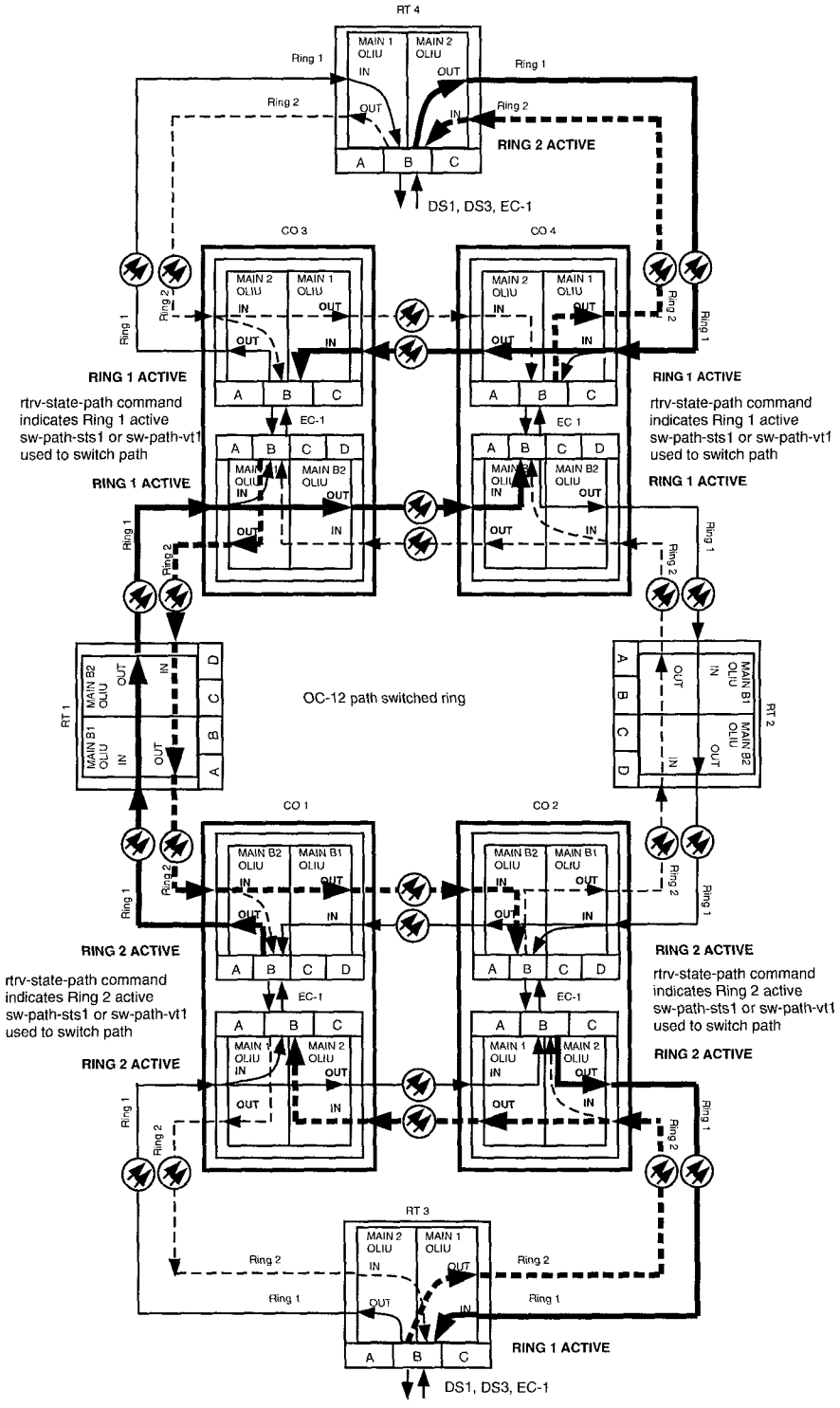


Figure 9. Example of DS3 Transmission Test in Dual Ring Interworking Network

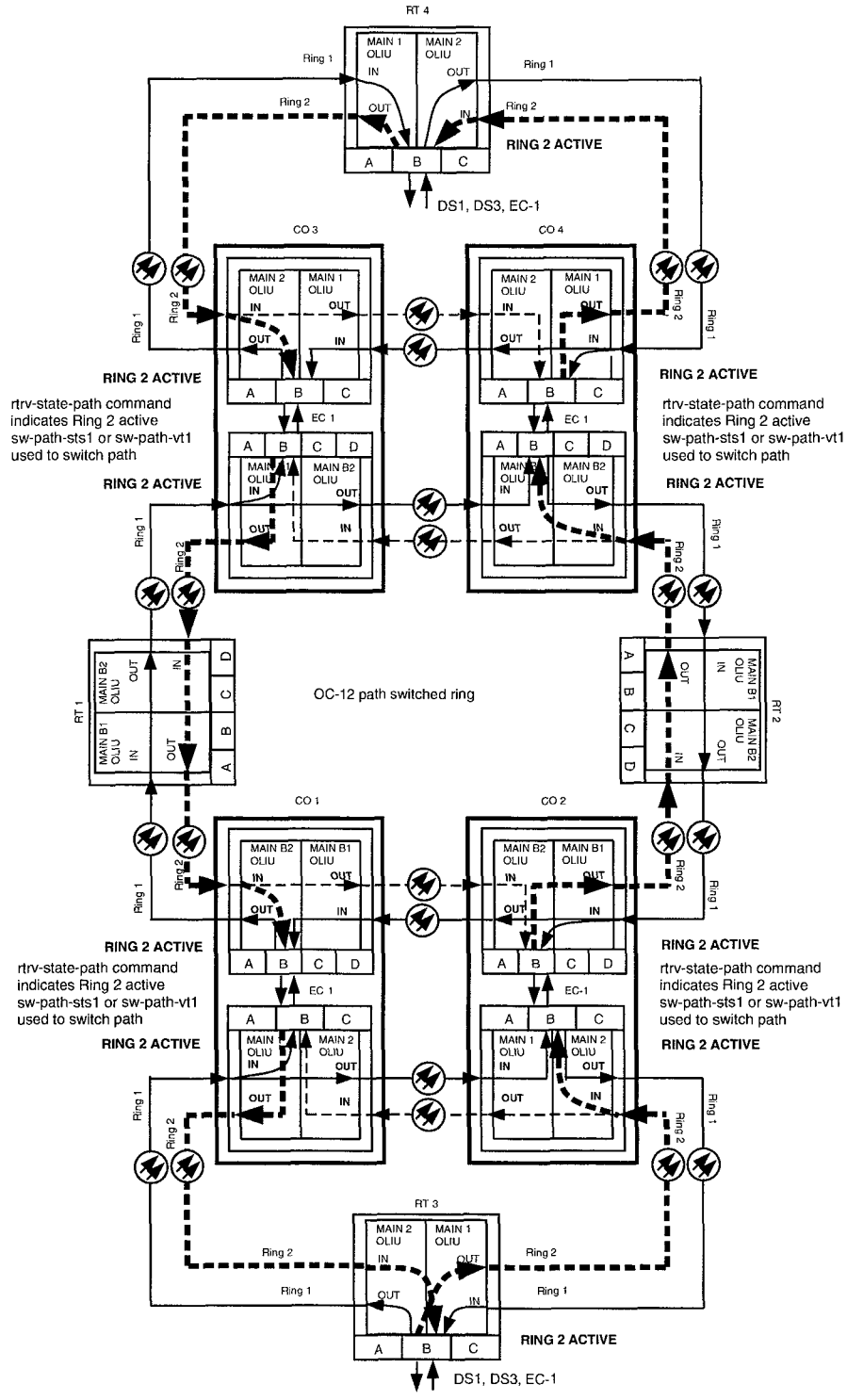


Figure 10. Example of DS3 Transmission Test in Dual Ring Interworking Network

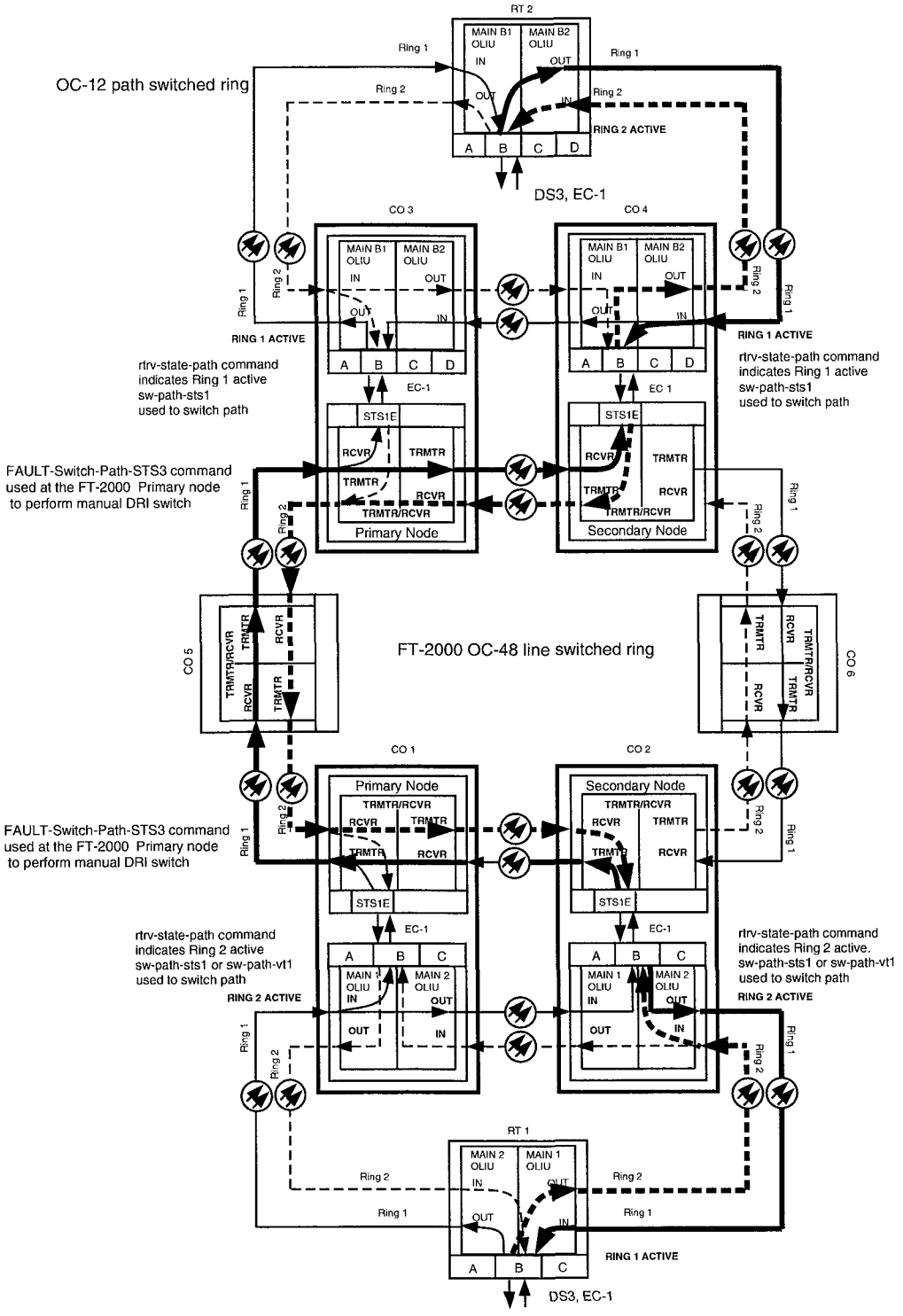


Figure 11. Example of DS3 Transmission Test in Dual Ring Interworking Network

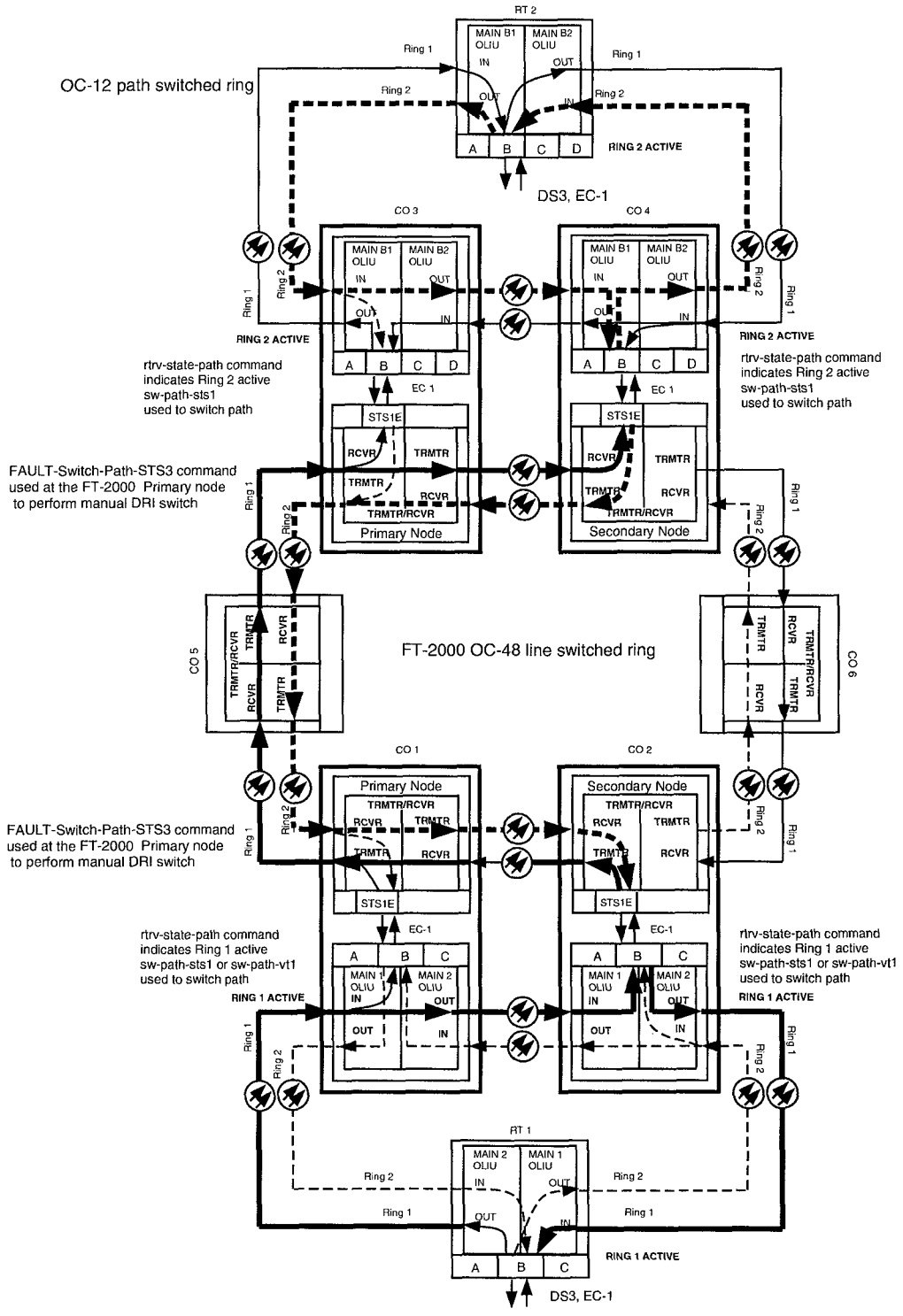


Figure 12. Example of DS3 Transmission Test in Dual Ring Interworking Network

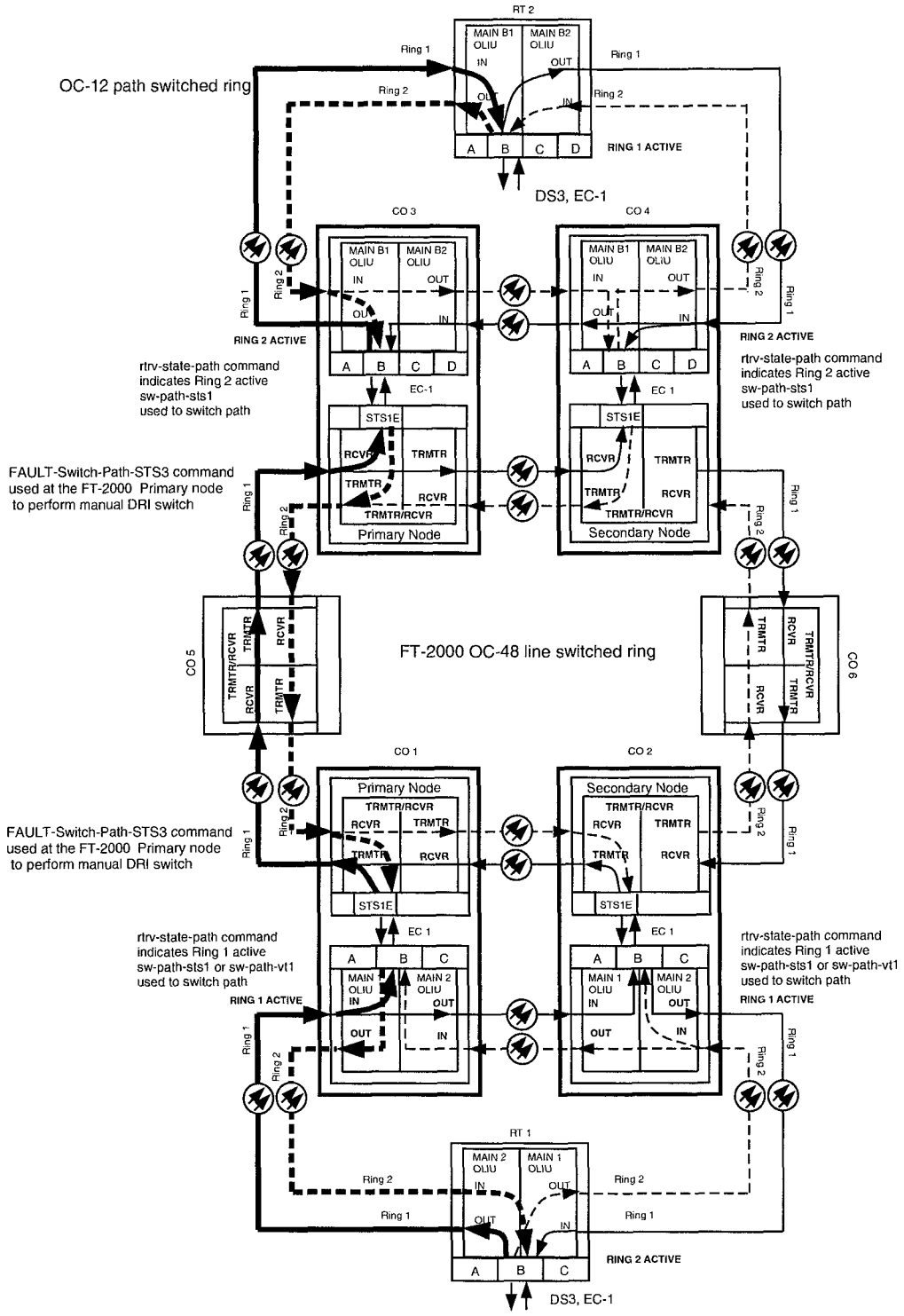


Figure 13. Example of DS3 Transmission Test in Dual Ring Interworking Network

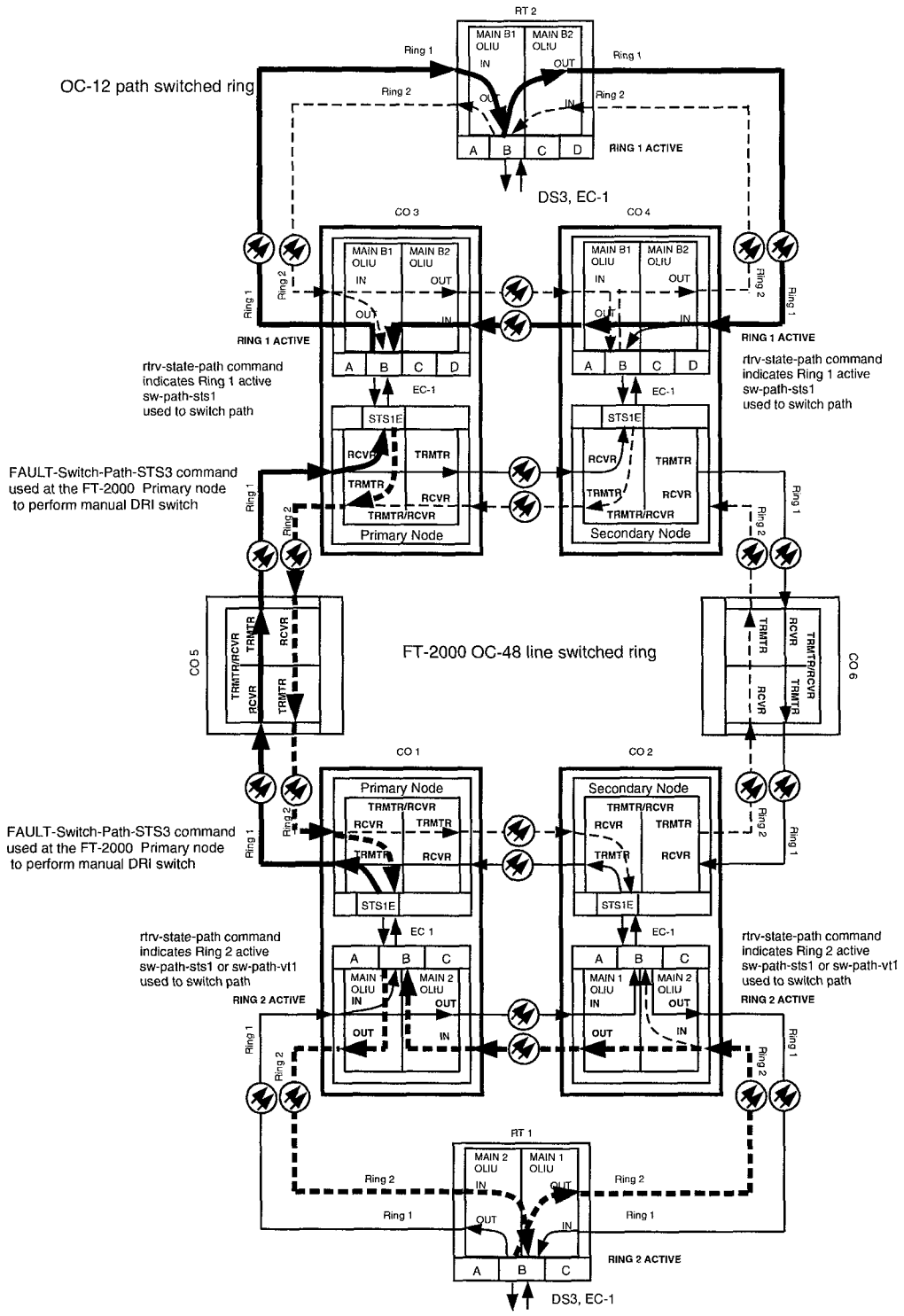


Figure 14. Example of DS3 Transmission Test in Dual Ring Interworking Network

Make Cross-Connections Using CIT
Single/Dual Homing OC12/OC3 Ring Configuration

1. ⇒ NOTE 1:
If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual and the DDM-2000 OC-3 manual: **`ent-crs-sts1`**, **`ent-crs-vt1`** (OC-3 only), **`rtrv-crs-sts1`**, **`rtrv-crs-vt1`** (OC-3 only), **`dlt-crs-sts1`**, and **`dlt-crs-vt1`** (OC-3 only).

⇒ NOTE 2:
You will have to login to more than one node in each ring to get a complete map of the network using the **`rtrv-map-network`** and **`rtrv-map-neighbor`** command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections.

Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figures 1 and 2 show examples of simple schematics.

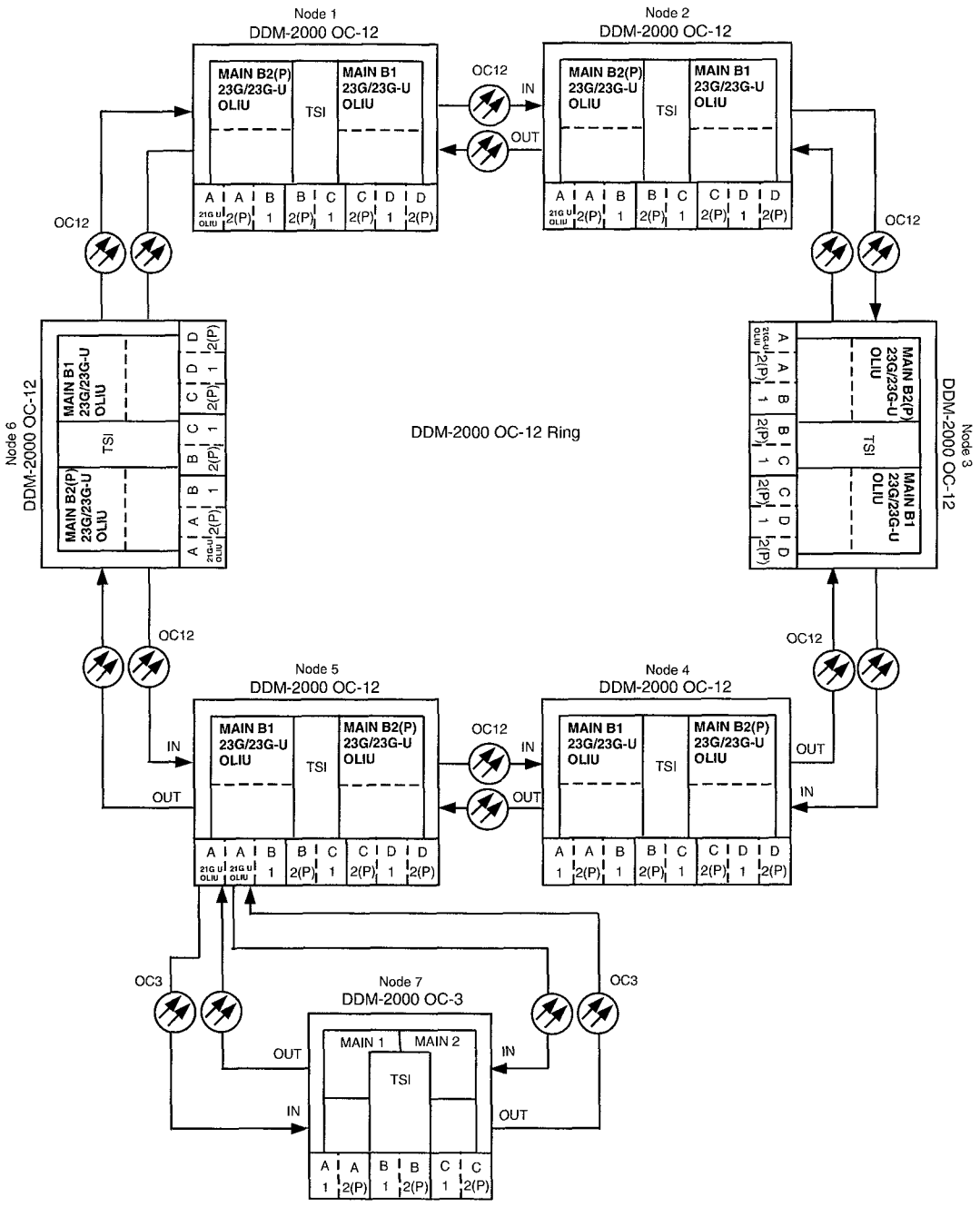


Figure 1. Sample Single Homed Network Schematic

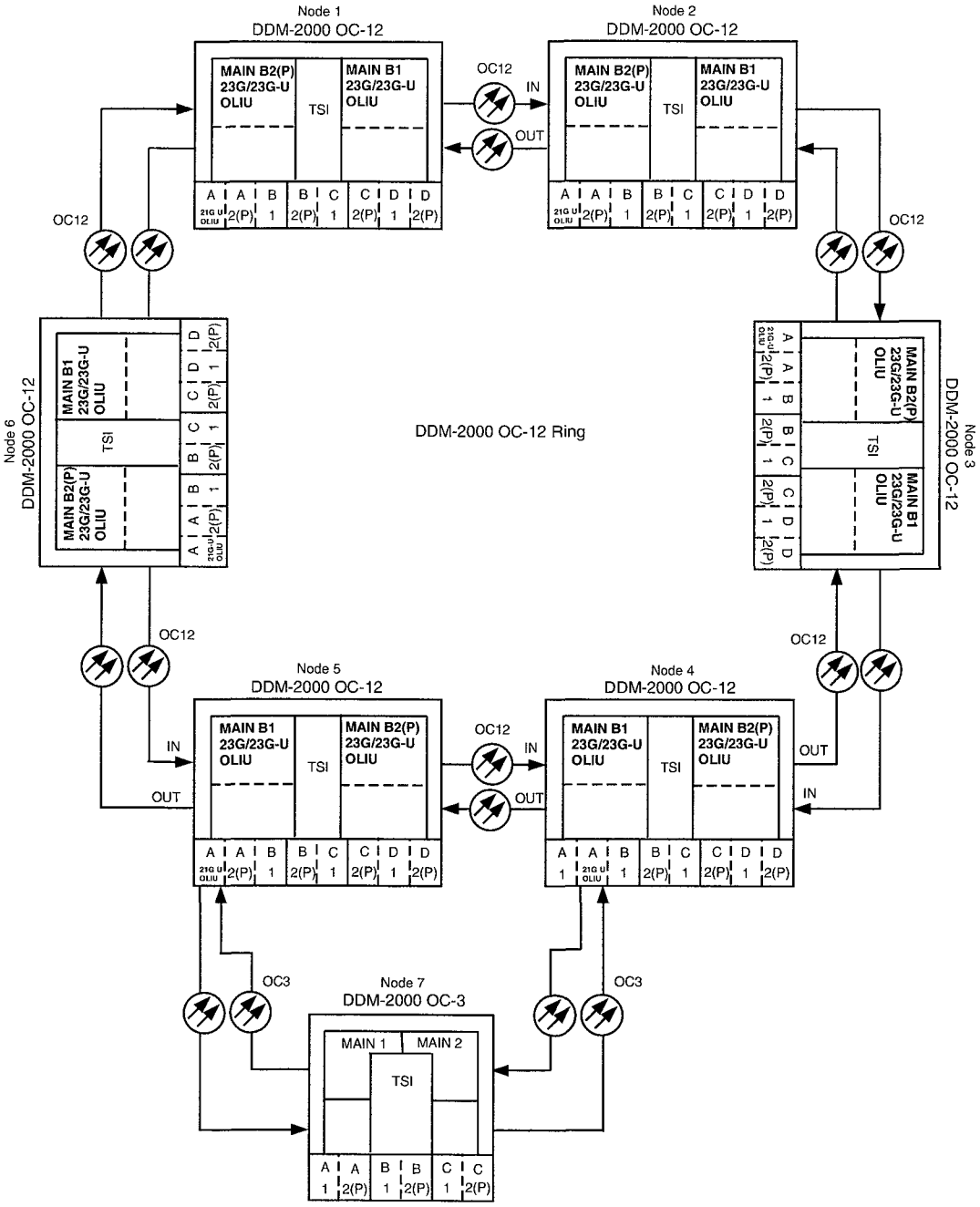


Figure 2. Sample Dual Homed Network Schematic

Log in to any node in each ring in the network and use the **rtrv-map-network** and/or **rtrv-map-neighbor** command to retrieve a map of the network which lists all the systems and how they are connected to each other.

Sample output reports are shown in Figures 2 and 3:

```
    Node5 95-12-27 13:09:53  DDM-2000 OC-12, R5.1.1
M   rtrv-map-network:  COMPLD
 /* Network Map for Node5
   ================================================================================
    System Name           Comm.   Product              NE          Alarm
      (TID)               Status  Type                 Type        Group
   ================================================================================
   Node5                          DDM-2000 OC-12       DSNE          3
   Node4                          DDM-2000 OC-12       AGNE          3
   Node3                          DDM-2000 OC-12                     3
   Node2                          DDM-2000 OC-12                     3
   Node1                          DDM-2000 OC-12                     3
   Node6                          DDM-2000 OC-12                     3
   Node7                          DDM-2000 OC-3                      3
 */
```

Figure 3. Sample Report From rtrv-map-network Command

```
    Node7 95-12-27 13:09:53  DDM-2000 OC-3, R9.1.1
M   rtrv-map-neighbor:  COMPLD
    /* Neighbor Map for Node7
   ================================================================================
                                      Link
    System Name           Connected   Comm.            Product
      (TID)               Through     Status           Type
   ================================================================================
   Node7                                               DDM-2000 OC-3
   Node5                  main-1                       DDM-2000 OC-12
   Node4                  main-2                       DDM-2000 OC-12

 */
```

Figure 4. Sample Report From rtrv-map-neighbor Command

2. Verify system configuration is same as specified on work order or circuit order. For example, see Figures 5, 6, and 7.

3. ⇒ NOTE:
   Cross-connections consist of drop and pass-through connections. For example in Figure 5, drop connections are made at Nodes 1, 4, and 5. Pass-through cross-connections are made at other nodes in the network (Figure 2). Also, cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and FT-2000 OC-48 rings, as required. See **`ent-crs-( )`** command in the Commands and Reports section of Volume 1 of this manual.

   From work order or circuit order, determine the terminating (drop) nodes for the service being established.

4. From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

5. From work order or circuit order, determine the host OC-12 node(s) that connects to the OC-3 ring(s).

6. ⇒ NOTE:
   In dual homing configurations (Figures 5 and 6), **OLIU** circuit packs must be installed in the correct slots in the host OC-12 nodes to support the direction of traffic required. For example in Figure 5, for traffic to be routed between Node 1 (See Figure 2) and the OC-3 system, the **21-Type OLIU** must be installed in **FUNCTION UNITS** group **A**, **B**, **C**, or **D**, slot **1** of Node 5 and **FUNCTION UNITS** group **A**, **B**, **C**, or **D**, slot **2(P)** of Node 4. This is required because traffic entering Node 5, slot **FN-A-1** from the OC-3 shelf is automatically connected to the **MAIN-B-1 OLIU** when cross-connections are made. Traffic entering slot **FN-A-2(P)** is automatically connected to the **MAIN-B-2 OLIU**.

In single homing configurations (Figure 7), the **21-Type OLIU** in **FUNCTION UNITS** group **A**, **B**, **C**, or **D**, slot **1** of the OC-12 shelf must be connected to the **MAIN-1 OLIU** in the OC-3 shelf. The **21-Type OLIU** in **FUNCTION UNITS** group **A**, **B**, **C**, or **D**, slot **2(P)** of the OC-12 shelf must be connected to the **MAIN-2 OLIU** in the OC-3 shelf.

Use the **`rtrv-eqpt:`** command at each node in the network to verify that each shelf is properly equipped for the service being established. Ensure that **OLIU** circuit packs are installed in the correct slots in the host OC-12 nodes.

7. ⇒ NOTE 1:
Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections in DDM-2000 OC-3. Only STS-1 cross-connections are allowed in DDM-2000 OC-12. In an OC-3 shelf, use VT1.5 cross-connections for DS1 services if you expect to cross-connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at an OC-3 shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group [see **`ent-crs-sts1`** command].

⇒ NOTE 2:
The following commands may be used to delete, enter, and retrieve cross-connections: **`dlt-crs-vt1`** (OC-3 only), **`dlt-crs-sts1`**, **`ent-crs-vt1`** (OC-3 only), **`ent-crs-sts1`**, **`rtrv-crs-vt1`** (OC-3 only), and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of each system manual for a description of commands.

NOTE 3:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All terminating drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, either all VT1.5 or STS-1.

2. If all 28 VT1.5s (DS1s) in an STS-1 are being passed through at a node in a VT1.5 path-switched ring, then the cross-connection may be provisioned as either a pass-through STS-1 or VT1.5. However, if you anticipate dropping VT1.5s from the pass-through node in the future, you should provision the pass-throughs as VT1.5 cross-connections. Provisioning now as a VT1.5 cross-connect will avoid a hit on traffic if the STS-1 cross-connect has to be converted to 28 VT1.5 cross-connects to drop DS1s at a later time.

3. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order or circuit order, determine the cross-connections [STS-1 or VT1.5] to be made at each node [pass-through, terminating (drop), and host OC-12 node(s)] associated with the kind of service being established.

8. Starting at one of the terminating nodes for the DS1/STS1 circuit being established, use the **`rtrv-crs-( ):`** command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS1 #1 low speed port in the **DS1** circuit pack in slot #2 of **LOW SPEED GROUP B** (b-2-1) is to be connected to timeslot m-1-2-1 and the **`rtrv-crs-vt1`** command shows that the cross-connection is already established, you should determine from office records if this port is already in-service before continuing with this procedure.

If cross-connections are already assigned or improperly assigned, refer trouble to the organization responsible for facility design. Improperly assigned cross-connections may have to be deleted using the **dlt-crs-( )** commands.

9. ⇒ NOTE:
   Channel state provisioning provides IS, AUTO, and NMON states for VT/STS1 channels similar to the port states for DS1 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

   At all nonterminating pass-through nodes in the network, use the **ent-crs-vt1:** or **ent-crs-sts1:**) command to provision pass-through connections. [For example, to make the DS1 pass-through cross-connection for channel m-1-2-1 in other OC-3 shelves, use the **ent-crs-vt1:m-1-2-1,m-1-2-1:cct=twoway** command. To make pass-through cross-connections for STS-1 #1 in an OC-12 shelf, use the **ent-crs-sts1:m-1,m-1:cct=twoway** command.]

10. At both terminating (drop) nodes of the circuit being established, use the **ent-crs-( ):** command to make the terminating cross-connections (for example at the OC-3 node in Figure 5, **ent-crs-vt1:m-1-2-1,b-2-1:cct=twoway**)

11. At the host OC-12 ring node sites, make proper cross-connections. For example, in Figure 5 at Node 5, if STS-1 channel #1 from the OC-3 **MAIN-1 OLIU** is to be cross-connected to STS#1 in the OC-12 **MAIN-B-1 OLIU** then the command **ent-crs-sts1:mb-1,a-1:cct=twoway** would be used to make the cross-connection.

12. Use the **rtrv-crs-vt1:** or **rtrv-crs-sts1:** command to verify that the proper connections have been made. If an improper cross-connection is made, use the **dlt-crs-vt1:** or **dlt-crs-sts1:** command to delete the improper cross-connection and reenter the cross-connection.

13. At terminating nodes equipped with **BBG11/BBG11B 3DS3** circuit packs, use the **set-trace-sts1** command to verify the proper cross-connect path of a STS-1 cross-connected STS-1 signal.

    Reference: **DLP-558**

14. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

15. If `ne-acty`, `inc. VT AIS`, `inc. STS1 AIS`, `inc. VT unequipped`, or `inc. STS1 unequipped` alarms are present, look for missing or improperly made cross-connections. Use **TAP-119** to locate missing cross-connections, if required.

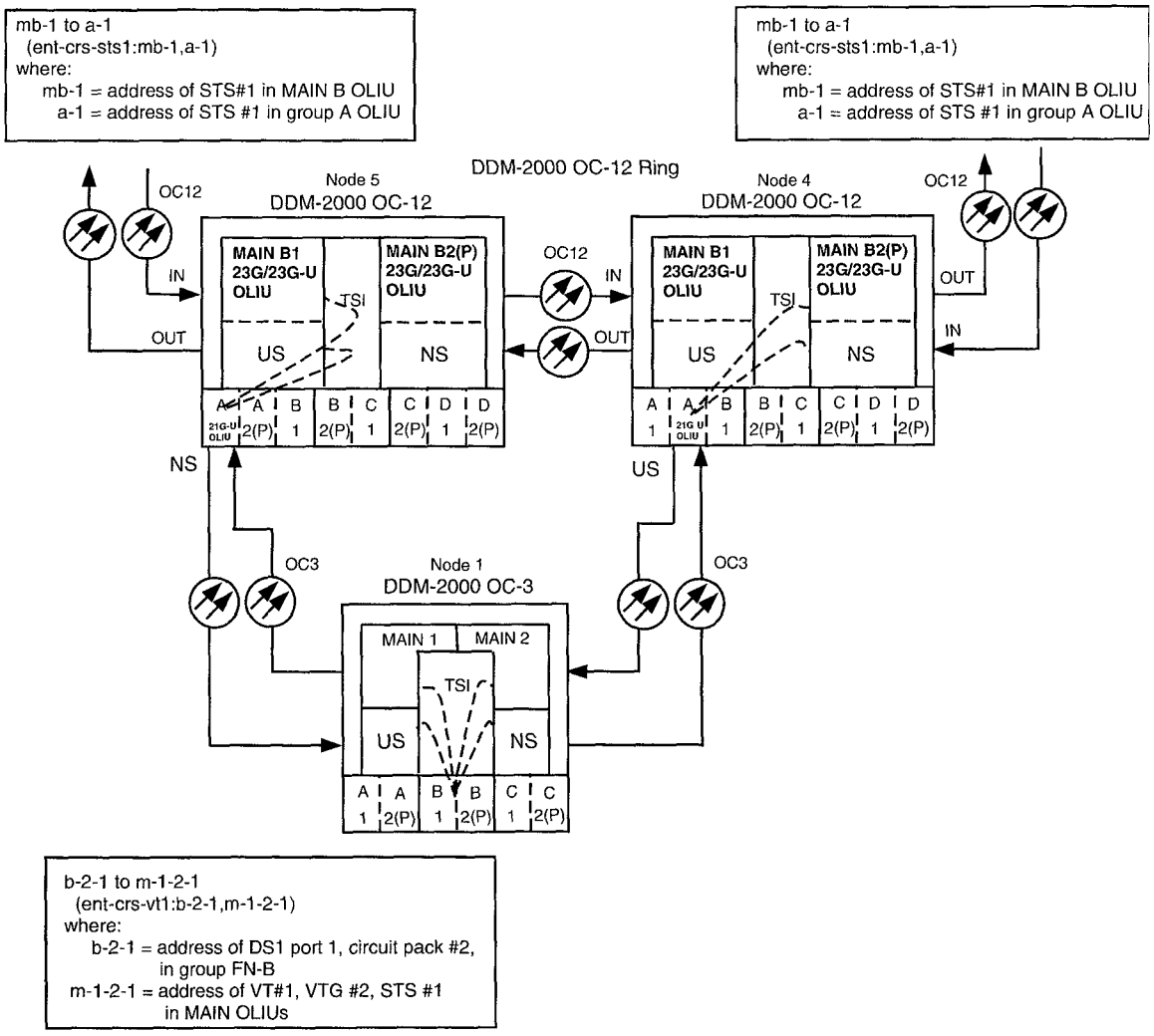


Figure 5. Example of Dual Homing OC-12/OC-3 Cross-connections

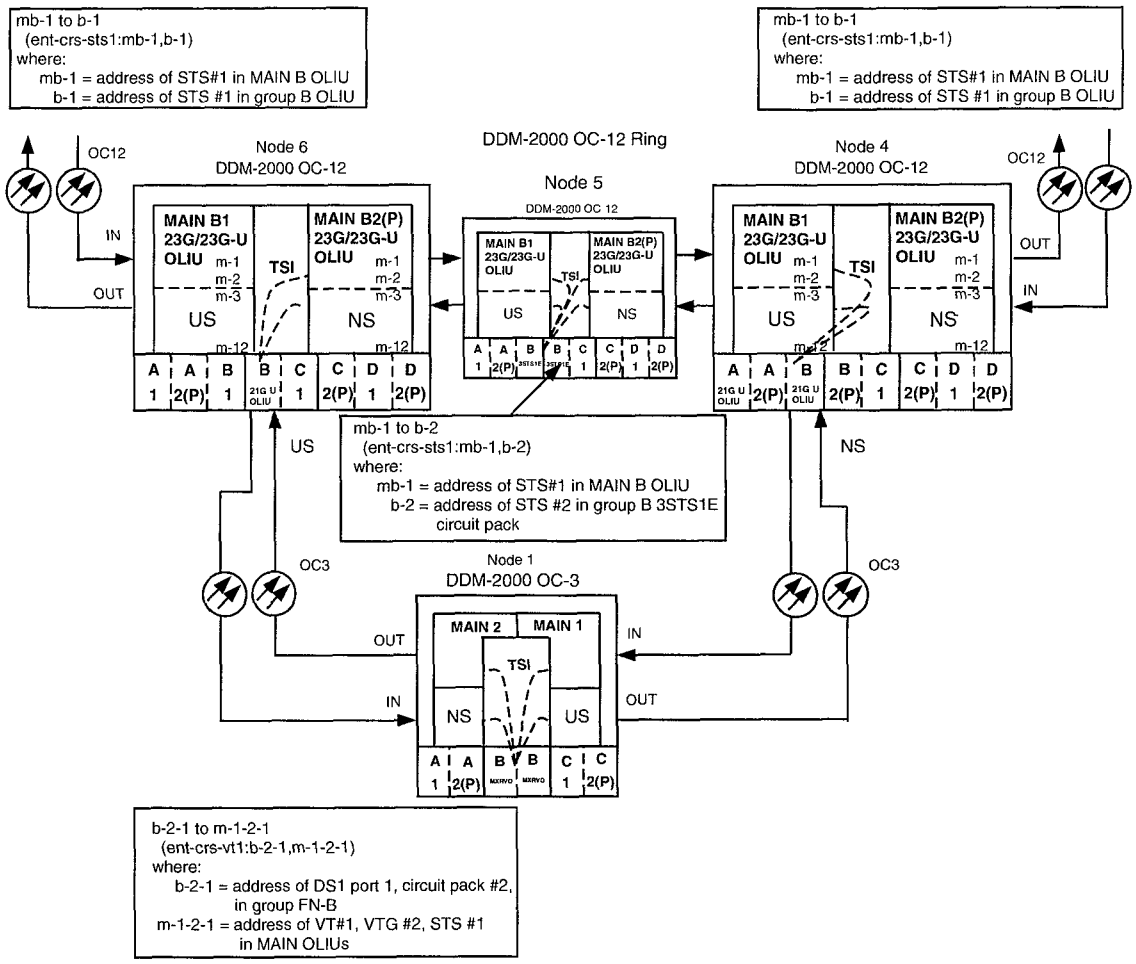


Figure 6. Example of Dual Homing OC-12/OC-3 Cross-connections

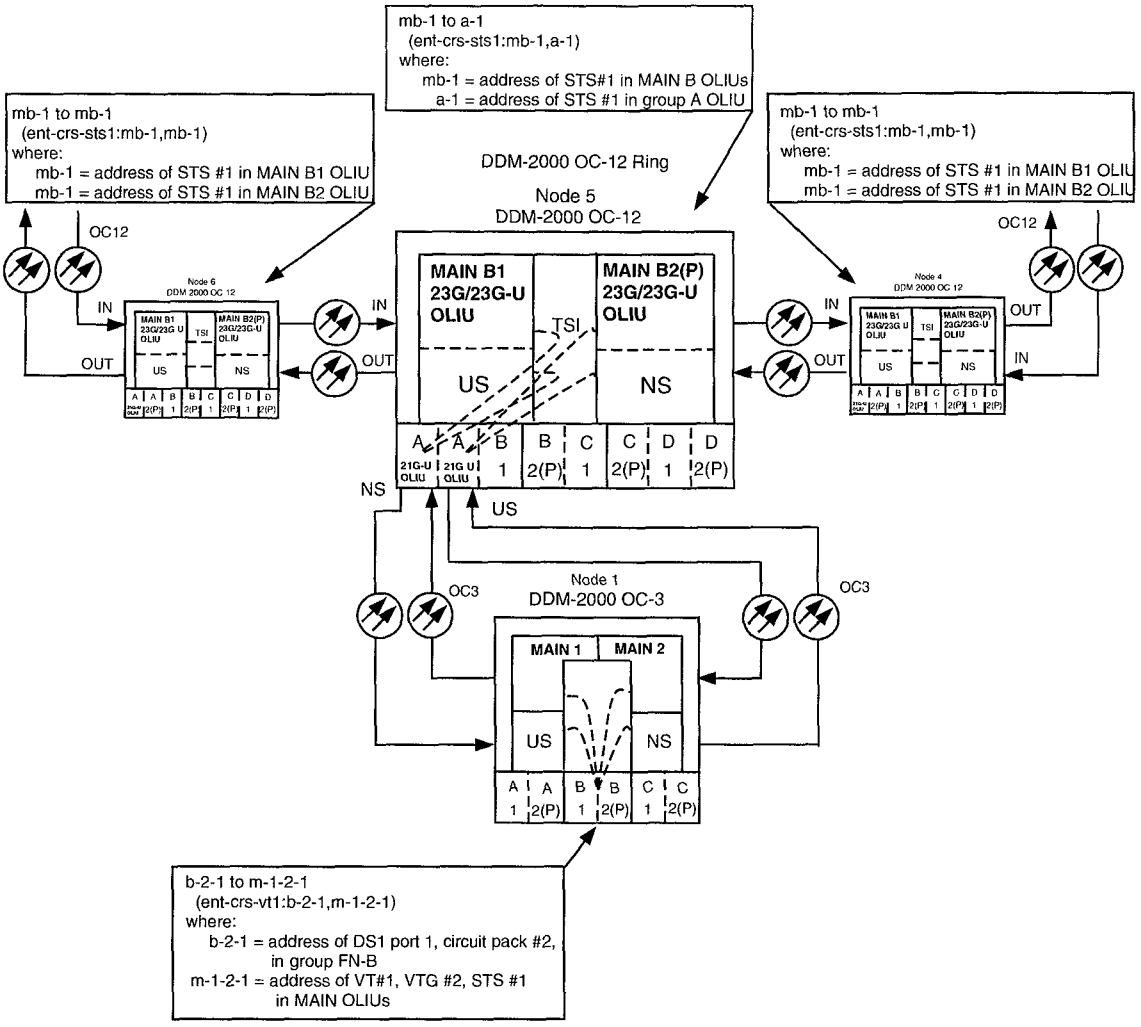


Figure 7. Example of Single Homing OC-12/OC-3 Cross-connections

Remove –48 V DC User Panel Fuse

1. Obtain multimeter capable of measuring DC voltage in the 40 to 60 volt range.

2. ⚠ WARNING:
   –48 V DC is present in the fuse holders and the P1 and P2 power connections at rear of User Panel.

   ⚠ CAUTION:
   If system is in service, service interruption will occur if both fuses are removed or both power feeders are disconnected. Do not remove any User Panel fuse that does not indicate blown without first verifying that –48 V is present on the other incoming power feeder.

   Does fuse indicator indicate blown fuse?

   If **YES**, then continue with **Step 3**.
   If **NO**, then proceed to **Step 7**.

3. Replace –48 V blown fuse.

4. Did fuse blow again?

   If **YES**, then continue with **Step 5**.
   If **NO**, then proceed to **Step 7**.

5. Trouble in User Panel or backplane connector. If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions. If User Panel needs to be replaced, see **DLP-550**.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. ⚠ CAUTION:
   Before removing a fuse that does not have a failure indicator activated, you must first verify that –48 V is available to the shelf through the fuse that is not going to be removed.

   Remove the **SYSCTL**, then the **OHCTL**.

8. Refer to Figures 1 and 2 for the ED-8C727-30, G1 or G4 shelf.
   If fuse **FA** is being removed, verify that –48 V DC is present between pin **3** (positive lead) and pin **4** (negative lead) of **P2**.

   If fuse **FB** is being removed, verify that –48 V DC is present between pin **2** (positive lead) and pin **1** (negative lead) of **P2**.

   Requirement: Voltage must be between –40.00 V and –60.0 V DC

9. Was requirement met?

   If **YES**, then continue with **Step 10**.
   If **NO**, then proceed to **Step 13**.

10. Reinstall **SYSCTL** and **OHCTL**.

11. You can safely remove one fuse as required, if power is maintained to the shelf through the other fuse.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. Trouble in User Panel, power feeder(s), or office battery distribution. If you need assistance, notify your supervisor, your local technical support organization, or call Lucent Technologies RTAC, per local operating instructions. If User Panel needs to be replaced, see **DLP-550**.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

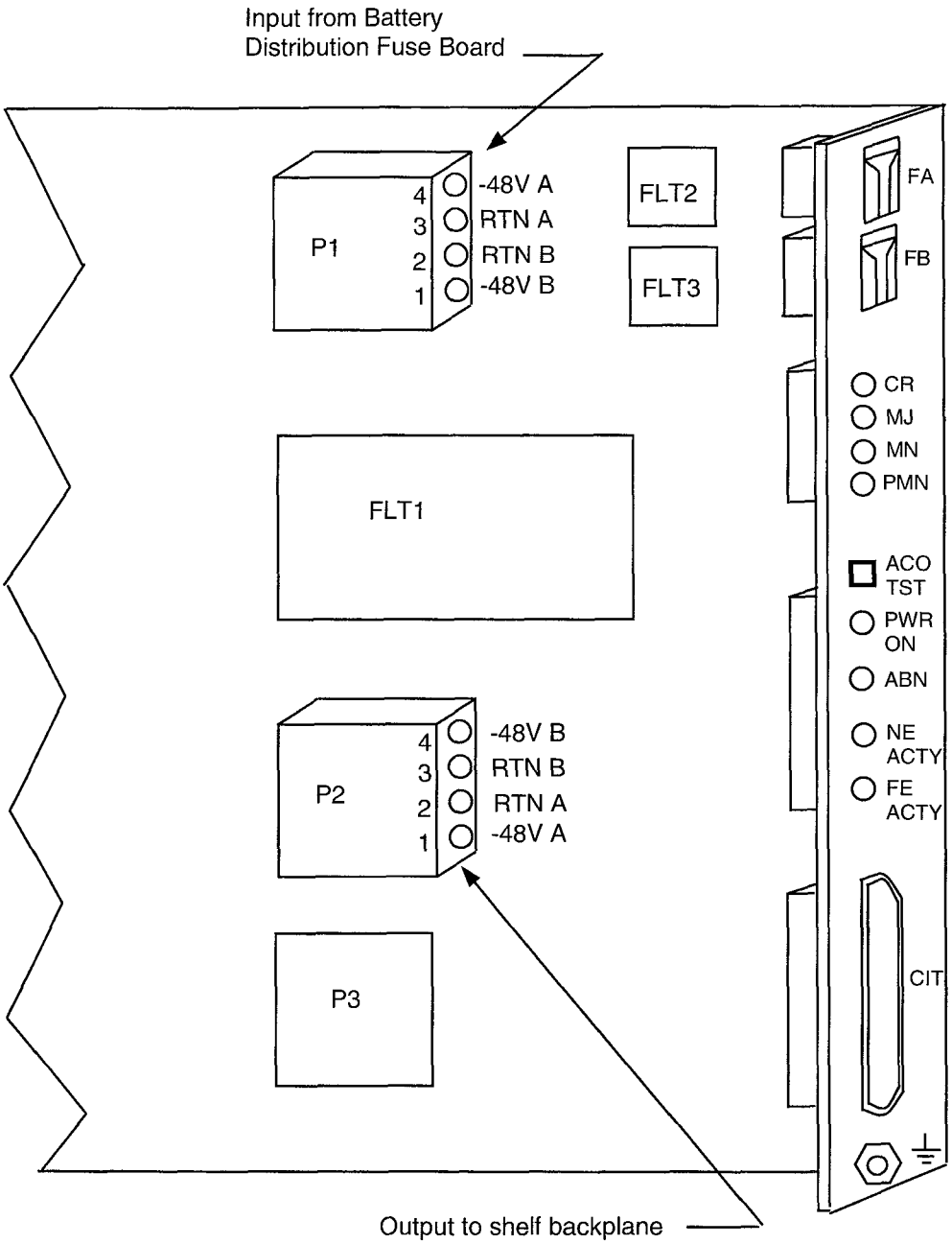


Figure 1. ED-8C727-31, G1 User Panel for ED-8C727-30, G1 DDM-2000 OC-12 Shelf

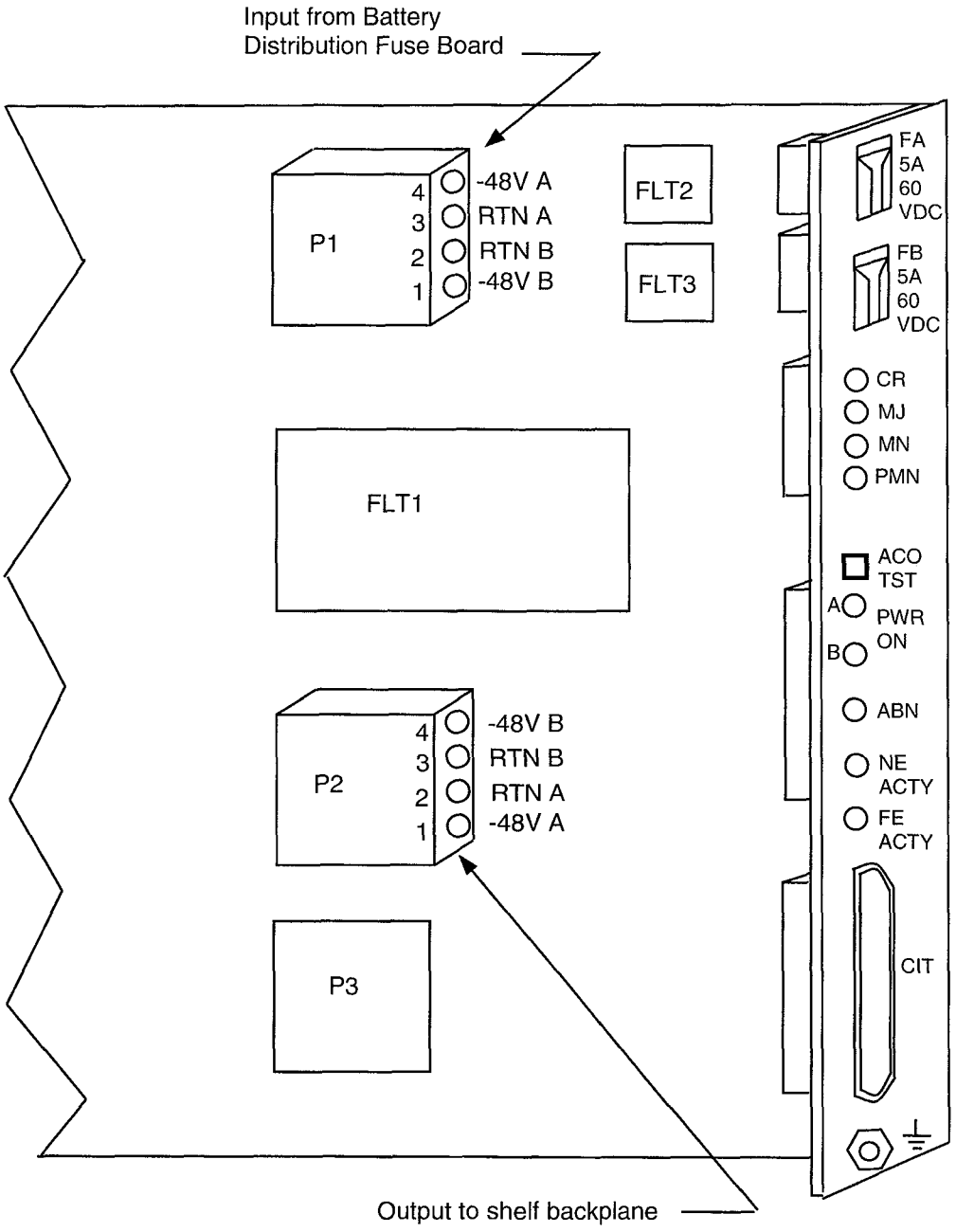


Figure 2. ED-8C727-31, G2 User Panel for ED-8C727-30, G4 DDM-2000 OC-12 Shelf

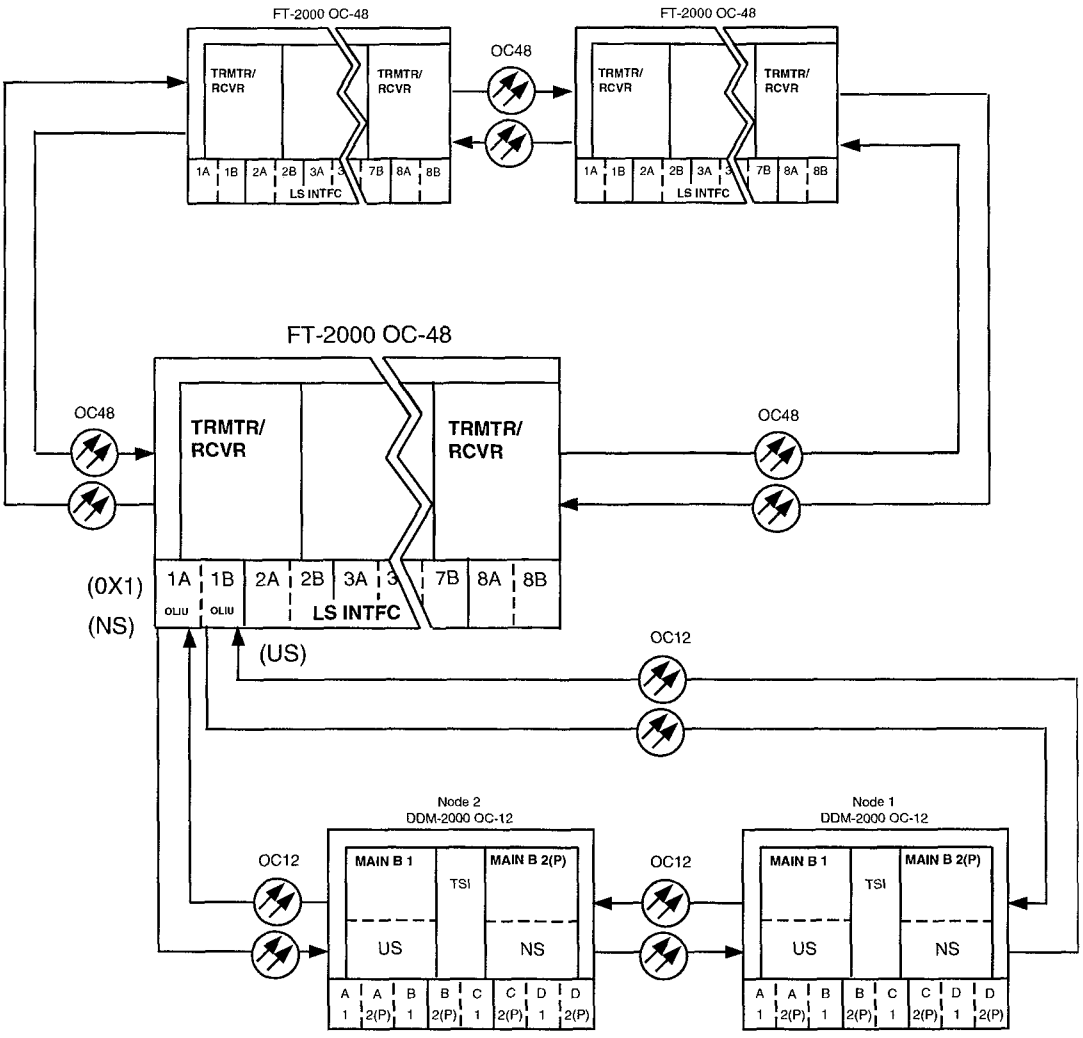
Make Cross-Connections Using CIT Single/Dual Homing and OC-12 Extensions OC-12/OC-48 Configuration

1. NOTE 1:
   If you are not familiar with doing cross-connections using the CIT commands, it is strongly suggested that you read *Cross-Connection Provisioning* in the "Administration and Provisioning" section of this manual and the appropriate documentation in the FT-2000 User/Service Manual. Also, read the description of the following commands in the "Commands and Reports" section of this manual and the DDM-2000 OC-12 manual: **`ent-crs-sts1`**, **`rtrv-crs-sts1`**, and **`dlt-crs-sts1`**.

   NOTE 2:
   You will have to login to more than one node in each ring to get a complete map of the network using the **`rtrv-map-network`** and **`rtrv-map-neighbor`** command. If a drawing of the network is not provided with the work order, it is recommended that you draw a simple schematic of the network before making cross-connections.

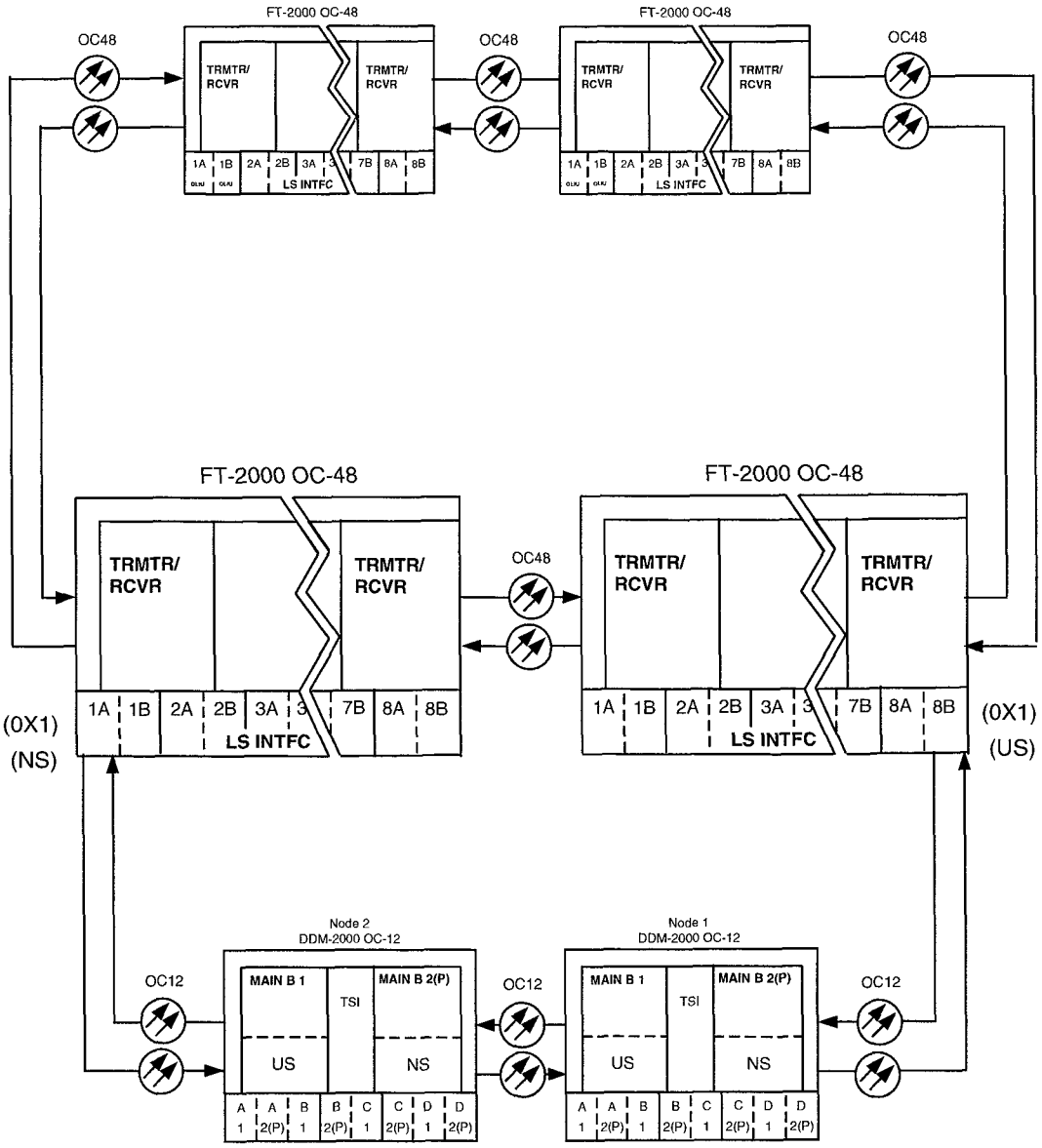
   Make a simple drawing of the network and list the TID of each node and how they are connected to each other. Figures 1 and 2 show examples of simple schematics.

2. Log into any node in each ring in the network and use the **`rtrv-map-network`** and/or **`rtrv-map-neighbor`** command to retrieve a map of the network which lists all the systems and how they are connected to each other.



DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)							
23-Type OLIUs (Rings Application)	**MAIN-B-1** dcc-m1	**MAIN-B-2** dcc-m2	**21-Type OLIUs (1+1)**	**FN-A** dcc-a	**FN-B** dcc-a	**FN-C** dcc-c	**FN-D** dcc-d
	US	NS		NS	NS	NS	NS

Figure 1. Sample Single Homed Network Schematic



DDM-2000 OC-12 DCC Network Side (NS)/User Side (US) Defaults (set-fecom:nsus=ns/us)

23-Type OLIUs (Rings Application)	MAIN-B-1 dcc-m1	MAIN-B-2 dcc-m2	21-Type OLIUs (1+1)	FN-A dcc-a	FN-B dcc-a	FN-C dcc-c	FN-D dcc-d
	US	NS		NS	NS	NS	NS

Figure 2. Sample Dual Homed Network Schematic

3. Verify system configuration is same as specified on work order or circuit order.

4. ⇒ NOTE:
   Cross-connections consist of drop and pass-through connections. For example in Figure 3, drop connections are made at OC-12 Nodes 1 and 3. Pass-through cross-connections are made at Node 2 in the network. Also, cross-connections must be made in all interconnected rings, including other DDM-2000 OC-3 rings, DDM-2000 OC-12 rings, and the FT-2000 OC-48 rings, as required. See **`ent-crs-( )`** command in the Commands and Reports section of Volume 1 of this manual.

   From work order or circuit order, determine the terminating (drop) nodes for the service being established.

5. From work order, circuit order, and the sketch made in Step 1, determine the pass-through nodes for the service being established.

6. From work order or circuit order, determine the host OC-48 node(s) that connects to the OC-12 ring(s) or extensions.

7. Use the **`rtrv-eqpt:`** command at each node in the network to verify that each shelf is properly equipped for the service being established. Ensure that **OLIU** circuit packs are installed in the correct slots in the host OC-48 nodes.

8. ⇒ NOTE 1:
   Only STS-1 cross-connections are allowed in FT-2000 OC-48.

   ⇒ NOTE 2:
   The following commands may be used to delete, enter, and retrieve cross-connections: **`dlt-crs-sts1`**, **`ent-crs-sts1`**, and and **`rtrv-crs-sts1`**. See the "Commands and Reports" section of each system manual for a description of commands.

NOTE 3:
In ring configurations, you should use the following rules in establishing cross-connections in each ring:

1. All drop connections (including DRI, if present) from the same STS-1 timeslot must be provisioned the same, all STS-1.

2. On STS-1 path-switched rings, all nodes in the ring must be provisioned as STS-1 cross-connections.

From work order or circuit order, determine the STS-1 cross-connections to be made at each node [pass-through, terminating (drop), and host OC-48 node(s)] associated with the kind of service being established.

9. Starting at one of the terminating nodes for the STS-1 circuit being established, use the **`rtrv-crs-( ):`** command at each node in the ring to verify that the cross-connections specified on the work order or circuit order may be made. For example, if the DS3 #1 low speed port in the **3DS3** circuit pack in **FUNCTION UNITS B** (b-1) is to be connected to timeslot mb-4 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-( )`** commands.

10. ⇒ NOTE:
    Channel state provisioning provides IS, AUTO, and NMON states for VT/STS1 channels similar to the port states for DS1 ports. When a cross-connection is made to a point of termination the channel is in the AUTO state and alarming is disabled. The channel must receive a good signal from either ring to cause the channel to transition to in-service (IS).

    At all nonterminating pass-through nodes in the network, use the **ent-crs-sts1:**) command to provision pass-through connections. [For example, to make the DS3 pass-through cross-connection for channel mb-4 in other OC-12 shelves, use the **ent-crs-sts1:mb-4,mb-4:cct=twoway** command.]

11. At both terminating (drop) nodes of the circuit being established, use the **ent-crs-sts1:** command to make the terminating cross-connections at OC-12 nodes (for example at the OC-12 Node 3 in Figure 3 **ent-crs-sts1:mb-4,b-1:cct=twoway**)

12. At the host FT-2000 OC-48 ring node sites, make proper cross-connections.

13. Use the **rtrv-crs-sts1:** command to verify that the proper connections have 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.

14. At OC-12 terminating nodes equipped with **BBG11/BBG11B 3DS3** circuit packs, use the **set-trace-sts1** command to verify the proper cross-connect path of a STS-1 cross-connected STS-1 signal.

    Reference: **DLP-558**

15. After all cross-connections are made, use the **rtrv-alm:** command to verify no alarms are present.

16. If `ne-acty, inc. STS1 AIS`, or `inc. STS1 unequipped` alarms are present, look for missing or improperly made cross-connections. Use **TAP-119** to locate missing cross-connections, if required.

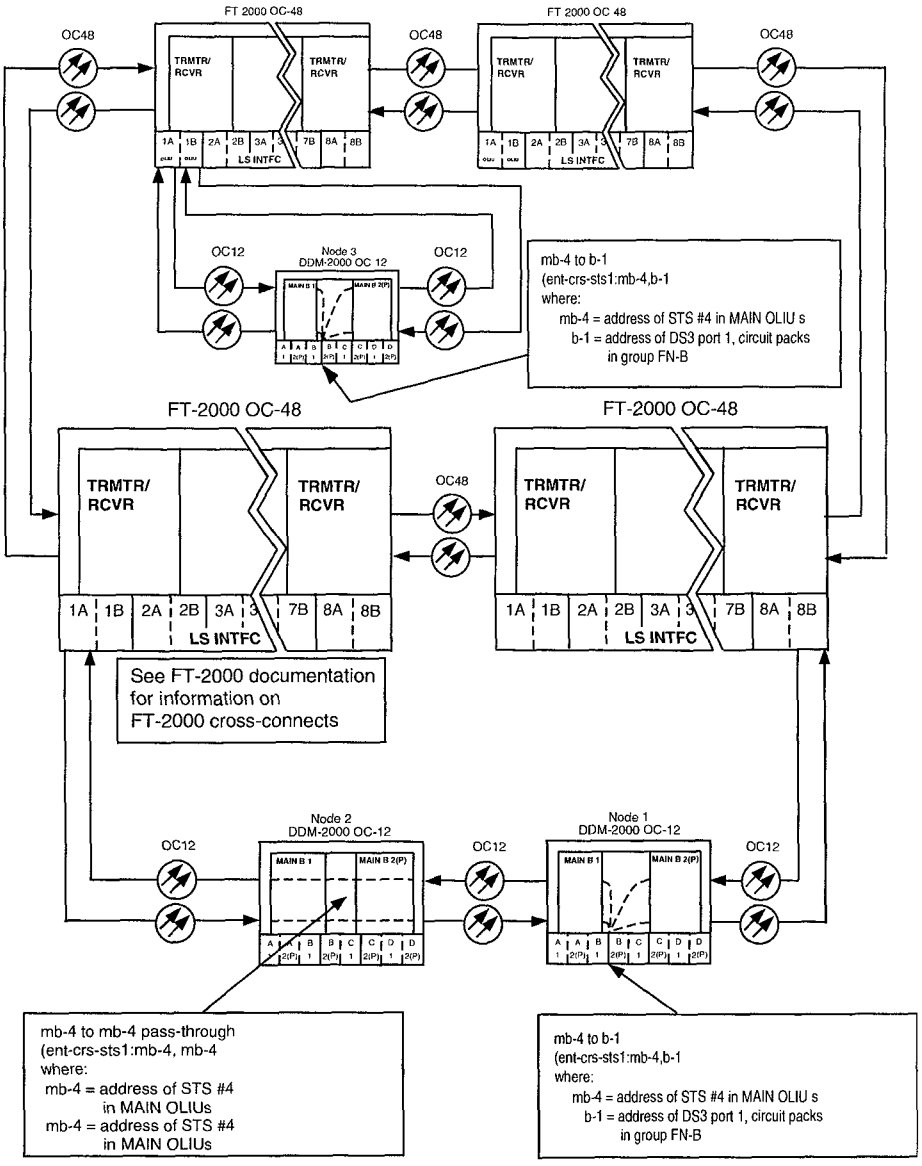


Figure 3. Example of Single/Dual Homing OC-12/OC-48 Cross-connections

Install BBG8 SYSCTL
New Shelf
Only BCP4 OHCTL Installed

1. NOTE:
   This procedure is used for installing the **SYSCTL** in a new shelf for the first time (initial shelf turnup, only **OHCTL** installed at this time). For procedures to replace an in-service **SYSCTL**, refer to **DLP-501**.

   Set **SYSCTL** switch **S1** sections **S1-1**, **S1-2**, and **S1-3** to **OFF**, **OFF**, **OFF**, respectively, to set the product (shelf) type. See Figure 1.

2. Set TBOS termination switch **S2** per Table A.

3. Set all **SYSCTL** switch **S2** sections **S2-2**,**S2-3**, **S2-4**, **S2-5**, **S2-6**, **S2-7**, and **S2-8** to **OFF**.

Table A. SYSCTL Switch 2 (S2)
TBOS Link Terminator

Shelf Position	Switch S2-1
Last	ON
Not Last	OFF

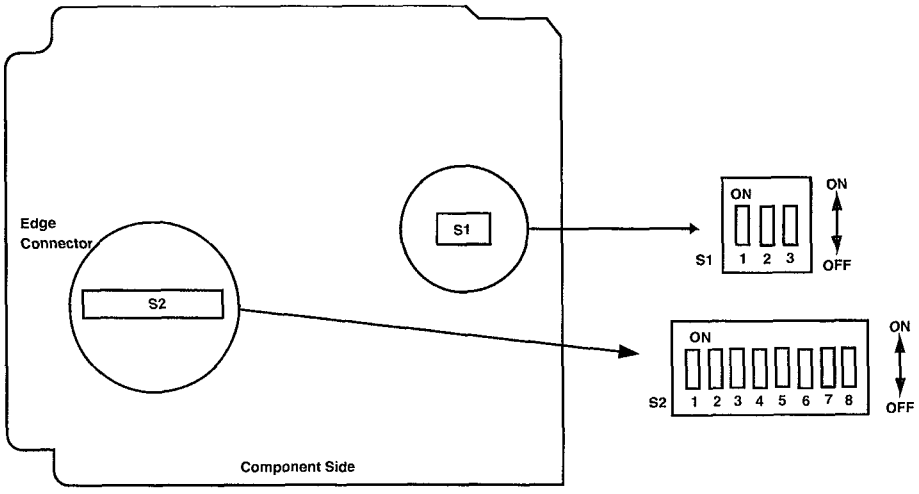


Figure 1. SYSCTL Option Settings

4. ⇒ NOTE:
   Both the **BBG8 SYSCTL** and **BCP4 OHCTL** must be installed for the controllers to function.

   Ensure the **BCP4 OHCTL** is installed.

   Reference: **DLP-500**

5. ⇒ NOTE:
   Steps 6 and 7 must be performed without unnecessary delays. Familiarize yourself with these steps before continuing with the procedure.

   Read Steps 6 and 7 before proceeding.

6. ⚠ CAUTION 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**.

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:
Ignore the **MJ**, **MN**, and **NE ACTY** LEDs on the User Panel.

Seat the **SYSCTL**.

If the following responses do not occur, proceed to **Step 8**.

Response: **FAULT** LED on **BBG8 SYSCTL** lights and **ABN** LED on the User Panel lights after approximately 5 seconds. **MJ** and **NE** may light or flash briefly. **FAULT** LED on the **SYSCTL** goes off after approximately 5 seconds. **ABN** LED goes off after approximately 15 seconds. Approximately 1 minute and 30 seconds after the **ABN** goes off, the **FAULT** LED on the **OHCTL** goes off and the **CR** alarm on the User Panel begins to flash.

7. Momentarily depress the **UPD/INIT** button on the **SYSCTL** while the **CR** LED is flashing (**you have 10 SECONDS** to do this).

If the following responses do not occur, continue with **Step 8**.

Response: **CR** LED on the User Panel stops flashing when the **UPD/INIT** button is pressed.

FAULT LED on **BCP4 OHCTL** and **ABN** LED on the User Panel are lighted after approximately 15 seconds. **ABN** goes off after approximately 30 seconds. Approximately 1 minute and 45 seconds after the **ABN** LED goes off, the **CR** alarm on the User Panel flashs again. **DO NOT** depress **UPD/INIT** pushbutton again when the **CR** alarm LED flashes.

8. ⇒ NOTE:
Compatible software must be installed in both the **BCP4 OHCTL** and the **BBG8 SYSCTL**. When the **OHCTL** and **SYSCTL** are installed for the first time, if software is not installed or if the software in the **SYSCTL** is not compatible with software in the **OHCTL**, the letter **P** or **d** will be displayed in the **FE ID** display. Displayed letters or conditions indicate 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**. 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.

c. The letter **d** displayed in the **FE ID** display indicates the **OHCTL** has no software or that the software in the **OHCTL** and **SYSCTL** is incompatible.

d. The letter **U** displayed in the **FE ID** display indicates that **SYSCTL** Switch **S1** is not set properly for the type of shelf being equipped. Repeat this procedure from Step 1.

e. The letter **E** displayed in the **FE ID** display indicates that the **SYSCTL** must be replaced. Replace the **SYSCTL** and repeat this procedure.

f. The letter **F** displayed in the **FE ID** display indicates that the **SYSCTL** faceplate latch is not fully latched. Latch the faceplate. (A reset occurs after the faceplate is latched.)

g. A flashing letter **L** displayed in the **FE ID** display indicates a low voltage condition (brownout) on the shelf. Use **TAP-111** to clear brownout condition.

Did the letter "**P**" or "**d**" appear in the **FE ID** display?

If **YES**, then continue with **Step 9**.
If **NO**, then proceed to **Step 11**.

9. Find circuit packs with compatible software and repeat this procedure, or install new software using the procedures of **DLP-527**.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Retrieve generic software version ID by depressing the **ACO** button longer than 2 seconds and observing version code on the **FE ID** display. 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**.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Provision STS-1 Path Trace

OVERVIEW: This procedure is used to provision the transmit and receive path trace fields of an STS cross-connected STS-1 signal. Path trace is only applicable to STS paths terminating to a **BBG11/BBG11B 3DS3** circuit pack because it is an STS-1 terminating device. This procedure can be performed from any network element in a DDM-2000 OC-12 network. See the "Commands and Reports" section in Volume 1 of this manual for additional information on the **`set-trace-sts1`** and **`rtrv-trace-sts1`** commands.

1. If required, condition the CIT and connect it to the local DDM-2000 network element.

   Reference: **DLP-516**

2. From office records, determine which DDM-2000 OC-12 network elements are the source and destination terminating network elements for the STS-1 path(s) to be traced.

3. ⇒ NOTE:
   When performing this test, one DDM-2000 terminating shelf will be referred to as the near end and the other terminating shelf as the far end. These designations are arbitrary; either shelf can be the near-end or the far-end shelf.

   Establish a login to the near-end terminating shelf.

4. Use the command **`rtrv-crs-sts1`** to determine the address of the STS-1 drop at each terminating location.

5. ⇒ NOTE 1:
   The path trace string may be up to 62 character long. The transmit (*trc*) and receive (*exptrc*) strings should be different within the same location; however, the *exptrc* from one location must identically match the *trc* at the other location.

   ⇒ NOTE 2:
   Trace strings are case sensitive. Be sure to match capitals and lower case entries in the trace (*trc*) message at the near-end with the expected trace (*exptrc*) message at the far-end.

   From office records, determine the path trace character string for each STS-1 path to be traced (path is between the source and destination network elements).

6. Use **set-trace-sts1:** *address*:**exptrc=***ExpectedIncomingPathTrace*,**trc=***OutgoingPathTrace* command to provision the near-end Expected Incoming Path Trace (*exptrc*) string and near-end Outgoing Path Trace (*trc*) string.

7. Establish remote login to the far-end STS-1 terminating network element.

   Reference: **DLP-517**

8. Use **set-trace-sts1:** *address*:**exptrc=***ExpectedIncomingPathTrace*,**trc=***OutgoingPathTrace* command at the far-end to provision the Expected Incoming Path Trace (*exptrc*) string the same as you did for the *trc* string at the near-end terminating element. Provision the Outgoing Path Trace (*trc*) string the same as you did for the *exptrc* string at the near-end terminating element.

9. Use **rtrv-trace-sts1:***address* command to retrieve the provisioned transmit and receive path trace strings for the STS-1 channel being tested.

10. Did the `STS-1 Path Trace Report` indicate `Status: GOOD`?

    If **YES**, then proceed to **Step 14**.
    If **NO**, then continue with **Step 11**.

11. Did the `STS-1 Path Trace Report` indicate `Status: MISMATCH`?

    If **YES**, then proceed to **Step 13**.
    If **NO**, then continue with **Step 12**.

12. Indications are that there is no incoming path trace message (`Status: UNAVAILABLE`). Verify that both terminating nodes are using **BBG11/BBG11B DS3** circuit packs. Verify cross-connections and terminating addresses at all nodes. Repeat this test from Step 9.

13. Indications are that the Incoming Path Trace string message (`INCTRC`) does not match the Expected Path Trace string message (`EXPTRC`) — (`Status: MISMATCH`). Verify that the path string entered as the Expected Incoming Path Trace (`EXPTRC`) at this node matches exactly the Outgoing Path Trace string (`TRC`) entered at the other terminating node. circuit packs. Verify cross-connections and terminating addresses at all nodes. Repeat this test from Step 9.

14. Has the **`rtrv-trace-sts1:`***`address`* command been performed at both terminating ends?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with **Step 15**.

15. Log out of remote location. Repeat this test from Step 9. for the other terminating end.

Establish New Alarm Group
System In-Service

OVERVIEW: This procedure establishes a new alarm group in an in-service system. It requires that a new AGNE be designated and new alarm group numbers be assigned to associated network elements. See the "Commands and Reports" section in Volume 1 of this manual for additional information on the **set-ne** command.

1. If required, condition CIT and connect it to the local DDM-2000 network element.

   Reference: **DLP-521**

2. Use the **rtrv-map-network** command to display all network elements that are a part of this network (associated with the same DSNE). Note the various *Alarm Group* numbers associated with each network element.

3. One at a time, log into a shelf in each alarm group that exists now and use the **rtrv-alm** command to verify that no alarms exist in any alarm group. If any alarms exist, they must be cleared before establishing a new alarm group.

4. ⇒ NOTE:
   All network elements in the same alarm group must have the same alarm group number (**almgrp=***1* through *255*).

   From office records or work order, determine which DDM-2000 network element will be the new AGNE for the new alarm group. Determine new alarm group number (1-255) for the new AGNE and each associated network element.

5. From office records or work order, determine which DDM-2000 network elements will be in the same alarm group (*almgrp*) with the new AGNE.

6. Use **set-ne:tid=***tid*,**agne=***yes*,**almgrp=***1* through *255)* command to designate the new AGNE and its alarm group number.

7. ⇒ NOTE:
   Other network elements of the same alarm group may be provisioned as backup AGNEs if required.

   At each network element in the new alarm group, use **set-ne:tid=***tid*,**agne=***yes* or *no*,**almgrp=***1* through *255* command to assign the new alarm group number.

8. Wait a few minutes, then verify that alarms are clear. Use the **rtrv-map-network** command to verify that all required network elements have been changed to the new alarm group.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Sync Messaging
Change Kbyte to Sbyte

1. ⇒ NOTE:
   This procedure may be used to change Kbyte sync messaging to Sbyte sync messaging.

   Use **rtrv-alm** command to verify that there are no alarms or protection switches present on the system.

2. ⇒ NOTE 1:
   To minimize the amount of time that DDM-2000 shelves are in holdover mode when upgrading a ring network from Kbyte to Sbyte messages, it is recommended that you first upgrade the node(s) farthest away from the external timing source, then proceed to nodes closer to the timing source. For example, if all the line timed nodes in the network shown in Figure 1 had their *Sync Source (src)* set to *main-b-1*, the farthest node from the external timing source would be Node D.

   ⇒ NOTE 2:
   Note that in Figure 2, if Node B is changed to Sbyte first, then Node C will go into holdover. Note that in Figure 3, if Node D is changed to Sbyte first, then Node C and Node B, none of the nodes will go into holdover.

   Use the **rtrv-sync/set-sync** command at each node in the network to display/set the synchronization source.

3. Use **rtrv-oc12/set-oc12:** command to verify/enable sync messaging (kbyte) at each node.

4. Determine the farthest node from the external timing source.

5. Use **set-oc12:syncmsg=***Sbyte* command to enable Sbyte sync messaging at each node, starting from the node furthest from the external timing source.

6. Use the **rtrv-sync** command to display the provisioning and operational information of the synchronization interface.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

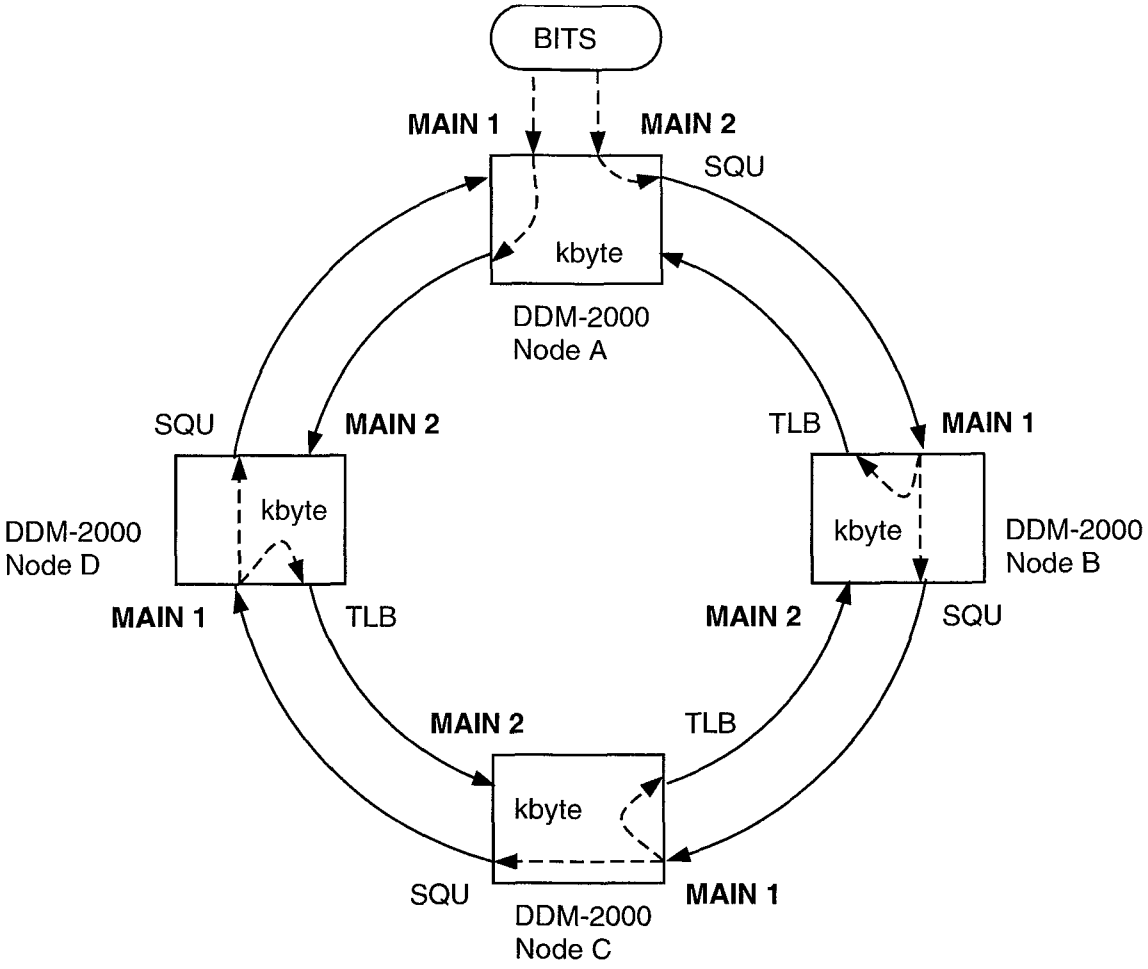


Figure 1. Normal OC-12 Ring Using Kbyte Messaging

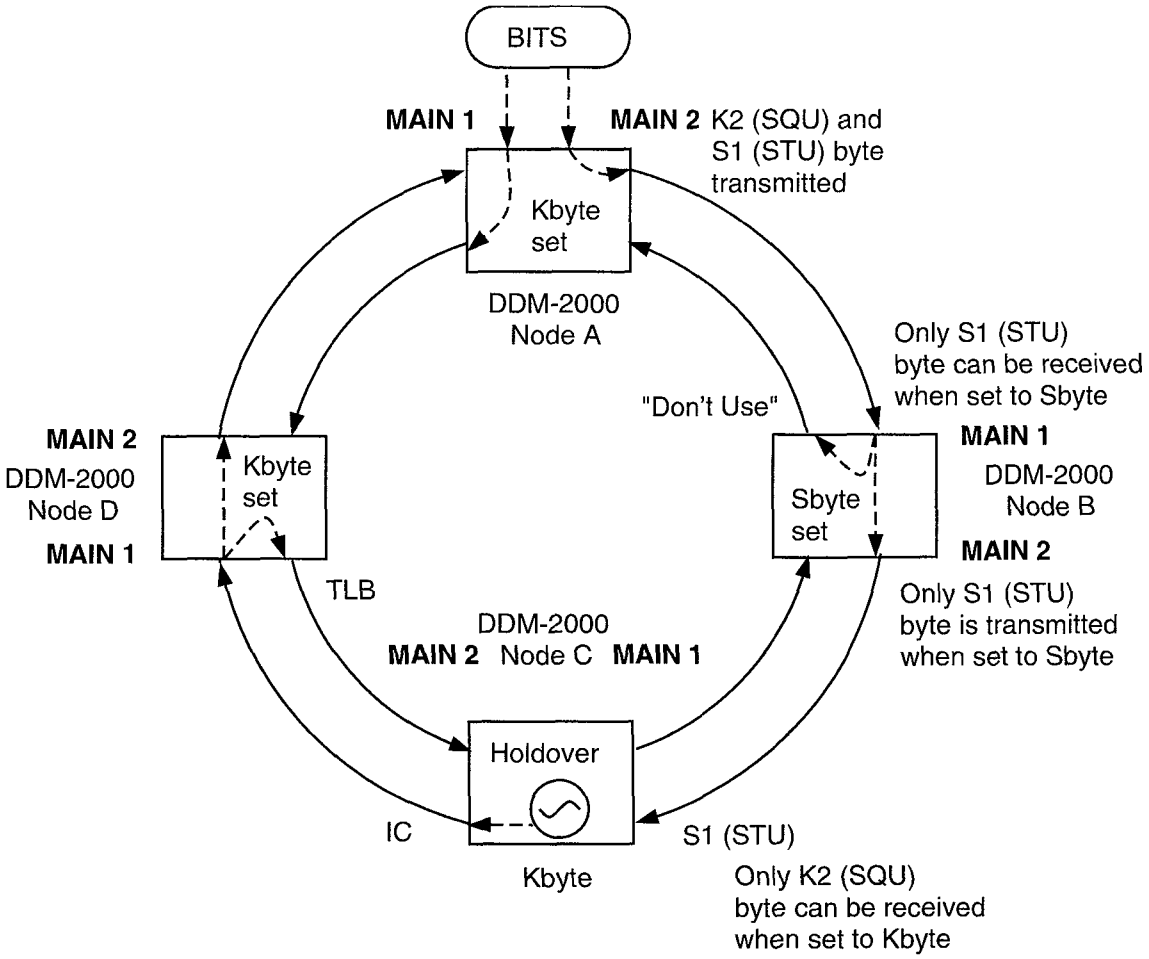


Figure 2. Abnormal Sequence of Changing Kbyte to Sbyte - One Node in Holdover

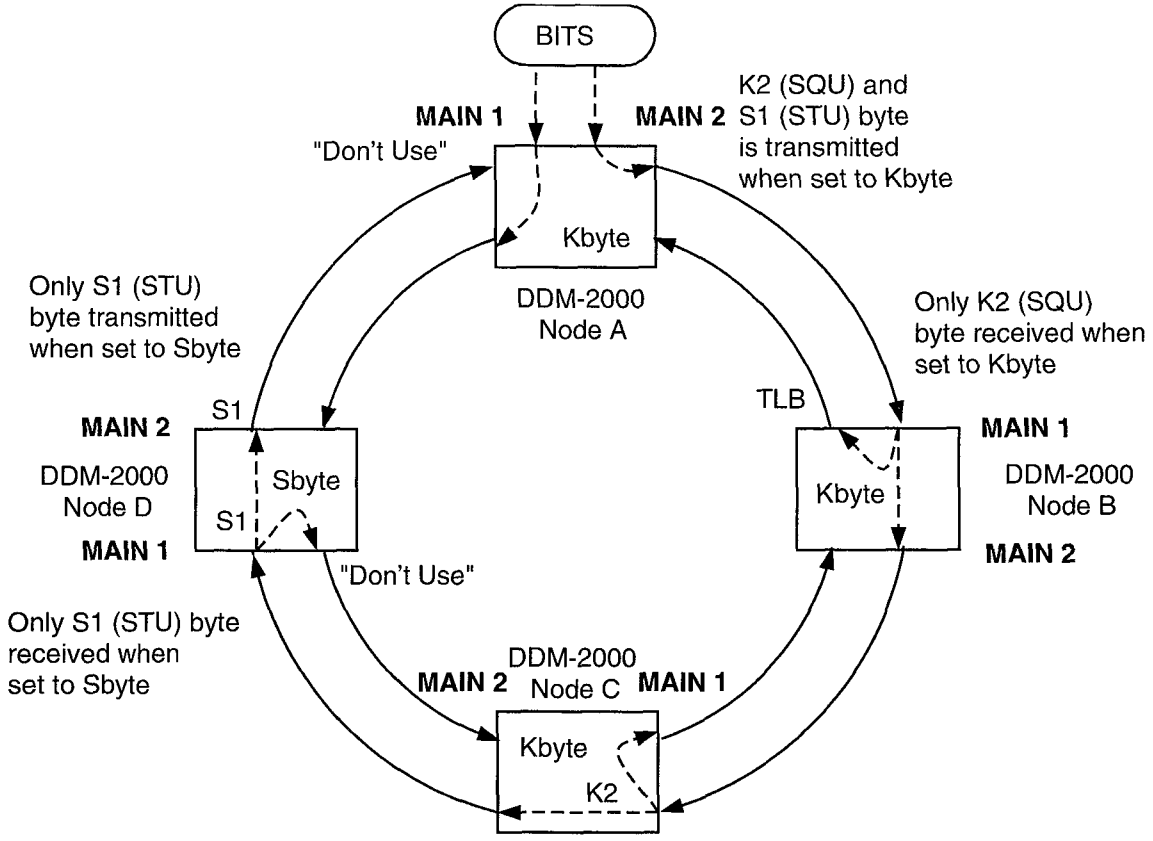


Figure 3. Normal Sequence of Changing Kbyte to Sbyte